Re: FOIA/PA-2012-0220

Group D

RECORDS BEING WITHHELD IN PART

NO.	DATE	DESCRIPTION/ (PAGE COUNT)
1.	Undated	Overview of Segmentation Process, 26 pages/(EX. 6)
2.	Undated	UFSAR/UFHA/DSAR Change Request Notice D0044657, 4 pages/(EX. 6)
3.	Undated	UFSAR/UFHA/DSAR Change Request Notice D0044659, 4 pages/(EX. 6)
4.	Undated	AREVA NP Inc, Engineering Information Record, 46 pages (EX.4, EX. 6)
5.	Undated	San Onofre Nuclear Generating Station, Unit 2, March 6, 2012, Reason for Tube Plugging, 3 pages/(EX. 6)
6.	Undated	Test Plan for In-Situ Pressure Testing, 5 pages (EX. 6, EX.4)
7.	5/18/10	Email from Greg Werner to R4DRS-PBS2, Subject: FW: SONGS Unit 3 Refueling Outage Date Change, Portions are marked Outside of Scope, 2 pages (EX. 6)
8.	10/18/10	AREVA NP Inc Engineering Information Record, 70 pages/(EX. 6, EX. 4)
9.	1/18/11	Engineering Change Package ,49 pages (EX. 6)
10.	5/20/11	San Onofre Nuclear Generating Station Steam Generator Replacement Project, 27 pages (EX.6)
11.	6/7/11	Email from Louis Carson to James Shepherd, Subject: FW: SONGS - - S/G Segmentation, 50.59 evaluations/screenings, DSAR & UFSAR changes, 2 pages (EX. 6)
12.	6/7/11	Email from Louis Carson to Natasha Green, Subject: FW: SONGS - - - Effluent Evaluation for S/G Segmentation, 1 page (EX.6)
13.	6/7/11	Email from Louis Carson to Natasha Green, Subject: FW:

		SONGS - - S/G Segmentation pictures, 7 pages (EX. 6)
14.	1/5/12	Email from David Axline to Isaac Anchondo, Subject: NRC ISI Inspection data request-Steam Generator, with Attachment (Raw Data From CD) 55 pages (EX. 4, EX. 6)
15.	2/14/12	Email from Mike Russell to Natasha Greene...John O'Donnell, Subject: This Week at SONGS, 1 page (EX. 6)
16.	2/15/12	Email from Mike Russell to Louis Carson...John O'Donnell, Subject: Wednesday at San Onofre, 1 page (EX. 6)
17.	2/15/12	Email from Mike Russell to Louis Carson...John O'Donnell, Subject: Fw:Important Station Update, 2 pages (EX. 6)
18.	2/16/12	Email from Greg Werner to Emmett Murphy...Jim Melfi, Subject: FW: SONGS U2/3 Steam Generator Status Reports, 4 pages (EX. 6)
19.	2/21/12	Email from David Axline to Emmett Murphy, Subject: SONGS SG Update, 1 page (EX. 6)
20.	2/24/12	Email from Linda Conklin to Isaac Anchondo, Subject: RE: Agenda for SONGS 2/24 SG phone call, 4 pages (EX 6)
21.	2/27/12	Email from Isaac Anchondo to NRC at SONGS, Subject: RE: NN 201854749, EX. 6, EX. 5 (Predecisional) 21 pages
22.	2/29/12	Email from Isaac Anchondo to David Axline, Subject: RE: SG secondary inspection videos, EX. 6, EX. 5 (Predecisional) 1 page
23.	2/29/12	Email from Ryan Treadway to John Reynoso, Subject: SONGS CMOA Presentation, EX. 4, EX. 6, 101 pages
24.	3/6/12	Email from David Axline to Isaac Anchondo, Emmett Murphy; Subject: Fw: U3 Tube Wear Photos, 165 pages including Raw Data on CD, Ex. 6, Ex. 4
25.	3/7/12	Email from Randy Lantz to Randy Hall...James Drake, Subject: FW: SONGS Unit 3 In Situ testing schedule, Ex. 6, 1 page
26.	3/8/12	Email from Randy Hall to Greg Werner...Jim Melfi, Subject: FW: Handouts for NRC In-Situ Pressure Test Call, Suggest Portions marked for Ex. 6, EX. 4, 24 pages
27.	4/20/12	Email from Greg Werner to Carl Thurston...John Reynoso, Subject: FW: presentation, 28 pages, Ex. 4, EX. 6

28.	Undated	Condition Monitoring Report – (40 pages) EX. 4
29.	2/06/2012	SONGS Unit 2 Steam Generator Inspection AGENDA (8 pages) EX. 6, EX. 4
30.	2/10/2012	SCE Update on SONGS Steam Generator Inspections (17 pages) EX. 6, EX. 4
31.	2/16/2012	FW: SONGS U2/3 Steam Generator Status Reports (4 pages) EX. 6
32.	4/16/2012	E-mail from Allison Spolerich to Andrew Johnson; Subject: Information Update-Description has changed-NRC teleconference (2 pages) EX. 6

OVERVIEW OF SEGMENTATION PROCESS

The goal of segmentation is to separate the non-radioactive portion of the original steam generator (steam dome and transition cone) from the original steam generator's lower assembly that includes the steam generator tubes that contain low level radioactive materials.

During the cycle 16 refueling outages, the original steam generators (OSGs) from Unit 2 and 3 were prepared for segmentation activities and removed from the respective containments before being staged in the North Industrial Area (NIA) in the segmentation facility. Segmentation and preparation for shipping is scheduled to begin January 2011 and will be performed by SCE and subcontractors.

As described in Bechtel Plan 25221-PP-13 "OSG Preparation Plan" the OSGs were drained, covers were installed on manways and other openings to prevent spills of residual fluids and to control access, and a fixative was applied to the exterior surface of the OSG channel head to fix loose contamination prior to the OSGs being moved to the segmentation facility. The OSGs were moved using specially designed vehicles from the Units 2 and 3 protected area to the segmentation facility.

The segmentation facility (OSGSF) was constructed under NECP 800175654 (ASC D0033902) to provide a weather-proof facility for the on-site staging and preparation of the OSGs for disposal. The OSGSF is a 100 ft x 110 ft x 54 ft high steel-framed, fire-retardant fabric structure designed to withstand 100 mph winds. The facility is equipped to contain the OSGs and allow segmentation of contaminated material, collect spills (berm), prevent radioactive material from reaching the ground water (Coverguard) and protect work activities and the OSGs from rain water intrusion (external barrier). Shielding will be used as needed to keep occupational and public direct dose rates to as low as reasonably achievable. Steel plate material is located where heavy construction traffic is expected or the external severance cut is made. The OSGSF will be established as a temporary radiologically controlled area (RCA) prior to beginning segmentation. HEPA units will be staged for use but, due to the expected absence of airborne radioactive material during segmentation, are not expected to be needed. If HEPA units are used, smoke eater equipment will be used during cuts for diver opening to minimize degradation of HEPA filters.

The OSGs are positioned horizontally in a bermed area on pedestals that will provide sufficient support when the OSGs are filled. The berm capacity is 63,000 gallons. Since an OSG may contain approximately 73,000 gallons, pumps connected to a temporary water storage tank are provided to transfer water from the berm in the unlikely event of a catastrophic failure of an OSG while it is filled with water. There will be several empty temporary storage tanks staged outside the OSGSF to allow for transfer and temporary holding of water if a leak occurs in a filled OSG.

The sequence for segmentation is:

- create one 6 inch opening at the upper most surface of the steam dome using a Petrogen torch
- fill the steam dome with 50,000 gallons of water from the fire water system to cover the upper part of the tube sheet. Personnel will be present throughout the fill and can take action to stop and contain a leak during the fill process.
- create the diver access point
- add approximately 23,000 gallons of water for additional shielding. Personnel will be present throughout the fill and can take action to stop and contain a leak during the fill process.
- install a pump and filter into the flooded steam dome to maintain water clarity and remove contamination. This also provides recirculation to aid in obtaining samples of the water to determine concentrations of licensed material.
- perform internal cuts underwater in the specified sequence using a plasma torch and remove designated sections
- install a pump and hose to drain the OSGs to either the temporary water storage tanks or, if the water meets all radiological effluent and NPDES permit requirements, to the NIA sump. Personnel will be present throughout the drain and can take action to stop and contain a leak.
- perform an external cut at the transition cone to lower assembly weld to sever the steam dome from the lower assembly using a remotely-operated clamshell mechanical cutter

- open the OSGSF to atmosphere once air samples from inside the facility are below detectable radioactive airborne effluent levels
- remove the steam dome and move it outside of the OSGSF and cover with tarps
- quickly fit the tube bundle cap onto the steam generator lower assembly
- weld tube bundle cap on using tack welding followed by an automated machine welding system
- survey the steam dome and transition cone before making additional cuts to meet shipping constraints.
- Apply transport coatings to meet DOT requirements and the DOT Special Request requirements.
- Transport the DOT-compliant package(s) off-site to the appropriate disposal facility.
- Steam Dome/Transition Cone
  - Based on initial survey data, the steam dome and transition cone were expected to be free released once segmentation is completed. Once separated from the lower assembly, the steam dome will be moved outside the OSGSF and surveyed.
    - If the steam dome is radioactive. The steam dome and transition cone will be disposed of as low level radioactive waste. Any re-sizing activities (e.g. cutting) will be performed within an enclosure with positive ventilation controls to minimize the potential for an unmonitored radioactive airborne release and spill protection. This may be the OSGSF or a temporary enclosure. Local air samples will be taken and counted as effluent samples to document airborne contamination levels.
    - If HP has successfully decontaminated the steam dome to allow for free-release, it will be disposed consistent with all applicable regulations and may be sent to a salvage company for the steel.

The steam generator lower assembly (SGLA) includes the steam generator tubes and is expected to be classified as Class A low level radioactive waste, requiring disposal at the Energy Solutions licensed facility in Clive, Utah. The SGLA will have a DOT cover welded over the exposed tube bundle and will be shipped in accordance with all Department of Transportation regulations and the DOT Special Request requirements. HP OSG SEGMENTATION PLAN provides additional details for the shipment of the SGLA.

Wastewater not meeting NPDES release criteria will be treated until NPDES release criteria are satisfied. Wastewater treatment and discharge issues are discussed in greater detail in the next section of this document.

To the extent practicable, waste minimization techniques will be used in accordance with SO123-XV-17.1 and NRC Information Notice 94-23. Applicable portions of the Process Control Program will be implemented during packaging and shipment. Waste disposal will be performed in accordance with all regulatory requirements.

Debris, filters, sediment and sludge will be evaluated per existing HP procedures for the control of solid wastes. The solids will be disposed of in accordance with all regulatory requirements

LIQUID

Wastewater

Approximately 73,000 gallons of fire water is required for each OSG to provide shielding during underwater segmentation. The water may, as segmentation proceeds, contain suspended and entrained licensed radioactive material and solids. As previously stated, smears taken of the OSGs while they were still in containment, indicate the presence of low levels of loose contamination on the outside of the steam dome. Per HP OSG Segmentation Plan, section 7, efforts will be made to remove loose contamination before segmentation begins to minimize the potential for a personnel (diver) contamination event and as a good HP ALARA practice.

Each OSG has accumulated metallic oxides on the tube sheet from corrosion of the condensate and feedwater systems over the course of plant operation. Current estimates are between 3,700 to 4,500 pounds of metallic oxides per OSG (Refer to Attachment F). During OSG filling and underwater segmentation, there is a very low potential for the water to resuspend or partially dissolve some fraction of those metal oxides that could then be removed during OSG draining. At the divers' discretion, the water will be circulated continuously through a filter (<5 microns) during the segmentation to remove solids and to maintain water clarity. An AMP-50 will also be placed adjacent to the filter to monitor the dose rate and alert personnel to unexpected radioactivity in the water. Steam generator blowdown analyses performed for the 6 months prior to the cycle 16 outages showed no detectable gamma activity in either Unit 2's or Unit 3's OSGs. Unit 2's steam generator blowdown samples occasionally showed detectable tritium, with one sample containing approximately 5 E-6 microcuries/ml. Unit 3 steam generator blowdown samples did not show detectable tritium. Given that the steam generator blowdown samples were taken during operation when the blowdown is higher temperature, it is highly unlikely that the concentrations in the water drained from the OSGs after the internal cuts have been completed would be any higher than those values. Using the steam generator blowdown sample data, a reasonable estimate of the total potential radioactive liquid releases from segmentation of the OSG is 2.8E-3 Ci of tritium with an associated dose of 1.9E-6 mrem (Attachment A).

(b)(6)

Comment [h1] [redacted] was calculating the metallic oxides [redacted] determined from copper an iron samples and estimating removal by blowdown and sludge lancing (performed in previous cycles and not ALARA for amount removed).

Ex6

The most conservative scenario in terms of the potential concentrations of licensed material in the OSG water would be if a tube were breached during the internal cuts and there was residual water (RCS) in the breached tube. Based on RCS samples prior to shutdown of each Unit, isotopes that could be introduced into the OSG water include manganese-54 (^{54}Mn), cobalt-57 (^{57}Co), cobalt-58 (^{58}Co), cobalt-60 (^{60}Co), cesium-134 (^{134}Cs), cesium-137 (^{137}Cs) and tritium (^{3}H). Refer to Reference 5 page 2-9 for full list of isotopes. Using very conservative assumptions, the amount of licensed material that could be introduced into the OSG water if a tube were breached was calculated (Attachment A):

Maximum Potential Concentrations in OSG Wastewater
(Nicked tube)

Isotope	Unit 2 OSG concentration (μCi/ml)	Unit 3 OSG concentration (μCi/ml)
^{54}Mn	4.8E-7	5.1E-7
^{57}Co	2.7E-8	1.6E-8
^{58}Co	1.4E-5	7.4E-6
^{60}Co	2.2E-7	3.5E-7
^{134}Cs	1.1E-7	4.6E-8
^{137}Cs	1.2E-7	5.8E-8
^{3}H	3.3E-5	7.4E-6
Total	**4.8E-5**	**1.6E-5**

As a result of the constant recirculation of the contents of the OSG during segmentation activities, samples of the contents in the OSG can be obtained and analyzed to determine concentrations relative to radioactive effluent release control limits for gamma isotopes and tritium. As described in the Sampling Plan (Attachment D), wastewater will be sampled and dispositioned in accordance with existing radioactive effluent control procedures and the ODCM (Reference 6); this includes taking the sample of record for determining compliance with the radioactive effluent control program at the ODCM-credited release point. Wastewater will also be sampled and analyzed as appropriate for environmental (NPDES) permit requirements. If licensed radioactive material is detected in the liquid when analyzed to RETS levels, then the radioactive liquid shall be pumped into the temporary storage tanks, transferred to Unit 2 or Unit 3 and released through an ODCM-credited liquid effluent release point, primarily the Unit 2 or Unit 3 Full Flow Condensate Polishing Demineralizer (FFCPD) Hold Up Tank (HUT). Depending on the isotopes identified, treatment by filtration may be performed prior to discharge. If applicable NPDES limits are not met, non-radioactive wastewater may be processed to meet the NPDES limits and then disposed of through a low volume waste stream as defined in the NPDES permit, such as the NIA sump. Licensed material generated at Units 2 & 3 cannot be discharged through the NIA without changes to the Operating Licenses.

To minimize the use of water during segmentation, the majority of water will be transferred from one OSG after internal cuts have been completed by the diver to the next OSG that will undergo segmentation. Using very conservative assumptions, the maximum amount of licensed material that could potentially be discharged in radioactive liquid effluents was calculated (Attachment A):

Isotope	Total Ci
^{54}Mn	5.4E-4
^{57}Co	2.4E-5
^{58}Co	1.2E-2
^{60}Co	3.1E-4
^{134}Cs	8.7E-5
^{137}Cs	1.0E-4
^{3}H	2.2E-2
Total	**3.5E-2**

with a projected contribution of 4.5E-2 mrem total body and 3.8E-1 mrem to the organ (GI-LLI) over the year. Samples will be taken of the ODCM-credited release point and any licensed material in the liquid released, along with the calculated dose to the public, will be reported in the Annual Radioactive Effluent Release Report.

Cross-contamination of a non-radioactive system

The fire water system is not physically connected to the OSG and cannot therefore inadvertently result in licensed materials being siphoned back into the firewater system. In addition, the OSG is vented to atmosphere and fire water is at a higher pressure, further eliminating the potential for contaminating a previously uncontaminated system as discussed in NRC Information Bulletin 80-10 or NRC Information Notice 91-40.

Outdoor, unprotected tank

OSG

The berm surrounding the OSG and equipment in the OSGSF is 92 ft by 104 ft, with a maximum capacity of 63,000 gallons. Since the berm is not capable of containing the entire contents of a single OSG (73,000 gallons) during segmentation, the OSG will be considered an outdoor, unprotected tank with potentially radioactive contents per License Control Specification (LCS) 3.7.110.

The second OSG staged in the OSGSF will also be filled to approximately 80% with water to provide shielding for personnel working in the OSGSF. Once the initial fill has been completed, the fill and vent holes will be covered and welded shut so that the water will not drain from the sealed OSG in the unlikely event that a seismic event occurs. It is highly improbable that both OSGs would fail at the same time since the openings to the OSG are welded shut unless segmentation activities are actively underway.

A set of pumps connected to a temporary water storage tank will be installed to pump the berm in case of leakage. Each temporary storage tank will also be considered as an outdoor unprotected tank if radioactive liquid is pumped to it.

Using the values determined in conservative scenario for total curies that could potentially be released, the maximum amount of licensed material in the wastewater (excluding tritium) is 8.0E-3 curies (Attachment A). This hypothetical maximum total inventory is extremely conservative and well below the LCS limit of 10 curies.

Once internal cuts begin in an OSG, a sample will be performed on the OSG at least once every seven (7) days and documented to ensure that the total contents of the OSG is maintained within limits of the LSC (e.g. ≤10 Ci). Due to the large volume of water in the OSG and the need to maintain clarity to ensure diver safety and minimize the potential for nicking a tube, the water cannot be reasonably circulated quickly enough to meet the guidance in Regulatory Guide 1.21 revision 1 to ensure representative sampling. However, the water will be recirculated at low flow rates throughout internal segmentation activities and a sample will be obtained to determine the concentrations of licensed material. In addition, an alarming dose instrument (e.g. AMP-50) will be placed on the water filter housing with a dose rate set point low enough to provide immediate indication of a breached RCS tube. Even though obtaining a representative sample to determine the inventory in the water-filled OSG cannot practically be achieved, the measures described in this paragraph provide a practicable attempt to meet the intent of the LCS. The once-per-seven day sample will be continued until the OSG has been drained.

Baker Tank or Poly Tank
If radioactive water is added to a Baker or Poly Tank during segmentation, then the tank's total curie content shall be determined once every 7 days and verified to be less than 10 curies total radioactivity, excluding tritium and dissolved and entrained noble gases by survey of the tank or sample and analysis of the tanks contents.

Spill Prevention and Control Measures

During OSG segmentation work activities, the following preventative spill measures will be in place (Reference 3)

- **Plant Grade** – a bottom steel plate and reinforced concrete pedestal were installed followed by surface grade protective material (Coverguard) to prevent water intrusion into the subsurface soil or water from a spill or leak. A 70,000 gallon-capacity berm was installed over the pedestals as the initial barrier to collect a spill or leak. Steel plate material was then installed and located where heavy construction traffic is expected or the external severance cut is made. A perimeter barrier was installed around the perimeter of the OSGSF to prevent rainwater intrusion.

- **Divers Platform** – a "drip pan" tarp will be installed on the divers' platform creating a collection pool to spray down divers and divert rinse water into the OSG.

- **Segmentation Storage** – segmented pieces that are contaminated or radioactive are stored in a container or covered to prevent exposure to the elements and potential washdown during rainfall.

- **Water Lines** – at a minimum, water line from the pump to storage tank will be handled with the following precautions.
  - All joints will have a secondary water collection system installed (reference 3).
  - Should a hose need repair or replacement, the pump will be secured and then the hose will be disconnected over some type of container to collect water.
  - Wastewater hoses and pipes must be handled with extreme care. This water is not allowed to enter plant drains or catch basins until analysis determines the wastewater meets NPDES permit limits and administrative controls for liquid radioactive liquids. The planned release of water containing licensed material that was generated at Units 2 and 3 cannot currently be released through the NIA sump without changes to the licenses.

Water used to provide shielding for the divers during internal segmentation activities will be re-used by transferring it to the next original steam generator to undergo segmentation. Hose connections will be bagged and taped for the transfer and personnel will be present at all times during the transfer. There will be some residual water in the steam dome/transition cone after transfer; the volume is conservatively estimated at approximately 514 gals (Reference 4a: HP OSG Segmentation Plan dated 5/19/2011, item 26). Since the first steam dome will need to be temporarily staged outside of either the OSGSF or RSGSF due to space constraints, the area will be pre-staged by covering the asphalt with plastic sheeting and placing absorbent snakes around the area for spill containment. Equipment and collection drums for the residual water will be placed in a bermed area of at least 900 gallons capacity. Hoses used to transfer the water will be restrained and connections will be bagged and taped. The collected water will be disposed of in accordance with SO123-XV-29 and the radioactive effluent control program.

In addition to the above, temporary covers will be placed over yard area drains near piping runs during fill and drain events to prevent the unplanned release of liquids in the unlikely event that equipment failure or human error results in a leak or spill. These drains should be uncovered if rain occurs or is anticipated. OSG drain down should not occur when it is raining without Ops and Chemistry concurrence.

Station procedures (SO23-4-6, SO123-XV-17.3) concerning spills will be implemented at all times. Spills that occur within a bermed area will be contained and cleaned up expeditiously, preferably by transferring the spill to an appropriate waste tank.

1. If a leak or spill outside of a bermed area or a tank or a collection basin, project personnel will immediately perform spill mitigation and notify the Control Room, Environmental Protection, and NRA per Reference 3 (OSG Segmentation Plan)

2. The leak or spill will be evaluated to determine if it triggers the voluntary communication protocol under SO123-XV-3.5 and the Industry Ground Water Protection Initiative. Unplanned or uncontrolled releases will be also be evaluated for reportability in accordance with the attachment to SO123-XV-17.3, SO123-XV-2.1, SO123-III-5.25, and 10 CFR 50.72 and 50.73.

<u>Rain Water</u>

One other liquid release source exists: collected rainwater. The OSGSF contains a protective barrier around its perimeter to prevent the intrusion of rain water. Berms located outdoors without overhead protection can collect rainwater. Procedure SO23-XXVII-29.24 addresses sampling and disposal of berm rainwater and, in combination with chemistry procedure SO123-III-5.42 will be used to determine the appropriate handling of any liquids collected in these berms.

The steam domes and transition cones will be moved out of the OSGSF and staged on saddle supports and dunnage within the North Industrial Area until they can be prepared for shipment.

Tarps or similar protective measures will be installed as soon as the separated domes and transition cones have been placed on their supports to prevent rain washing the surfaces or the inadvertent erosion of contaminated surfaces and subsequent unmonitored release of licensed material. The protective measures will be maintained unless the separated components have been free-released.

Water containing detectable levels of radioactivity or NPDES compounds of interest will be transferred to the plant for discharge through an ODCM-credited release point.

AIRBORNE

Particulate Matter and Radioiodines

There is a potential for very low amounts of radioactive material to be released through discharges to the atmosphere at the following points in the segmentation process

- Creating openings in the steam dome using Petrogen torches and/or plasma cutting
- Underwater segmentation using plasma torches
- External mechanical severance cutting
- Tube bundle cover welding
- Steam dome segmentation (if contaminated)
- Waste tank vents (if waste or berm water contains licensed material)
- Miscellaneous (negligible)

Radiological airborne releases are not anticipated to be significant since cutting of contaminated surfaces will only occur underwater. No radioiodines are reasonably expected to be present due to the amount of time that has elapsed since the OSGs were removed from containment.

Creating the initial fill and vent hole and the divers' access point on the steam dome is not expected to create airborne radioactive material. Contamination control measures were applied prior to the removal of the OSGs from containment to minimize the potential for airborne radioactive releases during segmentation of the OSGs. This included encapsulation of the external surface of the OSG channel head to fix residual loose contamination, except for those areas that will be cut during segmentation. Contamination on cut areas of the OSG is expected to be < 5,000 dpm/100 cm^2 loose and <100,000 dpm/100 cm^2 fixed plus loose contamination. Under the HP plan, strippable coating will be applied to the entire steam dome and transition cone areas to minimize or eliminate loose contamination prior to any cutting. Low volume air samplers of the OSGSF will be used for effluent purposes to verify that airborne radioactivity is not being created.

Cutting of contaminated surfaces will only occur underwater and is not expected to generate airborne radioactive material. Any material liberated during the plasma torch cutting would be dissolved or entrained in the water rather than become airborne. As described in the section on liquids, there is a slight probability that low concentrations of tritium may occur in the water contained in the OSG. It is not credible that the underwater cutting will create sufficient momentum for liquid vapor to result in tritium being released into the air. However, a tritium sample will be taken once per 24 hours in the general vicinity of the divers' platform to verify that tritium is not being released during this activity.

The external cut to separate the OSG steam dome and transition cone from the lower assembly (SGLA) section will be performed using a mechanical clamshell device. If the project elects to use torch cutting for this step, a primary containment enclosure with filtered exhaust and/or local area vent must be constructed before the thermal cutting begins to eliminate the potential for an unmonitored radioactive airborne effluent release. High efficiency particulate air (HEPA) ventilation devices will be placed in service and used throughout this thermal cutting operation if it is necessary; smoke eaters will also be used for torch cutting to protect the HEPA filters. Continuous samples will be taken inside to OSGSF during the segmentation process to confirm that there has been no unmonitored release of particulate matter. HP air samples will also be taken and analyzed before the OSGSF doors are opened and during work activities that may cause airborne contamination.

As described above, the cutting activities are not reasonably expected to result in the release of radioactive airborne particulate matter due to contamination control measures and removal by the water in the OSG. Attachment B evaluates a bounding scenario wherein radioactivity would be released if the loose contamination is not successfully removed over the longest projected duration of 800 hours during cutout of the fill/vent holes/divers opening and welding activities (e.g.,install lifting pads, installation of tube bundle cover). The maximum amount that could be released is 3.2E-4 Ci of ^{60}Co by airborne pathway. This airborne ^{60}Co could result in a potential dose to a member of the public of 7.8E-3 mrem.

Steam dome segmentation will be performed inside the OSGSF or an equivalent structure with filtered ventilation if the steam dome or transition cone are contaminated ≥5,000 dpm/100 cm^2 loose and ≥100,000 dpm/100 cm^2 fixed plus loose contamination. Below these levels, HP may perform localized mechanical decontamination on the steam dome inside a small tented area with protective measures on the asphalt for contamination control. Work area samples will be obtained during mechanical decontamination evolutions and the sample results provided to Chemistry-Effluent Engineering for evaluation. As described in the section on liquids, contamination control and protective measures will be implemented for these components once they are moved out of the OSGSF and they are either free-released or shipped off-site for disposal in accordance with all regulatory requirements.

There is no reasonable expectation that the waste water will contain noble gases or other licensed material. As such, it is not credible that there would be a release of airborne radioactive material from water collected in open berms or through the vent of a wastewater tank.

Tritium

Unit 2's steam generator blowdown samples occasionally showed detectable tritium, with one sample containing approximately 5 E-6 microcuries/ml. Unit 3 steam generator blowdown samples did not show detectable tritium. Given that the steam generator blowdown samples were taken during operation when the blowdown is higher temperature, it is highly unlikely that the concentrations in the water drained from the OSGs after the internal cuts have been completed would be any higher than those values.

Attachment B provides a reasonable estimate of the curies that could be released during underwater segmentation. For a bounding scenario wherein radioactivity would be released continuously for the longest projected duration of 84 days, the maximum amount that could be released is 1.9E-3 curies of ^{3}H by airborne pathway. This minute amount of airborne tritium could result in a potential dose to a member of the public of 3.3E-7 mrem.

Noble gases

Noble gases are not reasonably expected to be present on the secondary side of the OSG due to the amount of time that has elapsed since the OSGs were in service and will not be generated during the segmentation activities.

OSGSF

NUREG-0472, NUREG-0800 Section 11.4, and Reg. Guide 1.143 stipulate monitoring on the discharge from radioactive waste treatment systems or on the exhaust of buildings that house those systems. Regulatory guidance allows the use of sampling and analysis in place of instrumented monitoring for temporary systems and work activities. The systems and equipment used for the OSG segmentation and waste disposal will be located outside of buildings with a monitored HVAC but will be enclosed to prevent an unmonitored release of airborne radioactive material.

Given that the OSG segmentation is a temporary activity, the sampling outside of the OSGSF will document the expected absence of airborne radioactive effluents. Additional information can be obtained as needed from the HP sampling of the inner enclosure's exhaust.

CONCLUSION:

Dose and Curies

The segmentation of the OSGs from Units 2 and 3 is not expected to result in a release of airborne radioactive material, including particulate matter and tritium, due to contamination control measures taken. Similarly, wastewater releases from these work activities is not expected to contain licensed material. Using the highest sample result for steam generator blowdown during the six months preceding the cycle 16 outages, 2.8E-3 curies of 3H could be released with an associated dose to a member of the public of 1.9E-6 mRem.

Direct dose calculations and actions to mitigate the direct dose to a member of the public due to radiation exposure during OSG segmentation activities are found in Reference 4. A constant or average dose rate of 10 microR/hr at the west seawall (occupancy factor of 300 hrs) is required in order to meet the station's ALARA goal of 4 mrem per year as required in SO123-VII-20.16. Direct dose to the public at the beach will be measured using TLDs 55 and 56 and will be accounted for in the Annual Radioactive Effluent Release Report.

In the event that a steam generator tube containing residual RCS is nicked during segmentation, a conservative estimate of the maximum amounts of licensed material that could be released during the proposed work activities are:

- 1.9E-3 Ci of gaseous tritium and 3.2E-4 Ci of gaseous ^{60}Co with a total organ dose of 7.8E-3 mrem

- Estimated maximum liquid curies released of 3.5E-2 curies with 4.5 E-2 mrem total body and 3.8 E-1 mrem organ (GI-LLI)

Ground water - The multiple spill prevention and containment measures described provides reasonable assurance that waste water being collected in any of the equipment or that comes into contact with the sealed surface cannot credibly reach the subsurface soil or ground water. In the unlikely event that a spill or leak of water occurs, administrative measures such as the WIPR (Attachment A of work package 25221-003-M0P-0057-0001-000) have been implemented to ensure that the voluntary communication requirements of the industry Ground Water Protection Initiative are met.

SCE will continue to meet all regulatory requirements for the control and release of liquids and gaseous discharges from the site that might occur during the OSG segmentation process to dispose of the OSGs. Any resultant releases of wastewater and airborne material are projected to be incremental and well below the regulations and will be reported in the Annual Radioactive Effluent Release Report. There will be no significant dose to a member of the public due to the proposed work activities.

Performed By (b)(6) Date: 20 May, 2011 Ex 6

Peer Reviewed By (b)(6) Date: 20 May, 2011 Ex 6

ATTACHMENT A
LIQUID EFFLUENT EVALUATION FOR OSG SEGMENTATION IN NIA

WASTEWATER
Steam generator blowdown (reasonable estimate)
Unit 2: 73000 gal/OSG * 2 OSGs * 5.1E-6 microCi/ml ^{3}H * 3785 ml/gal = **2.82E-3** Ci
Unit 3: 73000 gal/OSG * 2 OSGs * <LLD microCi/ml ^{3}H * 3785 ml/gal = no Ci

Dose impact: 5.1E-6 microCi/ml/1E-3 microCi/ml MPC * 1000 gpm release rate/185000 gpm dilution * 0.282 DCF * 1E-3 = 7.8E-9 mRem/hr
For a total duration of 10 days, dose: 7.8E-9 mRem/hR * 10 days * 24 hrs/day = 1.9E-6 mRem
Reasonable estimate of total projected doses of 1.9E-6 mrem total body/organ dose is below the ALARA standards in 10 CFR 50 Appendix I

Conservative estimate:
- Estimated water processed and discharged = 73,000 gal per OSG = 2.92E5 gal total
- 5 gallons of RCS from nicked tube for each generator with the isotopes listed in Tables based on RCS activity when shutdown (no decay).
- RCS Activity prior to shutdown from ACIDS 6 months before beginning of cycle 16
- OSG microCi/ml = RCS microCi/ml x 5 gal / 73.000 gal
- Total Ci Released = RCS microCi/ml x 5 gal x 2 units x 3785 ml/gal x 73.000 gal
- Projected Dose (ODCM Eq. 1-16)
- Maximum undiluted liquid waste flow during time period = 1000 gpm (FFCPD HUT)
- Average dilution flow = 185,000 gpm (1 circulating water pump)
- Liquid MPC Limit = 10CFR20 App B Table II Col 2
- Dose Commitment Factor (DCF) = (ODCM Table 1-4)
- Duration = 10 days (2.5 days per OSG)

Table A-1

UNIT 2

Isotope	RCS microCi/ml	OSG microCi/ml	Total Ci Released	Diluted microCi/ml	MPC Limit microCi/ml	TBody DCF	Dose Rate mrem/hr
^{54}Mn	7.0E-3	4.8E-7	2.6E-4	2.6E-9	1E-4	5.58	1.4E-8
^{57}Co	3.9E-4	2.7E-8	1.5E-5	1.4E-10	4E-4	236	3.4E-8
^{58}Co	2.0E-1	1.4E-5	7.6E-3	7.4E-8	9E-5	1350	9.9E-5
^{60}Co	3.2E-3	2.2E-7	1.2E-4	1.2E-9	3E-5	3820	4.5E-6
^{134}Cs	1.6E-3	1.1E-7	6.1E-5	5.9E-10	9E-6	13300	7.8E-6
^{137}Cs	1.8E-3	1.2E-7	6.8E-5	6.6E-10	2E-5	7850	5.2E-6
^{3}H	4.8E-1	3.3E-5	1.8E-2	1.8E-7	3E-3	0.282	5.0E-8
Total	6.9E-1	4.8E-5	2.6E-2	2.6E-7	-	-	1.2E-4

Table A-2

UNIT 2

Isotope	Diluted microCi/ml	Organ DCF (Liver)	Liver Dose mrem/hr	Organ DCF (GI-LLI)	GI-LLI Dose Mrem/hr
^{54}Mn	2.6E-9	7060	1.8E-5	21600	5.6E-5
^{57}Co	1.4E-10	142	2.0E-8	3590	5.2E-7
^{58}Co	7.4E-8	603	4.4E-5	12200	9.0E-4
^{60}Co	1.2E-9	1730	2.0E-6	32500	3.8E-5
^{134}Cs	5.9E-10	16300	9.6E-6	285	1.7E-7
^{137}Cs	6.6E-10	12000	8.0E-6	232	1.5E-7
^{3}H	1.8E-7	0.282	5.0E-8	0.282	5.0E-8
Total	2.6E-7	-	8.2E-5	-	9.9E-4

ATTACHMENT A

Table A-3							
UNIT 3							
Isotope	RCS microCi/ml	OSG microCi/ml	Total Ci Released	Diluted microCi/ml	MPC Limit microCi/ml	TBody DCF	Dose Rate mrem/hr
^{54}Mn	7.4E-3	5.1E-7	2.8E-4	2.7E-9	1E-4	5.58	1.5E-8
^{57}Co	2.3E-4	1.6E-8	8.7E-6	8.4E-11	4E-4	236	2.0E-8
^{58}Co	1.1E-1	7.4E-6	4.1E-3	4.0E-8	9E-5	1350	5.3E-5
^{60}Co	5.1E-3	3.5E-7	1.9E-4	1.9E-9	3E-5	3820	7.2E-6
^{134}Cs	6.8E-4	4.6E-8	2.6E-5	2.5E-10	9E-6	13300	3.3E-6
^{137}Cs	8.5E-4	5.8E-8	3.2E-5	3.1E-10	2E-5	7850	2.5E-6
^{3}H	1.5E-1	7.4E-6	4.1E-3	4.0E-8	3E-3	0.282	1.1E-8
Total	2.3E-1	1.6E-5	8.7E-3	8.5E-8	-	-	6.6E-5

Table A-4					
UNIT 3					
Isotope	Diluted microCi/ml	Organ DCF (Liver)	Liver Dose mrem/hr	Organ DCF (GI-LLI)	GI-LLI Dose mrem/hr
^{54}Mn	2.7E-9	7060	1.9E-5	21600	5.9E-5
^{57}Co	8.4E-11	142	1.2E-8	3590	3.0E-7
^{58}Co	4.0E-8	603	2.4E-5	12200	4.8E-4
^{60}Co	1.9E-9	1730	3.3E-6	32500	6.1E-5
^{134}Cs	2.5E-10	16300	4.1E-6	285	7.1E-8
^{137}Cs	3.1E-10	12000	3.8E-4	232	7.3E-8
^{3}H	4.0E-8	0.282	1.1E-8	0.282	1.1E-8
Total	8.5E-8	-	5.4E-5	-	6.0E-4

- **Bounding release scenario is below instantaneous liquid release concentrations in 10CFR20.**
- Maximum activity that could be released if a tube with residual RCS is nicked:

Isotope	Unit 2	Unit 3	Total Ci
^{54}Mn	2.6E-4	2.8E-4	5.4E-4
^{57}Co	1.5E-5	8.7E-6	2.4E-5
^{58}Co	7.6E-3	4.1E-3	1.2E-2
^{60}Co	1.2E-4	1.9E-4	3.1E-4
^{134}Cs	6.1E-5	2.6E-5	8.7E-5
^{137}Cs	6.8E-5	3.2E-5	1.0E-4
^{3}H	1.8E-2	4.1E-3	2.2E-2
Total	2.6E-2	8.7E-3	**3.5E-2**

ATTACHMENT A

- Projected Dose to a member of the public if a tube containing RCS is nicked is estimated to be:

TBody Dose Rate (mrem/hr) = 1.2E-4 + 6.6E-5 = 1.9E-4 mrem/hr

Organ dose – GI-LLI (mrem/hr) = 9.9E-4 + 6.0E-4 = 1.6E-3 mrem/hr

Tbody dose (mrem) = 1.9E-4 mrem/hr x 10 days x 24 hr/day = **4.5E-2** mrem

Organ dose (mrem) = 1.6E-3 mrem/hr x 10 days x 24 hr/day = 3.8E-1 mrem

- 10 CFR 50 Appendix I whole body dose limit for liquids is 3 millirem/year
- 10 CFR 50 Appendix I organ dose limit for liquids is 10 millirem/year

Conservative estimate of total projected doses of 4.5E-2 and 3.8E-1 mrem are below the ALARA standards in 10 CFR 50 Appendix I

10 CURIE LIMIT
BAKER TANK or 1200 GALLON POLY TANK
If an outdoor unprotected tank is used during OSG segmentation and radioactive water is added to the tank, then the tank's total curie content shall be determined once every 7 days and verified to be less than 10 curies total radioactivity, excluding tritium and dissolved and entrained noble gases.

Bounding Assumptions:

- Tank Dimensions = 42 feet x 9.7 feet x 8.5 feet (from microshield calculation)
- Tank Volume = 21,000 gal
- Assume point source of ^{60}Co at 10 curie in middle of tank
- Distance to point source = 4.9 feet x 1 meter/3.28 feet = 1.49 meters = 149 cm
- Assume 100 percent water to shield a point source
- Path length of water from source to radiation instrument = 149 cm
- Half Value Layer (HVL) for ^{60}Co through water (The Health Physics and Radiological Handbook, Table 6.2) = 11 cm of water
- 10 curie of ^{60}Co = 10 rem/hr at 1 meter

  Reduction of ^{60}Co gamma radiation through water (HVL)

  = 149 cm/11 = 13.5

  Reduction in transmission of ^{60}Co gamma radiation $=(1/2)^{13.5}$ = 8.6E-5

  Estimated dose rate of 10 Ci of ^{60}Co on outside of tank (1.49 meters)

  = 10 rem/hr x $(1 \text{ meter}/1.49 \text{ m})^2$ x 1E3 mrem/rem x 8.6E-5

  = 0.39 mrem/hr for 10 curie point source of ^{60}Co

Micro-shield calculation of the tank yielded the following result:

- With 10 Ci of Reference 5 isotopes evenly distributed in a tank full of water, the calculations yielded a dose rate of 42 mrem/hr with no decay and 40 mrem/hr with 500 day decay on the side of tank at its center point. The principal isotope was ^{60}Co.

- It is reasonable to assume that radioactivity in the water will be evenly distributed. However, the dose rate limit in Attachment D is set at 4 mrem/hr to be conservative.

ATTACHMENT A

OSG

During OSG underwater segmentation, once internal cuts begin in an OSG, a sample will be performed on the OSG at least once every seven (7) days and documented to ensure that the total contents of the OSG is maintained within limits of the LSC (less than 10 curies total radioactivity, excluding tritium and dissolved and entrained noble gases). The once-per-seven day sample will be continued until the OSG has been drained.

A sample is required to determine the OSG total curie content since the primary side radioactivity precludes using dose rate measurements to determine total curie content in the secondary side water.

Unit 2: OSGs

The total curie content from Table A-1: (2.6E-2 – 1.8E-2) = 8.1E-3 curies for both OSGs
Each OSG: 8.1E-3/2 = 4.1E-3 curies/OSG << 10 curies limit in the LCS

Unit 3 OSGs:

The total curie content from Table A-3: (8.7E-3 – 4.1E-3) = 4.6E-3 curies for both OSGs
Each OSG: 4.6E-3/2 = 2.3E-3 curies/OSG << 10 curies limit in the LCS

ATTACHMENT B
AIRBORNE EFFLUENT EVALUATION FOR OSG SEGMENTATION IN NIA

FILL/VENT HOLES, DIVERS OPENING and WELDING ACTIVITIES
Airborne radioactive release is not reasonably expected to occur during cutting (fill/vent holes and diver opening) or welding activities since strippable coating will be applied to cut lines and welding surfaces before these activities occur.

1. Bounding Assumptions:
   - Plasma torch flowrate = 10 cfm x 2.832E-2 m^3 /cu ft x 1 min/60 sec = 4.7E-3 m^3 /sec
   - Loose surface contamination limit of 2.5E4 dpm/100 cm^2
   - 2.22E6 dpm/microCi = 4.5E-7 microCi/dpm
   - Plasma cut cause airborne release from path 1 cm wide x 1 cm long each second
   - Loose surface contamination = ^{60}Co is most restrictive isotope for dose calculation
   - ODCM NIA Camp Mesa X/Q.= 3.9E-6 sec/m^3
   - Estimated work duration = 800 hours (200 hours per OSG) or 33.3 days

2. ^{60}Co Release Rate (microCi/sec)
   = 2.5E4 dpm/100 cm^2 x 1 cm x 1 cm/sec x 4.5E-7 microCi/dpm= 1.1E-4 microCi/sec

3. ^{60}Co Concentration in air at site boundary (uCi/cc)
   = 1.1E-4 microCi/sec x 4.7E-3 m^3 x 3.9E-6 sec/m^3 = 2.0E-12 microCi/cc or 0.7% of MPC

   - ^{60}Co Gaseous MPC Limit = 3E-10 microCi/cc (10CFR20 App B Table II Col 1)

   - **Bounding release scenario is below regulatory limits in 10CFR20.**

4. Bounding Total Curies and Site Boundary Dose Assumptions:

   - Work Activity duration (diver opening and welding activities on 4 OSGs) = 33.3 days x 8.64E4 sec/day = 2.88E6 sec

   1.1E-4 micoCi/sec x 2.88E6 sec x 1 Ci/1E6 microCi = **3.17E-4** Ci of ^{60}Co

5. Controlling Location: Camp Mesa is 480 meters from NIA

   - Using the NIA ERWiK for Camp Mesa to estimate the dose rate mrem/hr

   ^{60}Co = 1.1E-4 microCi/sec x 782 mrem/year per microCi/sec x 1 year/8760 hrs
   = 9.8E-6 mrem/hr

   9.8E-6 mrem/hr x 33.3 days x 24 hr/day = 7.8E-3 mrem

   - **7.8E-3** mrem to the most restrictive age group from airborne ^{60}Co

   10CFR50 App I Organ dose limit = 15 mrem/qtr

ATTACHMENT B

UNDERWATER SEGMENTATION

Airborne radioactive release is not reasonably expected to occur during underwater segmentation as any licensed material on the secondary side will be entrained in the water and is not expected to become airborne.

1. Bounding Assumptions:
   - Plasma torch causes 1 cubic meter of air to attain 100 % humidity each second
   - At 100 % Humidity and 104°F (40°C) air contains about 51 ml water/m^3 (Attachment C)
   - Tritium concentration (maximum blowdown concentration) = 5.1E-6 microCi/ml
   - ODCM NIA Camp Mesa X/Q.= 3.9E-6 sec/m^3
   - Work duration = 84 days (21 days/OSG)

2. Tritium Release Rate (microCi/sec)
   = 5.1E-6 microCi/ml x 51 ml/sec = 2.6E-4 microCi/sec

3. Tritium Concentration in air at Camp Mesa (microCi/cc)
   = 2.6E-4 microCi/sec x 1 m^3 x 3.9E-6 sec/m^3 = 1.0E-9 microCi/cc or 0.5% of MPC

   - Tritium Gaseous MPC Limit = 2E-7 microCi/cc (10CFR20 App B Table II Col 1)

   - **Bounding release scenario is below regulatory limits in 10CFR20.**

4. Bounding Total Curies and Site Boundary Dose Assumptions:

   - Work Activity duration (on 4 OSGs) = 84 days x 8.64E4 sec = 7.26E6 sec

   2.6E-4 microCi/sec x 7.26E6 sec x 1 Ci/1E6 microCi = **1.9E-3** Ci of tritium

   -

5. Controlling Location: Camp Mesa is 480 meters from NIA

   - Using the NIA ERWiKs for Camp Mesa to estimate the dose rate mrem/hr

   mrem/hr = 2.6E-4 microCi/sec x 5.46 E-3 mrem/year per microCi/sec x 1 year/8760 hrs
   = 1.6E-10 mrem/hr

   Bounding potential dose impact = 1.6E-10 mrem/hr x 84 days x 24 hr/day = 3.3E-7 mrem

   - 3.3E-7 mrem to the total body from airborne ^3H for the underwater segmentation activity

TOTAL DOSE AND CURIES

- Total projected airborne curies is **1.9E-3** Ci of Tritium and **3.2E-4** Ci of ^{60}Co

- Total projected airborne dose is **3.3E-7** mrem from Tritium and **7.8E-3** mrem from ^{60}Co

- 10CFR50 App I Organ dose limit = 15 mrem/qtr

- **Bounding release scenario projected dose due to airborne effluents is well below ALARA standards.**

ATTACHMENT C

MOISTURE PER CUBIC METRE OF AIR AT SPECIFIC TEMPERATURE AND RELATIVE HUMIDITY

TEMP (°C)	GRAMS PER CUBIC METRE AT SPECIFIC RELATIVE HUMIDITY (RH)									
	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
65	160.3	144.3	128.2	112.2	96.2	80.2	64.1	48.1	32.1	16.0
60	129.6	116.6	103.7	90.7	77.8	64.8	51.8	38.9	25.9	13.0
55	103.9	93.5	83.1	72.7	62.3	52.0	41.6	31.2	20.8	10.4
50	82.7	74.4	66.2	57.9	49.6	41.4	33.1	24.8	16.5	8.3
45	65.2	58.7	52.2	45.6	39.1	32.6	26.1	19.6	13.0	6.5
40	50.9	45.8	40.7	35.6	30.5	25.5	20.4	15.3	10.2	5.1
35	39.2	35.3	31.4	27.4	23.5	19.6	15.7	11.8	7.8	3.9
30	30.0	27.0	24.0	21.0	18.0	15.0	12.0	9.0	6.0	3.0
25	22.8	20.5	18.2	16.0	13.7	11.4	9.1	6.8	4.6	2.3
20	17.1	15.4	13.7	12.0	10.3	8.6	6.8	5.1	3.4	1.7
15	12.7	11.4	10.2	8.9	7.6	6.4	5.1	3.8	2.5	1.3
10	9.3	8.4	7.4	6.5	5.6	4.7	3.7	2.8	1.9	0.9
5	6.8	6.1	5.4	4.8	4.1	3.4	2.7	2.0	1.4	0.7
0	4.8	4.3	3.8	3.4	2.9	2.4	1.9	1.4	1.0	0.5
-5	3.2	2.9	2.6	2.2	1.9	1.6	1.3	1.0	0.6	0.3
-10	2.1	1.9	1.7	1.5	1.3	1.1	0.8	0.6	0.4	0.2
-15	1.4	1.3	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.1
-20	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.3	0.2	0.1

ATTACHMENT D
GENERAL SAMPLING PLAN

Shaw:

- Will ensure adequate recirculation of OSG prior to sampling for disposal of wastewater. Notify chemistry at 86424 1 hour prior to samples being collected.
- Wherever above ground piping and hoses (wastewater transfer) are used, conduct inspections for leakage once per shift, as a minimum.
- Sample liquid content contained by berms for analysis by Station Chemistry prior to disposal.
- Notify Station Chemistry if radioactive liquid is added to any tank located outside of the OSGSF bermed area.

Station Chemistry:

- SCE Chemistry will analyze OSG water samples for gamma and perform once per seven day surveillance for unprotected tanks (OSG) total curie content during underwater segmentation when OSG is filled with water. The sample may be obtained from the steam dome by divers or HP. Refer to Attachment A for 10 curie calculation. Results will be entered into ACIDS.
- SCE Chemistry will analyze at least one sample of wastewater per OSG for tritium and gamma (1 liter) prior to drain down and analyze it to RETS levels. The sample may be obtained from the steam dome by divers or HP. Sample results will be entered into ACIDS
- Prior to disposal, the wastewater from each OSG will be sampled and analyzed by SCE chemistry for NPDES requirements.
- Representative sampling and analysis of ODCM-credited release point will be performed in accordance with all existing Station procedures to comply with the requirements of the NPDES permits and the ODCM.
- Station Chemistry will analyze airborne samples (particulate matter and ^{3}H) in accordance with existing Station procedures to comply with the requirements of the ODCM and to verify that there has not been an unmonitored release.

Station Health Physics:

- Perform continuous general area airborne particulate sampling with weekly sample collection throughout the OSG segmentation process inside and outside the OSGSF
- Perform HP grab samples for particulate during activities with the possibility to create airborne activity, i.e. diver opening cutout, TBC welding.
- Sample for airborne tritium once per 24 hours during underwater segmentation process within the general area of the divers platform.
- Perform continuous airborne particulate sampling with daily sample collection at the outlet of HEPA ventilation units when in use.
- Perform once per seven day surveillance for unprotected tanks total curie content commencing within 1 day after water containing licensed material is added to the tank and once per 7 days thereafter until tank has been drained.
    - For 20,000 gallon Baker or 1200 gallon Poly tanks, measure the dose rate at 4 foot interval at the middle of the tank side around the perimeter of tank. The dose rate at any point should be less than 4 mrem/hr to ensure the 10 curie limit is not exceeded.

ATTACHMENT E

Spill Mitigation

- During any water movement from one location to another within the North Industrial Area, all drains will have drain covers.
    - These drains should be uncovered if rain occurs. OSG drain down should not occur when raining without Ops and Chemistry concurrence.
- The water storage tanks will be contained within berms.
    - All hose connections will be bagged and taped during water movements.
- If a leak or spill occurs, follow the guidance provided in section 1.1.3.1 of the OSG Segmentation Plan

FA6

ATTACHMENT F

Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

Unit 2, E088. Cycle 15 Total Oxides Accumulated (lbs of oxides).

Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Removed by Blowdown	Total Oxides Accumulated	2E088 Cycle Total
12/31/07	0.00	0.00	0.00	0.00	0.00	4140.25
1/31/08	13.60	18.77	21.77	0.44	21.34	4161.59
2/29/08	11.63	16.05	18.62	0.37	18.24	4179.83
3/31/08	10.66	14.71	17.06	0.34	16.72	4196.55
4/30/08	12.43	17.15	19.90	0.40	19.50	4216.05
5/31/08	11.38	15.70	18.22	0.36	17.85	4233.91
6/30/08	15.31	21.13	24.51	0.49	24.02	4257.92
7/31/08	12.74	17.58	20.39	0.41	19.99	4277.91
8/31/08	11.13	15.36	17.82	0.36	17.46	4295.37
9/30/08	10.78	14.88	17.26	0.35	16.91	4312.28
10/31/08	12.71	17.54	20.35	0.41	19.94	4332.22
11/30/08	11.61	16.02	18.59	0.37	18.21	4350.44
12/31/08	8.16	11.26	13.06	0.26	12.80	4363.24
1/31/09	0.00	0.00	0.00	0.00	0.00	4363.24
2/28/09	3.77	5.20	6.04	0.12	5.91	4369.15
3/31/09	14.44	19.93	23.12	0.46	22.65	4391.80
4/30/09	12.96	17.88	20.75	0.41	20.33	4412.14
5/31/09	13.59	18.75	21.75	0.44	21.32	4433.46
6/30/09	12.56	17.33	20.11	0.40	19.70	4453.16
7/31/09	14.14	19.51	22.64	0.45	22.18	4475.34
8/31/09	14.28	19.71	22.86	0.46	22.40	4497.74
9/30/09	11.75	16.22	18.81	0.38	18.43	4516.18
10/31/09		0.00	0.00	0.00	0.00	4516.18
Cycle 15 totals	239.63	330.69	383.60	7.67	375.93	4516.18

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 4140.25

ATTACHMENT F Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

Ex 6

Unit 2, E089. Cycle 15 Total Oxides Accumulated (lbs of oxides).						
Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Oxides Removed by Blowdown	Total Oxides Accumulated	2E088 Cycle Total
12/31/07	0.00	0.00	0.00	0.00	0.00	4113.25
1/31/08	13.60	18.77	21.77	0.44	21.34	4134.59
2/29/08	11.63	16.05	18.62	0.37	18.24	4152.83
3/31/08	10.66	14.71	17.06	0.34	16.72	4169.55
4/30/08	12.43	17.15	19.90	0.40	19.50	4189.05
5/31/08	11.38	15.70	18.22	0.36	17.85	4206.91
6/30/08	15.31	21.13	24.51	0.49	24.02	4230.92
7/31/08	12.74	17.58	20.39	0.41	19.99	4250.91
8/31/08	11.13	15.36	17.82	0.36	17.46	4268.37
9/30/08	10.78	14.88	17.26	0.35	16.91	4285.28
10/31/08	12.71	17.54	20.35	0.41	19.94	4305.22
11/30/08	11.61	16.02	18.59	0.37	18.21	4323.44
12/31/08	8.16	11.26	13.06	0.26	12.80	4336.24
1/31/09	0.00	0.00	0.00	0.00	0.00	4336.24
2/28/09	3.77	5.20	6.04	0.12	5.91	4342.15
3/31/09	14.44	19.93	23.12	0.46	22.65	4364.80
4/30/09	12.96	17.88	20.75	0.41	20.33	4385.14
5/31/09	13.59	18.75	21.75	0.44	21.32	4406.46
6/30/09	12.56	17.33	20.11	0.40	19.70	4426.16
7/31/09	14.14	19.51	22.64	0.45	22.18	4448.34
8/31/09	14.28	19.71	22.86	0.46	22.40	4470.74
9/30/09	11.75	16.22	18.81	0.38	18.43	4489.18
10/31/09		0.00	0.00	0.00	0.00	4489.18
Cycle 15 totals	239.63	330.69	383.60	7.67	375.93	4489.18

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 4113.25

Ex 6

ATTACHMENT F Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

Unit 3, E088. Cycle 15 Total Oxides Accumulated (lbs of oxides).						
Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Oxides Removed by Blowdown	Total Oxides Accumulated	3E088 Cycle Total
12/31/08	10.53	14.53	16.86	0.34	16.52	3438.69
1/31/09	12.60	17.39	20.17	0.40	19.77	3458.46
2/28/09	8.87	12.24	14.20	0.28	13.92	3472.37
3/31/09	11.10	15.32	17.77	0.36	17.41	3489.78
4/30/09	9.84	13.58	15.75	0.32	15.44	3505.22
5/31/09	10.53	14.53	16.86	0.34	16.52	3521.74
6/30/09	10.36	14.30	16.58	0.33	16.25	3537.99
7/31/09	10.21	14.09	16.34	0.33	16.02	3554.01
8/31/09	10.21	14.09	16.34	0.33	16.02	3570.03
9/30/09	10.30	14.21	16.49	0.33	16.16	3586.19
10/31/09	11.16	15.40	17.86	0.36	17.51	3603.69
11/30/09	10.18	14.05	16.30	0.33	15.97	3619.66
12/31/09	11.54	15.93	18.47	0.37	18.10	3637.77
1/31/10	10.30	14.21	16.49	0.33	16.16	3653.93
2/28/10	10.59	14.61	16.95	0.34	16.61	3670.54
3/31/10	6.35	8.76	10.17	0.20	9.96	3680.50
4/30/10	8.46	11.68	13.55	0.27	13.28	3693.78
5/31/10	10.94	15.10	17.51	0.35	17.16	3710.94
6/30/10	9.25	12.77	14.81	0.30	14.51	3725.45
7/31/10	9.74	13.44	15.59	0.31	15.28	3740.73
8/31/10	10.67	14.72	17.08	0.34	16.74	3757.47
9/30/10	9.24	12.75	14.79	0.30	14.50	3771.97
10/31/10	2.17	3.00	3.48	0.07	3.41	3775.37
Cycle 15 totals	225.15	310.70	360.41	7.21	353.20	3775.37

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 3422.17

ATTACHMENT F Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

EX 6

Unit 3, E089. Cycle 15 Total Oxides Accumulated (lbs of oxides).						
Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Oxides Removed by Blowdown	Total Oxides Accumulated	3E089 Cycle Total
12/31/08	10.53	14.53	16.86	0.34	16.52	3420.50
1/31/09	12.60	17.39	20.17	0.40	19.77	3440.27
2/28/09	8.87	12.24	14.20	0.28	13.92	3454.18
3/31/09	11.10	15.32	17.77	0.36	17.41	3471.59
4/30/09	9.84	13.58	15.75	0.32	15.44	3487.03
5/31/09	10.53	14.53	16.86	0.34	16.52	3503.55
6/30/09	10.36	14.30	16.58	0.33	16.25	3519.80
7/31/09	10.21	14.09	16.34	0.33	16.02	3535.82
8/31/09	10.21	14.09	16.34	0.33	16.02	3551.84
9/30/09	10.30	14.21	16.49	0.33	16.16	3568.00
10/31/09	11.16	15.40	17.86	0.36	17.51	3585.50
11/30/09	10.18	14.05	16.30	0.33	15.97	3601.47
12/31/09	11.54	15.93	18.47	0.37	18.10	3619.58
1/31/10	10.30	14.21	16.49	0.33	16.16	3635.74
2/28/10	10.59	14.61	16.95	0.34	16.61	3652.35
3/31/10	6.35	8.76	10.17	0.20	9.96	3662.31
4/30/10	8.46	11.68	13.55	0.27	13.28	3675.59
5/31/10	10.94	15.10	17.51	0.35	17.16	3692.75
6/30/10	9.25	12.77	14.81	0.30	14.51	3707.26
7/31/10	9.74	13.44	15.59	0.31	15.28	3722.54
8/31/10	10.67	14.72	17.08	0.34	16.74	3739.28
9/30/10	9.24	12.75	14.79	0.30	14.50	3737.04
10/31/10	2.17	3.00	3.48	0.07	3.41	3742.69
Cycle 15 totals	225.15	310.70	360.41	7.21	353.20	3742.69

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 3403.98

REFERENCES

1. "Liquid Holdup Tanks" Licensing Control Specification 3.7.110
2. Nuclear Engineering Change Package 800175654
3. OSG Segmentation Plan
4. Health Physics Original Steam Generator Segmentation Plan dated 2/9/2011

4a. Health Physics Original Steam Generator Segmentation Plan dated 5/19/2011

5. "Final Characterization, Classification, & Shielding Analysis Report, WMG 6055-RE-121 Rev 2, May 2009"

SAN ONOFRE PROCEDURES CITED

6. SONGS Offsite Dose Calculation Manual (SO123-ODCM)
7. SO123-III-5.25, "Evaluation and Reporting of Abnormal Releases of Radioactive Material from Units 1, 2, and 3"
8. SO123-III-5.42, "Evaluation Miscellaneous Release Sources"
9. SO123-IX-2.206, "Hazardous Materials/Waste Inspections"
10. SO123-XV-2.1, "NPDES Monitoring"
11. SO123-XV-16, "Spill Prevention, Countermeasure, and Control Plan"
12. SO123-XV-17.1, "Hazardous Waste/Mixed Waste Minimization"
13. SO123-XV-17.3, "Spill Contingency Plan"
14. SO123-VII-20.16, Direct Radiation Exposure Controls and Monitoring
15. SO123-XV-29 "Disposition of Plant-Generated Liquid Waste"
16. SO123-GPI-1, "Ground Water Protection Initiative"
17. SO123-XV-3.5, "Ground Water Protection Initiative Voluntary Communication Protocol"

EVALUATION CHECKLIST

1. Description of change including document number.

This evaluation applies to San Onofre Nuclear Generating Station Units 2 & 3, Steam Generator Replacement Project, OSG Segmentation Plan to segment the OSG and properly dispose of the resulting wastewater and solid waste in accordance with applicable requirements and regulations.

2. Does this change adversely affect the method of deriving monitor setpoints?

Response NO, there are no changes to any method to derive monitor setpoints and effluent radiation monitors will continue to be used to ensure compliance with all regulatory requirements.

3. Does this change adversely affect the isotopic concentration limits on liquid effluents conforming to 10CFR20 Appendix B, Table II, Column 2?

Response NO, there are no changes to isotopic concentration limits on liquid effluents.

4. Does this change adversely affect the annual or quarterly dose limits on liquid effluents?

Response NO, there will be no significant increase in radioactive liquid releases as a result of the planned activities."

5. Does this change modify the frequency requirement to calculate dose or to generate the 31 day dose projection?

Response NO, doses due to radioactive effluents from SONGS will continue to be calculated and the 31 day dose projection will continue to be performed at the current frequency

6. Does this change adversely affect the dose rate limits associated with the isotopic concentration limitations on gaseous effluents conforming to 10CFR20 Appendix B, Table II, Column 1?

Response NO, there are no changes to the dose rate limits associated with the isotopic concentration limitations on gaseous effluents.

7. Does this change adversely affect the annual or quarterly dose limits on gaseous effluents?

Response NO, there are no changes to the annual or quarterly dose limits on gaseous effluents

8. Does this change adversely affect the annual or quarterly dose limits from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents?

Response NO, there are no changes to the annual or quarterly dose limits from I-131, I-133, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents. There will be no significant increase in radioactive gaseous releases, including tritium, as a result of the planned activities."

9. Does this change adversely affect the annual total dose limits conforming to 40CFR190?
Response NO, there are no changes to the annual total dose limits conforming to 40CFR190.

10. Does this change conflict with the requirements of:
(a) NUREG 0133?

Response NO, there is no conflict with the requirements NUREG 0133. The effluent control program will continue to be implemented and all regulatory requirements will continue to be met.

(b) IE Bulletin 80-10?

Response NO, there is no conflict with the requirements IE Bulletin 80-10

11. Does this change adversely affect the Effluent program such that resultant doses or Curies will no longer be ALARA?

Response NO, this change does not adversely affect the Effluent program such that resultant doses or Curies will no longer be ALARA. Radioactive liquid and gaseous effluents resulting from these work activities are not projected to increase significantly and will have little or no impact on resultant doses to a member of the public.

12. Does this change adversely affect the ODCM instrumentation's reliability or functional capability, including surveillance tests and component design?

Response NO, this change does not adversely affect the ODCM instrumentation's reliability or functional capability, including surveillance tests and component design.

13. Does this change adversely affect the monitoring, sampling, or analysis methodology or frequencies of liquid or gaseous effluent as detailed in the ODCM?

Response NO, there are no changes to the monitoring, sampling, or analysis methodology or frequencies of liquid or gaseous effluent as detailed in the ODCM. Radioactive liquid and gaseous releases resulting from these work activities will be performed in accordance with all of the existing requirements of the ODCM.

14. Does this change adversely affect the functional capability of the gaseous or liquid radwaste effluent treatment system?

Response NO, this change does not adversely affect the functional capability of the gaseous or liquid radwaste effluent treatment system.

15. Does this change adversely affect or conflict with the guidance given in Reg. Guide 1.21?

Response NO, this change does not adversely affect or conflict with the guidance given in Reg. Guide 1.21. SCE will continue to monitor, control, and report radioactive releases in accordance with Reg Guide 1.21.

16. Does this change adversely affect any regulatory direction or guidance in the ODCM not specifically mentioned above?

Response NO, this change does not adversely affect any regulatory direction or guidance in the ODCM not specifically mentioned above.

CONCLUSION:

Dose and Curies

The segmentation of the OSGs from Units 2 and 3 is not expected to result in a release of airborne radioactive material, including particulate matter and tritium, due to contamination control measures taken. Similarly, wastewater releases from these work activities is not expected to contain licensed material. Using the highest sample result for steam generator blowdown during the six months preceding the cycle 16 outages, 2.8E-3 curies of 3H could be released with an associated dose to a member of the public of 1.9E-6 mRem.

Direct dose calculations and actions to mitigate the direct dose to a member of the public due to radiation exposure during OSG segmentation activities are found in Reference 4. A constant or average dose rate of 10 microR/hr at the west seawall (occupancy factor of 300 hrs) is required in order to meet the stations ALARA goal of 4 mrem per year as required in SO123-VII-20.16. HP will also control access to the areas, particularly during removal of the steam dome and installation of the shielding cap for shipment. Direct dose to the public at the beach will be measured using TLDs 55 and 56 and will be accounted for in the Annual Radioactive Effluent Release Report.

In the event that a steam generator tube containing residual RCS is nicked during segmentation, a conservative estimate of the maximum amounts of licensed material that could be released during the proposed work activities are:

- 1.9E-3 Ci of gaseous tritium and 3.2E-4 Ci of gaseous ^{60}Co with a total organ dose of 7.8E-3 mrem

- Estimated maximum liquid curies released of 3.5E-2 curies with 4.5 E-2 mrem total body and 3.8 E-1 mrem organ (GI-LLI)

Ground water - The multiple spill prevention and containment measures described provides reasonable assurance that waste water being collected in any of the equipment or that comes into contact with the sealed surface cannot credibly reach the subsurface soil or ground water. In the unlikely event that a spill or leak of water occurs, administrative measures such as the WIPR (Attachment A of work package 25221-003-M0P-0057-0001-000) have been implemented to ensure that the voluntary communication requirements of the industry Ground Water Protection Initiative are met.

SCE will continue to meet all regulatory requirements for the control and release of liquids and gaseous discharges from the site that might occur during the OSG segmentation process to dispose of the OSGs. Any resultant releases of wastewater and airborne material are projected to be incremental and well below the regulations and will be reported in the Annual Radioactive Effluent Release Report. There will be no significant dose to a member of the public due to the proposed work activities.

Performed By (b)(6) Date: 20 May, 2011

Peer Reviewed By (b)(6) Date: 20 May, 2011

Ex 6

UFSAR/UFHA/DSAR CHANGE REQUEST

Page 1 of 4

A. IDENTIFICATION

Change Notice No.: D0044657
(Unique ID from SCASE)

Units 2 and 3

Title: Solid Waste Management System

Date Prepared: 1/21/2011

Document Affected: UFSAR

Section/Rev. No.: 11.4 Rev. 21

Orig. Organization: DEO/SGRP

Originator (b)(6)

Ex 6

Originating Design Document(s) or Other: Order 800175654 NECP 800074957 ASC D0044582

Operating License/TS affected? [X] No [ ] Yes Section:

Status of Change [ ] Final [X] Pending implementation/approval of Order 800175654 NECP 800074957ASC D0044582

B. DESCRIPTION

Describe Why Change is Necessary (Attach additional pages as required):
Changes to UFSAR Section 11.4.1 are made to describe temporary facilities added in the Unit 1 North Industrial Area as part of the solid waste management at SONGS. These facilities are the Original Steam Generator Segmentation Facility (OSGSF), the Replacement Steam Generator Storage Facility (RSGSF), and the Decontamination Facility. RSGSF is used to store RSGs before installing inside SONGS Units 2 and 3 and also temporarily storing two OSGs. OSGSF is used to store the OSGs after they are removed from SONGS Units 2 and 3. It is also used for the segmentation and packaging of the OSGs for offsite transport and disposal.

Summary of Change (Attach additional pages and/or marked up pages as required):
See attached changes.

C. Prior NRC approval consideration per 10CFR50.59 [15]

10 CFR50.59 Screen or Evaluation [ ] N/A document justification [X] Reference 800074957-0020 NECP Operation

[ ] 10 CFR 50.59 Review Required ________ Notification Number

Justify Why 10 CFR 50.59 Screen or Evaluation is N/A (Attach additional pages as required):

D. SITE PROGRAM/PROCEDURE IMPACT (stand-alone changes only)

[X] No [ ] Yes Notification Number

UFSAR/UFHA/DSAR CHANGE REQUEST
(Continued)

E. TECHNICAL REVIEW:

An optional technical review may be requested by the Originator, Section Owner, or Section Owner Supervisor. No qualifications are required to perform this review which is based upon technical expertise. (Mark N/A in "Reviewed By" blank if not used.)

(b)(6)	(Case 19998)				
Reviewed By	Date	Reviewed By	Date	Reviewed By	Date

F. APPROVED BY:

The following Originator signature (electronic signature in SAP) requires T49911.

(b)(6) (See Case 19998) ______ Date Qualifications Verified By ______ Initials/Date
Originator

The following Section Owner signature (electronic signature in SAP) requires 1) T49912, 2) T49911 and PQS 263855, or 3) PQS 233773 (applicable to UFSAR Chapter 17 changes only).

(b)(6) (See Case 19998) ______ Date Qualifications Verified By ______ Initials/Date
Section Owner

The following Section Owner Supervisor signature (electronic signature in SAP) requires 1) T49912, 2) T49911 and PQS 263855, or 3) PQS 233773 (applicable to UFSAR Chapter 17 changes only).

(b)(6) (See Case 19998) ______ Date Qualifications Verified By ______ Initials/Date
Section Owner Supervisor

The following UFSAR Program Manager or designee signature (electronic signature in SAP) requires 1) T49912 or 2) T49911 and PQS 263855.

(b)(6) (See Case 19998) ______ Date Qualifications Verified By ______ Initials/Date
UFSAR Program Manager

The following NRA signature (electronic signature in SAP) [Manager, Plant Licensing or designee] requires 1) T49912 or 2) T49911 and PQS 263855.

(b)(6) (See Case 19998) ______ Date Qualifications Verified By ______ Initials/Date
Performed By NRA

G. FORWARD TO CDM-SONGS

Codes and standards applicable to the solid waste management system are listed in Appendix 3.2A.

Collection, transfer, packaging, and storage of radioactive wastes will be performed so as to maintain any potential radiation exposure to plant personnel to as low as is reasonably achievable (ALARA) levels, consistent with the recommendations of Regulatory Guide 8.8 and within the dose limits of 10CFR20. Some of the design features incorporated to maintain ALARA criteria include remotely actuated flushing, quick disconnect, equipment layout permitting the shielding of components containing radioactive materials, and use of shielded casks where necessary. Packaging and transport of radioactive wastes will be in conformance with 10CFR71, 49CFR170-178 and applicable burial site licensing conditions. Collection, solidification packaging, and storage of radioactive wastes will be performed in conformance with 10CFR50. Laundry is normally cleaned by a licensed offsite processor and returned after it is laundered, however, it may be cleaned on site at the 68' laundry facility if desired. Decontamination of waste material (metals) is normally performed at either Unit 1 A40/42 buildings, U2/3 37' RW Room 335B, or SYF Decontamination Shop. Storage of radioactive wastes will normally be performed at the Multi-Purpose Handling Facility (MPHF) located at the SYF.

The North Industrial Area or Unit 1 Industrial Area is used from time to time for temporary staging of large contaminated equipment from Units 2 and 3 as it is decontaminated or prepared for shipment to an off-site facility for treatment and/or disposal. Examples of the types of equipment that could be temporarily staged in the Unit 1 Industrial Area include the original steam generators and the reactor vessel heads. Appropriate contamination control, spill prevention, and effluent control measures are developed and implemented to prevent unplanned, unmonitored releases of radioactive liquids and/or radioactive airborne material during temporary storage, treatment, and packaging activities of the contaminated equipment.

The original steam generators from Units 2 and 3 were moved into temporary structures in the Unit 1 Industrial Area following the steam generator replacement activities during the cycle 16 refueling outages (2009 and 2010). The temporary structures are the Original Steam Generator Segmentation Facility (OSGSF), the Replacement Steam Generator Storage Facility (RSGSF), and the Decontamination Facility. These temporary structures were erected to provide an enclosed space protected from the weather for pre-installation preparation of the replacement steam generators and for on-site segmentation and shipping preparation of the original steam generators.

All of these facilities are metal frame/fabric covered structures. Each structure provides for a completely enclosed space, has a watertight covering, and protects from the marine air environment. Each facility has foundations and floors suitable for the intended occupancy. Doors, as appropriate, are included for ingress and egress of large components. The facilities contain sufficient power, lighting, ventilation, furniture, and other services required to support the work activities planned. Shielding is provided to maintain doses to members of the public ALARA. These features, radiological protection controls for work activities, and effluent control measures are designed to ensure that there are no unmonitored releases of radioactive effluents and no spills to the environment. Once the original steam generators have been prepared to meet all

applicable DOT and NRC shipping requirements, they are transported to an appropriate disposal facility.

11.4.2 SYSTEM DESCRIPTION

11.4.2.1 General Description

The solid waste management system is subdivided into three categories:

- X Wet/Liquid waste(s) and spent resin disposal
- X Dry waste disposal
- X Filter handling and disposal

Plant layout drawings illustrating the packaging, storage, and shipping areas of the site are presented in figures 11.4-1 and 11.4-2. The expected nuclide activity of the liquid waste and spent resin inputs to the SWMS are presented in section 11.2.2.1.4.

Tables 11.4-1 and 11.4-2 list the expected volumes of wastes to be processed on an annual basis, their physical forms, their radioactive nuclide activity, and the bases for volume estimates provided.

UFSAR/UFHA/DSAR CHANGE REQUEST

Page 1 of 4

A. IDENTIFICATION

Unit 1

Change Notice No.: D0044659
(Unique ID from SCASE)

Title: DSAR Facility Description

Date Prepared: 1/21/2011

Document Affected: DSAR

Section/Rev. No.: 1.3

Orig. Organization: DEO/SGRP

Originator: (b)(6)

Ex 6

Originating Design Document(s) or Other: Order 800175864 NECP 800074957 ASC D0044582

Operating License/TS affected? [X] No [ ] Yes Section:

Status of Change [ ] Final [X] Pending implementation/approval of NECP 800074957 ASC D0044582

B. DESCRIPTION

Describe Why Change is Necessary (Attach additional pages as required):
Changes to DSAR Section 1.3 are made to describe temporary facilities added in the Unit 1 North Industrial Area for temporary staging of large contaminated equipment from Units 2 and 3 as it is decontaminated or prepared for shipment to an off-site facility for treatment and/or disposal.

Summary of Change (Attach additional pages and/or marked up pages as required):
See attached changes.

C. Prior NRC approval consideration per 10CFR50.59 [15]

10 CFR50.59 Screen or Evaluation

[ ] N/A document justification

[X] Reference 800074957-0020 NECP Operation

[ ] 10 CFR 50.59 Review Required ______ Notification Number

Justify Why 10 CFR 50.59 Screen or Evaluation is N/A (Attach additional pages as required):

D. SITE PROGRAM/PROCEDURE IMPACT (stand-alone changes only)

[X] No [ ] Yes Notification Number

D/3

UFSAR/UFHA/DSAR CHANGE REQUEST
(Continued)

E. TECHNICAL REVIEW:

An optional technical review may be requested by the Originator, Section Owner, or Section Owner Supervisor. No qualifications are required to perform this review which is based upon technical expertise. (Mark N/A in "Reviewed By" blank if not used.) Ex 6

(b)(6)	(See Case 20074)				
Reviewed By	Date	Reviewed By	Date	Reviewed By	Date

F. APPROVED BY:

The following Originator signature (electronic signature in SAP) requires T49911.

(b)(6) (See Case 20074) ______ Qualifications Verified By ______ Ex 6
Originator — Date — Initials/Date

The following Section Owner signature (electronic signature in SAP) requires 1) T49912, 2) T49911 and PQS 263855, or 3) PQS 233773 (applicable to UFSAR Chapter 17 changes only).

(b)(6) (See Case 20074) ______ Qualifications Verified By ______ Ex 6
Section Owner — Date — Initials/Date

The following Section Owner Supervisor signature (electronic signature in SAP) requires 1) T49912, 2) T49911 and PQS 263855, or 3) PQS 233773 (applicable to UFSAR Chapter 17 changes only).

(b)(6) (See Case 20074) ______ Qualifications Verified By ______ Ex 6
Section Owner Supervisor — Date — Initials/Date

The following UFSAR Program Manager or designee signature (electronic signature in SAP) requires 1) T49912 or 2) T49911 and PQS 263855.

(b)(6) (See Case 20074) ______ Qualifications Verified By ______ Ex 6
UFSAR Program Manager — Date — Initials/Date

The following NRA signature (electronic signature in SAP) [Manager, Plant Licensing or designee] requires 1) T49912 or 2) T49911 and PQS 263855.

(b)(6) (See Case 20074) ______ Qualifications Verified By ______ Ex 6
Performed By NRA — Date — Initials/Date

G. FORWARD TO CDM-SONGS

this formation is adequate to support the structural loads. The site enjoys favorable meteorological conditions, except for relatively few occasions, with daily land and sea breezes. Investigations in meteorology, oceanography, and environmental monitoring have been conducted to verify the environmental characteristics of the site.

1.3 FACILITY DESCRIPTION

Three nuclear generating units and supporting facilities are located on the SONGS site. Figure 2-1 shows the original layout of the SONGS Site Plan. SONGS 1 was comprised of a Westinghouse three-loop, 450 MWe Nuclear Steam Supply System (NSSS) and turbine-generator. All spent fuel has been removed from the reactor and transferred to the ISFSI.

The major structures on the SONGS 1 portion of the site were the: Containment Sphere Turbine Building, Fuel Storage Facility, Reactor Auxiliary Building, and the Intake and Discharge Structure. These structures and their foundations have been removed or abandoned as described in Facility Description sections. The decommissioned general arrangement is shown on drawing 40028.

Insert from next page.

1.4 REGULATORY HISTORY & MAJOR PROJECTS

SONGS 1 operation was authorized by a Provisional Operating License issued on March 27, 1967, by the NRC's predecessor, the Atomic Energy Commission (AEC). Initial criticality was achieved on June 14, 1967, and SONGS 1 began commercial operation on January 1, 1968. The Environmental Report and the Final Environmental Statement (FES) were issued in accordance with applicable regulations implementing the requirements of the National Environmental Policy Act of 1969.

On July 28, 1970, following two extensions to the Provisional Operating License, SCE submitted an application to convert the Provisional Operating License to a Full-Term Operating License (FTOL or simply the "Operating License"). In connection with this application, SCE provided, in February, 1986, and August, 1991, updated information relevant to the findings and conclusions contained in the FES. Based on the updated information, the NRC issued an Environmental Assessment in September, 1991, which updated the FES. This was followed by issuance of the Facility Operating License (OL) on September 26, 1991. The license authorized SONGS 1 operation until March 2, 2004, 40 years after the date of issuance of the Construction Permit.

The long delay (from July, 1970, to September, 1991) in issuing the OL was caused by the NRC (and AEC) re-evaluation of the SONGS 1 design in light of industry operating experience and the updated design standards which were established after the plant was constructed. SONGS 1 operated under a Provisional Operating License since March 27, 1967, as authorized by 10 CFR 2.109, until the OL was issued.

SONGS 1 was permanently shut down on November 30, 1992, at the end of Fuel Cycle No. 11. On April 2, 1992, SCE submitted an application to the NRC to modify the OL to an Operating (Possession Only) License (POL). The NRC issued the license amendment on October 23, 1992. The POL became effective on March 9, 1993, after SCE provided certification that operation of

The North Industrial Area or Unit 1 Industrial Area is used from time to time for temporary staging of large contaminated equipment from Units 2 and 3 as it is decontaminated or prepared for shipment to an off-site facility for treatment and/or disposal. Examples of the types of equipment that could be temporarily staged in the Unit 1 Industrial Area include the original steam generators and the reactor vessel heads. All these activities are not associated with the Unit 1 Decommissioning.

20004-018 (10/18/2010)

AREVA

AREVA NP Inc.

Engineering Information Record

Document No.: 51 - 9176667 - 001

SONGS 2C17 & 3C17 Steam Generator Degradation Assessment

AREVA

20004-018 (10/18/2010)
Document No.: 51-9176887-001

SONGS 2C17 & 3C17 Steam Generator Degradation Assessment

Safety Related? ☒ YES ☐ NO

Does this document contain assumptions requiring verification? ☐ YES ☒ NO

Does this document contain Customer Required Format? ☐ YES ☒ NO

Signature Block

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Record of Revision

Revision No.	Pages/Sections/ Paragraphs Changed	Brief Description / Change Authorization
000	All	Original Issue
001	1.0, 4.0, 5.0, 6.0, 8.0, 9.0	Added tube-to-tube wear as an existing degradation mechanism

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1.0 INTRODUCTION

This document provides the Steam Generator (SG) Degradation Assessment (DA) for SONGS Units 2 and 3 in satisfaction of the requirements of NEI 97-06 (Reference [1]) and sub tier guidelines, most notably the EPRI PWR SG Examination Guidelines (Reference [2]) and the EPRI SG Tube Integrity Assessment Guidelines (Reference [3]). This DA is for the first inservice examination of the SONGS Units 2 SGs, that began January10, 2012, and for the U3 primary-to-secondary leak outage that began January 31, 2012. It is also for the 3C17 outage, based on updating needs. A key purpose of this assessment/inspection is to identify potential areas of the tube which may be subject to degradation. The assessment is used to document the basis for the inspection scope and identify the examination techniques to be used.

This document supersedes AREVA document 51-9168795-000 "SONGS 2C17 Steam Generator Degradation Assessment". This document is being written during the 2C17 refueling outage, which is the first planned inspection of the Unit 2 replacement steam generators, as well as during the simultaneous Unit 3 primary-to-secondary leak outage that began January 31, 2012.

On January 31, 2012, SONGS Unit 3 shut down for primary-to-secondary leakage of 80 gallons per day (gpd), with an increasing trend.

EPRI Steam Generator Inspection Guidelines Ref. [2] require a Degradation Assessment be prepared prior to SG Inspection. This document is being generated to incorporate experience during the 2C17 planned inspection and address the unplanned Unit 3 inspection. SONGS Unit 3 operated 336 days with newly-installed replacement steam generators.

2.0 SG DESIGN DESCRIPTION

(b)(4)

(b)(4)

Table 2-1 SG Design Highlights

Number of SGs per unit	2
Tube material	SB-163 (Inconel 690 TT)
	Rows 1-13 are stress-relieved
Number of tubes per SG	9727
Tube nominal outside diameter	0.750 in.
Tube nominal wall thickness	0.043 in.
Pitch	1.00 in.
Layout of tubes	Equilateral triangular array
Tube Support Plates	Seven trefoil broached plates, 405 ferritic stainless steel
Tube Support Plate Thickness	1.38"
Anti Vibration Bars	Six sets (AV1 – AV12), 405 Stainless Steel
AVB dimensions	(b)(4)
Tubesheet Material Note: Unit 3 material re-certified due to heat addition during repair of Divider Plate-to-Channelhead weld.	Low alloy steel Unit 2: (SA-508 Gr3 Class 2) Unit 3: (SA-508 Gr3 Class 1)
Tubesheet nominal thickness	(b)(4)

Ex. 4

Ex 4

Figure 2-1 SONGS 2 & 3 RSG General Arrangment Drawing

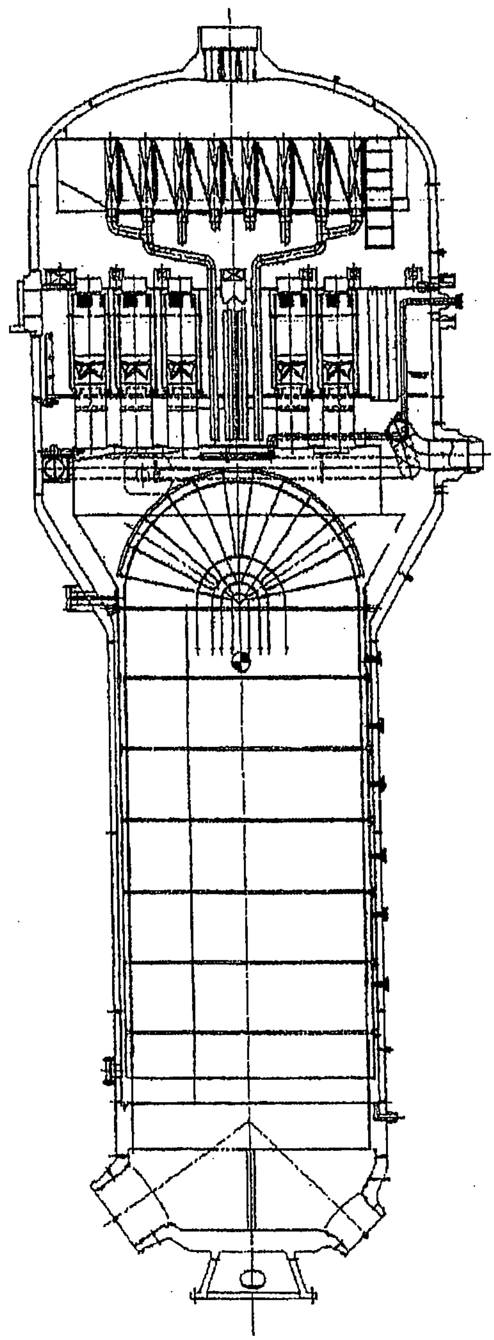


Figure 2-2 SONGS 2 & 3 RSG AVB Layout

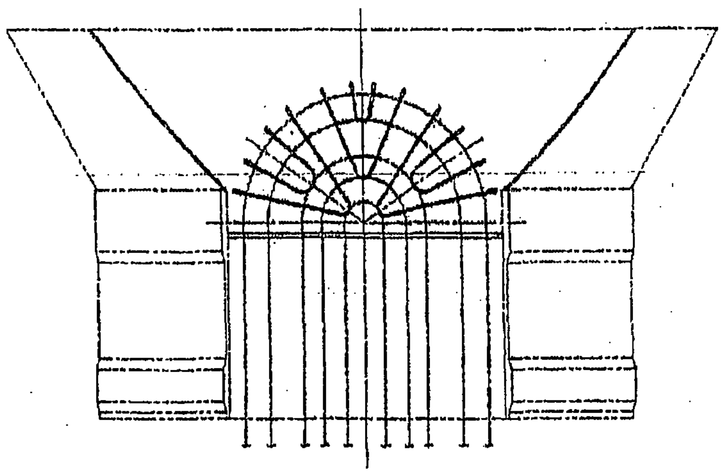


Figure 2-3 SONGS 2 & 3 RSG TSP Layout

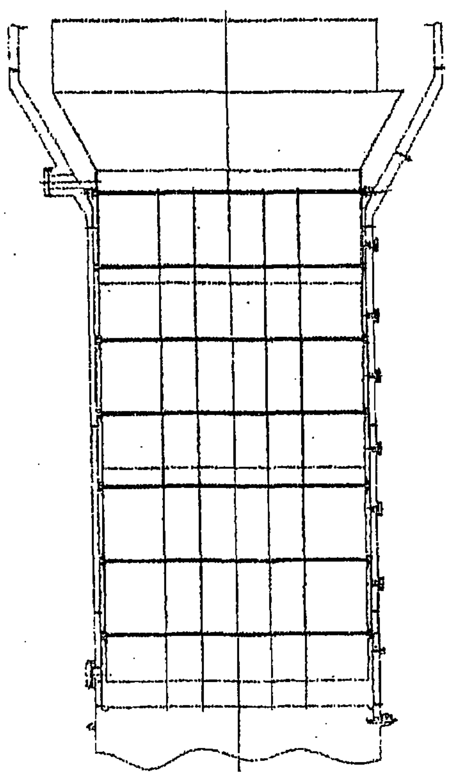


Figure 2-4: SONGS-2&3 AVB Retainer Bar General Arrangement (overhead view)

(b)(5)

Figure 2-5 SONGS 2 & 3 Tube-to-Tubesheet Installation

(b)(4)

3.0 PERFORMANCE CRITERIA

The steam generator is designed and fabricated in accordance with Section III of the American Society of Mechanical Engineers (ASME) Code as a Class 1 pressure vessel with the following safety-related functions: 1) to maintain the integrity of the reactor coolant pressure boundary, 2) to support the capability to shutdown the reactor and maintain it in a safe shutdown condition, and 3) to support the capability to prevent and mitigate the consequences of accidents that could result in potential off site exposure comparable to 10 CFR 50.67.

To support these functions, the steam generator must be designed to facilitate in-service inspection of its primary and secondary side components. Inspection of the primary side is required by Section XI of the ASME Code and Title 10 of the Code of Federal Regulations (CFR), Part 50.55a. These inspection requirements are further detailed in the plant Technical Specification, and NEI 97-06 Reference [1] along with supporting EPRI documents identified in References [2] and [3] (SG Examination Guidelines and Integrity Assessment Guidelines, respectively). The secondary side, non-pressure retaining components are not subject to the ASME Code and 10CFR inspection requirements per-se, but are subject to other examination requirements per the guidance of References [1] and [2]. SONGS Plant Technical Specifications (Reference [15]) define steam generator performance criteria in terms of structural and leakage integrity as follows:

- SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational leakage.
- *Structural Integrity Performance Criterion*: "All inservice steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down and all anticipated transients included in the design specification) and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads."
- *Accident Induced Leakage Performance Criterion*: The primary to secondary accident induced leakage rate for any design basis accident, other than a steam generator tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all steam generators and leakage rate for an individual steam generator. Leakage is not to exceed 0.5 gpm per steam generator and 1 gpm through both steam generators.
- *Operational Leakage Performance Criterion*: The operational leakage performance criterion is specified in SONGS LCO 3.4.13 "RCS Operational Leakage" which states

that RCS operational leakage shall be limited to 150 gallons per day primary to secondary leakage through any one steam generator.

4.0 DEGRADATION MECHANISMS

Steam generator tube degradation, in general, results from mechanical and corrosion related processes. Degradation mechanisms are classified as existing or potential. Existing degradation mechanisms are indications of degradation previously and/or currently observed in a SG. Potential degradation mechanisms are indications of degradation that have not been discovered in prior inspections in the SGs, but are judged to have a potential to occur in the current inspection period based on industry experience and/or laboratory data. All tubing locations associated with existing or potential degradation mechanisms must be inspected during each technical specification inspection period.

According to Reference [3], an assessment of existing and potential degradation mechanisms should consider, but not be limited to, other plant experiences of similar design, material susceptibility, operating temperatures and pressures, residual stresses resulting from fabrication processes (bending or expansion), and secondary side water chemistry.

Following fabrication, there were no confirmed foreign objects and no plugged tubes in any of the SONGS steam generators. The SONGS SGs have no existing tube corrosion and no associated relevant chemistry excursions or intrusions. Due to the design improvements of the SONGS replacement SGs, only degradation from wear mechanisms are expected. Table 4-1 summarizes existing tube degradation mechanisms for ongoing inspections and the first Technical Specification inspection interval (144 EFPM following first ISI).

Table 4-1: SONGS Degradation Mechanisms

Degradation		Location	Classification
Unit 2	Wear	Retainer Bars	Existing
		AVB	Existing
		TSP	Existing
		Tube-to-tube interaction	Potential
		Foreign Object	Existing
Unit 3	Wear	Retainer Bars	Existing
		AVB	Existing
		TSP	Existing
		Tube-to-tube interaction	Existing
		Foreign Object	Potential

4.1 Existing and Potential Degradation Mechanisms

Since the 2C17 inspection began, tubing wear has been identified at AVBs, TSPs, Retainer Bars and at foreign objects. These mechanisms are now classified as existing. Tube-to-tube wear as seen in Unit 3 has not been identified in Unit 2. Tube-to-tube wear in Unit 2 is classified as a potential degradation mechanism.

The inspection for the Unit 3 primary-to-secondary leak outage has begun. Thus far, wear at AVBs, TSPs and from tube-to-tube interaction have been identified. Thus, AVB wear, TSP wear and tube-to-tube interaction wear are classified as existing in Unit 3. Foreign object wear has not been detected in Unit 3 and remains a potential degradation mechanism for Unit 3.

4.1.1 Tube Support Wear (TSPs, AVBs and Retainer Bars)

Tube support wear is considered a mechanically-related degradation mechanism and occurs at the contact points between the tube OD and the tube support structure (TSP, Retainer Bar or AVB). Wear typically is the result of thermal-hydraulic action in the steam generator causing relative motion between the tube and its support with a resultant tube wall loss.

The bobbin coil technique is fully qualified for the detection and sizing of wear at TSP, AVB, and Retainer Bars. A 100% inspection will be performed in 2C17, the Unit 3 primary-to-secondary leak outage, and 3C17. Thus all potential locations will be examined, and scope expansion is not applicable.

Wear at TSPs has been identified in Unit 2 ranging from 6%TWD to 20% TWD as measured by bobbin.

Wear at AVBs has been identified in Unit 2 ranging from 4% TWD to 35% TWD as measured by bobbin.

Wear at Retainer Bar locations has been identified in Unit 2, up to 90% TWD as measured by +Point™. The 90% TWD indication will require in situ pressure testing.

4.1.2 Foreign Object Wear

Foreign object wear results from relative motion between the tube and the loose part with the net effect of a reduced wall thickness. The probability of foreign object wear at SONGS-2 and 3 is minimal due to SONGS's foreign material exclusion (FME) controls and the steam generator's foreign object trapping feature. In particular, SONGS replacement steam generators feedwater ring spray nozzles exit holes are 0.24" diameter. This significantly limits the size of a foreign object that could travel beyond the feedring. This arrangement is capable of trapping very small objects and preventing them from reaching the tube bundle. These systems are designed to preclude foreign objects from entering the tube bundle; however, they do not preclude damage from pre-existing foreign objects inadvertently remaining in the steam generator or foreign objects small enough to pass through the trapping system.

Two indications in adjacent tubes, of wear due to foreign object(s), have been detected in Unit 2. These are on the top of the 4th hot leg TSP (4th counted by starting at the hot leg tubesheet). The depths are 10% and 16% TWD as measured by +Point™.

4.1.3 Tube-to-tube Wear

Inspections during the Unit 3 primary-to-secondary leak outage have identified tube-to-tube wear in the u-bend region of both SG 88 and 89. Pending further confirmation, evidence indicates that tube-to-tube wear resulted in the SG 88 tube leak that resulted in the Unit 3 shutdown.

4.2 Manufacturing Related Conditions

Tube manufacturing related conditions typically result from tube mill and/or tube installation processes These conditions typically do not result in tube degradation; however, the conditions are detectable using eddy current examination techniques and need to be addressed; examples include permeability variations, manufacturing burnish marks, and dings. During the SONGS-2 and 3 pre-service (baseline) inspection (PSI), these conditions were detected during the bobbin probe examination and special interest examinations for indication confirmation and characterization.

4.2.1 Ding (DNG) and Dent (DNT)

Dings typically manifest themselves as a local reduction (plastic deformation) in the tube wall caused by the handling and installation of the tube. While the ding itself does not constitute degradation, dings can become an initiation site for stress-related corrosion and cracking. Dings can also mask true degradation. Typically, when a tube is "dinged" the tube ID experiences a tensile stress while the OD surface experiences a compressive stress. Due to tube material's elasticity, the tube springs back putting the ID surface in compression and the OD in tension. During the PSI all of these indications at all locations were reported as Dings. During the 2C17, U3 primary-to-secondary leak outage and 3C17 examinations all of these locations at tube support locations will be reported as Dents (DNT).

During the PSI, nearly the entire DNG population as reported by bobbin was less than 1 volt, where twice this voltage (2 volts) is typically the bobbin probe industry reporting threshold for dings. A sample of the larger voltage dings was subsequently examined with a +Point™ probe. No indications of degradation were reported with the +Point™ probe.

Reporting of DNG and DNT indications during the 2C17, Unit 3 primary-to-secondary leak outage and 3C17 will utilize a 1 volt reporting criteria.

4.2.2 Manufacturing Burnish Mark (MBM)

Manufacturing Burnish Marks typically result from light buffing during tube manufacture for removal of small blemishes on the tube's OD surface. Most MBM's are located in the freespan regions and typically have no impact on tube integrity. Larger magnitude MBMs do have the potential to mask other signals of true degradation. The two MBMs detected during the SONGS-2 PSI are small in voltage (0.32 and 0.22V) and are not expected to mask other indications. Each MBM was subsequently examined with the +Point™ probe for confirmation and characterization. No MBMs were identified during the Unit 3 baseline inspection.

4.2.3 Geometric Distortion (GMD)

During the Unit 2 PSI, a total of 50 GMD indications were identified (19 in SG 88 and 31 in SG 89). During the Unit 3 PSI, a total of eight GMD indications were identified (three in SG 88 and five in SG 89). All of these indications were detected during the +Point™ inspections of the tubesheet. The GMD indications are a result of the lift-off response caused by slight changes in the tube geometry in the expanded region of the tubesheet.

4.2.4 Bulge (BLG)

During the Unit 2 PSI, one BLG was recorded at B01 +1.15 in SG 89. This location was examined with +Point™. The +Point™ inspection showed no tube degradation.

During the Unit 3 PSI, ten BLG indications were recorded in SG 88 and three BLG indications were identified in SG 89. All locations were subsequently inspected with +Point™. The +Point™ inspection showed no tube degradation.

4.2.5 Permeability Variation (PVN)

Permeability variation is inherent to the material manufacturing process prior to thermal treatment of the tubing. Commonly-used test coils during eddy current in-service inspections (i.e. non-magnetically biased probes) may not be able to detect degradation signals in the midst of interfering permeability variation signals. In such cases, the selected use of magnetically biased probes frequently can reduce the permeability interference to obtain an acceptable inspection. When these attempts are unsuccessful, an additional engineering evaluation may be performed and the tube may or may not be recommended for plugging. During the pre-service examination, one permeability variation was detected. This occurred in tube 67-69 of SG 89 at B11 +4.26. The PVN was based on the bobbin inspection. The +Point™ inspection showed no tube degradation.

No PVN indications were identified in the Unit 3 baseline.

4.3 Degradation Not Existing or Not Potential

The following degradation mechanisms have been classified as not existing or not potential for 2C17, Unit 3 primary-to-secondary leak outage, 3C17, or the first Tech Spec inspection interval, and therefore need not be explicitly included in the inspection plans.

4.3.1 IGA/SCC (ID and/or OD)

The Inconel Alloy 690TT tubing in the SONGS-2 and 3 replacement steam generators provides a significant increase in resistance to corrosion related degradation, especially when compared to the original SONGS-2 and 3 steam generators which operated using 600MA tubing. Worldwide, approximately 88 plants are in operation using Alloy 690TT tubing (over 200 steam generators) with no reported indications of corrosion after 20+ years of service Reference [5].

An EPRI Technical Report Reference [20] evaluated the effects of stress corrosion cracking in older generation Mill-Annealed units and used this data to predict the improvement for more enhanced tubing material, i.e. I-600TT and I-690TT. The results of the report showed that primary water stress corrosion cracking (PWSCC) prediction methods are well established and indicate PWSCC should not be a concern over unit operating life. Predictions relative to outside diameter stress corrosion cracking/ inter-granular attack (ODSCC / IGA), although indicating degradation susceptibility somewhat earlier in life than PWSCC, are typically less reliable since the secondary side could be affected by chemistry, sludge loading, and other service related conditions. However, based on the 20 plus years of operating experience at I-600TT units, the susceptibility to secondary side corrosion degradation has proved to be significantly less compared to I-600MA units.

In a collaborative effort with EPRI in the 1990s, Westinghouse provided a relative ranking of improvement factors between various materials in primary and secondary water environments. These predictive models provided the expected results for hot leg operating temperatures up to 618 °F. This information is presented below in Table 4-2.

Experience shows that the exposure time required to initiate IGA/SCC is strongly dependent on exposure temperature, where higher temperatures lead to earlier crack initiation on both the primary and secondary sides. SONGS-2 and 3 operate at a nominal hot leg temperature much less than 618°F. Several other plants with I-690TT replacement steam generators operate with hot leg temperatures up to 620°F (e.g., South Texas Project-1, VC Summer, Shearon Harris, etc.) Reference [4]. These plants which have operated longer than SONGS-2 and 3 and also at higher temperatures provide a reliable indicator for the development of IGA/SCC. The absence of corrosion in these plants is strong evidence that corrosion should not develop in the SONGS-2 and 3 tubes in the foreseeable future.

Based on the above discussions, IGA/SCC (ID or OD) does not present a realistic threat to SONGS-2 or 3 tube integrity in the foreseeable future.

Table 4-2: Corrosion Resistance Ranking of Alloys 600MA, 600TT, and 690TT

CORROSION MODE	Alloy 600MA	Alloy 600TT	Alloy 690TT
A. STRESS CORROSION CRACKING			
1. Chloride			
• Acid	1	1	1
• Acid + SO_4 (trace)	2-3	2	1
• Neutral (or AVT)	1	1	1
2. Caustic			
• Below 6 %	3	2	1
• 10 to 50 %	4	2	2
3. Caustic plus Copper Oxide	4	3	2
4. Water			
• Pure, Pri. and AVT w/H_2	4	2-3	1
• Pure w/O_2	4	3	1
5. Sulfur Compounds			
• Acid Sulfate	3	1	1
• Alkaline Sulfate	1	1	1
• Acid Reduced Compounds	3-4	2	(1)
• Alkaline Reduced Comps.	2	(3)	3
6. Lead			
• Acid	4	4	1
• Neutral (or AVT)	3-4	3	1
• Alkaline	3-4	3	4-5
B. INTERGRANULAR CORROSION	(Note: Copper oxide tends to increase susceptibility for intergranular corrosion)		
1. Acid	3-4	2-3	1-2
2. Alkaline	4	2	1
C. PITTING IN CHLORIDES (Note: Copper and copper oxide tend to increase susceptibility for pitting)	3-4	3-4	2
D. WASTAGE (Note: Copper oxide tends to increase susceptibility for wastage)			
1. Phosphates	3	(3)	(2)
2. Sulfates	3	3	2
Rankings: 1 = Best; 5 = Worst; ( ) = Estimate MA = Mill Annealed; TT = Thermal Treated			

4.3.2 Tube Support Cracking / Corrosion Induced Tube Denting

SONGS-2 and 3 tube supports have been manufactured using stainless steel to circumvent degradation problems that were experienced with first generation carbon steel supports. Stainless steel is highly resistant to general and flow assisted corrosion in well-controlled steam generator secondary water environments, typical of modern chemistry control protocols such as that implemented at SONGS-2 and 3. As a result, corrosion-related tube support degradation is very unlikely to occur at SONGS-2 and 3. Corrosion-induced tube denting occurs when support corrosion produces magnetite, which consumes more volume than the original metal, thus causing the tube to deform (dent). Since stainless steel produces a thin adherent protective oxide layer, these conditions are prevented from developing, and therefore corrosion induced tube denting is not possible at SONGS-2 and 3. However, it is possible that in-service ding / dent signals could occur near a support structure, likely a result of minor tube to support structure relative motions.

4.3.3 Pitting

Pitting is a form of general corrosion degradation driven by local galvanic differences in the tubing. Pitting occurs by dissolution of surface material with no preferential grain boundary attack and consequently does not grow to large volumes due to small-localized galvanic differences. Pitting is usually observed at plants using sea or brackish circulating water systems along with the presence of copper in the secondary system. It is expected that pitting has a low probability of occurrence especially given the lack of this in the SONGS Original SGs and the improved corrosion resistance of I-690TT tubing in the Replacement SGs.

4.3.4 Thinning

Thinning is a general term used to describe two different steam generator damage mechanisms, neither of which is considered to be a threat to the SONGS-2 or 3 steam generators. The first is a wastage mechanism resulting from the use of phosphate-based secondary chemistry controls. This mechanism has not been observed in plants that do not use phosphate chemistry, and is therefore not a threat to the SONGS-2 or 3 steam generators. The other is a type of thinning typically observed in Westinghouse Model 51 SGs caused by acid-sulfate crevice conditions within cold leg deposits. Under modern chemistry control regimes, and design improvements of the SONGS Unit-2 and 3 replacement SGs, this mechanism is very unlikely to develop.

4.3.5 Impingement

Impingement damage has only been identified in a limited number of once-through steam generators (OTSG). It is caused by micron-sized debris particles and specific flow conditions generated within and above drilled tube support plates in OTSG designs. Impingement has not been identified in any other steam generator design and is therefore considered to have a low probability of developing at SONGS-2 or 3.

5.0 EXAMINATION TECHNIQUES

The pre-service examination must utilize inspection techniques that are capable of detecting each mechanism or condition identified in Table 5-1. For each mechanism, Table 5-1 identifies inspection technique(s) capable of detection/characterization. These techniques will be used during the 2C17, Unit 3 primary-to-secondary leak outage, and 3C17 inspections. The bobbin probes will be used to inspect all tubes full-length. The +Point™ probe will be used to inspect the tubesheet region, U-bends, and as a diagnostic tool to resolve ambiguous bobbin probe indications. References [13] and [19] also provide additional detail and guidance for inspection techniques.

Table 5-1 Inspection Techniques Targeting Potential Damage Mechanisms and Conditions

Damage mechanism or condition	Location	Inspection Technique	SONGS ETSS	EPRI ETSS (includes information for integrity assessment)
Wear at all tube supports	All tubes full length	Bobbin	1	96004.1 r/13
Wear due to foreign object or Retainer Bars or tube-to-tube interaction	All tubes full length	Bobbin	1	27091.2 r/0
Wear with foreign object not present or present and Retainer Bars not present or present and tube-to-tube wear	Special Interest	+Point™	2	27903.1 r/0 27903.2 r/0 27903.4 r/0 27903.5 r/0 (See Note1)
Wear	AVBs	+Point™	2	10908.1 r/0
Wear	Broached supports	+Point™	2	96910.1 r/10
Characterization of various signals detected by bobbin coil,	ubends	+Point™	3	96511.2 r/16 96511.3 r/16

Note 1: Includes the ".1", ".2", ".4", and ".5" ETSSs in the 27901, 27902, 27904, 27905, 27906, and 27907 series, (all r/0) with extended applicability to geometric transitions because the +Point™ coil is surface-riding

6.0 2C17 AND 3C17 INSPECTION SCOPE

6.1 Unit 3 Primary-to-Secondary Leak Outage Inspection Scope

Initially, the Unit 3 inspection scope is 100% full-length bobbin exam.

6.2 2C17 and 3C17 Base Inspection Scope

The 2C17 inspection is the first inservice inspection on the replacement steam generators. As required by Reference [2], a full-length inspection of all inservice tubing will be performed with bobbin coil probes. In addition, some bobbin signals will also be inspected with +Point™ coils for clarification and characterization purposes. Table 6-1 provides a summary of the planned inspections.

Table 6-1 First ISI Tube Examination Summary

Inspection Extent	*Inspection Type*	*Inspection Scope*	*Mechanisms or Conditions Assessed*
Full length (Tube end hot to tube end cold)	Bobbin coil	100% (9727 tubes) All steam generators (per the requirement of Reference [15] and thus the only scope that is not pro-active)	Wear due to foreign object or tube supports
Special interest (extent varies)	+Point™ coil	• 100% of Dents and Dings ≥ 2 volts • All previous and new bulges • All Bobbin wear calls • All previous and new PLP (with a 2-tube bounding pattern & 1 inch above and below PLP edges) • All previous and new MBM • All previous and new PVN • All NQI • Additional as needed	For characterization of various signals detected by bobbin coil

Notes:
PLP= Possible Loose Part
MBM= Manufacturing burnish marks
PVN= Permeability Variation
NQI = Non-Quantifiable Indications

6.3 Expansion of Inspection Scope

The need for, and extent of, any expansion in the examination scope will be determined based upon technical specification requirements and guidance provided in the EPRI SG Examination Guidelines Reference [2]. Scope expansions may also be required to support the operational assessment for the next operating period.

Since a 100% bobbin inspection is being performed, no expansion is applicable to the bobbin inspection.

If potential loose parts (PLPs) are detected by eddy current, rotating coil examinations of the affected tube(s) will be performed to clarify the location/extent of the part, and detect foreign object wear of tubing. The planned scope around a PLP is a 2-tube bounding pattern, with minimum extent of 1 inch above or below PLP edges. Reference [17] addresses appropriate visual examination follow-up on eddy current PLP indications.

If a foreign object is detected by visual inspection, rotating coil examinations of potentially affected tube(s) will be performed to clarify the location/extent of the object, and detect foreign object wear of tube(s). A typical 2-tube pattern bounding pattern may be increased on a case-by-case basis based on the nature of the foreign object(s). The region of examination will also consider potential migration of the object during plant operation (both around the periphery of the tube bundle (including the center no-tube lane), and into the tube bundle). There will be an expansion of the rotating coil examination to all tubes within 3 pitches of the periphery of the tube bundle if the object could have credibly migrated around the periphery of the tube bundle. The axial extent will typically be on a case-by-case basis based on the nature of the foreign object(s).

During the 2C17 inspection, two PLP indications were identified in SG 88 on top of 04H in tubes 136-76 and 137-77. In response to this, an examination of the tubesheet periphery tubes in each SG was initiated. A ring of tubes three rows deep (1030 locations per SG leg) is being inspected from TSH -1.0 to TSH +3.0 and TSC -1.0 to TSC +3.0 with the Plus Point probe.

All activities and decisions associated with foreign objects and foreign object wear will be recorded in the AREVA Foreign Object Tracking System (FOTS) system.

In addition, any new conditions reported should also receive rotating coil inspection. SCE plans to inspect any new indications, such as DNG, DNT, MBM, PVN, GMD, BLG, AVB wear, TSP wear, foreign object wear, etc., with rotating coil inspections. However, if a large population of AVB wear and TSP wear indications are detected, sampling that meets integrity assessment needs may need to be considered.

6.4 Manufacturing Follow-up Inspections

6.4.1 Verification of AVB Positioning

The data for both SGs from the bobbin probe inspection of 100% of the tubing will be used to locate and compare the eddy current Anti-Vibration Bar (AVB) locations (depth of penetration into the tube bundle) with the AVB locations on MHI Design Drawings. This is being done on a one-time basis at both SONGS Units 2 and 3 because of an industry communication after completion of the SONGS Units 2 and 3 PSIs. The Nuclear Regulatory Commission (NRC) Staff told the NEI SG Task Force that their Information Notice 2005-29 "Steam Generator Tube Support Configuration" was also intended for stainless steel supports. EPRI communicated this NRC intention in a Letter to SGMP members (SGMP-10-01) dated July 19, 2010.

6.4.2 Divider Plate Weld Inspections

Visual and Ultrasonic examinations will be performed on all SGs to check the condition of Divider Plate welds. The Divider Plate separates the inlet and outlet plenums of the primary channelhead.

During manufacturing of the Unit 3 SGs, there was Divider Plate-to-Channelhead weld separation. The root cause report indicated that a key contributor to this was the use of air carbon-arc gouging to remove stainless steel cladding, in preparation for the Divider Plate-to-Channnelhead weld. Repair of this condition was a necessary part of completion of manufacturing.

After discovery of this condition in the Unit 3 SGs, similar inspections in the Unit 2 SGs verified that the same condition did not exist in the Unit 2 SGs. Comparative assessment indicated that a key contributor to this is that machining was used for Unit 2, rather than air carbon-arc gouging.

References [21] and [22] reported and described this Divider Plate-to-Channelhead weld separation.

SCE made a commitment Reference [23] to the Nuclear Regulatory Commission (NRC) in response to this Unit 3 Divider Plate-to-Channelhead weld separation. It is quoted below:

"SCE commits to perform additional confirmatory examinations of the divider plate welds following the installation of the RSGs for both Units 2 and 3. The examinations will consist of remote visual examinations of the accessible areas of the divider plate to channel head and tubesheet welds and repeat baseline straight beam ultrasonic examinations from the accessible locations outside the channel head. Examinations will be performed during the first steam generator inspection outage and in a steam generator inspection outage near the end of the first 10-year inspection interval for the RSGs for each unit."

The remote visual and ultrasonic examinations were performed during 2C17 and there were no indications of degradation.

6.5 Channel Head Degradation

During the fall 2011 refueling outage, visual inspection of the steam generators (SGs) at a Westinghouse-designed plant found apparent defects in the channel head of one of the three steam generators. This unit has been in commercial operation since 1987. The inspection showed indications of degradation in the cladding and/or divider plate-to-channel head weld, with exposure and wastage of the channel head base material. The visually observed degradation is located only in one SG, and only on the cold leg side of the channel head in the vicinity of the central drain line. The largest defect in the cladding is 7.7 mm (0.3 inch) x 14.4 mm (0.6 inch) by ultrasonic examination. There are five other smaller observed defects in the cladding in the region of the drain line. The cause of the cladding degradation is not currently known and may have been an isolated occurrence. To date, cladding degradation similar to that which occurred has not been observed in the SG channel head bowls in other operating plants. A breach of the SG channel head bowl cladding is necessary for wastage (including erosion) of the channel head base metal to occur. If a breach of the cladding occurs, it is judged by Westinghouse that this same type of degradation in the channel head base metal could occur in other Westinghouse-designed and Combustion Engineering (CE)-Designed SGs.

Due to the design differences between Westinghouse SGs and the SONGS 2 and 3 MHI SGs, the recommendations from Westinghouse have been adapted to the SONGS SGs. This adaptation presented below is conservative because:

- SONGS SGs do not have a drain line
- SONGS SGs have Stainless Steel and Inconel 690 cladding that are highly resistant to stress corrosion cracking
- SONGS SGs have less than two years of operation

With the channel head bowl in a dry condition (during plant shutdown), perform a visual scan by naked eye or by video camera (i.e., if performed by video camera, no magnification is required) of the low lying areas (e.g., areas where a pool of primary water with concentrated boric acid could remain in the drained SGs) of both the hot and cold legs of the inside surface of the channel head during the next scheduled opening of the primary manways for tubing eddy current testing for each SG. Cold leg inspection is only minimally applicable because the flat bottom of the channelhead is at the same level as the reactor coolant outlet. Key areas of inspection include

- For hot and cold legs: the flat bottom of the channelhead
- For hot leg only: approximately 6 inches of upward channelhead curve immediately above the flat-bottom of the channelhead
- For hot leg only: the divider plate-to-channelhead weld within approximately 6 inches of the flat bottom of the channelhead (which is addressed in 6.3.2)

The inspections shall look for evidence of gross defects (such as indications in welds, missing weld filler material, a breach in the weld metal, unusual discoloration of the weld metal, dings or gouges, etc.).

Document the results. Reference [26] includes guidance if unusual conditions are found. This scanning process (as described above) should be repeated each time the primary manways are removed for scheduled tubing eddy current testing until:

- More detailed information is available (e.g. the material of the cladding of the original experience-reporting plant)
- Negated by industry experience
- The pre-outage SG degradation assessment determines that this inspection is not necessary.

7.0 TUBE REPAIR LIMITS, AND CONDITION MONITORING LIMITS

The Tube Repair Limit for the potential degradation mechanisms is ≥ 35% and is explained in detail in Reference [14].

The Performance Criteria are in Reference [15].

Structural and Condition Monitoring (CM) limits were calculated in accordance with section 5.3.3 of Reference [18]. At the time this document was prepared, statistical data (mean and standard deviation) for the tube material properties were not available for Unit 3. Consequently, ASME Code minimum material properties for 620F were used for (Su+Sy) (111.6 ksi). It must be stressed that this approach is highly conservative. If needed for condition monitoring purposes, the material properties for an individual tube can be used if available.

Operating parameters were taken from Reference [14], and are very conservative, using 2250 psia for primary NOP and 792 psia for secondary pressure. Thus, 3dP is 3*(2250-792)=4374 psid. Actual Unit 2 secondary pressure for cycle 16 was 820 psia (Reference [27]). Thus, 3dP using the actual secondary side pressure is 4290 psid. Condition monitoring limits are provided for both 3dP values.

Condition monitoring limits for both eddy current techniques expected to be used for sizing are provided in Figures 7-1 through 7-4. NDE measurement uncertainties for ETSS 96004.1 r/13 are slope=0.98, intercept=2.89, technique standard error= 4.19, and analyst standard error =.5*technique standard error or 0.5*4.19=2.095. NDE measurement uncertainties for ETSS 27903.1 r/0 are slope=0.97, intercept=2.80, technique standard error= 2.11, and analyst standard error =.5*technique standard error or 0.5*2.11=1.055.

The structural limits shown in Figures 7-1 through 7-4 include no uncertainties. The CM limits include uncertainties for NDE uncertainty and the burst pressure relationship. As discussed above, the ASME Code minimum values were used for material properties. Hence, no uncertainty needs to be applied to the material properties.

Figure 7-1: Structural and Condition Monitoring Limit Curves for Wear at 792 psia Secondary Pressure (ETSS 96004.1)

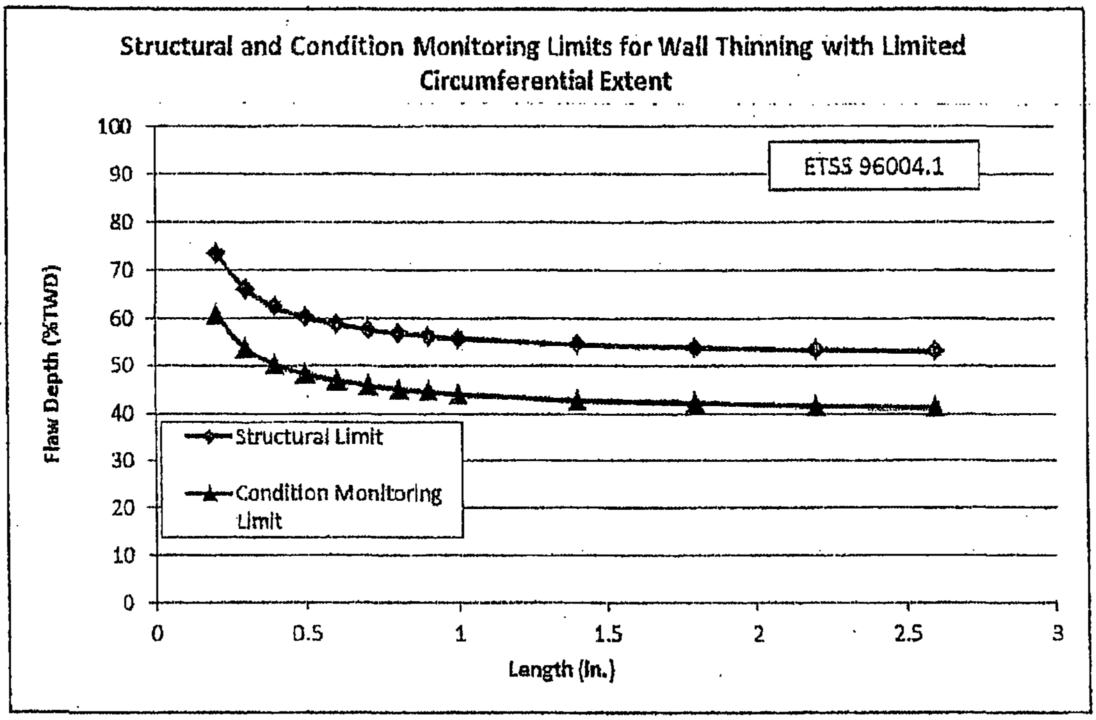


Figure 7-2: Structural and Condition Monitoring Limit Curves for Wear at 820 psia Secondary Pressure (ETSS 96004.1)

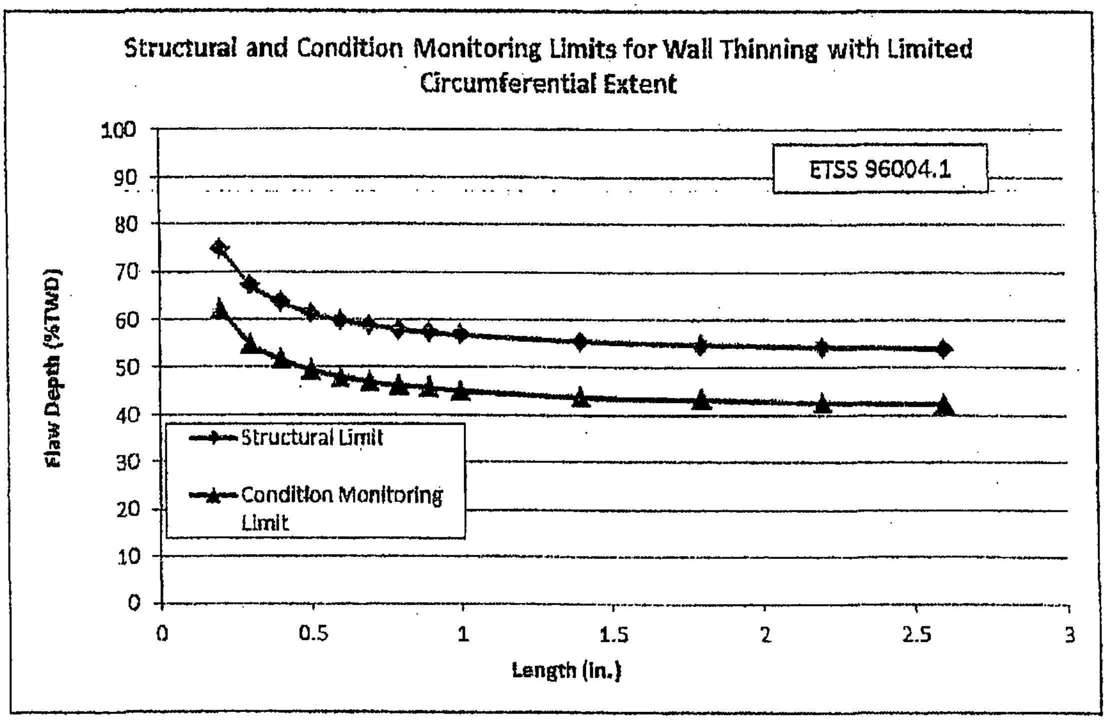


Figure 7-3: Structural and Condition Monitoring Limit Curves for Wear at 792 psia Secondary Pressure (ETSS 27903.1)

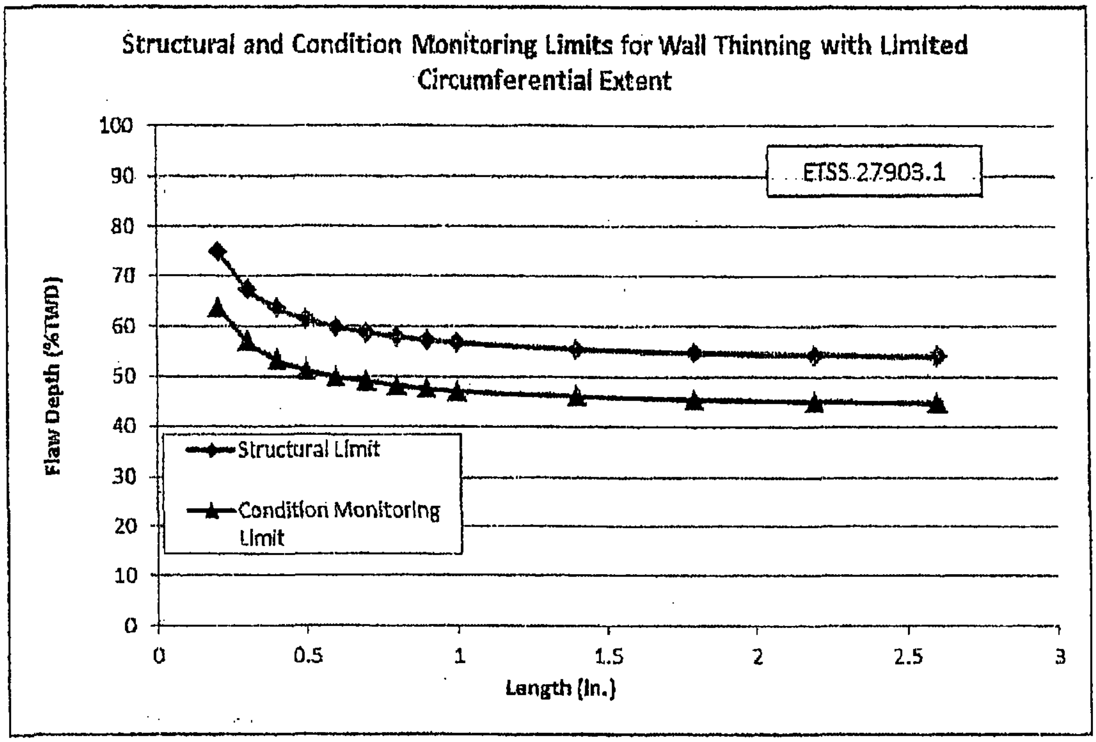
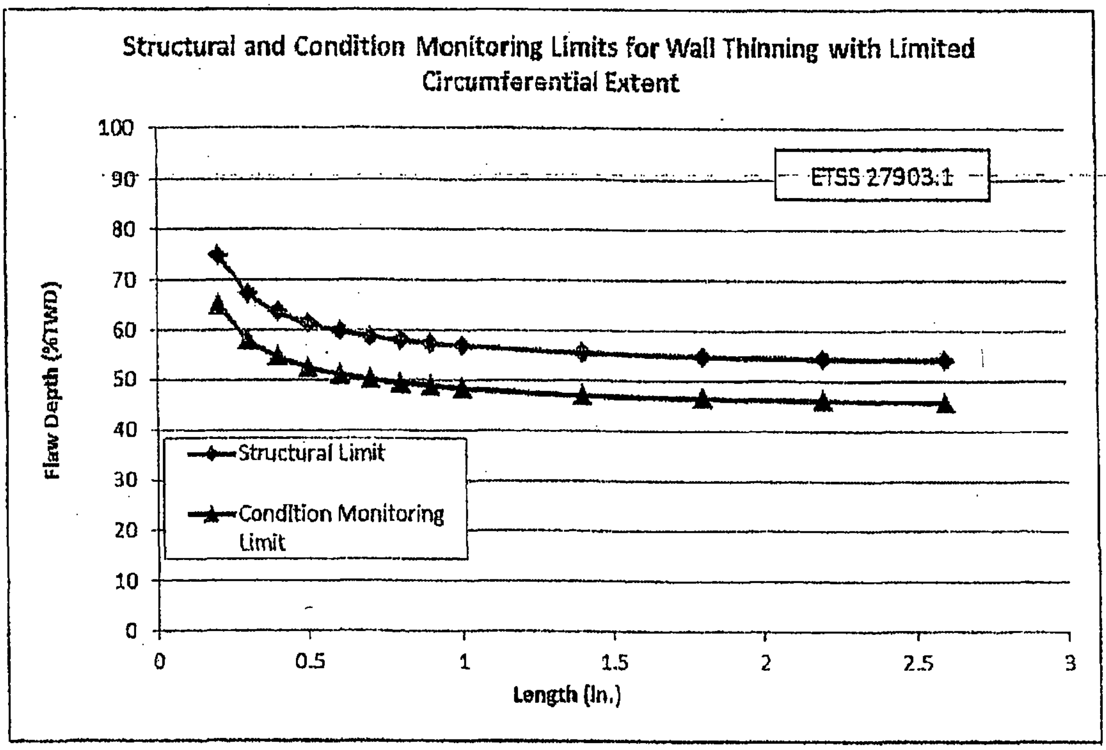


Figure 7-4: Structural and Condition Monitoring Limit Curves for Wear at 820 psia Secondary Pressure (ETSS 27903.1)



8.0 DEGRADATION GROWTH RATES

The 2C17 inspection is currently in progress and most data are collected. AVB wear has been identified in approximately 1400 tubes. The two largest AVB wear flaws measure 35% TWD. TSP Wear has been identified in approximately 100 tubes. The largest TSP wear flaws measure 20% TWD. When all inspections have been completed a final growth rate will be calculated for each mechanism.

9.0 REPAIR PROJECTIONS

SONGS-2 and 3 steam generator tubes may be removed from service by plugging using qualified plugs and materials (I-690TT). Welded plugs may be used in instances where mechanically expanded or rolled plugs are not suitable. The SONGS Unit-2 and 3 SGs currently have no tubes plugged and are analyzed to operate up to 8% tube plugging per SG. Tubes designated for plugging will be reviewed to determine the potential requirement of stabilizing the tube prior to plugging. Conservatively assuming that every tube to be plugged (up to 8%) will also be stabilized, using a typical AREVA u-bend stabilizer which weighs approximately 30 lb, results in less than a 2% increase in total SG weight. AREVA qualitatively judges this increase in weight to be insignificant. In general, the need to stabilize will be reviewed considering Reference [3, Section 6.4.1]. In summary:

- Circumferential cracks will be stabilized unless a stabilization analysis is in place to show that continued operation will not result in tube severance.

- When plugging for wear, the need for stabilization or monitoring of adjacent tubes should be evaluated based upon continued degradation after tube plugging.

- Secondary side foreign object wear, especially in instances where the object cannot be retrieved from the steam generator, should be evaluated for stabilization.

- Stabilization is not required if an evaluation is performed that justifies tube plugging without stabilization.

-Wear at Retainer Bar locations was detected in Unit 2. The evaluation of this mechanism is ongoing at the time this document is being written. Stabilization is being evaluated for these locations.

The damage mechanisms detected in 2C17 and potential in the Unit 3 primary-to-secondary leak outage and 3C17 are wear at tube support plates, retainer bars, AVBs, from tube-to-tube interaction, and from foreign objects. Based on operating experience, TSP wear is not expected to require tube stabilization. TSP wear is typically seen in the early operating cycles, and subsides with each subsequent operating cycle. Since the tube motion is limited by the TSPs and the secondary-side flow is predominately parallel with the tube, the severity of the TSP wear is typically much less than the tube's repair criteria (i.e. 35% TW). Prairie Island AREVA replacement SGs demonstrate this with upper 95th TSP wear growth rates decreasing from 11 %TW/EFPY to 3.6 %TW/EFPY respectively after the first and second operating cycles following SG replacement. The maximum TSP %TW after the first (1.36 EFPY) and second (1.62 EFPY) operating cycles was 21 %TW and 19 %TW respectively. Additionally, TSP wear was not detected during the first Callaway inspection following replacement, only AVB wear .AVB wear from industry experience provides that wear in the first cycles of operation may be of concern for the life of the plant, Reference [24]. Based on the Prairie Island replacement SGs, the upper 95th AVB wear growth decreased only slightly between the first and second operating cycles following replacement, (from 7.6 to 7.2 %TW/EFPY). The maximum %TW seen during the first in-service inspection (1.36 EFPY) was 8 %TW, and the maximum seen during the second in-service inspection (1.62 EFPY) was 20 %TW. For the Callaway plant, the upper 95thAVB growth rate was 9.4 %TW/EFPY with a maximum detected depth of 14 %TW after the first operating cycle (1.3 EFPY). In comparison, AVB wear for late model SGs such as the Westinghouse Model F, have produced significant (35% TW and greater) AVB wear indications in the first or second cycles of operation.

Tube plugging is determined by the Technical Specification plugging criteria (i.e. 35 %TW and greater) and the Operational Assessment (OA). The OA considers all sources of tube loading (bending, pressure, axial, seismic, etc.) and targets the most limiting loading condition to meet the structural and leakage integrity performance criteria for the upcoming operating interval. Tube severance from AVB or TSP wear is also evaluated as part of the OA analysis and is not probable if the tube does not require plugging. If however the tube will be plugged for TSP or AVB wear, then stabilization of this tube is recommended. This approach eliminates any need to evaluate the wear in the out-of service tube for the life of the plant, when a stabilizer is used. If stabilization is not performed for tubes to be plugged, an AREVA engineering evaluation will be performed using available SONGS Unit-2 data and industry data to justify this condition for the end of plant life; or at minimum until the next planned SG tube inspection. Bobbin sizing of AVB and TSP wear, in the presence of multiple wear scars in the same plane, will oversize the wear. Therefore, sizing from Bobbin will inherently be conservative for determination of compliance with the performance criteria and stabilization considerations. Rotating coil inspections of TSP or AVB wear may be useful in assessment of the performance criteria, and stabilization requirements, in the event conditions require further review.

Loose parts wear will be evaluated for stabilization on a case-by-case basis, especially if the object cannot be removed.

Selection of a stabilizer type will be dependent on the exact nature of the degradation mechanism, tube location, and flaw size and growth rate. Stabilizer selection will be made on a case-by-case basis.

9.1 Wear rates and projections

Industry experience and the results of the 2C17 Inspection have shown that new replacement steam generators can experience populations and rates of wear, mainly at AVB intersections. Experience during the 2C17 and Unit 3 primary-to-secondary leak outage show that the previous Section 9.0 discussion of Prairie Island and Callway have limited applicability. The experience of tube support wear at the St. Lucie Unit 2 SGs now appears more similar (in number of indications).

The quantity and rates of AVB wear in the SONGS-2 SGs will necessitate a fully-probabilistic full-bundle model to provide meaningful projections of growth and population. This has not yet been performed for the 2C17 inspection.

Based on preliminary results, the quantity and rates of wear at AVBs, TSPs, and from tube-to-tube contact will necessitate a fully-probabilistic full-bundle model to provide meaningful projections of growth and population. This has not yet been performed for the Unit 3 Primary-to-Secondary Leak Outage.

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9.2 Effect of Thermal-Hydraulic changes

Following the 2C17 and 3C17 outages, SONGS will increase Thot of the RCS from 598 deg to 608 deg F, without changing reactor thermal power (further detail is in Ref. 17). Industry experience shows that changes to plant operating conditions can have a significant impact on wear rates. Changes in wear initiation rates (DC Cook) and degradation growth rates (Millstone and Davis-Besse) have occurred after changing plant conditions, from power uprates, Measurement Uncertainty Recapture, and changes to turbine configuration (DC Cook). The operational assessment calculations will make an allowance for the potential for an increase in initiation and/or growth rates.

10.0 SECONDARY SIDE CONSIDERATIONS

Per Reference [3], the steam generator program shall include measures to maintain steam generator secondary side integrity. The secondary side inspection plan for SONGS-2 and 3 is found in Reference [17], and describes the specific inspections for 2C17 and 3C17. Reference [17] is very detailed in its discussion of the inspections planned for 2C17/3C17 and beyond. During 2C17 and 3C17, Foreign Object Search and Retrieval (FOSAR) will be conducted at the tubesheet, covering the peripheral annulus and center no-tube lane, and as needed to target areas where ECT identified foreign objects or wear that was likely caused by a foreign object. FOSAR inspections in the Unit 3 forced outage will be performed as needed depending on the identified source of the primary-to-secondary leak and other factors yet to be identified.

11.0 LEAKAGE INTEGRITY SCREENING

CM evaluations must demonstrate that operational and accident induced leakage integrity was also maintained over the past operating period. At operating conditions, the leak rate is limited to 150 gpd through any one steam generator. The primary to secondary accident induced leakage rate for any design basis accident, other than a steam generator tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage for all steam generators and leakage for an individual steam generator. For all degradation mechanisms, leakage is not to exceed 1 gpm (1440 gpd) from all steam generators, and 0.5 gpm from any single SG.

EPRI has developed degradation-specific voltages for leakage screening. These voltages are based on pulled tube data and are documented in Reference [28]. Table 11-1 below provides the screening voltages for wear at tube supports (TSP and AVB). If the maximum NDE voltage exceeds the EPRI "Threshold Voltage" using a quantified sizing technique, then a NDE max depth threshold (%TW) will be used to determine if in situ testing is or is not required per Reference [28]. If the NDE sizing technique is not quantified (while exceeding the threshold voltage), then a leak test will be required. If the NDE indication voltage exceeds the EPRI "Critical Voltage", leak testing is required regardless of the %TW. In the event of loose parts wear, Retainer Bar wear, or wear due to tube-to-tube interaction, voltage screening is irrelevant (due to the large variability associated with these), and the determination to in situ test is based on the maximum %TW of the wear indication.

Table 11-1: Voltage Thresholds for Leakage Screening

Degradation Mechanism	Threshold Voltage	Critical Voltage
TSP Wear (Bobbin)	15.2v	25.0v
AVB Wear (Bobbin Differential)	12.1v	25.0v

12.0 INDUSTRY EXPERIENCE

12.1 Operating Experience Reports

Nuclear Regulatory Commission (NRC) Information Notices (INs) and the Institute of Nuclear Power Operations (INPO) Operating Experience (OE) and Construction Experience (CE) notices issued during the last several years were reviewed to identify any issues that may relate to the SONGS replacement SGs or I-690TT tubing. Pertinent issues are discussed below.

ECT probe issues and automated data analysis errors
CE10002, IN 2010-05, OE18385, and OE27802 describe issues with ECT probes and errors associated with automated data analyses processes

- CE10002: During the Watts Bar Unit 2 Steam Generator pre-service examination eddy current data was being collected utilizing magnetically biased bobbin probes. Support plate mix residual seemed excessive in terms of amplitude for tubes never exposed to operational conditions. A radiograph was taken of one of the questionable probes along with the same design probe manufactured in a previous year. The radiograph revealed that the magnets placed in the questionable probe were not centered with respect to the coils resulting in a variation of the two coils as they passed through the carbon steel tube supports which resulting in excessive mix residual. The radiograph of the older probe showed the magnets properly centered. Other probes from the same manufacturer produced during the same time period had the same detrimental properties. Tubes tested with the off-centered magnets were retested with symmetrically centered magnets. The consequence of this is experience is that the additional noise produced by the non-centered magnets can affect the probability of detection (POD) in the tubes being examined. Currently there are no EPRI criteria for the validation of the correct placement of the magnets in a magnetically biased probe. Caution should be exercised when utilizing magnetically biased probes to ensure the response from these probes is reasonable with respect to mix residual noise levels from tube supports. This residual response was much easier to detect on the Prime/Quarter Prime differential process channel in the calibration standard. The raw frequency distortions were more subdued. At Watts Bar Unit 2 the nominal residual in the calibration standard was approximately 0.7 volts peak to peak. When using the probes with the non-centered magnets the residual was approximately 1.5 volts peak to peak.

- IN 2010-05: A 73% wear flaw identified at Braidwood-1 in 2009 was caused by a foreign object. Investigation revealed that the flaw had been present in the inspection data during the past two inspections (2006 and 2007), but not identified. The licensee assessed the cause of this event and determined that it was a historic human performance issue related to the amount of technical rigor applied during the review of the distorted eddy current data that the automated data analysis system identified during the 2006 and 2007 inspections. A contributing cause was that one of the automated data analysis systems did not identify the distorted indication.

- OE18385: During the spring 2004 maintenance outage at Shearon Harris, it was discovered that the computer data screening (CDS) sorts used during the previous outage did not evaluate all regions of the tubes. A tube defect present during the previous outage was missed as a result of the gap in CDS sort coverage.
- OE27802: During the Fall 2008 outage at Byron Unit 2, a wear indication at the 07H tube support plate was detected but not reported by the Automated Data Analysis Software (ADS). The cause of the missed indication was signal distortion caused by close proximity of the wear and foreign object to the edge of the support plate. The sorts successfully detected the indication, but rejected it due to a phase angle criterion setup on channel 5 (130 kHz). The indication was successfully detected and reported by the manual analysis team. The use of the low frequency within this particular sort caused undue interference from the support signal which caused it to reject the indication.

  In response to the above, specific training will be given to analysts on the lessons learned from these events and where applicable, appropriate data will be included in the SONGS-2 site specific performance demonstration. Furthermore, AREVA requires an independent verification of any automated analysis system sort coverage prior to implementation of the sorts. Also, the AREVA Lead Level III will review any automated sorts to ensure that no gaps in sort coverage exists.

IN 2005-29: Unexpected tube support configurations (collector bars and bat-wings)

- Byron Unit 1 replaced their four steam generators with Babcock and Wilcox International RSGs in 1997. In 2005, the "B" steam generator bobbin eddy current inspection revealed that the collector bars engaged, or partially engaged, only 10 of 67 row 1 tubes. The non-engaged tubes were identified through eddy current data analysis software programmed to compare existing support structures with design locations. Follow-up review found that the condition existed prior to placing the generators in service. The concern was that disengaged tubes would vibrate and become worn. To date, no associated wear has been detected. (This finding was also documented in OE20410)
- Waterford Unit 3 has two steam generators designed and manufactured by CE. Routine eddy current inspections found that two diagonal batwing supports (similar to AVBs (Anti-Vibration Bars)) in steam generator 2 had moved. Wear scars were observed in tubes in the affected rows. As a result, many tubes were stabilized and plugged, and an analysis was performed to confirm integrity was not compromised. (This finding was also documented in OE20932 & OE24018)

  The 100% bobbin probe inspection planned for 2012 will readily detect conditions associated with this should it manifest itself. Also, the inspection scope includes detecting all eddy current AVB locations and comparing them with the AVB locations on MHI Design Drawings.

Foreign object experiences:
TTS Loose parts at Shearon Harris (OE18651), South Texas Project-1 (OE20539), Surry-1 (OE22839), and Braidwood-1 (OE16235) all result in tube wear with two of the four plants required to perform follow-up in-situ pressure testing.

- OE18651: The loose parts issue at Shearon Harris resulted in operational tube leakage. The plant was shut down so that FOSAR and ECT examinations could be performed. Two tubes were identified with significant ECT indications. Both tubes were in-situ pressure tested. One tube passed in-situ leak testing and the second tube failed leak testing. The leak rate at accident conditions measured 23 gpd. Both tubes passed in-situ proof testing. Follow-up metallurgical analysis on the loose part adjacent to leaking tube indicated material composition of Stellite-6 and forged carbon steel.

- OE20539: The loose part issue at STP-1 resulted in three tubes experiencing tube wear. During the FOSAR and sludge lancing activities, wire material was removed from the SG. Additionally, an apparent tube wear indication was also discovered. A decision was made to then open the primary side of the SG and perform ECT on the affected tube and adjacent bounding tubes, requiring an increase of the outage scope. The examination found wear on the affected tube and two adjacent tubes, with a maximum measured wear of approximately18%TW. The tube with the most severe wear was plugged to be conservative, even though the plugging limit (>40% TW) had not been reached. None of the three tubes required in-situ testing.

- OE22839: The loose part issue at Surry-1 resulted in four tubes experiencing tube wear and required two of the tubes to be in-situ pressure testing. A review of the Surry 2001 ECT raw data identified that the indication had been present during the previous examination yet was not called due to its proximity to the TTS. Calvert-2 had a similar experience during the 2009 inspection with loose part wear. Application of the 2006 eddy current analysis techniques to the 2001 bobbin probe raw data identified a wear indication on the tube approximately ¼" above the tube transition region. Had this indication been discovered in 2001, RPC characterization of the degradation could have been performed and the tube potentially plugged. The foreign objects would also have likely been recovered, precluding further wear to the surrounding tubes. As a result of not detecting the indication during the previous examination it had time to grow thus causing two tubes to be in-situ pressure tested. One tube passed both leakage and proof testing. The other tube passed proof testing but leaked before reaching the test pressure. The leak rate was measured at 0.98 gpm. The loose parts were a ¾" nut and a rod-like object located at the TTS.

- OE16235: The loose parts issue at Braidwood-1 resulted in an expansion to 100%. During the previous Braidwood-1 outage, foreign objects consisting primarily of pieces of Flexitallic Gasket were discovered and returned to service. The following outage, a 50% bobbin scope plus 100% periphery tubes was planned for all four SGs. A 48%TW indication resulting from foreign object wear in one SG caused inspection results to be classified as Category C-2 thus forcing an expansion to 100% in the affected SG. The largest depth detected was 48%TW. In-situ testing was not required. A total of 21 tubes required plugging

IN 2004-10, IN 2004-17, IN 2004-16: Foreign material leads to tube degradation and leakage

- IN 2004-10 and IN 2004-17 describe how foreign objects within SGs resulted in tube degradation and leakage. The INs emphasis the importance of FME control, ECT and visual inspections to detect foreign objects, and implementation of appropriate corrective actions if detected. IN 2004-17 noted that a three frequency "turbo mix" enabled the bobbin probe to detect an otherwise undetectable foreign object wear defect at the top of tubesheet at Shearon Harris.

- IN 2004-16 describes a leakage event which occurred in a Palo Verde replacement SG. The leak resulted from a perforation which was caused by a packing screw prior to tube installation in the SG. Because the screw also caused a dent at the same location, the interfering dent signal masked the defect signal during pre-service examinations and the defect was not identified.

OE31365, OE30514, OE30402, OE29785: FME from gaskets, welding/cutting, and fabrication

- OE31365, OE30514, OE30402 and OE29785 all describe events involving foreign material intrusion originating from gasket material and cutting/welding/machining debris as recently as June 2010. The recurring nature of these events underscores the continuing need for a heightened level of awareness for FME practices and recurring training and evaluation of procedures to prevent such events.
    - OE31365 Large pieces of Flexitallic gaskets found during steam generator inspection
    - OE30788 Loss of foreign material control during RCS cutting and welding activities
    - OE30402 Machining material (curl) discovered in secondary side of steam generator
    - OE29875 Foreign object found in no-tube lane, related to fabrication

OE21907, OE26178, OE27767, MER ATL 10-223: Eddy current probes lead to FME

- OE21907, OE26178, OE27767, MER ATL 10-223, and OE26718 describe FME events resulting from loss of integrity of eddy current and/or secondary side probes.
    - OE 21907: During the 1RF11 core offload at Comanche Peak Unit 1, foreign material found inside the reactor vessel was determined to have originated from a rotating eddy current probe assembly used for SG tube examinations during a prior outage. This foreign material ultimately led to five fuel assemblies leaking during the previous operating cycle.
    - OE26178: During the Fall 2007 outage at Three Mile Island Unit 1, a fabrication problem with some rotating eddy current probes was discovered during the inspection. In this case, fabrication issues resulted in some roll pins coming loose which resulted in the introduction of foreign material into the primary side of the steam generators. The eddy current probe was of a design which incorporates roll pins (Zetec item 10022824). This design was discontinued by the manufacturer.
    - OE27767: During Prairie Island Unit 2 fall 2008 outage, some bobbin eddy current probes used to conduct steam generator tube examinations had guide feet failures that

generated foreign material inside the steam generator primary side. The manufacturer determined that the cause of the guide feet failure was the use of PET material - which has exhibited brittleness in some applications - in the fabrication of the guide feet. This practice was discontinued by the manufacturer.

- MER ATL 10-223: Eddy current probe components detached and became foreign objects within the SG primary side which required removal. Primary side magnetite on the tube ID surface and tube denting contributed to the probe failures.
- OE26718: During the Spring 2008 outage at Wolf Creek, a portion of the probe head on the visual inspection tool became separated from the inspection wand during an upper bundle-in-bundle inspection. The visual inspection was being performed above the 4th support plate at the time of the incident. The probe head pieces could not be located. An evaluation was performed allowing the pieces to remain in the steam generator until the next scheduled inspection.

Other Foreign object related OE reports:

- Numerous INPO OE reports provide reminders that foreign objects represent a threat to tube integrity in SGs of all designs. Foreign objects continue to cause tube wear and in some cases, operational leakage, in the industry. Occasionally, identified foreign object wear has been significant enough to necessitate in-situ pressure testing to confirm that the tube had provided the necessary margins of safety (e.g., Surry Unit 1, 2006 refueling outage, OE23178). Most foreign object wear occurs at or near the secondary face of the tubesheet but there have been occurrences of foreign object wear at or near tube supports. For example, Braidwood Unit 1 identified foreign object wear in two tubes at the 6th lattice support (OE19455). Calvert Cliffs Unit 2 (OE29002) identified a large number of foreign objects and associated degradation during their 2009 outage, and two repairable indications were not detected by the bobbin probe due to the close proximity of the tubesheet.

During the SONGS-2 2012 eddy current inspection, multiple processes will be in place to prevent loss of accountability of test probes. The acquisition software manages probe inventory thereby ensuring that only the correct probe is used during the specified portion of the test plan and is removed and accounted for at the end of that testing process or at end of probe life. Secondly, the FME process ensures that a probe lodged in a tube or identification of missing probe parts, during probe change-out, are entered into the open systems log; thus initiating the corrective action process. Finally, during the primary side closeout, a video inspection of the steam generator bowl is performed immediately before installation of the manway diaphragms. These steps provide assurance that an eddy current probe, or pieces of an eddy current probe, are not left in the steam generators upon completion of testing.

In addition to the accountability of probe inventory, other requirements are in place to help limit the risk of probe failures. The AREVA NP procedure for FME control requires that all tooling entering and exiting the FME area be inspected for loose, damaged, or missing parts. This inspection is documented by the initials of the person recording the entry and exit of the tooling on the FME Control Log. This inspection is done pre-entry to prevent entry of damaged equipment into the FME area and again upon exiting the FME area to ensure the equipment is still intact and that no pieces are missing.

Reference [17] documents SCEs approach for addressing foreign objects and foreign object wear. During the 2C17 outage, secondary side visual inspections will include the open tube lane, the entire peripheral annulus, and appropriate visual examination follow-up on eddy current PLP indications in each steam generator.

IN 2007-37: Heavy accumulation of deposits on the secondary side

- Heavy accumulation of deposits on the secondary side of the Cruas Unit 4 SGs changed the flow behavior and ultimately caused tube fatigue cracking and operational leakage. The Cruas problem reflects an advanced state of deposit accumulation which is not anticipated at SONGS in the foreseeable future because of the recent SG replacement.

Corrosion Experience

Worldwide industry experience with I-690TT SG tubing, regardless of SG design, was reviewed to obtain an indication of its corrosion performance. Of the approximately 75 plants in operation with I-690TT tubing, none have reported indications of corrosion after as many as 20 years of service Reference [5].

13.0 REFERENCES

1) NEI, "SG Program Guidelines," NEI 97-06, Rev. 3, January 2011

2) EPRI, "PWR SG Examination Guidelines: Revision 7," 1013706, October 2007

3) EPRI, "SG Integrity Assessment Guidelines: Revision 3," 1019038, November, 2009

4) EPRI, "PWR Secondary Water Chemistry Guidelines - Revision 7," 1016555, February 2009

5) EPRI, SG Degradation Database

6) EPRI, "Steam Generator Reference Manual," TR-103824, December 1994

7) EPRI Report "Alloy 690 for SG Tubing Applications," EPRI NP-6997-SD, October 1990

8) MHI Report L5-04GA062, Rev. 13 (S023-617-1-M502, Rev. 12) "Joint Qualification Report, San Onofre Nuclear Generating Station, Unit 2 and 3 Replacement Steam Generators" and SCE Report OTH-617-1-X265, Rev. 0 "Replacement Steam Generator Joint Qualification Report"

9) SCE Specification S023-617-01 "Conformed Specification for Design and Fabrication of the Replacement Steam Generators for Unit 2 and Unit 3, San Onofre Nuclear Generating Station Units 2 and 3"

10) MHI Report L5-04GA051 (S023-617-1-M265) "Summary Design Report"

11) MHI Purchase Specification L5-04FZ041, Rev. 4 (S023-617-1-M149, Rev. 4) "Heat Transfer Tubing, San Onofre Nuclear Generating Station, Unit 2 & 3 Replacement Steam Generators"

12) SCE Mini-Specification S023-617-018, Rev. 0, "Specification for Steam Generator Outage Services, SONGS Units 2 and 3", January 2010

13) AREVA 54-ISI-411-00: "Pre-Service Eddy Current Insp. of SONGS Units 2 and 3 Steam Generators"

14) MHI Calculation L5-04GA433 (SO23-617-1-C1262) "Regulatory Guide 1.121 Analysis, San Onofre Nuclear Generating Station, Units 2 and 3, REPLACEMENT STEAM GENERATORS"

15) Technical Specifications, SONGS Units 2 and 3, Section 5.5.2.11.b

16) Deleted

17) SCE Document "Secondary Side Integrity Assessment for Steam Generators Cycle 17 Refueling Outages in 2012", January, 2011 with Addendum 1, June 2011

18) EPRI, "Steam Generator Degradation Specific Management Flaw Handbook - Revision 1," 1019037, November 2009

19) AREVA 51-9104383-002 "SONGS Units 2 & 3 Replacement Steam Generators Eddy Current Technique Validation6 January, 2012

20) EPRI Report 1003589, "Pressurized Water Reactor Generic Tube Degradation Predictions", July 2003.

21) Letter from J. R. Hall (NRC) to SCE dated September 25, 2009; Subject: Summary of September 15, 2009, Meeting with Southern California Edison Company on Weld Defects Found in the Replacement Steam Generators Intended for Use at San Onofre Nuclear Generating Station (SONGS), Unit 3. Note that this letter also refers to the NRC's documentation of SCE's presentation slides for that meeting.

22) Letter from A. E. Scherer (SCE) to Document Control Desk (NRC) dated September 11, 2009; Subject: Docket No. 50-362, Root Cause Evaluation, Divider Plate Weld Joint Separation in the Replacement Steam Generators, San Onofre Nuclear Generating Station, Unit 3

23) Letter from R. J. St Onge (SCE) to Document Control Desk (NRC) dated December 7, 2009; Subject: Docket Nos. 50-361 and 50-362, Inspection of Divider Plate Weld Joint in the Replacement Steam Generators, San Onofre Nuclear Generating Station, Units 2 and 3 (Note that SCE tracking of this commitment is on SAP Order 800414457)

24) EPRI Report 1008438, "Three Mile Island Plugged Tube Severance: A Study of Damage Mechanisms", May 2003

25) EPRI Report 1014983, "Steam Generator In-Situ Pressure Test Guidelines, Revision 3", August 2007.

26) Westinghouse Nuclear Safety Advisory Letter Number NSAL-12-1 "Steam Generator Channel Head Degradation", January 5, 2012

27) SCE Letter ALM/DA17 from A. L. Matheny, (SCE) to Alan Brown (AREVA) dated 18 January, 2012, "Numerical Values for the Steam Generator Degradation Assessment, San Onofre Nuclear Generating Station Unit 2, Southern California Edison"

28) EPRI Report 1014983, Rev. 3 "Steam Generator In Situ Pressure Test Guidelines" August 2007

References 8 through 12, 14, 15, 17, 21, 22, 23, 26 and 27 are not retrievable from the AREVA document control system but can be retrieved from the Southern California Edison document control system. This process is allowed per AREVA administrative procedure 0402-01, Appendix 2.

(b)(6)

Ex 6

San Onofre Nuclear Generating Station (SONGS) Unit 2, March 6, 2012 REASON for Tube Plugging	Steam Generator E-088 (Number of Tubes)	Steam Generator E-089 (Number of Tubes)
Tubes with wear exceeding Technical Specification criteria (greater than or equal to 35% through-wall) at Anti-Vibration Bar (AVB) locations	2	0
Tubes with wear NOT exceeding Technical Specification criteria at Anti-Vibration Bar (AVB) locations	2	0
Tubes with wear exceeding Technical Specification criteria at Retainer Bar locations	2	2
Tubes with wear NOT exceeding Technical Specification criteria at Retainer Bar locations	0	2
Tubes with NO wear at Retainer Bar locations (Note 1)	92	90
Total plugged tubes	98	94
Total tubes in the steam generator design	9727	9727

Note 1: Tubes plugged with NO wear at Retainer Bar locations is preventive to eliminate wear at Retainer Bar locations.

Prepared by: (b)(6) [redacted] SCE

EX 6

Peer Check by: (b)(6) [redacted] AREVA

D/5

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San Onofre Nuclear Generating Station (SONGS) Unit 2, March 6, 2012 REASON for Tube Plugging	Steam Generator E-088 (Number of Tubes)	Steam Generator E-089 (Number of Tubes)
Tubes with wear at Anti-Vibration Bar (AVB) locations	4	0
Tubes with wear at Retainer Bar locations	2	4
Tubes with NO wear at Retainer Bar locations (Note 1)	92	90
Total plugged tubes	98	94
Total tubes in the steam generator design	9727	9727

Note 1: Tubes plugged with NO wear at Retainer Bar locations is preventive to eliminate wear at Retainer Bar locations.

Prepared by (b)(6) [redacted], SCE

Peer Check by (b)(6) [redacted] AREVA

EX. 6

You can let the NRC staff know we intend to start in-situ pressure testing early next week (either Monday 3/12 or Tuesday 3/13).

We can support a conference call to discuss our plans on either Thursday 3/8 or Friday 3/9 of this week.

We expect a final list of tubes to test by Friday 3/9. (b)(6)

EX 6

In addition let them know we expect to test more than 100 tubes.

TEST PLAN FOR IN-SITU PRESSURE TESTING

Plant/Unit:	SONGS Unit 2
S/G	89
Outage:	Feb 2012
Revision:	00

Notes:

1.0 Perform the pressure tests in accordance with the latest EPRI recommendations and the test sequence prepared for each individual tube. Hold time: 2 minutes minimum.

2.0 Do not exceed 200 psi/sec pressurization rate when raising pressure to each test point.

3.0 The hold times, test pressures, and test sequences may be altered by the appropriate customer representative.

4.0 For defects that do not require axial loading, the PE/Shift Leader may change the probe position as required to complete the testing. For defects that require a specific axial loading, the test plan must be revised and reviewed by Lynchburg before changing the free-span probe position.

5.0 Probe insertion tolerances are +/- 3".

6.0 Test candidates and target setpoints may be removed from the list at the discretion of the customer.

7.0 Control tolerances for the pressure test is -0/+300 for both the pressure gage and pressure transducer.

7.1 In the event of leakage, follow the appropriate steps listed below based on the location of the indication and the test pressure when leakage is discovered.

7.2 General

a) When testing a leaking tube, increase the hold times to a minimum of five minutes.

b) Secure the test if the test pressure can not be achieved or maintained on a leaking location.

7.3 Leakage Detected At U-Bend Locations

a) U-bend indications can only be tested with water with the tube pressurized end-to-end.

D/6

11

b) Hold each target pressure for a minimum of five minutes. Secure the test if the target pressure cannot be reached or maintained.

7.4 Leakage Detected At Less Than NODP/MSLB Mid-Point Pressure

If a leak is discovered at a pressure less than the NODP/MSLB midpoint, then perform a leak test at the mid-point pressure. After completing the test at the mid-point pressure, continue to the MSLB test pressure.

7.5 Leakage Detected Between NODP/MSLB Mid-Point and MSLB Pressure

If a leak is discovered between the mid-point and MSLB test pressures, then stabilize system pressure and perform a leak test at this intermediate pressure. At the conclusion of the test at this intermediate test pressure, increase pressure to the MSLB test pressure.

7.6 Leakage Detected At MSLB Pressure

a) If the leak rate is increasing when at the MSLB test point, continue the test until the leak rate has stabilized.
b) After successful completion of the MSLB test point, repeat the test at the NODP point.
c) If there are additional tubes to be tested in the steam generator, continue to those additional tubes unless this is the second consecutive leaking tube. Otherwise, perform a system leak test to insure that the measured leakage was from the tube and not from somewhere in the testing system.
d) In the event that a system leak is discovered, fix the problem and repeat the required test points on the target location(s).
e) After confirming that a tube was leaking, inform the outage manager and/or the customer contact that a leaking tube has been found.

Prepared by: (b)(6) Date: 2/8/2012 Ex 6

Reviewed by: (b)(6) Date: 02/08/2012 Ex 6

Customer approval of in-situ test plan:

(b)(6) Date: 2/8/12 Ex 6

SG 89

Full-Length Pressure Test

Required Test Configuration

Water Supply Probe:	Full-Length Tool Head
Location:	TEH or TEC
"Stopper" Probe:	Full-Length Tool Head
Location:	TEH or TEC

If required, the water supply probe may be substituted for the full length tool head. Position the water supply probe six inches from the tube end if it is used.

If required, the MAS probe may be substituted for the full length tool head. Position the MAS probe six inches from the tube end if it is used.

Required Test Pressures

Test Condition	Water Pressure (psig)
NODP	1850
(NODP +MSLB)/2 (If applicable)	2500
MSLB	3200
MSLB +600	3800 *
MSLB +1100	4300 *
MSLB +1600	4800 *
3 x NODP	5300 *

* Not a leak test. Leak rate stabilization not required.

Test Candidate:

119-133

Test Pressure Calculations

PLANT: [illegible] 2

Testing of Unlocked Tubes or Axial Defects

Full Tube Setup or Localized

(b)(6)

Inputs:

P_{sys}= [illegible] psia

P_{sec_ss}= [illegible] psia

ΔP_{no}= [illegible] psi — Normal Operating Differential Pressure

$\Delta P_{faulted}$= [illegible] psi — MSLB Differential Pressure per SONGS UFSAR, Chapter 5

OD_{tube}= [illegible] in ID_{tube}= 0.664 in t_{wall}= [illegible] in

Safety Factors:

SF_{MSLB}= 1.43 SF_{NOP}= 3

Correction Factors:

$CF_{thermal}$= [illegible] $CF_{[illegible]}$= psi

CF_{gage}= [illegible] psi P_{sec_test}= 0 psi NOTE: P_{sec_test} is for N_2 overpressure, etc.

TARGET TEST PRESSURES:

1.0 Normal Operating

P_1 = 15psi + ΔP_{no} * $CF_{thermal}$ + CF_{gage} + P_{sec_test}

Water Testing

P_1 = 1831 psi **Target Pressure = 1850 psig**

2.0 MSLB/FAULTED

P_2 = 15psi + $\Delta P_{faulted}$ * $CF_{thermal}$ + CF_{gage} + P_{sec_test}

Water Testing

P_2 = 3187 psi **Target Pressure = 3200 psig**

3.0 STRUCTURAL LIMIT

Condition1 = 15psi + SF_{NOP} * ΔP_{no} * $CF_{thermal}$ + CF_{gage} + P_{sec_test}

Condition1 = 5263 psi

Condition2 = 15psi + SF_{MSLB} * $\Delta P_{faulted}$ * $CF_{thermal}$ + CF_{gage} + P_{sec_test}

Condition2 = 4504 psi

P_3 = Larger of Condition 1 or Condition 2

Water Testing

P_3 = 5263 psi **Target Pressure = 5300 psig**

EX 6

(b)(4)

Greene, Natasha

From: Werner, Greg
Sent: Tuesday, May 18, 2010 12:29 PM
To: R4DRS-PSB2
Cc: Makor, Shiattin; Fairbanks, Abin
Subject: FW: SONGS Unit 3 Refueling outage Date Change

Outside of Scope

From: Reynoso, John
Sent: Monday, May 17, 2010 5:01 PM
To: Lantz, Ryan
Subject: SONGS Unit 3 Refueling outage Date Change

Ryan,
This information was release today;

To: All SONGS Employees and Contractors

Many of you have heard discussions recently regarding a delayed start to the U3 Steam Generator Replacement Outage. A delayed start would give all work groups additional time for outage preparation. A team of SONGS employees has evaluated multiple options, and factors such as remaining fuel, licensing commitments and the impact on our personnel were all considered. It has been decided to move the start date of the outage from September 26 to October 10, 2010. This additional two weeks will be used entirely for outage preparation, including job walkdowns, equipment staging and personnel briefings. It is important we give ourselves the best possible opportunity for a safe, successful and timely completion of the outage.

Thank you for your support.

(b)(6)

D/7

EX 6 #14

John Reynoso, PE Resident Inspector
San Onofre Nuclear Generating Station
***USNRC-RIV** Division Reactor Projects, Branch D*
949-492-2642

20004-018 (10/18/2010)

AREVA

AREVA NP Inc.

Engineering Information Record

Document No.: 51 - 9177491 - 000

SONGS 2C17 Steam Generator Condition Monitoring and Preliminary Operational Assessment

D/8
#15

Safety Related? ☒ YES ☐ NO

Does this document contain assumptions requiring verification? ☐ YES ☒ NO

Does this document contain Customer Required Format? ☐ YES ☒ NO

Signature Block

(b)(6)

EX 6

Note: P/LP designates Preparer (P), Lead Preparer (LP)
R/LR designates Reviewer (R), Lead Reviewer (LR)
A/A-CRF designates Approver (A), Approver of Customer Requested Format (A-CRF)
A/A-CRI designates Approver (A), Approver - Confirming Reviewer Independence (A-CRI)

Record of Revision

Revision No.	Pages/Sections/ Paragraphs Changed	Brief Description / Change Authorization
000	All	Original Release

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1.0 PURPOSE

In accordance with the EPRI Steam Generator Integrity Assessment Guidelines [2], a Condition Monitoring (CM) assessment must be performed at the conclusion of each steam generator eddy current examination. This process is described as "backward-looking," since its purpose is to confirm that adequate Steam Generator (SG) integrity was maintained during the most recent operating period. It involves an evaluation of the as-found conditions of the steam generator relative to established performance criteria for structural and leakage integrity. The performance criteria are defined in plant technical specifications. The performance criteria are based on NEI 97-06 [1] (see Section 4.0 below).

In addition to the CM assessment, an operational assessment (OA) must also be performed to ensure that steam generator tubing will meet the technical specification performance criteria throughout the upcoming operating cycle. The OA projects and evaluates postulated steam generator tube degradation mechanisms, including those currently and previously existing in the subject SGs.

This report concludes that the SONGS steam generator performance criteria were satisfied by Unit 2 during the operating period prior to 2C17, and concludes that there is reasonable assurance that the performance criteria will be satisfied throughout the next operating cycle.

2.0 SCOPE

This evaluation pertains to the SONGS Unit 2 replacement steam generators, which are reactor coolant system components. The CM assessment documented in this report is required to be completed prior to plant entry into Mode 4 during start up after a SG inspection. A preliminary OA is conservatively included in this document. The Unit 2 SGs passed CM, thus an OA shall be completed for the next inspection interval within 90 days after Mode 4.

3.0 BACKGROUND

SONGS Unit 2 is a two loop Combustion Engineering (CE) PWR which began commercial operation in 1983. The original CE steam generators were replaced in the fall of 2010 with new SGs designed and manufactured by Mitsubishi Heavy Industries (MHI).

(b)(4)

(b)(4)

Figure 3-1: SONGS Steam Generator Support Structure Layout

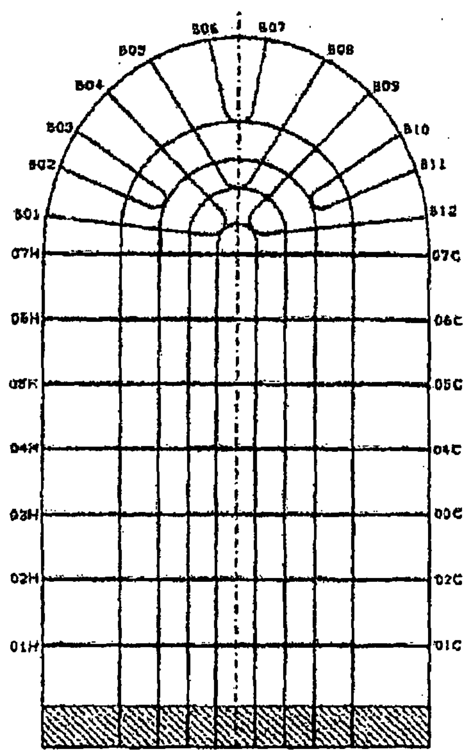

Figure 3-2: View From Above Bundle Showing Retainer Bar Locations

(b)(4)

Figure 3-3: Sketch Showing Retainer Bar Location

(b)(4)

(b)(4)

Figure 3-4: Sketch Showing Retainer/Retaining Bar Configuration

(b)(4)

4.0 PERFORMANCE CRITERIA

The SONGS-2 performance criteria, based on NEI 97-06 [1], are as follows:

- *Structural Integrity Performance Criterion*: All inservice steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, cooldown, and all anticipated transients included in the design specification) and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary-to-secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary-to-secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

- *Accident Induced Leakage Performance Criterion*: The primary to secondary accident induced leakage rate for the limiting design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. In the SONGS-2 SGs, for all types of degradation, leakage is not to exceed 0.5 gpm per SG and 1 gpm through both SGs.

- *Operational Leakage Performance Criterion*: The RCS operational primary-to-secondary leakage through any one SONGS-2 SG shall be limited to 150 gallons per day (0.104 gpm) per SONGS Limiting Condition for Operation (LCO) 3.4.13 "RCS Operational Leakage."

5.0 INSPECTION SUMMARY

The SONGS Unit 2, 2C17 work scope included the following inspection activities for each of the two replacement steam generators (SG88 and SG89) using site validated ECT techniques [8]:

- Bobbin Coil Examinations
  - All in-service tubes, full length tube-end to tube-end
- Rotating Coil Examinations
  - Tubesheet Periphery and Divider Lane Tubes, TTS +3"/-1", Both Legs, approximately 3 tube in from the periphery and 2 tubes in from the divider lane
  - Full u-bend Exam of Tubes Adjacent to Retainer Bars
- Secondary Side Visual Examinations
  - Foreign object search and retrieval (FOSAR) as required based on ECT
  - Post sludge lancing FOSAR examination at the top-of-tubesheet (periphery and the divider lane)
  - Visual Inspections of the upper tube bundle at the 7th TSP and AVB / retainer bar regions
- Primary Side Visual Examinations
  - As-Found and As-Left visual examinations of the primary channel heads

The subsections below discuss each aspect of the inspection and describe findings that are relevant to the condition monitoring and operational assessment.

5.1 Eddy Current Inspections Performed

A summary of the total number of bobbin probe and rotating probe examinations performed during 2C17 is provided in Table 5-1.

5.2 Degradation Identified

The following tube degradation mechanisms were identified during the 2C17 steam generator eddy current inspections:

- Anti-Vibration Bar (AVB) wear
- Tube Support Plate (TSP) wear
- Retainer Bar (RB) wear
- Foreign Object (FO) wear

Table 5-2

Table 5-2 summarizes the number of degradation indications and the number of affected tubes for each of the four wear categories. The table provides the number detected, the number plugged as a result of the degradation type, and the number returned to service during 2C17. Note that the number returned to service reflects the fact that tube plugging due to one degradation type can reduce the number of another type left in service.

A complete accounting of the number of tubes plugged and stabilized during the 2C17 outage is provided in Table 5-3, and the plugging/stabilization lists for both SGs are provided in Appendices A through C.

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Table 5-4

Table 5-4 through Table 5-7 summarize reported AVB wear, TSP wear, RB wear, and FO wear depths, respectively. Table 5-6 and Table 5-7 provide detailed information on all of the RB wear and FO wear flaws identified. Within Table 5-6 and Table 5-7, the structurally equivalent length and depth, as well as the overall length and maximum depth of the wear are provided. These structurally equivalent dimensions correspond to a rectangular flaw which would burst at the same pressure as the measured flaw; determined using the methods described in Section 5.1.5 of reference [5].

Figure 5-1Figure 5-1 through Figure 5-9Figure 5-9 provide tubesheet maps illustrating the locations of degradation reported in each steam generator. The AVB wear is most prevalent in the central region of the tubesheet matrix, in longer tube rows (Figure 5-1Figure 5-1, Figure 5-2Figure 5-2). Two other regions within each SG are also affected to a lesser degree. These regions are located near the periphery in slightly lower rows. TSP wear has affected fewer tubes than has AVB wear. TSP wear was identified at nearly every support elevation, with a greater tendency to occur on the hot leg than on the cold leg (Figure 5-3Figure 5-3, Figure 5-4Figure 5-4, Figure 5-5Figure 5-5, Figure 5-6Figure 5-6). RB wear was identified in only six tubes (Figure 5-7Figure 5-7, Figure 5-8Figure 5-8). Foreign object wear was identified in two tubes in SG88 (Figure 5-9Figure 5-9).

Figure 5-10 and Figure 5-11 provide histograms of the reported depths of AVB wear which demonstrate that the vast majority of AVB wear was less than 25 %TW. Four AVB wear flaws were sized ≥30%TW and the affected tubes were stabilized and plugged. Figure 5-12 and Figure 5-13 provide histograms of TSP wear depths and illustrate that the growth rate of TSP wear during the first operating cycle was less aggressive than that of AVB wear. The maximum reported TSP wear flaw was 20%TW.

The decision to stabilize the tubes that were plugged due to AVB wear indications was a proactive decision to address the potential for continued growth of the indications. Industry experience has shown that most wear indications will eventually reach a certain depth plateau and cease to grow thereafter. However, with only one inspection, such an assumption could not be justified at this point. Therefore, the conservative decision was made to stabilize these four tubes prior to plugging.

Although a significant number of AVB wear indications was detected, the quantity, depths, and locations of the indications are consistent with other recently replaced steam generators. The most compatible comparison is to the replacement steam generators at St. Lucie Unit 2. St. Lucie Unit 2 also replaced their original square-bend steam generators with u-bend steam generators. The quantity, depths, and locations of the SONGS-2 AVB wear indications are very similar to those seen at St. Lucie in their first inspection. The TSP wear indications are also within expectations based on inspection results from other recently replaced steam generators.

The retainer bar wear indications were not expected as they have not been reported in other MHI steam generators with the retainer bar design. As a result of the finding of retainer bar wear, the degradation assessment was revised during the outage to include this new mechanism.

5.3 Secondary Side Visual Examination Results

During the eddy current inspection of SG88, foreign object indications and foreign object wear indications were reported in two adjacent tubes at the 4th TSP (see Table 5-7 and Figure 5-9~~Figure 5-9~~). Consequently, a secondary side foreign object search and retrieval effort was initiated, and the team successfully located and removed the object from the steam generator. Photographs of the object taken during retrieval are provided in Figure 5-14. Note that the FO wear indication identified in tube SG88 R137 C77 is visible in the left photo in Figure 5-14. A follow-up analysis performed by SCE identified the object as weld metal debris [17]. These two adjacent tubes are being left in service because the indications are below the Technical Specification plugging limit and the cause of the degradation has been removed.

Due to the eddy current wear indications at the retainer bars, secondary side visual inspections of the retainer bars were performed in both steam generators. These inspections were performed on the retainer bars at B01, B02, B03, B10, B11, and B12. These retainer bars were selected for visual inspection since they are smaller in diameter and all retainer bar wear occurred at one of these locations. The visual inspections were focused on verifying the integrity of the retainer bar and the associated welds. All retainer bars and welds inspected were determined to be in the as-designed configuration. No cracking or degradation of the welds or retainer bars was observed.

The other secondary side examination activities (i.e., post-lancing visual exam at the top-of-tubesheet, visual exams performed in the upper bundle region) identified no foreign objects and no evidence of internal structure degradation. No conditions which could generate foreign objects or threaten tube integrity were identified during these examinations.

5.4 Primary Channel Head Visual Examination Results

Remote visual examinations of the four primary channel heads were performed upon removal of the primary manway diaphragms (i.e., as-found) and immediately prior to re-installation of the diaphragms (i.e., as-left). No degradation of the structures in this region of the SGs was identified, and no foreign objects were identified. No tubes had been plugged previously in either SG, hence no plug examinations were performed.

Remote visual examination of the four primary channel heads was performed for the accessible areas of the divider plate to channel head and tubesheet welds. There were no indications. This was a commitment to the Nuclear Regulatory Commission to follow-up on experience during manufacturing of the SONGS Unit 3 steam generators.

Remote visual examination of the four primary channel heads was performed for the low-lying areas. This was a response to industry experience reported in Westinghouse Nuclear Safety Advisory Letter (NSAL) 12-1. In cold leg channel heads, the area was the flat bottom. In the hot leg channel heads, the area was the flat bottom and the bottom six inches of the sides of the channel head and divider plate. No abnormal conditions, such as wastage or a breach of the channel head cladding, were observed. This inspection satisfies the requirements of NSAL 12-1.

Table 5-1: Steam Generator Tube Inspection Scope Summary

SCOPE DESCRIPTION			S/G 88			S/G 89		
Leg	Exam Description	Extents	Analyzed	Scope	% Completed	Analyzed	Scope	% Completed
Hot / Cold	100 % Bobbin F/L	TEH-TEC	9,727	9,727	100.00%	9,727	9,727	100.00%
Expansion								
Hot	HL Tubesheet Periphery	TSH+3/-1	1,030	1,030	100.00%	1,030	1,030	100.00%
Cold	CL Tubesheet Periphery	TSC+3/-1	1,030	1,030	100.00%	1,030	1,030	100.00%
Hot	HL Retainer Bar Tube RPC	07H-B06	96	96	100.00%	96	96	100.00%
Cold	CL Retainer Bar Tube RPC	07C-B07	96	96	100.00%	96	96	100.00%
	Total Plan		12,182	12,182	100.00%	12,141	12,141	100.00%

Table 5-2: Wear Indication Summary

	SG 88		SG 89		Total	
Detected						
Location	Tubes	Inds	Tubes	Inds	Tubes	Inds
AVB	595	1757	804	2591	1399	4348
TSP	180	225	119	139	299	364
RB	2	2	4	5	6	7
FO	2	2	0	0	2	2
Total	779	1986	927	2735	1706	4721
Plugged*						
Location	Tubes	Inds	Tubes	Inds	Tubes	Inds
AVB	4	4	0	0	4	4
TSP	0	0	0	0	0	0
RB	2	2	4	5	6	7
FO	0	0	0	0	0	0
Total	6	6	4	5	10	11
Returned to Service						
Location	Tubes	Inds	Tubes	Inds	Tubes	Inds
AVB	591	1732	804	2591	1395	4323
TSP	180	225	117	137	297	362
RB	0	0	0	0	0	0
FO	2	2	0	0	2	2
Total	773	1959	921	2728	1694	4687

* This reflects only the tubes that were plugged due to degradation. Total plugging, including those tubes plugged preventively, is discussed in Section 5.2.

No tubes were plugged to address TSP wear; however, two tubes plugged for other reasons contained one TSP wear flaw each. Hence the number returned to service has been reduced by two.

Table 6-3: Plugging/Stabilization Summary

	SG 88		SG 89		Total	
	Tubes Plugged	Tubes Stabilized	Tubes Plugged	Tubes Stabilized	Tubes Plugged	Tubes Stabilized
AVB	4	4	0	0	4	4
TSP	0	0	0	0	0	0
RB	2	2	4	4	6	6
FO	0	0	0	0	0	0
RB Preventive*	92	12	90	11	182	23
Total	98	18	94	15	192	33

* Although 96 tubes were included in the retainer bar inspection scope (see Table 6-1), only 94 tubes were removed from service due to their proximity to the retainer bars. Two tubes were removed from the list of potentially affected tubes after closer review of the design drawings and consultation with MHI.

Table 5-4: Reported AVB Wear Depths (%TW)

SG	Average	Upper 95th	Maximum
88	10.1	19.2	35
89	9.8	18.0	29
Both SGs	9.9	19.0	35

Table 5-5: Reported TSP Wear Depths (%TW)

SG	Average	Upper 95th	Maximum
88	9.7	14.0	17
89	10.7	16.0	20
Both SGs	10.1	15.0	20

Table 5-6: Retainer Bar Wear

SG	Row	Col	Location	Sizing ETSS	Maximum Depth (%TW)	Circ Extent (in)	Axial Extent (in)	Structural Depth (%TW)	Structural Length (in)
88	124	48	B03+0.67"	27903.1	47	0.36	0.31	43.4	0.27
88	125	49	B03+0.46"	27903.1	58	0.30	0.28	52.4	0.22
89	118	44	B11-0.50"	27903.1	30	0.16	0.26	26.5	0.21
89	119	133	B02+0.54"	27903.1	90	0.48	0.43	83.8	0.29
89	120	132	B10+0.50"	27903.1	28	0.16	0.23	25.3	0.18
89	120	132	B11-0.42"	27903.1	30	0.21	0.35	27.0	0.30
89	127	127	B03+0.50"	27903.1	38	0.31	0.45	34.7	0.30

Table 5-7: Foreign Object Wear

SG	Row	Col	Location	Sizing ETSS	Maximum Depth (%TW)	Circ Extent (in)	Axial Extent (in)	Structural Depth (%TW)	Structural Length (in)
88	136	76	04H+0.56"	27901.1	29	0.31	0.25	25.7	0.21
88	137	77	04H+0.76"	27901.1	33	0.31	0.20	30.2	0.15

Figure 5-1: SG88 AVB Wear

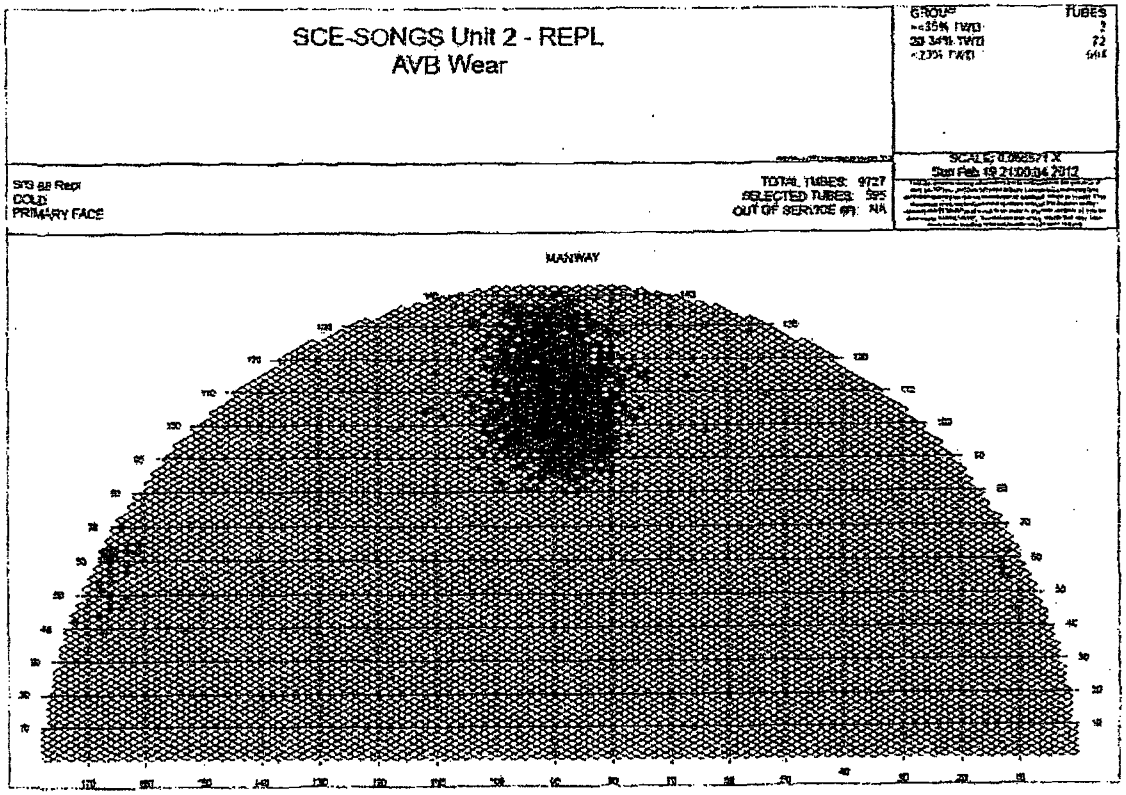


Figure 5-2: SG89 AVB Wear

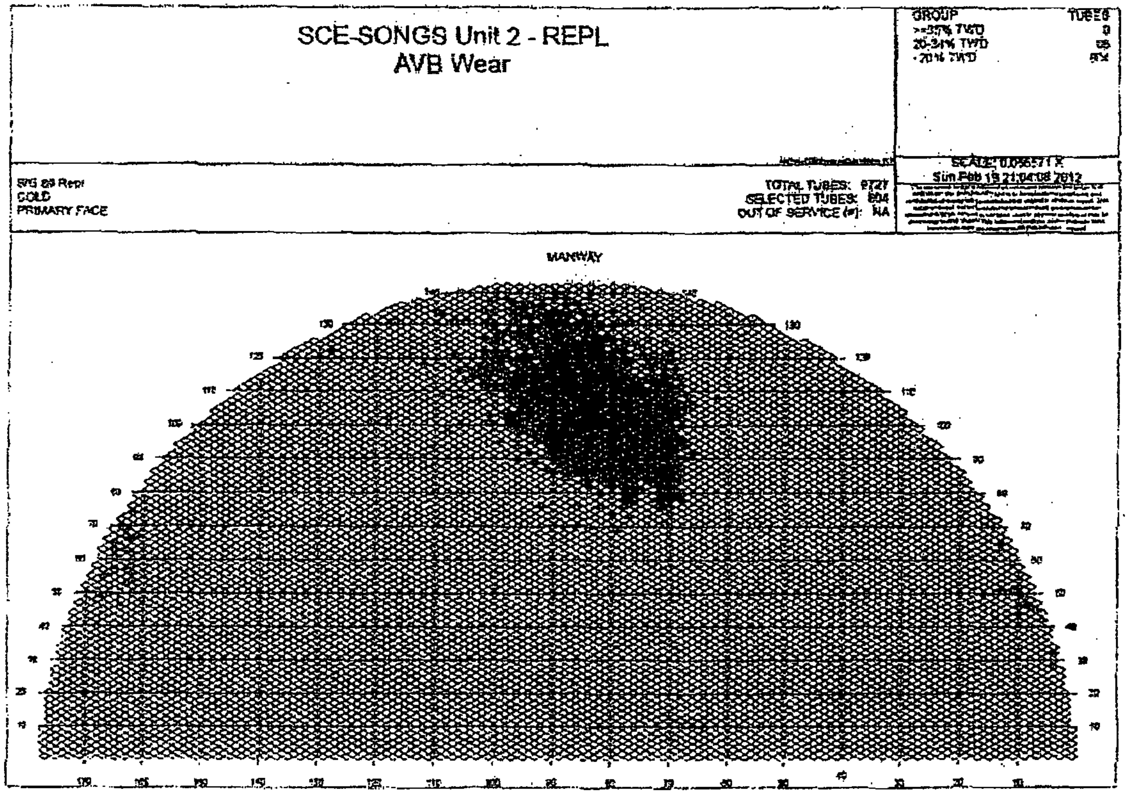


Figure 5-3: SG88 TSP Wear – Hot Leg

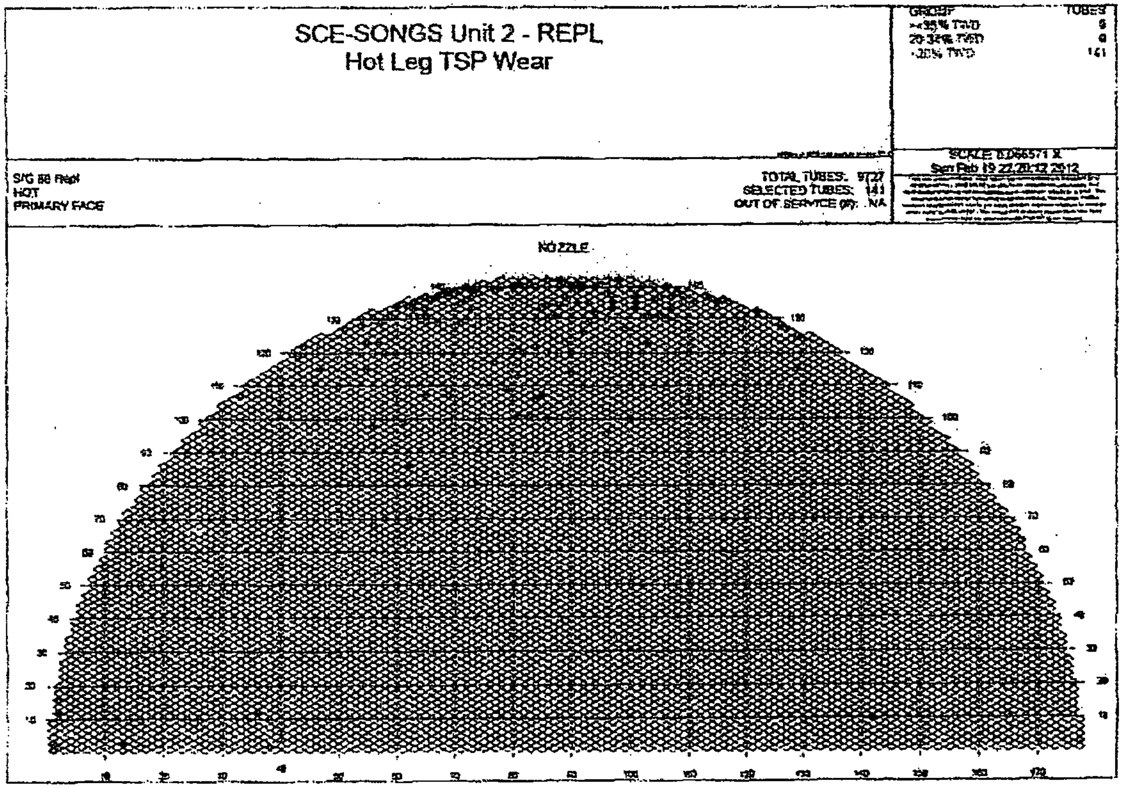


Figure 5-4: SG88 TSP Wear – Cold Leg

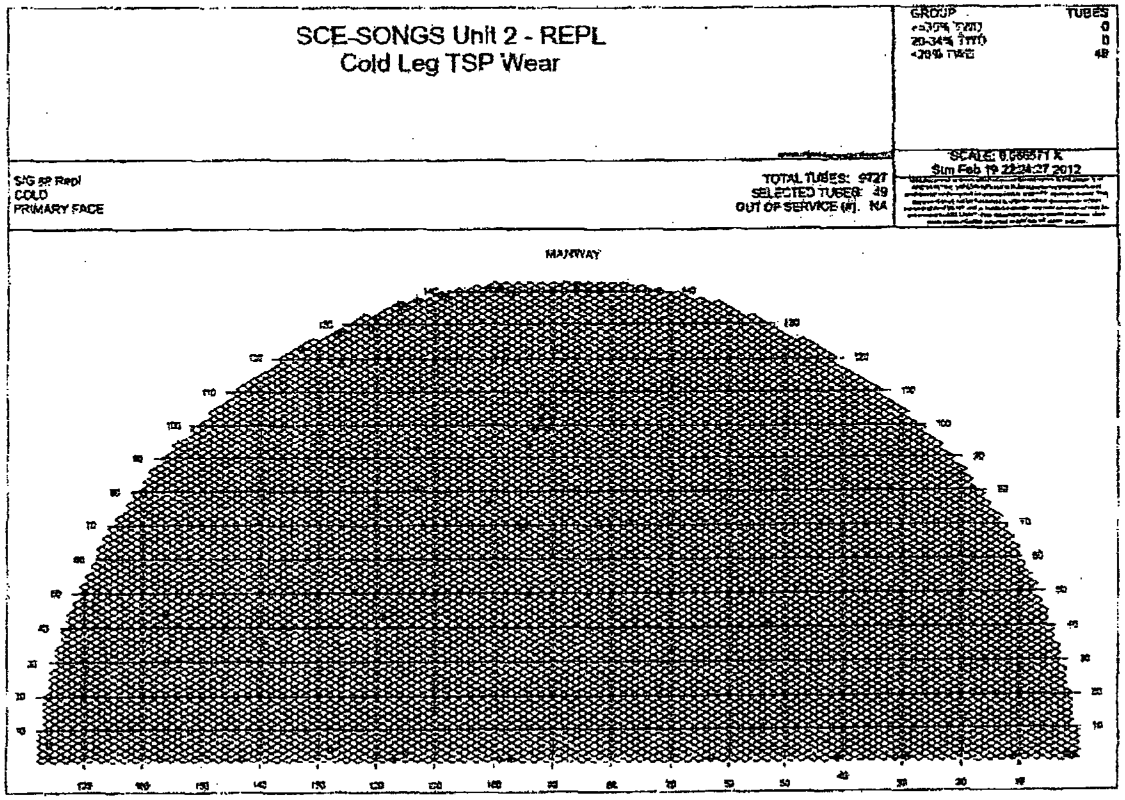


Figure 5-5: SG89 TSP Wear – Hot Leg

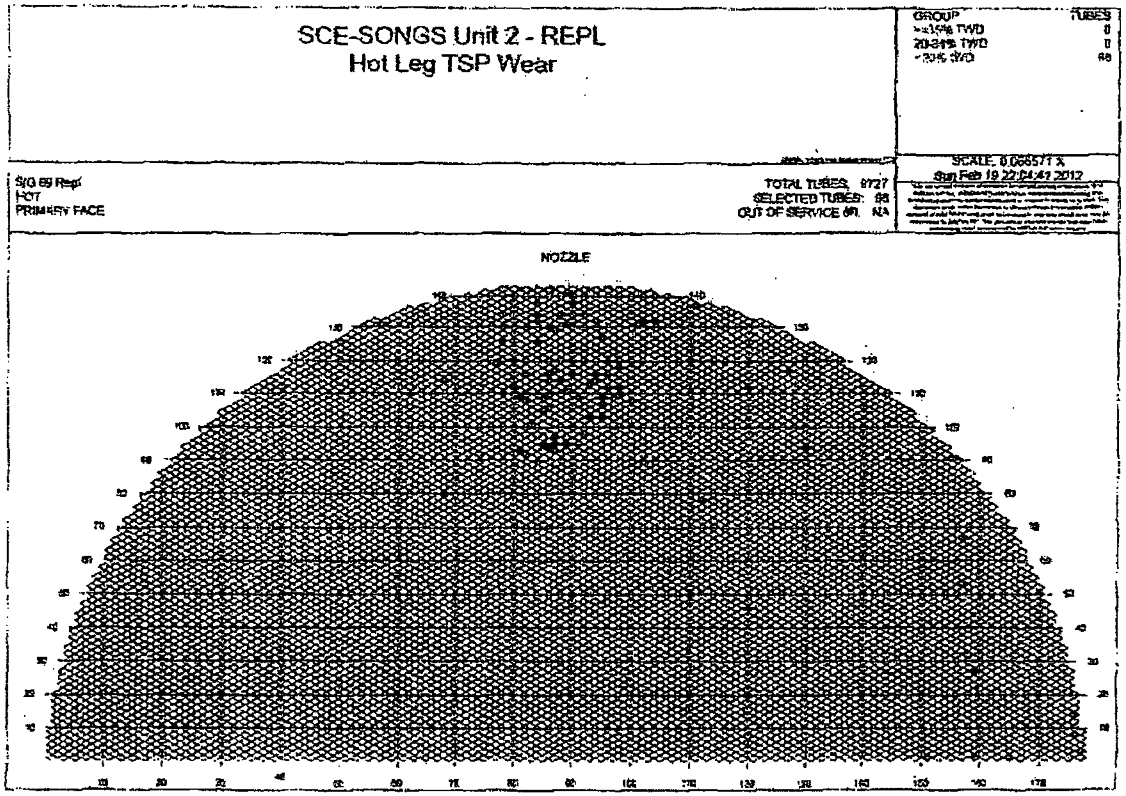


Figure 5-6: SG89 TSP Wear – Cold Leg

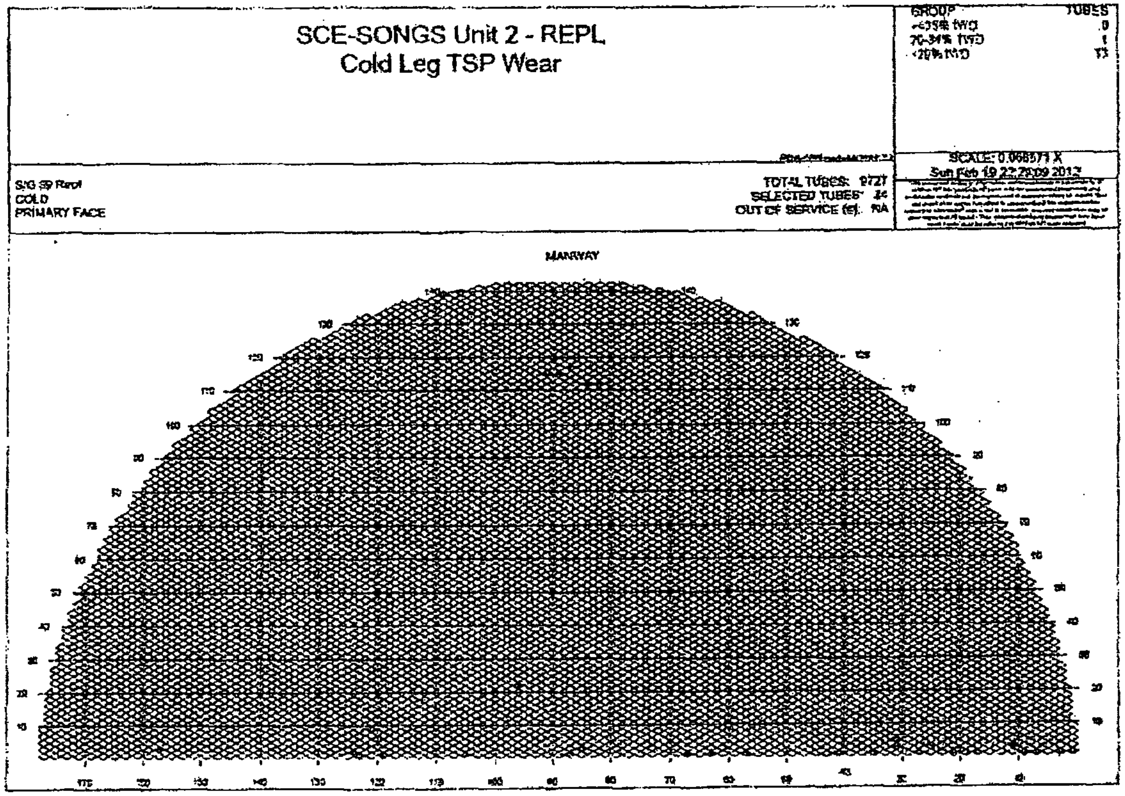


Figure 5-7: SG88 Retainer Bar Wear

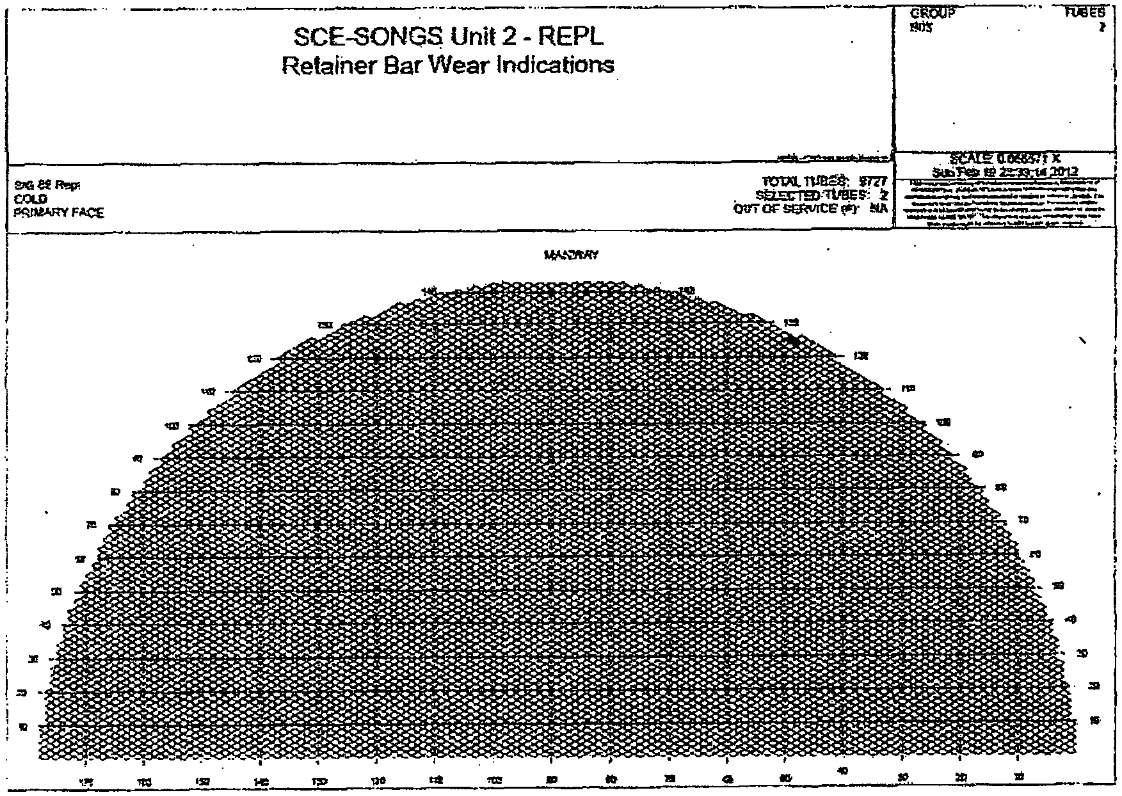
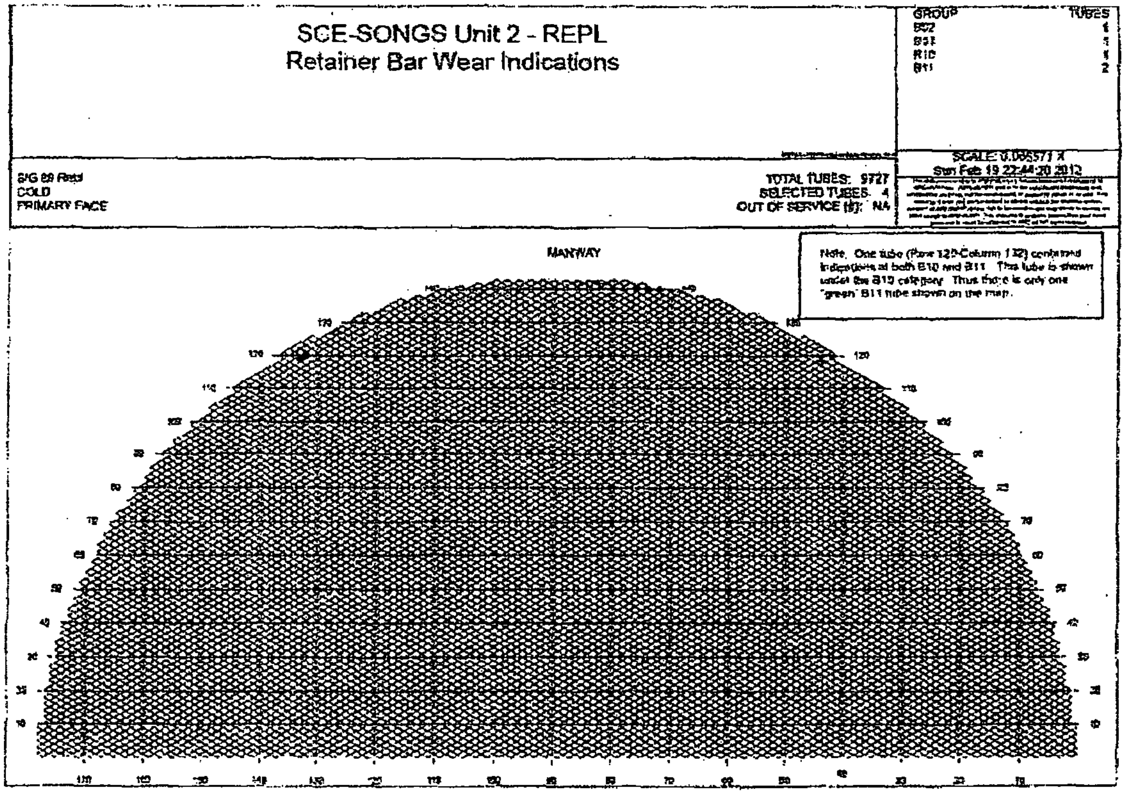


Figure 5-8: SG89 Retainer Bar Wear



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an AREVA and Siemens company

Figure 5-9: SG88 Foreign Object Wear

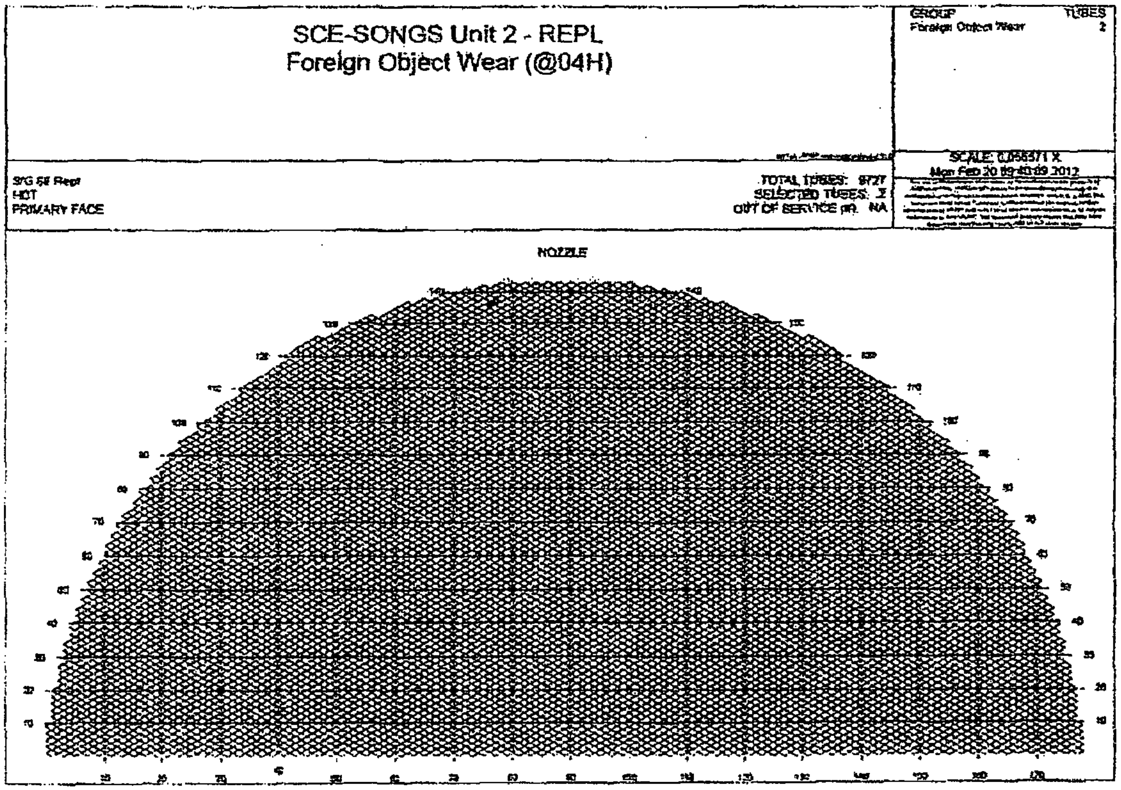


Figure 5-10: SG88 AVB Wear Depth Distribution

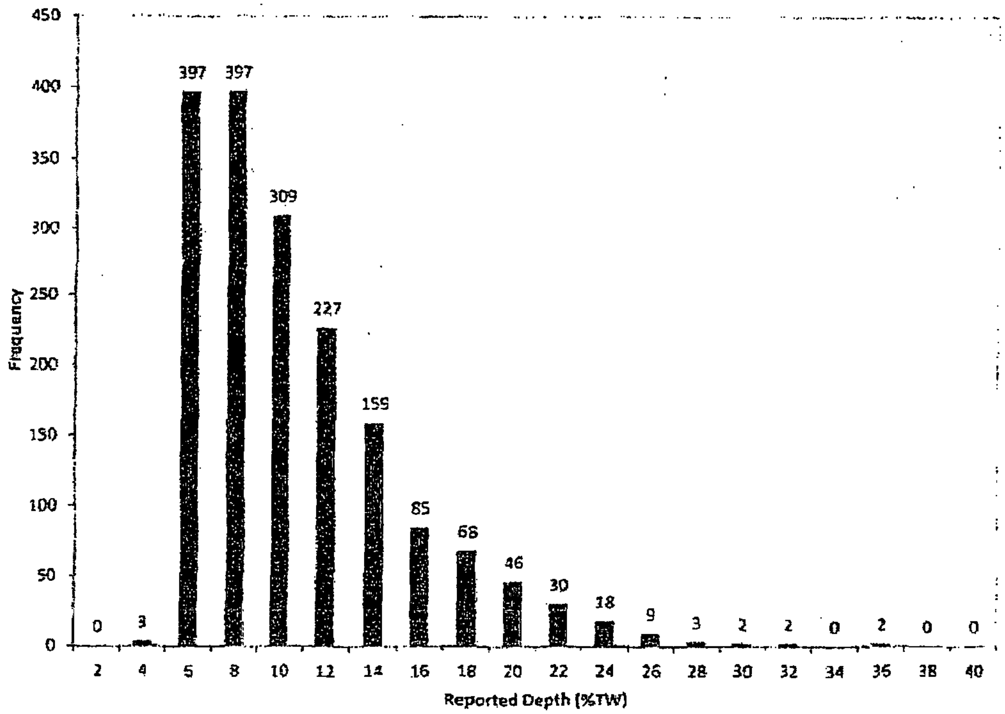


Figure 5-11: SG89 AVB Wear Depth Distribution

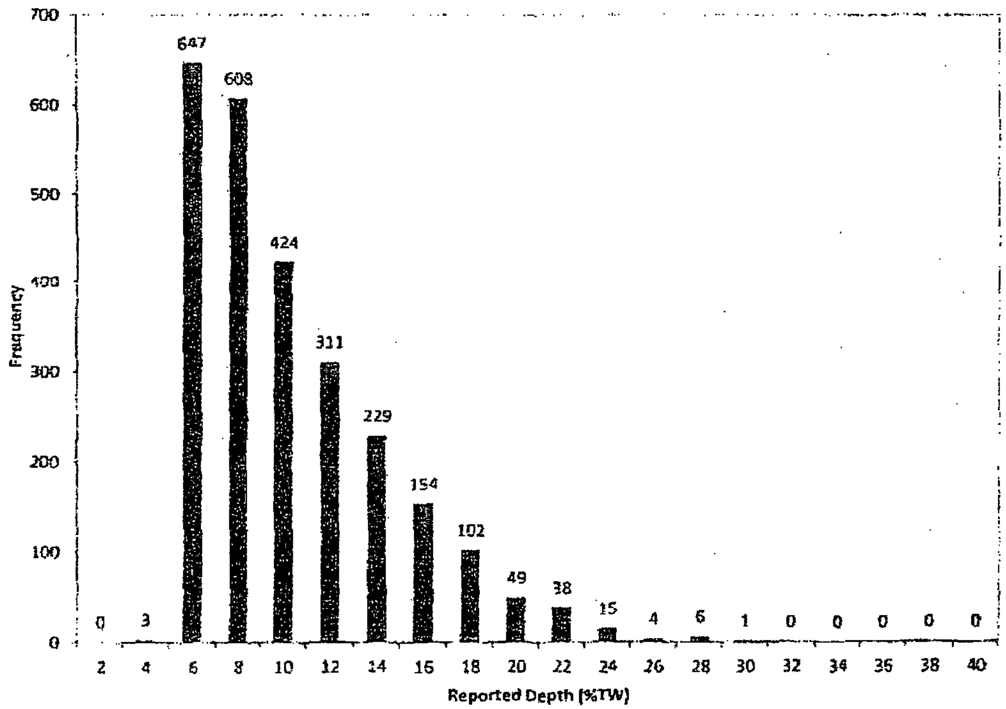


Figure 5-12: SG88 TSP Wear Depth Distribution

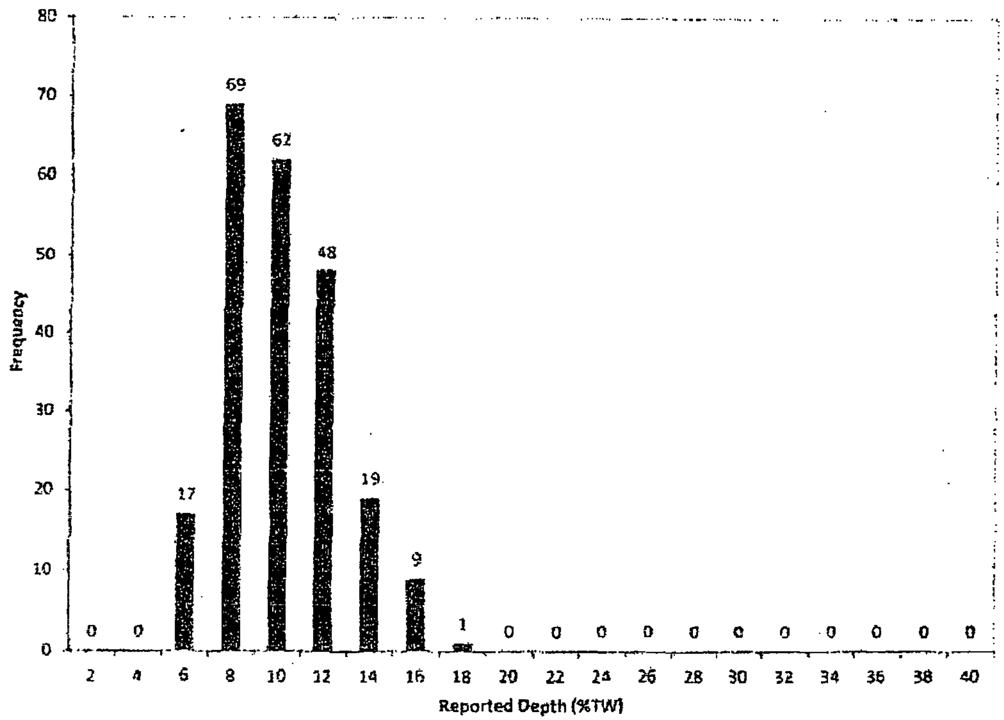


Figure 5-13: SG89 TSP Wear Depth Distribution

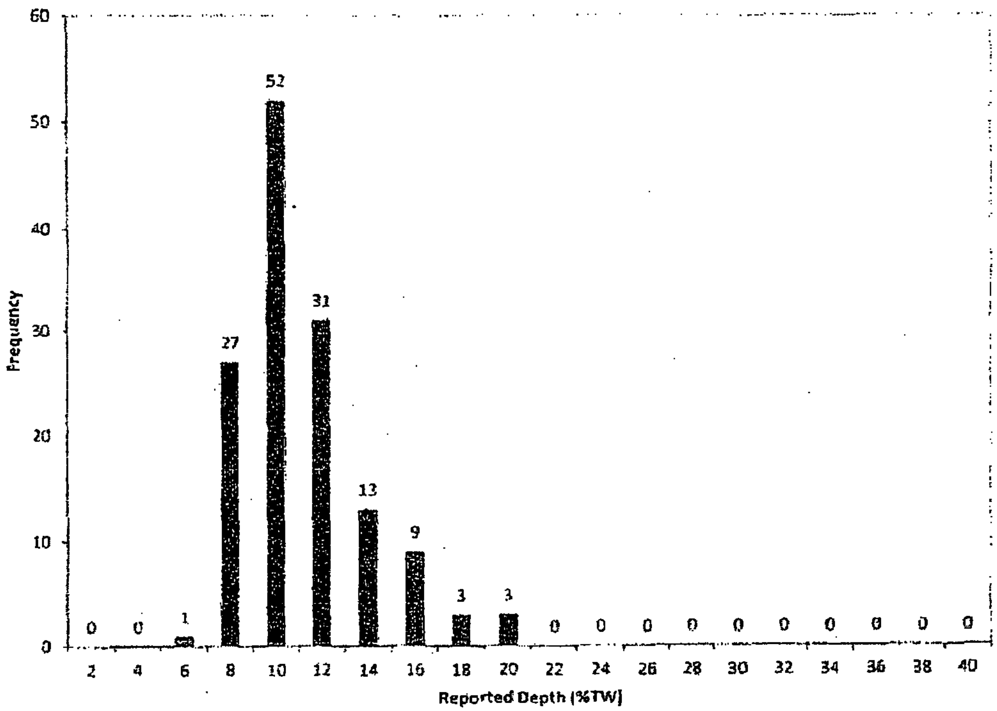
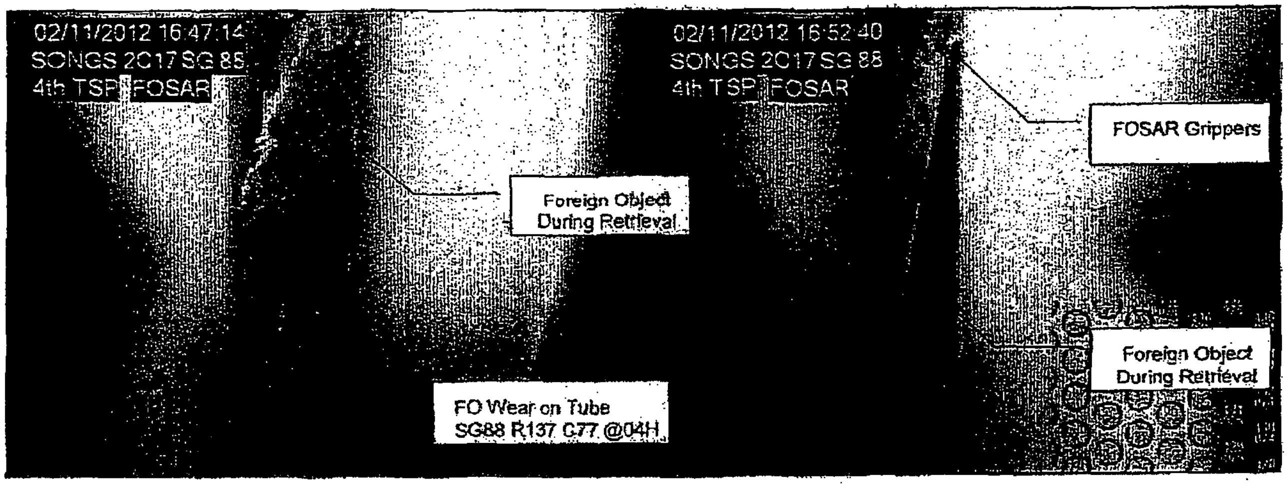


Figure 5-14: Foreign Object Retrieved from SG88



6.0 CONDITION MONITORING ASSESSMENT

In order to satisfy condition monitoring requirements, all degradation mechanisms detected during the 2C17 outage must meet the structural and leakage performance criteria described in Section 4.0. Satisfaction of the CM criteria can be demonstrated either analytically or through in-situ pressure testing. Structural and accident induced leakage integrity are evaluated analytically based on the degradation mechanism's characteristics, including circumferential extent, axial length, and through-wall depth. Operational leakage integrity is monitored via leakage detection systems and procedures during plant operation.

Consistent with the structural integrity criteria described in Section 4.0, the limiting pressure loading occurs at a value of three times the normal operating differential pressure. For SONGS-2 this value is 4290 psi [7]. In addition to pressure loads, the CM must also consider the impact of non-pressure accident loads if they could have a significant effect on the burst pressure of the degraded tubes. A review of the screening guidance of reference [2, Section 3.7.2] provides the basis for concluding that non-pressure accident loads are not limiting for the identified tube wear in SONGS-2 SG tubes. Reference [2] indicates that the burst pressure of flat bar wear in u-bend flanks of re-circulating SG tubes (i.e., AVB wear), wear less than 270° in circumferential extent at supports below the top TSP, and degradation with circumferential involvement less than 25 PDA (Percent Degraded Area) anywhere in the tube bundle; will not be significantly affected by non-pressure loads. The accident induced leakage performance criteria must also be assessed, and in addition to the SLB pressure (2560 psi [7]), must also consider non-pressure loads where appropriate. This is discussed in more detail within this section.

In order for a degraded tube to be returned to service, the degradation must be measured using a qualified ECT sizing technique, and the degradation must be evaluated as acceptable for continued operation The sizing techniques qualified for use at SONGS-2 are identified in the degradation assessment [7] and are detailed in the ECT technique site validation document [8]. If a degradation mechanism cannot be sized with appropriate sizing confidence, it is plugged on detection. All degradation identified during the current outage was measured with a qualified ECT technique.

This was the first inservice inspection of the SONGS Unit 2 SG tubes; performed after one cycle of operation following SG replacement. The potential for mechanical wear to develop at various locations within the SGs was recognized prior to the examination, but the identification of significant wear at retainer bars was not specifically anticipated. Although the examination program as planned was well capable of detecting this mechanism, the degradation assessment [7] was revised during the outage to include this new mechanism.

6.1 Input Parameters

Table 6-1~~Table 6-1~~ and Table 6-2~~Table 6-2~~ identify the input parameters used to perform the condition monitoring assessment. In particular, these inputs were used within the AREVA Mathcad tool which implements the SG Flaw Handbook equations [10], in order to generate the limit curves discussed in Section 6.2. The flaw model for axial thinning with limited circumferential extent was used for the analyses (Section 5.3.3 of Reference 5). The 4290 psi 3ΔP value is based on a conservative assessment of Unit 2 secondary side steam pressure as measured during cycle 16. It is also expected to conservatively represent the operating pressure differential (with 3x margin) during the next fuel cycle, which is applicable to the operational assessment discussed later in this report. The planned primary temperature increase will result in a higher steam pressure and a lower value of 3ΔP; however, the 4290 psi value conservatively does not reflect this reduction.

Table 6-1: SONGS-2 Steam Generator Input Values

Parameter	Value
Desired probability of meeting burst pressure limit	0.95
Tubing wall thickness	0.043 inch, [7]
Tubing outer diameter	0.750 inch, [7]
Mean of the sum of yield and ultimate strengths at temperature	116000 psi, [14]
Standard deviation of the sum of yield and ultimate strengths	2360 psi, [15]
3 X Normal Operating Pressure Differential (3XNOPD)	4290 psid, [7]
EFPD from SG Replacement through 2C17	627.11, [12]
Expected EFPD from 2C17 to 2C18	578, [13]

Table 6-2: Eddy Current ETSS Input Values (Reference 6)

Parameter	ETSS 96004.1	ETSS 27903.1	ETSS 27901.1
Probe Type	Bobbin Coil	+Point	+Point
NDE depth sizing regression parameters	Slope = 0.98 Intercept = 2.89 %TW	Slope = 0.97 Intercept = 2.80 %TW	Slope = 1.05 Intercept = -1.97 %TW
NDE depth sizing technique uncertainty (std)	4.19 %TW	2.11 %TW	2.30 %TW
NDE depth sizing analysis uncertainty (std)	2.10 %TW	1.06 %TW	1.15 %TW
Total NDE (Sizing and Technique) (std)*	4.69 %TW	2.36 %TW	2.60 %TW

* Total uncertainty is the technique and analysis uncertainties combined via the square root of the sum of the squares.

6.2 Evaluation of Structural Integrity

6.2.1 AVB wear and TSP wear

AVB wear and TSP wear were evaluated with the flaw model described in reference [5] as "axial part-throughwall degradation < 135° in circumferential extent." The maximum circumferential extent of a single 100%TW wear scar formed by a long flat bar positioned tangentially to the tube surface (e.g., an AVB) is 55.4°. For double-sided AVB wear the total circumferential extent for this limiting case would be well below the 135° limit established by this model; hence, this flaw model is appropriate for AVB wear. For double-sided AVB wear and double- or triple-sided TSP wear this model also remains bounding because the AVB and TSP geometries provide sufficient circumferential separation between the wear scars to permit each indication to be treated separately. The separation between centerline contact points for AVB wear and TSP wear is 180° and 120°, respectively, and results in negligible circumferential interaction between separate wear locations in the same axial plane of the tube.

The topic of external loads must be addressed. The maximum reported AVB wear depth (35 %TW), adjusted upward to conservatively account for sizing uncertainty (ETSS 96004.1), is 45%TW. If it assumed that this flaw is double-sided; and it is further conservatively assumed that the total circumferential extent is 111° (see above), the resulting PDA would be 14. Similarly, the maximum reported TSP wear depth (20%TW) adjusted to account for NDE uncertainty is 30%TW. If it assumed that this wear depth occurs at all three TSP land contacts, each with the limiting circumferential extent of 55.4°, the resulting PDA would be 14. Because the circumferential involvement of these flaws is less than 25 PDA, external loads need not be considered in the evaluation of burst integrity.

The bobbin probe was used to estimate the depth of AVB wear and TSP wear through the application of ETSS 96004.1. CM limit curves for AVB wear and TSP wear based upon ETSS 96004.1 and the parameters provided in Table 6-1~~Table 6-1~~ and Table 6-2~~Table 6-2~~, are provided in Figure 6-1~~Figure 6-1~~ and Figure 6-2, respectively. These figures also include the throughwall depth of each indication reported, plotted at the assumed axial flaw length. The assumed flaw length for AVB wear indications was derived from the flaw profiles (using line-by-line sizing). Twenty-two AVB wear indications were profiled with emphasis placed on the deeper indications for profiling. Of the AVB wear scars profiled (using line by line sizing) the maximum structural length was determined to be slightly less than 0.6 inches. A bounding length of 0.7 inches was chosen for the AVB wear as shown on Figure 6-1~~Figure 6-1~~. This is slightly longer than the 0.6 inch width of the AVBs.

The TSP wear flaws are plotted at a length of 1.4 inches, slightly longer than the thickness of the TSPs (1.38 inches). Since all AVB wear and TSP wear flaws lie below their respective CM limit curves, it is concluded that the structural integrity performance criterion was satisfied with respect to these degradation mechanisms during the operating period preceding the 2C17 outage.

6.2.2 Retainer Bar Wear

Retainer bar wear was also evaluated with the "axial part-throughwall degradation < 135° in circumferential extent" degradation model as described in reference [5]. The maximum measured circumferential extent of RB wear was 0.46 inches (Table 5-6) which corresponds with an angular extent at the mid tube wall of 75°; well within the 135° requirement for this flaw model. Because of the rather short axial extent of the RB wear indications, it is prudent to also consider the potential for rupture in the circumferential direction. For the indication with the largest circumferential extent (0.46

inch, SG89 R119 C133 B02), and a limiting assumption that the wear is 100%TW over the entire circumferential extent, the percent degraded area (PDA) is found to be 21 PDA (i.e., (0.46)/(π(mid-wall diameter))). This limiting flaw was evaluated with the degradation model for circumferential cracking under pressure loading as described in reference [2]. Based on this model the lower bound burst pressure in the circumferential direction was determined to be 6470 psi; much less limiting than the results from the axial part- throughwall model (discussed below). This provides the basis for concluding that the axial part-throughwall degradation model is appropriate for the evaluation of RB wear.

External loads which are assumed to exist concurrently with the SLB accident do not significantly affect burst pressure in tubes with flaws located in the u-bend region on the tube flanks (±45°) [2]. +Point probe examinations were performed with another eddy current probe placed in an adjacent tube in order to estimate the position of the limiting flaw (SG89 R119 C133 B02) relative to the tube flank. This testing showed that the flaw lies approximately 40 to 50 degrees from the flank position; consequently, the RB wear may not lie entirely within the flank region. However, it is also known that external loads do not significantly affect burst pressure in tubes with flaws whose circumferential involvement is less than 25 PDA [2]. The upper bound circumferential involvement of the limiting RB wear flaw is only 21 PDA. It is therefore concluded that the limiting condition monitoring structural criteria is 3x normal operating pressure differential, rather than 1.2x the combined loading of SLB pressure and external loads. In short, it is appropriate to consider pressure loading-only for the structural integrity evaluation of RB wear flaws.

The axial depth profile of each RB wear flaw was measured using ETSS 27903.1, and this data was used to determine the structurally significant dimensions of the flaws using the methods described in Section 5.1.5 of reference [5]. The results are provided in Table 5-6 and are plotted on the CM curve provided in Figure 6-3. Since the RB wear in tube SG89 R119 C133 B02 lies above the CM curve in Figure 6-3, it could not be demonstrated on the basis of NDE measurements and analytical evaluation that this tube met the structural integrity performance criteria. Consequently, this tube was subjected to in-situ pressure testing. All other RB wear indications lie below the CM curve and, hence, are shown to meet the structural integrity performance criteria analytically.

In-situ accident leakage and structural proof testing was performed on tube SG89 R119 C133 B02 in accordance with the guidance provided in reference [4]. The normal operating, accident level, and proof test hold pressures were adjusted to account for temperature effects on material strength, and other factors related to the test process. All testing was accomplished using full tube pressurization. The tube was held pressurized at the required hold times without any difficulties. No leakage or rupture occurred at any time during the test, thereby successfully demonstrating that the tube met the SONGS accident leakage performance criteria and structural integrity performance criteria during the operating period preceding the 2C17 outage. This result also demonstrates the generous level of conservatism inherent in the flaw sizing and analytical methods used to evaluate SONGS SG tube volumetric degradation. The in-situ test results are documented in reference [15].

6.2.3 Foreign Object Wear

Foreign object wear was evaluated with the "axial part- throughwall degradation < 135° in circumferential extent" flaw model as described in reference [5]. The measured circumferential extent of both reported FO wear flaws was 0.31 inches or 50°, which is well within the 135° constraint of this model. Although these flaws are short axially, the circumferential involvement is only 14 PDA. Thus these tubes would not preferentially burst in the circumferential mode prior to axial burst, and the use of the axial part-throughwall flaw model remains appropriate (see Section 6.2.2). In addition, because these flaws are located well below the top TSP (i.e., they are at the 4th TSP), and because the circumferential involvement is less than 25 PDA, external loads need not be considered in the evaluation of burst integrity.

The +Point probe was used to measure the axial depth profile of the flaws through the application of ETSS 27901.1. This data was used to determine the structurally significant dimensions of the flaws (Table 5-7) by applying the methods described in Section 5.1.5 of reference [5]. The applicable CM limit curve, based upon ETSS 27901.1 and the parameters provided in Table 6-1~~Table 6-1~~ and Table 6-2~~Table 6-2~~, is shown in Figure 6-4 along with the structurally equivalent dimensions of each FO wear flaw. Since both flaws lie well below the CM limit curve, it is concluded that the structural integrity performance criteria was satisfied with respect to foreign object wear during the operating period preceding the 2C17 outage.

6.3 Evaluation of Accident Induced Leakage Integrity

6.3.1 AVB wear and TSP wear

Volumetric degradation that is predominantly axial in orientation and is greater than 0.25 inch long will leak and burst at essentially the same pressure [2]. The SONGS-2 AVB wear and TSP wear flaws meet this description. The evaluation in Section 6.2.1 demonstrated that the AVB wear and TSP wear identified during the 2C17 outage satisfied the burst integrity criteria at a pressure of 4290 psi. Consequently, the leakage integrity of AVB wear and TSP wear at the much lower SLB pressure differential of 2560 psi is also demonstrated by that evaluation. All of the tubes with AVB wear and TSP wear flaws satisfied the SONGS accident induced leakage performance criteria during the operating period prior to the 2C17.

6.3.2 Retainer Bar Wear

The accident induced leakage integrity of tubes with RB wear is bounded by tube SG89 R119 C133 which had the largest measured RB wear flaw identified during the 2C17 outage. The leakage integrity of this tube was confirmed by in-situ pressure testing, during which the tube did not leak or rupture at any pressure level. Based upon the in-situ test results it is concluded that all of the tubes with RB wear flaws satisfied the SONGS accident induced leakage performance criteria during the operating period prior to the 2C17 outage. The in-situ test is discussed in more detail in Section 6.2.2 and in reference [15].

6.3.3 Foreign Object Wear

Since the axial length of the FO wear flaws is less than 0.25 inch it is theoretically possible that pop-through and leakage could occur prior to tube rupture. Per reference [2], a conservative evaluation of this potential may be performed through the use of the reference [5] flaw model for uniform depth. 360° volumetric degradation. The limit curve of Figure 6-5 identifies the throughwall limit for uniform 360° thinning at 2560 psi. As with a CM limit, this curve includes the effects of relational, material strength, and NDE sizing uncertainties. The relational uncertainty is the uncertainty between the actual burst pressure and the calculated burst pressure based on known structural lengths and depths. The reported maximum depth and overall axial length for the two FO wear flaws are also shown in Figure 6-5. Because both flaws lie well below the curve it is concluded that the foreign object wear identified did not violate the accident induced leakage performance criteria during the operating period prior to the 2C17 outage.

6.4 Evaluation of Operational Leakage Integrity

Throughout the operating period preceding the 2C17 outage, SONGS Unit 2 experienced no measurable primary to secondary leakage. Therefore, the operational leakage performance criterion was satisfied during this period.

6.5 Condition Monitoring Conclusion

This condition monitoring assessment has evaluated all SG tube degradation detected during the 2C17 outage against the three SONGS technical specification performance criteria. Through a combination of eddy current inspection, analytical evaluation, in-situ pressure testing, and operational leakage monitoring it has been determined that the three performance criteria: 1) structural integrity, 2) accident induced leakage integrity, and 3) operational leakage integrity; were satisfied during the operating period prior to the 2C17 outage.

Figure 6-1: CM Limit for AVB Wear, ETSS 96004.1

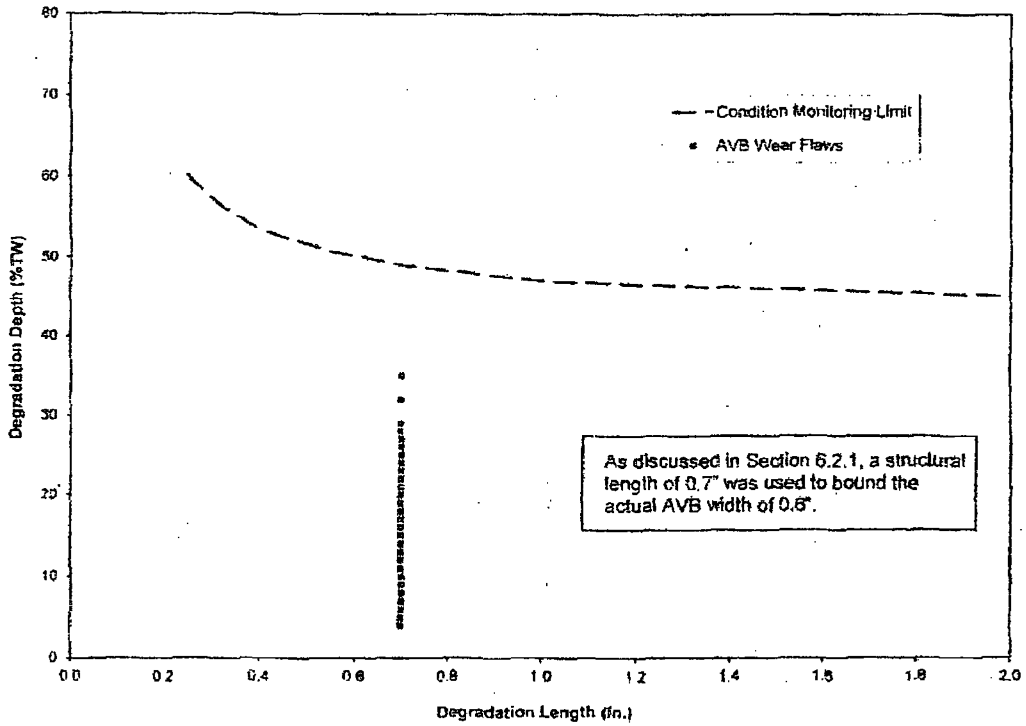


Figure 6-2: CM Limit for TSP Wear, ETSS 96004.1

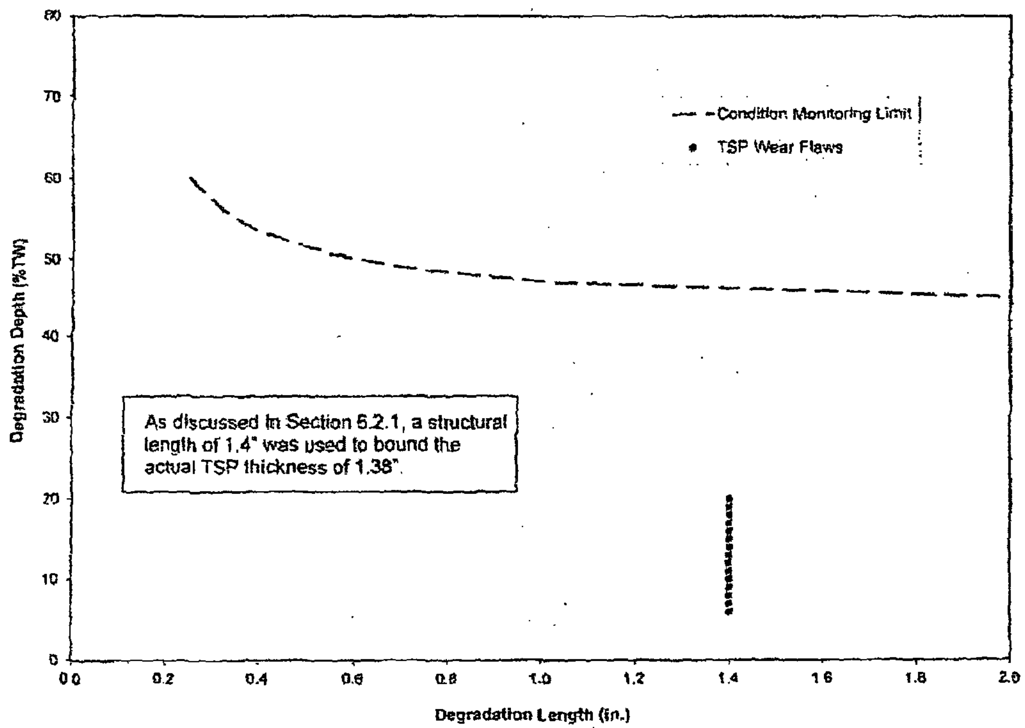


Figure 6-3: CM Limit for RB Wear, ETSS 27903.1

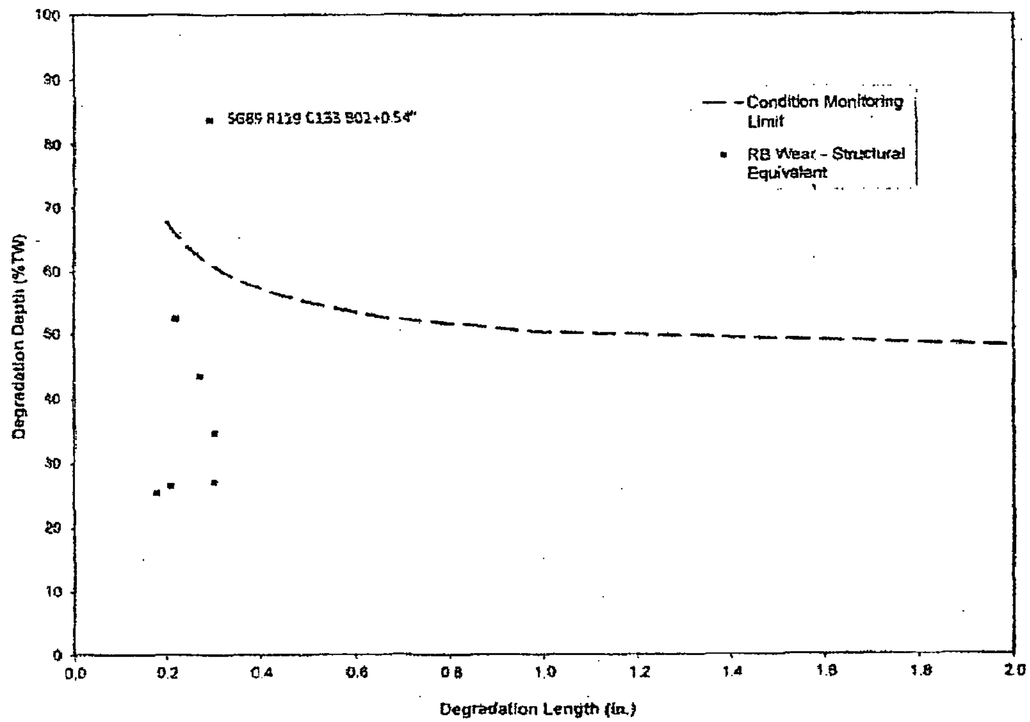


Figure 6-4: CM Limit for FO Wear, ETSS 27901.1

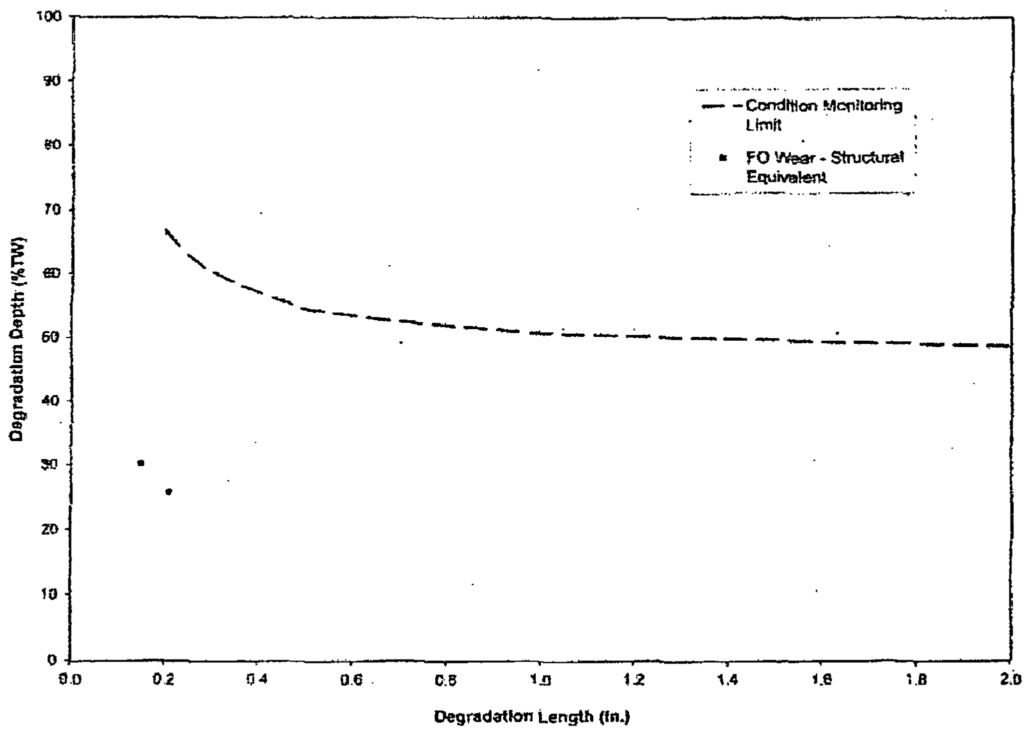
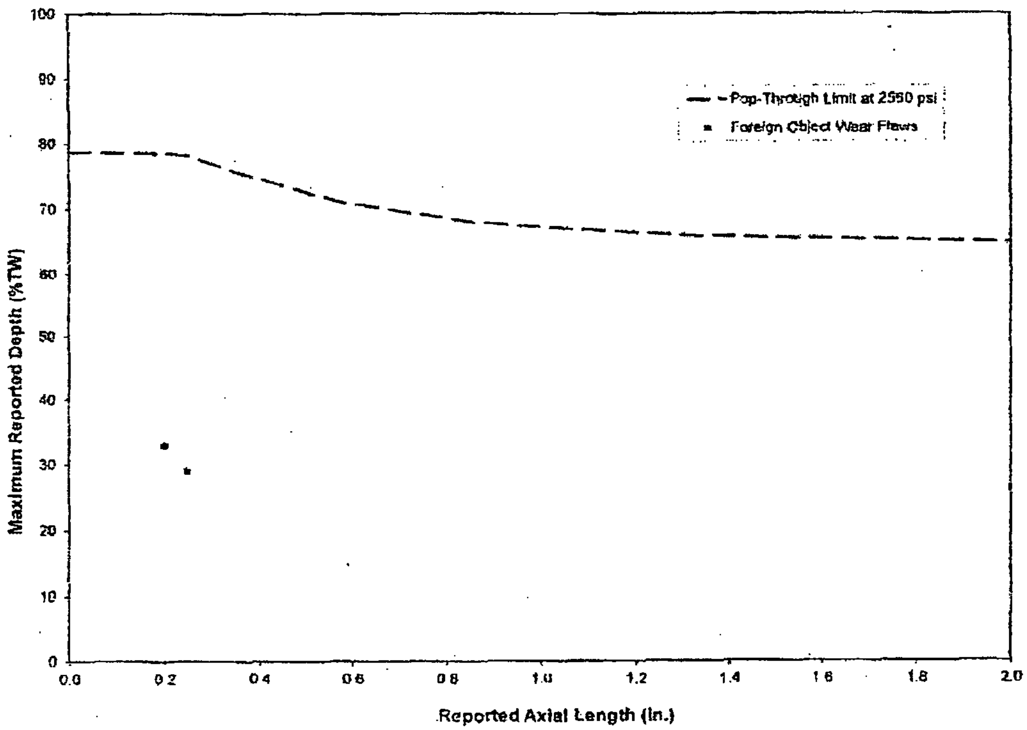


Figure 6-5: Foreign Object Pop-Through at 2560 psi, Uniform 360° Thinning, ETSS 27901.1



7.0 OPERATIONAL ASSESSMENT

The SONGS SG Program requires that a "forward looking" Operational Assessment (OA) be performed to determine if the steam generator tubing will continue to meet the structural and leakage integrity requirements at the end of the upcoming operating cycle based upon an evaluation of the degradation mechanisms observed during the current inspection. As previously discussed, the following tube degradation mechanisms were identified during the 2C17 steam generator inspections:

- Anti-vibration bar (AVB) wear
- Tube support plate (TSP) wear
- Retainer bar (RB) wear
- Foreign object (FO) wear

7.1 Evaluation of Structural Integrity

The fundamental OA structural integrity criteria is that the projected worst case degraded tube for each existing degradation mechanism must meet the limiting structural performance parameter with a 95% probability and 50% confidence. Due to the relatively large number of AVB wear and TSP wear flaws identified during the 2C17 outage, a probabilistic approach was used to perform the OA for these mechanisms. The basic input parameters provided in Table 6-1~~Table 6-1~~ and Table 6-2~~Table 6-2~~ are also used for the operational assessment.

7.1.1 AVB Wear and TSP Wear

The typical deterministic approach for performing an OA for wear is to identify the worst case flaw during the current outage, apply an upper bound growth rate to reflect growth during the next cycle, and compare the resulting depth (i.e., the end-of-cycle (EOC) depth) to the OM limit curve. This is generally appropriate for degradation mechanisms which involve a small number of flaws. However, when a large number of flaws of a particular mechanism are expected to develop or are left inservice, it is non-conservative to perform a deterministic OA evaluation of this type. A probabilistic approach addresses

(b)(4)

[redacted]

calculated and compared with the value of 3XNOPD. This process is repeated thousands of times (via a monte carlo process) in order to develop a probability of burst for the worst case degraded tube. This value must be at least 95% to successfully satisfy the fundamental OA criteria. If the result is less than 95%, a lower plugging limit must be implemented. The calculation also considers uncertainties associated with material strength, NDE sizing, the ratio of maximum flaw depth to structurally significant flaw depth, and the burst equation itself. Within the full bundle OA tool, AVB and TSP wear are evaluated using the EPRI Flaw Handbook degradation model for axial part-throughwall degradation less than 135° in circumferential extent, subjected to pressure loading of 3XNOP.

7.1.1.1 Growth Rates

One of the underlying assumptions implemented within the full bundle OA tool is that growth rates going forward are random with respect to the current wear depth. Since the SONGS-2 SGs have operated for only one cycle it is not known if or to what extent this behavior will manifest itself

(b)(4)

(b)(4)

The growth rate distributions applicable to AVB wear and TSP wear are provided in Figure 7-1, Figure 7-2, and Figure 7-3.

7.1.1.2 Structural Depth Ratio

Structural lengths and depths were obtained for 22 AVB wear indications that were line-by-line sized with the +Point probe. The selection of indications for line-by-line sizing was based on depth of the indication with emphasis placed on the deeper indications. Since the results of the operational assessment are highly dependent on the deepest flaws returned to service, use of the structural lengths and depths from 22 of the deeper indications is justified. The structural depths were compared to the maximum depths for each flaw to obtain a ratio of structural to maximum depth. The ratio of structural depth to maximum depth ranged from a low of 0.76 to a high of 0.94. The average and the standard deviation of this ratio are 0.882 and 0.052, respectively. These values were used as inputs to the full bundle OA tool for the AVB wear evaluations. Using the distribution of structural to maximum depth ratios, the OA tool randomly applies a ratio value, sampled from this normal distribution, to each postulated maximum depth at the EOC. The sampled ratio value is constrained to a minimum and maximum of 0.8 and 1.0, respectively. For TSP wear, a fixed value of 1.0 was conservatively used for the ratio of structural to maximum depth.

7.1.1.3 Initiation and Depth Distribution of New Indications

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7.1.1.4 Results of Probabilistic OA for AVB Wear and TSP Wear

The fundamental OA criteria is that the projected worst case degraded tube for each existing degradation mechanism must meet the limiting structural performance parameter with a 95% probability and 50% confidence. The results of the probabilistic OA for AVB wear and TSP wear are provided in Table 7-1. The values provided in the table represent the projected EOC probability of non-burst for the entire population of flaws in the specified group. These values compare directly with the 95/50 OA criteria. Note that the combined probability of non-burst for AVB wear is simply the product of the probabilities for the two depth groups evaluated (e.g., 0.981 x 0.991 = 0.972). Implementation of the ≥30%TW preventive plugging limit for AVB wear provided additional margin to the OA criteria in SG88 such that the probability of non-burst for AVB wear exceeds 97% in both SGs. When considering AVB and TSP wear in combination, the probability of non-burst at the end of the next cycle is 97%. In all cases the OA structural integrity criteria is satisfied.

Table 7-1: Projected EOC Probability of Non-Burst

		No. of Tubes Requiring Plugging		End-of-Cycle Tube Degradation Probability of Non-Burst	
Flaw Category	Plugging Limit	SG88	SG89	SG88	SG89
AVB Wear >20%	≥30 %TW	4	0	0.981	0.984
AVB Wear ≤20%	≥30 %TW	No Plugging Required		0.991	0.986
All AVB Wear				[redacted]	
TSP Wear	≥35 %TW	No Plugging Required		[redacted]	
AVB & TSP Wear Combined				[redacted]	

Figure 7-1: SG88 and SG89 Combined Depth Growth Rate Distribution, AVB Wear >20%TW

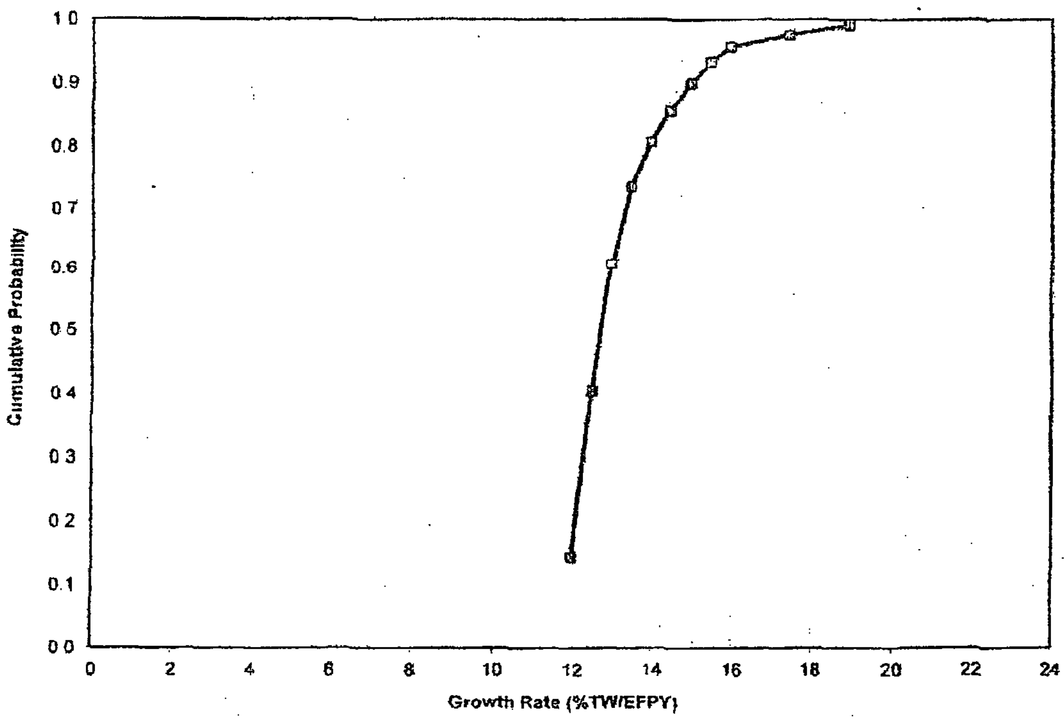


Figure 7-2: SG88 and SG89 Combined Depth Growth Rate Distribution, AVB Wear ≤20%TW

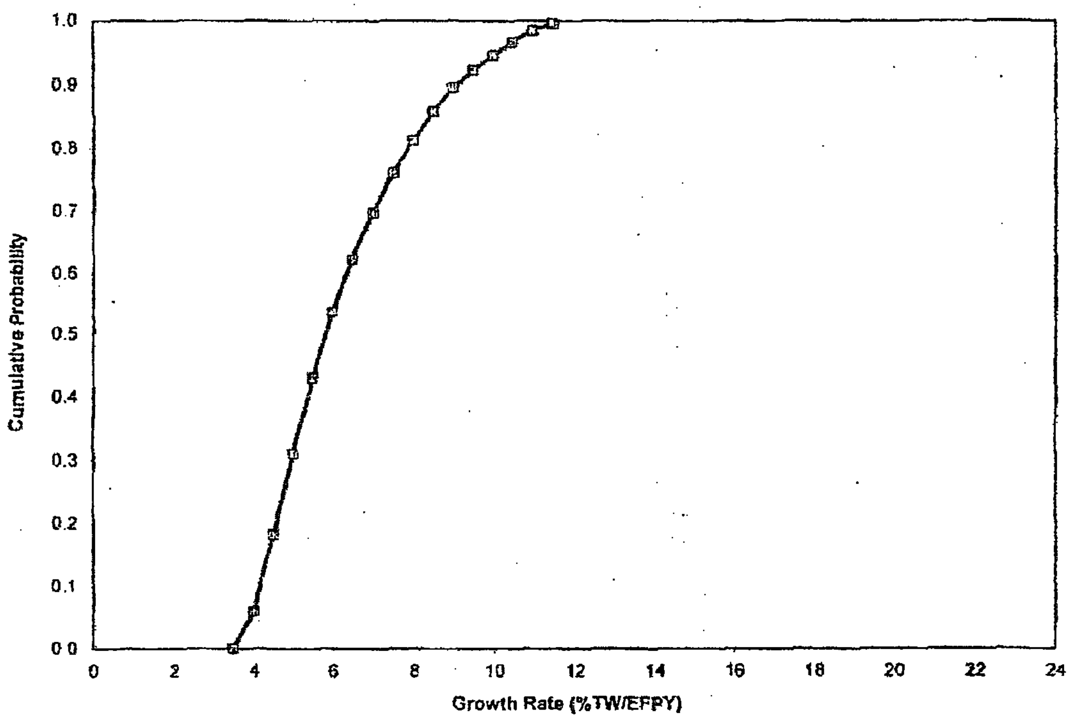
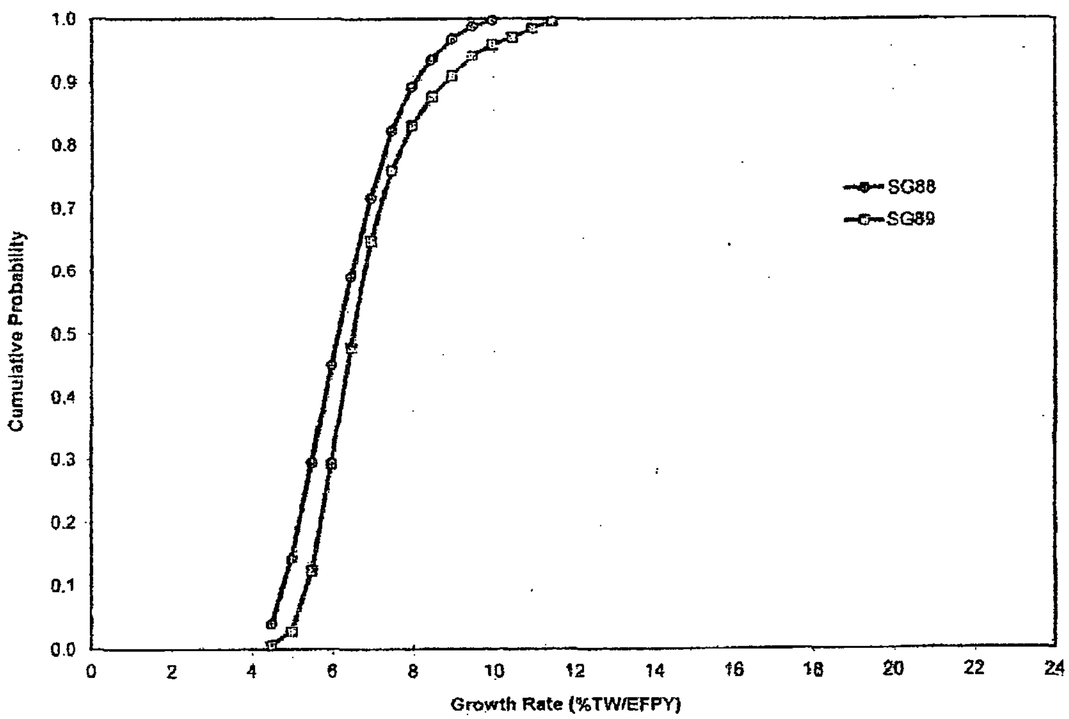


Figure 7-3: Depth Growth Rate Distributions, TSP Wear

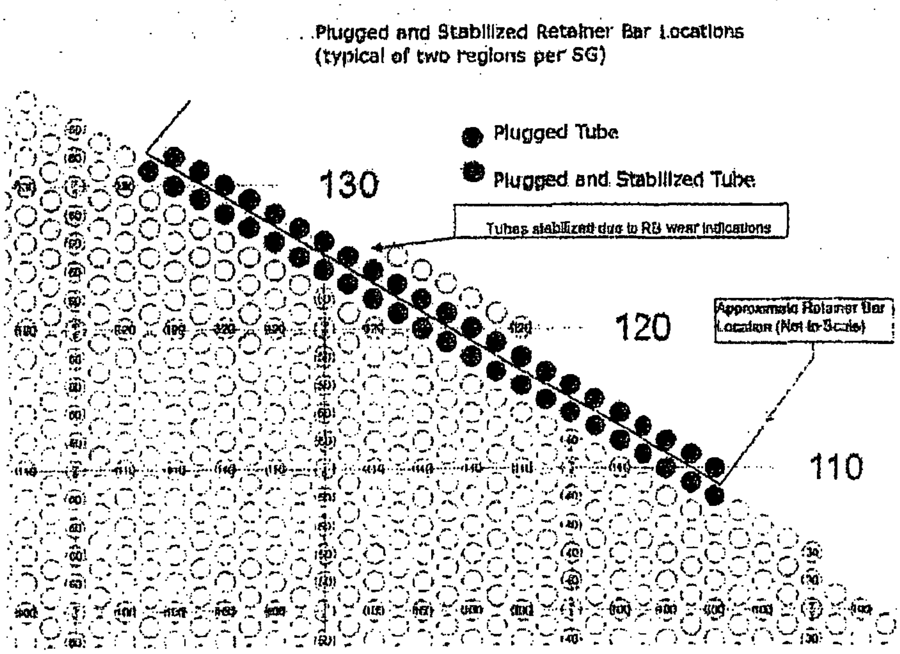


7.1.2 Retainer Bar Wear

To eliminate the potential for future RB wear in inservice tubes, all tubes adjacent to retainer bars were plugged in both SGs. Prior to plugging, all tubes with RB wear indications were stabilized with u-bend cable stabilizers. The tubes on either side of all retainer bars, at each end of the retainer bars, and at the center of the retainer bars, were also stabilized prior to plugging in both SGs. This augmented stabilization, depicted in Figure 7-4~~Figure 7-4~~, provides additional material volume to resist continued RB wear, and provides added assurance that the retainer bars will not interact with inservice tubes. This figure shows the stabilization pattern for SG88, including the two tubes with RB wear indications in SG88. These corrective actions provide reasonable assurance that retainer bar wear will not challenge the structural integrity performance criteria during the remaining life of the steam generators. In addition, the stabilization of these tubes provides reasonable assurance that a tube severance event will not occur during the remaining life of the steam generators.

Monitoring of the tubes adjacent to these plugged tubes will be performed during the next scheduled steam generator inspection.

Figure 7-4: Augmented Retainer Bar Stabilization (SG88 Shown)



7.1.3 Foreign Object Wear

All Unit 2 SG tubes were examined full length with bobbin coil probes. Two tubes were identified with foreign object and foreign object wear indications. The object which caused the foreign object indication and associated wear was retrieved from the steam generator. Consequently, there is no capacity for the degradation to progress during future operation. After removal of the part, the affected locations were inspected with a +Point™ technique qualified for depth sizing (with the part not present). Neither indication exceeded the SONGS 35%TW plugging limit (see Table 5-7). Since the indications were below the SONGS plugging limit and the part was removed, these tubes were left in service. No other foreign objects or foreign object wear flaws were identified during the eddy current examination.

Subsequent analysis by SCE determined the part as weld metal debris. Therefore, this is not indicative of degradation of secondary side internals.

The SG work activities performed during this refueling outage included post sludge lancing secondary side visual inspections of the TTS annulus and no-tube lane regions in both SGs, and visual examinations of the upper bundle, including the retainer bars and the retainer bar welds. Other than the object discussed above, these examinations identified no foreign objects or conditions which could credibly generate foreign objects capable of impacting tube integrity.

In summary, based on extensive ECT inspections augmented by secondary side visual examinations and FOSAR, no foreign objects capable of causing tube degradation are known to remain in the Unit 2 SGs. Hence, there is reasonable assurance that foreign objects will not cause the structural or leakage integrity performance criteria to be exceeded prior to the next tube examination in each steam generator

7.2 Evaluation of Leakage Integrity

All tubes with degradation exceeding the technical specification plugging limit have been removed from service by plugging. Per reference [2], the onset of pop-through leakage for axially oriented volumetric flaws with limited circumferential extent - the nature of the degradation identified in SONGS-2 SGs - is coincident with burst. Since none of the identified degradation mechanisms are projected to exceed the structural performance criteria prior to the next scheduled inspection in each SG, there is reasonable assurance that neither the operational, nor the accident-induced leakage performance criteria will be exceeded prior to the next inspection of the Unit 2 SGs.

7.3 Secondary Side Internals

Although interaction of tubes with retainer bars resulted in significant degradation in several tubes, this condition has been remediated through tube stabilization and plugging. No degradation of secondary side internals which could impact tube integrity prior to the next examination was identified during this outage. No tube support deficiencies or misplacement were identified during the 100% bobbin probe examination or during the secondary side visual examinations.

7.4 Operational Assessment Conclusion

Based upon the results of the 2C17 eddy current tube examinations, the primary and secondary side visual examinations, and the implemented corrective actions; this preliminary operational assessment concludes the steam generator structural and leakage integrity performance criteria will be satisfied until the final operational assessment is completed.

As a preliminary OA, this assessment is only valid for 90 days after entry into Mode 4. The possible restoration of hot leg primary side temperature does introduce additional uncertainties into the analyses. Therefore, this operational assessment will be updated with additional supporting information for the assumptions on growth rates for AVB and TSP wear.

In addition, the potential for tube-to-tube wear (similar to that seen in SONGS Unit 3) will also be included in the final operational assessment. More discussion on this subject is provided in the next section.

8.0 POTENTIAL APPLICABILITY OF UNIT 3 FINDINGS TO UNIT 2 OA

During the 2C17 inspection, SONGS Unit 3 was shut down due to a primary-to-secondary leak. After eddy current testing of the Unit 3 steam generators, it was determined that the likely cause of the leak in Unit 3 was tube-to-tube wear in the u-bends. The Unit 3 tube-to-tube wear is believed to be due to in-plane motion and instability of the u-bends of the tubes. A Root Cause Assessment has been initiated.

If this event had happened after the SONGS-2 outage or at another plant, the EPRI guidelines would require that SONGS address this operating experience in the degradation assessment prior to the next Unit 2 steam generator inspection. In this case, the degradation would be included as a potential mechanism and a sample inspection with a qualified technique would be required. For the tube-to-tube wear, the bobbin coil is fully capable of detecting this mechanism. Since all in-service tubes were inspected full length with bobbin coil probes, the Unit 2 inspection scope was more than adequate to detect this mechanism. No indications of tube-to-tube wear were detected in any Unit 2 tube.

However, since this event occurred during the Unit 2 inspection, SCE took several additional steps to provide additional assurance that this mechanism had not initiated in the Unit 2 steam generators These steps included the following:

- Review of the bobbin data with "re-calibrated" eyes sensitized to the potential for tube-to-tube wear
- Supplemental visual inspections of the 7th TSP and the u-bends in the vicinity of B04
- Evaluation of the axial extents of the AVB wear flaws

These additional inspections and reviews were performed to determine if any precursor signals of tube-to-tube wear were present in Unit 2.

The review of the bobbin data included about 1000 tubes in each steam generator in the same region as the tube-to-tube wear in the Unit 3 steam generators. This review showed no evidence of tube-to-tube wear.

The purpose of the supplemental visual inspections was to look for evidence of tube-to-tube wear and tube-to-AVB wear in the region experiencing this wear in Unit 3's steam generators and thus support the results of the eddy current inspection program. The visual inspections in the u-bend near the B04 support included multiple passes between Columns 73 and 87. No evidence of tube-to-tube wear or AVB wear indications extending significantly outside of the AVB interface was observed. Visual inspections of the 7th TSP inspections were performed to look for TSP wear, blockage of the broached openings, and tube alignment with the 7th TSP. No abnormal or unexpected conditions were observed.

The eddy current data on a sample of the deeper wear indications were also reviewed for wear extending outside the bounds of the AVB. These reviews showed that the wear indications were contained within the confines of the AVB intersection.

Therefore, it is concluded that the tube-to-tube wear is either due to a phenomenon specific to Unit 3 or the tube-to-tube wear has not yet initiated in Unit 2. If the outcome of the Root Cause Assessment shows that Unit 2 is susceptible to this mechanism, this operational assessment should be reviewed and revised as necessary at that time.

The above discussion assumes that operating conditions for the upcoming cycle of operation are the same as in the previous cycle of operation for Unit 2. As discussed earlier, SCE has plans to restore the primary side hot leg temperature to a temperature of 608F. In light of the Unit 3 findings, SCE is currently reconsidering the T-hot restoration, but a decision has not been made at the time of preparation of this report. An increase in T-hot will change velocities, densities, and pressures within the tube bundle. It should be noted that there are considerable uncertainties associated with these pending changes that have not been evaluated by AREVA. Therefore, if SCE proceeds with T-hot restoration, this operational assessment will be reviewed and revised to address the potential for increased wear rates. Information from the Unit 3 Root Cause Assessment will be addressed in the final operational assessment regarding the possible development of tube-to-tube wear in Unit 2.

9.0 CONCLUSIONS

The results of the steam generator inspections performed during the SONGS 2C17 refueling outage and evaluated in the condition monitoring assessment, confirmed that the three technical specification performance criteria were satisfied during the operating cycle prior to 2C17. Tube plugging and stabilization activities implemented during 2C17 remediated degraded conditions and placed the SGs in a condition acceptable for operation. This preliminary operational assessment concludes that the steam generator structural and leakage integrity performance criteria will be satisfied until the final operational assessment is completed.

As stated in Section 7.4, this operational assessment is preliminary. The final operational assessment will be completed within 90 days of Mode 4 and will consider information on the effect of a possible T-hot restoration on growth rates of AVB and TSP wear and the possible development of tube to tube wear.

10.0 REFERENCES

1. NEI 97-06, "SG Program Guidelines," Rev. 3, January 2011.
2. EPRI Report 1019038, "SG Integrity Assessment Guidelines: Revision 3", November 2009.
3. EPRI Report 1013706, "PWR SG Examination Guidelines: Revision 7", October 2007.
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5. EPRI Report 1019037 "Steam Generator Degradation Specific Management Flaw Handbook, Revision 1", December 2009.
6. EPRI, SG Management Project, "sgmp.epriq.com."
7. AREVA Document 51-9176667-000, "SONGS 2C17 & 3C17 Steam Generator Degradation Assessment." February 2012
8. AREVA Document 51-9104383-002, "SONGS Units 2 & 3 Replacement Steam Generator Eddy Current Technique Validation," December 2011
9. AREVA Document 03-9170186-001, "Secondary Side Visual Inspection Plan and Procedure for SONGS 2C17," November 2011 (SONGS Procedure Number SO23-XXVII-25.36)
10. AREVA NP Document 32-5033045-002, "Mathcad Implementation of SG Flaw Handbook Equations for Integrity Assessment", September 2008.
11. AREVA Proprietary Document 32-9104082-002, "MATHCAD Implementation of SG Full Probabilistic Operational Assessment", March 2011.
12. *Matheny, Southern California Edison, "Numerical Values for the SG DA, SONGS Unit 2, Southern California Edison," January 18, 2012
13. *Matheny, Southern California Edison, "Numerical Values for the SG OAs, SONGS Units 2 and 3," February 8, 2012
14. *SONGS Unit 2 Replacement Steam Generator Receipt Inspection QA Document Review Package, (statistics evaluated in Excel file "CMTR Final with Stats.xlsx")
15. AREVA 51-9177395-000, "In-Situ Pressure Test Summary for SONGS Unit 2 (Feb 2012)"
16. AREVA 51-9172250-000, "CMOA of TMI-1 SGs at 1R19," November 2011
17. *SONGS Nuclear Notification 201854749, Created February 13, 2012

*Document is not retrievable from the AREVA document control system, but can be retrieved from the SCE document control system. Per AREVA Administrative Procedure 0402-01, Appendix 2, this document is an acceptable reference.

AREVA Project Manager Signature ________________________ Date _______________

Appendix A

Tube Plugging List

SG88 Revision 0

AREVA

San Onofre Nuclear Station Unit 2 - 2C17 - S/G 88R

PLUG LIST (Rev. 0)

S/G	Row	Col	Hot Leg	Cold Leg	Reason for Tube Repair	Tube Qty.	Stab	Rev.
SONGS2_88R	108	34	ROLLED	ROLLED	Preventative - Retainer Bar	1	NO	0
SONGS2_88R	110	34	ROLLSTAB	ROLLED	Preventative - Retainer Bar	2	YES	0
SONGS2_88R	109	35	ROLLSTAB	ROLLED	Preventative - Retainer Bar	3	YES	0
SONGS2_88R	111	35	ROLLED	ROLLED	Preventative - Retainer Bar	4	NO	0
SONGS2_88R	110	36	ROLLED	ROLLED	Preventative - Retainer Bar	5	NO	0
SONGS2_88R	112	36	ROLLED	ROLLED	Preventative - Retainer Bar	6	NO	0
SONGS2_88R	111	37	ROLLED	ROLLED	Preventative - Retainer Bar	7	NO	0
SONGS2_88R	113	37	ROLLED	ROLLED	Preventative - Retainer Bar	8	NO	0
SONGS2_88R	112	38	ROLLED	ROLLED	Preventative - Retainer Bar	9	NO	0
SONGS2_88R	114	38	ROLLED	ROLLED	Preventative - Retainer Bar	10	NO	0
SONGS2_88R	113	39	ROLLED	ROLLED	Preventative - Retainer Bar	11	NO	0
SONGS2_88R	115	39	ROLLED	ROLLED	Preventative - Retainer Bar	12	NO	0
SONGS2_88R	114	40	ROLLED	ROLLED	Preventative - Retainer Bar	13	NO	0
SONGS2_88R	116	40	ROLLED	ROLLED	Preventative - Retainer Bar	14	NO	0
SONGS2_88R	115	41	ROLLED	ROLLED	Preventative - Retainer Bar	15	NO	0
SONGS2_88R	117	41	ROLLED	ROLLED	Preventative - Retainer Bar	16	NO	0
SONGS2_88R	116	42	ROLLED	ROLLED	Preventative - Retainer Bar	17	NO	0
SONGS2_88R	118	42	ROLLED	ROLLED	Preventative - Retainer Bar	18	NO	0
SONGS2_88R	117	43	ROLLED	ROLLED	Preventative - Retainer Bar	19	NO	0
SONGS2_88R	119	43	ROLLED	ROLLED	Preventative - Retainer Bar	20	NO	0
SONGS2_88R	118	44	ROLLED	ROLLED	Preventative - Retainer Bar	21	NO	0
SONGS2_88R	120	44	ROLLED	ROLLED	Preventative - Retainer Bar	22	NO	0
SONGS2_88R	119	45	ROLLED	ROLLED	Preventative - Retainer Bar	23	NO	0
SONGS2_88R	121	46	ROLLSTAB	ROLLED	Preventative - Retainer Bar	24	YES	0
SONGS2_88R	120	46	ROLLSTAB	ROLLED	Preventative - Retainer Bar	25	YES	0
SONGS2_88R	122	46	ROLLED	ROLLED	Preventative - Retainer Bar	26	NO	0
SONGS2_88R	121	47	ROLLED	ROLLED	Preventative - Retainer Bar	27	NO	0
SONGS2_88R	123	47	ROLLED	ROLLED	Preventative - Retainer Bar	28	NO	0
SONGS2_88R	122	48	ROLLED	ROLLED	Preventative - Retainer Bar	29	NO	0
SONGS2_88R	124	48	ROLLSTAB	ROLLED	SVI @ 80S+0.60	30	YES	0

SONGS2_88R	123	49	ROLLED	ROLLED	Preventative - Retainer Bar	31	NO	0
SONGS2_88R	125	49	ROLLSTAB	ROLLED	SVI @ 803+0.45	32	YES	0
SONGS2_88R	124	50	ROLLED	ROLLED	Preventative - Retainer Bar	33	NO	0
SONGS2_88R	126	50	ROLLED	ROLLED	Preventative - Retainer Bar	34	NO	0
SONGS2_88R	125	51	ROLLED	ROLLED	Preventative - Retainer Bar	35	NO	0
SONGS2_88R	127	51	ROLLED	ROLLED	Preventative - Retainer Bar	36	NO	0
SONGS2_88R	126	52	ROLLED	ROLLED	Preventative - Retainer Bar	37	NO	0
SONGS2_88R	128	52	ROLLED	ROLLED	Preventative - Retainer Bar	38	NO	0
SONGS2_88R	127	53	ROLLED	ROLLED	Preventative - Retainer Bar	39	NO	0
SONGS2_88R	129	53	ROLLED	ROLLED	Preventative - Retainer Bar	40	NO	0
SONGS2_88R	128	54	ROLLED	ROLLED	Preventative - Retainer Bar	41	NO	0
SONGS2_88R	130	54	ROLLED	ROLLED	Preventative - Retainer Bar	42	NO	0
SONGS2_88R	129	55	ROLLED	ROLLED	Preventative - Retainer Bar	43	NO	0
SONGS2_88R	131	55	ROLLED	ROLLED	Preventative - Retainer Bar	44	NO	0
SONGS2_88R	130	56	ROLLSTAB	ROLLED	Preventative - Retainer Bar	45	YES	0
SONGS2_88R	132	56	ROLLSTAB	ROLLED	Preventative - Retainer Bar	46	YES	0
SONGS2_88R	131	57	ROLLED	ROLLED	Preventative - Retainer Bar	47	NO	0
SONGS2_88R	131	121	ROLLED	ROLLED	Preventative - Retainer Bar	48	NO	0
SONGS2_88R	130	122	ROLLSTAB	ROLLED	Preventative - Retainer Bar	49	YES	0
SONGS2_88R	132	122	ROLLSTAB	ROLLED	Preventative - Retainer Bar	50	YES	0
SONGS2_88R	129	123	ROLLED	ROLLED	Preventative - Retainer Bar	51	NO	0
SONGS2_88R	131	123	ROLLED	ROLLED	Preventative - Retainer Bar	52	NO	0
SONGS2_88R	128	124	ROLLED	ROLLED	Preventative - Retainer Bar	53	NO	0
SONGS2_88R	130	124	ROLLED	ROLLED	Preventative - Retainer Bar	54	NO	0
SONGS2_88R	127	125	ROLLED	ROLLED	Preventative - Retainer Bar	55	NO	0
SONGS2_88R	129	125	ROLLED	ROLLED	Preventative - Retainer Bar	56	NO	0
SONGS2_88R	126	126	ROLLED	ROLLED	Preventative - Retainer Bar	57	NO	0
SONGS2_88R	128	126	ROLLED	ROLLED	Preventative - Retainer Bar	58	NO	0
SONGS2_88R	125	127	ROLLED	ROLLED	Preventative - Retainer Bar	59	NO	0
SONGS2_88R	127	127	ROLLED	ROLLED	Preventative - Retainer Bar	60	NO	0

SONGS2_88R	124	128	ROLLED	ROLLED	Preventative - Retainer Bar	61	NO	0
SONGS2_88R	126	128	ROLLED	ROLLED	Preventative - Retainer Bar	62	NO	0
SONGS2_88R	123	129	ROLLED	ROLLED	Preventative - Retainer Bar	63	NO	0
SONGS2_88R	125	129	ROLLED	ROLLED	Preventative - Retainer Bar	64	NO	0
SONGS2_88R	122	130	ROLLED	ROLLED	Preventative - Retainer Bar	65	NO	0
SONGS2_88R	124	130	ROLLED	ROLLED	Preventative - Retainer Bar	66	NO	0
SONGS2_88R	121	131	ROLLED	ROLLED	Preventative - Retainer Bar	67	NO	0
SONGS2_88R	123	131	ROLLED	ROLLED	Preventative - Retainer Bar	68	NO	0
SONGS2_88R	120	132	ROLLSTAB	ROLLED	Preventative - Retainer Bar	69	YES	0
SONGS2_88R	122	132	ROLLED	ROLLED	Preventative - Retainer Bar	70	NO	0
SONGS2_88R	119	133	ROLLED	ROLLED	Preventative - Retainer Bar	71	NO	0
SONGS2_88R	121	133	ROLLSTAB	ROLLED	Preventative - Retainer Bar	72	YES	0
SONGS2_88R	118	134	ROLLED	ROLLED	Preventative - Retainer Bar	73	NO	0
SONGS2_88R	120	134	ROLLED	ROLLED	Preventative - Retainer Bar	74	NO	0
SONGS2_88R	117	135	ROLLED	ROLLED	Preventative - Retainer Bar	75	NO	0
SONGS2_88R	119	135	ROLLED	ROLLED	Preventative - Retainer Bar	76	NO	0
SONGS2_88R	116	136	ROLLED	ROLLED	Preventative - Retainer Bar	77	NO	0
SONGS2_88R	118	136	ROLLED	ROLLED	Preventative - Retainer Bar	78	NO	0
SONGS2_88R	115	137	ROLLED	ROLLED	Preventative - Retainer Bar	79	NO	0
SONGS2_88R	117	137	ROLLED	ROLLED	Preventative - Retainer Bar	80	NO	0
SONGS2_88R	114	138	ROLLED	ROLLED	Preventative - Retainer Bar	81	NO	0
SONGS2_88R	116	138	ROLLED	ROLLED	Preventative - Retainer Bar	82	NO	0
SONGS2_88R	113	139	ROLLED	ROLLED	Preventative - Retainer Bar	83	NO	0
SONGS2_88R	115	139	ROLLED	ROLLED	Preventative - Retainer Bar	84	NO	0
SONGS2_88R	112	140	ROLLED	ROLLED	Preventative - Retainer Bar	85	NO	0
SONGS2_88R	114	140	ROLLED	ROLLED	Preventative - Retainer Bar	86	NO	0
SONGS2_88R	111	141	ROLLED	ROLLED	Preventative - Retainer Bar	87	NO	0
SONGS2_88R	113	141	ROLLED	ROLLED	Preventative - Retainer Bar	88	NO	0
SONGS2_88R	110	142	ROLLED	ROLLED	Preventative - Retainer Bar	89	NO	0
SONGS2_88R	112	142	ROLLED	ROLLED	Preventative - Retainer Bar	90	NO	0

SONGS2_88R	108	143	ROLLSTAB	ROLLED	Preventative - Retainer Bar	91	YES	0
SONGS2_88R	111	143	ROLLED	ROLLED	Preventative - Retainer Bar	92	NO	0
SONGS2_88R	109	144	ROLLED	ROLLED	Preventative - Retainer Bar	93	NO	0
SONGS2_88R	110	144	ROLLSTAB	ROLLED	Preventative - Retainer Bar	94	YES	0
					Totals:	94	14	

(b)(4)

[redacted]

Appendix B

Tube Plugging List

SG88 Revision 1

San Onofre Nuclear Station Unit 2 - 2C17 - S/G 88R
PLUG LIST (Rev. 1)

S/G	Row	Col	Hot Leg	Cold Leg	Reason for Tube Repair	Tube Qty.	Stab	Rev.
SONGS2_88R	112	88	ROLLSTAB	ROLLED	35% TWD @ 809+0.00	1	YES	1
SONGS2_88R	133	81	ROLLSTAB	ROLLED	55% TWD @ 808+0.00	2	YES	1
SONGS2_88R	120	92	ROLLSTAB	ROLLED	32% TWD @ 807+0.00	3	YES	1
SONGS2_88R	126	84	ROLLSTAB	ROLLED	32% TWD @ 808+0.00	4	YES	1
					Totals	4	4	

(b)(4)

Appendix C

Tube Plugging List

SG89 Revision 0

AREVA

San Onofre Nuclear Station Unit 2 - 2C17 - S/G 89R
PLUG LIST (Rev. 0)

S/G	Row	Col	Hot Leg	Cold Leg	Reason for Tube Repair	Tube Qty.	Stab	Rev.
SONGS2_89R	109	34	ROLLED	ROLLED	Preventative - Retainer Bar	1	NO	0
SONGS2_89R	110	34	ROLLSTAB	ROLLED	Preventative - Retainer Bar	2	YES	0
SONGS2_89R	109	35	ROLLSTAB	ROLLED	Preventative - Retainer Bar	3	YES	0
SONGS2_89R	111	35	ROLLED	ROLLED	Preventative - Retainer Bar	4	NO	0
SONGS2_89R	110	36	ROLLED	ROLLED	Preventative - Retainer Bar	5	NO	0
SONGS2_89R	112	36	ROLLED	ROLLED	Preventative - Retainer Bar	6	NO	0
SONGS2_89R	111	37	ROLLED	ROLLED	Preventative - Retainer Bar	7	NO	0
SONGS2_89R	113	37	ROLLED	ROLLED	Preventative - Retainer Bar	8	NO	0
SONGS2_89R	112	38	ROLLED	ROLLED	Preventative - Retainer Bar	9	NO	0
SONGS2_89R	114	38	ROLLED	ROLLED	Preventative - Retainer Bar	10	NO	0
SONGS2_89R	113	39	ROLLED	ROLLED	Preventative - Retainer Bar	11	NO	0
SONGS2_89R	115	39	ROLLED	ROLLED	Preventative - Retainer Bar	12	NO	0
SONGS2_89R	114	40	ROLLED	ROLLED	Preventative - Retainer Bar	13	NO	0
SONGS2_89R	116	40	ROLLED	ROLLED	Preventative - Retainer Bar	14	NO	0
SONGS2_89R	115	41	ROLLED	ROLLED	Preventative - Retainer Bar	15	NO	0
SONGS2_89R	117	41	ROLLED	ROLLED	Preventative - Retainer Bar	16	NO	0
SONGS2_89R	116	42	ROLLED	ROLLED	Preventative - Retainer Bar	17	NO	0
SONGS2_89R	118	42	ROLLED	ROLLED	Preventative - Retainer Bar	18	NO	0
SONGS2_89R	117	43	ROLLED	ROLLED	Preventative - Retainer Bar	19	NO	0
SONGS2_89R	119	43	ROLLED	ROLLED	Preventative - Retainer Bar	20	NO	0
SONGS2_89R	118	44	ROLLSTAB	ROLLED	SVI @ B11-0.50	21	YES	0
SONGS2_89R	120	44	ROLLED	ROLLED	Preventative - Retainer Bar	22	NO	0
SONGS2_89R	119	45	ROLLED	ROLLED	Preventative - Retainer Bar	23	NO	0
SONGS2_89R	121	45	ROLLSTAB	ROLLED	Preventative - Retainer Bar	24	YES	0
SONGS2_89R	120	46	ROLLSTAB	ROLLED	Preventative - Retainer Bar	25	YES	0
SONGS2_89R	122	46	ROLLED	ROLLED	Preventative - Retainer Bar	26	NO	0
SONGS2_89R	121	47	ROLLED	ROLLED	Preventative - Retainer Bar	27	NO	0
SONGS2_89R	123	47	ROLLED	ROLLED	Preventative - Retainer Bar	28	NO	0
SONGS2_89R	122	48	ROLLED	ROLLED	Preventative - Retainer Bar	29	NO	0

SONGS2_89R	124	48	ROLLED	ROLLED	Preventative - Retainer Bar	30	NO	0
SONGS2_89R	123	49	ROLLED	ROLLED	Preventative - Retainer Bar	31	NO	0
SONGS2_89R	125	49	ROLLED	ROLLED	Preventative - Retainer Bar	32	NO	0
SONGS2_89R	124	50	ROLLED	ROLLED	Preventative - Retainer Bar	33	NO	0
SONGS2_89R	126	50	ROLLED	ROLLED	Preventative - Retainer Bar	34	NO	0
SONGS2_89R	125	51	ROLLED	ROLLED	Preventative - Retainer Bar	35	NO	0
SONGS2_89R	127	51	ROLLED	ROLLED	Preventative - Retainer Bar	36	NO	0
SONGS2_89R	126	52	ROLLED	ROLLED	Preventative - Retainer Bar	37	NO	0
SONGS2_89R	128	52	ROLLED	ROLLED	Preventative - Retainer Bar	38	NO	0
SONGS2_89R	127	53	ROLLED	ROLLED	Preventative - Retainer Bar	39	NO	0
SONGS2_89R	129	53	ROLLED	ROLLED	Preventative - Retainer Bar	40	NO	0
SONGS2_89R	128	54	ROLLED	ROLLED	Preventative - Retainer Bar	41	NO	0
SONGS2_89R	130	54	ROLLED	ROLLED	Preventative - Retainer Bar	42	NO	0
SONGS2_89R	129	55	ROLLED	ROLLED	Preventative - Retainer Bar	43	NO	0
SONGS2_89R	131	55	ROLLED	ROLLED	Preventative - Retainer Bar	44	NO	0
SONGS2_89R	130	56	ROLLSTAB	ROLLED	Preventative - Retainer Bar	45	YES	0
SONGS2_89R	132	56	ROLLSTAB	ROLLED	Preventative - Retainer Bar	46	YES	0
SONGS2_89R	131	57	ROLLED	ROLLED	Preventative - Retainer Bar	47	NO	0
SONGS2_89R	131	121	ROLLED	ROLLED	Preventative - Retainer Bar	48	NO	0
SONGS2_89R	130	122	ROLLSTAB	ROLLED	Preventative - Retainer Bar	49	YES	0
SONGS2_89R	132	122	ROLLSTAB	ROLLED	Preventative - Retainer Bar	50	YES	0
SONGS2_89R	129	123	ROLLED	ROLLED	Preventative - Retainer Bar	51	NO	0
SONGS2_89R	131	123	ROLLED	ROLLED	Preventative - Retainer Bar	52	NO	0
SONGS2_89R	128	124	ROLLED	ROLLED	Preventative - Retainer Bar	53	NO	0
SONGS2_89R	130	124	ROLLED	ROLLED	Preventative - Retainer Bar	54	NO	0
SONGS2_89R	127	125	ROLLED	ROLLED	Preventative - Retainer Bar	55	NO	0
SONGS2_89R	129	125	ROLLED	ROLLED	Preventative - Retainer Bar	56	NO	0
SONGS2_89R	126	126	ROLLED	ROLLED	Preventative - Retainer Bar	57	NO	0
SONGS2_89R	128	126	ROLLED	ROLLED	Preventative - Retainer Bar	58	NO	0

SONGS2_89R	125	127	ROLLED	ROLLED	Preventative - Retainer Bar	59	NO	0
SONGS2_89R	127	127	ROLLSTAB	ROLLED	SVI @ B09+0.63	60	YES	0
SONGS2_89R	124	128	ROLLED	ROLLED	Preventative - Retainer Bar	61	NO	0
SONGS2_89R	126	128	ROLLED	ROLLED	Preventative - Retainer Bar	62	NO	0
SONGS2_89R	123	129	ROLLED	ROLLED	Preventative - Retainer Bar	63	NO	0
SONGS2_89R	125	129	ROLLED	ROLLED	Preventative - Retainer Bar	64	NO	0
SONGS2_89R	122	130	ROLLED	ROLLED	Preventative - Retainer Bar	65	NO	0
SONGS2_89R	124	130	ROLLED	ROLLED	Preventative - Retainer Bar	66	NO	0
SONGS2_89R	121	131	ROLLED	ROLLED	Preventative - Retainer Bar	67	NO	0
SONGS2_89R	123	131	ROLLED	ROLLED	Preventative - Retainer Bar	68	NO	0
SONGS2_89R	120	132	ROLLSTAB	ROLLED	SVI @ B10-0.50 SVI @ B11-0.42	69	YES	0
SONGS2_89R	122	132	ROLLED	ROLLED	Preventative - Retainer Bar	70	NO	0
SONGS2_89R	119	133	ROLLSTAB	ROLLED	SVI @ B02+0.54	71	YES	0
SONGS2_89R	121	133	ROLLSTAB	ROLLED	Preventative - Retainer Bar	72	YES	0
SONGS2_89R	118	134	ROLLED	ROLLED	Preventative - Retainer Bar	73	NO	0
SONGS2_89R	120	134	ROLLED	ROLLED	Preventative - Retainer Bar	74	NO	0
SONGS2_89R	117	135	ROLLED	ROLLED	Preventative - Retainer Bar	75	NO	0
SONGS2_89R	119	135	ROLLED	ROLLED	Preventative - Retainer Bar	76	NO	0
SONGS2_89R	116	136	ROLLED	ROLLED	Preventative - Retainer Bar	77	NO	0
SONGS2_89R	118	136	ROLLED	ROLLED	Preventative - Retainer Bar	78	NO	0
SONGS2_89R	115	137	ROLLED	ROLLED	Preventative - Retainer Bar	79	NO	0
SONGS2_89R	117	137	ROLLED	ROLLED	Preventative - Retainer Bar	80	NO	0
SONGS2_89R	114	138	ROLLED	ROLLED	Preventative - Retainer Bar	81	NO	0
SONGS2_89R	116	138	ROLLED	ROLLED	Preventative - Retainer Bar	82	NO	0
SONGS2_89R	113	139	ROLLED	ROLLED	Preventative - Retainer Bar	83	NO	0
SONGS2_89R	115	139	ROLLED	ROLLED	Preventative - Retainer Bar	84	NO	0
SONGS2_89R	112	140	ROLLED	ROLLED	Preventative - Retainer Bar	85	NO	0
SONGS2_89R	114	140	ROLLED	ROLLED	Preventative - Retainer Bar	86	NO	0

SONGS2_89R	111	141	ROLLED	ROLLED	Preventative - Retainer Bar	87	NO	0
SONGS2_89R	118	141	ROLLED	ROLLED	Preventative - Retainer Bar	88	NO	0
SONGS2_89R	110	142	ROLLED	ROLLED	Preventative - Retainer Bar	89	NO	0
SONGS2_89R	112	142	ROLLED	ROLLED	Preventative - Retainer Bar	90	NO	0
SONGS2_89R	109	143	ROLLSTAB	ROLLED	Preventative - Retainer Bar	91	YES	0
SONGS2_89R	111	143	ROLLED	ROLLED	Preventative - Retainer Bar	92	NO	0
SONGS2_89R	108	144	ROLLED	ROLLED	Preventative - Retainer Bar	93	NO	0
SONGS2_89R	110	144	ROLLSTAB	ROLLED	Preventative - Retainer Bar	94	YES	0
					Totals:	94	15	

(b)(4)

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NECP Number 800074957 (Order 800175654)
Rev. 0 ASC No. D0044582

Reference: SO123-XXIV-10.1

Title:

SGRP- TEMPORARY FACILITIES OUTSIDE THE PROTECTED AREA (070800358-52)

NECP Type	TEMPORARY NECP REMOVAL DATE
ISSUE FOR CONSTRUCTION	N/A

Quality Class	Unit
IV	123

Tier Level
TIER II

NECP Owner:
(b)(6) Ex 6

Verification of PQS must be completed and verified before entering name in the "Prepared By", "Verified By" and "Approved By (FLS) blocks. A signature or electronic approval in the SCASE transaction will indicate PQS verification.

PQS T4EN90 is required for the NECP Preparation, Approval, and Closure of Tier I and II.
PQS T4EN91 is required for the NECP Preparation, Approval, and Closure of Tier III and IV.

Prepared by: (Print name and sign)	Date	
(b)(6)	JAN-18, 2011	Ex 6

Verified by (IRE/Checker)	Date	
(b)(6)	01-18-2011	Ex 6

Approved by: (FLS	Date	
(b)(6)	1/18/2011	Ex 6

Approved By: (Manager, DE)	Date

Approved by: (Other)	Date

Important to Safety or RO?:
☐ Yes ☒ No

License Amendment Request required: If YES, list PCN No.
☐ Yes ☒ No

Are there any "YES" responses on Form 26-182 or 26-571?:
☒ Yes ☐ No

D/9
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Implements NCR (N-CAP) disposition item?: ☐ Yes ☒ No

If YES, indicate NCR#/Rev/Disp Item#

List the 10CFR 50.59/72.48 SCN and or SE Operations:

Operation 800074957-0020 (SCN 070800358-54)

The previous 10CFR 50.59 Screen is still applicable to ASC D0044582 and concluded that the proposed activities are not adverse.

(Not applicable for U2/3 Tier 1 NECPs or Temp NECP in support of Maintenance Activities installed no more than 90 days at power)

DESCRIPTION OF CHANGE

A. Reason for Change:

Industry experience has shown that the tubing in steam generators similar to those installed at SONGS Units 2 and 3 are experiencing unexpectedly high rates of tube wall degradation, as revealed by periodic eddy current testing during refueling outages. The tube wall degradation has required affected tubes to be plugged, progressively reducing the heat transfer capacity of the existing steam generators. Industry experience indicates that this reduction increases to the point where the original steam generators (OSGs) need to be replaced in order for the plant to continue operating within the limits of its Technical Specifications. At SONGS, degradation of the tubes reached the point necessitating replacement of the original Unit 2 and Unit 3 steam generators during the Cycle 16 Refueling Outages. This work will be implemented under the auspices of the Steam Generator Replacement Project (SGRP).

This ECP is a part of the Steam Generator Replacement Project and requires temporary facilities be erected for staging of the original steam generators and for a decontamination area to support replacement of the steam generators.

ASC D0044582 is created to add DSAR and UFSAR changes and provides minor editorial changes (see BOLD sections on Pages 2, 3, 8, 9, 10 and 11). This ASC reflects changes in ASC D0033902 for completeness.

ASC D0033902 provided design features of the temporary facilities outside the PA and authorized field work of severing, removing, segmenting and packaging of OSGs for off-site shipment and disposal of the Original Steam Generator Steam Domes (OSGSD)/transition cones and steam dome internal components. A shielding/shipping package (tube bundle cover, TBC), will be installed onto the OSG Lower Assembly (OSGLA). Other activities include the cutting up the steam dome and steam dome internals and transporting them to the SONGS Mesa area. Cover Page Sections A, B, C, D, F, H, J, and K are updated. Design Criteria, ALARA, Fire Protection and SPI checklists are all reviewed for this ASC. For the Summary of Impacts to various groups, please see SPI Assessment Part B. Previous attachments of this NECP are not included in this ASC. Related references for the OSG Segmentation are provided in Attachment B.

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B. Functional Objective of the Change:

Temporary facilities include the Original Steam Generator Segmentation Facility (OSGSF) and the Replacement Steam Generator Storage Facility (RSGSF). They will be constructed within the SONGS Owner Controlled Area (OCA) west of Interstate Highway I-5 for onsite staging of steam generators and for a decontamination facility. The locations for these facilities are as shown on Bechtel Drawing 25221-000-C0-1000-00003 (SO23-617-3-D151).

The OSGSF and RSGSF, as shown on Bechtel Drawings 25221-000-C0-1000-00001 (SO23-617-3-D149) and 25221-000-C0-1000-00002 (SO23-617-3-D150), are required to be erected and functional to support the Unit 2 and Unit 3 SGR outages (Cycle 16). These temporary facilities will remain in place until the completion of segmentation and packaging of the Unit 3 Original Steam Generators (OSGs) for offsite transport and disposal after which time this facility will be disassembled and removed.

The OSGSF will provide a weather protected area for onsite storage of the OSGs that will accommodate cutting up the OSG steam domes once they are severed from the OSGs and may also support cutup of the OSG lower assembly.

Both of these facilities are metal frame/fabric covered structures. Each structure will provide for a completely enclosed space, have a watertight covering, and protect from the marine air environment. Each facility will have foundations and floors suitable for the intended occupancy. Doors, as appropriate, will be included for ingress and egress of large components. The facilities will contain sufficient power lighting, ventilation, furniture, and other services required to support the work activities planned.

This ECP will install the facilities and will remain open until the end of the Unit 3 SGRO at which time the facilities will be removed.

Other trailers and sea vans will be positioned in available space throughout the Industrial Area and will be used to contain materials and equipment required to support the SGR Outage. Trailers and sea vans will be installed in accordance with the general requirements shown on Bechtel Drawing 25221-000-C0-1000-00001.

All aspects associated with the supply of the temporary power are addressed in NECP 800149981.

For Rigging and Handling of the SGs reference NECP 800072640 (ECP 061200409-10 (Unit 2)) and NECP 800072641 (ECP 061200409-12 (Unit 3)).

The facility for the RSGs will be erected per PP-16, Temporary Site Facilities Plan. Cribbing for the RSGs and OSGs will be addressed in PP-16, and PP-74, OSG Segmentation Plan respectively.

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Effluent Engineering, HP, and ALARA issues for all work activities performed in the OSGSF and Decon facility will be addressed in the plans for those work activities. This ASC updated Unit 2 and Unit 3 OSG Supports and Shielding Arrangement and also include design features of the facility that accommodate the following activities. The design and operations of these activities are outside the scope of the NECP and ASC.

1. Wet Cut Preparation and Internal Cuts.
2. External Cut Preparation and Mechanical Cutting.
3. Separation of the OSGSD and OSGLA.
4. Tube Bundle Cover Installation.
5. Pre-weld Heat Treatment and Welding.
6. Cut-up Steam Dome and Storage of Cut-up Pieces.

Other activities such as assembling the OSGLA in container and transportation to Utah are not considered in this ASC.

The OSG Segmentation Facility Preparations and the Design of the OSG Support Saddles are described in Sections 1.1.2.1 and 1.1.2.2 respectively in the OSG Segmentation Plan dated 5/10/2010. Other activities related to the facility design are considered below with reference to OSG Segmentation Plan dated 5/10/2010 and HPP-11 Revision 0, dated 7/13/2010.

Spill Berm

Spill berm has been installed over the entire OSGSF area to contain the water in case there is a leak during wet cutting activity. With reference to Section 1.1.2.2 of the OSG Segmentation Plan, 'Coverguard' (Blue Diamond) matting manufactured by Bainbridge International, Ltd. was laid over the entire horizontal at-grade asphalt surface (100' x 110' approximate) after installation of the OSG support pedestals and prior to installation of a spill berm. The 'Coverguard' matting will protect the berm from being punctured by a rock or something. A spill berm manufactured by Interstate Products, Inc. was installed over the 'Coverguard' material and covers nearly the entire asphalt floor area of the OSGSF (100' x 110' approximate). This type of berm has been specially designed to fit within the OSGSF and to cover the OSG concrete support pedestals. It is fabricated from XR-5 fabric material which is strong enough to allow vehicular traffic to enter and exit while maintaining its function to contain any 'spill' material. The capacity of the Spill Berm is approximately 70,000 gallons.

Attachment 2 of the OSG Segmentation Plan contains the drawings for the SONGS OSGSF spill berm. Steel plate material is then installed over the spill berm material in those areas where heavy construction equipment traffic is expected and under those areas where external OSG severance cut(s) will be made. These plates will also provide a smooth surface on which shadow shield frames and A-frame rigging fixture(s) can set or roll on. Protective barrier measures to prevent the inflow of rainwater, etc. were installed around the periphery of the OSGSF. These devices are integrated with

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the fabric and structure of the facility. In addition to the 70,000 gallon capacity of the berm, there will be a pump and hoses staged for later draining of the OSG's. This set of pumps and hoses will be connected to the temporary water storage tanks that will hold the water from the OSG's. The hoses will be able to drain the water from the berm should a leak developed. The water would be moved into the tanks for temporary storage. Each OSG holds about 73,000 gallons.

Water Treatment

A pump and filter will be installed by a diver into the bottom of the flooded Steam Dome. The pump will have a large filter that filters to less than 5 microns. Attached to the filter will be a dosimeter to monitor for contamination. A Health Physic technician will be monitoring both the diver communication and the filter dose readings while the diver is in the water. There is no expectation of any contamination occurring. The filter/hose/pump set up will be contained within the Steam Dome. It will be running almost continuously, at the divers' discretion. The divers' objective is to keep water clarity high, Edison's objective is to monitor and filter out metals or contamination that would prevent the free release of the water through the sump after the generators are drained. The circulation will allow us to have representative samples taken, from the effluent release testing perspective. The expectation is that the water will not be contaminated from either the radiological or the NPDES standards.

Once the divers complete the internal severance cut, they will then take a hose for draining the OSG and anchor it to the bottom of the steam dome. This will allow Edison to drain the OSG with a pump and siphon arrangement. The tanks will continue to be circulated with the diver's filter system. After the water has been circulated, a representative sample will be drawn by SONGS Chemistry and analyzed for both NPDES and radioactive material levels. It is expected that the water will be below the Site requirements for release

If the water is not acceptable for release, the water will be stored temporarily in the Baker tanks. The water will be filtered to remove the out of specification material, re-circulated and tested until it meets the Site's release requirements. The Baker tank will have its own containment berm.

HEPA Ventilation and Vacuum Set-up

There will be two 2500 CFM HEPA ventilation units available for the work at the OSGSF. These units each require a 480 v, 10 amp electric power supply.
Three electric 15 gallon HEPA vacuum cleaners will be used to support work inside of the posted Radioactive Materials Area. Drop-out lids on 55-gallon drums will be needed for evolutions that create heavy slag and other debris. Use of the drop-out drums will allow increase capacity and a quick turn around of the equipment once the container is full.

Secondary Side Water Management and Effluent Monitoring
It is anticipated that the water used in the OSG will be free of radioactive material when

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it comes time to empty the OSG and dispose of the water. This assumption is based upon the known operational history of the OSGs (e.g. no catastrophic tube failures) and results from abrasive smear contamination surveys of the OSG internals. Water to fill the OSGs will come from the Unit 2/3 water supply with the fill being coordinated with Units 2/3 Operations and SONGS Fire Department. Each OSG will be filled with approximately 75,000 gallons of water to allow for underwater work operations.

The filled OSG will be classified as an Outdoor Unprotected Storage Tank under License Control Specification (LCS 3.7.110). A radiological survey will be performed every 7 days to ensure that the OSG radiation is not greater than the limits (10 Curies) in the LCS. This is required since the berm capacity of approximately 70,000 gallons is less than 1.5 times the capacity of the OSG secondary volume(s) to be filled.

A water re-circulation and filtration system will be used for the water inside the OSG secondary to maintain clarity during the diving operations.

An alarming dose rate instrument (e.g. AMP-50) shall be placed on the water filter housing with a dose rate set point low enough to allow for minor fluctuations in background but provide an immediate indication of a breached tube. Water sampling is required prior to release of the used water to the Unit 1 Industrial Area Yard Drain Sump. These samples can be obtained from the OSG shell opening access area or the Baker, or similar, storage tank(s) using the dip method or obtained from the filter skid location. The water from the OSGs will be pumped into Baker Tank(s), or similar, for holding prior to releasing to the Unit 1 yard sump.

• Effluent Engineering must perform an evaluation prior to releasing water from the OSG/storage tanks to the Unit 1 Yard Sump if no radioactivity found. If radioactivity found in the water, they have to be transported and dumped in the Units 2 and 3 High Conductivity Sumps.

• Release levels will be handled per SONGS Procedure SO123-XV-29 "Disposition of Plant Generated Liquid Waste"

NOTE: There will be pumps located in the bermed area of the tent that can pump water to the Baker Tanks in the event of a large scale leak from the OSG.

Air Sampling and Effluent Monitoring
Multiple types of air sampling equipment will be used to monitor personnel, work areas and to verify compliance with plant procedures regarding airborne exposures and effluent monitoring. Several air samplers will be used to pull samples during specific work evolutions (e.g. cutting of the OSG shell). Both low volume and high volume air samplers can be used for HP job coverage.
Low volume air samplers will be used for effluent monitoring. These samples will be clearly marked as effluent samples. Based upon lessons learned from the R2C16 outage, there should be example air sample tags filled out and the HP Technicians pulling these samples need to be briefed on the correct information to put on the tags. Air monitors, such as the AMS-4, will also be used to provide continuous monitoring

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with set alarm points 0.3 DAC Slow and 1.0 DAC Fast. Below is a basic list of the air sampling units, with quantities, that will be required to support the OSG work:

1. low volume samplers (4)
2. high volume air samplers (2)
3. AMS-4 (2)

C. Safety Analysis:

The OSGSF and Decontamination Facilities are metal frame / fabric covered structures that are designed and anchored for 100 MPH wind loads. These structures are not designed for seismic or tornado loads.. However, their framing and fabric covering are light weight components that would not produce missiles during a tornado that have more severe effects than the tornado-generated missiles listed in UFSAR Table 3.5-6, so their failure would not affect the integrity of adjacent Quality Class I or II structures. The fabric covering is fire retardant which satisfies the combustible restrictions of Procedure SO1-XXVIII-6.1.2 for the Industrial Area and the adjacent ISFSI.

The trailers and sea vans are not designed for tornado loads. However, they would not produce missiles during a tornado that have more severe effects then the tornado-generated missiles listed in UFSAR Table 3.5-6, so their failure would not affect the integrity of adjacent Quality Class I or II structures. The trailers and sea vans are located, installed and contents controlled per plant Procedure SO1-XXVIII-6.1.2 as applicable. This ensures that appropriate clearances, safety, debris exclusion and fire protection measures are maintained.

These facilities and trailers will be located in the Unit 1 Industrial Area. As this site is approximately 10 feet lower than plant grade surrounding Unit 2 and 3, the installation of these facilities will not affect plant flooding from the effects of local intense precipitation. The facilities are also located so that they will not interfere with normal site drainage in the area.
Effluent Engineering, HP, and ALARA issues for all work activities performed in the OSGSF and Decon facility will be addressed in the plans for those work activities.

Therefore, these temporary facilities will have no impact on plant safety.

The OSG Segmentation activities will post industrial safety concerns. SO123-IT-1, Infrequently Performed Test or Evolutions Procedure and a Management Oversight Review will be conducted. The activities will also affect HP, ALARA, and effluent control. HPP-11 is prepared to address HP and ALARA issues. Chemistry effluent control and OCDM, Fire protection, and NEIL insurance are also considered. All these are considered for the design of the Facility but the activities are out of the scope of this ASC.

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D. Design Criteria/Inputs Discussion:

SCE document SO23-617-3-M3 (Bechtel Document 25221-000-3DR-C01G-00001) "Civil/Structural Design Criteria for San Onofre Nuclear Generating Station Units 2 and 3 Steam Generator Replacement Project", provides criteria for the design, modification and/or evaluation of new permanent, and temporary structures/facilities associated with the Steam Generator Replacement Project (SGRP) for San Onofre Nuclear Generating Station (SONGS) Units 2 and 3.

Refer to Bechtel Drawing 25221-000-C0-1000-00001 (**SO23-617-3-D149**) for specific design requirements of these facilities.

Edison Project Design Criteria Manual for SONGS Units 2 & 3 (SDC-013, dated 6/27/84) is applicable to ASC D0033902.

OPERATING EXPERIENCE:
A keyword search was performed in the SONGS OE Database. The words "trailer installation", "trailer", "temporary facility", "tent facility", "tent", "temporary anchor", "anchor installation", and "base plate" were used in a keyword search." All internal and external sources were used in this search and no date field was specified. Therefore, the search encompassed the entire database.

No items were found to be applicable to this scope of work.

OE's are obtained from McGuire, Calvert Cliffs, and SONGS Decommissioning projects. OE's for divers are obtained from Browns Ferry 3, Heysham 2, Dungeness B, Point Beach 2, DC Cook 1, Duane Arnold, and NRC Notice 97-68: Loss of Control of Diver in a SFSP.

E. Site Computer Software Change Request:

NONE

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Reference: SO123-XXIV-10.1

F. Test Objectives/Acceptance Criteria:

The water that fills the OSGs during the underwater cutting activities will be tested for compliance with the Site's NPDES and effluent requirements.

G. Materials:

For Engineering requirements for purchase of facility structure see Bechtel Drawing 25221-000-C0-1000-00001 (Attachment 2).

All other materials will be purchased as commercial grade items per the ASTM's or specific product call outs on the design drawings.

H. Special Construction Requirements:

All work will be performed in accordance with the procedures listed below or SCE approved equivalents.

For the following non-permanent plant drawings, see the associated ECP attachment:

Bechtel Drawing Number	**SCE Drawing Number**
Bechtel Drawing 25221-000-C0-1000-00001	**SO23-617-3-D149**
Bechtel Drawing 25221-000-C0-1000-00002	**SO23-617-3-D150**
Bechtel Drawing 25221-000-C0-1000-00003	**SO23-617-3-D151**

See Attachment 1 for other relevant documents.

The Bechtel Corporate Environmental Safety and Health (ES&H) program and existing SONGS safety program will be adapted to ensure compliance with applicable laws, regulations, and the SONGS safety program.

All load-handling activities shall be performed by trained personnel and in accordance with the technical requirements of SONGS Procedure SO123-I-7.24, "Rigging Manual" and SONGS Procedure SO123-I-1.13, "NUREG 0612 Cranes, Rigging, & Lifting Controls".

For OSGSF work activities along ISFSI Exclusion Zone, coordinate with Security before commencing work.

Install and anchor temporary facilities in accordance with the manufacturer's instructions.

ENGINEERING CHANGE PACKAGE COVERSHEET

NECP Number 800074957 (Order 800175654)
Rev. 0 ASC No. **D0044582**

Reference: SO123-XXIV-10.1

List of Drawings for ASC D0033902:

Items	Company	Drawing	Rev.	Title
New Components	Energy Solutions	C-068-163046-001 Sheets 1 and 2	4	SGLA Closure Details
	Energy Solutions	C-068-163046-100 Sheets 1 and 2	2	SGLA Tube Bundle Cover Details
	Energy Solutions	C-068-163046-110 Sheet 1	1	SGLA Closure Hardware Details
	Energy Solutions	C-068-163046-120 Sheet 1	0	Manway Impact Limiter
Rigging and Handling	Bechtel	CO-1000-00007	0	OSG Cribbing Details for Wet Cut Segmentation Method
Segmentation	Bechtel	CO-1000-00008	0	OSG Steam Dome Removal & Segmentation
OSG	Edison/CE	SO23-915-77	2	OSG Outline
OSG	Edison/CE	SO23-915-132	0	OSG General Arrangement and Assembly -Elevation
OSG	Edison/CE	SO23-915-91	1	Baffle Assembly
OSG	Edison/CE	SO23-915-109	1	Tube Support Details
OSG	Edison/CE	SO23-915-106	1	Tube to Tube Sheet Assembly Section View
OSG	Edison/CE	SO23-915-105	1	Tube to Tube Sheet Assembly
OSG	Edison/CE	SO23-915-199	0	Steam Separator
OSG	Edison/CE	SO23-915-147	1	Miscellaneous Details
OSG	Edison/CE	SO23-915-136	0	Upper Shell Details and Assembly
OSG	Edison/CE	SO23-915-149	0	Separator Support Plate Details and Assembly
OSG	Edison/CE	SO23-915-167	0	Steam Dome Assembly Upper

J. Risk Assessments:

Reference Operation 800074957-0030 (OTH Assignment 070800358-55)

For ASC D0033902, see Risk Assessment Matrix in Attachment A. **This Risk Matrix is still applicable to ASC D0044582.**

ENGINEERING CHANGE PACKAGE COVERSHEET

NECP Number 800074957 (Order 800175654)
Rev. 0 ASC No. **D0044582**

Reference: SO123-XXIV-10.1

K. Other:

(b)(6)

TESTING (FOR ISCO or Temp NECPs ONLY). Check the Applicable Block(s):

Testing required for Installation or Removal:
☒ Yes ☐ No

Standard Construction Test Required – (for generic component level functional testing such as loop, testing, instrument calibration, hydro testing, continuity checks, system flush, etc.)
☒ Yes ☐ No

Test Guidelines Required (Test Guidelines Attached)
☐ Yes ☒ No

License Amendment Request/Mode Restraint/Other limitations:

No License Amendments are required.

Minor changes to the Unit 2 & Unit 3 UFSAR or the Unit 1 DSAR are made. No changes to Technical Specifications are required.

All work will be outside of the Protected Area and may commence when Unit 2 and 3 are in any Mode of plant operation.

DESIGN CRITERIA REQUIREMENTS CHECKLIST

ECP No. 800074957 REV No. 0 Page 12 of 46
ASC No. D0044582

THE RESPONSE TO EACH ENTRY ON THIS FORM SHALL BE BASED UPON A REVIEW OF ALL QUESTIONS PRESENTED IN THE CHECKLIST GUIDELINES (FORM 26-182-1).

Applicability

1. High Energy Line Break Analysis

Yes [3] No X Remarks:[4]

2. Containment Materials

Yes ______ No X Remarks:

3. ALARA

Yes X No ______ Remarks: See Attached Form HP(123) 26-247

4. Environmental Qualification (EQ)

Yes ______ No X Remarks:

5. Tornado Missiles

Yes ______ No X Remarks:

6. Internal Missiles

Yes ______ No X Remarks:

7. Other missiles

Yes ______ No X Remarks:

8. Flooding

Yes ______ No X Remarks:

9. Appendix R/Fire Protection

Yes X No ______ Remarks: See Form 26-292 and Form 26-404B

10. Environmental Effects

Yes ______ No X Remarks:

11. Seismic

Yes ______ No X Remarks: Temp facilities are not required to be designed for seismic interaction since their failure during a seismic event will not affect any Seismic Class I SSCs.

12. Separation Criteria

Yes ______ No X Remarks:

13. Single Failure/FMEA

Yes ______ No X Remarks:

DESIGN CRITERIA REQUIREMENTS CHECKLIST

ECP No. 800074957 REV No. 0
ASC No. D0044582

14. Security system Impact

Yes ______ No __X__ Remarks: ______________

15. Emergency Plan Impact

Yes ______ No __X__ Remarks: ______________

16. Electrical system

Yes ______ No __X__ Remarks: ______________

17. Station Blackout

Yes ______ No __X__ Remarks: ______________

18. ISI Program Plan

Yes ______ No __X__ Remarks: ______________

19. Digital

Yes ______ No __X__ Remarks: ______________

20. Software

Yes ______ No __X__ Remarks: ______________

21. Primary System Temperature

Yes ______ No __X__ Remarks: ______________

22. Non-safety Interaction

Yes ______ No __X__ Remarks: ______________

23. Industrial Safety

Yes ______ No __X__ Remarks: ______________

24. Dry Cask Storage/ISFSI

Yes ______ No __X__ Remarks: ______________

25. Control Room Habitability

Yes ______ No __X__ Remarks: ______________

26. Flow Induced Vibration

Yes ______ No __X__ Remarks: ______________

DESIGN CRITERIA REQUIREMENTS CHECKLIST

ECP No. 800074957 REV No. 0 Page 14 of 46
ASC No. D0044582

27. Lubrication Materials

Yes ______ No X Remarks: ______

Prepared By: (b)(6) Date: 8/23/10

ALARA DESIGN REVIEW CHECKLIST

ECP Number [1] 800074957
Rev. No [2] 0 ASC No. D0044582

Reference: SO123-VII-20.4.1

UNIT: [4] 1,2, 3 SYSTEM: [5] ___________

FACILITY/EQUIPMENT AFFECTED: [6] OSG Segmentation Project

I. ALARA CONSIDERATIONS [7]
A. ENGINEERING DESIGN FEATURES

1. Reliability: long life, low maintenance
   YES ___ NO ___ N/A X

2. Provisions for flushing/filling/draining
   YES X NO ___ N/A ___

3. Prevention of crud traps
   YES ___ NO ___ N/A X

4. Smooth, non-porous surfaces
   YES ___ NO ___ N/A X

5. Crud Control: Low Cobalt-bearing Material
   YES ___ NO ___ N/A X

B. AREA ARRANGEMENT
1. Minimum exposure to traffic
   YES X NO ___ N/A ___

2. Separation from other equipment/drains/aisle ways
   YES X NO ___ N/A ___

3. Provisions for component laydown/storage
   YES X NO ___ N/A ___

C. PROVISIONS FOR OPERATING
1. Platforms and access for operator tours
   YES ___ NO ___ N/A X

2. Access for inservice inspection
   YES ___ NO ___ N/A X

3. Remote readout instrumentation
   YES ___ NO ___ N/A X

4. Remote valve/equipment operators
   YES ___ NO ___ N/A X

ALARA DESIGN REVIEW CHECKLIST

ECP Number [1] 800074957

Rev. No [2] 0 ASC No. D0044582

Reference: SO123-VII-20.4.1

5. Adequate sampling lines, hood/sink
YES ___ NO ___ N/A _X_

D. PROVISIONS FOR MAINTENANCE

1. Adequate lighting, electrical outlets, other utilities are provided
YES _X_ NO ___ N/A ___

2. Insulation or shrouding can be easily removed and replaced
YES ___ NO ___ N/A _X_

3. Components are removable for maintenance
YES ___ NO ___ N/A _X_

4. Space and access (platforms, etc.) for maintenance
YES ___ NO ___ N/A _X_

5. Rigging equipment is necessary and available
YES _X_ NO ___ N/A ___

E. PROVISIONS FOR RADIATION PROTECTION

1. Proper access control to prevent entry to high radiation areas (gates, barriers, etc.)
YES _X_ NO ___ N/A ___

2. Adequacy of shielding (fixed shielding or open space)
YES _X_ NO ___ N/A ___

3. Temporary shielding
YES _X_ NO ___ N/A ___

4. Adequate ventilation
YES _X_ NO ___ N/A ___

5. Supplied breathing air
YES _X_ NO ___ N/A ___

6. Controlling the spread of contamination
YES _X_ NO ___ N/A ___

7. Decontamination of components, materials, tools, etc.
YES _X_ NO ___ N/A ___

8. Radiation monitors
YES _X_ NO ___ N/A ___

ALARA DESIGN REVIEW CHECKLIST

ECP Number [1] 800074957 Page 17 of 46
Rev. No [2] 0 ASC No. D0044582

Reference: SO123-VII-20.4.1

9. Adequate communication
YES X NO ___ N/A ___

10. Drainage/Curbing
YES X NO ___ N/A ___

II. CONSTRUCTION CONSIDERATIONS [8]

Identify interfacing systems and components which, because of their interaction with or proximity to the subject design change, could jeopardize the safety of workmen or increase their exposure to radiation.

Description/Identity of interfacing systems and/or components (i.e., line/component ID No.) ________

III. MAXIMUM EXPECTED DOSE RATES [9] 1.2 REM PER HOUR

mRem/hr (as determined from UFSAR radiation zone drawings)

IV. SPECIAL MAINTENANCE AND INSPECTION REQUIREMENTS [10] ________

V. PREVIOUS EXPERIENCE WITH EQUIPMENT [11] PLATFORM TRAILERS, DIVERS, CUTTING

REMARKS [12] ________

Prepared by Responsible Engineer [13]

Name (print) (b)(6) Signature: ________ Date 9/13/2010 EX 6

ALARA DESIGN REVIEW CHECKLIST

ECP Number [1] 800074957
Rev. No [2] 0 ASC No. D0044582

Reference: SO123-VII-20.4.1

KEYPOINTS:

NOTE: Use the REMARKS Section or attach sheet(s) if additional space is needed for keypoint Entries. Always identify the item number when using additional space.

[1] Enter the design change document (e.g., DCP, ECP, FCN, etc.) number.
[2] Enter the design change document revision number.
[3] Enter page number according to the pagination scheme required by appropriate procedures.
[4] Enter the affected unit number(s) associated with the design change.
[5] Enter the affected system designator(s) associated with the design change.
[6] Enter the Facility/Equipment identification number and name affected by the design change.
[7] Check each item to indicate ALARA considerations.
- Check "YES" to indicate that the design change does adequately consider the item for ALARA
- Check "N/A" to indicate this item is not applicable to the design change for ALARA considerations.

[8] Identify interfacing systems and/or components (i.e., line numbers or component ID numbers) for construction considerations.
[9] Enter the maximum expected dose rates from UFSAR.
[10] Identify special maintenance and inspection requirements. Include whether work will result in generation or significant volumes of radioactive waste.
[11] Enter previous experience with equipment, including applicable industry operating experiences.
[12] Enter additional remarks.
[13] Identify the responsible engineer who prepared this checklist.

SUMMARY FIRE PROTECTION DESIGN CHECKLIST
(Form 26-292, Section A)

ECP Number 800074957
Rev. No. 0 ASC No. **D0044582**

Unit: 123

1.0 COMMUNICATIONS – For Units 2 and 3 does the change modify, delete or relocate communications equipment or cables (e.g. PAX phones, equipment or cables, UHF radio equipment, antennae or coaxial cable, sound-powered phone jacks or cables)?
☐ Yes ☒ No

2.0 EMERGENCY LIGHTING - For Units 2 and 3 does the change modify, add, remove or relocate emergency lighting? This included self-contained, battery powered emergency lights and diesel-backed lighting for the Units 2&3 control room.
☐ Yes ☒ No

3.0 MODIFICATIONS TO ELECTRICAL DEVICES AND CIRCUITS - For Units 2 and 3 does the change modify, or reroute electrical devise or circuits which are part of a safe shutdown cable scheme? This includes changes such as adding, deleting or modifying electrical devices, fuses, breaker settings or cables on an elementary diagram or vendor drawing. Does the change add any safe shutdown circuits or add 480V cables to SDC raceways? Does the change add or relocate safety related or safe shutdown equipment in a fire area or zone? Does the change modify safe shutdown instrument/indicator ranges, automatic actuation logic, or the actuated state of safe shutdown equipment?
☐ Yes ☒ No

NOTE: Cables which are added to the control room should be limited to those necessary for operation of the control room.

4.0 MODIFICATIONS TO THE MECHANICAL FUNCTION OF COMPONENTS – For Units 2 and 3, does the change add, delete or modify a mechanical component in a safe shutdown system? Does the change alter the process function of an electrical, mechanical safe shutdown component, or the means available to operate it or changes its normal state, loss of power/air state, or state required for safe shutdown? Does the change alter a safe shutdown Motor Operated Valve internal/external parts(s)?
☐ Yes ☒ No

5.0 MISCELLANEOUS SUBJECTS – For Units 2 and 3, does the change alter the Reactor Coolant Pump lube oil inventory or Lube Oil Collection System, modify platforms or ladders, modify or add instrument tubing, add cryogenic or compressed gas vessels, or add equipment which is sensitive to radio frequencies?
☐ Yes ☒ No

SUMMARY FIRE PROTECTION DESIGN CHECKLIST
(Form 26-292, Section A)

ECP Number 800074957
Rev. No. 0 ASC No. **D0044582**

Unit: 123

6.0 FIRE DETECTION AND SUPPRESSION SYSTEMS – For Units 2 & 3 does the change add, remove, relocated, or modify equipment or components associated with the Fire Detection and Suppression Systems (e.g., fire detectors, fire pumps, jockey pumps, fire water tanks and backup/makeup water supply, yard mains, water suppression, gaseous suppression – including remodeling of protected rooms, hydrants, standpipe, hose stations, hose houses, extinguishers, seismic Category 1 tanks/pumper unit)?
☐ Yes ☒ No

7.0 AIR FLOW AND CONTROL – For Units 2 and 3, does the change add, remove, replace, or modify air flow equipment such as HVAC fans, louvers, openings, vents fire dampers, or ductwork? Does the change add heat-producing equipment to the UNITS 2&3 emergency chiller rooms, the auxiliary feedwater pump rooms, 9' elevation communications room or the component cooling water pump rooms?
☐ Yes ☒ No

8.0 PASSIVE FIRE PROTECTION FEATURES – For Units 2 and 3, does the change add, delete, modify, or penetrate passive fire protection features, including fire barriers which prevent the spread of fire (walls, floors, raised floors, ceilings, drop ceilings, doors, dampers, penetrations, curbs, fire area/zone boundaries, non-rated coverings of barrier openings, SONGS2&3 turbine aux. feedwater pump oil shroud or aux. feedwater pump missiles shield, the slope of grade in the yard, raised grading around manholes); barriers which protect equipment from the effects of fire(raceway fire wrap, raceway fire stops, fire resistant coatings, structural steel fire proofing, radiant energy shields, remove sand from sand-filled manholes); or features which protect equipment from the effects of suppression activities (curbs, spray shields, or drains)?
☐ Yes ☒ No

9.0 PHYSICAL INTERFERENCES – For Units 2 and 3, does the change add or relocate any equipment, e.g., HVAC ductwork, piping, conduit, cable trays, supports, long-term scaffolding, walls, or other structural elements?
☐ Yes ☒ No o

10.0 AREA USE & COMBUSTIBLE HAZARDS – For Units 2 and 3, does the change alter the use of a fire area/zone or the type, amount or location of combustible hazard in a fire area/zone (including the yard area)?This includes permanent storage of combustibles and combustible liquids, flammable gas cylinders, cable insulation, etc. Transient (e.g. temporary) combustibles due to construction or maintenance are not applicable to the checklist.

SUMMARY FIRE PROTECTION DESIGN CHECKLIST
(Form 26-292, Section A)

ECP Number 800074957 Page 21 of 46
Rev. No. 0 ASC No. **D0044582**

Unit: 123

Does the change relocate/add charcoal filters; remodel plant areas; add combustibles near the fire pumps (Units 2&3),within 50 feet of safety related tanks, within 20 feet of safety related panels; establish battery rooms, record storage/warehouse areas, workshops, or aux boiler/fuel tanks? Does the change add new safety-related panels or cable trays?

☐ Yes ☒ No

11.0 CHANGES TO SAFE SHUTDOWN – For Units 2 and 3 ability to achieve and maintain safe shutdown in the event of a fire, has change identified impacts to Fire Protection/Appendix R documents or analyses, Operation SSD methods, OR a new Manual Action, Repair Action, or change of existing SSD Action?

☐ Yes ☒ No

12.0 PROPERTY AND LOSS INSURANCE STANDARDS – For Units 1, 2, 3 and OCA does the changes have any potential impact on SONGS compliance with NEIL Property & Loss Insurance Standards? (See Detailed Question 12 for summary of NEIL requirements)

☒ Yes ☐ No

13.0 OCA FIRE PROTECTION CAPABILITY, AND FIRE PROTECTION PROGRAM – For SONGS ISFSI, Unit 1 areas, Owner Controlled Area (OCA), South Yard, and Multi-Purpose Handling Facility (MPHF), does the change have any potential impact on manual fire fighting capability, 800 MHZ UHF system, Fire Protection related equipment? Does the change increase the likelihood of a significant offsite release of radioactive material due to a fire? Does the change add or delete major combustible/fire hazards?

☒ Yes ☐ No

NOTES:

(1) If all responses to this Summary Checklist are "NO", the FP Checklist is complete and the Detailed Checklists are not needed.

(2) For each Summary Checklist answered "YES", the corresponding Detailed Checklist(s) are to be completed and should include a brief explanation.

(3) For affirmative "YES" responses on Detailed Checklists (26-292-1 thru 13), create a single Fire Protection Engineering (FPE) assignment in MOSAIC. The referenced assignment number is adequate and further explanatory text is optional.

Prepared By:	Date:	PAX
(b)(6)	9/13/2010	(b)(6)

EX 6

DETAILED FIRE PROTECTION DESIGN CHECKLIST
(FORM 26-292-13 SECTION B)

ECP Number 800074957
Rev. No. 0 ASC No. D0044582

REFERENCE: SO123-XV-51, 26-404

12.0 PROPERTY AND LOSS INSURANCE STANDARDS – For UNITS 1, 2, 3 and OCA, does the change have any potential impact on NEIL Property & Loss Insurance Standards?

12.1 NEIL Insurance

12.1.1 Does the change have any impact on Nuclear Electric Insurance Limited (NEIL) Property and Loss Insurance Standards applicable to SONGS? Examples are design changes for additional or renovations of plant buildings, trailers, warehouses, fire water supply system, fire pumps, sprinklers, deluge, CO2, Halon, underground piping, hydrants, standpipe systems, detection systems, alarms systems, supervisor systems, fire protection systems for the oil and hydrogen hazards associated with the turbine-generators, fire protection systems designed to protect against fire hazards associated with oil filled equipment, such as large transformers, feed water pumps, reactor coolant pumps, diesel generators, motor generator sets, etc. (Use Design Guideline 12 in 90049, Attachment 1 for additional details on (NEIL requirements)
☒ Yes ☐ No

Enter additional information including FPE assignment (required for any YES answer):

SPI 800074957-0040 has been generated to Mark Tolson to evaluate NEIL impacts.

PREPARED BY:	DATE:	PAX
(b)(6)	9/13/2010	(b)(6)

13.0 OCA FIRE PROTECTION CAPABILITY, AND FIRE PROTECTION PROGRAM – For SONGS ISFSI, Unit 1areas, Owner Controlled Area (OCA), South Yard, and Multi-Purpose Handling Facility (MPHF), does the change have any potential impact on manual fire fighting capability, 800-MHZ UHF system, or Fire Protection-related equipment? Does the Change increase the likelihood of a significant offsite release of radioactive material due to a fire? Does the Change add or delete major combustible/fire hazards?

DETAILED FIRE PROTECTION DESIGN CHECKLIST
(FORM 26-292-13 SECTION B)

ECP Number 800074957
Rev. No. 0 ASC No. D0044582

REFERENCE: SO123-XV-51, 26-404

13.1 Manual Fire Fighting Capability

13.1.1 Does the Change adversely impact Manual Fire fighting capabilities? Examples of such Changes are: alterations of hydrants, hose stations, fire main, fire extinguisher changes, hindering access to site areas for fire fighting and fire vehicles, etc.
☐ Yes ☒ No

13.1.2 Does the Change adversely impact water sources to OCA fire main? Examples of such Changes are Reduction of volume, alteration of piping, associated isolation valves, U2/3 firewater tanks, makeup/backup supply (JRWSS), etc.
☐ Yes ☒ No

13.1.3 Does the Change adversely impact the SONGS 800-MHZ UHF communication system? Examples of such Changes are: Removal/relocation of antennas, alteration of repeaters, cable, amplifiers, etc.
☐ Yes ☒ No

13.2 Introduction of major combustible hazards

13.2.1 Does the Change introduce/remove MAJOR fire/combustible hazards that may require changes to fire fighting capabilities? This includes permanent storage of significant combustibles, combustible liquids, flammable gas cylinders, wooden or unprotected buildings, etc.
☐ Yes ☒ No

13.2.2 Does the Change affect the ISFSI combustible control zone or reduce the ISFSI Area combustible storage restrictions?
☐ Yes ☒ No

13.3 ISFSI and offsite release of radioactive material

13.3.1 Does the Change adversely affect the ability to maintain ISFSI or any OSFSO-related structures in Unit 1 in a safe condition in the event of a fire?

DETAILED FIRE PROTECTION DESIGN CHECKLIST
(FORM 26-292-13 SECTION B)

ECP Number 800074957
Rev. No. 0 ASC No. D0044582

REFERENCE: SO123-XV-51, 26-404

13.3.2 Does the Change increase the likelihood of a significant offsite release of radioactive material due to a fire in Unit1, SYF – MPHF, or OCS?
☐ Yes ☒ No

Enter additional information including FPE assignment (required for any YES answer):

SPI 800074957-0050 has been generated to Jerry Gisi to review for EP and PFP impact and an SPI 800074957-0060 has been generated to Ronnie Morales to add appropriate extinguishers and update the extinguisher surveillance procedure.

PREPARED BY:	DATE:	PAX
(b)(6)	9/13/2010	(b)(6)

NECP Number 800074957

Rev. No. 0

REFERENCES: SO123-XV-51, 26-404B

SITE PROGRAMS IMPACT ASSESSMENT Part A
1.0 OPERATIONS IMPACT:
A. Are there specific requirements for establishing equipment/system operability associated with this change or document?
☐ Yes ☒ No
B. Are there any administrative limits or restrictions associated with the operation of equipment/system related to this change or document?
☐ Yes ☒ No
C. Are there any specific plant modes or conditions required for system operation?
☐ Yes ☒ No
D. Are there any specific plant conditions during which this system should not be operated?
☐ Yes ☒ No
E. Are there any specific operating parameters (such as pressure, temperature, delta-P, flow, etc.) established or changed in conjunction with this change or document?
☐ Yes ☒ No
F. Does the design or the document include consideration for abnormal operating modes (such as backflush, heat treat, bypass operation, etc.)?
☐ Yes ☒ No
G. Does the design or document address manual, remote and automatic operating modes of the system or equipment affected?
☐ Yes ☒ No
H. Does the design or document identify power sources for new components and include reference to designed loss of power response?
☐ Yes ☒ No
I. I. Does the design or document address how system or component failure will be indicated to plant operators (alarms, annunciators, process parameter changes, etc.)?
☐ Yes ☒ No
J. Are there changes to interfacing or auxiliary systems requirements to establish and maintain operability (power sources, cooling water, HVAC, lubrication, etc.)?
☐ Yes ☒ No
K. Does this change or document as-built all or part of an existing Temporary Engineering Change Package (Temp NECP)?
☐ Yes ☒ No

NECP Number 800074957

Rev. No. 0

REFERENCES: SO123-XV-51, 26-404B

1. OPERATIONS IMPACT (Continued)

L. Are Operations methods affected:

1.L.1 System alignment/operations
1.L.2 Alarm or abnormal indication response
1.L.3 Technical Specification surveillance
1.L.4 New or deleted material codes (e.g., chart paper, ink, bulbs)
1.L.5 Keys for new locked valves or panels
1.L.6 Reactivity balance calculation (Shut Down Margin, Estimated Control Position, Estimated Control Boron)

☐ Yes ☒ No

M. Does the design or document change require additional operation training? (If unclear, contact Operations and NTD to determine if training is required.)

☐ Yes ☒ No

N. Is operator training required before the new equipment is declared operable? Contact NTD/Operations Training to determine training requirements.

☐ Yes ☒ No

O. Are there any special tools, M&TE, or other equipment required to support Operations Test Group (OTG) testing of equipment associated with this change or document?

☐ Yes ☒ No

P. Does the design or document change lead to an OPS procedure change? If yes, create N-SPI to NTD OPS.

☐ Yes ☒ No

Q. Does the change add, modify, or replace Control Room hardware? If yes, create N-SPI to NTD OPS.

☐ Yes ☒ No

2.0 OPERATIONS / MAINTENANCE IMPACT

A. Are there changes to plant mode or system alignment requirements associated with surveillance testing (such as systems or components required to be bypassed, interlocks defeated, or standby equipment required to be placed in service)?

☐ Yes ☒ No

B. Has system logic been modified in a manner which would affect operation or surveillance performance?

☐ Yes ☒ No

NECP Number 800074957

Rev. No. 0

REFERENCES: SO123-XV-51, 26-404B

2. OPERATIONS MAINTENANCE IMPACT (Continued)

C. Have any set points (including breaker and relay) been added or modified?
☐ Yes ☒ No

D. Are technical specification set points or automatic trip functions added, deleted, or modified by this change or document?
☐ Yes ☒ No

E. Have battery or diesel generator (DG) load calculations been affected?
☐ Yes ☒ No

F. Have any surveillance requirements or criteria been added, deleted, or changed as a result of this change or document?
☐ Yes ☒ No

G. Are there any assumptions, design inputs, or references which may affect plant operation, maintenance, or overall performance?
☐ Yes ☒ No

H. Is there specialized training needed for the operation or maintenance (e.g. calibration, etc.) of any equipment added?
☐ Yes ☒ No

I. Are there changes that could affect the Control Room Envelope boundary inleakage?
☐ Yes ☒ No

NOTE: If there is a YES response to any of the above, contact the Operations and/or Maintenance Divisions and Operations and/or Maintenance NTD representative to determine the impact. If so, create a separate N-SPI Operation to the Operations and/or Maintenance Division and NTD, as appropriate, for further assessment.

3.0 MAINTENANCE IMPACT

A. Is equipment added, deleted or modified (including different model, configuration, setpoint, parameters, etc.)?
☐ Yes ☒ No

B. Is any plant installed software added, deleted or modified?
☐ Yes ☒ No

C. Are any Maintenance procedures impacted or new procedure(s) required?
☐ Yes ☒ No

NECP Number 800074957

Rev. No. 0

REFERENCES: SO123-XV-51, 26-404B

3. MAINTENANCE IMPACT (Continued)

D. Are any Maintenance RMOs impacted or new RMO(s) required?
☐ Yes ☒ No

E. Are there any new or modified vendor manuals, instruction or installation details associated with this change document?
☐ Yes ☒ No

F. Is an environmental qualification data package required or modified by the change or document?
☐ Yes ☒ No

G. Are electrical schemes added or deleted by this change or document?
☐ Yes ☒ No

H. Is maintenance training impacted or new training required? Contact the Maintenance Training SPOC to determine training requirements.
☐ Yes ☒ No

I. Is any plant labeling added, deleted, or modified?
☐ Yes ☒ No

J. Are there any special tools, M&TE, cleaners, lubrication, or lifting devices required to support installation or maintenance of equipment, as a result of this change?
☐ Yes ☒ No

4.0 MAINTENANCE ENGINEERING/COMPUTER ENGINEERING IMPACT

A. Does the change or document affect existing site computer software or hardware (i.e., algorithmic changes, add inputs, delete inputs, modify existing loops, or setpoint changes) for systems such as the Plant Monitoring System, Critical Functions Monitoring System, Safety Parameter Display System, Core Protection Calculators, Core Operation Limit Supervisory System, Fire and Security Monitoring Systems, Chemistry and Health Physic Systems, Full Flow Condensate Polisher or Make-up Demineralizer, AMAG, Polar Crane, Met Tower, Rad Monitoring Data Acquisition System, or the Emergency Response Data System (NUREG 1394, Dwg. 90052)?
☐ Yes ☒ No

B. Is software supplied with this change or document; software deliverables (including firmware) consists of source code, ladder logic, or executable code supplied via listings, magnetic tape, disk, or read only memory (ROM, PROM, EPROM, EEPROM)?
☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

4. MAINTENANCE ENGINEERING/COMPUTER ENGINEERING IMPACT (Continued)

C. Does the change require computer hardware/software modification?

4.C.1 Revise the range/description/algorithm for a monitored point?
4.C.2 Add/modify a programmable controller?

☐ Yes ☒ No

NOTES: (1) If 4A, B, or C apply to large, predominantly software oriented systems, as listed in 4A, contact Computer Engineering.

(2) If the modification or deletion of firmware/software is for control equipment not covered by the systems referenced in 4A, contact Controls/Electrical group in Design Engineering.

D. Does the change or document add, delete, or modify ASME Section III or Section XI code classified welds or components (including supports) subject to Inservice Inspection (ISI) per SO23-XVII-1 ISS2 and 90073 (Unit 2) or 90074 (Unit 3)?

☐ Yes ☒ No

E. Does the change or document add components which will require formal periodic inspection/testing under the Inservice Testing (IST) program (for Units 2&3, see 90055) or the Check Valve Program, per SO123-V-5.22.5, or modify performance requirements or actual performance characteristics of components which are currently covered by the plant IST or Check Valve Program requirements?

☐ Yes ☒ No

F. Does the change or document add or modify any containment penetration? The penetration includes containment isolation valves, vents, drains, and boundary valves, etc.?

☐ Yes ☒ No

G. Will the change add equipment or components that require coatings or linings (e.g., tanks or piping)? Will the change add equipment or components to the Turbine Building or outside environment that require coatings? Or, will the change add equipment or components to the containment? If Yes to any of these contact Coating Specialist in ME for N-SPI required actions.

☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

H. Does this change have the potential to impact the ongoing oil sampling and analysis trends conducted by the Reliability and Predictive Maintenance Engineering Group? For example, the replacement of seals, gears, pump housings, slinger rings, bushings or washers which can introduce anomalies in the trending of chromium, iron, tin, or copper concentrations. Refer to Attachment 2 to SO123-V-14, Oil Sampling and Analysis Program Test Specification and Evaluation Guide, for a listing of plant tag numbers included in this program. If uncertain, contact the Oil Analysis Program Manager in ME.

☐ Yes ☒ No

5.0 SYSTEMS ENGINEERING (SE) IMPACT

A. Does the change affect any of the programs (e.g., S/G program, etc.) owned by Systems Engineering?

☐ Yes ☒ No

B. Does the change affect any Maintenance Rule Function or component scope?

☐ Yes ☒ No

C. Does the change affect the secondary plant thermal efficiency?

5.C.1 Create a new or increase the bypass of any secondary energy stream of drains/vents to atmosphere or to the condenser?

5.C.2 Create a new or change the drain/vent path of any secondary component?

5.C.3 Change heat exchanger performance, i.e., change level, modifies internal configuration or plug tubes in condenser, FW heater or MSR?

5.C.4 Change the turbine steam path or turbine gland seal/exhaust (includes FW turbine)?

☐ Yes ☒ No

D. Does the change affect the Thermal Performance Monitoring Program?

5.D.1 Modify or change any instrument used in the Thermal Performance Monitoring Program?

☐ Yes ☒ No

E. Does the change or document involve UFSAR activity or the Physical Security Plan (PSP), through change, reference, assumption or discussion?

☐ Yes ☒ No

F. Could this change affect the criticality ranking of equipment modified by this NECP? If yes, create N-SPI Operation for the Equipment Reliability Group.

☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

G. Does the activity modify the SONGS Facility Rating? Modifications to the SONGS Facility Rating is defined as any change to the Main Generator, Main Transformer, Aux Transformer, or Reserve Aux Transformer, including all necessary support systems, subsystems, train, component, device, instrument, controls, or power. If "Yes", contact the System Engineering Electrical/I&C Supervisor.

☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

6.0 CHEMISTRY IMPACT

A. Does the change or document include the installation of new sample lines or modification of existing sample lines? (If yes, calculate sample line volume(s).)
☐ Yes ☒ No

B. Does the change or document add or modify a system used to transfer, process, or discharge radioactive liquid or gaseous waste?
☐ Yes ☒ No

C. Does the change or document impact or modify an effluent (gaseous or liquid) radiation monitoring system or sampler?
☐ Yes ☒ No

D. Does the change or document add or modify a chemical addition/treatment system?
☐ Yes ☒ No

E. Does the change or document modify the Post Accident Sampling System?
☐ Yes ☒ No

F. Does the change or document add or modify chemistry instrumentation?
☐ Yes ☒ No

7.0 EMERGENCY PREPAREDNESS

A. Does the change or document add, delete, or modify the Unit 2/3 Meteorological Instrumentation or the SONGS ISFSI?
☐ Yes ☒ No

B. Does the change or document add, delete, or modify the Onsite Emergency Siren System, Site Assembly Areas, or Evacuation Routes?
☐ Yes ☒ No

C. Does the change or document add, delete, or modify the Onsite Public Address System, PA Siren Tone Generator, or required telephones?
☐ Yes ☒ No

D. Does the change or document add, delete, or modify the radiation monitors listed in SO123-VIII-1 Recognition and Classification of Emergencies, or the offsite Pressurized Ion Chambers (PICs) ?
☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

7. EMERGENCY PREPAREDNESS (Continued)

E. Does the change or document add, delete, or modify the Emergency Response Data System (ERDS)?

☐ Yes ☒ No

F. Does the change or document add, delete, or modify the Perimeter Public Address System (PPAS)?

☐ Yes ☒ No

G. Does the change or document add, delete, or modify the EOF or Medical Building Decontamination Shower Holding Tanks?

☐ Yes ☒ No

H. Does the change or document add, delete, or modify the 800MhZ Radio system?

☐ Yes ☒ No

I. Does the change or document add, delete, or modify the Emergency Operations Facility (EOF) e.g. HVAC, DG, MET Tower, Isolation Doors, ARMS, MCA, telecommunications, furniture, or equipment, or the facility arrangement as specified in Emergency Plan Figure 7-4?

☐ Yes ☒ No

J. Does the change or document add, delete, or modify the Technical Support Center (TSC), e.g. HVAC, CREACUS, telecommunications, furniture, or equipment, or the facility arrangement as specified in Emergency Plan Figure 7-1?

☐ Yes ☒ No

K. Does the change or document add, delete, or modify the Operations Support Center (OSC), e.g. HVAC, telecommunications, furniture, or equipment, or the facility arrangement as specified in Emergency Plan Figure 7-2?

☐ Yes ☒ No

L. Does the change or document add, delete, or modify the Emergency News Center (ENC), e.g. HVAC, telecommunications, furniture, or equipment?

☐ Yes ☒ No

M. Does the change or document add, delete, or modify the Yellow Phone System (YPS)?

☐ Yes ☒ No

N. Does the change or document add, delete, or modify the Blue Phone dedicated line to the California Governor's Office of Emergency Services?

☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

7. EMERGENCY PREPAREDNESS (Continued)

O. Does the change or document add, delete, or modify the Emergency Notification System (Red Phone)?
☐ Yes ☒ No

P. Does the change or document add, delete, or modify the Emergency Recall System, including changes to the SCE pager vendor or contract that would affect SONGS emergency response?
☐ Yes ☒ No

Q. Does the change or document add, delete, or modify the Does Assessment Computer (DACs) or the software that runs it?
☐ Yes ☒ No

R. Does the change or document add, delete, or modify the Core Damage Assessment computer program or the ability to run that program in TSC or EOF?
☐ Yes ☒ No

S. Does the change or document add, delete, or modify access to, or egress from any Emergency Response Facility?
☐ Yes ☒ No

T. Does the change or document add, delete, or modify the integration of the SONGS Emergency Plan with the SONGS Physical Security Plan or Safeguards Contingency Plan?
☐ Yes ☒ No

U. Does the change or document add, delete, or modify the Emergency Response Organization (ERO) training program?
☐ Yes ☒ No

V. Does the change or document add, delete, or modify the Protected Area Personnel Accountability (PAPA) system?
☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

8.0 SECURITY IMPACT

A. Does the change or document add, delete, or modify Security equipment or instrumentation?

☐ Yes ☒ No

B. Does the proposed change or activity have the potential of affecting the Security strategy? If the response to any question is YES, contact a Security SME in the Design Engineering Organization for further instructions. Use the following criteria to determine the potential.

Does the proposed change affect the location within plant, capacity (pump flow/head, tank volume, battery, etc.) or power source of:

8.B.1 Alternate and/or normal decay heat removal systems including high and low head primary and secondary makeup capability and containment post-accident heat removal?
8.B.2 Normal and/or remote safe shutdown instrumentation or controls including normal and alternate power capability?
8.B.3 Station Blackout capabilities, including electrical cross-ties?
8.B.4 Fixed or mobile fire suppression pump systems?

☐ Yes ☒ No

C. Does the change or document modify Security requirements established by 10CFR 73.58 as defined in Regulatory Guide 5.74, "Managing the Safety/Security Interface"? (For guidance on impact, refer to SO123-XXIV-1.1, Attachment 4, Section 6, Security System.)

9.a HEALTH PHYSICS

Are Health Physics Program Changes required?

☐ Yes ☒ No

9.b ALARA

Does the change or document add, delete, or modify a system or component which could impact radiological controls or ALARA requirements/goals?

☐ Yes ☒ No

10.0 LICENSING DOCUMENT

A. Does the change require a Technical Specification Bases change or a Licensee Controlled Specification (LCS) change?

☐ Yes ☒ No

NOTE: If above response is YES, contact the Manager, Licensing in the NRA Division.

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REFERENCES: SO123-XV-51, 26-404B

11.0 MATERIAL SUPPORT

NOTES: (1) If a YES response is indicated below, ensure, with assistance from Material Support, that sufficient quantities are included in the original purchase to provide spares which may be needed during the start-up testing, and the initial operation period (prior to completion of the normal spare parts assessment). In addition, if physically modifying the Control Room, ensure equipment necessary to update the simulator is also included in the original purchase. Initiate N-SPI Operation to the NTD simulator group to ensure equipment has been ordered and installation will be completed.

(2) If communication with Material Support verifies impact, reference applicable vendor document numbers (e.g. Spare Parts Lists, manuals or drawings which contain piece part information, etc.) in the N-SPI Operation to facilitate Material Support's updating of the SAP Piece Part Database.

(3) For newly installed design changes, additional spare parts may need to be expedited to ensure timely availability. This requirement should be written into the N-SPI Operation.

(4) Spare parts identified to support startup needs can be procured with the initial equipment purchase. Accelerating this purchase may require working the N-SPI Operation concurrent with issuing the NECP to ensure timely delivery.

A. **Does this change or document (including documents comprising the NCDB data base) add, delete, or modify equipment (components with a plant tag number), such as valves, pumps, relays, starters, transmitters, gauges, etc.?**

   ☐ Yes ☒ No

B. **Does the change or document add, delete, or modify piece parts (items which are part of a component), such as gaskets, o-rings, seals, packings, transistors, switches, IC boards, pump impellers/shafts, valve stems/discs. etc.?**

   ☐ Yes ☒ No

C. **Does this change or document (including documents comprising the NCDB data base) add, delete, or modify any of the following information which may impact the spare parts database?**

   1. Manufacturer
   2. Manufacturers part number, figure number, or model number
   3. Manufacturers drawing number
   4. Vendor print number (VPL)
   5. Valve mark number
   6. Equipment setpoint

   ☐ Yes ☒ No

REFERENCES: SO123-XV-51, 26-404B

12.0 OTHER IMPACT

Are other Site Program/Procedure Changes required? This includes, but is not limited to the following:

A. Does the change require new or revised training lesson plans? (contact NTD division on N-SPI need)

☐ Yes ☒ No

B. Does the change require System Description changes? (contact NTD division on N-SPI need)

☐ Yes ☒ No

C. Does the change require Reload Ground Rules changes (contact NFM division on N-SPI need, refer to SO23-XXXVI-4.2)

☐ Yes ☒ No

D. Are the UFSAR chapter 6 or 15 accident analyses potentially affected (contact NFM division on N-SPI need)

☐ Yes ☒ No

E. Is fuel reliability potentially affected (by RCS chemistry changes, RCS material changes, increase in potential for foreign material, etc.)? (Contact NFM division on N-SPI need)

☐ Yes ☒ No

F. Is the control Room Envelope Habitability Program affected? (Contact ME-Auxiliary Process Division on SPI need)

☐ Yes ☒ No

G. Does the change add, relocate, or remove the storage of chemicals in excess of 100 lbs, including system process containers or tanks? (Contact DE Division for review of TGIS and Control Room Habitability impact)

☐ Yes ☒ No

H. Does the change or document involve a change to the maintenance, monitoring, operation, condition, configuration, or contents of any chemical tank, vessel, or storage device?

☐ Yes ☒ No

I. Does the change or document involve a change to the maintenance, monitoring, operation, condition, configuration, or discharges to the storm drain system or an NPDES discharge pathway?

☒ Yes ☐ No

J. Does the change or document involve a change to the type or quantity of chemicals discharged to the ocean via an approved NPDES discharge pathway?

☒ Yes ☐ No

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REFERENCES: SO123-XV-51, 26-404B

12. OTHER IMPACT (Continued)

K. Does the change or document involve a change to the stack emissions of the existing permanent combustion (IC) engines?
☐ Yes ☒ No

L. Does the change or document involve adding or deleting permanently installed ICs?
☐ Yes ☒ No

M. Does the change or document involve any potential modification to the SPCC or the N-SPIII Contingency Plan?
☐ Yes ☒ No

N. Does the change or document involve a temporary or permanent modification to the site drainage or grading plan?
☐ Yes ☒ No

O. Does the change or document involve areas identified in the SONGS cultural resources and endangered species habitat map?
☐ Yes ☒ No

P. Does the change or document involve a change to the maintenance, monitoring, operation, condition, configuration, or process volume for the Mesa or North Industrial Area Waste Water Treatment Plant?
☐ Yes ☒ No

Q. Does the change or document involve a change to a system used for secondary containment or monitoring of an underground storage tank?
☐ Yes ☒ No

13.0 ENVIRONMENTAL PROTECTION GROUP IMPACT

A. Does the change or document involve a change to the maintenance, monitoring, operation, condition, configuration, or contents of any chemical tank, vessel, or storage device?
☐ Yes ☒ No

B. Does the change or document involve a change to the maintenance, monitoring, operation, condition, configuration, or discharges to the storm drain system or an NPDES discharge pathway?
☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

C. Does the change or document involve a change to the type or quantity of chemicals discharged to the ocean via an approved NPDES discharge pathway?

☐ Yes ☒ No

D. Does the change or document involve a change to the stack emissions of the existing permanent internal combustion (IC) engines?

☐ Yes ☒ No

E. Does the change or document involve adding or deleting permanently installed ICs?

☐ Yes ☒ No

F. Does the change or document involve any potential modification to the SPCC or the Spill Contingency Plan?

☐ Yes ☒ No

G. Does the change or document involve a temporary or permanent modification to the site drainage or grading plan?

☐ Yes ☒ No

H. Does the change or document involve areas identified in the SONGS cultural resources and endangered species habitat map?

☐ Yes ☒ No

I. Does the change or document involve a change to maintenance, monitoring, operation, condition, configuration, or process volume for the Mesa or North Industrial Area Waste Water Treatment Plant?

☐ Yes ☒ No

J. Does the change or document involve a change to a system used for secondary containment or monitoring of an underground storage tank?

☐ Yes ☒ No

14.0 REACTOR DESIGN AND MONITORING PROGRAM

A. Does the change or document affect nuclear fuel or the way nuclear fuel is operated, handled, or stored?

☐ Yes ☒ No

B. Does the change or document affect nuclear fuel assembly components such as CEAs, neutron sources, or fuel rod encapsulation tubes?

☐ Yes ☒ No

NOTE: If there is a YES response to either question above, contact Nuclear Fuels.

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REFERENCES: SO123-XV-51, 26-404B

15.0 REACTIVITY MANAGEMENT PROGRAM

A. Does the change or document affect operation, instrumentation, maintenance or testing of reactivity control systems or components? Examples:

15.A.1 CEAs and CEA drive mechanisms
15.A.2 Boron concentration or level in RCS, SFP, SITs, RWST, BAMU, safety injection lines, etc.

☐ Yes ☒ No

B. Affect operation, instrumentation, maintenance or testing of power indications. Examples:

15.B.1 RCS, main steam or feedwater flow, temperature or pressure
15.B.2 Incore or excore detectors
15.B.3 Main turbine controls
15.B.4 Feedwater chemistry (venture defouling)
15.B.5 Ultrasonic flow meter (AMAG)

☐ Yes ☒ No

C. Does the change or document result in the potential for overcooling the RCS via new or different testing evolutions, steam load variations, main feedwater flow variations, etc.?

☐ Yes ☒ No

NOTE: If there is a YES response to any of the above, contact Operations.

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REFERENCES: SO123-XV-51, 26-404B

16.0 PROBABILISTIC RISK ASSESSMENT (PRA) PROGRAM

NOTES:

(1) NECPs that solely install replacement components or parts qualified via the SEE process do NOT require a PRA N-SPI Operation; therefore, the screening questions included in this section do not need to be addressed for SEE NECPs.

(2) Please refer to the following list of PRA-affecting Systems when responding to the question below:

AFW, CCW, SWC, Containment Isolation, Containment Spray, Containment Emergency Cooling, CVCS, HPSI, LPSI, Instrument Air, Main Feedwater, Condensate System including condensate tanks and demineralized water tanks, Main Steam, Plant Protection System, Safety Injection Tanks, RCS Pressure Control, Electrical Power (emergency diesel generators, Honda generator G005, transformers, 6.9kV, 4160V, 480V, 120V AC or 125/250V DC non-1E and 1E systems) HVAC (Normal and Emergency Chilled Water Systems), Normal and Emergency HVAC (Non-1E and 1E Switchgear, Pump Rooms), TGIS and CRIS or control room annunciators, indications and control associated with the aforementioned systems.

A. **Does the change/activity prevent a PRA-affecting system or component's ability to perform its design function?**
☐ Yes ☒ No

B. **Does the change/activity add or remove any equipment from a PRA-affecting system?**
☐ Yes ☒ No

C. **Does the change activity impact the way components in a PRA-affecting system are operated (e.g., manual vs. automatic, air-operated vs. motor-operated, DC-operated vs. AC-operated, etc.)?**
☐ Yes ☒ No

D. **Does the change/activity impact any operator actions associated with PRA-affecting systems?**
☐ Yes ☒ No

E. **Does the change/activity create any new plant system or component that interacts with or impact a PRA affecting system?**
☐ Yes ☒ No

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REFERENCES: SO123-XV-51, 26-404B

16. PROBABILISTIC RISK ASSESSMENT (PRA) PROGRAM (Continued)

F. Does this modification add new equipment that may increase the fire loading or the potential for flooding in the installation area (fire or flood initiating event frequency impact)?

☐ Yes ☒ No

NOTE: If there is a YES response to any of the above, contact the PRA Group in Nuclear Fuels to determine the impact. If the PRA group determines an impact exists, assign a separate N-SPI Operation to the PRA group for further assessment.

17.0 GROUNDWATER PROTECTION PROGRAM

NOTE: The groundwater protection program is to prevent the contamination of the groundwater from radioactive sources

A. Does the change to the system, structure, component (SSC), or work activity involve radioactive materials?

☒ Yes ☐ No

B. Does the change affect an SSC or work activity that does not normally contain radioactive materials but has the potential to be radiologically contaminated from a leak (e.g., Steam generator tube rupture or pipe break) or drainage path (e.g., Floor drain or sump)?

☒ Yes ☐ No

C. Does the change add or remove SSCs in the ground below elev. +5 ft (water table)?

☐ Yes ☒ No

IF YES TO QUESTION A, B, OR C CONTINUE TO QUESTION D, E, F, AND G

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REFERENCES: SO123-XV-51, 26-404B

17. GROUNDWATER PROTECTION PROGRAM (Continued)

D. Is the affected SSC or work activity conducted or located outdoors (outside of a building or enclosure)?
☒ Yes ☐ No

E. Is the SSC or work activity located underground or inaccessible for inspection?
☐ Yes ☒ No

F. Is it possible that the change could cause an undetected radiological release to the groundwater?
☒ Yes ☐ No

G. Does the change affect the groundwater monitoring wells or the groundwater levels?
☐ Yes ☒ No

NOTE: If there is a YES response to QUESTION D, E, F, or G contact the Design Engineering Mechanical Analysis & System Group to determine the impact and required actions.

SITE PROGRAMS IMPACT ASSESSMENT
Part B

ECP Number 800074957
Rev. No. 0 ASC No. D0044582

REFERENCE: SO123-XV-51, 26-404

NOTE: The originator of this impact assessment shall contact the NTD representative for any of the below line organizations if there is a potential impact determined from the Form 26-404 assessment. NTD will determine if training is needed.

CONTACTS:

Organization/Impact	Contact/Assessment Information
1. OPERATIONS ☐ YES ☒ NO	
2. OPERATIONS/MAINTENANCE ☐ YES ☒ NO	
3. MAINTENANCE ☐ YES ☒ NO	
4. MAINTENANCE ENGINEERING/COMPUTER ENGINEERING ☐ YES ☒ NO	
5. SYSTEMS ENGINEERING ☐ YES ☒ NO	
6. CHEMISTRY ☐ YES ☒ NO	
7. EMERGENCY PREPAREDNESS ☐ YES ☒ NO	
8. SECURITY ☐ YES ☒ NO	

SITE PROGRAMS IMPACT ASSESSMENT
Part B

ECP Number 800074957

Rev. No. 0 ASC No. D0044582

REFERENCE: SO123-XV-51, 26-404

CONTACTS:

Organization/Impact	**Contact/Assessment Information**
9. A. HEALTH PHYSICS ☐ YES ☒ NO	
B. ALARA ☒ YES ☐ NO	(b)(6) ALARA
10. LICENSING DOCUMENT ☐ YES ☒ NO	
11. MATERIAL SUPPORT ☐ YES ☒ NO	
12. OTHER ☒ YES ☐ NO	(b)(6) NEIL Insurance
13. ENVIRONMENTAL PROTECTION GROUP ☐ YES ☒ NO	
14. REACTOR DESIGN AND MONITORING PROGRAM ☐ YES ☒ NO	
15. REACTIVITY MANAGEMENT PROGRAM ☐ YES ☒ NO	

SITE PROGRAMS IMPACT ASSESSMENT
Part B

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REFERENCE: SO123-XV-51, 26-404

CONTACTS:

Organization/Impact	**Contact/Assessment Information**
16. PROBABILISTIC RISK ASSESSMENT (PRA) PROGRAM ☐ YES ☒ NO	
17. GROUNDWATER PROTECTION PROGRAM ☒ YES ☐ NO	(b)(6)
OTHER (b)(6)	**Effluent Control, ODCM, Regulatory Support.**

EVo

DESCRIPTION OF IMPACT:

REQUIRED ACTIONS:

LIMITATIONS (TIME OR PROCESS):

DESIGN SETPOINTS:

OTHER CONDITIONS:

REQUIRED IMPLEMENTATION DATE(S):

FEEDBACK REQUIREMENTS:

Attachment A
Original Steam Generators Segmentation
Risk Assessment Matrix

No.	Risk/Threat Description	Risk Severity	Risk Probability	Potential Consequence	Mitigation Strategy	Action Required	Responsible	Status	Notes
1. General									
1.1	Quality: The ASC and project design features have omissions and/or errors.	High	Medium	May require rework, causing schedule delays and budget overruns.	Emphasize importance of thorough review of all design work and ASC sections.	Formal review of all parties with comments and resolutions documented.	All	Completed	
1.2	Team Work: Inadequate support from, and communication between, the OSG Segmentation WORK stakeholders.	Medium	High	May cause errors in ASC, design, work packages, and project delay.	Develop and clearly communicate stakeholders' roles and responsibilities early in the process. Establish high standards for communication between the stakeholders and for the issue resolution process.	Monitor team work during all phases of OSG Segmentation WORK.	All	Completed	

2. Engineering and Contractors									
2.1	OSG Rigging and Support Arrangement.	High	Low	Not properly designed will damage equipment, harm workers, delay the project and have adverse safety impact.	Need a good plan to arrange the OSG set up and design additional supports properly.	Engineering to review support design and OSG arrangement.	SGRP	Completed	
3. Other Stakeholders									
3.1	Affected SPIs not accurately identified.	Medium	Low	Public concerns and Regulatory actions.	Involved all potential stakeholders.	Provide formal assignments.	SGRP & All	Completed	

Attachment A
Original Steam Generators Segmentation
Risk Assessment Matrix

4. Testings									
4.1	Water Chemistry Tests	Low	Low	Not well prepared will cause water contaimination	Review testing procedure.	Prepare plans and PJB and SME involvement.	SCE Chemistry.	Completed	

5. ALARA and Safety									
5.1	ALARA				See Section 17 of HPP-11 Rev. 0 (SGR-A10210-11).		HP	Completed	
5.2	Industrial Safety Control.	High	Medium	Fatality and Severe Injuries.	Facility Design to consider Industrial Safety.	Make sure industrial safety is considered for all activities in Facility.	All	Completed	
5.3	Radiological Safety and Effluent Control	High	Medium	Radiation Exposure to Public	Review Offsite Dose and provide effluent control carefully.	Review ODCM and effluent control activities.	Chemistry, HP, and NRA Group	Completed	
5.4	Radiological safety and effluent control	High	Medium	Unmonitored release of radioactive airborne effluents	Evaluate potential consequences. Airborne contamination control measures. Establish administrative protocols for stop work	Discussion and planning before the layout is finalized.	Chemistry, HP, and NRA Group	Completed	
5.5	Radiological safety and effluent control	High	Medium	Unmonitored release of radioactive liquids – trigger voluntary communication protocol under the Ground Water Protection Initiative	Spill containment and contamination control measures. Establish administrative protocols for stop work	Discussion and planning before the layout is finalized.	Chemistry and GPI Steering committee	Completed	

Attachment B: Road Map to OSG Segmentation documentation

OSG Segmentation	References
Segmentation Methods	Project Plan
Equipment for HP and Effluent	HP Plan
Facilities Design	NECP or ASC to the NECP
Contractor Equipment	Project Plan
Cutting Technology	Project Plan
Effluent Controls for Cutting	HP Plan
Water Processing	Project Plan
Site Area Boundary Dose	HP Plan
Shielding	HP Plan first, then Project Plan
Access Control	HP Plan
Preliminary Work Completed	Project Plan
Risk Assessment of Physical work	Project Plan
Risk Assessment of Facilities Capability	ASC to the NECP
Edison Provided Facilities and Structures	NECP and Project Plan
Material Movement	Project Plan
Time Line	Project Plan
Dose Estimate	HP Plan
ALARA	HP Plan

References:

1. NECP 800074957 ASC D0033902 dated 9/17/2010
2. Project Plan: OSG Segmentation Plan dated 5/10/2010
3. HP Plan: HPP-11 Revision 0, dated 7/13/2010

SAN ONOFRE NUCLEAR GENERATING STATION
STEAM GENERATOR REPLACEMENT PROJECT
ORIGINAL STEAM GENERATOR SEGMENTATION

EFFLUENT/ODCM EVALUATION
Revision 2
Date: May 20, 2011

This Effluent Evaluation (EOE) focuses on the radiological effluent impacts of the treatment and disposal of wastewater and solids that will be produced during segmentation of the Unit 2 and 3 original steam generators (OSG) to prepare them for final disposition, including disposal of low level radioactive waste at a licensed facility as needed. Discharges of wastewater will be performed in accordance with the radioactive effluent control program and conditions of the NPDES permit.

Specifically, the potential radiological impact to the public and environment are considered; worker exposure and solid radioactive waste considerations are addressed by the Health Physics (HP OSG SEGMENTATION PLAN Health Physics OSG Segmentation Plan).

Nuclear Engineering Change Package 800175654 and OSG Segmentation Plan have been generated to address engineering issues associated with the segmentation of the original steam generators (OSGs).

This Effluent/ODCM Evaluation (EOE) is arranged as follows:

- Overview: general discussion of segmentation process
- Liquid: liquid radioactive water management and disposal
- Airborne: airborne radioactive effluents
- Attachments: Calculations and Sampling Plan

If changes are made to the references cited such that the radiological or chemical constituents are changed in physical form, total inventory, or specific concentrations, this evaluation must be reviewed and revised accordingly. Likewise, changes in systems (equipment, piping) that are used to transfer, treat, or dispose of radioactive fluids and/or wastes also require a review of this evaluation with appropriate amendments.

Specifically, if the waste once generated necessitates alternative treatment or disposal techniques than those discussed in this document or if processing or on-site staging of radioactive wastes extends over an FSAR update cycle, further evaluation must be performed and, in the latter case, the FSAR should be updated to reflect any additional temporary storage areas not already described. Failure to review and modify this evaluation may result in violation of regulatory or administrative requirements.

Amended or new permits obtained for the segmentation and any additional documentation that are generated to address regulatory issues will be retained in accordance with site recordkeeping requirements.

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OVERVIEW OF SEGMENTATION PROCESS

The goal of segmentation is to separate the non-radioactive portion of the original steam generator (steam dome and transition cone) from the original steam generator's lower assembly that includes the steam generator tubes that contain low level radioactive materials.

During the cycle 16 refueling outages, the original steam generators (OSGs) from Unit 2 and 3 were prepared for segmentation activities and removed from the respective containments before being staged in the North Industrial Area (NIA) in the segmentation facility. Segmentation and preparation for shipping is scheduled to begin January 2011 and will be performed by SCE and subcontractors.

As described in Bechtel Plan 25221-PP-13 "OSG Preparation Plan" the OSGs were drained, covers were installed on manways and other openings to prevent spills of residual fluids and to control access, and a fixative was applied to the exterior surface of the OSG channel head to fix loose contamination prior to the OSGs being moved to the segmentation facility. The OSGs were moved using specially designed vehicles from the Units 2 and 3 protected area to the segmentation facility.

The segmentation facility (OSGSF) was constructed under NECP 800175654 (ASC D0033902) to provide a weather-proof facility for the on-site staging and preparation of the OSGs for disposal. The OSGSF is a 100 ft x 110 ft x 54 ft high steel-framed, fire-retardant fabric structure designed to withstand 100 mph winds. The facility is equipped to contain the OSGs and allow segmentation of contaminated material, collect spills (berm), prevent radioactive material from reaching the ground water (Coverguard) and protect work activities and the OSGs from rain water intrusion (external barrier). Shielding will be used as needed to keep occupational and public direct dose rates to as low as reasonably achievable. Steel plate material is located where heavy construction traffic is expected or the external severance cut is made. The OSGSF will be established as a temporary radiologically controlled area (RCA) prior to beginning segmentation. HEPA units will be staged for use but, due to the expected absence of airborne radioactive material during segmentation, are not expected to be needed. If HEPA units are used, smoke eater equipment will be used during cuts for diver opening to minimize degradation of HEPA filters.

The OSGs are positioned horizontally in a bermed area on pedestals that will provide sufficient support when the OSGs are filled. The berm capacity is 63,000 gallons. Since an OSG may contain approximately 73,000 gallons, pumps connected to a temporary water storage tank are provided to transfer water from the berm in the unlikely event of a catastrophic failure of an OSG while it is filled with water. There will be several empty temporary storage tanks staged outside the OSGSF to allow for transfer and temporary holding of water if a leak occurs in a filled OSG.

The sequence for segmentation is:

- create one 6 inch opening at the upper most surface of the steam dome using a Petrogen torch
- fill the steam dome with 50,000 gallons of water from the fire water system to cover the upper part of the tube sheet. Personnel will be present throughout the fill and can take action to stop and contain a leak during the fill process.
- create the diver access point
- add approximately 23,000 gallons of water for additional shielding. Personnel will be present throughout the fill and can take action to stop and contain a leak during the fill process.
- install a pump and filter into the flooded steam dome to maintain water clarity and remove contamination. This also provides recirculation to aid in obtaining samples of the water to determine concentrations of licensed material.
- perform internal cuts underwater in the specified sequence using a plasma torch and remove designated sections
- install a pump and hose to drain the OSGs to either the temporary water storage tanks or, if the water meets all radiological effluent and NPDES permit requirements, to the NIA sump. Personnel will be present throughout the drain and can take action to stop and contain a leak.
- perform an external cut at the transition cone to lower assembly weld to sever the steam dome from the lower assembly using a remotely-operated clamshell mechanical cutter

- open the OSGSF to atmosphere once air samples from inside the facility are below detectable radioactive airborne effluent levels
- remove the steam dome and move it outside of the OSGSF and cover with tarps
- quickly fit the tube bundle cap onto the steam generator lower assembly
- weld tube bundle cap on using tack welding followed by an automated machine welding system
- survey the steam dome and transition cone before making additional cuts to meet shipping constraints.
- Apply transport coatings to meet DOT requirements and the DOT Special Request requirements.
- Transport the DOT-compliant package(s) off-site to the appropriate disposal facility.
- Steam Dome/Transition Cone
    - Based on initial survey data, the steam dome and transition cone were expected to be free released once segmentation is completed. Once separated from the lower assembly, the steam dome will be moved outside the OSGSF and surveyed.
        - If the steam dome is radioactive. The steam dome and transition cone will be disposed of as low level radioactive waste. Any re-sizing activities (e.g. cutting) will be performed within an enclosure with positive ventilation controls to minimize the potential for an unmonitored radioactive airborne release and spill protection. This may be the OSGSF or a temporary enclosure. Local air samples will be taken and counted as effluent samples to document airborne contamination levels.
        - If HP has successfully decontaminated the steam dome to allow for free-release, it will be disposed consistent with all applicable regulations and may be sent to a salvage company for the steel.

The steam generator lower assembly (SGLA) includes the steam generator tubes and is expected to be classified as Class A low level radioactive waste, requiring disposal at the Energy Solutions licensed facility in Clive, Utah. The SGLA will have a DOT cover welded over the exposed tube bundle and will be shipped in accordance with all Department of Transportation regulations and the DOT Special Request requirements. HP OSG SEGMENTATION PLAN provides additional details for the shipment of the SGLA.

Wastewater not meeting NPDES release criteria will be treated until NPDES release criteria are satisfied. Wastewater treatment and discharge issues are discussed in greater detail in the next section of this document.

To the extent practicable, waste minimization techniques will be used in accordance with SO123-XV-17.1 and NRC Information Notice 94-23. Applicable portions of the Process Control Program will be implemented during packaging and shipment. Waste disposal will be performed in accordance with all regulatory requirements.

Debris, filters, sediment and sludge will be evaluated per existing HP procedures for the control of solid wastes. The solids will be disposed of in accordance with all regulatory requirements

LIQUID

Wastewater

Approximately 73,000 gallons of fire water is required for each OSG to provide shielding during underwater segmentation. The water may, as segmentation proceeds, contain suspended and entrained licensed radioactive material and solids. As previously stated, smears taken of the OSGs while they were still in containment, indicate the presence of low levels of loose contamination on the outside of the steam dome. Per HP OSG Segmentation Plan, section 7, efforts will be made to remove loose contamination before segmentation begins to minimize the potential for a personnel (diver) contamination event and as a good HP ALARA practice.

Each OSG has accumulated metallic oxides on the tube sheet from corrosion of the condensate and feedwater systems over the course of plant operation. Current estimates are between 3,700 to 4,500 pounds of metallic oxides per OSG (Refer to Attachment F). During OSG filling and underwater segmentation, there is a very low potential for the water to resuspend or partially dissolve some fraction of those metal oxides that could then be removed during OSG draining. At the divers' discretion, the water will be circulated continuously through a filter (<5 microns) during the segmentation to remove solids and to maintain water clarity. An AMP-50 will also be placed adjacent to the filter to monitor the dose rate and alert personnel to unexpected radioactivity in the water. Steam generator blowdown analyses performed for the 6 months prior to the cycle 16 outages showed no detectable gamma activity in either Unit 2's or Unit 3's OSGs. Unit 2's steam generator blowdown samples occasionally showed detectable tritium, with one sample containing approximately 5 E-6 microcuries/ml. Unit 3 steam generator blowdown samples did not show detectable tritium. Given that the steam generator blowdown samples were taken during operation when the blowdown is higher temperature, it is highly unlikely that the concentrations in the water drained from the OSGs after the internal cuts have been completed would be any higher than those values. Using the steam generator blowdown sample data, a reasonable estimate of the total potential radioactive liquid releases from segmentation of the OSG is 2.8E-3 Ci of tritium with an associated dose of 1.9E-6 mrem (Attachment A).

Comment [h1]: [redacted] was calculating the metallic oxides [redacted] determined from copper an iron samples and estimating removal by blowdown and sludge lancing (performed in previous cycles and not ALARA for amount removed).

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The most conservative scenario in terms of the potential concentrations of licensed material in the OSG water would be if a tube were breached during the internal cuts and there was residual water (RCS) in the breached tube. Based on RCS samples prior to shutdown of each Unit, isotopes that could be introduced into the OSG water include manganese-54 (^{54}Mn), cobalt-57 (^{57}Co), cobalt-58 (^{58}Co), cobalt-60 (^{60}Co), cesium-134 (^{134}Cs), cesium-137 (^{137}Cs) and tritium (^{3}H). Refer to Reference 5 page 2-9 for full list of isotopes. Using very conservative assumptions, the amount of licensed material that could be introduced into the OSG water if a tube were breached was calculated (Attachment A):

Maximum Potential Concentrations in OSG Wastewater
(Nicked tube)

Isotope	Unit 2 OSG concentration (μCi/ml)	Unit 3 OSG concentration (μCi/ml)
^{54}Mn	4.8E-7	5.1E-7
^{57}Co	2.7E-8	1.6E-8
^{58}Co	1.4E-5	7.4E-6
^{60}Co	2.2E-7	3.5E-7
^{134}Cs	1.1E-7	4.6E-8
^{137}Cs	1.2E-7	5.8E-8
^{3}H	3.3E-5	7.4E-6
Total	**4.8E-5**	**1.6E-5**

As a result of the constant recirculation of the contents of the OSG during segmentation activities, samples of the contents in the OSG can be obtained and analyzed to determine concentrations relative to radioactive effluent release control limits for gamma isotopes and tritium. As described in the Sampling Plan (Attachment D), wastewater will be sampled and dispositioned in accordance with existing radioactive effluent control procedures and the ODCM (Reference 6); this includes taking the sample of record for determining compliance with the radioactive effluent control program at the ODCM-credited release point. Wastewater will also be sampled and analyzed as appropriate for environmental (NPDES) permit requirements. If licensed radioactive material is detected in the liquid when analyzed to RETS levels, then the radioactive liquid shall be pumped into the temporary storage tanks, transferred to Unit 2 or Unit 3 and released through an ODCM-credited liquid effluent release point, primarily the Unit 2 or Unit 3 Full Flow Condensate Polishing Demineralizer (FFCPD) Hold Up Tank (HUT). Depending on the isotopes identified, treatment by filtration may be performed prior to discharge. If applicable NPDES limits are not met, non-radioactive wastewater may be processed to meet the NPDES limits and then disposed of through a low volume waste stream as defined in the NPDES permit, such as the NIA sump. Licensed material generated at Units 2 & 3 cannot be discharged through the NIA without changes to the Operating Licenses.

To minimize the use of water during segmentation, the majority of water will be transferred from one OSG after internal cuts have been completed by the diver to the next OSG that will undergo segmentation. Using very conservative assumptions, the maximum amount of licensed material that could potentially be discharged in radioactive liquid effluents was calculated (Attachment A):

Isotope	Total Ci
^{54}Mn	5.4E-4
^{57}Co	2.4E-5
^{58}Co	1.2E-2
^{60}Co	3.1E-4
^{134}Cs	8.7E-5
^{137}Cs	1.0E-4
^{3}H	2.2E-2
Total	**3.5E-2**

with a projected contribution of 4.5E-2 mrem total body and 3.8E-1 mrem to the organ (GI-LLI) over the year. Samples will be taken of the ODCM-credited release point and any licensed material in the liquid released, along with the calculated dose to the public, will be reported in the Annual Radioactive Effluent Release Report.

Cross-contamination of a non-radioactive system

The fire water system is not physically connected to the OSG and cannot therefore inadvertently result in licensed materials being siphoned back into the firewater system. In addition, the OSG is vented to atmosphere and fire water is at a higher pressure, further eliminating the potential for contaminating a previously uncontaminated system as discussed in NRC Information Bulletin 80-10 or NRC Information Notice 91-40.

Outdoor, unprotected tank

OSG

The berm surrounding the OSG and equipment in the OSGSF is 92 ft by 104 ft, with a maximum capacity of 63,000 gallons. Since the berm is not capable of containing the entire contents of a single OSG (73,000 gallons) during segmentation, the OSG will be considered an outdoor, unprotected tank with potentially radioactive contents per License Control Specification (LCS) 3.7.110.

The second OSG staged in the OSGSF will also be filled to approximately 80% with water to provide shielding for personnel working in the OSGSF. Once the initial fill has been completed, the fill and vent holes will be covered and welded shut so that the water will not drain from the sealed OSG in the unlikely event that a seismic event occurs. It is highly improbable that both OSGs would fail at the same time since the openings to the OSG are welded shut unless segmentation activities are actively underway.

A set of pumps connected to a temporary water storage tank will be installed to pump the berm in case of leakage. Each temporary storage tank will also be considered as an outdoor unprotected tank if radioactive liquid is pumped to it.

Using the values determined in conservative scenario for total curies that could potentially be released, the maximum amount of licensed material in the wastewater (excluding tritium) is 8.0E-3 curies (Attachment A). This hypothetical maximum total inventory is extremely conservative and well below the LCS limit of 10 curies.

Once internal cuts begin in an OSG, a sample will be performed on the OSG at least once every seven (7) days and documented to ensure that the total contents of the OSG is maintained within limits of the LSC (e.g. ≤10 Ci). Due to the large volume of water in the OSG and the need to maintain clarity to ensure diver safety and minimize the potential for nicking a tube, the water cannot be reasonably circulated quickly enough to meet the guidance in Regulatory Guide 1.21 revision 1 to ensure representative sampling. However, the water will be recirculated at low flow rates throughout internal segmentation activities and a sample will be obtained to determine the concentrations of licensed material. In addition, an alarming dose instrument (e.g. AMP-50) will be placed on the water filter housing with a dose rate set point low enough to provide immediate indication of a breached RCS tube. Even though obtaining a representative sample to determine the inventory in the water-filled OSG cannot practically be achieved, the measures described in this paragraph provide a practicable attempt to meet the intent of the LCS. The once-per-seven day sample will be continued until the OSG has been drained.

Baker Tank or Poly Tank
If radioactive water is added to a Baker or Poly Tank during segmentation, then the tank's total curie content shall be determined once every 7 days and verified to be less than 10 curies total radioactivity, excluding tritium and dissolved and entrained noble gases by survey of the tank or sample and analysis of the tanks contents.

Spill Prevention and Control Measures

During OSG segmentation work activities, the following preventative spill measures will be in place (Reference 3)

- **Plant Grade** – a bottom steel plate and reinforced concrete pedestal were installed followed by surface grade protective material (Coverguard) to prevent water intrusion into the subsurface soil or water from a spill or leak. A 70,000 gallon-capacity berm was installed over the pedestals as the initial barrier to collect a spill or leak. Steel plate material was then installed and located where heavy construction traffic is expected or the external severance cut is made. A perimeter barrier was installed around the perimeter of the OSGSF to prevent rainwater intrusion.

- **Divers Platform** – a "drip pan" tarp will be installed on the divers' platform creating a collection pool to spray down divers and divert rinse water into the OSG.

- **Segmentation Storage** – segmented pieces that are contaminated or radioactive are stored in a container or covered to prevent exposure to the elements and potential washdown during rainfall.

- **Water Lines** – at a minimum, water line from the pump to storage tank will be handled with the following precautions.
    - All joints will have a secondary water collection system installed (reference 3).
    - Should a hose need repair or replacement, the pump will be secured and then the hose will be disconnected over some type of container to collect water.
    - Wastewater hoses and pipes must be handled with extreme care. This water is not allowed to enter plant drains or catch basins until analysis determines the wastewater meets NPDES permit limits and administrative controls for liquid radioactive liquids. The planned release of water containing licensed material that was generated at Units 2 and 3 cannot currently be released through the NIA sump without changes to the licenses.

Water used to provide shielding for the divers during internal segmentation activities will be re-used by transferring it to the next original steam generator to undergo segmentation. Hose connections will be bagged and taped for the transfer and personnel will be present at all times during the transfer. There will be some residual water in the steam dome/transition cone after transfer; the volume is conservatively estimated at approximately 514 gals (Reference 4a: HP OSG Segmentation Plan dated 5/19/2011, item 26). Since the first steam dome will need to be temporarily staged outside of either the OSGSF or RSGSF due to space constraints, the area will be pre-staged by covering the asphalt with plastic sheeting and placing absorbent snakes around the area for spill containment. Equipment and collection drums for the residual water will be placed in a bermed area of at least 900 gallons capacity. Hoses used to transfer the water will be restrained and connections will be bagged and taped. The collected water will be disposed of in accordance with SO123-XV-29 and the radioactive effluent control program.

In addition to the above, temporary covers will be placed over yard area drains near piping runs during fill and drain events to prevent the unplanned release of liquids in the unlikely event that equipment failure or human error results in a leak or spill. These drains should be uncovered if rain occurs or is anticipated. OSG drain down should not occur when it is raining without Ops and Chemistry concurrence.

Station procedures (SO23-4-6, SO123-XV-17.3) concerning spills will be implemented at all times. Spills that occur within a bermed area will be contained and cleaned up expeditiously, preferably by transferring the spill to an appropriate waste tank.

1. If a leak or spill outside of a bermed area or a tank or a collection basin, project personnel will immediately perform spill mitigation and notify the Control Room, Environmental Protection, and NRA per Reference 3 (OSG Segmentation Plan)

2. The leak or spill will be evaluated to determine if it triggers the voluntary communication protocol under SO123-XV-3.5 and the Industry Ground Water Protection Initiative. Unplanned or uncontrolled releases will be also be evaluated for reportability in accordance with the attachment to SO123-XV-17.3, SO123-XV-2.1, SO123-III-5.25, and 10 CFR 50.72 and 50.73.

<u>Rain Water</u>

One other liquid release source exists: collected rainwater. The OSGSF contains a protective barrier around its perimeter to prevent the intrusion of rain water. Berms located outdoors without overhead protection can collect rainwater. Procedure SO23-XXVII-29.24 addresses sampling and disposal of berm rainwater and, in combination with chemistry procedure SO123-III-5.42 will be used to determine the appropriate handling of any liquids collected in these berms.

The steam domes and transition cones will be moved out of the OSGSF and staged on saddle supports and dunnage within the North Industrial Area until they can be prepared for shipment.

Tarps or similar protective measures will be installed as soon as the separated domes and transition cones have been placed on their supports to prevent rain washing the surfaces or the inadvertent erosion of contaminated surfaces and subsequent unmonitored release of licensed material. The protective measures will be maintained unless the separated components have been free-released.

Water containing detectable levels of radioactivity or NPDES compounds of interest will be transferred to the plant for discharge through an ODCM-credited release point.

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Particulate Matter and Radioiodines

There is a potential for very low amounts of radioactive material to be released through discharges to the atmosphere at the following points in the segmentation process

- Creating openings in the steam dome using Petrogen torches and/or plasma cutting
- Underwater segmentation using plasma torches
- External mechanical severance cutting
- Tube bundle cover welding
- Steam dome segmentation (if contaminated)
- Waste tank vents (if waste or berm water contains licensed material)
- Miscellaneous (negligible)

Radiological airborne releases are not anticipated to be significant since cutting of contaminated surfaces will only occur underwater. No radioiodines are reasonably expected to be present due to the amount of time that has elapsed since the OSGs were removed from containment.

Creating the initial fill and vent hole and the divers' access point on the steam dome is not expected to create airborne radioactive material. Contamination control measures were applied prior to the removal of the OSGs from containment to minimize the potential for airborne radioactive releases during segmentation of the OSGs. This included encapsulation of the external surface of the OSG channel head to fix residual loose contamination, except for those areas that will be cut during segmentation. Contamination on cut areas of the OSG is expected to be < 5,000 dpm/100 cm^2 loose and <100,000 dpm/100 cm^2 fixed plus loose contamination. Under the HP plan, strippable coating will be applied to the entire steam dome and transition cone areas to minimize or eliminate loose contamination prior to any cutting. Low volume air samplers of the OSGSF will be used for effluent purposes to verify that airborne radioactivity is not being created.

Cutting of contaminated surfaces will only occur underwater and is not expected to generate airborne radioactive material. Any material liberated during the plasma torch cutting would be dissolved or entrained in the water rather than become airborne. As described in the section on liquids, there is a slight probability that low concentrations of tritium may occur in the water contained in the OSG. It is not credible that the underwater cutting will create sufficient momentum for liquid vapor to result in tritium being released into the air. However, a tritium sample will be taken once per 24 hours in the general vicinity of the divers' platform to verify that tritium is not being released during this activity.

The external cut to separate the OSG steam dome and transition cone from the lower assembly (SGLA) section will be performed using a mechanical clamshell device. If the project elects to use torch cutting for this step, a primary containment enclosure with filtered exhaust and/or local area vent must be constructed before the thermal cutting begins to eliminate the potential for an unmonitored radioactive airborne effluent release. High efficiency particulate air (HEPA) ventilation devices will be placed in service and used throughout this thermal cutting operation if it is necessary; smoke eaters will also be used for torch cutting to protect the HEPA filters. Continuous samples will be taken inside to OSGSF during the segmentation process to confirm that there has been no unmonitored release of particulate matter. HP air samples will also be taken and analyzed before the OSGSF doors are opened and during work activities that may cause airborne contamination.

As described above, the cutting activities are not reasonably expected to result in the release of radioactive airborne particulate matter due to contamination control measures and removal by the water in the OSG. Attachment B evaluates a bounding scenario wherein radioactivity would be released if the loose contamination is not successfully removed over the longest projected duration of 800 hours during cutout of the fill/vent holes/divers opening and welding activities (e.g.,install lifting pads, installation of tube bundle cover). The maximum amount that could be released is 3.2E-4 Ci of ^{60}Co by airborne pathway. This airborne ^{60}Co could result in a potential dose to a member of the public of 7.8E-3 mrem.

Steam dome segmentation will be performed inside the OSGSF or an equivalent structure with filtered ventilation if the steam dome or transition cone are contaminated ≥5,000 dpm/100 cm^2 loose and ≥100,000 dpm/100 cm^2 fixed plus loose contamination. Below these levels, HP may perform localized mechanical decontamination on the steam dome inside a small tented area with protective measures on the asphalt for contamination control. Work area samples will be obtained during mechanical decontamination evolutions and the sample results provided to Chemistry-Effluent Engineering for evaluation. As described in the section on liquids, contamination control and protective measures will be implemented for these components once they are moved out of the OSGSF and they are either free-released or shipped off-site for disposal in accordance with all regulatory requirements.

There is no reasonable expectation that the waste water will contain noble gases or other licensed material. As such, it is not credible that there would be a release of airborne radioactive material from water collected in open berms or through the vent of a wastewater tank.

Tritium

Unit 2's steam generator blowdown samples occasionally showed detectable tritium, with one sample containing approximately 5 E-6 microcuries/ml. Unit 3 steam generator blowdown samples did not show detectable tritium. Given that the steam generator blowdown samples were taken during operation when the blowdown is higher temperature, it is highly unlikely that the concentrations in the water drained from the OSGs after the internal cuts have been completed would be any higher than those values.

Attachment B provides a reasonable estimate of the curies that could be released during underwater segmentation. For a bounding scenario wherein radioactivity would be released continuously for the longest projected duration of 84 days, the maximum amount that could be released is 1.9E-3 curies of ^{3}H by airborne pathway. This minute amount of airborne tritium could result in a potential dose to a member of the public of 3.3E-7 mrem.

Noble gases

Noble gases are not reasonably expected to be present on the secondary side of the OSG due to the amount of time that has elapsed since the OSGs were in service and will not be generated during the segmentation activities.

OSGSF

NUREG-0472, NUREG-0800 Section 11.4, and Reg. Guide 1.143 stipulate monitoring on the discharge from radioactive waste treatment systems or on the exhaust of buildings that house those systems. Regulatory guidance allows the use of sampling and analysis in place of instrumented monitoring for temporary systems and work activities. The systems and equipment used for the OSG segmentation and waste disposal will be located outside of buildings with a monitored HVAC but will be enclosed to prevent an unmonitored release of airborne radioactive material.

Given that the OSG segmentation is a temporary activity, the sampling outside of the OSGSF will document the expected absence of airborne radioactive effluents. Additional information can be obtained as needed from the HP sampling of the inner enclosure's exhaust.

CONCLUSION:

Dose and Curies

The segmentation of the OSGs from Units 2 and 3 is not expected to result in a release of airborne radioactive material, including particulate matter and tritium, due to contamination control measures taken. Similarly, wastewater releases from these work activities is not expected to contain licensed material. Using the highest sample result for steam generator blowdown during the six months preceding the cycle 16 outages, 2.8E-3 curies of 3H could be released with an associated dose to a member of the public of 1.9E-6 mRem.

Direct dose calculations and actions to mitigate the direct dose to a member of the public due to radiation exposure during OSG segmentation activities are found in Reference 4. A constant or average dose rate of 10 microR/hr at the west seawall (occupancy factor of 300 hrs) is required in order to meet the station's ALARA goal of 4 mrem per year as required in SO123-VII-20.16. Direct dose to the public at the beach will be measured using TLDs 55 and 56 and will be accounted for in the Annual Radioactive Effluent Release Report.

In the event that a steam generator tube containing residual RCS is nicked during segmentation, a conservative estimate of the maximum amounts of licensed material that could be released during the proposed work activities are:

- 1.9E-3 Ci of gaseous tritium and 3.2E-4 Ci of gaseous ^{60}Co with a total organ dose of 7.8E-3 mrem
- Estimated maximum liquid curies released of 3.5E-2 curies with 4.5 E-2 mrem total body and 3.8 E-1 mrem organ (GI-LLI)

Ground water - The multiple spill prevention and containment measures described provides reasonable assurance that waste water being collected in any of the equipment or that comes into contact with the sealed surface cannot credibly reach the subsurface soil or ground water. In the unlikely event that a spill or leak of water occurs, administrative measures such as the WIPR (Attachment A of work package 25221-003-M0P-0057-0001-000) have been implemented to ensure that the voluntary communication requirements of the industry Ground Water Protection Initiative are met.

SCE will continue to meet all regulatory requirements for the control and release of liquids and gaseous discharges from the site that might occur during the OSG segmentation process to dispose of the OSGs. Any resultant releases of wastewater and airborne material are projected to be incremental and well below the regulations and will be reported in the Annual Radioactive Effluent Release Report. There will be no significant dose to a member of the public due to the proposed work activities.

Performed By (b)(6) Date: 20 May, 2011

Peer Reviewed By (b)(6) Date: 20 May, 2011

ATTACHMENT A
LIQUID EFFLUENT EVALUATION FOR OSG SEGMENTATION IN NIA

WASTEWATER
Steam generator blowdown (reasonable estimate)
Unit 2: 73000 gal/OSG * 2 OSGs * 5.1E-6 microCi/ml ^{3}H * 3785 ml/gal = **2.82E-3** Ci
Unit 3: 73000 gal/OSG * 2 OSGs * <LLD microCi/ml ^{3}H * 3785 ml/gal = no Ci

Dose impact: 5.1E-6 microCi/ml/1E-3 microCi/ml MPC * 1000 gpm release rate/185000 gpm dilution * 0.282 DCF * 1E-3 = 7.8E-9 mRem/hr
For a total duration of 10 days, dose: 7.8E-9 mRem/hR * 10 days * 24 hrs/day = 1.9E-6 mRem
Reasonable estimate of total projected doses of 1.9E-6 mrem total body/organ dose is below the ALARA standards in 10 CFR 50 Appendix I

Conservative estimate:
- Estimated water processed and discharged = 73,000 gal per OSG = 2.92E5 gal total
- 5 gallons of RCS from nicked tube for each generator with the isotopes listed in Tables based on RCS activity when shutdown (no decay).
- RCS Activity prior to shutdown from ACIDS 6 months before beginning of cycle 16
- OSG microCi/ml = RCS microCi/ml x 5 gal / 73.000 gal
- Total Ci Released = RCS microCi/ml x 5 gal x 2 units x 3785 ml/gal x 73.000 gal
- Projected Dose (ODCM Eq. 1-16)
- Maximum undiluted liquid waste flow during time period = 1000 gpm (FFCPD HUT)
- Average dilution flow = 185,000 gpm (1 circulating water pump)
- Liquid MPC Limit = 10CFR20 App B Table II Col 2
- Dose Commitment Factor (DCF) = (ODCM Table 1-4)
- Duration = 10 days (2.5 days per OSG)

Table A-1

UNIT 2

Isotope	RCS microCi/ml	OSG microCi/ml	Total Ci Released	Diluted microCi/ml	MPC Limit microCi/ml	TBody DCF	Dose Rate mrem/hr
^{54}Mn	7.0E-3	4.8E-7	2.6E-4	2.6E-9	1E-4	5.58	1.4E-8
^{57}Co	3.9E-4	2.7E-8	1.5E-5	1.4E-10	4E-4	236	3.4E-8
^{58}Co	2.0E-1	1.4E-5	7.6E-3	7.4E-8	9E-5	1350	9.9E-5
^{60}Co	3.2E-3	2.2E-7	1.2E-4	1.2E-9	3E-5	3820	4.5E-6
^{134}Cs	1.6E-3	1.1E-7	6.1E-5	5.9E-10	9E-6	13300	7.8E-6
^{137}Cs	1.8E-3	1.2E-7	6.8E-5	6.6E-10	2E-5	7850	5.2E-6
^{3}H	4.8E-1	3.3E-5	1.8E-2	1.8E-7	3E-3	0.282	5.0E-8
Total	6.9E-1	4.8E-5	2.6E-2	2.6E-7	-	-	1.2E-4

Table A-2

UNIT 2

Isotope	Diluted microCi/ml	Organ DCF (Liver)	Liver Dose mrem/hr	Organ DCF (GI-LLI)	GI-LLI Dose Mrem/hr
^{54}Mn	2.6E-9	7060	1.8E-5	21600	5.6E-5
^{57}Co	1.4E-10	142	2.0E-8	3590	5.2E-7
^{58}Co	7.4E-8	603	4.4E-5	12200	9.0E-4
^{60}Co	1.2E-9	1730	2.0E-6	32500	3.8E-5
^{134}Cs	5.9E-10	16300	9.6E-6	285	1.7E-7
^{137}Cs	6.6E-10	12000	8.0E-6	232	1.5E-7
^{3}H	1.8E-7	0.282	5.0E-8	0.282	5.0E-8
Total	2.6E-7	-	8.2E-5	-	9.9E-4

ATTACHMENT A

Table A-3							
UNIT 3							
Isotope	RCS microCi/ml	OSG microCi/ml	Total Ci Released	Diluted microCi/ml	MPC Limit microCi/ml	TBody DCF	Dose Rate mrem/hr
^{54}Mn	7.4E-3	5.1E-7	2.8E-4	2.7E-9	1E-4	5.58	1.5E-8
^{57}Co	2.3E-4	1.6E-8	8.7E-6	8.4E-11	4E-4	236	2.0E-8
^{58}Co	1.1E-1	7.4E-6	4.1E-3	4.0E-8	9E-5	1350	5.3E-5
^{60}Co	5.1E-3	3.5E-7	1.9E-4	1.9E-9	3E-5	3820	7.2E-6
^{134}Cs	6.8E-4	4.6E-8	2.6E-5	2.5E-10	9E-6	13300	3.3E-6
^{137}Cs	8.5E-4	5.8E-8	3.2E-5	3.1E-10	2E-5	7850	2.5E-6
^{3}H	1.5E-1	7.4E-6	4.1E-3	4.0E-8	3E-3	0.282	1.1E-8
Total	2.3E-1	1.6E-5	8.7E-3	8.5E-8	-	-	6.6E-5

Table A-4					
UNIT 3					
Isotope	Diluted microCi/ml	Organ DCF (Liver)	Liver Dose mrem/hr	Organ DCF (GI-LLI)	GI-LLI Dose mrem/hr
^{54}Mn	2.7E-9	7060	1.9E-5	21600	5.9E-5
^{57}Co	8.4E-11	142	1.2E-8	3590	3.0E-7
^{58}Co	4.0E-8	603	2.4E-5	12200	4.8E-4
^{60}Co	1.9E-9	1730	3.3E-6	32500	6.1E-5
^{134}Cs	2.5E-10	16300	4.1E-6	285	7.1E-8
^{137}Cs	3.1E-10	12000	3.8E-4	232	7.3E-8
^{3}H	4.0E-8	0.282	1.1E-8	0.282	1.1E-8
Total	8.5E-8	-	5.4E-5	-	6.0E-4

- **Bounding release scenario is below instantaneous liquid release concentrations in 10CFR20.**
- Maximum activity that could be released if a tube with residual RCS is nicked:

Isotope	Unit 2	Unit 3	Total Ci
^{54}Mn	2.6E-4	2.8E-4	5.4E-4
^{57}Co	1.5E-5	8.7E-6	2.4E-5
^{58}Co	7.6E-3	4.1E-3	1.2E-2
^{60}Co	1.2E-4	1.9E-4	3.1E-4
^{134}Cs	6.1E-5	2.6E-5	8.7E-5
^{137}Cs	6.8E-5	3.2E-5	1.0E-4
^{3}H	1.8E-2	4.1E-3	2.2E-2
Total	2.6E-2	8.7E-3	**3.5E-2**

ATTACHMENT A

- Projected Dose to a member of the public if a tube containing RCS is nicked is estimated to be:

TBody Dose Rate (mrem/hr) = 1.2E-4 + 6.6E-5 = 1.9E-4 mrem/hr

Organ dose – GI-LLI (mrem/hr) = 9.9E-4 + 6.0E-4 = 1.6E-3 mrem/hr

Tbody dose (mrem) = 1.9E-4 mrem/hr x 10 days x 24 hr/day = **4.5E-2** mrem

Organ dose (mrem) = 1.6E-3 mrem/hr x 10 days x 24 hr/day = 3.8E-1 mrem.

- 10 CFR 50 Appendix I whole body dose limit for liquids is 3 millirem/year
- 10 CFR 50 Appendix I organ dose limit for liquids is 10 millirem/year

Conservative estimate of total projected doses of 4.5E-2 and 3.8E-1 mrem are below the ALARA standards in 10 CFR 50 Appendix I

10 CURIE LIMIT
BAKER TANK or 1200 GALLON POLY TANK
If an outdoor unprotected tank is used during OSG segmentation and radioactive water is added to the tank, then the tank's total curie content shall be determined once every 7 days and verified to be less than 10 curies total radioactivity, excluding tritium and dissolved and entrained noble gases.

Bounding Assumptions:
- Tank Dimensions = 42 feet x 9.7 feet x 8.5 feet (from microshield calculation)
- Tank Volume = 21,000 gal
- Assume point source of ^{60}Co at 10 curie in middle of tank
- Distance to point source = 4.9 feet x 1 meter/3.28 feet = 1.49 meters = 149 cm
- Assume 100 percent water to shield a point source
- Path length of water from source to radiation instrument = 149 cm
- Half Value Layer (HVL) for ^{60}Co through water (The Health Physics and Radiological Handbook, Table 6.2) = 11 cm of water
- 10 curie of ^{60}Co = 10 rem/hr at 1 meter

  Reduction of ^{60}Co gamma radiation through water (HVL)

  = 149 cm/11 = 13.5

  Reduction in transmission of ^{60}Co gamma radiation $=(1/2)^{13.5}$ = 8.6E-5

  Estimated dose rate of 10 Ci of ^{60}Co on outside of tank (1.49 meters)

  = 10 rem/hr x $(1 \text{ meter}/1.49 \text{ m})^2$ x 1E3 mrem/rem x 8.6E-5

  = 0.39 mrem/hr for 10 curie point source of ^{60}Co

Micro-shield calculation of the tank yielded the following result:
- With 10 Ci of Reference 5 isotopes evenly distributed in a tank full of water, the calculations yielded a dose rate of 42 mrem/hr with no decay and 40 mrem/hr with 500 day decay on the side of tank at its center point. The principal isotope was ^{60}Co.

- It is reasonable to assume that radioactivity in the water will be evenly distributed. However, the dose rate limit in Attachment D is set at 4 mrem/hr to be conservative.

ATTACHMENT A

OSG

During OSG underwater segmentation, once internal cuts begin in an OSG, a sample will be performed on the OSG at least once every seven (7) days and documented to ensure that the total contents of the OSG is maintained within limits of the LSC (less than 10 curies total radioactivity, excluding tritium and dissolved and entrained noble gases). The once-per-seven day sample will be continued until the OSG has been drained.

A sample is required to determine the OSG total curie content since the primary side radioactivity precludes using dose rate measurements to determine total curie content in the secondary side water.

Unit 2: OSGs

The total curie content from Table A-1: (2.6E-2 – 1.8E-2) = 8.1E-3 curies for both OSGs
Each OSG: 8.1E-3/2 = 4.1E-3 curies/OSG << 10 curies limit in the LCS

Unit 3 OSGs:

The total curie content from Table A-3: (8.7E-3 – 4.1E-3) = 4.6E-3 curies for both OSGs
Each OSG: 4.6E-3/2 = 2.3E-3 curies/OSG << 10 curies limit in the LCS

ATTACHMENT B
AIRBORNE EFFLUENT EVALUATION FOR OSG SEGMENTATION IN NIA

FILL/VENT HOLES, DIVERS OPENING and WELDING ACTIVITIES
Airborne radioactive release is not reasonably expected to occur during cutting (fill/vent holes and diver opening) or welding activities since strippable coating will be applied to cut lines and welding surfaces before these activities occur.

1. Bounding Assumptions:
   - Plasma torch flowrate = 10 cfm x 2.832E-2 m^3 /cu ft x 1 min/60 sec = 4.7E-3 m^3 /sec
   - Loose surface contamination limit of 2.5E4 dpm/100 cm^2
   - 2.22E6 dpm/microCi = 4.5E-7 microCi/dpm
   - Plasma cut cause airborne release from path 1 cm wide x 1 cm long each second
   - Loose surface contamination = ^{60}Co is most restrictive isotope for dose calculation
   - ODCM NIA Camp Mesa X/Q = 3.9E-6 sec/m^3
   - Estimated work duration = 800 hours (200 hours per OSG) or 33.3 days

2. ^{60}Co Release Rate (microCi/sec)
   = 2.5E4 dpm/100 cm^2 x 1 cm x 1 cm/sec x 4.5E-7 microCi/dpm= 1.1E-4 microCi/sec

3. ^{60}Co Concentration in air at site boundary (uCi/cc)
   = 1.1E-4 microCi/sec x 4.7E-3 m^3 x 3.9E-6 sec/m^3 = 2.0E-12 microCi/cc or 0.7% of MPC

   - ^{60}Co Gaseous MPC Limit = 3E-10 microCi/cc (10CFR20 App B Table II Col 1)

   - **Bounding release scenario is below regulatory limits in 10CFR20.**

4. Bounding Total Curies and Site Boundary Dose Assumptions:

   - Work Activity duration (diver opening and welding activities on 4 OSGs) = 33.3 days x 8.64E4 sec/day = 2.88E6 sec

   1.1E-4 micoCi/sec x 2.88E6 sec x 1 Ci/1E6 microCi = **3.17E-4** Ci of ^{60}Co

5. Controlling Location: Camp Mesa is 480 meters from NIA

   - Using the NIA ERWiK for Camp Mesa to estimate the dose rate mrem/hr

   ^{60}Co = 1.1E-4 microCi/sec x 782 mrem/year per microCi/sec x 1 year/8760 hrs
   = 9.8E-6 mrem/hr

   9.8E-6 mrem/hr x 33.3 days x 24 hr/day = 7.8E-3 mrem

   - **7.8E-3** mrem to the most restrictive age group from airborne ^{60}Co

   10CFR50 App I Organ dose limit = 15 mrem/qtr

ATTACHMENT B

UNDERWATER SEGMENTATION

Airborne radioactive release is not reasonably expected to occur during underwater segmentation as any licensed material on the secondary side will be entrained in the water and is not expected to become airborne.

1. Bounding Assumptions:
   - Plasma torch causes 1 cubic meter of air to attain 100 % humidity each second
   - At 100 % Humidity and 104°F (40°C) air contains about 51 ml water/m^3 (Attachment C)
   - Tritium concentration (maximum blowdown concentration) = 5.1E-6 microCi/ml
   - ODCM NIA Camp Mesa X/Q.= 3.9E-6 sec/m^3
   - Work duration = 84 days (21 days/OSG)

2. Tritium Release Rate (microCi/sec)
   = 5.1E-6 microCi/ml x 51 ml/sec = 2.6E-4 microCi/sec

3. Tritium Concentration in air at Camp Mesa (microCi/cc)
   = 2.6E-4 microCi/sec x 1 m^3 x 3.9E-6 sec/m^3 = 1.0E-9 microCi/cc or 0.5% of MPC

   - Tritium Gaseous MPC Limit = 2E-7 microCi/cc (10CFR20 App B Table II Col 1)

   - **Bounding release scenario is below regulatory limits in 10CFR20.**

4. Bounding Total Curies and Site Boundary Dose Assumptions:

   - Work Activity duration (on 4 OSGs) = 84 days x 8.64E4 sec = 7.26E6 sec

   2.6E-4 microCi/sec x 7.26E6 sec x 1 Ci/1E6 microCi = **1.9E-3** Ci of tritium

5. Controlling Location: Camp Mesa is 480 meters from NIA

   - Using the NIA ERWiKs for Camp Mesa to estimate the dose rate mrem/hr

   mrem/hr = 2.6E-4 microCi/sec x 5.46 E-3 mrem/year per microCi/sec x 1 year/8760 hrs
   = 1.6E-10 mrem/hr

   Bounding potential dose impact = 1.6E-10 mrem/hr x 84 days x 24 hr/day = 3.3E-7 mrem

   - 3.3E-7 mrem to the total body from airborne ^3H for the underwater segmentation activity

TOTAL DOSE AND CURIES

- Total projected airborne curies is **1.9E-3** Ci of Tritium and **3.2E-4** Ci of ^{60}Co
- Total projected airborne dose is **3.3E-7** mrem from Tritium and **7.8E-3** mrem from ^{60}Co
- 10CFR50 App I Organ dose limit = 15 mrem/qtr
- **Bounding release scenario projected dose due to airborne effluents is well below ALARA standards.**

ATTACHMENT C

MOISTURE PER CUBIC METRE OF AIR AT SPECIFIC TEMPERATURE AND RELATIVE HUMIDITY

TEMP (°C)	GRAMS PER CUBIC METRE AT SPECIFIC RELATIVE HUMIDITY (RH)									
	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
65	160.3	144.3	128.3	112.3	96.2	80.2	64.1	48.1	32.1	16.0
60	129.6	116.6	103.7	90.7	77.8	64.8	51.8	38.9	25.9	13.0
55	103.9	93.5	83.1	72.7	62.3	52.0	41.6	31.2	20.8	10.4
50	82.7	74.4	66.2	57.9	49.6	41.4	33.1	24.8	16.5	8.3
45	65.2	58.7	52.2	45.6	39.1	32.6	26.1	19.6	13.0	6.5
40	50.9	45.8	40.7	35.6	30.5	25.5	20.4	15.3	10.2	5.1
35	39.2	35.3	31.4	27.4	23.5	19.6	15.7	11.8	7.8	3.9
30	30.0	27.0	24.0	21.0	18.0	15.0	12.0	9.0	6.0	3.0
25	22.8	20.5	18.2	16.0	13.7	11.4	9.1	6.8	4.6	2.3
20	17.1	15.4	13.7	12.0	10.3	8.6	6.8	5.1	3.4	1.7
15	12.7	11.4	10.2	8.9	7.6	6.4	5.1	3.8	2.5	1.3
10	9.3	8.4	7.4	6.5	5.6	4.7	3.7	2.8	1.9	0.9
5	6.8	6.1	5.4	4.8	4.1	3.4	2.7	2.0	1.4	0.7
0	4.8	4.3	3.8	3.4	2.9	2.4	1.9	1.4	1.0	0.5
-5	3.2	2.9	2.6	2.2	1.9	1.6	1.3	1.0	0.6	0.3
-10	2.1	1.9	1.7	1.5	1.3	1.1	0.8	0.6	0.4	0.2
-15	1.4	1.3	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.1
-20	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.3	0.2	0.1

ATTACHMENT D
GENERAL SAMPLING PLAN

Shaw:

- Will ensure adequate recirculation of OSG prior to sampling for disposal of wastewater. Notify chemistry at 86424 1 hour prior to samples being collected.
- Wherever above ground piping and hoses (wastewater transfer) are used, conduct inspections for leakage once per shift, as a minimum.
- Sample liquid content contained by berms for analysis by Station Chemistry prior to disposal.
- Notify Station Chemistry if radioactive liquid is added to any tank located outside of the OSGSF bermed area.

Station Chemistry:

- SCE Chemistry will analyze OSG water samples for gamma and perform once per seven day surveillance for unprotected tanks (OSG) total curie content during underwater segmentation when OSG is filled with water. The sample may be obtained from the steam dome by divers or HP. Refer to Attachment A for 10 curie calculation. Results will be entered into ACIDS.

- SCE Chemistry will analyze at least one sample of wastewater per OSG for tritium and gamma (1 liter) prior to drain down and analyze it to RETS levels. The sample may be obtained from the steam dome by divers or HP. Sample results will be entered into ACIDS

- Prior to disposal, the wastewater from each OSG will be sampled and analyzed by SCE chemistry for NPDES requirements.

- Representative sampling and analysis of ODCM-credited release point will be performed in accordance with all existing Station procedures to comply with the requirements of the NPDES permits and the ODCM.

- Station Chemistry will analyze airborne samples (particulate matter and ^{3}H) in accordance with existing Station procedures to comply with the requirements of the ODCM and to verify that there has not been an unmonitored release.

Station Health Physics:

- Perform continuous general area airborne particulate sampling with weekly sample collection throughout the OSG segmentation process inside and outside the OSGSF

- Perform HP grab samples for particulate during activities with the possibility to create airborne activity, i.e. diver opening cutout, TBC welding.

- Sample for airborne tritium once per 24 hours during underwater segmentation process within the general area of the divers platform.

- Perform continuous airborne particulate sampling with daily sample collection at the outlet of HEPA ventilation units when in use.

- Perform once per seven day surveillance for unprotected tanks total curie content commencing within 1 day after water containing licensed material is added to the tank and once per 7 days thereafter until tank has been drained.

    - For 20,000 gallon Baker or 1200 gallon Poly tanks, measure the dose rate at 4 foot interval at the middle of the tank side around the perimeter of tank. The dose rate at any point should be less than 4 mrem/hr to ensure the 10 curie limit is not exceeded.

ATTACHMENT E

Spill Mitigation

- During any water movement from one location to another within the North Industrial Area, all drains will have drain covers.
    - These drains should be uncovered if rain occurs. OSG drain down should not occur when raining without Ops and Chemistry concurrence.
- The water storage tanks will be contained within berms.
    - All hose connections will be bagged and taped during water movements.
- If a leak or spill occurs, follow the guidance provided in section 1.1.3.1 of the OSG Segmentation Plan

ATTACHMENT F

Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

Ex 6

Unit 2, E088. Cycle 15 Total Oxides Accumulated (lbs of oxides).

Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Removed by Blowdown	Total Oxides Accumulated	2E088 Cycle Total
12/31/07	0.00	0.00	0.00	0.00	0.00	4140.25
1/31/08	13.60	18.77	21.77	0.44	21.34	4161.59
2/29/08	11.63	16.05	18.62	0.37	18.24	4179.83
3/31/08	10.66	14.71	17.06	0.34	16.72	4196.55
4/30/08	12.43	17.15	19.90	0.40	19.50	4216.05
5/31/08	11.38	15.70	18.22	0.36	17.85	4233.91
6/30/08	15.31	21.13	24.51	0.49	24.02	4257.92
7/31/08	12.74	17.58	20.39	0.41	19.99	4277.91
8/31/08	11.13	15.36	17.82	0.36	17.46	4295.37
9/30/08	10.78	14.88	17.26	0.35	16.91	4312.28
10/31/08	12.71	17.54	20.35	0.41	19.94	4332.22
11/30/08	11.61	16.02	18.59	0.37	18.21	4350.44
12/31/08	8.16	11.26	13.06	0.26	12.80	4363.24
1/31/09	0.00	0.00	0.00	0.00	0.00	4363.24
2/28/09	3.77	5.20	6.04	0.12	5.91	4369.15
3/31/09	14.44	19.93	23.12	0.46	22.65	4391.80
4/30/09	12.96	17.88	20.75	0.41	20.33	4412.14
5/31/09	13.59	18.75	21.75	0.44	21.32	4433.46
6/30/09	12.56	17.33	20.11	0.40	19.70	4453.16
7/31/09	14.14	19.51	22.64	0.45	22.18	4475.34
8/31/09	14.28	19.71	22.86	0.46	22.40	4497.74
9/30/09	11.75	16.22	18.81	0.38	18.43	4516.18
10/31/09		0.00	0.00	0.00	0.00	4516.18
Cycle 15 totals	239.63	330.69	383.60	7.67	375.93	4516.18

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 4140.25

ATTACHMENT F

Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

Unit 2, E089. Cycle 15 Total Oxides Accumulated (lbs of oxides).						
Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Oxides Removed by Blowdown	Total Oxides Accumulated	2E088 Cycle Total
12/31/07	0.00	0.00	0.00	0.00	0.00	4113.25
1/31/08	13.60	18.77	21.77	0.44	21.34	4134.59
2/29/08	11.63	16.05	18.62	0.37	18.24	4152.83
3/31/08	10.66	14.71	17.06	0.34	16.72	4169.55
4/30/08	12.43	17.15	19.90	0.40	19.50	4189.05
5/31/08	11.38	15.70	18.22	0.36	17.85	4206.91
6/30/08	15.31	21.13	24.51	0.49	24.02	4230.92
7/31/08	12.74	17.58	20.39	0.41	19.99	4250.91
8/31/08	11.13	15.36	17.82	0.36	17.46	4268.37
9/30/08	10.78	14.88	17.25	0.35	16.91	4285.28
10/31/08	12.71	17.54	20.35	0.41	19.94	4305.22
11/30/08	11.61	16.02	18.59	0.37	18.21	4323.44
12/31/08	8.16	11.26	13.06	0.26	12.80	4336.24
1/31/09	0.00	0.00	0.00	0.00	0.00	4336.24
2/28/09	3.77	5.20	6.04	0.12	5.91	4342.15
3/31/09	14.44	19.93	23.12	0.46	22.65	4364.80
4/30/09	12.96	17.88	20.75	0.41	20.33	4385.14
5/31/09	13.59	18.75	21.75	0.44	21.32	4406.46
6/30/09	12.56	17.33	20.11	0.40	19.70	4426.16
7/31/09	14.14	19.51	22.64	0.45	22.18	4448.34
8/31/09	14.28	19.71	22.86	0.46	22.40	4470.74
9/30/09	11.75	16.22	18.81	0.38	18.43	4489.18
10/31/09		0.00	0.00	0.00	0.00	4489.18
Cycle 15 totals	239.63	330.69	383.60	7.67	375.93	4489.18

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 4113.25

ATTACHMENT F Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

Unit 3, E088. Cycle 15 Total Oxides Accumulated (lbs of oxides).						
Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Oxides Removed by Blowdown	Total Oxides Accumulated	3E088 Cycle Total
12/31/08	10.53	14.53	16.85	0.34	16.52	3438.69
1/31/09	12.60	17.39	20.17	0.40	19.77	3458.46
2/28/09	8.87	12.24	14.20	0.28	13.92	3472.37
3/31/09	11.10	15.32	17.77	0.36	17.41	3489.78
4/30/09	9.84	13.58	15.75	0.32	15.44	3505.22
5/31/09	10.53	14.53	16.86	0.34	16.52	3521.74
6/30/09	10.36	14.30	16.58	0.33	16.25	3537.99
7/31/09	10.21	14.09	16.34	0.33	16.02	3554.01
8/31/09	10.21	14.09	16.34	0.33	16.02	3570.03
9/30/09	10.30	14.21	16.49	0.33	16.16	3586.19
10/31/09	11.16	15.40	17.86	0.36	17.51	3603.69
11/30/09	10.18	14.05	16.30	0.33	15.97	3619.66
12/31/09	11.54	15.93	18.47	0.37	18.10	3637.77
1/31/10	10.30	14.21	16.49	0.33	16.16	3653.93
2/28/10	10.59	14.61	16.95	0.34	16.61	3670.54
3/31/10	6.35	8.76	10.17	0.20	9.96	3680.50
4/30/10	8.46	11.68	13.55	0.27	13.28	3693.78
5/31/10	10.94	15.10	17.51	0.35	17.16	3710.94
6/30/10	9.25	12.77	14.81	0.30	14.51	3725.45
7/31/10	9.74	13.44	15.59	0.31	15.28	3740.73
8/31/10	10.67	14.72	17.08	0.34	16.74	3757.47
9/30/10	9.24	12.75	14.79	0.30	14.50	3771.97
10/31/10	2.17	3.00	3.48	0.07	3.41	3775.37
Cycle 15 totals	225.15	310.70	360.41	7.21	353.20	3775.37

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 3422.17

ATTACHMENT F

Total Oxides Accumulated for Unit 2 and 3 OSGs
Calculated by (b)(6)

Unit 3, E089. Cycle 15 Total Oxides Accumulated (lbs of oxides).						
Month	Iron Accumulated	Magnetite Accumulated	Oxides Acumulated	Oxides Removed by Blowdown	Total Oxides Accumulated	3E089 Cycle Total
12/31/08	10.53	14.53	16.86	0.34	16.52	3420.50
1/31/09	12.60	17.39	20.17	0.40	19.77	3440.27
2/28/09	8.87	12.24	14.20	0.28	13.92	3454.18
3/31/09	11.10	15.32	17.77	0.36	17.41	3471.59
4/30/09	9.84	13.58	15.75	0.32	15.44	3487.03
5/31/09	10.53	14.53	16.86	0.34	16.52	3503.55
6/30/09	10.36	14.30	16.58	0.33	16.25	3519.80
7/31/09	10.21	14.09	16.34	0.33	16.02	3535.82
8/31/09	10.21	14.09	16.34	0.33	16.02	3551.84
9/30/09	10.30	14.21	16.49	0.33	16.16	3568.00
10/31/09	11.16	15.40	17.86	0.36	17.51	3585.50
11/30/09	10.18	14.05	16.30	0.33	15.97	3601.47
12/31/09	11.54	15.93	18.47	0.37	18.10	3619.58
1/31/10	10.30	14.21	16.49	0.33	16.16	3635.74
2/28/10	10.59	14.61	16.95	0.34	16.61	3652.35
3/31/10	6.35	8.76	10.17	0.20	9.96	3662.31
4/30/10	8.46	11.68	13.55	0.27	13.28	3675.59
5/31/10	10.94	15.10	17.51	0.35	17.16	3692.75
6/30/10	9.25	12.77	14.81	0.30	14.51	3707.26
7/31/10	9.74	13.44	15.59	0.31	15.28	3722.54
8/31/10	10.67	14.72	17.08	0.34	16.74	3739.28
9/30/10	9.24	12.75	14.79	0.30	14.50	3737.04
10/31/10	2.17	3.00	3.48	0.07	3.41	3742.69
Cycle 15 totals	225.15	310.70	360.41	7.21	353.20	3742.69

Wet Sludge removed = 0

Oxides brought forward to Cycle 15 from Cycle 14 = 3403.98

REFERENCES

1. "Liquid Holdup Tanks" Licensing Control Specification 3.7.110
2. Nuclear Engineering Change Package 800175654
3. OSG Segmentation Plan
4. Health Physics Original Steam Generator Segmentation Plan dated 2/9/2011
4a. Health Physics Original Steam Generator Segmentation Plan dated 5/19/2011
5. "Final Characterization, Classification, & Shielding Analysis Report, WMG 6055-RE-121 Rev 2, May 2009"

SAN ONOFRE PROCEDURES CITED

6. SONGS Offsite Dose Calculation Manual (SO123-ODCM)
7. SO123-III-5.25, "Evaluation and Reporting of Abnormal Releases of Radioactive Material from Units 1, 2, and 3"
8. SO123-III-5.42, "Evaluation Miscellaneous Release Sources"
9. SO123-IX-2.206, "Hazardous Materials/Waste Inspections"
10. SO123-XV-2.1, "NPDES Monitoring"
11. SO123-XV-16, "Spill Prevention, Countermeasure, and Control Plan"
12. SO123-XV-17.1, "Hazardous Waste/Mixed Waste Minimization"
13. SO123-XV-17.3, "Spill Contingency Plan"
14. SO123-VII-20.16, Direct Radiation Exposure Controls and Monitoring
15. SO123-XV-29 "Disposition of Plant-Generated Liquid Waste"
16. SO123-GPI-1, "Ground Water Protection Initiative"
17. SO123-XV-3.5, "Ground Water Protection Initiative Voluntary Communication Protocol"

EVALUATION CHECKLIST

1. Description of change including document number.

This evaluation applies to San Onofre Nuclear Generating Station Units 2 & 3, Steam Generator Replacement Project, OSG Segmentation Plan to segment the OSG and properly dispose of the resulting wastewater and solid waste in accordance with applicable requirements and regulations.

2. Does this change adversely affect the method of deriving monitor setpoints?

Response NO, there are no changes to any method to derive monitor setpoints and effluent radiation monitors will continue to be used to ensure compliance with all regulatory requirements.

3. Does this change adversely affect the isotopic concentration limits on liquid effluents conforming to 10CFR20 Appendix B, Table II, Column 2?

.Response NO, there are no changes to isotopic concentration limits on liquid effluents.

4. Does this change adversely affect the annual or quarterly dose limits on liquid effluents?

Response NO, there will be no significant increase in radioactive liquid releases as a result of the planned activities."

5. Does this change modify the frequency requirement to calculate dose or to generate the 31 day dose projection?

Response NO, doses due to radioactive effluents from SONGS will continue to be calculated and the 31 day dose projection will continue to be performed at the current frequency

6. Does this change adversely affect the dose rate limits associated with the isotopic concentration limitations on gaseous effluents conforming to 10CFR20 Appendix B, Table II, Column 1?

Response NO, there are no changes to the dose rate limits associated with the isotopic concentration limitations on gaseous effluents.

7. Does this change adversely affect the annual or quarterly dose limits on gaseous effluents?

Response NO, there are no changes to the annual or quarterly dose limits on gaseous effluents

8. Does this change adversely affect the annual or quarterly dose limits from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents?

Response NO, there are no changes to the annual or quarterly dose limits from I-131, I-133, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents. There will be no significant increase in radioactive gaseous releases, including tritium, as a result of the planned activities."

9. Does this change adversely affect the annual total dose limits conforming to 40CFR190?
Response NO, there are no changes to the annual total dose limits conforming to 40CFR190.

10. Does this change conflict with the requirements of:
(a) NUREG 0133?

Response NO, there is no conflict with the requirements NUREG 0133. The effluent control program will continue to be implemented and all regulatory requirements will continue to be met.

(b) IE Bulletin 80-10?

Response NO, there is no conflict with the requirements IE Bulletin 80-10

11. Does this change adversely affect the Effluent program such that resultant doses or Curies will no longer be ALARA?

Response NO, this change does not adversely affect the Effluent program such that resultant doses or Curies will no longer be ALARA. Radioactive liquid and gaseous effluents resulting from these work activities are not projected to increase significantly and will have little or no impact on resultant doses to a member of the public.

12. Does this change adversely affect the ODCM instrumentation's reliability or functional capability, including surveillance tests and component design?

Response NO, this change does not adversely affect the ODCM instrumentation's reliability or functional capability, including surveillance tests and component design.

13. Does this change adversely affect the monitoring, sampling, or analysis methodology or frequencies of liquid or gaseous effluent as detailed in the ODCM?

Response NO, there are no changes to the monitoring, sampling, or analysis methodology or frequencies of liquid or gaseous effluent as detailed in the ODCM. Radioactive liquid and gaseous releases resulting from these work activities will be performed in accordance with all of the existing requirements of the ODCM.

14. Does this change adversely affect the functional capability of the gaseous or liquid radwaste effluent treatment system?

Response NO, this change does not adversely affect the functional capability of the gaseous or liquid radwaste effluent treatment system.

15. Does this change adversely affect or conflict with the guidance given in Reg. Guide 1.21?

Response NO, this change does not adversely affect or conflict with the guidance given in Reg. Guide 1.21. SCE will continue to monitor, control, and report radioactive releases in accordance with Reg Guide 1.21.

16. Does this change adversely affect any regulatory direction or guidance in the ODCM not specifically mentioned above?

Response NO, this change does not adversely affect any regulatory direction or guidance in the ODCM not specifically mentioned above.

CONCLUSION:

Dose and Curies

The segmentation of the OSGs from Units 2 and 3 is not expected to result in a release of airborne radioactive material, including particulate matter and tritium, due to contamination control measures taken. Similarly, wastewater releases from these work activities is not expected to contain licensed material. Using the highest sample result for steam generator blowdown during the six months preceding the cycle 16 outages, 2.8E-3 curies of 3H could be released with an associated dose to a member of the public of 1.9E-6 mRem.

Direct dose calculations and actions to mitigate the direct dose to a member of the public due to radiation exposure during OSG segmentation activities are found in Reference 4. A constant or average dose rate of 10 microR/hr at the west seawall (occupancy factor of 300 hrs) is required in order to meet the stations ALARA goal of 4 mrem per year as required in SO123-VII-20.16. HP will also control access to the areas, particularly during removal of the steam dome and installation of the shielding cap for shipment. Direct dose to the public at the beach will be measured using TLDs 55 and 56 and will be accounted for in the Annual Radioactive Effluent Release Report.

In the event that a steam generator tube containing residual RCS is nicked during segmentation, a conservative estimate of the maximum amounts of licensed material that could be released during the proposed work activities are:

- 1.9E-3 Ci of gaseous tritium and 3.2E-4 Ci of gaseous ^{60}Co with a total organ dose of 7.8E-3 mrem

- Estimated maximum liquid curies released of 3.5E-2 curies with 4.5 E-2 mrem total body and 3.8 E-1 mrem organ (GI-LLI)

Ground water - The multiple spill prevention and containment measures described provides reasonable assurance that waste water being collected in any of the equipment or that comes into contact with the sealed surface cannot credibly reach the subsurface soil or ground water. In the unlikely event that a spill or leak of water occurs, administrative measures such as the WIPR (Attachment A of work package 25221-003-M0P-0057-0001-000) have been implemented to ensure that the voluntary communication requirements of the industry Ground Water Protection Initiative are met.

SCE will continue to meet all regulatory requirements for the control and release of liquids and gaseous discharges from the site that might occur during the OSG segmentation process to dispose of the OSGs. Any resultant releases of wastewater and airborne material are projected to be incremental and well below the regulations and will be reported in the Annual Radioactive Effluent Release Report. There will be no significant dose to a member of the public due to the proposed work activities.

Performed By: (b)(6) Date: 20 May, 2011

Peer Reviewed By: (b)(6) Date: 20 May, 2011

Greene, Natasha

From: Carson, Louis
Sent: Tuesday, June 07, 2011 6:42 AM
To: Shepherd, James
Cc: Greene, Natasha
Subject: FW: SONGS - - S/G Segmentation, 50.59 evaluations/screenings, DSAR & UFSAR changes
Attachments: ASC_20D0044582_20Final_20Signed.pdf; UFSAR 11.4 ACN D0044657.pdf; DSAR Section 1.0 ACN D0044659.pdf; 10 CFR 50.59doc.doc

Importance: High

Hi Jim:

As the SONGS Unit-1 Project Mgr., was the licensee suppose to process any paper thru you for the change in the Unit-1 Site usage??

SONGS Units 2-3 took over the far NW section of the Unit-1 Industrial site to store, stage, and dismantle (cutup) for shipment to Utah decommissioned steam generators. Basically, they took an area of the site that had been decommissioned (not released from the license??) and established it as a Radioactive Materials Storage Area, Hi-Rad Area, and Solid Radwaste Processing Area.

We have Unit 2-3 inspectors onsite this week, and they will be looking into the dismantlement work, although it's at Unit-1.

Th'X
Jim

From: (b)(6)
Sent: Friday, May 27, 2011 5:38 PM
To: Carson, Louis
Cc: (b)(6)
Subject: SONGS - - S/G Segmentation, 50.59 evaluations/screenings, DSAR & UFSAR changes

Louis,

Here are the other relevant documents and evaluations for the S/G Replacement activities, which included Segmentation.

1. OSG NECP 800074957 which described the 50.59 SCN performed and concluded that the proposed activities have no adverse effects (See Page 2 in document or previous screen in SAP Operation 800074957-0020).

<---- Here is the Original 50.59 (the Word document)

2. The UFSAR changes in Record D0044657.

C 18
2/11

3. The DSAR Changes in Record D0044659.

(b)(6)

Ex 6

From: Carson, Louis
To: Greene, Natasha
Subject: FW: SONGS - - - Effluent Evaluation for S/G Segmentation
Date: Tuesday, June 07, 2011 8:44:07 AM
Attachments: OSGsegmentationEOE 5-19 2011 rev 2.doc
Importance: High

Tasha:

This is significant.

Louis

(b)(6)

From: [redacted]
Sent: Friday, May 27, 2011 5:17 PM
To: Carson, Louis
Cc: (b)(6)
Subject: SONGS - - - Effluent Evaluation for S/G Segmentation

I've been working on getting copies of the Effluent Evaluation (below) and the 50.59 reviews - - - I will be sending the 50.59 reviews in separate email.

As the work progresses, we have determined that was necessary to make slight adjustments to the Effluent Evaluations. We had hoped that the Steam Dome shell would
survey out as clean, but we are finding 20-50 ncpm/frisker probe area over much of the shell. We are going to attempt to abrasively decon a specimen of the shell (the underwater
diver access hole that we cut out at the start of this job) and track the man-hours/cost. Therefore, we had to evaluate both the thermal cutting and the decon of the shell.

D/12
19

Greene, Natasha

From: Carson, Louis
Sent: Tuesday, June 07, 2011 8:45 AM
To: Greene, Natasha
Subject: FW: SONGS - - S/G Segmentation pictures
Attachments: DSC00221.JPG; DSC00224.JPG; DSC00242.JPG

FYI:

From: (b)(6)
Sent: Friday, May 27, 2011 5:07 PM
To: Carson, Louis
Cc: (b)(6)
Subject: SONGS - - S/G Segmentation pictures

Louis,

I thought you might like to see some progress pictures of what we have been doing in the U-1 yard. This evolution occurred last Saturday (5-21-11). We had a Tech on the beach with a micro-Rem meter during the entire evolution and only saw an increase of 20 uRem/hr.

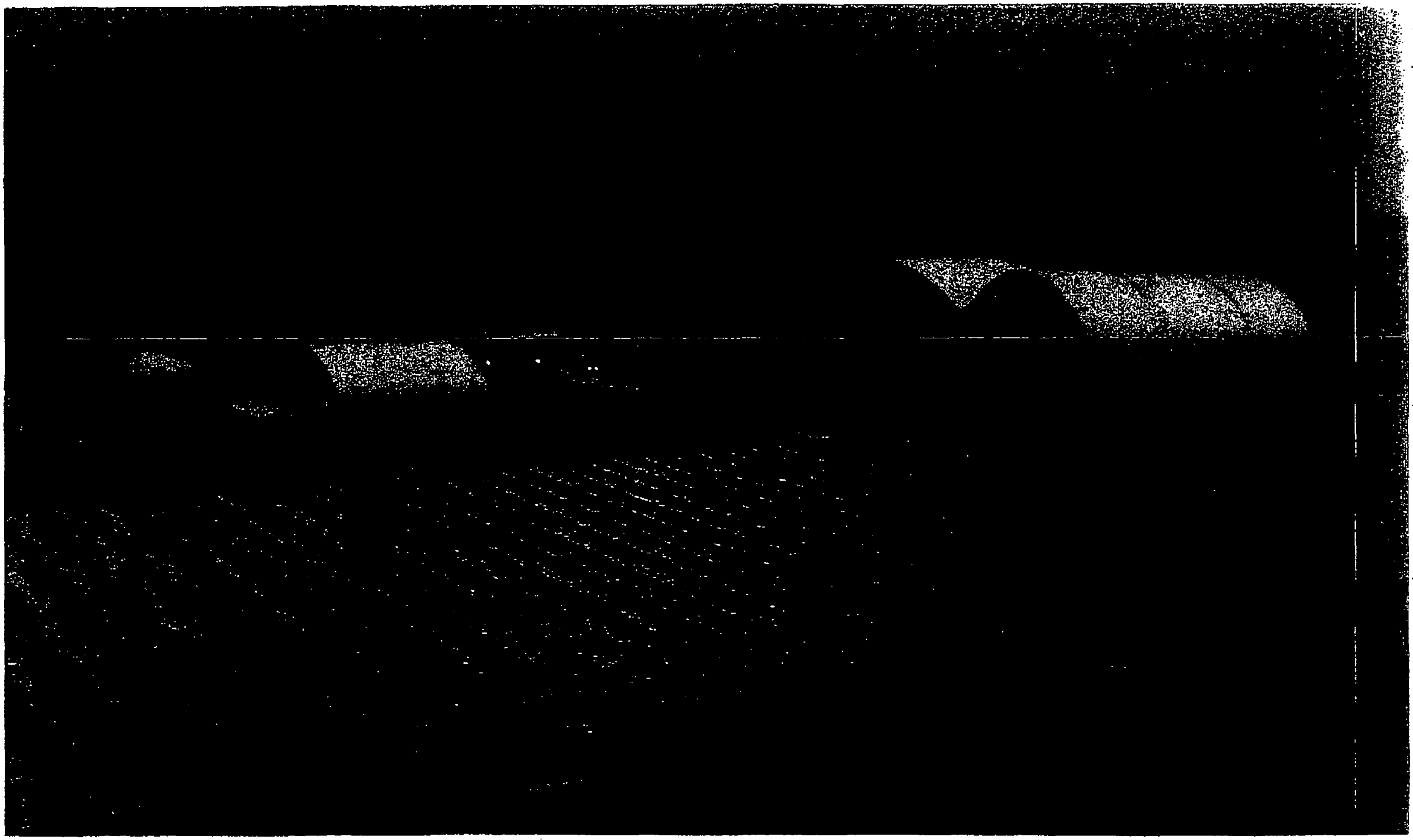
Steam Dome being pulled away from the lower assembly (@ 10 feet of the Tube Bundle and baffle extend out of the S/G shell)

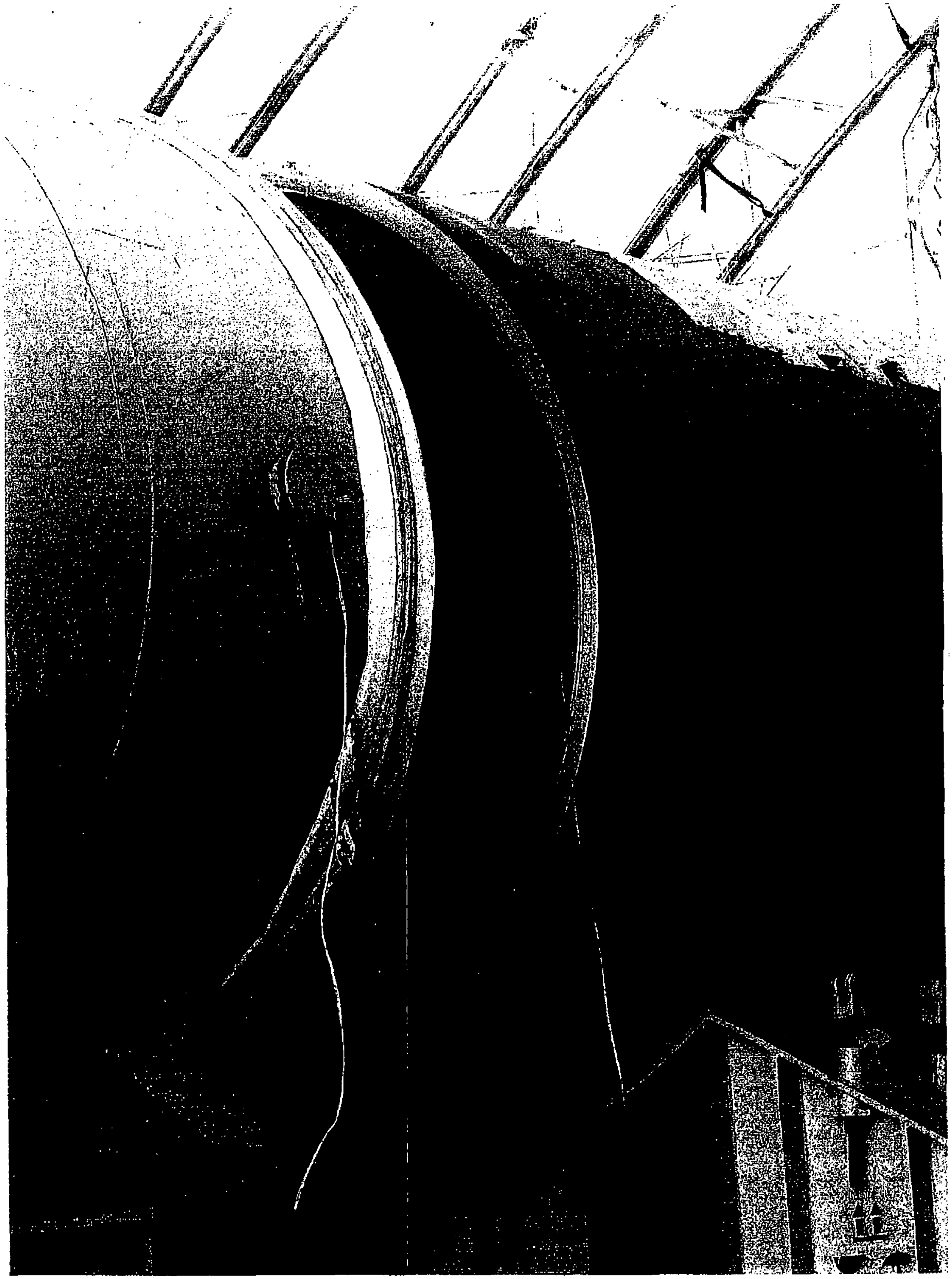
Contact with the face of the tube bundle was 1.6 Rem/hr, 800 mr/hr at 30 cm, 8 mr/hr at 50', 2 mr/hr at 100'

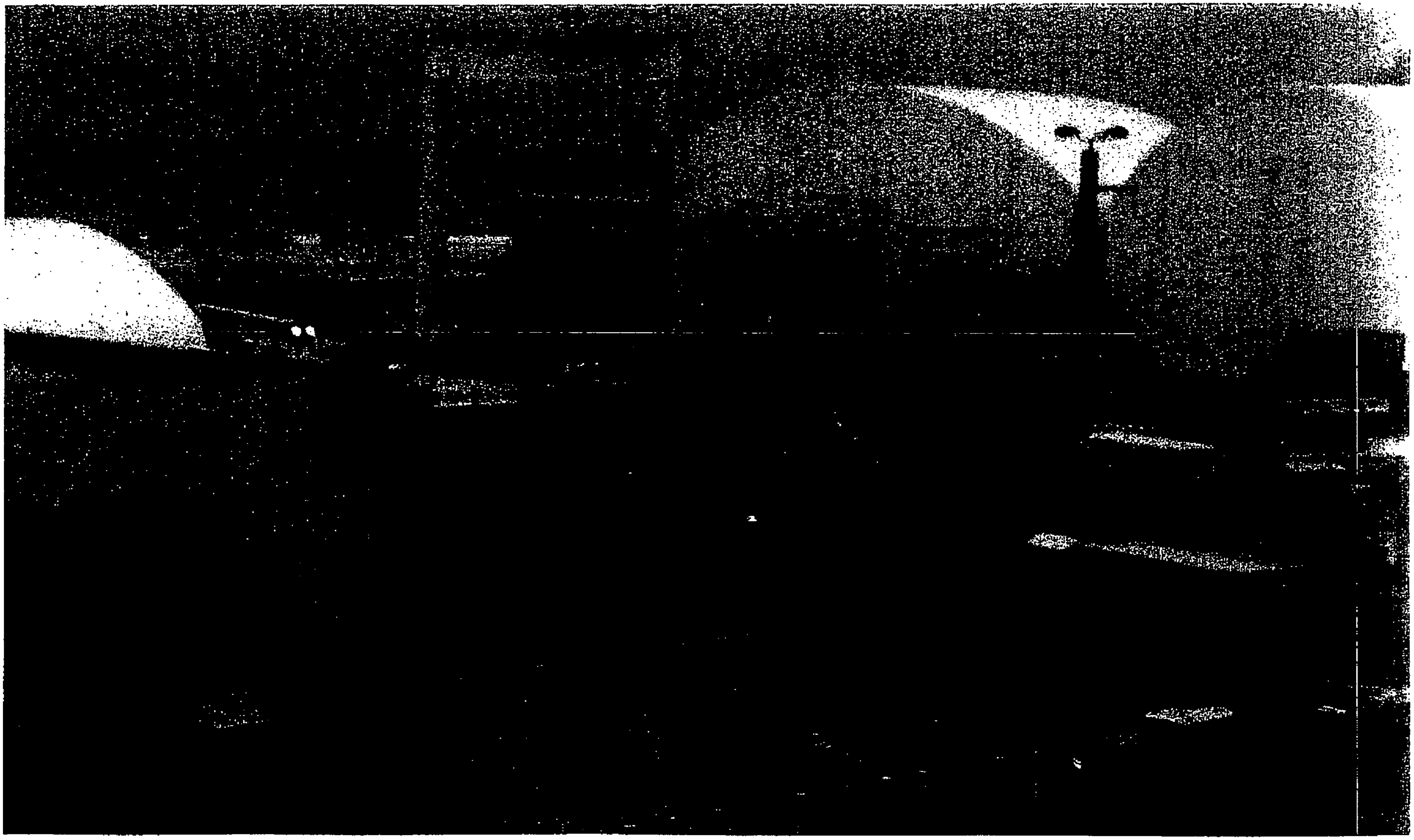
Steam Dome off and in the yard, the Transportation Cap staged and ready to move in:

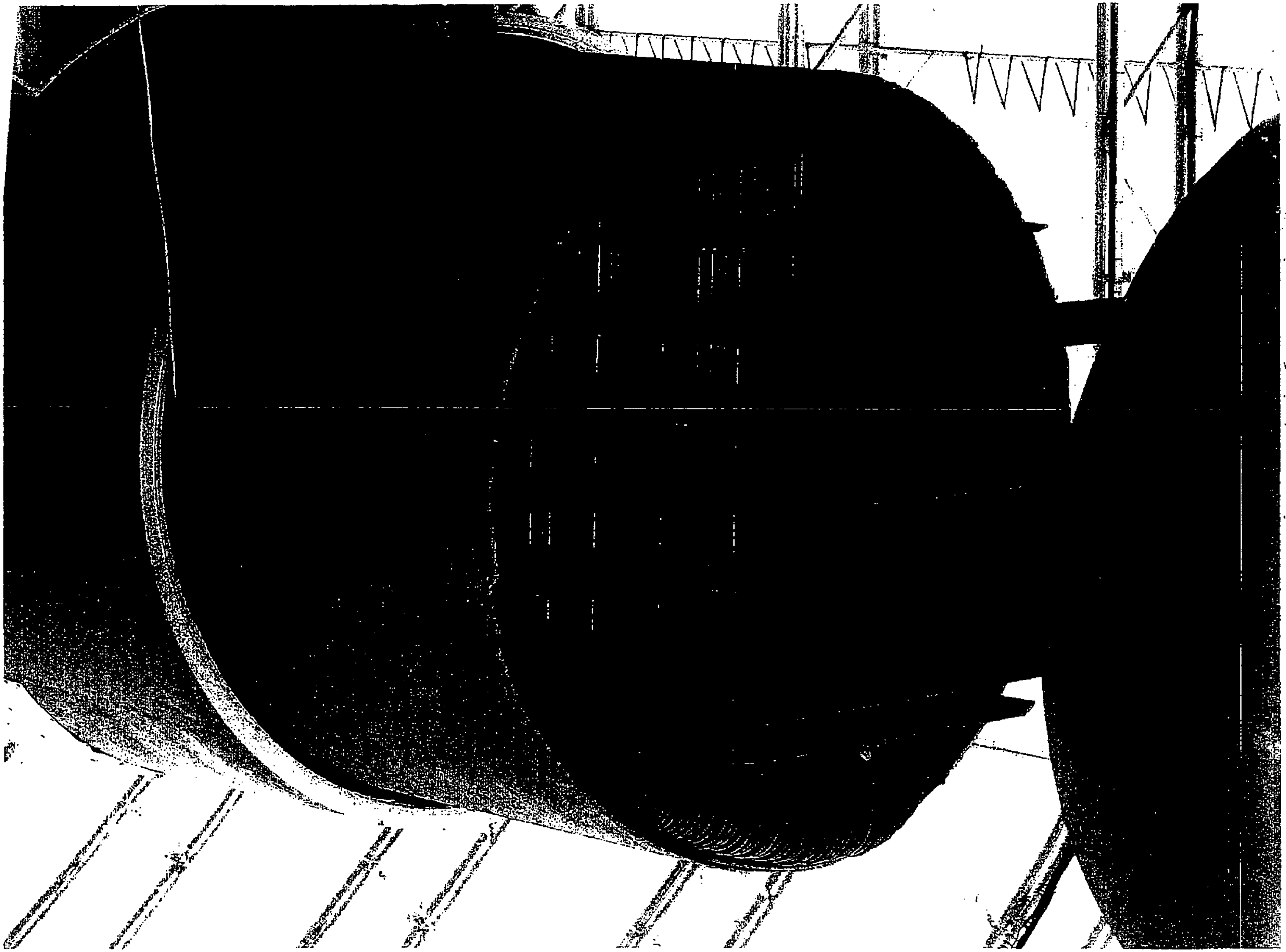
Transportation Cap being installed over the tube bundle/baffle

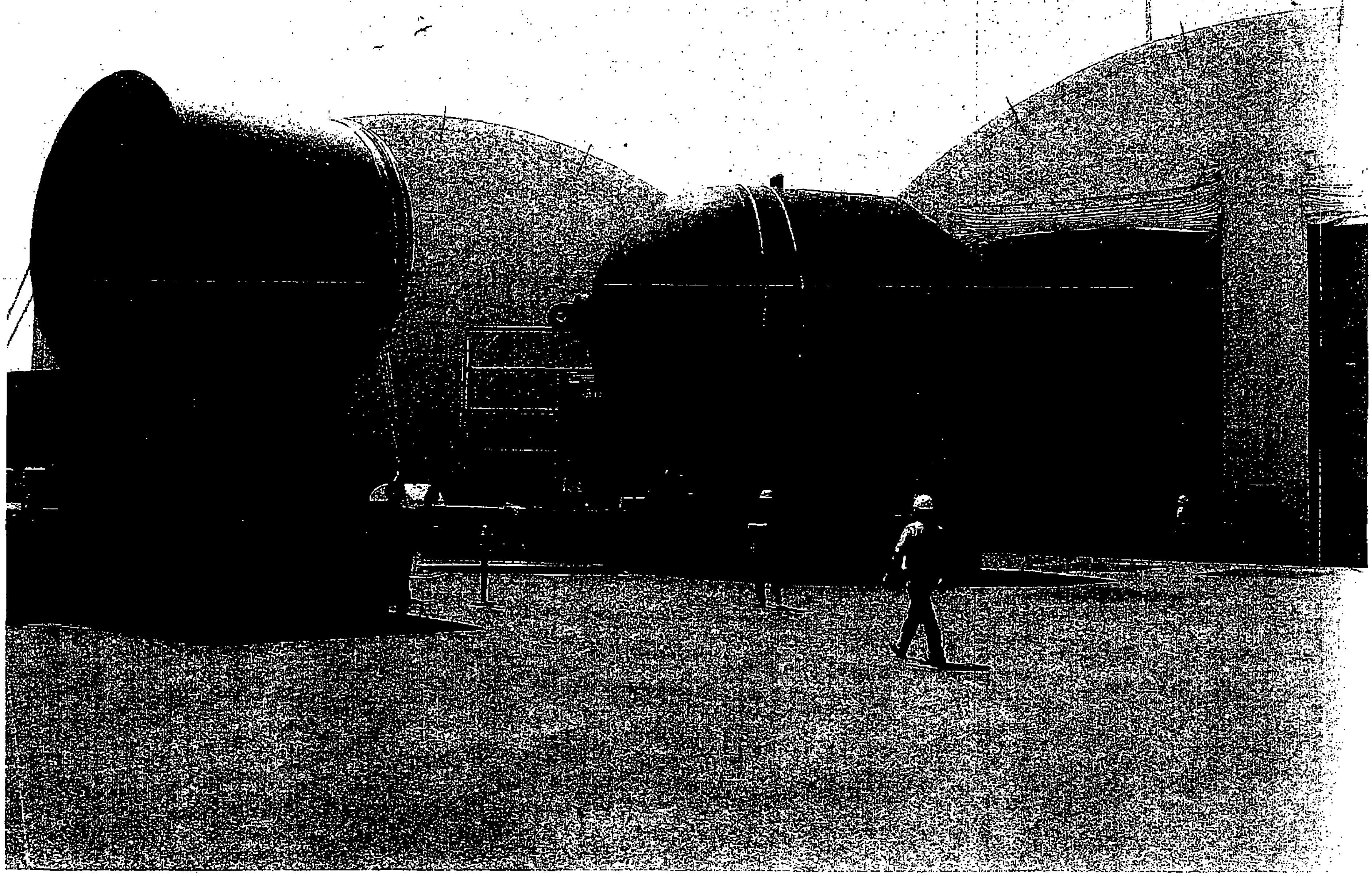
D/13
20











From: (b)(6)
To: Anchondo, Isaac
Cc: (b)(6)
Subject: NRC ISI Inspection data request-Steam Generator
Date: Thursday, January 05, 2012 9:05:58 PM
Attachments: SG Tubing Inservice Inspection Program and Plan SONGS2 12-19-11.docx
03-9101495-01 AREVA Data Analysis GL for SONGS.pdf
SONGS2-SG Site Validated Eddy Current Technique Sheets.pdf
Report-Focused Assessment-SG Program 2011 7-19-11 w sigs.pdf

Issac, below is the data you requestec for the SG portion of your ISI Inspection. I'll upload the information to IMS. Let me know if you have any questions or need clarification.

(b)(6)
Inspections Manager
Nuclear Regulatory Affairs
San Onofre Nuclear Generating Station
(b)(6)

A.4 Steam Generator Tube Inspections

a) A detailed schedule of:

i) Steam generator tube inspection, data analyses, and repair activities for the upcoming outage.
January 27 thru February 4, with repair if needed on February 5

ii) Steam generator secondary side inspection activities for the upcoming outage. (If occurring)
Foreign Object Search and Retrieval (FOSAR) in the tubesheet region - January 29 on one Steam Generator and February 1 on the other Steam Generator.

b) Please provide a copy of your steam generator inservice inspection program and plan.

The attached file is the steam generator inservice inspection program and plan.

Please include a copy of the operational assessment from last outage and a copy of the following documents as they become available:

i) Degradation assessment
ii) Condition monitoring assessment

Operational Assessment from the last outage is not applicable because this will be the first inservice inspection. The other 2 documents should be available while the NRC inspector is onsite.

c) If you are planning on modifying your Technical Specifications such that they are consistent with Technical Specification Task Force Traveler TSTF-449, "Steam Generator Tube Integrity," please provide copies of your correspondence with the NRC regarding deviations from the standard technical specifications.

Not Applicable.

d) Copy of steam generator history documentation given to vendors performing eddy current testing of the steam generators during the upcoming outage.

D/14 (21)

Not provided separately. Provided in item b) Degradation Assessment and item e) Data Analyst Guideline.

e) Copy of steam generator eddy current data analyst guidelines and site validated eddy current technique specification sheets. Additionally, please provide a copy of EPRI Appendix H, "Examination Technique Specification Sheets," qualification records.

This attached file is the data analyst guideline.

This attached file is the site validated eddy current technique specification sheets.

f) Identify and quantify any steam generator tube leakage experienced during the previous operating cycle. Also provide documentation identifying which steam generator was leaking and corrective actions completed or planned for this condition (If applicable).

Not Applicable.

g) Provide past history of the condition and issues pertaining to the secondary side of the steam generators (including items such as loose parts, fouling, top of tube sheet condition, crud removal amounts, etc.)

Nothing applicable because this is the first inservice inspection of these replacement steam generators.

h) Provide copies of your most recent self assessments of the steam generator monitoring, loose parts monitoring, and secondary side water chemistry control programs.

This attached file is the most recent self assessment of the steam generator program (that includes the requested topics).

i) Indicate where the primary, secondary, and resolution analyses are scheduled to take place.

Primary: Onsite
Secondary: Offsite at ANATEC facility in San Clemente, CA
Resolution: Onsite

j) Provide a summary of the scope of the steam generator tube examinations, including examination methods such as Bobbin, Rotating Pancake, or Plus Point, and the percentage of tubes to be examined. Do not provide these documents separately if already included in other information requested.

Already included in other requested information.

##

A.5 Additional information related to all ISI activities

a) A list with a brief description of inservice inspection, boric acid corrosion control program, and steam generator tube inspection related issues (e.g., condition reports) entered into your corrective action program since the beginning of the last refueling outage (for Unit 2). For example, a list based upon data base searches using key words related to piping or steam generator tube degradation such as: inservice inspection, ASME Code, Section XI, NDE, cracks, wear, thinning, leakage, rust, corrosion, boric acid, or errors in piping/steam generator tube examinations.

None for steam generator tube inspection.

SCOPE/PROGRAM DESCRIPTION: The scope of this Focused Assessment was review of all elements of the San Onofre Nuclear Generating Station (SONGS) Steam Generator (SG) Program. The scope included following SONGS Procedure SO123-XV-SA-1, titled "Focused Assessment Process". This Focused Assessment was specifically scheduled after completion of Steam Generator Replacement at Units 2 and 3 for the most meaningful focus toward the site's future. Key Elements of the program are managed by Plant Engineering and Chemistry. The Assessors were internal. Similar external assessment will be done during a September 2011 Institute of Nuclear Power Operations (INPO) SG Review Visit at SONGs, which will add to this internal Focused Assessment.

The purpose of the Steam Generator (SG) Program is to ensure tube integrity. The program contains a balance of:

- Prevention (including chemistry control),
- Inspection,
- Evaluation and repair, and
- Leakage monitoring measures

This program is an industry-wide practice because Technical Specifications require Pressurized Water Reactor licensees to have a Steam Generator Program. A Nuclear Energy Institute (NEI) guideline, with referenced Electric Power Research Institute (EPRI) guidelines, provides detailed requirements, guidance, and technical bases for the program.

OBJECTIVES: The objectives included:

1. Assessing overall performance relative to requirements and guidance
2. Verifying that program addresses requirements
3. Verifying program performance standards reflect best industry practices
4. Assessing effectiveness of ongoing program monitoring.
5. Status of previously-identified areas for improvement (in the 2006 INPO SG Review Visit at SONGS and the corresponding 2008 Effectiveness Review)

ASSESSMENT TEAM:

Name	Organization	Functions	Objectives
(b)(6)	Plant Engineering	Assessor and Coordinator	1 - 5 (All Plant Engineering elements)
	Chemistry	Lead Assessor	1 - 4 (Chemistry elements)
	Chemistry	Assessor	1 - 4 (Secondary Chemistry element)
	Chemistry	Assessor	1 - 4 (Primary Chemistry element)
	Chemistry	Assessor	1 - 4 (Leakage Monitoring

(b)(6)			element)
	Plant Engineering (consulted with Maintenance & Construction Services)	Assessor	1 - 4 (Foreign Material Exclusion element)

Team members qualifications include technical expertise and assessment skills.

Team members verified their qualifications prior to performance of the task. SO123-XV-SA-1, Focused Assessment Section 6.2.3.1 requires Assessors qualified to at least ENCODE ASSESR. Section 6.2.3.2 requires Lead Assessor is qualified to Encode LEDASR or NOADA1.

ASSESSMENT:

The SONGS Steam Generator Program Site Order SO23-SG-1, Attachment 10, Requirements 2, 2nd bullet recommends that SONGS Focused Assessments use the INPO document containing performance standards, assessment methods, and checklists for INPO Steam Generator Review Visits. This INPO document was downloaded from the INPO website on April 1, 2011 and was Attachment (1) to the Plan for this Focused Assessment. Attachment (1) to the Plan addressed Objectives 1 through 4 of this plan. Additionally, the most recent INPO annual summary (currently 2009) of INPO Steam Generator Review Visit Beneficial Practices and Recommendations was reviewed for completeness. Note that Attachment (1) to the Plan is not included in this Report because it is 22 pages.

Performance Standards: Site Order SO23-SG-1, Steam Generator Program, Section II-References contains the approximately 2 page listing of performance standard references. Attachment (1) to the Plan for this Focused Assessment addressed these and also addresses industry expectations and best practices.

Assessment Method: Attachment (1) to the Plan for this Focused Assessment addressed this.

Previously Identified Areas for Improvement: This is Objective 5 of this plan. The applicable organization (Plant Engineering) reviewed the INPO Report for the SONGS Steam Generator Review Visit dated September 12, 2006, corresponding SONGS Action Request Number 060901124 and corresponding Effectiveness Review in SONGS NN 200006632 and Order 800074255.

References:

1. Site Order SO23-SG-1, Steam Generator Program, Section II-References contains the approximately 2 page listing of references.

2. INPO Annual Summary of Steam Generator Review Visit Beneficial Practices and Recommendations (most recent, downloadable from INPO website)
3. INPO Report for the SONGS Steam Generator Review Visit dated September 12, 2006, corresponding SONGS Action Request Number 060901124 and corresponding Effectiveness Review in SONGS NN 200006632 and Order 800074255.
4. Site Order SO123-PM-1, Program Management
5. Site Order SO123-SA-1, Self Assessment Order
6. Procedure SO123-XV-SA-1, Focused Assessment Process (Note that consistency with this procedure was maintained when Revision 2 was issued during this assessment.)

Key Personnel Contacted:

(b)(6) Supervisor, Chemistry, Effluents)
(b)(6) (Chemistry, Effluents)
(b)(6) Supervisor, Chemistry)
(b)(6) Systems Engineering, Primary Systems-Mechanical, Steam Generators)
(Chemistry)
(b)(6) (Chemistry)
(b)(6) Supervisor, Systems Engineering, Primary Systems-Mechanical)
(Manager, Projects, Maintenance & Construction Services)

Results:

Strengths:

(1) Inspection Element: SONGS uses an on-site SG mockup facility extensively for new equipment trials and training. The facility was highly engineered by the SG manufacturer (e.g., 5 design drawings and 80 fabrication drawings) to provide confidence that new equipment trial results are applicable to the actual SGs installed in Units 2 and 3. This has resulted in successful trial and smooth plant implementation of new Foreign Object Search and Retrieval (FOSAR) remotely-operated equipment through handholes during the preservice inspections. The mockup includes the primary sides (including a section of tubes extending several feet above the tubesheet). The mockup includes a handhole, with the applicable adjacent geometries of the peripheral region between the tubes and vessel wall, which was vital to trial capabilities for remote visual examination of the blowdown trench adjacent to the vessel wall. The handhole region also includes tubes at the center "no-tube lane", which was vital to trial capabilities for remote visual examination "in-bundle" (within the region with tubes). The new equipment (AREVA's RANGER) that will be used for primary-side work is also scheduled to complete equipment trials to increase confidence in efficient and ALARA implementation during the first inservice inspection.

(2) Primary-Side Water Chemistry Element: SONGS implemented Reactor Coolant System Zinc Injection in Cycle 15. This was the final cycle of operation with the Original Steam Generators. Zinc injection was continued with the Replacement

Steam Generators. The main goal of this practice is to reduce radioactive corrosion products in the Reactor Coolant System and thus reduce personnel radiation exposure.

(3) Primary-Side Water Chemistry Element: SONGS pro-actively transitioned to a "Constant" pH 7.1 from a "Modified" pH 6.9 – 7.2 program in Cycles 13 and 14. Maintained lithium target at 3.5 ppm for Beginning Of Cycle operation. This was a pro-active industry guideline recommendation to reduce the potential for Primary Water Stress Corrosion Cracking of steam generator tubing.

Recommendations:

(1) Inspection Element: SONGS should task the steam generator secondary-side sludge lancing supplier with identifying tubes potentially contacted by equipment, and associated focused visual inspection. This can be coordinated by the sludge lancing supplier, that also supplies the normal secondary-side top-of-tubesheet remote visual inspection. Relevant recent industry experience is discussed in the SONGS Units 2 and 3 Cycle 17 Degradation Assessment (the Secondary Side Integrity Assessment reference). NN 201401181 Task 3 initiated for this recommendation.

(2) Primary-to-Secondary Leakage Monitoring Element: Consider proposing a plant modification for both Units to install Argon injection to the Volume Control Tank. This would provide a capability to increase Reactor Coolant System (RCS) Argon 41 activity to between 0.06 and 0.15 uCi/gm. This is a new recommendation in the DRAFT Revision 4 to the EPRI Primary-to-Secondary Leak Monitoring Guideline. This DRAFT is in final review (for utility executives approval). This would alleviate the following SONGS challenges:

- Online radiation monitor detection of a 30 gallon per day (gpd) leak or smaller is challenged if:
  - The condenser vacuum pump is in service (for Radiation Monitor 7818)
  - The condenser vacuum pump is in service and the RCS gaseous activity is <0.055 uCi/cubic centimeter (for Radiation Monitor 7870)
- Grab Sample detection of a 5 gpd leak or smaller may require a longer counting time if RCS gaseous activity is <0.055 uCi/cubic centimeter.

NN 201401181 Task 4 initiated for this recommendation.

(3) Primary-to-Secondary Leakage Monitoring Element: Consider increasing timing coordination between Chemistry calculation of 30 gpd set points for Radiation Monitors 2(3)RT-7870 and 2(3)RT-7818 and the Radiation Monitor groups 90 day functional tests in which the set points are changed in 2(3)RT-7870, 2(3)RT6753 and 2(3)RT-6759. This may decrease the time between set point calculation and

subsequent set point change. NN 201401181 Task 5 initiated for this recommendation.

(4) Secondary-Side Water Chemistry Element: Evaluate adding lead to SONGS bulk hydrazine specifications. A review of the INPO 2009 Steam Generator Review Visit recommendations identified a potential gap in SONGS bulk chemical program. The industry recommendation was for another plant to add lead (Pb) to its bulk hydrazine chemical specifications. SONGS does not have lead in its current hydrazine specifications. SONGS vendor does include lead in the Certificate of Analysis which provides the shipment's chemistry analyses and the vendor's specifications. SONGS vendor's specifications are <1 ppm "Heavy Metals as lead". NN 201401181 Task 2 initiated for this recommendation.

Conclusion:

The Focused Assessment Objectives were met. There were no significant findings (deficiencies), however there were several Strengths and Recommendations. There is satisfactory status of previously-identified areas for Improvement (in the 2006 INPO SG Review Visit at SONGS and corresponding 2008 Effectiveness Review). The overall conclusion of this Focused Assessment is that the SONGS Steam Generator Program meets expectations.

Prepared by: (b)(6)

Reviewed by: (b)(6)

(b)(6)

Approved by: (b)(6) Engineering-Mechanical

Approved by: (b)(6) Chemistry July 19, 2011

All tubes will be examined full length (TEH-TEC) using the bobbin coil technique. Tubes which cannot be inspected with a 0.610 bobbin probe will be examined with a rotating coil probe in the area of the restriction.

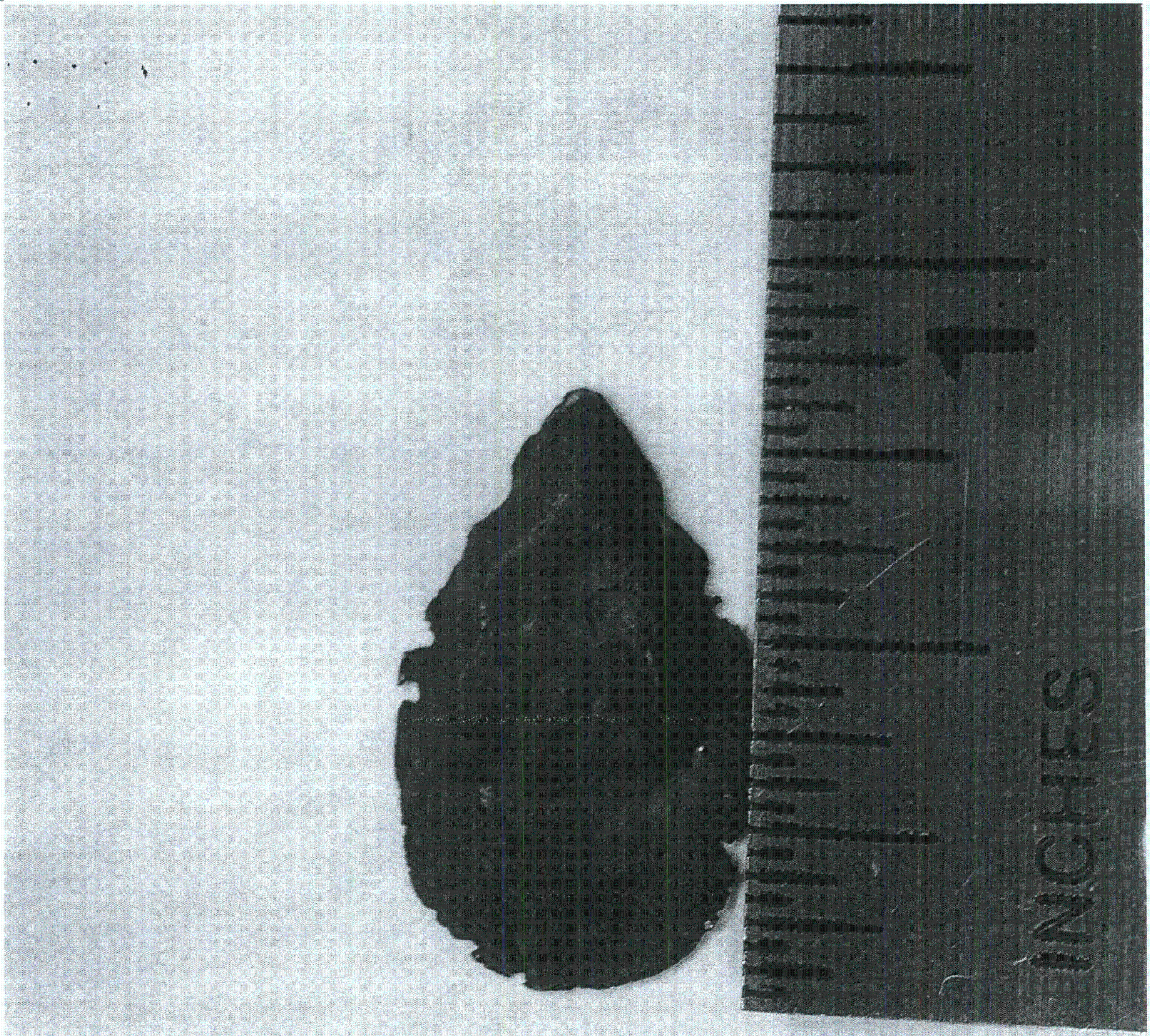
Special interest examinations of selected bobbin codes will be performed using the rotating coil techniques. Planned locations to be inspected include:

- I-codes : DNI, DSI, DTI, LPI, NQI (estimated 10 locations per SG)
- DNT, DNG ≥ 2.00 volts (including PSI calls: SG 88 - 4 locations; SG 89 - 2 locations)
- PLP (including PSI calls: SG 88 – 1 tube location, plus the 18 tubes in a 2-tube bounding pattern)
- PVN (using a mag bias rotating coil probe)
- Historical (Pre-Service Exam) bobbin codes. NQI, BLG, MBM and PVN

Note that visual inspection of the secondary-side top-of-tubesheet region will also be performed. This is commonly referred to as Foreign Object Search and Retrieval (FOSAR).

(b)(6)

Ex 6



ATTACHMENT
21 A

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	1	1	04C	-0.5	12		
SG88	1	1	05C	-0.57	11		
SG88	1	13	05H	-0.07	10		
SG88	1	13	06H	-0.27	10		
SG88	1	47	06C	0.39	11		
SG88	12	48	04C	-0.58	11		
SG88	14	168	04H	0	7		
SG88	28	4	05H	0.41	13		
SG88	80	72	06H	-0.71	10		
SG88	84	100	05C	-0.63	10		
SG88	85	85	07H	-0.8	17	16	
SG88	85	87	07H	-0.59	19		
SG88	85	89	07H	-0.63	14		
SG88	85	99	06C	-0.5	14		
SG88	87	81	07C	-0.55	10	13	
SG88	87	99	05C	-0.59	11		
SG88	87	99	07C	-0.52	17		
SG88	88	94	07C	-0.57	17		
SG88	88	94	07H	-0.63	14		
SG88	88	96	07H	-0.68	17	12	
SG88	89	85	07H	-0.79	10	6	
SG88	89	91	07H	-0.61	15		
SG88	89	95	07H	-0.61	19		
SG88	89	105	06C	-0.56	11		
SG88	90	96	07C	-0.57	16		
SG88	91	79	07H	0	17	14	
SG88	91	81	07H	-0.72	17	15	
SG88	91	83	05C	-0.13	7		
SG88	91	83	06C	-0.02	8		
SG88	91	83	07C	-0.11	17	19	
SG88	91	85	06C	-0.06	10		
SG88	91	85	07C	-0.06	15	16	
SG88	92	74	06H	-0.63	11		
SG88	92	78	07H	-0.17	14	12	
SG88	92	84	05C	-0.13	20	19	
SG88	92	84	05H	-0.04	9		
SG88	92	84	06C	-0.09	25	24	
SG88	92	84	06H	0	20	19	
SG88	92	84	07C	-0.13	35	31	
SG88	92	84	07H	-0.15	32	28	
SG88	92	86	06C	0	16		
SG88	92	86	07C	-0.6	14	14	
SG88	92	88	07H	-0.7	10	13	
SG88	92	90	04C	-0.64	7		
SG88	92	96	05C	-0.52	11		

B

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	92	96	06C	-0.5	18	22	
SG88	92	96	07C	-0.59	21	20	
SG88	93	73	07H	-0.57	9		
SG88	93	75	07H	-0.66	12	9	
SG88	93	77	07H	-0.83	8		
SG88	93	81	06C	0	18		
SG88	93	81	07C	-0.17	16	16	
SG88	93	81	07H	0	14	7	
SG88	93	83	02C	0.37	17		
SG88	93	83	03C	0	19		
SG88	93	83	03H	0	21	17	
SG88	93	83	04C	0	18		
SG88	93	83	05C	0	26	21	
SG88	93	83	05H	-0.63	23	19	
SG88	93	83	06C	0	31	23	
SG88	93	83	06H	0	39	38	1.44
SG88	93	83	07C	0	47	41	1.5
SG88	93	83	07H	0	54	51	1.15
SG88	93	85	03C	0	17		
SG88	93	85	03H	0.43	17		
SG88	93	85	04C	-0.59	12		
SG88	93	85	05C	0	20	22	
SG88	93	85	05H	0	24	16	
SG88	93	85	06C	0	37	31	
SG88	93	85	06H	0	39	37	
SG88	93	85	07C	0	49	41	1.49
SG88	93	85	07H	0	40	34	
SG88	93	87	05C	-0.59	11		
SG88	93	87	07H	-0.69	12	7	
SG88	93	93	05C	-0.57	12		
SG88	93	93	07C	-0.59	16	18	
SG88	94	74	07H	-0.64	8		
SG88	94	78	07H	-0.64	19	18	
SG88	94	80	04C	-0.68	10		
SG88	94	80	04H	-0.56	13		
SG88	94	80	05H	0.37	10		
SG88	94	80	06C	0	16		
SG88	94	80	07C	0	20	20	
SG88	94	80	07H	-0.15	26	17	
SG88	94	82	04C	0	23	24	
SG88	94	82	04H	-0.57	12		
SG88	94	82	05C	0	27	26	
SG88	94	82	05H	0	32	22	
SG88	94	82	06C	0	31	27	
SG88	94	82	06H	0	36	25	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	94	82	07C	0	50	40	1.52
SG88	94	82	07H	0	38	30	
SG88	94	84	03C	-0.09	20	21	
SG88	94	84	03H	0.41	16		
SG88	94	84	04C	0	22	20	
SG88	94	84	05C	0	31	23	
SG88	94	84	05H	-0.09	22	17	
SG88	94	84	06C	0	46	40	1.39
SG88	94	84	06H	0	47	50	1.42
SG88	94	84	07C	0	50	41	1.48
SG88	94	84	07H	0	57	49	1.43
SG88	94	86	04C	-0.59	13		
SG88	94	86	04H	-0.59	11		
SG88	94	86	05C	0.38	11		
SG88	94	86	05H	0	14		
SG88	94	86	06C	0.02	26	23	
SG88	94	86	06H	0	26	23	
SG88	94	86	07C	0	33	27	
SG88	94	86	07H	0	32	29	
SG88	94	88	05C	-0.53	10		
SG88	94	94	07C	-0.57	15		
SG88	94	106	07H	-0.72	10		
SG88	95	75	07H	-0.66	14	10	
SG88	95	79	04H	-0.56	12		
SG88	95	79	06C	0	18		
SG88	95	79	06H	-0.66	25	24	
SG88	95	79	07C	0	26	25	
SG88	95	79	07H	0	31	24	
SG88	95	81	03C	-0.6	9		
SG88	95	81	03H	0	14		
SG88	95	81	04C	0	20	20	
SG88	95	81	04H	-0.55	18		
SG88	95	81	05C	0	21	24	
SG88	95	81	05H	0	18		
SG88	95	81	06C	0	31	33	
SG88	95	81	06H	0	36	35	1.43
SG88	95	81	07C	0	50	45	1.54
SG88	95	81	07H	0	47	36	
SG88	95	83	01H	0	25	26	
SG88	95	83	03C	-0.02	19		
SG88	95	83	03H	0.06	31	26	
SG88	95	83	04C	-0.06	21	21	
SG88	95	83	04H	-0.06	20	19	
SG88	95	83	05C	-0.13	30	28	
SG88	95	83	05H	-0.06	24	21	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	95	83	06C	-0.13	34	35	
SG88	95	83	06H	0	44	43	1.5
SG88	95	83	07C	0	56	48	1.57
SG88	95	83	07H	0	62	53	1.55
SG88	95	85	01H	-0.44	18		
SG88	95	85	03C	-0.11	12		
SG88	95	85	03H	0	19		
SG88	95	85	04C	-0.42	17		
SG88	95	85	04H	-0.59	23	21	
SG88	95	85	05C	0	17		
SG88	95	85	05H	0	25	20	
SG88	95	85	06C	0	29	29	
SG88	95	85	06H	-0.28	33	32	
SG88	95	85	07C	0	58	53	1.48
SG88	95	85	07H	0	52	39	1.12
SG88	95	87	04C	-0.42	11		
SG88	95	87	05C	-0.62	13		
SG88	95	87	06C	0	17		
SG88	95	87	07C	0	16	14	
SG88	95	89	06C	0.33	13		
SG88	95	91	07H	-0.72	12	8	
SG88	95	93	07H	-0.68	14	12	
SG88	95	95	05C	-0.52	10		
SG88	95	97	06C	-0.48	14		
SG88	95	97	07C	-0.45	13		
SG88	96	76	06H	-0.68	9		
SG88	96	80	04C	0	10		
SG88	96	80	04H	-0.57	15		
SG88	96	80	05C	0	17		
SG88	96	80	05H	0.47	12		
SG88	96	80	06C	0	24	21	
SG88	96	80	06H	-0.66	10		
SG88	96	80	07C	0	29	29	
SG88	96	80	07H	0	28	25	
SG88	96	82	01H	0	15		
SG88	96	82	03C	-0.13	13		
SG88	96	82	03H	0	19		
SG88	96	82	04C	-0.08	23	28	
SG88	96	82	04H	-0.02	19		
SG88	96	82	05C	-0.13	17		
SG88	96	82	05H	-0.02	17		
SG88	96	82	06C	-0.17	32	29	
SG88	96	82	06H	-0.26	35	35	
SG88	96	82	07C	0	53	45	1.53
SG88	96	82	07H	0	51	40	1.52

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	96	84	01H	0	23	23	
SG88	96	84	03C	-0.06	13		
SG88	96	84	03H	0	14		
SG88	96	84	04C	-0.13	21	25	
SG88	96	84	04H	0	10		
SG88	96	84	05C	0	25	23	
SG88	96	84	05H	0	20	17	
SG88	96	84	06C	-0.06	34	31	
SG88	96	84	06H	0	47	49	1.43
SG88	96	84	07C	0	51	41	1.56
SG88	96	84	07H	0	48	38	1.5
SG88	96	86	03C	0	10		
SG88	96	86	03H	0.32	11		
SG88	96	86	04C	0	15		
SG88	96	86	04H	0	16		
SG88	96	86	05C	0	16		
SG88	96	86	05H	0	16		
SG88	96	86	06C	0	28	27	
SG88	96	86	06H	-0.28	31	28	
SG88	96	86	07C	0	35	32	
SG88	96	86	07H	-0.15	37	37	
SG88	96	88	03C	-0.54	10		
SG88	96	88	04C	-0.53	13		
SG88	96	88	04H	-0.44	17		
SG88	96	88	05C	0	18		
SG88	96	88	05H	0	18		
SG88	96	88	06C	0	28	30	
SG88	96	88	06H	0	31	30	
SG88	96	88	07C	0	43	38	1.5
SG88	96	88	07H	0	45	33	
SG88	96	90	07H	-0.6	8		
SG88	97	75	07H	-0.64	15	15	
SG88	97	77	06H	-0.62	8		
SG88	97	77	07H	0	22	22	
SG88	97	79	03H	0	12		
SG88	97	79	04C	0	16		
SG88	97	79	04H	-0.57	17		
SG88	97	79	05C	0	18		
SG88	97	79	05H	0.41	16		
SG88	97	79	06C	0	30	26	
SG88	97	79	06H	-0.81	30	33	
SG88	97	79	07C	0	35	35	
SG88	97	79	07H	0	43	33	
SG88	97	81	01H	-0.48	24	25	
SG88	97	81	03C	-0.57	16		

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	97	81	03H	0	32	26	
SG88	97	81	04C	0	18		
SG88	97	81	04H	0	26	27	
SG88	97	81	05C	0	30	23	
SG88	97	81	05H	0	27	19	
SG88	97	81	06C	0	36	34	
SG88	97	81	06H	0	50	49	1.34
SG88	97	81	07C	0	72	70	1.72
SG88	97	81	07H	0	60	53	1.6
SG88	97	83	01H	-0.48	29	28	
SG88	97	83	03C	0	22	20	
SG88	97	83	03H	0	25	23	
SG88	97	83	04C	0	22	24	
SG88	97	83	04H	0	29	27	
SG88	97	83	05C	0	33	29	
SG88	97	83	05H	0	29	20	
SG88	97	83	06C	0	38	32	
SG88	97	83	06H	0	41	38	1.43
SG88	97	83	07C	0	57	49	1.4
SG88	97	83	07H	0	61	55	1.79
SG88	97	85	01H	-0.54	23	21	
SG88	97	85	03C	0	14		
SG88	97	85	03H	0	20	20	
SG88	97	85	04C	0	14		
SG88	97	85	04H	-0.52	20	18	
SG88	97	85	05C	0	26	25	
SG88	97	85	05H	0	25	18	
SG88	97	85	06C	0	38	36	
SG88	97	85	06H	0	38	33	
SG88	97	85	07C	0	45	37	
SG88	97	85	07H	0	50	45	1.59
SG88	97	87	04C	-0.15	15		
SG88	97	87	04H	0.48	12		
SG88	97	87	05C	0	24	21	
SG88	97	87	05H	0	17		
SG88	97	87	06C	0	31	26	
SG88	97	87	06H	-0.09	24	16	
SG88	97	87	07C	-0.15	39	32	
SG88	97	87	07H	0	40	28	
SG88	97	89	04H	-0.59	13		
SG88	97	89	05C	-0.57	10		
SG88	97	89	06C	0	16		
SG88	97	89	07C	0	22	18	
SG88	97	89	07H	0	16	16	
SG88	97	95	07H	-0.65	12		

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	98	74	07H	-0.68	11	9	
SG88	98	76	07H	-0.62	19	15	
SG88	98	78	04C	0.35	11		
SG88	98	78	05C	0.36	13		
SG88	98	78	05H	-0.63	13		
SG88	98	78	06C	0	22	18	
SG88	98	78	06H	-0.68	23	22	
SG88	98	78	07C	-0.63	13	13	
SG88	98	78	07H	0	27	21	
SG88	98	80	01H	-0.46	24	26	
SG88	98	80	02H	0	14		
SG88	98	80	03C	0	15		
SG88	98	80	03H	0	20	16	
SG88	98	80	04C	0	27	26	
SG88	98	80	04H	0	30	28	
SG88	98	80	05C	0	35	27	
SG88	98	80	05H	0	28	21	
SG88	98	80	06C	0	44	40	1.49
SG88	98	80	06H	0	52	51	1.4
SG88	98	80	07C	0	57	50	1.56
SG88	98	80	07H	0	67	61	1.05
SG88	98	82	01H	-0.48	24	23	
SG88	98	82	03C	-0.59	19		
SG88	98	82	03H	0	16		
SG88	98	82	04C	0	25	23	
SG88	98	82	04H	0	26	24	
SG88	98	82	05C	0	30	25	
SG88	98	82	05H	0	38	28	
SG88	98	82	06C	0	41	41	1.43
SG88	98	82	06H	0	44	43	1.49
SG88	98	82	07C	0	57	54	1.54
SG88	98	82	07H	0	57	52	1.48
SG88	98	84	02C	0.42	11		
SG88	98	84	03C	-0.15	25	27	
SG88	98	84	04C	0	21	18	
SG88	98	84	04H	-0.09	23	21	
SG88	98	84	05C	0	32	30	
SG88	98	84	05H	-0.04	20	15	
SG88	98	84	06C	-0.09	39	30	
SG88	98	84	06H	-0.11	25	13	
SG88	98	84	07C	0	53	43	1.38
SG88	98	84	07H	0	52	46	1.49
SG88	98	86	03C	0	19		
SG88	98	86	04C	-0.17	18		
SG88	98	86	04H	-0.52	23	23	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	98	86	05C	0.02	28	25	
SG88	98	86	05H	-0.07	19		
SG88	98	86	06C	0.02	38	32	
SG88	98	86	06H	0	42	45	1.35
SG88	98	86	07C	0	50	40	0.81
SG88	98	86	07H	0	48	41	0.92
SG88	98	88	03C	-0.09	17		
SG88	98	88	03H	0.43	10		
SG88	98	88	04C	-0.59	18		
SG88	98	88	04H	-0.48	23	20	
SG88	98	88	05C	-0.21	22	24	
SG88	98	88	05H	0.39	22	18	
SG88	98	88	06C	-0.13	37	33	
SG88	98	88	06H	-0.04	33	30	
SG88	98	88	07C	0	49	41	1.11
SG88	98	88	07H	0	41	35	
SG88	98	90	06C	0.42	11		
SG88	98	92	07H	-0.76	17	15	
SG88	98	96	07C	-0.55	16		
SG88	98	98	07C	-0.47	13		
SG88	98	104	06C	-0.59	10		
SG88	98	104	07C	-0.57	9		
SG88	99	77	06C	0.39	18		
SG88	99	77	06H	-0.7	22	20	
SG88	99	77	07C	-0.67	13	12	
SG88	99	77	07H	0	30	24	
SG88	99	79	03H	0.46	9		
SG88	99	79	04H	-0.57	19		
SG88	99	79	05C	0	19		
SG88	99	79	05H	0.41	20	17	
SG88	99	79	06C	0	33	26	
SG88	99	79	06H	0	31	29	
SG88	99	79	07C	0	41	36	
SG88	99	79	07H	0	40	33	
SG88	99	81	01H	-0.52	22	25	
SG88	99	81	03C	0	18		
SG88	99	81	03H	0	26	24	
SG88	99	81	04C	0	27	30	
SG88	99	81	04H	0	26	29	
SG88	99	81	05C	0	31	29	
SG88	99	81	05H	0	27	23	
SG88	99	81	06C	0	36	35	
SG88	99	81	06H	0	42	37	
SG88	99	81	07C	0	60	58	1.43
SG88	99	81	07H	0	68	64	1.46

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	99	83	01H	0	23	22	
SG88	99	83	02C	-0.04	7		
SG88	99	83	03C	-0.08	14		
SG88	99	83	03H	0.02	28	23	
SG88	99	83	04C	-0.19	28	26	
SG88	99	83	04H	-0.06	27	22	
SG88	99	83	05C	-0.13	26	21	
SG88	99	83	05H	-0.06	25	25	
SG88	99	83	06C	-0.15	33	33	
SG88	99	83	06H	0	52	52	1.55
SG88	99	83	07C	0	61	58	1.48
SG88	99	83	07H	0	62	58	0.93
SG88	99	85	02H	0	13		
SG88	99	85	03C	-0.47	14		
SG88	99	85	03H	0	13		
SG88	99	85	04C	0	24	27	
SG88	99	85	04H	-0.48	31	33	
SG88	99	85	05C	0	23	22	
SG88	99	85	05H	0	25	19	
SG88	99	85	06C	0	35	35	
SG88	99	85	06H	-0.21	33	32	
SG88	99	85	07C	0	46	41	1.45
SG88	99	85	07H	0	53	48	1.43
SG88	99	87	01H	-0.5	8		
SG88	99	87	02H	0	12		
SG88	99	87	03C	0	22	23	
SG88	99	87	03H	0.46	16		
SG88	99	87	04C	0	23	21	
SG88	99	87	04H	0	33	29	
SG88	99	87	05C	0	23	23	
SG88	99	87	05H	0	28	27	
SG88	99	87	06C	0	35	38	1.39
SG88	99	87	06H	0	44	41	1.37
SG88	99	87	07C	0	55	49	1.14
SG88	99	87	07H	0	61	52	1.56
SG88	99	89	04C	-0.59	9		
SG88	99	89	06C	-0.13	11		
SG88	99	89	06H	-0.13	14		
SG88	99	89	07C	0	18	16	
SG88	99	89	07H	-0.24	25	22	
SG88	99	99	07H	-0.66	12		
SG88	100	76	06C	0.33	13		
SG88	100	76	06H	-0.6	18		
SG88	100	76	07C	-0.02	22	18	
SG88	100	76	07H	-0.72	31	28	

C

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	100	78	04C	-0.17	10		
SG88	100	78	04H	-0.59	18		
SG88	100	78	05C	0.36	12		
SG88	100	78	05H	-0.02	15		
SG88	100	78	06C	0	21	24	
SG88	100	78	06H	-0.11	29	23	
SG88	100	78	07C	-0.06	35	37	
SG88	100	78	07H	-0.17	37	40	1.87
SG88	100	80	02H	0	15		
SG88	100	80	03C	0	19		
SG88	100	80	03H	0	23	21	
SG88	100	80	04C	-0.54	25	29	
SG88	100	80	04H	-0.59	31	34	
SG88	100	80	05C	0	29	27	
SG88	100	80	05H	0	30	25	
SG88	100	80	06C	0	32	30	
SG88	100	80	06H	0	47	41	1.29
SG88	100	80	07C	0	50	46	1.63
SG88	100	80	07H	0	63	52	1.52
SG88	100	82	01H	0	27	28	
SG88	100	82	02H	-0.02	15		
SG88	100	82	03C	-0.13	16		
SG88	100	82	03H	0	15		
SG88	100	82	04C	-0.12	16		
SG88	100	82	04H	0	22	18	
SG88	100	82	05C	-0.06	24	24	
SG88	100	82	05H	-0.02	21	17	
SG88	100	82	06C	-0.09	34	33	
SG88	100	82	06H	0	44	43	1.49
SG88	100	82	07C	0	63	58	1.58
SG88	100	82	07H	0	57	54	1.56
SG88	100	84	02H	0	10		
SG88	100	84	03C	-0.02	10		
SG88	100	84	03H	0.04	13		
SG88	100	84	04C	0.04	14		
SG88	100	84	04H	-0.02	13		
SG88	100	84	05C	-0.17	22	25	
SG88	100	84	05H	0	16		
SG88	100	84	06C	-0.17	30	31	
SG88	100	84	06H	-0.09	17		
SG88	100	84	07C	0	41	37	
SG88	100	84	07H	0	43	38	1.16
SG88	100	86	01H	0	26	28	
SG88	100	86	02H	0	19		
SG88	100	86	03C	0	22	21	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	100	86	03H	0	21	16	
SG88	100	86	04C	0	26	30	
SG88	100	86	04H	0	26	18	
SG88	100	86	05C	0	24	23	
SG88	100	86	05H	0	25	23	
SG88	100	86	06C	0	33	33	
SG88	100	86	06H	0	50	49	1.41
SG88	100	86	07C	0	55	47	1.37
SG88	100	86	07H	0	58	54	1.53
SG88	100	88	02H	0	14		
SG88	100	88	03C	-0.49	14		
SG88	100	88	03H	0.44	12		
SG88	100	88	04C	-0.48	16		
SG88	100	88	04H	-0.48	11		
SG88	100	88	05C	0	19		
SG88	100	88	05H	0.04	19		
SG88	100	88	06C	0	28	27	
SG88	100	88	06H	-0.19	35	35	
SG88	100	88	07C	0	37	37	
SG88	100	88	07H	0	44	40	1.67
SG88	100	90	06C	0	14		
SG88	100	90	07C	-0.68	9	5	
SG88	100	90	07H	-0.69	11	12	
SG88	101	75	06C	0	12		
SG88	101	75	06H	-0.64	10		
SG88	101	75	07C	-0.68	13	13	
SG88	101	75	07H	-0.68	9	5	
SG88	101	77	04H	-0.59	20	24	
SG88	101	77	05C	0.3	13		
SG88	101	77	05H	-0.19	16		
SG88	101	77	06C	-0.09	21	21	
SG88	101	77	06H	0	31	32	
SG88	101	77	07C	-0.06	34	27	
SG88	101	77	07H	-0.15	35	30	
SG88	101	79	01H	-0.52	12		
SG88	101	79	02C	0.39	8		
SG88	101	79	03H	0.48	14		
SG88	101	79	04C	0	10		
SG88	101	79	04H	-0.02	12		
SG88	101	79	05C	0.36	16		
SG88	101	79	05H	-0.66	20	21	
SG88	101	79	06C	0	29	29	
SG88	101	79	06H	0	32	28	
SG88	101	79	07C	0	36	36	
SG88	101	79	07H	0	45	33	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	101	81	01H	-0.48	32	33	
SG88	101	81	02H	0.11	14		
SG88	101	81	03C	0	27	20	
SG88	101	81	03H	0	33	26	
SG88	101	81	04C	-0.57	21	20	
SG88	101	81	04H	0	34	28	
SG88	101	81	05C	0	33	24	
SG88	101	81	05H	-0.55	33	32	
SG88	101	81	06C	0	40	38	1.48
SG88	101	81	06H	0	44	41	1.35
SG88	101	81	07C	0	63	62	1.48
SG88	101	81	07H	0	67	66	1.58
SG88	101	83	01H	-0.48	26	26	
SG88	101	83	02H	0.48	15		
SG88	101	83	03C	0	26	24	
SG88	101	83	03H	0.48	23	14	
SG88	101	83	04C	0	23	25	
SG88	101	83	04H	0	34	32	
SG88	101	83	05C	0	35	30	
SG88	101	83	05H	0	29	28	
SG88	101	83	06C	0	41	37	
SG88	101	83	06H	0	55	57	1.52
SG88	101	83	07C	0	58	57	1.4
SG88	101	83	07H	0	63	62	1.27
SG88	101	85	01H	-0.54	17		
SG88	101	85	02C	0	12		
SG88	101	85	02H	0	16		
SG88	101	85	03C	0.04	25	24	
SG88	101	85	03H	0.43	13		
SG88	101	85	04C	-0.13	17		
SG88	101	85	04H	0	31	24	
SG88	101	85	05C	0.04	31	24	
SG88	101	85	05H	0	25	21	
SG88	101	85	06C	0	39	40	1.39
SG88	101	85	06H	0	44	42	1.43
SG88	101	85	07C	0	57	52	1.53
SG88	101	85	07H	0	56	58	1.34
SG88	101	87	01H	-0.52	11		
SG88	101	87	02H	0	20	16	
SG88	101	87	03C	0	19		
SG88	101	87	03H	-0.52	9		
SG88	101	87	04C	0	22	21	
SG88	101	87	04H	-0.52	25	23	
SG88	101	87	05C	-0.02	31	23	
SG88	101	87	05H	-0.02	25	18	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	101	87	06C	0	38	34	
SG88	101	87	06H	0	46	45	1.44
SG88	101	87	07C	0	59	50	1.58
SG88	101	87	07H	0	61	56	1.53
SG88	101	89	07H	0	11		
SG88	102	74	06H	-0.64	10		
SG88	102	74	07H	-0.7	8	5	
SG88	102	76	04H	-0.04	12		
SG88	102	76	05C	0.39	15		
SG88	102	76	05H	-0.59	10		
SG88	102	76	06C	-0.13	21	24	
SG88	102	76	06H	0	28	28	
SG88	102	76	07C	-0.02	36	35	
SG88	102	76	07H	-0.19	36	40	1.26
SG88	102	78	03C	0.21	15	17	
SG88	102	78	03H	-0.36	14	17	
SG88	102	78	04C	-0.31	23	28	
SG88	102	78	04H	-0.38	21	18	
SG88	102	78	05C	-0.21	24	25	
SG88	102	78	05H	-0.13	25	23	
SG88	102	78	06C	0.09	30	27	
SG88	102	78	06H	-0.62	18	14	
SG88	102	78	07C	-0.17	40	34	
SG88	102	78	07H	-0.28	42	40	1.07
SG88	102	80	01H	-0.52	18		
SG88	102	80	03C	-0.51	15		
SG88	102	80	03H	0.46	18		
SG88	102	80	04C	0	22	22	
SG88	102	80	04H	-0.55	31	35	
SG88	102	80	05C	0	28	28	
SG88	102	80	05H	0	27	21	
SG88	102	80	06C	0	45	39	1.48
SG88	102	80	06H	0	50	52	1.4
SG88	102	80	07C	0	49	49	1.45
SG88	102	80	07H	0	63	59	1.32
SG88	102	82	01H	-0.46	20	18	
SG88	102	82	02C	0.39	14		
SG88	102	82	03C	-0.53	14		
SG88	102	82	03H	0	23	18	
SG88	102	82	04C	0	26	27	
SG88	102	82	04H	0	30	29	
SG88	102	82	05C	0	34	30	
SG88	102	82	05H	-0.63	28	25	
SG88	102	82	06C	0	37	34	
SG88	102	82	06H	0	41	38	1.46

D

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	102	82	07C	0	72	68	1.61
SG88	102	82	07H	0	67	66	1.49
SG88	102	84	01H	-0.54	17		
SG88	102	84	02H	0	19		
SG88	102	84	03C	-0.02	23	19	
SG88	102	84	03H	0.52	18		
SG88	102	84	04C	-0.07	24	23	
SG88	102	84	04H	0	19		
SG88	102	84	05C	0	29	26	
SG88	102	84	05H	0	31	21	
SG88	102	84	06C	-0.24	37	37	
SG88	102	84	06H	0	45	46	1.48
SG88	102	84	07C	0	50	46	1.54
SG88	102	84	07H	0	49	48	1.24
SG88	102	86	01H	0	25	27	
SG88	102	86	02H	0.48	17		
SG88	102	86	03C	0	16		
SG88	102	86	03H	0	29	22	
SG88	102	86	04C	0	31	24	
SG88	102	86	04H	0	29	19	
SG88	102	86	05C	0	30	25	
SG88	102	86	05H	0	21	14	
SG88	102	86	06C	0	39	38	1.36
SG88	102	86	06H	0	43	38	1.41
SG88	102	86	07C	0	57	47	1.37
SG88	102	86	07H	0	61	52	1.48
SG88	102	88	01H	0.15	10		
SG88	102	88	02H	-0.09	12		
SG88	102	88	03C	-0.53	11		
SG88	102	88	04C	0.39	12		
SG88	102	88	04H	-0.54	22	18	
SG88	102	88	05C	-0.11	20	20	
SG88	102	88	05H	-0.61	19		
SG88	102	88	06C	-0.18	31	28	
SG88	102	88	06H	-0.09	34	27	
SG88	102	88	07C	-0.11	37	35	
SG88	102	88	07H	0	43	38	1.37
SG88	102	90	07C	-0.02	15	14	
SG88	102	92	07C	-0.55	13	17	
SG88	102	98	07H	-0.7	14		
SG88	103	75	04H	-0.59	11		
SG88	103	75	05C	0	16		
SG88	103	75	06C	0	18		
SG88	103	75	06H	0	18		
SG88	103	75	07C	0	26	24	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	103	75	07H	-0.66	25	19	
SG88	103	77	02H	0.34	10	11	
SG88	103	77	03H	-0.13	18	18	
SG88	103	77	04C	-0.31	20	22	
SG88	103	77	04H	-0.38	21	21	
SG88	103	77	05C	-0.08	18	18	
SG88	103	77	05H	-0.11	28	24	
SG88	103	77	06C	0.13	33	34	
SG88	103	77	06H	-0.55	38	35	
SG88	103	77	07C	-0.02	42	40	2.12
SG88	103	77	07H	-0.44	46	44	1.53
SG88	103	79	01H	-0.49	20	21	
SG88	103	79	02H	-0.64	13	14	
SG88	103	79	03C	0.04	19	17	
SG88	103	79	03H	-0.23	30	24	
SG88	103	79	04C	0.19	27	28	
SG88	103	79	04H	0.06	22	17	
SG88	103	79	05C	-0.04	32	29	
SG88	103	79	05H	-0.32	30	22	
SG88	103	79	06C	0.28	36	30	
SG88	103	79	06H	-0.36	41	36	
SG88	103	79	07C	0.02	61	66	1.58
SG88	103	79	07H	-0.34	60	65	1.64
SG88	103	81	01H	-0.52	23	25	
SG88	103	81	02H	0.44	12		
SG88	103	81	03C	0	23	25	
SG88	103	81	03H	0	21	20	
SG88	103	81	04C	0	19		
SG88	103	81	04H	0	32	36	
SG88	103	81	05C	0	29	30	
SG88	103	81	05H	0	29	32	
SG88	103	81	06C	0	34	32	
SG88	103	81	06H	0	37	36	
SG88	103	81	07C	0	61	62	0.99
SG88	103	81	07H	0	68	66	1.54
SG88	103	83	01H	-0.02	27	23	
SG88	103	83	02H	-0.08	13		
SG88	103	83	03C	-0.15	25	22	
SG88	103	83	03H	0	17		
SG88	103	83	04C	-0.06	18		
SG88	103	83	04H	-0.11	30	31	
SG88	103	83	05C	-0.24	29	30	
SG88	103	83	05H	0	30	33	
SG88	103	83	06C	-0.11	37	36	
SG88	103	83	06H	0	44	41	1.46

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	103	83	07C	0	54	52	1.53
SG88	103	83	07H	0	61	51	1.19
SG88	103	85	01H	-0.46	13		
SG88	103	85	02C	0	19		
SG88	103	85	02H	0	18		
SG88	103	85	03C	0	22	23	
SG88	103	85	03H	0	19		
SG88	103	85	04C	0	26	28	
SG88	103	85	04H	0	35	30	
SG88	103	85	05C	-0.13	29	27	
SG88	103	85	05H	0	25	23	
SG88	103	85	06C	0	37	33	
SG88	103	85	06H	0	50	52	1.47
SG88	103	85	07C	0	59	53	1.47
SG88	103	85	07H	0	61	52	1.11
SG88	103	87	01H	-0.48	10		
SG88	103	87	02C	0.34	9		
SG88	103	87	02H	0.42	13		
SG88	103	87	03C	0	21	20	
SG88	103	87	03H	0	16		
SG88	103	87	04C	0	24	26	
SG88	103	87	04H	-0.5	30	31	1.15
SG88	103	87	05C	0	29	27	
SG88	103	87	05H	0	17		
SG88	103	87	06C	0	37	39	1.36
SG88	103	87	06H	0	41	39	1.46
SG88	103	87	07C	0	55	53	1.17
SG88	103	87	07H	0	59	55	1.56
SG88	103	89	04H	-0.52	11		
SG88	103	89	06C	0.35	11		
SG88	103	89	07C	-0.09	13	12	
SG88	103	89	07H	-0.53	18	15	
SG88	103	91	07H	-0.76	11	7	
SG88	104	72	06H	-0.63	12		
SG88	104	76	03C	-0.48	10	13	
SG88	104	76	03H	-0.17	9	10	
SG88	104	76	04C	-0.29	16	19	
SG88	104	76	04H	-0.06	22	20	
SG88	104	76	05C	0.11	21	20	
SG88	104	76	05H	0	17	15	
SG88	104	76	06C	-0.08	30	25	
SG88	104	76	06H	-0.17	33	27	
SG88	104	76	07C	0.04	34	34	
SG88	104	76	07H	-0.15	39	38	2.3
SG88	104	78	01H	-0.15	25	26	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	104	78	02H	-0.08	15	10	
SG88	104	78	03C	0.13	26	21	
SG88	104	78	03H	-0.06	30	24	
SG88	104	78	04C	0	25	26	
SG88	104	78	04H	-0.28	30	26	
SG88	104	78	05C	0	30	24	
SG88	104	78	05H	-0.23	31	25	
SG88	104	78	06C	0	40	35	
SG88	104	78	06H	-0.42	45	40	1.4
SG88	104	78	07C	0.02	57	59	1.57
SG88	104	78	07H	-0.08	58	58	1.59
SG88	104	80	01H	-0.39	23	23	
SG88	104	80	02C	0	11	14	
SG88	104	80	02H	-0.11	18	16	
SG88	104	80	03C	0	24	18	
SG88	104	80	03H	-0.09	23	22	
SG88	104	80	04C	0	21	21	
SG88	104	80	04H	0.04	35	33	
SG88	104	80	05C	0	32	27	
SG88	104	80	05H	-0.19	34	27	
SG88	104	80	06C	0	43	38	1.49
SG88	104	80	06H	-0.15	44	39	1.41
SG88	104	80	07C	-0.04	65	67	1.58
SG88	104	80	07H	-0.38	61	57	1.57
SG88	104	82	01H	0	13		
SG88	104	82	02H	-0.06	9		
SG88	104	82	03C	-0.11	18		
SG88	104	82	03H	-0.04	15		
SG88	104	82	04C	-0.06	24	21	
SG88	104	82	04H	-0.1	27	25	
SG88	104	82	05C	-0.06	28	25	
SG88	104	82	05H	-0.13	30	26	
SG88	104	82	06C	-0.09	37	34	
SG88	104	82	06H	0	46	42	1.53
SG88	104	82	07C	0	55	55	1.64
SG88	104	82	07H	0	63	58	1.55
SG88	104	84	01H	0.08	16		
SG88	104	84	02H	0	16		
SG88	104	84	03C	-0.11	26	25	
SG88	104	84	03H	-0.02	22	17	
SG88	104	84	04C	-0.15	29	28	
SG88	104	84	04H	-0.02	35	31	
SG88	104	84	05C	-0.15	32	35	
SG88	104	84	05H	-0.08	32	29	
SG88	104	84	06C	0	44	43	1.39

E

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	104	84	06H	0	48	41	1.37
SG88	104	84	07C	0	63	50	1.11
SG88	104	84	07H	0	66	61	1.54
SG88	104	86	01H	-0.46	11		
SG88	104	86	02H	0.38	19		
SG88	104	86	03C	0	20	18	
SG88	104	86	03H	0	24	18	
SG88	104	86	04C	0	26	28	
SG88	104	86	04H	0	26	26	
SG88	104	86	05C	0	29	26	
SG88	104	86	05H	0	22	16	
SG88	104	86	06C	0	36	38	1.22
SG88	104	86	06H	0	42	39	1.35
SG88	104	86	07C	0	52	46	1.23
SG88	104	86	07H	0	58	55	1.73
SG88	104	88	03C	-0.5	8		
SG88	104	88	04C	0	13		
SG88	104	88	04H	-0.53	14		
SG88	104	88	05C	0	19		
SG88	104	88	05H	0	16		
SG88	104	88	06C	0	24	23	
SG88	104	88	06H	0	25	21	
SG88	104	88	07C	0	26	24	
SG88	104	88	07H	0	24	21	
SG88	104	90	04C	-0.57	11		
SG88	104	90	04H	-0.55	12		
SG88	104	90	05C	0	15		
SG88	104	90	06C	0	15		
SG88	104	90	06H	0	19		
SG88	104	90	07C	0	16	13	
SG88	104	90	07H	0	22	20	
SG88	105	75	03H	0	9		
SG88	105	75	04C	0.32	10		
SG88	105	75	04H	-0.57	18		
SG88	105	75	05C	0	15		
SG88	105	75	05H	0	21	20	
SG88	105	75	06C	0	25	24	
SG88	105	75	06H	0	30	31	
SG88	105	75	07C	0	37	38	1.47
SG88	105	75	07H	0	36	33	
SG88	105	77	03C	-0.21	13	13	
SG88	105	77	03H	0.11	14	15	
SG88	105	77	04C	-0.08	21	20	
SG88	105	77	04H	-0.21	23	17	
SG88	105	77	05C	0.04	26	25	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	105	77	05H	-0.23	26	24	
SG88	105	77	06C	0	30	28	
SG88	105	77	06H	-0.13	39	36	
SG88	105	77	07C	0.13	43	42	1.57
SG88	105	77	07H	-0.28	40	39	1.55
SG88	105	79	01H	0	21	22	
SG88	105	79	02H	-0.02	21	22	
SG88	105	79	03C	0	27	22	
SG88	105	79	03H	-0.19	28	24	
SG88	105	79	04C	-0.06	25	20	
SG88	105	79	04H	-0.23	30	24	
SG88	105	79	05C	-0.1	33	29	
SG88	105	79	05H	-0.17	33	27	
SG88	105	79	06C	0.02	43	45	1.46
SG88	105	79	06H	-0.34	54	54	1.46
SG88	105	79	07C	0.04	57	55	1.49
SG88	105	79	07H	-0.25	58	53	1.46
SG88	105	81	01H	-0.48	12		
SG88	105	81	03C	0	21	20	
SG88	105	81	03H	0	24	22	
SG88	105	81	04C	0	24	21	
SG88	105	81	04H	0	25	21	
SG88	105	81	05C	-0.11	36	28	
SG88	105	81	05H	0	30	25	
SG88	105	81	06C	0	40	37	
SG88	105	81	06H	0	44	40	1.26
SG88	105	81	07C	0	54	53	1.55
SG88	105	81	07H	0	60	54	1.53
SG88	105	83	01H	0	22	21	
SG88	105	83	02H	0	16		
SG88	105	83	03C	0	21	17	
SG88	105	83	04C	0	24	25	
SG88	105	83	04H	-0.59	28	24	
SG88	105	83	05C	0	33	30	
SG88	105	83	05H	0	33	27	
SG88	105	83	06C	0	38	35	
SG88	105	83	06H	0	41	34	1.4
SG88	105	83	07C	0	66	67	1.64
SG88	105	83	07H	0	55	48	1.48
SG88	105	85	01H	-0.47	11		
SG88	105	85	02H	0.45	18		
SG88	105	85	03C	0	18		
SG88	105	85	03H	0	25	22	
SG88	105	85	04C	0	18		
SG88	105	85	04H	0	27	25	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	105	85	05C	0	29	29	
SG88	105	85	05H	0	19		
SG88	105	85	06C	0.04	37	31	
SG88	105	85	06H	0	46	46	1.43
SG88	105	85	07C	0	57	56	1.36
SG88	105	85	07H	0	48	42	1.48
SG88	105	87	04C	-0.57	15		
SG88	105	87	04H	-0.09	14		
SG88	105	87	05C	0	21	22	
SG88	105	87	05H	-0.02	19		
SG88	105	87	06C	0	29	28	
SG88	105	87	06H	0	32	25	
SG88	105	87	07C	0	44	44	1.34
SG88	105	87	07H	0	44	41	1.31
SG88	105	89	04C	-0.74	9		
SG88	105	89	04H	-0.15	9		
SG88	105	89	06C	-0.55	12		
SG88	105	89	06H	0	18		
SG88	105	89	07C	0	12	10	
SG88	105	89	07H	0	23	17	
SG88	105	91	07H	-0.72	12	7	
SG88	106	74	07C	-0.64	7		
SG88	106	74	07H	-0.7	17	15	
SG88	106	76	02H	0	18	16	
SG88	106	76	03C	0	16	17	
SG88	106	76	03H	-0.15	20	17	
SG88	106	76	04C	0	21	26	
SG88	106	76	04H	-0.34	19	18	
SG88	106	76	05C	0	23	22	
SG88	106	76	05H	-0.34	25	19	
SG88	106	76	06C	0	26	22	
SG88	106	76	06H	-0.34	39	32	
SG88	106	76	07C	0.06	43	48	1.47
SG88	106	76	07H	-0.34	50	54	1.77
SG88	106	78	01H	-0.67	21	22	
SG88	106	78	02H	-0.55	14	17	
SG88	106	78	03C	0	18	24	
SG88	106	78	03H	-0.04	22	21	
SG88	106	78	04C	-0.02	23	22	
SG88	106	78	04H	-0.26	28	19	
SG88	106	78	05C	0.26	30	29	
SG88	106	78	05H	-0.17	35	27	
SG88	106	78	06C	0.06	39	36	
SG88	106	78	06H	-0.19	44	35	
SG88	106	78	07C	0.06	56	65	1.02

G

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	106	78	07H	-0.76	70	75	1.79
SG88	106	80	01H	0	16	16	
SG88	106	80	02H	0	13	14	
SG88	106	80	03C	0.13	17	19	
SG88	106	80	03H	0	24	24	
SG88	106	80	04C	0.17	30	31	
SG88	106	80	04H	0	23	20	
SG88	106	80	05C	0	28	26	
SG88	106	80	05H	-0.21	34	30	
SG88	106	80	06C	0.04	39	35	
SG88	106	80	06H	-0.23	37	35	
SG88	106	80	07C	0.11	49	56	1.56
SG88	106	80	07H	-0.25	56	60	1.68
SG88	106	82	01H	-0.37	24	22	
SG88	106	82	02H	0	20	16	
SG88	106	82	03C	0	21	16	
SG88	106	82	03H	0	24	20	
SG88	106	82	04C	0	27	28	
SG88	106	82	04H	0	27	17	
SG88	106	82	05C	0	30	23	
SG88	106	82	05H	0	32	25	
SG88	106	82	06C	0	40	41	1.39
SG88	106	82	06H	0	43	37	
SG88	106	82	07C	0	52	56	1.47
SG88	106	82	07H	0	54	46	1.52
SG88	106	84	01H	-0.45	17		
SG88	106	84	03H	0	29	20	
SG88	106	84	04C	-0.62	27	27	
SG88	106	84	04H	-0.07	27	22	
SG88	106	84	05C	-0.06	28	21	
SG88	106	84	05H	-0.17	23	18	
SG88	106	84	06C	0	39	38	1.33
SG88	106	84	06H	0	45	35	
SG88	106	84	07C	0	52	48	1.34
SG88	106	84	07H	0	58	53	1.8
SG88	106	86	03H	0.43	12		
SG88	106	86	04H	-0.63	16		
SG88	106	86	05C	0	17		
SG88	106	86	05H	0	21	13	
SG88	106	86	06C	0	21	20	
SG88	106	86	06H	0	33	26	
SG88	106	86	07C	0.04	20	22	
SG88	106	86	07H	0	41	37	1.4
SG88	106	88	04C	-0.55	11		
SG88	106	88	05C	-0.59	16		

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	106	88	05H	-0.63	9		
SG88	106	88	06C	0	16		
SG88	106	88	06H	-0.15	17		
SG88	106	88	07C	0	13	14	
SG88	106	88	07H	-0.18	24	17	
SG88	106	90	04H	-0.46	10		
SG88	106	90	05H	-0.55	9		
SG88	106	90	06H	-0.61	15		
SG88	106	90	07C	-0.13	19	19	
SG88	106	90	07H	-0.62	15	10	
SG88	106	92	06H	-0.63	16		
SG88	106	102	06H	-0.2	9		
SG88	107	75	04C	-0.63	16		
SG88	107	75	04H	0	19		
SG88	107	75	05C	0	21	21	
SG88	107	75	05H	0	22	21	
SG88	107	75	06C	0	28	26	
SG88	107	75	06H	0	32	25	
SG88	107	75	07C	0	41	44	1.26
SG88	107	75	07H	0	44	41	1.61
SG88	107	77	02H	0.13	14	9	
SG88	107	77	03C	0.13	17	20	
SG88	107	77	03H	0.08	21	20	
SG88	107	77	04C	0	22	26	
SG88	107	77	04H	-0.13	23	23	
SG88	107	77	05C	0	26	23	
SG88	107	77	05H	-0.13	31	24	
SG88	107	77	06C	0.02	32	27	
SG88	107	77	06H	-0.36	38	30	
SG88	107	77	07C	0.17	53	58	1.99
SG88	107	77	07H	-0.19	44	34	
SG88	107	79	01H	0.13	21	21	
SG88	107	79	02H	-0.13	11	12	
SG88	107	79	03C	0	22	22	
SG88	107	79	03H	0.11	17	16	
SG88	107	79	04C	0	15	15	
SG88	107	79	04H	-0.11	27	25	
SG88	107	79	05C	0	26	28	
SG88	107	79	05H	-0.17	27	22	
SG88	107	79	06C	0	31	24	
SG88	107	79	06H	-0.13	44	41	1.38
SG88	107	79	07C	0	52	53	1.67
SG88	107	79	07H	-0.42	61	58	1.47
SG88	107	81	01H	-0.48	12		
SG88	107	81	03C	-0.62	16		

I

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	107	81	03H	0	23	21	
SG88	107	81	04C	-0.6	19		
SG88	107	81	04H	0	22	25	
SG88	107	81	05C	0	21	20	
SG88	107	81	05H	0	30	33	
SG88	107	81	06C	0	28	27	
SG88	107	81	06H	0	37	39	1.35
SG88	107	81	07C	0	44	40	1.38
SG88	107	81	07H	0	50	35	
SG88	107	83	02H	0.04	12		
SG88	107	83	03H	0.02	14		
SG88	107	83	04C	-0.15	14		
SG88	107	83	04H	-0.04	13		
SG88	107	83	05C	-0.04	24	31	
SG88	107	83	05H	-0.02	25	26	
SG88	107	83	06C	-0.13	26	25	
SG88	107	83	06H	-0.11	32	33	
SG88	107	83	07C	0	46	45	1.11
SG88	107	83	07H	-0.02	37	39	1.58
SG88	107	85	01H	-0.48	8		
SG88	107	85	02H	0.42	12		
SG88	107	85	03H	-0.56	15		
SG88	107	85	04C	-0.5	13		
SG88	107	85	04H	-0.63	15		
SG88	107	85	05C	-0.51	20	25	
SG88	107	85	05H	0	24	19	
SG88	107	85	06C	0	28	30	
SG88	107	85	06H	0	33	33	
SG88	107	85	07C	0	43	42	1.37
SG88	107	85	07H	0	47	44	1.27
SG88	107	87	04H	-0.46	12		
SG88	107	87	05C	-0.48	12		
SG88	107	87	05H	-0.15	9		
SG88	107	87	06H	-0.23	20	17	
SG88	107	87	07H	-0.11	20	20	
SG88	107	89	07H	-0.57	11	9	
SG88	108	74	06H	-0.68	11		
SG88	108	74	07H	-0.66	11	7	
SG88	108	76	04C	0	13	17	
SG88	108	76	04H	-0.68	20	21	
SG88	108	76	05C	0	26	22	
SG88	108	76	05H	-0.19	31	30	
SG88	108	76	06C	0	31	27	
SG88	108	76	06H	-0.04	30	26	
SG88	108	76	07C	-0.15	48	54	1.39

J

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	108	76	07H	-0.17	62	69	1.67
SG88	108	78	02H	0.19	11	11	
SG88	108	78	03C	0.06	19	19	
SG88	108	78	03H	-0.06	18	16	
SG88	108	78	04C	0	26	27	
SG88	108	78	04H	-0.04	27	23	
SG88	108	78	05C	0	31	28	
SG88	108	78	05H	-0.08	24	20	
SG88	108	78	06C	0	36	32	
SG88	108	78	06H	-0.13	44	40	1.33
SG88	108	78	07C	0	54	59	1.72
SG88	108	78	07H	-0.13	59	67	1.6
SG88	108	80	01H	-0.02	15	17	
SG88	108	80	02C	0	12	12	
SG88	108	80	02H	0.17	11	11	
SG88	108	80	03C	0	20	18	
SG88	108	80	03H	0.11	18	21	
SG88	108	80	04C	0.19	10	12	
SG88	108	80	04H	0.21	27	24	
SG88	108	80	05C	0	30	25	
SG88	108	80	05H	-0.21	32	31	
SG88	108	80	06C	0	39	37	
SG88	108	80	06H	-0.4	42	41	1.42
SG88	108	80	07C	0.04	49	55	1.46
SG88	108	80	07H	-0.32	53	56	1.47
SG88	108	82	01H	0	15		
SG88	108	82	02H	0	16		
SG88	108	82	03C	-0.06	16		
SG88	108	82	03H	0	18		
SG88	108	82	04C	-0.08	16		
SG88	108	82	04H	0	29	30	
SG88	108	82	05C	-0.04	29	26	
SG88	108	82	05H	0	29	22	
SG88	108	82	06C	-0.09	36	33	
SG88	108	82	06H	0	45	40	1.38
SG88	108	82	07C	0	57	56	1.58
SG88	108	82	07H	0	60	55	1.41
SG88	108	84	03C	-0.06	11		
SG88	108	84	03H	0	16		
SG88	108	84	04C	-0.11	12		
SG88	108	84	04H	0	21	21	
SG88	108	84	05C	-0.08	20	24	
SG88	108	84	05H	0	22	17	
SG88	108	84	06C	-0.13	30	32	
SG88	108	84	06H	-0.15	37	36	

K

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	108	84	07C	-0.09	35	38	1.43
SG88	108	84	07H	0	46	39	1.27
SG88	108	86	04H	-0.57	11		
SG88	108	86	05C	-0.11	10		
SG88	108	86	05H	-0.53	8		
SG88	108	86	06H	0	19		
SG88	108	86	07C	-0.49	7		
SG88	108	86	07H	-0.59	13	14	
SG88	109	73	06H	-0.7	9		
SG88	109	75	04C	-0.5	11		
SG88	109	75	04H	0	18		
SG88	109	75	05C	0	20	22	
SG88	109	75	05H	0	19		
SG88	109	75	06C	0	26	25	
SG88	109	75	06H	0	31	32	
SG88	109	75	07C	-0.26	37	37	
SG88	109	75	07H	0	43	43	1.4
SG88	109	77	02H	-0.06	17	13	
SG88	109	77	03C	0	22	22	
SG88	109	77	03H	0.11	19	19	
SG88	109	77	04C	0	12	16	
SG88	109	77	04H	0.04	30	31	
SG88	109	77	05C	0	32	27	
SG88	109	77	05H	-0.11	31	26	
SG88	109	77	06C	0	37	29	
SG88	109	77	06H	-0.53	41	34	
SG88	109	77	07C	0	43	47	1.63
SG88	109	77	07H	-0.21	50	59	1.53
SG88	109	79	01H	0.06	14	14	
SG88	109	79	03C	-0.31	26	20	
SG88	109	79	03H	0.02	17	17	
SG88	109	79	04C	-0.04	20	22	
SG88	109	79	04H	0.02	31	32	
SG88	109	79	05C	-0.04	32	26	
SG88	109	79	05H	-0.15	29	26	
SG88	109	79	06C	-0.1	35	26	
SG88	109	79	06H	-0.15	40	32	
SG88	109	79	07C	0.19	53	53	1.57
SG88	109	79	07H	-0.19	53	49	1.64
SG88	109	81	01H	-0.41	15		
SG88	109	81	02H	0.52	14		
SG88	109	81	03C	0	21	18	
SG88	109	81	03H	0	22	19	
SG88	109	81	04C	-0.63	20	21	
SG88	109	81	04H	0	28	25	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	109	81	05C	0	32	26	
SG88	109	81	05H	0	26	25	
SG88	109	81	06C	0	39	33	
SG88	109	81	06H	0	43	39	1.26
SG88	109	81	07C	0	54	54	1.41
SG88	109	81	07H	0	64	60	1.58
SG88	109	83	02H	0.48	12		
SG88	109	83	04C	0	13		
SG88	109	83	04H	0	20	18	
SG88	109	83	05C	0	29	25	
SG88	109	83	05H	0.43	24	21	
SG88	109	83	06C	0	27	26	
SG88	109	83	06H	0	33	24	
SG88	109	83	07C	0	47	49	1.31
SG88	109	83	07H	0	39	29	
SG88	109	85	05C	-0.55	10		
SG88	109	85	06H	0.22	17		
SG88	109	85	07H	-0.64	23	17	
SG88	110	74	06H	0	15		
SG88	110	74	07C	0	11	12	
SG88	110	74	07H	0	14	12	
SG88	110	76	03C	-0.59	15		
SG88	110	76	03H	-0.11	19		
SG88	110	76	04C	-0.15	18		
SG88	110	76	04H	0	23	17	
SG88	110	76	05C	-0.15	23	22	
SG88	110	76	05H	0	31	24	
SG88	110	76	06C	0	35	26	
SG88	110	76	06H	-0.2	39	37	
SG88	110	76	07C	0	46	46	1.49
SG88	110	76	07H	0	41	33	
SG88	110	78	02H	0.17	14	15	
SG88	110	78	03C	-0.04	15	16	
SG88	110	78	03H	-0.15	16	15	
SG88	110	78	04C	-0.15	20	23	
SG88	110	78	04H	-0.24	21	21	
SG88	110	78	05C	0.02	27	23	
SG88	110	78	05H	-0.07	29	28	
SG88	110	78	06C	-0.1	33	28	
SG88	110	78	06H	-0.17	35	30	
SG88	110	78	07C	-0.21	46	45	1.56
SG88	110	78	07H	-0.11	43	40	1.52
SG88	110	80	03C	-0.61	18		
SG88	110	80	03H	0	16		
SG88	110	80	04C	-0.61	14		

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	110	80	04H	0	29	25	
SG88	110	80	05C	0	25	26	
SG88	110	80	05H	0	27	24	
SG88	110	80	06C	0	36	30	
SG88	110	80	06H	0	40	36	
SG88	110	80	07C	0	46	48	1.4
SG88	110	80	07H	0	54	50	1.54
SG88	110	82	02H	0.5	14		
SG88	110	82	03C	-0.66	14		
SG88	110	82	03H	0.3	20	16	
SG88	110	82	04C	0	18		
SG88	110	82	04H	-0.54	30	28	
SG88	110	82	05C	0	28	28	
SG88	110	82	05H	0	30	23	
SG88	110	82	06C	0	28	24	
SG88	110	82	06H	0	38	30	
SG88	110	82	07C	0	50	49	1.41
SG88	110	82	07H	0	40	32	
SG88	110	84	04C	-0.59	12		
SG88	110	84	04H	-0.56	13		
SG88	110	84	05C	-0.48	10		
SG88	110	84	05H	0	13		
SG88	110	84	06H	-0.2	26	19	
SG88	110	84	07H	-0.04	29	23	
SG88	111	73	06H	-0.65	9		
SG88	111	75	04C	-0.59	11		
SG88	111	75	04H	-0.15	12		
SG88	111	75	05C	0	15		
SG88	111	75	05H	0	18		
SG88	111	75	06C	0	20	18	
SG88	111	75	06H	0	26	24	
SG88	111	75	07C	0	34	30	
SG88	111	75	07H	0	35	32	
SG88	111	77	04C	-0.64	12		
SG88	111	77	04H	-0.61	18		
SG88	111	77	05C	-0.68	16		
SG88	111	77	05H	-0.19	22	21	
SG88	111	77	06C	0	23	24	
SG88	111	77	06H	-0.06	35	37	
SG88	111	77	07C	0	33	33	
SG88	111	77	07H	0	43	42	1.43
SG88	111	79	02C	0.43	11		
SG88	111	79	02H	0.46	12		
SG88	111	79	03C	0.35	12		
SG88	111	79	03H	0.48	10		

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (in)
SG88	111	79	04C	-0.62	15		
SG88	111	79	04H	0	18		
SG88	111	79	05C	0	24	20	
SG88	111	79	05H	0	24	26	
SG88	111	79	06C	0	25	23	
SG88	111	79	06H	0	35	34	
SG88	111	79	07C	0	41	36	
SG88	111	79	07H	0	42	32	
SG88	111	81	03C	-0.62	16		
SG88	111	81	03H	0	15		
SG88	111	81	04C	-0.62	12		
SG88	111	81	04H	0	17		
SG88	111	81	05C	0	26	24	
SG88	111	81	05H	0	23	23	
SG88	111	81	06C	0	33	30	
SG88	111	81	06H	0	46	45	1.29
SG88	111	81	07C	0	52	50	1.63
SG88	111	81	07H	0	56	53	1.42
SG88	111	83	02H	0	12		
SG88	111	83	03C	0	7		
SG88	111	83	03H	-0.02	14		
SG88	111	83	04C	-0.1	12		
SG88	111	83	04H	-0.02	14		
SG88	111	83	05C	-0.06	22	27	
SG88	111	83	05H	-0.06	19		
SG88	111	83	06C	-0.11	30	28	
SG88	111	83	06H	-0.19	34	35	1.35
SG88	111	83	07C	-0.11	37	39	1.47
SG88	111	83	07H	0	46	47	1.44
SG88	111	89	07H	-0.65	9	6	
SG88	112	74	06H	-0.72	13		
SG88	112	74	07C	0	12	14	
SG88	112	74	07H	0	18	10	
SG88	112	76	04H	-0.63	12		
SG88	112	76	05C	-0.66	14		
SG88	112	76	05H	0.45	11		
SG88	112	76	06C	-0.11	14		
SG88	112	76	06H	-0.13	25	25	
SG88	112	76	07C	-0.15	24	20	
SG88	112	76	07H	-0.74	21	17	
SG88	112	78	04C	-0.59	13		
SG88	112	78	04H	-0.58	17		
SG88	112	78	05C	-0.54	13		
SG88	112	78	05H	0	23	20	
SG88	112	78	06C	0	18		

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	112	78	06H	-0.22	33	27	
SG88	112	78	07H	-0.07	38	34	
SG88	112	80	02H	0.42	14		
SG88	112	80	03C	-0.65	12		
SG88	112	80	03H	0.48	12		
SG88	112	80	04C	0	16		
SG88	112	80	04H	-0.61	16		
SG88	112	80	05C	0	26	27	
SG88	112	80	05H	-0.63	11		
SG88	112	80	06C	0	30	29	
SG88	112	80	06H	0	35	35	
SG88	112	80	07C	0	48	48	1.21
SG88	112	80	07H	0	54	52	1.47
SG88	112	82	03H	0.04	12		
SG88	112	82	04C	-0.74	12		
SG88	112	82	04H	-0.59	16		
SG88	112	82	05C	-0.65	16		
SG88	112	82	05H	0	18		
SG88	112	82	06C	0.36	11		
SG88	112	82	06H	-0.21	30	29	
SG88	112	82	07C	0	16	18	
SG88	112	82	07H	0	42	40	1.44
SG88	112	84	07H	0.02	10	7	
SG88	113	39	04H	-0.57	8		
SG88	113	75	06C	0	11		
SG88	113	75	06H	-0.02	10		
SG88	113	75	07C	0	15	16	
SG88	113	75	07H	-0.15	14	11	
SG88	113	77	07H	-0.7	22	17	
SG88	113	79	02H	0.5	10		
SG88	113	79	03C	-0.59	12		
SG88	113	79	03H	0.43	12		
SG88	113	79	04C	-0.63	14		
SG88	113	79	04H	-0.61	20	20	
SG88	113	79	05C	0	16		
SG88	113	79	05H	0	18		
SG88	113	79	06C	0	27	22	
SG88	113	79	06H	0	35	27	
SG88	113	79	07C	0	37	35	
SG88	113	79	07H	0	38	32	
SG88	113	81	03C	-0.57	11		
SG88	113	81	03H	0	16		
SG88	113	81	04C	-0.61	14		
SG88	113	81	04H	-0.09	17		
SG88	113	81	05C	-0.63	17		

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	113	81	05H	0	23	21	
SG88	113	81	06C	0	26	23	
SG88	113	81	06H	0	37	34	
SG88	113	81	07C	0	37	33	
SG88	113	81	07H	0	40	35	
SG88	113	83	06H	-0.09	24	19	
SG88	113	83	07H	-0.73	32	30	
SG88	114	74	07H	-0.68	8	5	
SG88	114	76	07C	-0.15	15	11	
SG88	114	76	07H	-0.73	20	13	
SG88	114	78	05H	0.45	10		
SG88	114	78	06C	0.34	10		
SG88	114	78	06H	0	23	21	
SG88	114	78	07C	-0.58	16	21	
SG88	114	78	07H	-0.74	30	24	
SG88	114	80	03H	0.48	15		
SG88	114	80	04C	0	16		
SG88	114	80	04H	-0.6	19		
SG88	114	80	05C	0	20	23	
SG88	114	80	05H	0	27	22	
SG88	114	80	06C	0	28	22	
SG88	114	80	06H	0	40	39	0.94
SG88	114	80	07C	0	35	33	
SG88	114	80	07H	0	40	29	
SG88	115	75	07H	-0.73	14	9	
SG88	115	77	07H	-0.76	9	5	
SG88	115	79	03H	-0.58	13		
SG88	115	79	04C	0.47	12		
SG88	115	79	04H	0	18		
SG88	115	79	05C	0	14		
SG88	115	79	05H	0	22	18	
SG88	115	79	06C	0	23	23	
SG88	115	79	06H	0	33	31	
SG88	115	79	07C	0	37	39	1.39
SG88	115	79	07H	0	32	34	
SG88	115	81	07H	-0.72	8		
SG88	116	76	07H	-0.68	20	21	
SG88	116	78	03H	0	14		
SG88	116	78	04H	0.39	11		
SG88	116	78	05C	0.44	13		
SG88	116	78	05H	-0.13	16		
SG88	116	78	06C	0	21	19	
SG88	116	78	06H	-0.13	36	32	
SG88	116	78	07C	0	19	17	
SG88	116	78	07H	0	53	50	1.25

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	116	80	05H	0.4	10		
SG88	116	80	06C	0.41	8		
SG88	116	80	06H	0	17		
SG88	116	80	07C	0.41	8	13	
SG88	116	80	07H	-0.77	22	23	
SG88	116	82	07H	-0.77	9	6	
SG88	116	88	07H	-0.63	13		
SG88	117	77	05C	-0.66	10		
SG88	117	77	05H	0	13		
SG88	117	77	06H	0	17		
SG88	117	77	07C	-0.61	14	13	
SG88	117	77	07H	-0.7	30	23	
SG88	117	79	02H	0	12		
SG88	117	79	03H	0	17		
SG88	117	79	04C	0	15		
SG88	117	79	04H	0	15		
SG88	117	79	05C	-0.11	12		
SG88	117	79	05H	0	28	24	
SG88	117	79	06C	0	33	26	
SG88	117	79	06H	0	39	33	
SG88	117	79	07C	0	47	41	1.46
SG88	117	79	07H	0	52	49	1.5
SG88	117	123	05H	-0.59	13		
SG88	118	76	07H	-0.68	14	11	
SG88	118	78	04C	-0.6	11		
SG88	118	78	04H	-0.61	13		
SG88	118	78	05H	-0.65	20	19	
SG88	118	78	06C	0.39	15		
SG88	118	78	06H	-0.02	27	21	
SG88	118	78	07H	0	35	37	
SG88	118	82	05H	0	10		
SG88	118	82	06H	0.42	11		
SG88	119	77	03H	-0.58	16		
SG88	119	77	04H	-0.58	20	24	
SG88	119	77	05C	-0.63	18		
SG88	119	77	05H	0.04	12		
SG88	119	77	06C	-0.13	13		
SG88	119	77	06H	-0.04	34	34	
SG88	119	77	07C	0	43	40	1.61
SG88	119	77	07H	0	44	40	1.43
SG88	119	79	04H	-0.63	14		
SG88	119	79	05C	0	10		
SG88	119	79	05H	0	16		
SG88	119	79	06C	0.32	12		
SG88	119	79	06H	0	32	30	

SONGS-3 List of TSP Wear Indications (PRELIMINARY)

SG	ROW	COL	ELEV	INCH	Bobbin %TW	+Point™ %TW	+Point™ Length (In)
SG88	119	79	07C	0	36	39	1.34
SG88	119	79	07H	0	50	50	1.5
SG88	119	85	05H	0	10		
SG88	119	85	06H	-0.02	11		
SG88	120	76	07H	-0.7	12	7	
SG88	120	78	03C	-0.15	9		
SG88	120	78	03H	0.46	13		
SG88	120	78	04C	-0.04	10		
SG88	120	78	04H	-0.63	24	23	
SG88	120	78	05C	-0.15	16		
SG88	120	78	05H	-0.61	18		
SG88	120	78	06C	-0.08	16		
SG88	120	78	06H	-0.11	35	39	1.44
SG88	120	78	07C	-0.09	34	32	
SG88	120	78	07H	0	47	50	1.69
SG88	120	80	07H	-0.77	12		
SG88	121	77	04H	-0.76	15		
SG88	121	77	05H	-0.7	10		
SG88	121	77	06H	-0.13	23	20	
SG88	121	77	07C	-0.54	20	18	
SG88	121	77	07H	-0.79	19	13	
SG88	121	79	04H	-0.72	10		
SG88	121	79	05H	-0.74	12		
SG88	121	79	06H	-0.17	23	21	
SG88	121	79	07H	-0.74	34	34	
SG88	122	78	07H	-0.78	6		
SG88	123	73	06H	-0.74	11		
SG88	124	76	07H	-0.77	11	6	
SG88	125	83	06H	0.35	9		
SG88	128	104	05H	-0.69	7		
SG88	130	100	06H	-0.71	10		
SG88	132	80	07H	-0.85	8		
SG88	132	122	03H	-0.58	7		
SG88	133	83	06H	-0.76	12		
SG88	135	79	06H	-0.83	11		
SG88	136	102	06H	-0.65	10		
SG88	138	70	06H	-0.7	12		
SG88	140	84	07H	-0.74	9		

SONGS Unit 3 Line-by-Line Sizing (PRELIMINARY)

SG	Row	Col	Ind	%TW	Elev	Inch1	Category
SG89	99	89	TWD	0	07H	-0.96	TSP Wear
SG89	99	89	TWD	5	07H	-0.93	TSP Wear
SG89	99	89	TWD	9	07H	-0.9	TSP Wear
SG89	99	89	TWD	7	07H	-0.87	TSP Wear
SG89	99	89	TWD	28	07H	-0.85	TSP Wear
SG89	99	89	TWD	52	07H	-0.82	TSP Wear
SG89	99	89	TWD	50	07H	-0.8	TSP Wear
SG89	99	89	TWD	61	07H	-0.77	TSP Wear
SG89	99	89	TWD	65	07H	-0.74	TSP Wear
SG89	99	89	TWD	69	07H	-0.72	TSP Wear
SG89	99	89	TWD	69	07H	-0.69	TSP Wear
SG89	99	89	TWD	71	07H	-0.66	TSP Wear
SG89	99	89	TWD	71	07H	-0.64	TSP Wear
SG89	99	89	TWD	72	07H	-0.61	TSP Wear
SG89	99	89	TWD	69	07H	-0.58	TSP Wear
SG89	99	89	TWD	56	07H	-0.56	TSP Wear
SG89	99	89	TWD	49	07H	-0.53	TSP Wear
SG89	99	89	TWD	49	07H	-0.51	TSP Wear
SG89	99	89	TWD	61	07H	-0.48	TSP Wear
SG89	99	89	TWD	53	07H	-0.45	TSP Wear
SG89	99	89	TWD	45	07H	-0.43	TSP Wear
SG89	99	89	TWD	40	07H	-0.4	TSP Wear
SG89	99	89	TWD	34	07H	-0.37	TSP Wear
SG89	99	89	TWD	34	07H	-0.35	TSP Wear
SG89	99	89	TWD	30	07H	-0.32	TSP Wear
SG89	99	89	TWD	28	07H	-0.29	TSP Wear
SG89	99	89	TWD	27	07H	-0.27	TSP Wear
SG89	99	89	TWD	27	07H	-0.24	TSP Wear
SG89	99	89	TWD	29	07H	-0.22	TSP Wear
SG89	99	89	TWD	28	07H	-0.19	TSP Wear
SG89	99	89	TWD	30	07H	-0.16	TSP Wear
SG89	99	89	TWD	31	07H	-0.14	TSP Wear
SG89	99	89	TWD	31	07H	-0.11	TSP Wear
SG89	99	89	TWD	26	07H	-0.09	TSP Wear
SG89	99	89	TWD	29	07H	-0.06	TSP Wear
SG89	99	89	TWD	29	07H	-0.03	TSP Wear
SG89	99	89	TWD	33	07H	-0.01	TSP Wear
SG89	99	89	TWD	30	07H	0.02	TSP Wear
SG89	99	89	TWD	29	07H	0.04	TSP Wear
SG89	99	89	TWD	29	07H	0.07	TSP Wear
SG89	99	89	TWD	36	07H	0.1	TSP Wear
SG89	99	89	TWD	48	07H	0.13	TSP Wear
SG89	99	89	TWD	51	07H	0.16	TSP Wear
SG89	99	89	TWD	50	07H	0.18	TSP Wear

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SONGS Unit 3 Line-by-Line Sizing (PRELIMINARY)

SG	Row	Col	Ind	%TW	Elev	Inch1	Category
SG89	99	89	TWD	45	07H	0.2	TSP Wear
SG89	99	89	TWD	51	07H	0.23	TSP Wear
SG89	99	89	TWD	54	07H	0.26	TSP Wear
SG89	99	89	TWD	61	07H	0.28	TSP Wear
SG89	99	89	TWD	63	07H	0.31	TSP Wear
SG89	99	89	TWD	62	07H	0.33	TSP Wear
SG89	99	89	TWD	61	07H	0.36	TSP Wear
SG89	99	89	TWD	59	07H	0.39	TSP Wear
SG89	99	89	TWD	42	07H	0.42	TSP Wear
SG89	99	89	TWD	32	07H	0.44	TSP Wear
SG89	99	89	TWD	47	07H	0.47	TSP Wear
SG89	99	89	TWD	56	07H	0.49	TSP Wear
SG89	99	89	TWD	48	07H	0.52	TSP Wear
SG89	99	89	TWD	33	07H	0.54	TSP Wear
SG89	99	89	TWD	9	07H	0.57	TSP Wear
SG89	99	89	TWD	8	07H	0.59	TSP Wear
SG89	99	89	TWD	11	07H	0.62	TSP Wear
SG89	99	89	TWD	8	07H	0.65	TSP Wear
SG89	99	89	TWD	8	07H	0.67	TSP Wear
SG89	99	89	TWD	8	07H	0.7	TSP Wear
SG89	99	89	TWD	5	07H	0.73	TSP Wear
SG89	99	89	TWD	6	07H	0.75	TSP Wear
SG89	99	89	TWD	0	07H	0.78	TSP Wear

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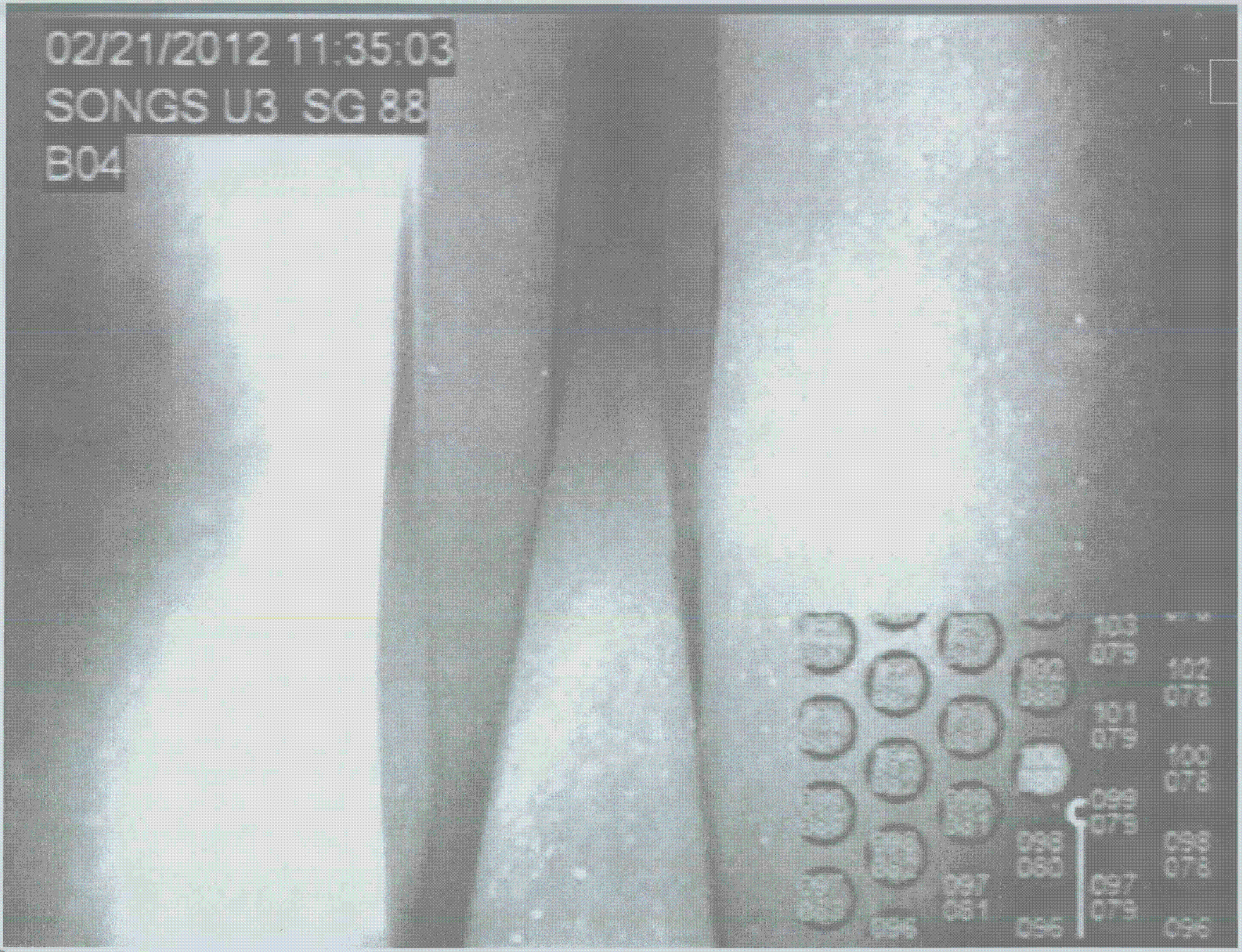
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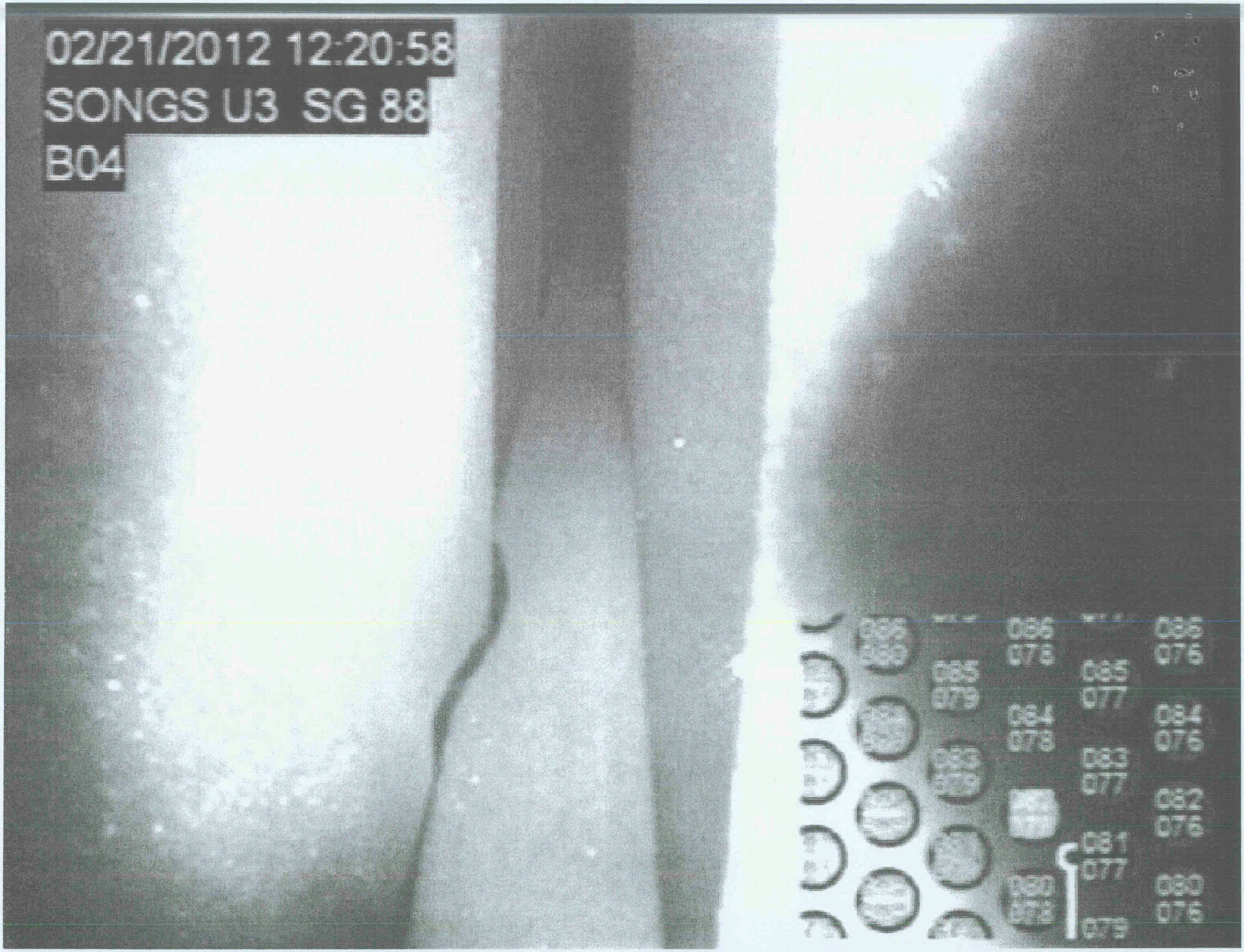

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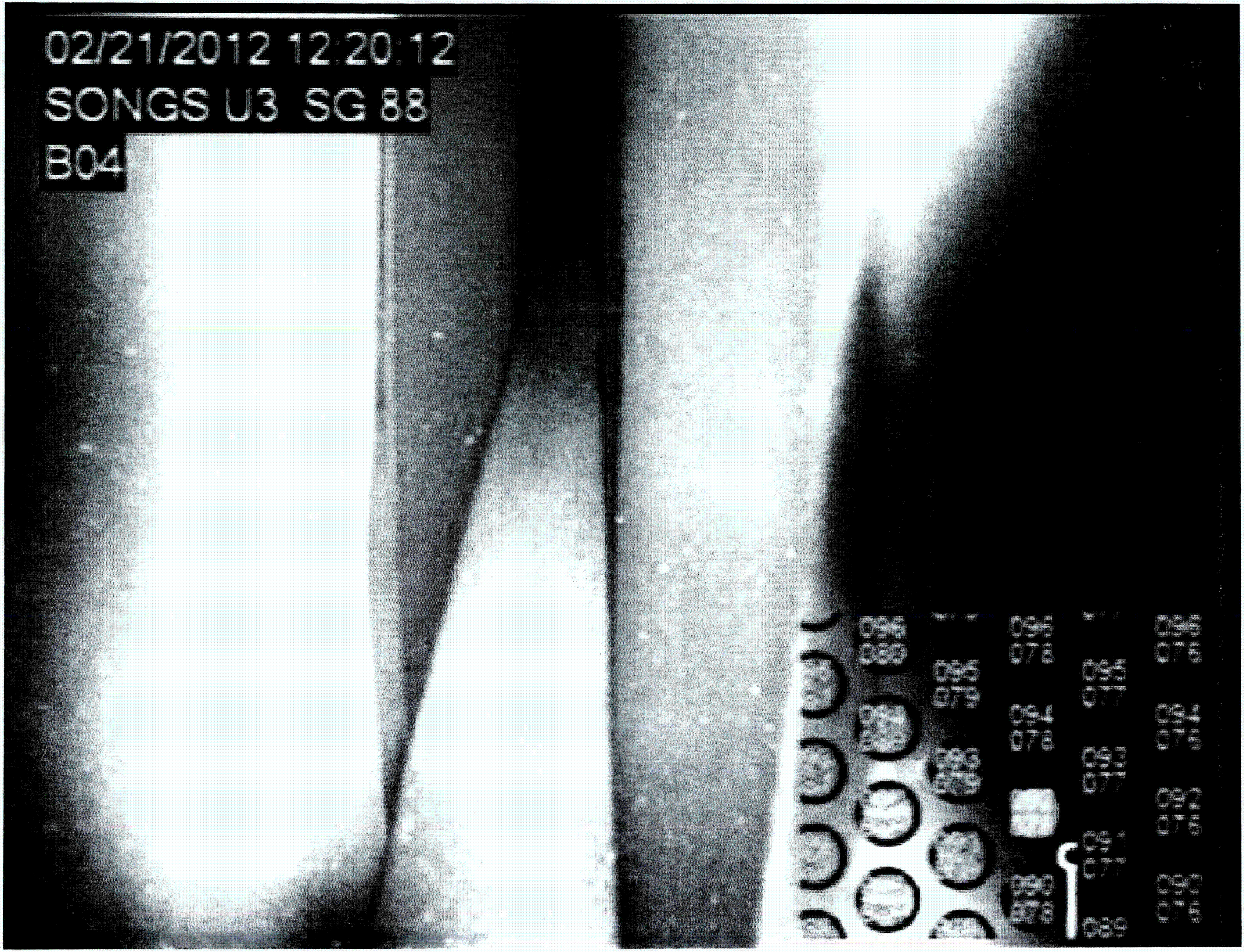
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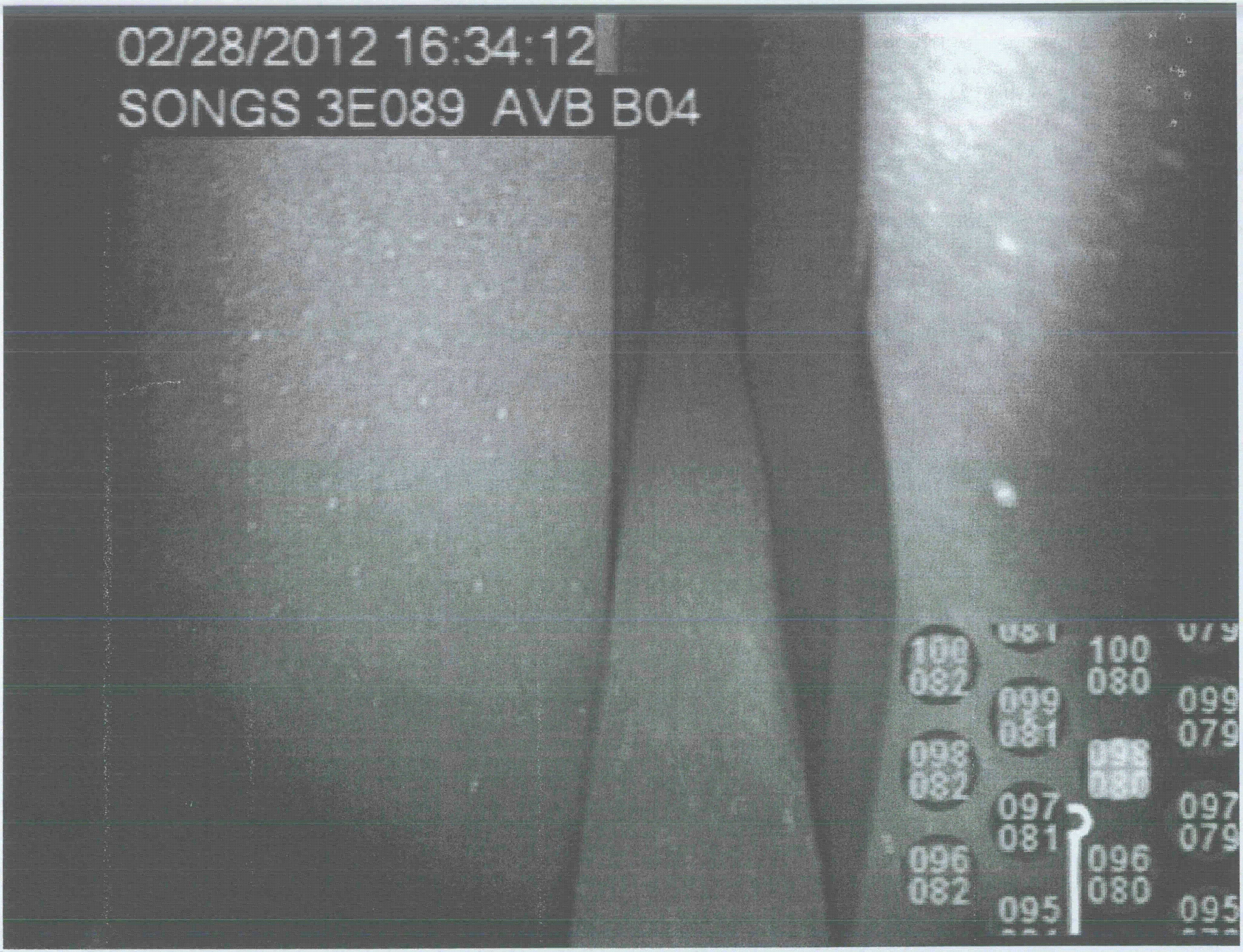
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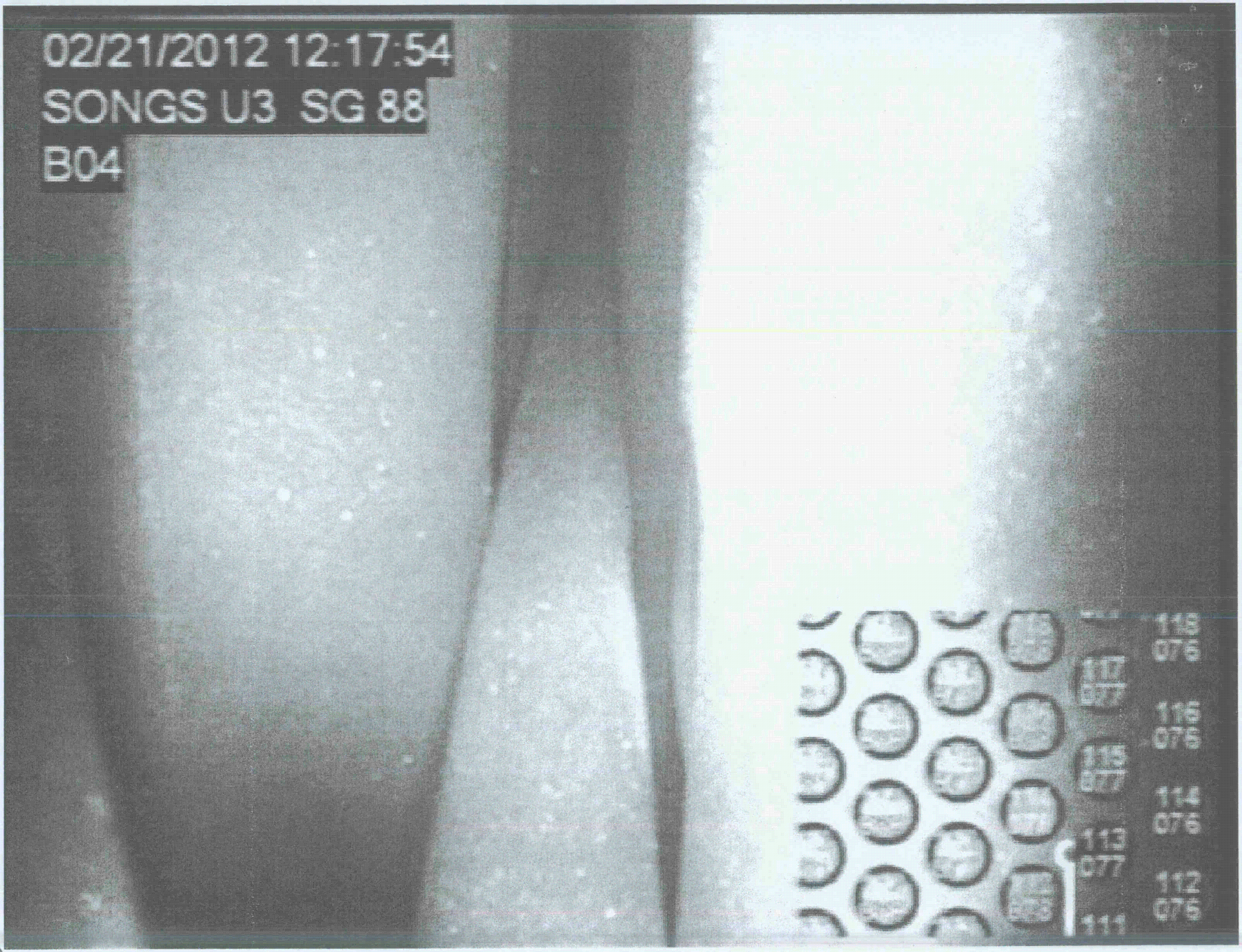
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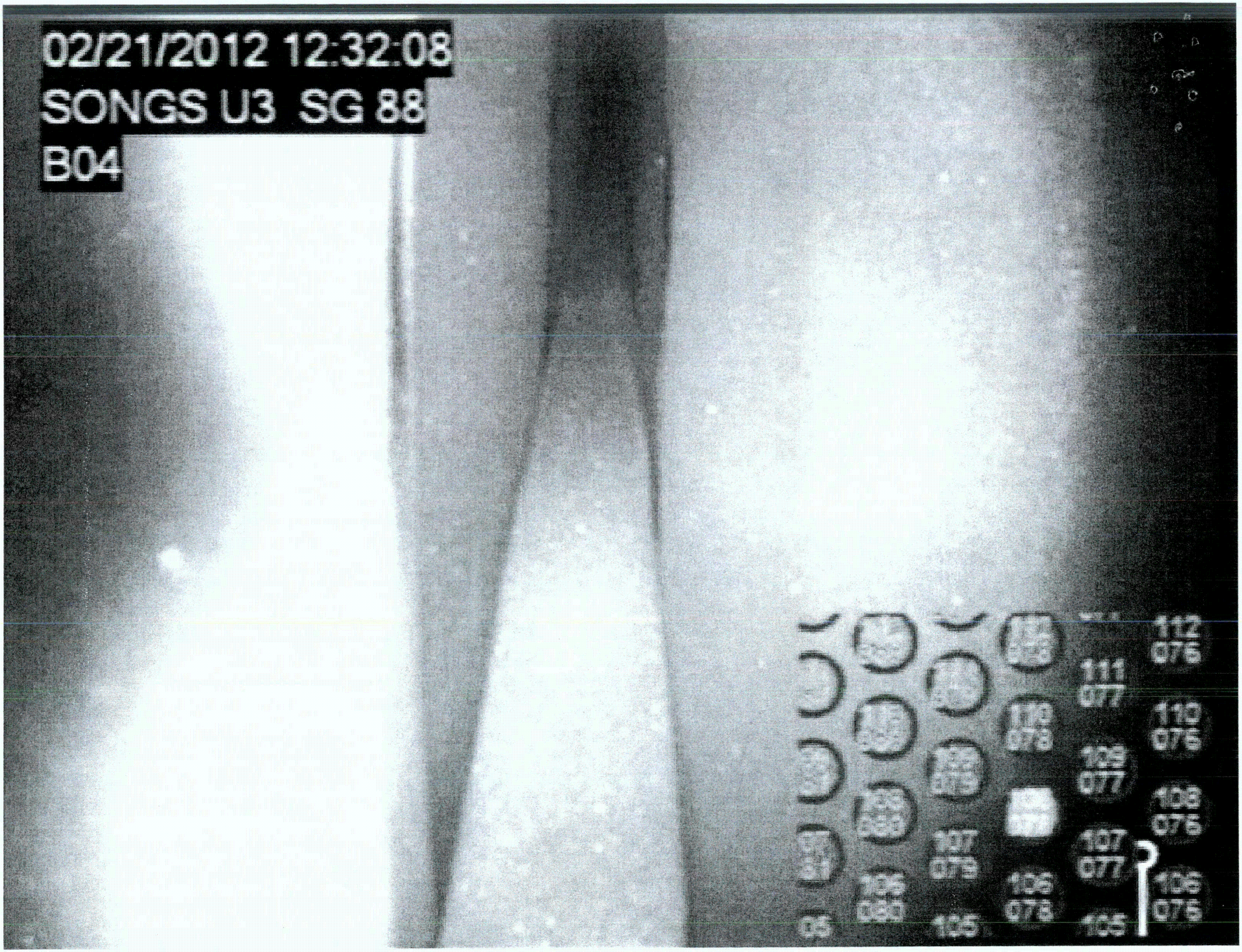
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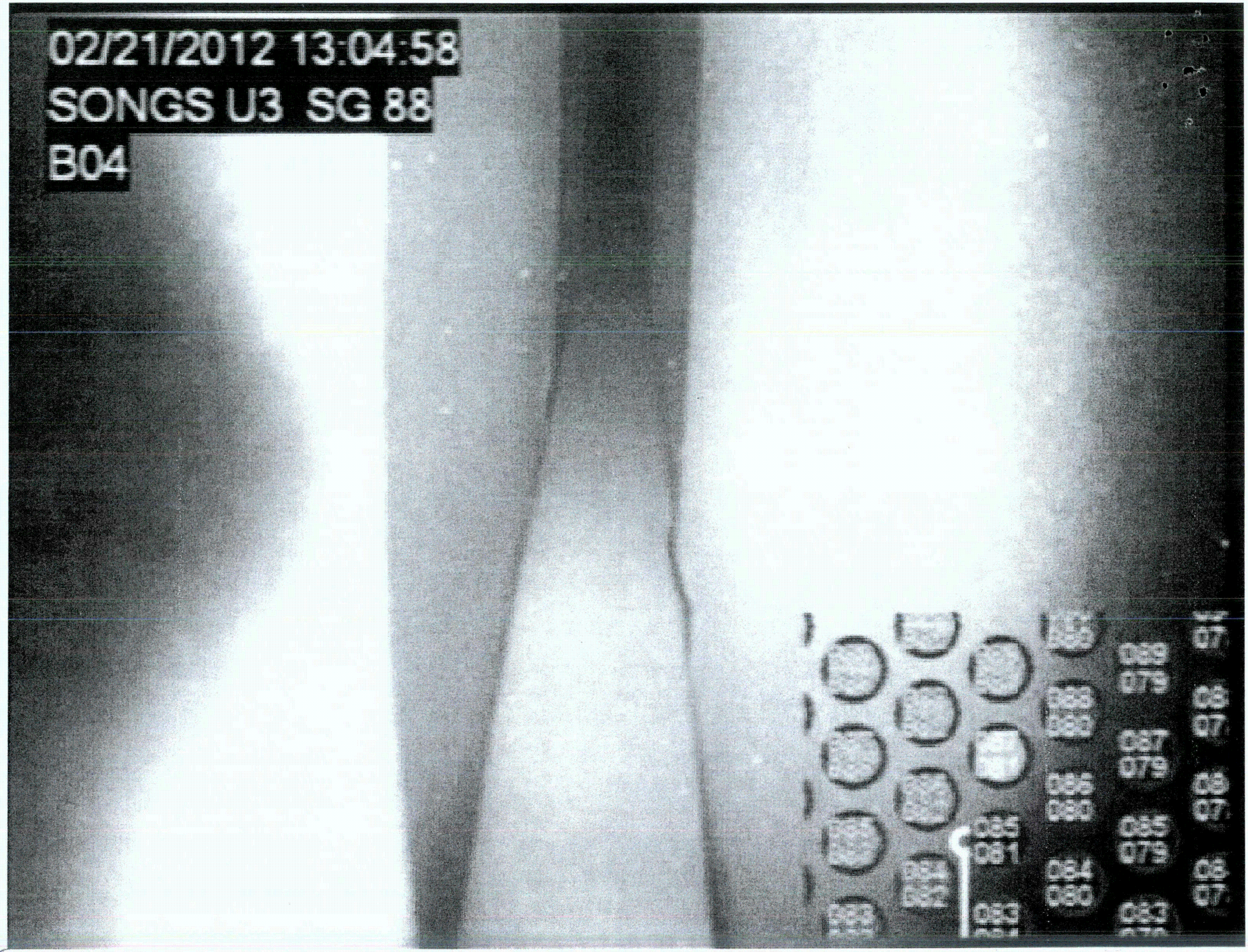

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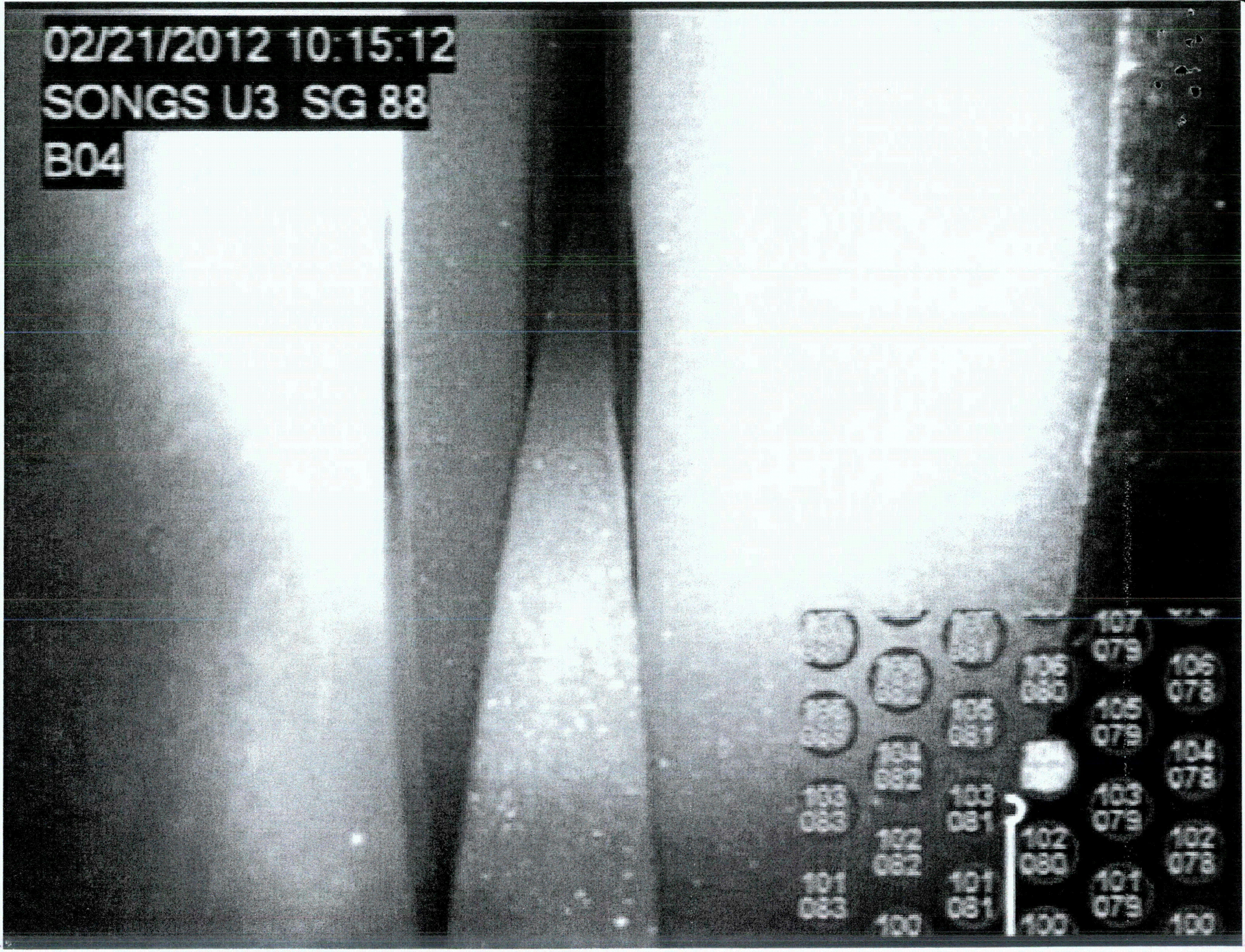
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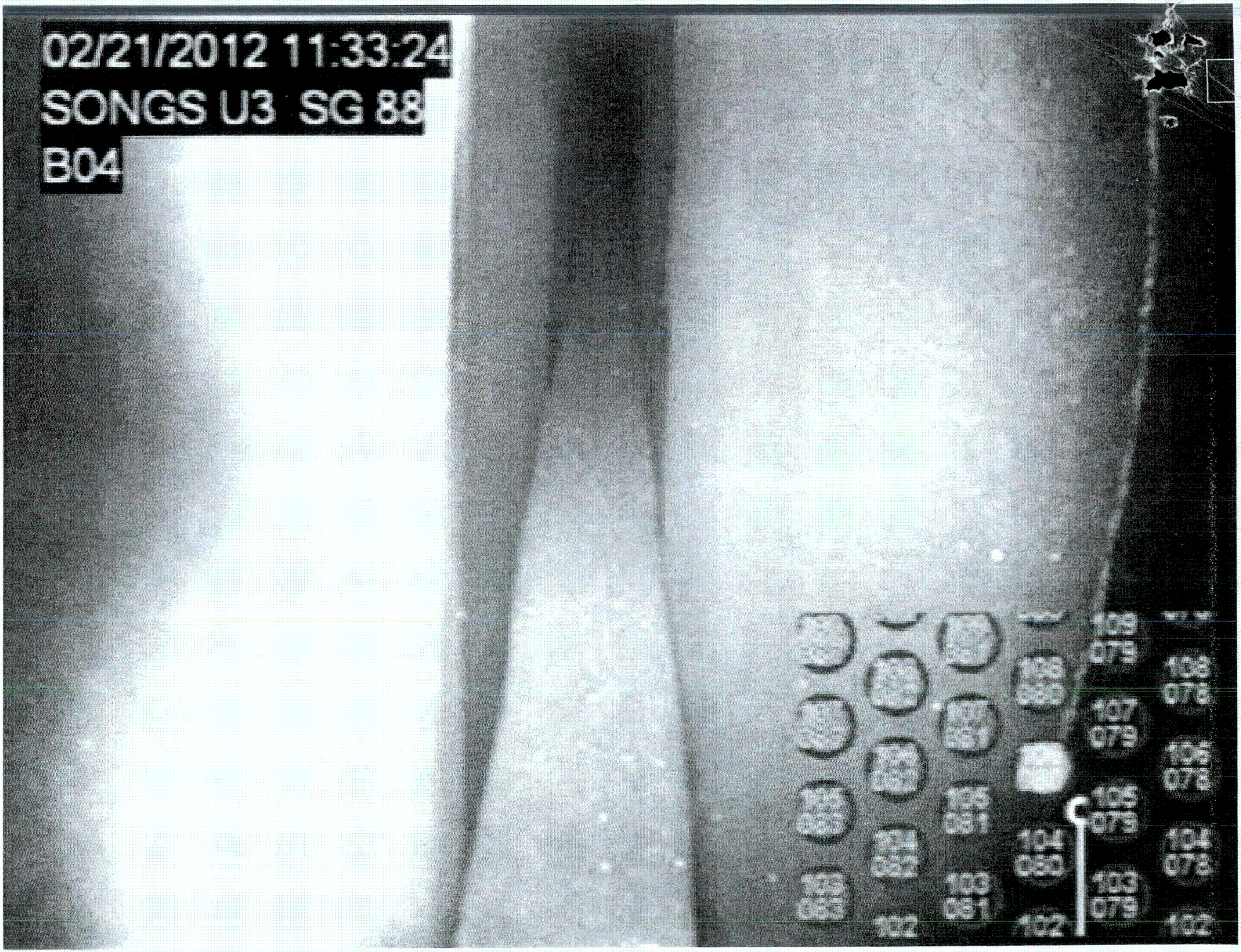
02/21/2012 11:33:24
SONGS U3 SG 88
B04

From: (b)(6)
To: Greene, Natasha; Carson, Louis; O'Donnell, John
Cc: (b)(6)
Subject: This Week at SONGS
Date: Tuesday, February 14, 2012 9:56:33 AM

Inspectors,

FYI, here is a overview of this weeks activities.

Outage Director's Message	With about three weeks remaining in the U2 RVH Replacement Outage, many projects and other work scopes are beginning to compete for the honor of being Outage Critical Path. This is as it should be as we begin final reassembly of the plant. As we move towards "breakers closed" we need to keep our focus on all of the many parallel paths to core reload and plant startup. From a high level this is not complicated, so here are a few key areas important to our success in exiting this important SONGS refueling outage: To fill the U2 RWST, we need to complete the ECCS schedule 10 piping replacement work. We also need sources of fill water, so OPS has developed an integrated water management and movement plan to do so. To restore U2 Train B operability, we need to complete the EDG modifications and testing. We also need to complete Installation of the Train B CCW HX, and restore Train B SWC. To reload the U2 reactor core, we need to complete the RRVH activities necessary to allow us to move it to the normal Head Stand, which will then allow us to remove the reactor cavity decking. Deck removal allows us to then complete the ICI cutup activities and remove the ICIs to the SFP. In parallel with all of those activities, we need to complete the repairs to the U2 E088 and E089 S/Gs, release the major primary plant WAR known as PPD01, fill the RCS and then remove the Temporary Reactor Head. For Unit 3, we continue Eddy Current inspections and data analysis of the U3 Steam Generators. This information will be used to develop a repair plan just as we done for Unit 2, and to then move forward with repairs. It's critically important as we complete all of the work described above, that we also complete the administrative requirements we often refer to as "paper closure". You've all heard the saying "the work isn't done until the paperwork's complete." That's particularly true for nukes like all of us on the SONGS team. As field work and post work testing completes, make sure ECPs are carefully walked down, schedules updated and work orders confirmed and closed out in accordance with our procedures. It's not too early to be looking at Mode 6, 5 and 4 restraints to ensure we are not performing administrative tasks on Critical Path! The weather forecast includes the potential for inclement weather through Wednesday, so keep your eyes on path, hold onto stairway handrails, and look out for each other! Let's have a Safe AND Productive Tuesday!

D/5
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Greene, Natasha

From:	(b)(6)
Sent:	Wednesday, February 15, 2012 5:54 AM
To:	Carson, Louis; Greene, Natasha; O'Donnell, John
Subject:	Wednesday at San Onofre

Next Shift Goals

Unit 2

- Plug and stabilize 2E088 and 2E089 S/G tubes
- Continue assembly of the Simplified Head Assembly (SHA) components.
- Begin removal of Reactor Cavity Decking-Forecast today at 15:00

Unit 3

- Continue SG U-Tube Eddy Current Inspections
- Preparations for S/G 3E088 Secondary Side Inspections- manways have been removed.

Outage Director's Message

In the last Director's update we pointed out that U2 will have priority over U3 for plant startup based upon the scope of S/G Eddy Current inspections and data analysis necessary to develop the repair and plant startup plans which will drive the safe and methodical recovery of U3 over the next several weeks.

We also pointed out that having both SONGS units shutdown creates an extra (but manageable) challenge for the first of the two plants to be brought back on line. Normally, with one unit at power we have a source of steam for the unit we are starting up. With both units shutdown we don't have the steam necessary to pressurize the Unit 2 Aux Steam System and use it to establish turbine gland seals and draw a main condenser vacuum. Without vacuum the Main and Feed Pump Turbines can't be run, and the Condensate and Feedwater systems cannot be as easily cleaned up to allow feeding the Steam Generators.

Is there a way to safely startup Unit 2 without Aux Steam in service? Absolutely! We will use RCPs to heat up the RCS while maintaining the MSIVs closed, then startup the U2 Reactor Plant. With the Reactor in operation as a heat source, we will then bring steam into the Turbine Plant slowly heating it up and pressurizing all of the secondary plant steam piping. This will allow getting us to the point in the plant startup sequence described above. Why this discussion? The added activities described above take schedule time, and that's what's driven "breakers closed" out a bit from the original March 4th date.

What we want to make very clear to the SONGS Outage Team is that this delay does NOT reflect negatively on our outage performance. In many if not most areas of outage execution to-date this remains one of the best outages we have executed. Of course we aren't quite done, so let's keep focused on the finish line until we cross it.

Most importantly, we have responded to the challenges we've encountered to date in both unit outages as great nukes do: We've gathered and analyzed the facts surrounding issues, analyzed all of options for resolution, and picked the option that allowed us to progress the outages in ways that relentlessly put nuclear and personnel safety first, but also in ways that demonstrated that safety and production go hand in hand. We will continue to manage issues until both units are safely back where they are best suited to be: on-line safely generating electrical power.

There's more wet weather in the forecast...Be careful and watch out for each other!! Remember the Employee Led Safety Team's recent campaign: "Don't Fall Down!"

Let's have a Safe AND Productive Wednesday!

D/16
30

(b)(6)

From: (b)(6)
To: Carson, Louis; Greene, Natasha; O'Donnell, John
Subject: Fw: IMPORTANT STATION UPDATE
Date: Wednesday, February 15, 2012 7:19:11 PM

FYI

----- (b)(6) on 02/15/2012 05:21 PM -----

From: Site VP and Station Manager (b)(6) (Broadcast)
To:
Date: 02/15/2012 05:05 PM
Subject: IMPORTANT STATION UPDATE
Sent by: NETWORK SECURITY-SONGS

SONGS Team:

As you know, we have been systematically working our way through additional Steam Generator Inspections and repairs as part of Unit 2 outage scope, and on Unit 3 following the shutdown on Jan. 31, due to a small leak. In previous communications, I informed you that our actions to shutdown Unit 3 were conservative and appropriate based on the leak; and that we are using a methodical approach to ensure we understand why this happened and how we can prevent recurrence. We will continue to adhere to our Nuclear Safety Culture Principle of "Decision Making Reflects Safety First," as our on-site engineering staff and supporting team works with vendors and other experts on our Steam Generators.

I do need to share with you where we are in our understanding of the issues, our Steam Generator Inspections, and how this factors into the schedules for both units. On Unit 2 we have completed Steam Generator primary side inspections, and tonight will be looking into the secondary side of Steam Generator E089 to perform some confirmatory checks on the support structure for the Steam Generator tubes. In working with industry experts and following industry guidance issued through the Electric Power Research Institute (EPRI), we have systematically followed a process to plug and in some cases reinforce a small number of tubes. This was done to ensure that the Steam Generators will be fully capable of safely performing their design function when we return Unit 2 to full power. As we work through the remainder of our major outage windows on Unit 2 to complete the Reactor Vessel Head Replacement project, restore our Emergency Core Cooling System (ECCS) piping to service, and close out the "B" train window, it is important to focus on safety and to follow the schedule. I know we can do that.

Due to the tube leak, we are conducting inspections on 100 percent of the tubes on Unit 3. These Steam Generators will likely require more extensive inspections, and we are working through a very comprehensive plan to ensure we fully understand what caused the tube leak and put in place the proper repairs. For the inspection plan, this will result in using several methods for testing the Steam Generator tubes. You have probably heard the term "eddy current testing," which is the method we use to detect tubing flaws. For our inspections on Unit 3, we will use a very precise system of eddy current probes in the Steam Generator tubes to fully quantify their integrity. After we collect all of the data, we'll follow a systematic process, engage the right experts, and apply EPRI guidance to ensure the Steam Generators are safely restored to their full design function. Based on this, the Unit 3 forced outage schedule will continue into the month of March, with our inspections targeted to be completed by the end of February. I cannot emphasize enough to you that we will ensure we follow proven industry practices to restore the Unit 3 Steam Generators. We cannot, and will not, take any chances

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with this.

I need your support as we work through the remainder of the refueling outage on Unit 2 and properly restore our Steam Generators to service on Unit 3. I realize this can be distracting to you, and you will want more information as we move forward. I also want you to understand that the leadership team at SONGS is committed to provide you the right information at the right time, and answer any questions you may have.

Most importantly, let's continue to work safely by looking out for ourselves and each other, follow our schedules, and make appropriate conservative decisions as we progress through these outages. I'm proud to be part of this team.

Thanks,

(b)(6)

From: Werner, Greg
To: Murphy, Emmett; Karwoski, Kenneth; Anchondo, Isaac; Melfi, Jim
Cc: Kennedy, Kriss; Pruett, Troy; Blount, Tom; Vegel, Anton; Warnick, Greg; Reynoso, John; Sifre, Wayne
Subject: FW: SONGS U2/3 Steam Generator Status Reports
Date: Thursday, February 16, 2012 2:55:09 PM
Attachments: Unit 3 NRC Steam Generator NRC Status Report 2 -16-2012.pdf
Unit 2 Steam Generator NRC Status Report 02-16-2012.pdf

FYI

From: (b)(6)
Sent: Thursday, February 16, 2012 9:47 AM
To: Werner, Greg; Lantz, Ryan; Hall, Randy; Kulesa, Gloria
Cc: (b)(6)
Subject: SONGS U2/3 Steam Generator Status Reports

From (b)(6) for 0800 Conference Call.

(b)(6)

Please consider the environment before printing this email

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D/18

SONGS Unit 3
Steam Generator Inspection and Eddy Current Testing
February 16, 2012

Status

Steam Generator 3E088 Secondary Side Leakage Test:
- Completed 2/10/12
- One leaking tube at approximately R106 C78, confirmed by eddy current
- Leak location in U-bend and is located 2" above 4th AVB on hot leg side
- Leakage rate approximately 0.001 gpm at 80 psi

Bobbin ECT

- Steam Generator 3E088:	Complete on	8590/9727 tubes	(88%)
- Steam Generator 3E089:	Complete on	7968/9727 tubes	(82%)
- Overall:	Complete on	16558/19454 tubes	(85%)

- Scope – 100% full-length bobbin followed by rotating probe as determined by bobbin results

Rotating Probe (special interest)
- Following completion of bobbin ECT
- Forecast to begin 2/16

In-situ Testing
- Leaking tube and any other indications required by EPRI guidelines
- Schedule following completion of eddy current testing

Findings to Date (as of 2/15/12)

Freespan Indications
- Leak is located near center of a 20" axially oriented freespan indication
- Similar indications found in adjacent tubes
- Consistent with tube to tube wear
- ~ 300 tubes with similar indications (present in both SG's)
- Reanalyzed ~ 1000 tubes in each Unit 2 SG for this mechanism; no indications found, the tubes were selected to bound the same region as the freespan indications in Unit 3

Wear at Support Structures - Tube Support Plates (TSP) and Anti-Vibration Bars (AVB)
- Wear found at TSP's and AVB's in tubes with freespan indications
- Overall ~ 280 TSP locations with wear => 35% (TS plugging limit)

Wear at Retainer Bars
- Four locations (SG88 – 3; SG89 – 1) with Non-Quantifiable Indications (NQI) by bobbin

SONGS Unit 2
Steam Generator Eddy Current Testing
0500 February 16, 2012

Status

Bobbin ECT
- Steam Generator 2E088: Complete on 9727/9727 tubes (100%)
- Steam Generator 2E089: Complete on 9727/9727 tubes (100%)
- Totals: 19454/19454 tubes (100%)

Rotating Probe (special interest)
- Steam Generator 2E088: Complete on 203/203 tubes (100%)
- Steam Generator 2E089: Complete on 162/162 tubes (100%)
- Totals: 365/365 tubes (100%)

Rotating Probe (top of tubesheet expanded scope)
- Steam Generator 2E088: Complete on 2060/2060 tubes (100%)
- Steam Generator 2E089: Complete on 2060/2060 tubes (100%)
- Totals: 4120/4120 tubes (100%)

Rotating Probe (tube/retainer bar intersections expanded scope)
- Steam Generator 2E088: Complete on 192/192 tubes (100%)
- Steam Generator 2E089: Complete on 192/192 tubes (100%)
- Totals: 384/384 tubes (100%)

Findings to Date

Bobbin ECT

	Through Wall Thickness Percentage, Number of Tubes				
	>35%	20-34%	10-19%	<10%	None
- Steam Generator 2E088:	2	74	406	600	8645
- Steam Generator 2E089:	-	65	496	768	8398
- Totals:	2	139	902	1368	17043

Rotating Probe (special interest)
- Steam Generator 2E088: Two wear indications at retainer bars, on separate tubes, 54% and 47% through wall depth.
- Steam Generator 2E089: Five wear indications at retainer bars, on four tubes. Indications characterized at 90%, 38%, 30% 29% and 28% through wall depth.

Rotating Probe (top of tubesheet expanded scope)
- Steam Generator 2E088: No wear or potential loose part indications.
- Steam Generator 2E089: No wear or potential loose part indications.

Rotating Probe (tube/retainer bar intersections)
- Steam Generator 2E088: No other indications.
- Steam Generator 2E089: No other indications.

Current Actions

- Eddy Current Testing	Review for Unit 3 type freespan indications – Complete
- Plug List Development	Steam Generator E088 – Complete
	Steam Generator E089 – Complete
- Plugging	In-progress
- Tube stabilization analyses	Complete
- Secondary Side Inspection	Steam Generator 2E089 retainer bars in progress
- NRC NRR Conference Call	0800 2/16/12

Planned Actions

- Examination in 2C18
- Discussions with manufacturer and NRC
- Industry communications per S/G Program