**Technical Task and Quality Assurance Plan in Support of BNFL
Part B: Studies of Ion Exchange Resin Integrity under Flowsheet
Extremes: Part II**

by

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Task Technical and Quality Assurance Plan in Support of BNFL Part B

Studies of Ion Exchange Resin Integrity under Flowsheet Extremes: Part II

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I. INTRODUCTION

A. Task Definition

This task will address four items related to ion exchange stability: (1) process upset evaluation of resin in contact with 1 molar sodium permanganate at 25 and 40 °C, (2) accelerated aging with nitric acid solution used during normal regeneration operations, (3) prolonged contacting of SuperLig® 644 resin with 5 molar nitric acid at room temperature, and (4) prolonged contacting of SuperLig® 644 resin with deionized water at 60 ± 5 °C.

All work here is nonradioactive and does not use actual Hanford Tank samples.

B. Customer/Requester

This work was developed through SRTC recommendations forwarded to the BNFL Pretreatment Technical Manager and approved.

C. Task Responsibilities

The Special Projects group is responsible for directing the research. The Actinide Technology Section (ATS) group will perform the accelerated aging tests, the permanganate reaction tests, and the resin digestion/dissolution tests. Additional performance of the work is expected within the following groups:

The Analytical Development Section (ADS) is responsible for analyzing sample chemistry per quality assurance requirements as well as tracking samples within the LIMS system. ADS will analyze liquid samples by SVOA and gaseous samples by VOA Halocarbon (5mL purge/trap) and VOA Halocarbon (direct gas loop). These VOA methods are consistent with EPA SW-846 methods.

The Materials Technology Section (MTS) will provide differential scanning calorimetry (DSC), thermal gravimetric analysis (TGA), and differential thermal analysis (DTA) (if applicable). These analyses will be controlled by the MTS Quality Assurance program and the instrument will be maintained as calibrated Measurement and Test Equipment.

D. Task Deliverables

One or more reports on the work covered by this TTP are to be delivered. The complete dataset will be available to the customer on request. Data and lab notebooks are handled per the Part B1 contract with BNFL.

II. TASK ACCEPTANCE CRITERIA

Customer approvals of the TTP constitute acceptance of the work plan.

III. TASK ACTIVITIES

A. "Process upset" test of SuperLig[®] 644 resin in contact with 1 molar sodium permanganate at 25 and 40 °C.

Resin is treated with a solution of 1 molar sodium permanganate in the RSST at room temperature. Significant self-heating is expected although no heat is applied. The reactivity of the system is characterized by monitoring the temperature and pressure changes. Only the gaseous products will be analyzed.

B. "Accelerated aging" test of SuperLig[®] 644 resin with the nitric acid solution used during normal operation.

Resin in 0.5 molar nitric acid is heated in the Reactive System Screening Tool (RSST). The reactivity of the system is characterized by monitoring temperature and pressure changes. Solid, liquid and gaseous degradation products will be analyzed.

C. Prolonged contacting of SuperLig[®] 644 resin with 5 molar nitric acid solution at room temperature.

Resin is contacted with 5 molar nitric acid at room temperature for at least 2 weeks or until it dissolves. Solid, liquid and gaseous degradation products will be analyzed.

D. Prolonged contacting of SuperLig[®] 644 resin with deionized water at 60 °C.

Resin is contacted with deionized water at 60 °C for at least one week or until it dissolves. Solid, liquid and gaseous degradation products will be analyzed.

A. "Process upset" test of SuperLig[®] 644 resin in contact with 1 molar sodium permanganate at 25 and 40 °C

Sodium permanganate is a powerful oxidizer that is expected to damage organic ion exchange resins. Work described in this section is intended to characterize the reaction that will occur as a result of the accidental addition of sodium permanganate solution to the SuperLig[®] 644 ion exchange column.

1. Reactivity scoping test. This test will be performed in accord with the National Fire Protection Agency (NFPA) guidelines⁸ for working with potentially energetic compounds. SuperLig[®] 644 resin (<50 mg) will be placed on a watchglass. A drop of 1 molar sodium permanganate will be added, and the vigorousness of the reaction will be noted. As suggested by the NFPA guidelines, the mass of the reactivity scoping test will be performed in a chemical hood with less than 50 mg of material, and personal protective equipment will include leather gloves and a face shield. In addition, a Plexiglas[™] barrier will be in place between the test reaction and personnel.
2. Scale-up test in RSST at 25 °C. Based on the intensity of the reactivity scoping test, a mass scale-up test may be performed in the RSST. Since this test is simulating resin packed in a column, the target liquid:solid ratio of about 3:1. The RSST test cell will be loaded with a

SuperLig[®] 644 resin (2.5 grams). The test cell will be loaded into the RSST. Before the RSST test is started, the 1 molar sodium permanganate (7.9 grams) solution will be added externally to a sealed Parr bomb. A syringe will be used to force the permanganate solution through an extension tube into the test cell, and the Parr bomb will be monitored for temperature and pressure. This test will be repeated at least once.

3. Scale-up test in RSST at 40 °C. The RSST test cell will be loaded with SuperLig[®] 644 resin (2.5 grams). The test cell will be loaded into the RSST. The 1 molar sodium permanganate solution will be warmed in a water bath before use. Before the RSST test is started, the warmed 1 molar sodium permanganate (7.9 grams) solution will be added externally to a sealed Parr bomb. A syringe will be used to force the permanganate solution through an extension tube into the test cell. This test will be repeated only if the results are significantly different from the Scale-up RSST test at 25 °C.
4. These SuperLig[®] 644 resin/NaMnO₄ reactions are expected to self-heat and may evolve gas.
5. Analyze the RSST reaction profiles (time vs. temperature, self-heating rate vs. temperature, pressure rate vs. temperature, and pressure vs. temperature) to characterize the reactivity of the system.
6. Gaseous Products. At the conclusion of the RSST test, the test cell is allowed to return to room temperature prior to collection the off-gas sample. The off-gas is vented to a Tedlar[™] bag, and sealed. Submit the gas sample to ADS for prompt analysis by VOA Halocarbon (purge/trap scan) and VOA Halocarbon (direct gas loop).
7. Results will include RSST reaction profiles and VOA analyses of the gas.

B. "Accelerated aging" test of SuperLig[®] 644 with the nitric acid solution used during normal operation.

The treatment to regenerate SuperLig[®] 644 ion exchange resin involves loading and eluting a 0.5 molar nitric acid solution. A study of the resin-nitric acid mixture as a function of temperature will 1) simulate the accelerated aging of the resin-nitric acid mixture on the ion exchange column and 2) verify the safe operating conditions.

In an earlier RSST test of SuperLig[®] 644 resin in 5 molar nitric acid solution, an exothermic reaction was observed in the range of 55 to 60 °C. The purpose of this test is to determine if a comparable exothermic reaction is observed for SuperLig[®] 644 resin in 0.5 molar nitric acid solution.

1. SuperLig[®] 644 resin (2.5 grams) and 0.5 molar nitric acid (7.9 grams) are loaded into the RSST, and containment is closed without backpressure. Since this test is simulating resin packed in a column, the target liquid:solid ratio of about 3:1 is much lower than our earlier RSST work (25:1 was used to simulate resin fines in the evaporator). All work should be performed in a chemical hood.

2. Slowly heat the system at 15 °C/hr (0.25 °C/min) up to 90 °C, and hold 24 hours. However, if an exotherm is observed, the reaction will be stopped and the data will be analyzed.
3. Analyze the RSST reaction profiles (time vs. temperature, self-heating rate vs. temperature, pressure rate vs. temperature, and pressure vs. temperature) to characterize the reactivity of the system.
4. Solid Products. Determine if any solid is left in the sample. If so, separate the solids from the liquid by decanting and/or a fine-bore pipette tip. Any solid resin remaining after acid reaction is to be rinsed with 5:1 liquid:solid ratio of water, then dried on a watchglass in the chemical hood. Subsequent drying will be performed under high vacuum at 50 °C. All DSC analyses are to be performed with slow temperature rise (5 °C/min) and with a purge of inert gas (nitrogen or argon). Heat to at least 300 °C, and if deemed useful, scan back down to ambient temperature.
5. Liquid Products. All liquid samples are analyzed for SVOA. In addition, a 3-mL aliquot of the liquid phase is to be evaporated to a solid paste on a watchglass in the chemical hood. Subsequent drying will be performed under vacuum at 50 °C or less. The dried residue is to be tested by MTS for DSC. DTA and TGA may be performed if deemed necessary.
6. Gaseous Products. At the conclusion of the RSST test, the test cell is allowed to return to room temperature prior to collection the off-gas sample. The off-gas is vented to a Tedlar™ bag, and sealed. Submit the gas sample to ADS for prompt analysis by VOA Halocarbon (purge/trap scan) and VOA Halocarbon (direct gas loop).
7. Results will include RSST reaction profiles, SVOA analyses of the liquids, and DSC/DTA/TGA scans of solids, and VOA analyses of the gas.

C. Prolonged contacting of SuperLig® 644 resin with 5 molar nitric acid solution at room temperature.

One option to facilitate change-out of spent ion exchange resin is complete dissolution prior to transfer. An earlier RSST test indicated complete dissolution of SuperLig® 644 in 5 molar nitric acid at 90 °C in less than 24 hours, and indicated about 50% dissolution in water at 90 °C for 24 hours. Furthermore, IBC stated that SuperLig® 644 dissolved in 5 molar nitric acid (resin:acid = 1:100) at 25 °C over a period of days. Work described in this section is intended to determine the time required to dissolve the resin in 5 molar nitric acid (resin:acid = 1:25) at room temperature. If dissolution is not achieved in 2 weeks, the test may be terminated. If the case of a partial dissolution, solid, liquid and gaseous samples will still be analyzed as described below.

For each RSST test (0.4 g resin), a larger-scale beaker test (10 g resin) will be conducted simultaneously. The larger-scale beaker test will be used to visually monitor the dissolution of resin. The RSST will be run continuously and the Parr bomb will remain sealed until the resin

has dissolved in the larger-scale beaker test. The target liquid:solid ratio of about 25:1 will be used for both RSST-scale and the larger-scale beaker tests.

1. RSST test. SuperLig® 644 resin (0.4 grams) and 5 molar nitric acid (10.0 grams) are loaded into the RSST, and containment is closed without backpressure.
2. Slowly heat the system at 15 °C/hr (0.25 °C/min) up to 25 °C ± 5 °C, and hold for at least 2 weeks or until dissolution is complete. Visually monitor the larger-scale beaker test to determine when dissolution is complete.
3. Larger-scale beaker test. SuperLig® 644 resin (4 grams) and 5 molar nitric acid (100 grams) are placed in a beaker, and stirred at a fast rate with a magnetic stir bar.
4. The beaker is covered with a watchglass and visually monitored for at least 2 weeks or until dissolution is complete. After the beaker-scale test indicates that dissolution is complete, the RSST test will be terminated, and the off-gas will be collected in a Tedlar™ bag.
5. Analyze the RSST reaction profiles (time vs. temperature, self-heating rate vs. temperature, pressure rate vs. temperature, and pressure vs. temperature) to characterize the reactivity of the system.
6. Solid Products. Determine if any solid is left in each sample. If so, separate the solids from the liquid by decanting and/or a fine-bore pipette tip. Any solid resin remaining after acid reaction are to be rinsed with 5:1 liquid:solid ratio of water, then dried on a watchglass in the chemical hood. Subsequent drying will be performed under high vacuum at 50 °C. All DSC analyses are to be performed with slow temperature rise (5 °C/min) and with a purge of inert gas (nitrogen or argon). Heat to at least 300 °C, and if deemed useful, scan back down to ambient temperature.
7. Liquid Products. All liquid samples are analyzed for SVOA. In addition, a 3-mL aliquot of the liquid phase is to be evaporated to a solid paste on a watchglass in the chemical hood. Subsequent drying will be performed under vacuum at 50 °C or less. The dried residue is to be tested by MTS for DSC. DTA and TGA may be performed if deemed necessary.
8. Gaseous Products. At the conclusion of the RSST test, the test cell is allowed to return to room temperature prior to collection the off-gas sample. The off-gas is vented to a Tedlar™ bag, and sealed. Submit the gas sample to ADS for prompt analysis by VOA Halocarbon (purge/trap scan) and VOA Halocarbon (direct gas loop).
9. Results will include RSST reaction profiles, SVOA analyses of the liquids, and DSC/DTA/TGA scans of solids, and VOA analyses of the gas.
10. If the SuperLig® 644 resin (4 grams) and 5 molar nitric acid (100 grams) completely dissolved in the large scale beaker test, that solution will be used in neutralization studies. If complete dissolution is not achieved, a solution will be prepared by heating a mixture of

SuperLig[®] 644 resin (4 grams) and 5 molar nitric acid (100 grams) to about 90 °C until it completely dissolves.

- a. 5-mL beaker test. A 5-mL aliquot of "SuperLig[®] 644 solution" will be placed in a beaker, and 5 molar sodium hydroxide will be added to achieve pH 12-13 (by pH paper). The neutralization reaction will be monitored for foaming. The tests will be repeated a minimum of three times.
- b. RSST test. A 5-mL aliquot of "SuperLig[®] 644 solution" will be loaded into the RSST. The amount of sodium hydroxide required to attain pH 12-13 in the 5-mL beaker test will be added externally to a sealed Parr bomb. A syringe will be used to force the sodium hydroxide through an extension tube into the test cell.
- c. The reaction is expected to self-heat and may evolve gas. Analyze the RSST reaction profiles (time vs. temperature, self-heating rate vs. temperature, pressure rate vs. temperature, and pressure vs. temperature) to characterize the reactivity of the system.

D. Prolonged contacting of SuperLig[®] 644 resin with deionized water at 60 °C.

Work is described in this section is intended to determine if the resin will completely dissolve in deionized water at 60 °C.

1. RSST test. SuperLig[®] 644 resin (0.4 grams) and deionized water (10.0 grams) are loaded into the RSST, and containment is closed without backpressure.
2. Slowly heat the system at 15 °C/hr (0.25 °C/min) up to 60 °C, and hold for at least one week or until dissolution is complete. Visually monitor the same-scale beaker test to determine when dissolution is complete.
3. Same-scale beaker test. SuperLig[®] 644 resin (0.4 grams) and deionized water (10 grams) are placed in a beaker, and stirred at a fast rate with a magnetic stir bar.
4. The beaker is covered with a watchglass and visually monitored for at least one week or until dissolution is complete. After the beaker-scale test indicates that dissolution is complete, the RSST test will be terminated, and the off-gas will be collected in a Tedlar[™] bag.
5. Analyze the RSST reaction profiles (time vs. temperature, self-heating rate vs. temperature, pressure rate vs. temperature, and pressure vs. temperature) to characterize the reactivity of the system.
6. Solid Products. Determine if any solid is left in each sample. If so, separate the solids from the liquid by decanting and/or a fine-bore pipette tip. Any solid resin remaining after reaction with de-ionized water is to be rinsed with 5:1 liquid:solid ratio of water, then dried on a watchglass in the chemical hood. Subsequent drying will be performed under high vacuum at 50 °C. All DSC analyses are to be performed with slow temperature rise (5°C/min) and with

a purge of inert gas (nitrogen or argon). Heat to at least 300 °C, and if deemed useful, scan back down to ambient temperature.

7. Liquid Products. All liquid samples are analyzed for SVOA. In addition, a 3-mL aliquot of the liquid phase is to be evaporated to a solid paste on a watchglass in the chemical hood. Subsequent drying will be performed under vacuum at 50 °C or less. The dried residue is to be tested by MTS for DSC. DTA and TGA may be performed if deemed necessary.
8. Gaseous Products. At the conclusion of the RSST test, the test cell is allowed to return to room temperature prior to collection the off-gas sample. The off-gas is vented to a Tedlar™ bag, and sealed. Submit the gas sample to ADS for prompt analysis by VOA Halocarbon (purge/trap scan) and VOA Halocarbon (direct gas loop).
9. Results will include RSST reaction profiles, SVOA analyses of the liquids, and DSC/DTA/TGA scans of solids, and VOA analyses of the gas.

E. Control of Experimental Conditions

These non-radioactive tests will use reagent grade chemicals weighed on calibrated balances. Weights will fall within $\pm 5\%$ of the desired value.

The experiments will occur at constant temperature. Personnel will measure the temperatures to $\pm 2\text{ }^{\circ}\text{C}$ using thermometers and/or thermocouples that are traceable to NIST standards.

F. Blanks and Controls

The WPTS personnel will submit blanks and control samples to ADS or to MTS to monitor preparations and analytical methods. Control samples will contain a defined quantity of the analyte of interest.

G. Measuring and Testing Equipment (M&TE)

This task will use the following M&TE: Balances, thermometers, pressure gauges thermocouples, and differential scanning calorimeters (DSC, DTA, and TGA are all done with the same instrument).

The thermometers, thermocouples, and pressure gauges will receive calibration against NIST-traceable standards by the SRTC Standards Laboratory. Balance calibration will use reference weights traceable to NIST standards. The DSC will use a standard reference material (typically silver metal) for calibration.

H. Documentation

A numbered notebook will record all pertinent instructions, results, and calculations in accordance with Manual L1, SRTC Procedures Manual, procedure 4.19.⁸ A laboratory notebook

will provide lifetime storage as a record. Drafts of all preliminary reports will receive review by selected WPTS for comments. Final reports will issue after comment resolution.

IV. TASK SCHEDULE Activities are performed in accordance with the BNFL Part B1 Schedule.

The following schedule estimates the completion of the deliverable for this task.

Issue Task Plan	April 17, 2000
Complete Experiments	June 5, 2000
Issue Report	June 15, 2000

V. RESEARCH FACILITY PLANNING – *Laboratory space is available for this task.*

VI. PROGRAMMATIC RISK REVIEW. Table 1 depicts the programmatic risks associated with this task and the associated mitigation, where identified.

Table 1. Programmatic Risk and Mitigation

Risk Factor	Event	Mitigation
Equipment	Failure	Replacement of item
Analytical Support	Failure	ADS has backup instruments
Personnel	Illness Vacation	Primary and secondary researchers and analysts identified.
Facility	Outage Electrical Ventilation	Adjust testing intervals.

VII. R&D HAZARDS SCREENING CHECKLIST

Listed below are characteristics of an experiment/project that may present hazards above normal risks to SRTC. Circle YES or NO for each item listed. For each "yes" answer you will be directed to a secondary hazard review or reviews that will direct completion of specific actions need to manage/mitigate the identified hazard.

Energies

A. Electricity (exposed energized parts > 50V).
See Figures 4 & 11.

YES

NO

B. Fissionable materials.

YES NO

Specify: _____

See Figures 4, 5, 6, 7, 9, & 11.

C. High noise levels (>85dBA).

YES NO

See Figures 4, 8, & 11.

D. Microwave/radiofrequencies (30 KHz- 300 GHz), electric or magnetic fields.

YES NO

See Figures 4, 8, & 11.

E. Lasers (other than class 1).

YES NO

See Figures 4, 8, & 11.

F. Moving equipment (exposed belts, chains, gears, pinch rollers, pulleys, rotating shafts/blades, wheels, etc.)

YES NO

See Figures 4 & 11.

G. Radioactive materials.

YES NO

Specify: Radionuclides

Amount:

Physical Form:

See Figures 4, 5, 6, 7, 9, & 11.

H. Static magnetic fields > 600 Gauss.

YES NO

See Figures 4, 8, & 11.

I. Sub-radiofrequency (<30 KHz) electric and magnetic fields.

YES NO

See Figures 4, 8, & 11.

J. Temperatures (<32° F or >150° F). Consider furnaces, ovens, dryers, boilers, steam systems, heaters, dewars, chillers, and release of compressed gases.

YES NO

See Figures 4, 8, 10, & 11.

K. Vacuum (external pressure > 15PSI).

YES NO

See Figures 4, 8, & 11.

L. Pressure (compressible materials > 30PSI; or non-compressible materials > 150PSI).

YES NO

See Figures 4, 8, & 11.

M Pressure vessels (> 15PSI and >6"ID; and/or contain toxic, corrosive, or nuclear materials).

YES NO

See Figures 4, 8 & 11.

Work Site Environmental Conditions

A. Boating or work over water.

YES NO

See Figure 4, 8, & 11.

B. Cold or heat stress conditions.

YES NO

See Figure 4, 8, & 11.

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C. Confined spaces/trenches/or evacuations.
See Figures 4, 8, & 11.

YES NO

D. Flammable atmospheres (> 10% LEL).
See Figures 4, 8, 10, & 11.

YES NO

E. Oxygen deficient atmospheres (<19.5% O₂).
See Figures 4, 8, & 11.

YES NO

F. Toxic atmosphere (airborne contaminant concentrations expected
to exceed 50% of the Threshold Limit Value).
See Figures 4, 5, 8, & 11.

YES NO

G. Activity performed in a nuclear facility.
See Figure 6.

YES NO

H. Work with radioactive or contaminated material or entry into
controlled area.
See Figures 6 & 7.

YES NO

Hazardous Materials

A. Biological Agents.
See Figures 4, 5, 8, 9, & 11.

YES NO

B. Carcinogens, mutagens, teratogens.
Specify: _____
See Figures 4, 5, 8, 9, & 11.

YES NO

C. Corrosives.
See Figures 4, 5, 8, 9, & 11.

YES NO

D. Cryogenic gases/liquids.
See Figures 4, 8, & 11.

YES NO

E. Flammable/combustible gases, liquids, solids.
Specify: Amount: _____
See Figures 4, 5, 8, 9, 10, & 11.

YES NO

F. Toxic Chemicals.
Specify: Amount: _____
See Figures 4, 5, 8, 9, & 11.

YES NO

G. Oxidizers.
Specify: Amount: <100 g
See Figures 4, 5, 8, 9, 10, & 11.

YES NO

H. Hydrocarbons (>55 gallons).
See Figures 4, 5, 8, 9, & 11.

YES NO

I. Any hazardous substance.
Specify: Caustic, acid _____
See Figures 4, 5, 8, 9, & 11.

YES NO

Environmental Compliance

A. Release of regulated gas or particulate to the environment.
See Figure 9.

YES

NO

B. Release of regulated materials to a waste disposal system.
See Figure 9.

YES

NO

C. Waste disposal problems (including equipment).
See Figure 9.

YES

NO

D. Creation of radioactive waste.
See Figure 9.

YES

NO

VIII. REFERENCES

1. TWRS Privatization, Contract No. DE-RP06-96RL13308, Modification No. A005.
2. M. E. Johnson, "Investigation of entrained solids filtration and Sr/TRU Precipitation", BNFL ref. Number 2003, March 11, 1999.
3. M. E. Johnson, "Request to Conduct Analysis of Archive AN-107 Sample and Permanganate Precipitation Trial", BNFL ref. Number 2140, March 23, 1999.
4. P. S. Townson, "TWRS-P Contract No. DE-AC06-96RL13308-W375, Sr/TRU Precipitation and Ultrafiltration Test Specification, BNFL ref. Number 1389, Jan. 22, 1999.
5. M. E. Johnson, "TWRS-P Contract No. DE-AC06-96RL13308-W375, BNFL ref. Number 000453
6. "Technical Notebook Use," Manual L1, Procedure 4.19, Rev. 5, February 2, 1998
7. "Conduct of Research and Development," WSRC-IM-97-0024, Rev. 0, May 31, 1998.
8. U.S. Department of Energy, "DOE Explosives Safety Manual," DOE M 440.1-1, September 30, 1995.
9. M. E. Johnson, "Evaluating Affects from Contacting SuperLig 644 Resin with Permanganate and Nitric Acid", BNFL ref. Number 012612, April 5, 2000.

Attachment 1. QA Plan Checklist

Listed below are the sections of the WSRC Quality Assurance Manual 1Q. The contents of the 1Q Manual are responsive to the requirements of DOE Quality Assurance Orders, 10CFR830.120 and to the WSRC Quality Assurance Management Plan (WSRC-RP-92-225). WSRC 1Q sections applicable to the work being performed for the TWRS Privatization Project should be indicated (mark Yes or No). Also indicate procedures SRTC implements to control the work (including L1, 8.21, Supplemental QA Requirements for RW-0333P, if applicable).

Yes	No	Title
		1.1 ORGANIZATION
X		1Q, QAP 1-1, Organization
X		L1, 1.02, SRTC Organization
		1-2 STOP WORK
X		1Q, QAP 1-2, Stop Work
		2-1 QUALITY ASSURANCE PROGRAM
X		1Q, QAP 2-1, Quality Assurance Program
X		L1, 8.01, SRTC QA Program Implementation
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.2-1
		2-2 PERSONNEL TRAINING & QUALIFICATION
X		1Q, QAP 2-2, Personnel Training & Qualification
X		L1, 5.01, SRTC Training, Orientation & Employee Development
	X	L1, 1.32, Read & Sign
X		L1, 1.33, Employee & Facility Access Orientation
		2-3 CONTROL OF RESEARCH & DEVELOPMENT ACTIVITIES
X		1Q, QAP 2-3, Control of Research & Development Activities
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.2-3
X		L1, 7.10, Control of Technical Work
X		L1, 4.19, Laboratory Notebook Use
X		L13-1, GT-QA-2-6, Analytical Support of Tasks
X		E7, 2.31, Engineering Calculations
		2-4 AUDITOR/LEAD AUDITOR QUALIFICATION & CERTIFICATION
	X	1Q, QAP 2-4, Auditor/Lead Auditor Qualification & Certification
		2-5 QUALIFICATION & CERTIFICATION OF INDEPENDENT INSPECTION PERSONNEL
	X	1Q, QAP 2-5, Qualification & Certification of Independent Inspection Personnel
		2-6 QA MANUAL REVISION
	X	1Q, QAP 2-6, QA Manual Revisions
		2-7 QA PROGRAM REQUIREMENTS FOR ANALYTICAL MEASUREMENT SYSTEMS
	X	1Q, QAP 2-7, QA Program Requirements for Analytical Measurement Systems
		2-10 INDEPENDENT INSPECTION PERSONNEL ON-THE-JOB TRAINING
	X	1Q, QAP 2-10, Independent Inspection Personnel – OTJ Training
		3.1 DESIGN CONTROL

Yes	No	Title
	X	1Q, QAP 3-1, Design Control
X		L1, 7.10, Control of Technical Work
		4-1 PROCUREMENT DOCUMENT CONTROL
X		1Q, QAP 4-1, Procurement Document Control
		5-1 INSTRUCTIONS, PROCEDURES & DRAWINGS
X		1Q, QAP 5-1, Instructions, Procedures & Drawings
	X	E7, 2.30, Drawings
X		L1, 1.01, SRTC Procedure Administration
X		L1, 1.01.1, SRTC Work Instructions
		6-1 DOCUMENT CONTROL
X		1Q, QAP 6-1, Document Control
X		L1, 1.30, SRTC Document Control
		7-2 CONTROL OF PURCHASED ITEMS & SERVICES
X		1Q, QAP 7-2, Control of Purchased Items & Services
		7-3 COMMERCIAL GRADE ITEM DEDICATION AND MATERIAL UPGRADE
	X	1Q, QAP 7-3, Commercial Grade Item Dedication & Material Upgrade
X		E7, 3.46, Replacement Item Evaluation/Commercial Grade Item Dedication
		8-1 IDENTIFICATION & CONTROL OF ITEMS
X		1Q, QAP 8-1, Identification & Control of Items
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.8-1
		9-1 CONTROL OF PROCESSES
	X	1Q, QAP 9-1, Control of Processes
		9-2 CONTROL OF NONDESTRUCTIVE EXAMINATION
	X	1Q, QAP 9-2, Control of NDE
		9-3 CONTROL OF WELDING & OTHER JOINING PROCESSES
	X	1Q, QAP 9-3, Control of Welding
		9-4 WORK CONTROL
X		1Q, QAP 9-4, Work Control
X		L1, 8.02, Attachment 8.9-4
		10-1 INSPECTION & VERIFICATION
X		1Q, QAP 10-1, Inspection & Verification
X		L1, 8.10, Inspection
X		L1, 8.10.1, Independent Inspection Releases
		11-1 TEST CONTROL
	X	1Q, QAP 11-1, Test Control
		12-1 CONTROL OF MEASURING & TEST EQUIPMENT

Yes	No	Title
X		1Q, QAP 12-1, Control of Measuring & Test Equipment
		12-2 CONTROL OF INSTALLED PROCESS INSTRUMENTATION
X		1Q, QAP 12-2, Control of Installed Process Instrumentation
		12-3 CONTROL & CALIBRATION OF RADIATION MONITORING EQUIPMENT
	X	1Q, QAP 12-3, Control of Radiation Monitoring Equipment
		13-1 PACKAGING, HANDLING, SHIPPING & STORAGE
X		1Q, QAP 13-1, Packaging, Handling, Shipping & Storage
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.13-1
		14-1 INSPECTION, TEST & OPERATING STATUS
	X	1Q, QAP 14-1, Inspection, Test & Operating Status
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.14-1
		15-1 CONTROL OF NONCONFORMING ITEMS
X		1Q, QAP 15-1, Control of Nonconforming Items
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.15-1
		15-2 CONTROL OF NONCONFORMING ACTIVITIES
X		1Q, QAP 15-2, Control of Nonconforming Activities
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.15-2
		16-1 CORRECTIVE ACTION SYSTEM
X		1Q, QAP 16-1, Corrective Action System
		16-2 QUALITY ALERT
X		1Q, QAP 16-2, Quality Alert
		17-1 QA RECORDS MANAGEMENT
X		1Q, QAP 17-1, QA Records Management
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.17-1
		18-2 QUALITY ASSURANCE SURVEILLANCES
X		1Q, QAP 18-2, Quality Assurance Surveillance
X		L1, 8.18.1, Surveillance
		18-3 QUALITY ASSURANCE EXTERNAL AUDITS
X		1Q, QAP 18-3, Quality Assurance External Audits
X		L1, 8.18, SRTC Quality Assurance Audit Program
		18-4 MANAGEMENT ASSESSMENTS
X		1Q, QAP 18-4, Management Assessments
		18-6 QUALITY ASSURANCE INTERNAL AUDITS
X		1Q, QAP 18-6, Quality Assurance Internal Audits
		19-2 QUALITY IMPROVEMENT
X		1Q, QAP 19-2, Quality Improvement

Yes	No	Title
X		L1, 8.02, SRTC QA Program Clarifications, Attachment 8.19-2
		20-1 SOFTWARE QUALITY ASSURANCE
X		1Q, QAP 20-1, Software Quality Assurance
X		L1, 8.20, Software Management & Quality Assurance
		21-1 ENVIRONMENTAL QUALITY ASSURANCE
	X	1Q, QAP 21-1, QA Requirements for the Collection & Evaluation of Environ. Data
		In addition to procedures noted above, if RW-0333P requirements are invoked, the following procedures may apply:
	X	L1, 8.21, Supplemental QA Requirements for RW-0333P
	X	L1, 3.07, Obtaining Analytical Services
	X	L1, 2.21, Radioactive Sample Receiving, Labeling, & Tracking
	X	L1, 4.19, Laboratory Notebook Use