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An Engineering Evaluation of Spherical Resorcinol Formaldehyde Resin

September 2010

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ACRONYMS

AES	atomic emission spectrometry
BV	bed volume
CST	crystalline silicotitanate
DI	deionized
DOE	US Department of Energy
DTA	differential thermal analysis
GC	gas chromatograph
HDPE	high-density polyethylene
HFIR	High Flux Isotope Reactor
ICP	inductively coupled plasma
MS	mass spectrometer
PID	photoionization detector
PNNL	Pacific Northwest National Laboratory
RF	resorcinol-formaldehyde
SCIX	small column ion exchange
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
SVOC	semivolatile organic compound
TGA	thermogravimetric analysis
VOC	volatile organic compound

1. INTRODUCTION

A small column ion exchange (SCIX) system has been proposed for removal of cesium from caustic, supernatant, and dissolved salt solutions stored or generated from high-level tank wastes at the US Department of Energy (DOE) Hanford Site and Savannah River Sites. In both instances, deployment of SCIX systems, either in-tank or near-tank, is a means of expediting waste pretreatment and dispositioning with minimal or no new infrastructure requirements.

Conceptually, the treatment approach can utilize a range of ion exchange media. Previously, both crystalline silicotitanate (CST), an inorganic, nonelutable sorbent, and resorcinol-formaldehyde (RF), an organic, elutable resin, have been considered for cesium removal from tank waste. More recently, Pacific Northwest National Laboratory (PNNL) evaluated use of SuperLig® 644, an elutable ion exchange medium, for the subject application. Results of testing indicate hydraulic limitations of the SuperLig® resin, specifically a high pressure drop through packed ion exchange columns. This limitation is likely the result of swelling and shrinkage of the irregularly shaped (granular) resin during repeated conversions between sodium and hydrogen forms as the resin is first loaded then eluted. It is anticipated that a similar flow limitation would exist in columns packed with conventional, granular RF resin. However, use of spherical RF resin is a likely means of mitigating processing limitations due to excessive pressure drop. Although size changes occur as the spherical resin is cycled through loading and elution operations, the geometry of the resin is expected to effectively mitigate the close packing that leads to high pressure drops across ion exchange columns.

Multiple evaluations have been performed to determine the feasibility of using spherical RF resin and to obtain data necessary for design of an SCIX process. The work performed consisted of examination of radiation effects on resin performance, quantification of cesium adsorption performance as a function of operating temperature and pH, and evaluation of sodium uptake (titration) as function of pH and counter-anion concentration. The results of these efforts are presented in this report. Hydraulic performance of the resin and the use of eluant alternatives to nitric acid have also been evaluated and have been reported elsewhere (Taylor 2009, Taylor and Johnson 2009).

2. EXPERIMENTAL PROGRAM

2.1 STANDARD PROCEDURES

Common to the test procedures described in this report were the conversion of resin to the hydrogen form and determination of factors for conversion of damp resin masses to dry resin equivalents (F-factors). The former is necessary in order to establish a consistent basis for expressing resin-loading behavior. Complete conversion of the resin to the hydrogen-loaded form is relatively straightforward and ensures that testing is performed using resin of homogeneous composition. In contrast, the preparation of sodium-form resin includes a final water-washing step that may result in some reconversion of the resin to the hydrogen form, yielding variations in resin properties that introduce error into F-factor values, which, in turn, introduce errors into distribution coefficient values. Determination of factors for converting damp resin mass values to a dry resin basis is required because it is necessary to store resin in liquid and under an inert atmosphere to prevent its oxidation. Subsequently, handling and transfers of resin between storage containers and test apparatuses involve the handling of resin that has had free liquids removed but is not completely dry.

2.1.1 Resin Pretreatment and Collection

Resin preparation was performed according to the protocol in SRNL-RPP-2004-0058 (Nash 2004). Resin used in testing was collected from Batch 5E-370-641, which was received from SRNL on December 2, 2008. Spherical RF resin, which was received in hydrogen form, was rinsed with five bed volumes (BV) of deionized (DI) water for at least 30 minutes and the slurry was agitated approximately every 10 minutes. The liquid was decanted in a manner that minimized resin contact with air and was then contacted with 5 BV 1.0 *M* NaOH for at least 16 h, during which time it was agitated periodically. The liquid was again decanted, and the resin was contacted with 3 BV DI water for at least 30 minutes and agitated periodically. The wash liquor was decanted, and a second and a third wash with 3 BV of DI water were performed. Preparation of sodium-form resin was completed with the third wash, leaving the resin in sodium form. For the hydrogen-form resin, the third water wash was decanted and 10 BV of 0.5 M nitric acid was transferred into the resin container. The acid-resin slurry was agitated periodically during a contact time of at least 2 h. The acid solution was decanted from the container, and the resin was washed with three batches of 3 BV DI water in the manner performed after the previous contact with NaOH. The resin was stored in the third rinse solution under an inert atmosphere (argon). Tape was placed over the joint between the lid and bottle to ensure an airtight seal.

Prior to each set of experiments, volumes of resin adequate for the test procedure and for F-factor determinations were collected from the pretreated resin that was stored in the desired state (sodium or hydrogen form) under liquid and inert gas (argon).

Resin for all tests other than the method validation equilibrations (a subset of the cesium loading determinations) was collected by pouring slurried resin directly into a Buchner funnel into which a Whatman 41 filter disc had been placed. The filter was prewetted with DI water to seal the filter paper to the funnel. Vacuum was initiated after wetting the filter and prior to sample transfer. As soon as transfer of resin to the filter was completed, a Petri dish modified with a hose nipple was placed over the funnel to serve as a lid, and argon was passed over the resin and through the filter as liquid was being removed. Vacuum was maintained for at least 2 minutes after the last drop of free liquid was observed to fall from the filter. When smaller numbers of resin samples were collected for use in K_d determinations, titrations, or radiolysis tests, associated samples for use in F-factor determinations were collected as the first and last resin samples. When larger sets of samples were collected (more than six samples), collection of material for F-factor determination was interspersed throughout the resin collection process. This approach was intended to compensate for incidental water loss that may have occurred after vacuum filtration was completed (i.e., during the process of collecting and weighing of filtered resin samples), which would generate a biased-low F-factor value. Due to the use of resin samples in F-factor measurements and equilibrations immediately after collection, samples collected for those purposes were not purged with argon for transfer to the vacuum furnace or to equilibration flasks.

In the case of the method validation test, water removal was performed under normal atmosphere (i.e., not under inert gas). In addition, volumes of resin for this test and the associated F-factor determination were removed from the supply container by submerging the larger-diameter end of a glass pipette into the supply container, allowing resin slurry to fill the end of the tube, then sealing the other end of the tube to prevent venting.

2.1.2 F-factor Determinations

With the exception of one set of cesium adsorption determinations (the method validation test), F-factor determinations were conducted in the same manner. Initial masses of damp acid-form resin samples collected for use in F-factor determinations subsequent to the method validation test were in the range of 1.0 to 1.2 g each. Sample containers were labeled and weighed prior to transfer of resin. Resin was added, and the net mass was determined incrementally until the value reached the target mass range. The sample containers were then capped, and the gross mass of each container was measured. Resin samples were transferred to a vacuum furnace, where they were reopened prior to being heated to a

nominal temperature of 50°C. Heating was maintained in the range of 50°C to 55°C under a pressure of not more than 60 Torr (absolute). Determinations made in conjunction with the second and third K_d determination tests (i.e., the two tests following method validation) were performed with no materials other than the resin samples and their containers in the furnace during drying. In the remaining tests, a beaker containing a dessicant (anhydrous calcium sulfate) was placed in the furnace to trap moisture released from the damp resin. The added desiccant significantly accelerated the drying process.

The resin samples were periodically removed from the furnace, capped, and weighed, and the masses were recorded. In all cases, the intervals between consecutive weighings were at least 3 h. Heating/weighing cycles were repeated until no mass changes at the milligram level were observed after three consecutive weighings.

The method for determining F-factors that was used in conjunction with the method validation test is described in Sect. 4.2.1 of this report.

2.2 RADIOLYSIS TESTING

Radiolysis testing focused on irradiating samples of RF resin under various conditions to determine whether the RF resin would degrade when exposed to a radiation field. Samples of RF were irradiated in various solutions that the resin would be exposed to during normal use, including an average simulant for Savannah River Site (SRS) supernatant in tanks 1, 2, and 3, a simulant for Hanford tank AP-101, water, and 0.5 *M* HNO_3. The gamma dose to the samples ranged from 50 Mrad to 300 Mrad. Large volumes of resin were irradiated in a Co-60 source to levels ranging from 100 to 300 Mrad; smaller volumes were irradiated to levels ranging from 50 to 300 Mrad in ORNL's High Flux Isotope Reactor (HFIR). Radiation effects were evaluated by two methods: collection and analysis of gas samples collected from the headspace over the liquid/resin samples and determination of cesium distribution coefficients for irradiated resin. The small volumes allow for K_d tests to be performed at each specified dose, while the large volume samples had K_d tests performed only at the endpoint, 300 Mrad, which will be reported in Sect. 4.2.6, "Radiolysis K_d Tests."

Common to all radiolysis test samples was the determination of gas volumes generated due to resin and solution degradation and the analysis of gas and liquid samples for resin degradation products: hydrogen, oxygen, nitrogen, nitrous oxide, carbon monoxide, carbon dioxide, and volatile organic compounds (VOCs).

2.2.1 Co-60 Irradiations

Preconditioned RF was dewatered using filter paper and was transferred into a graduated cylinder by sluicing using the target solution (i.e., SRS simulant, water, or 0.5 *M* HNO_3). The amounts of RF and solution were adjusted so that the total depth of the liquid and resin was 40% greater than the depth of the settled resin. The volume of resin was approximately 330 mL; the liquid volume was 220 mL. Irradiations under water and SRS waste simulant were performed using sodium-form resin; hydrogen-form resin was irradiated under 0.5*M* HNO_3. In each case, the mass of the irradiated resin was calculated from the initial resin volume and previously determined resin bulk densities: 0.368 g/mL for H-form resin and 0.297 g/mL for sodium form resin (Fiskum 2006).

Unirradiated control samples were prepared by placing resin under SRS simulant, water, and 0.5 *M* HNO_3. In each case, the solution of interest was added to 10 mL of preconditioned RF until the total sample volume was 16.7 mL. The samples were subjected to the same chemical exposure conditions (contact duration, handling and temperature) as the radiolysis samples.

After RF resin samples were prepared at ORNL and transferred into stainless steel containers, they were sent to SRNL for radiolysis up to 100 Mrad. Irradiation sample containers were vented during irradiation at SRNL. Preliminary irradiations were performed at SRNL because the SRNL Co-60 source has a more intense gamma field, thus shortening the irradiation time for a 100 Mrad dose to 2 weeks from the 4 months that would be required using the ORNL Co-60 source. The maximum temperature indicated

during the SRNL irradiations was 30°C. The control samples were placed in a warm water bath for 14 days to simulate temperature conditions during the SRNL irradiations.

Following irradiation at SRNL, the sample containers were returned to ORNL and were placed into the Co-60 source in Building 4501. After the three sample chambers were returned from SRNL, they were connected to the gas-sampling port using separate gas lines. A digital pressure gauge was included in each line. The idea was to record the pressure in each line manually each day, but the pressure gauges would only run for 2 weeks before the batteries needed to be changed. The batteries were not replaced because the pressure gauges could have reset.

The lines were connected to a sampling port, which included a baratron pressure transducer, vacuum pump, and a Cajon fitting. The volume of the sampling port was determined with the use of the 2-L expansion port. A schematic of the apparatus and connections can be seen in Fig. 1; a picture of the sample containers is provided in Fig. 2, and a picture of the sample and connectors in the irradiator is provided in Fig. 3.

The samples were lowered into the irradiator. At 50 Mrad intervals from 150 to 300 Mrad, gas samples (approximately 10 mL each) were collected from each sample container and were analyzed. After each gas grab sample, the sample container in the irradiator was vented. All lines above the double valves were evacuated after each sample. At the end of the radiolysis, liquid samples were obtained and tested for semivolatile organic compounds (SVOCs) and formaldehyde. The resin was also collected, and K_d tests were performed in triplicate. The results were compared with the results for the control samples.

Previous experiments have been performed from 0–100 Mrad at SRS and PNNL (Crawford 1993, Bibler 1994, and Carlson 1995). The purpose of the Co-60 source testing is to expand upon the previous experiments.

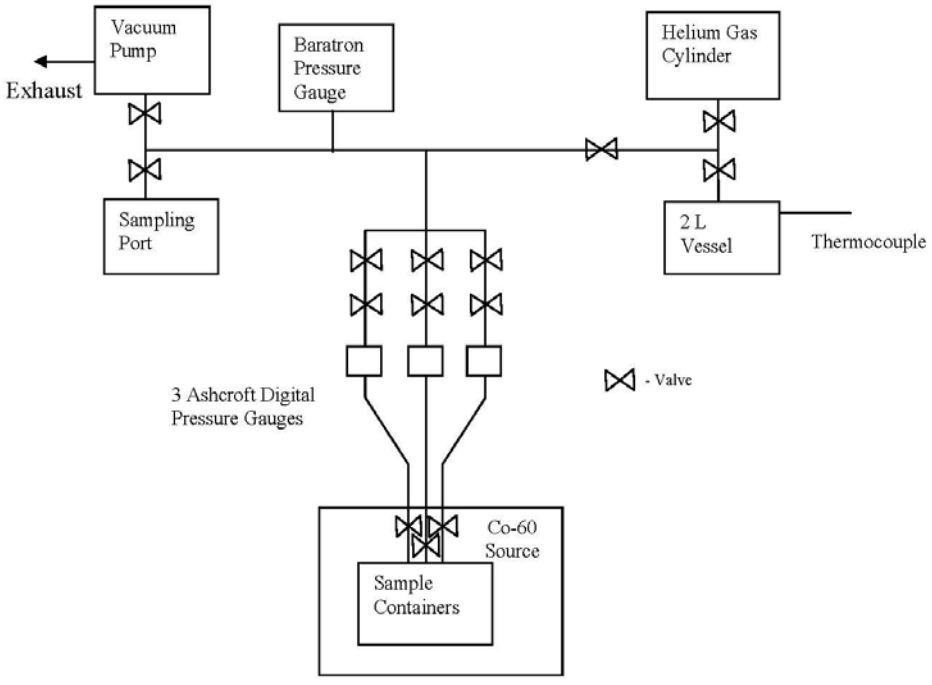

Fig. 1. Cobalt-60 source schematic.

Fig. 2. Cobalt-60 source sample containers.

Fig. 3. Cobalt-60 source with samples and connections.

2.2.2 HFIR Irradiations

Preconditioned RF was transferred into a graduated cylinder with the aid of the target solution (i.e., SRS, Hanford, water, or 0.5 *M* HNO_3). As in the Co-60 irradiations, the amounts of RF and solution were adjusted so that the depth of the slurry was 40% greater than the depth of the settled resin. The volume of resin in each sample was approximately 83 mL; the liquid volume was 52 mL. The combined sample was loaded into a 150 mL HOKE® stainless steel sample bottle. The void space (nominally 15 mL) was minimized to facilitate generation of pressure adequate for the subsequent transfer of gas into containers for shipping to the analytical laboratory. As with the Co-60 sample irradiations, the masses of the resin were determined using previously determined bulk densities for H-form resin and Na-form resins. Irradiations under HNO_3 were performed using H-form resin; irradiations under water, SRS simulant, and

Hanford simulant were performed using Na-form resin. Based on the previously stated bulk densities for the resin in these forms (Fiskum, 2006), the dry-basis resin mass of H-form samples was 19.14g and the approximate mass of resin in Na-form samples was 15.45g.

Irradiations were performed by placing the resin samples into the HFIR spent fuel pool. Individual samples containing virgin resin were irradiated to doses of 150, 200, 250, and 300 Mrad. Additional samples of virgin resin and oxidized material (with an oxygen uptake of 7 mmoles oxygen/g of dry resin) submerged in water were irradiated to doses of 50 and 100 Mrad. The oxidized material had the same pretreatment as the virgin resin, but was in contact with Hanford simulant with a known oxygen exposure when it was used in the hydraulic conductivity test loop for several weeks.

The testing conditions for the HFIR experiments are presented in Table 1.

Table 1. HFIR testing conditions

Liquid	Type of resin	Exposures [Mrad]
Water	New	50, 100, 150, 200, 250, 300
Water	Used	50, 100
0.5 M nitric acid	New	150, 200, 250, 300
Hanford simulant	New	150, 200, 250, 300
SRS simulant	New	150, 200, 250, 300

The sample containers were placed into HFIR sample canisters (Fig. 4), which are stainless steel cylinders that fit inside HFIR's cylindrical fuel assembly. The sample canister has a vent line and an inert gas supply line. The interior dimensions of the HFIR sample can are 24 in. long and 3 in. inner diameter.

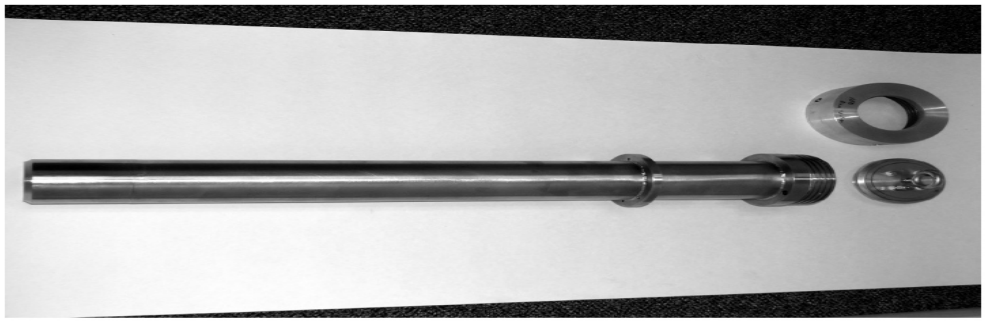

Fig. 4. HFIR sample canister.

Per HFIR operating requirements, no plastic or polymeric materials (as would be used in O-rings) can be placed inside a HFIR sample canister for irradiation due to the high probability of failure from gamma radiolysis. Accordingly, the inner Hoke® container that was selected for use does not utilize polymer or elastomer materials. As stated previously, the container was sized so that the sample would occupy 90% of the canister volume to allow room for gas expansion while allowing sufficient pressure buildup to facilitate gas sample collection.

Also per HFIR requirements, rupture disks were installed to protect against overpressure of the internal sample container. In the event of an overpressure, disk rupture would have resulted in venting of the internal container into the HFIR canister. The rupture disks used on sample vessels containing SRS and Hanford simulants were fabricated from Inconel 600; vessels containing resin under water or nitric acid were made of tantalum. All rupture discs were fabricated to fail at 300 psig. A picture of the sample container stand and a picture of the sample container can be seen in Fig. 5 and Fig. 6, respectively.

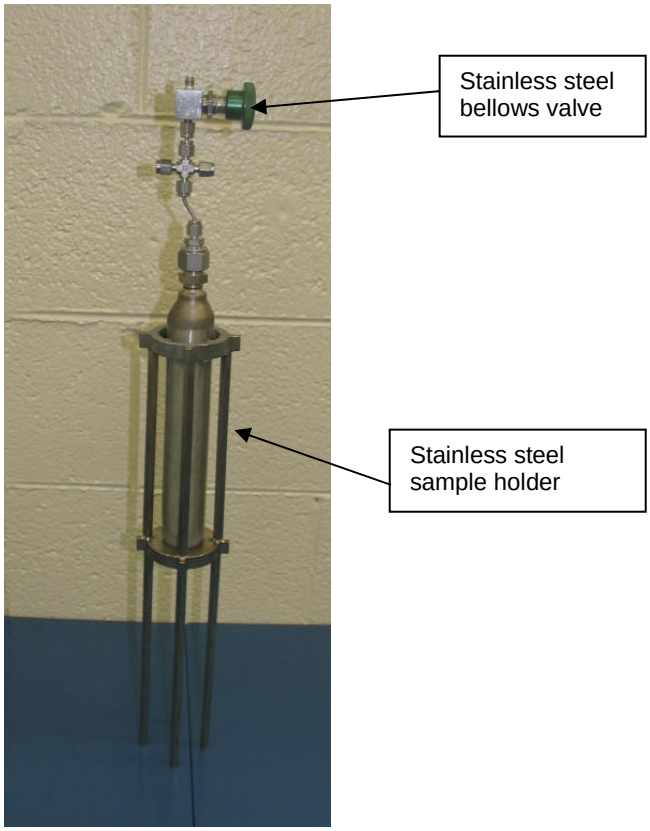

Fig. 5. HFIR sample container stand.

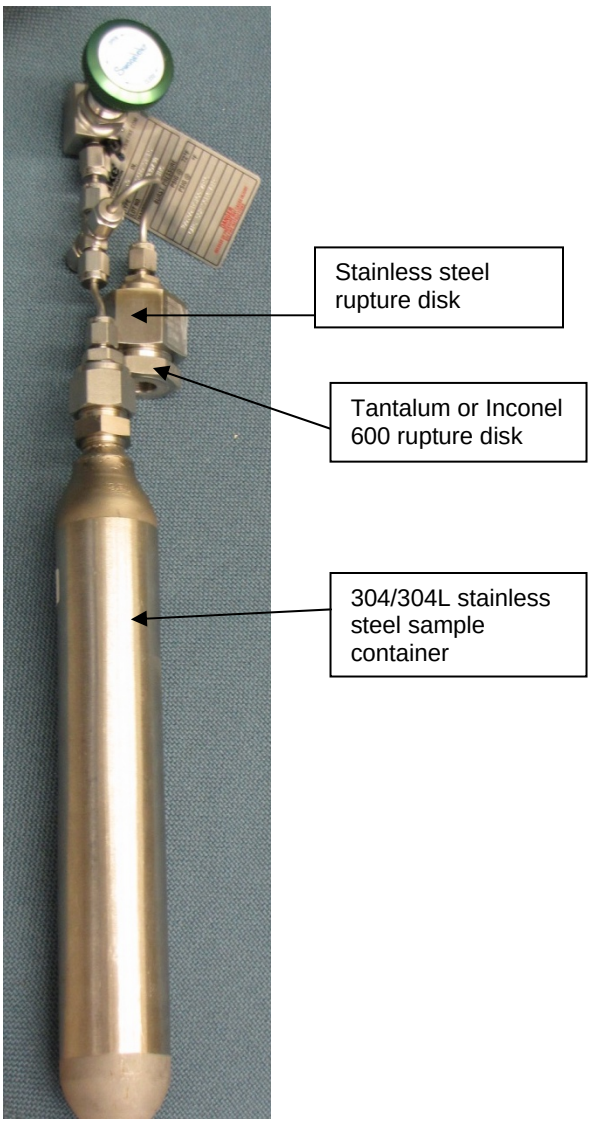

Fig. 6. HFIR sample container.

In preparation for irradiating the samples at HFIR, a sketch of the sample containers and configuration, a list of materials and quantities, the MSDS, purchase records, and fabrication drawings were provided in order to comply with HFIR documentation requirements.

Once the sample containers were loaded with resin and simulant and were ready to be irradiated, they were delivered to the irradiation facility at HFIR. Once there, the operators at the facility handled the samples. The irradiation facility determined the specific fuel element and provided the information used to determine the amount of time needed to acquire the correct dose. The irradiation time varied from 4 h to 5 days, depending on the dose. The temperature was monitored and ranged from 48°C to 51°C.

After the irradiation, the samples were returned and were connected to the gas-sampling manifold used in the Co-60 source experiments. The gas and liquid samples were obtained and delivered to the Y-12 Analytical Laboratory, where they were tested for VOCs and SVOCs. The resin was also characterized based on visual observations. After the characterizations, K_d tests were performed (in triplicate) on the resin with the Hanford simulant, found in Sect. 4.2. The sample canister is shown being lowered into the HFIR spent fuel pool in Fig. 7 and into a spent fuel element in Fig. 8.

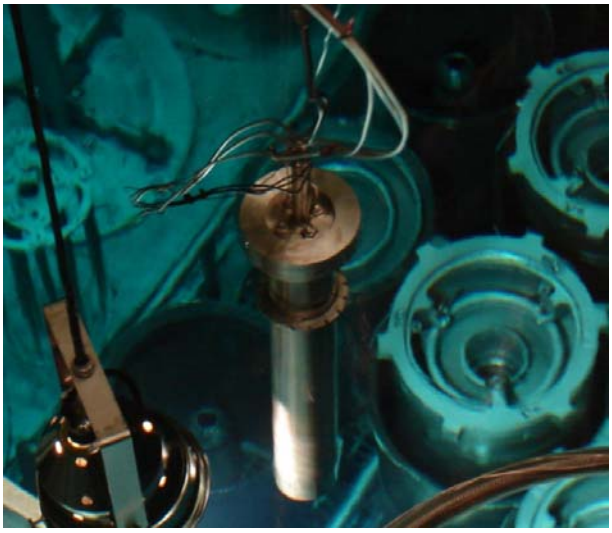

Fig. 7. Sample canister being lowered into the HFIR spent fuel pool.

Fig. 8. Sample canister being lowered into a spent fuel element.

2.2.3 Gas volume determinations

Gas volumes were measured using a manifold configuration consisting of a sampling port for the gas sample to expand into, a vacuum pump, a pressure transducer, a sample vessel connector, and a 2 L metering chamber (Fig. 1).

The sample container gas headspace volume in the large-volume sample containers needed to be determined. Before the large samples were sent to SRS for irradiation up to 100 Mrad, the gas volume for each sample was determined using a calibrated baratron pressure transducer, a 2-L expansion vessel, and a vacuum pump. The baseline pressure of the evacuated, 2-L expansion vessel was recorded. The 2-L expansion vessel was then isolated from the rest of the system. The sample chamber with the resin and solution was connected to the system. With the exception of the 2-L vessel, air from the room was permitted throughout the piping system.

After the system was closed to the room air, the pressure of the system was measured and recorded. The air in the closed system was permitted to expand into the 2-L vessel, and the new, lower pressure was recorded. The pressure of the empty 2-L vessel and the two system pressures were used to determine the internal gas-phase volume of the entire system. The sample chamber was closed to the system, and the internal volume of the system with the sample chamber and the 2-L vessel were determined in a similar fashion. The sample chamber was opened to the room air one final time before its valve was closed and capped. The same procedure was used to determine the internal gas volume for the other two samples before their sample chambers were sealed. The sealed sample chambers were then sent to SRNL. The manifold, headspace for the HFIR samples, and the gas grab sample bottle volumes were also determined in this way.

The final volumes can be found in Table 2. The difference in the manifold volume between the Co-60 source and the HFIR samples is due to the connector used to connect to the sample container (quick connect for the Co-60 source and a screwed connector for the HFIR samples).

Table 2. Gas volumes for radiolysis testing

	Volume (cm^3)
Manifold—Co-60 source	87.7
Manifold—HFIR samples	85.5
Co-60 source sample void space—HNO_3	620.7
Co-60 source sample void space—water	618.3
Co-60 source sample void space—SRS	618.7
HFIR sample containers void space	35
Gas sample	10

2.2.4 Gas Sampling

Gas samples were collected using sample bottles supplied by the Analytical Services organization at the Y-12 National Security Complex. The sample bottles used were 10 mL in volume and were sealed with valves at their upper and lower ends. Both a sample bottle and the appropriate irradiation vessel were connected to the gas manifold (Fig. 1). With the sampling bottle open to the manifold and the sample source closed, the manifold and sample bottle were evacuated, and the pressure was recorded. The level of vacuum was approximately 0.2 Torr. The sample bottle valve was closed, and the vacuum pump was turned off and isolated from the manifold. The sample source was opened to the manifold, allowing gas to transfer into the manifold. The pressure in the manifold was recorded and was used to calculate the sample volume. The sample bottle was then opened to the manifold, allowing collection of a sample for analysis. The pressure was measured in this configuration to facilitate determination of the sample volume sent for analysis.

2.2.5 Radiolysis Sample Analysis

Gas compositions were determined using a Varian Aerograph gas chromatograph equipped with Porapak and molecular sieve columns and a photoionization detector (PID). The gas was also analyzed by mass spectrometry, with a VG Micromass Ltd. VG 3001.

The SVOCs in the liquid samples were analyzed using a Hewlett Packard Model 5989A gas chromatograph/mass spectrometer (GC/MS).

The total organic carbon was analyzed using a Tekmar-Dohrmann DC-80 total organic carbon analyzer.

2.3 CESIUM PARTITIONING TEST (K_d DETERMINATIONS)

Partitioning testing was performed to obtain equilibrium isotherm data for spherical RF resin for incorporation into a column performance prediction model, which will be utilized in the design of equipment for remediation of stored Hanford and/or SRS waste. Previous determinations have been made and used to develop two isotherm predictors. The work reported here obtained additional data over a broader range of cesium and hydroxide concentrations, which is to be used to improve existing models. The tests performed were also intended to evaluate the stability of the resin over extended periods of contact with tank waste and the effect of radiation exposure on resin performance.

Prior to each set of equilibrations, volumes of resin adequate for both equilibration tests and F-factor determinations were collected from the pretreated resin that was stored in the desired state (Na- or H-form) under liquid and inert gas (argon).

For the method validation tests, two samples were removed from the pretreated (Na form) resin for determination of a conversion factor between damp and dry Na-form resin masses (F-factors, see Sect. 2.1.2). Volumes of resin were removed from the supply container by submerging the larger-diameter

end of a glass pipette into the supply container, allowing resin slurry to fill the end of the tube, then sealing the other end of the tube to prevent venting. The sample material in the tube was transferred to a Buchner funnel into which a Whatman 41 filter disc had been placed. The filter was prewetted with DI water to seal the filter paper to the funnel. Vacuum was initiated after wetting the filter and prior to sample transfer. In each instance, free water was removed by maintaining vacuum until transfer of water from the filter into the catch flask was no longer observed. Vacuum was maintained for 2 min after the last drop of free liquid was observed to fall from the filter. Additional resin samples for use in equilibration testing were collected during the procedure in which F-factor samples were prepared. In the case of the method validation test, water removal was performed under normal atmosphere (i.e., not under inert gas). In all subsequent K_d determination tests, the resin was prepared as described in Sect. 2.1 of this report; per that description, all K_d determinations other than the initial method validation tests were performed using H-form resin. The decision to perform Cs loading determinations based on H-form resin was based on the variability in Na loading on prepared sodium-form resin, due to the potential exchange of H^+ for Na^+ during water washing of the sodium-form material prior to its use.

2.4 TITRATIONS

The objective of the titration evaluation was to obtain sodium uptake data corresponding to the conversion of RF resin from hydrogen to sodium form, in order to support modeling of RF column performance. The tests performed were designed to examine the effects of sodium ion concentration, free hydroxide concentration, and choice of counter ion on conversion from hydrogen to sodium form.

Previous titration determinations have been performed, and the data were used to develop predictors of resin performance. Analogous to the K_d determinations reported in this document, additional titrations were performed over expanded titrant composition ranges to obtain data for model enhancement.

Testing was performed in three phases. The objective of the first phase was to identify an appropriate background salt for use in high ionic strength testing. The objective of the second phase was to establish a titration curve at lower sodium concentrations using a titrant in which sodium is present in only NaOH form. The third phase of testing focused on the effects of increased sodium concentration in the titrant on cation exchange. Due to the anticipated existence of inflection points in the titration curve at lower sodium concentrations, testing was performed at several initial pH values to isolate these points. After being dewatered, damp resin samples were transferred to polymer flasks (typically polypropylene) containing the desired titrant. The slurries produced were purged with argon, sealed, and transferred to a temperature-controlled orbital shaker. The equilibration temperature was controlled in the range 25°C to 26°C during all testing. The agitation rate was maintained at approximately 125 rpm.

An autotitrator was used to measure the hydroxide concentration of the samples. After contact, a portion of the titrant solution was placed into a glass beaker with a stir bar. The autotitrator has a pH probe (to be placed in the beaker) and a tube that dispenses the acid or base that is needed for the titration. 0.01 *M* hydrochloric acid was used as the titration solution. The titrator will also let the user choose a set point for the titration, which was 7.0 in all cases.

3. MATERIALS

3.1 DISSOLVED SALT SURROGATE COMPOSITIONS

Table 3 shows the recipes for making the SRS and Hanford simulants. The SRS simulant recipe was the average composition of Tanks 1, 2, and 3 (Smith 2007). The Hanford simulant recipe was found in the literature also (Arm et al. 2006).

Table 3. Compositions of dissolved salt surrogates

Chemical compound	SRS Tanks 1, 2, and 3 (g/L)	Hanford Tank AP-101 (g/L)
$NaNO_3$	336.7	154.2
$NaNO_2$	16.6	49.0
NaOH	58.4	81.6
$NaAlO_2$	10.7	21.3
Na_2CO_3	8.5	47.7
Na_2SO_4	4.3	5.7
NaCl	0.82	2.3
NaF	1.2	0.0

Cesium nitrate and potassium nitrate that are normally in the simulants were replaced with additional sodium nitrate to prevent cesium and potassium uptake by the RF resin, which could impact the K_d tests performed later. If cesium was needed, it was added as cesium nitrate. Also, minor components such as chromium and phosphate were not included.

4. RESULTS

4.1 RADIOLYSIS

4.1.1 Analytical Results—Gas

The gas was sampled using the gas sampling procedure in Sect. 2.2.4. The pressure was recorded and used to determine the amount of gas produced. The samples were analyzed at the Y-12 Analytical Laboratory for hydrogen, oxygen, nitrogen, nitrous oxide, carbon monoxide, carbon dioxide, and VOCs. The number of moles calculated was based on gas pressure measurements. The volume fractions were used to determine the number of moles produced for each gas, as seen in Table 4. The analyzed gases do not add up to the total volume of gas produced. The HFIR sample gas analysis is for the whole accumulated dose, where the Co-60 source samples were vented after each sample was taken. The raw data obtained can be found in Appendix A.

As can be seen in Table 5, hydrogen is the predominant generated gas species, and a small amount of methane is also produced. The gas generation data in Table 5 are only for 50 Mrad increments. The sample containers were vented after every gas sample was taken. The total amount of gas also seems to increase as the dose rate increases. When the initial volume of air in the canister was subtracted from the amount of gas generated, some values were negative, which indicates an error in the analytical results or that the gas was consumed. The samples with the negative number of moles generated were assumed to have zero number of moles of that specific gas produced, except for oxygen. Oxygen can be consumed by the resin, so those negative values that are shown can represent either consumed oxygen or analytical error.

Gas analysis results for the Co-60 source samples can be found in Table 5. The original gas grab sample containers for analytical purposes were made of glass with Teflon stopcocks, which were found to leak over time. These sample containers were used only with the 150 Mrad samples; Y-12 provided the stainless steel gas sample containers for the 175 Mrad to 300 Mrad samples and for the HFIR samples. The pressure readings were still valid, so the total number of moles of gas could be calculated, but there were no analytical results for the sample irradiated to 150 Mrad.

Table 4. Gas produced during HFIR sample radiolysis[a]

HFIR samples		Number of moles generated per gram dry resin					Number of moles generated per gram dry resin per Mrad	
	Dose (Mrad)	Total	Hydrogen	Methane	Nitrogen	Oxygen	Total	Hydrogen
Nitric acid	300	2.0774E–04	3.4734E–05	2.0657E–08	4.7800E–05	–5.4401E–06	6.9247E–07	1.1578E–07
	250	8.9612E–04	6.9001E–05	8.9443E–08	1.2685E–04	–1.9257E–05	3.5845E–06	2.7601E–07
	200	1.4560E–03	3.6152E–04	2.9103E–07	3.5762E–04	–1.9358E–05	7.2800E–06	1.8076E–06
	150	7.7084E–05	5.0258E–06	1.5248E–08		–1.2742E–05	5.1389E–07	3.3505E–08
Water	300	3.5083E–04	2.8347E–04	1.4019E–07		–1.4957E–05	1.1694E–06	9.4490E–07
	250	1.6364E–04	9.6861E–05	9.8041E–08		–1.6948E–05	6.5458E–07	3.8744E–07
	200	1.7506E–04	1.7461E–08	1.2611E–04		3.1027E–05	8.7530E–07	8.7306E–11
	150	1.8119E–04	1.0237E–04	1.0857E–07		–1.7044E–05	1.2079E–06	6.8247E–07
	100 (new)[b]	1.7922E–04	2.0251E–06	1.7776E–08	7.8672E–05	1.5913E–05	1.7922E–06	2.0251E–08
	50 (new)[b]							
	100 (old)[b]	1.7292E–04	2.3794E–05	1.7146E–08	3.7984E–05	2.2761E–05	1.7292E–06	2.3794E–07
	50 (old)[b]	9.1415E–05	9.0967E–09	9.1269E–08	7.0933E–06	2.6465E–06	1.8283E–06	1.8193E–10
Hanford	300	1.2755E–04	7.3035E–05	1.2609E–08		–1.7050E–05	4.2517E–07	1.4790E–07
	250	2.2244E–04	1.5026E–04	4.4343E–08		–1.5372E–05	8.8978E–07	2.0872E–07
	200	1.5068E–04	9.0405E–05	2.9989E–08		–1.6867E–05	7.5338E–07	1.6470E–07
	150	1.7007E–04	7.4846E–05	1.2147E–09		1.6560E–05	1.1338E–06	1.2577E–07
SRS	300	3.8331E–04	1.8138E–04	7.6517E–08		7.0678E–05	1.2777E–06	1.6442E–07
	250	3.0424E–04	9.9366E–05	6.0703E–08		6.3684E–05	1.2170E–06	1.0862E–07
	200	5.1334E–05	2.1555E–05	4.9875E–09		–4.6398E–06	2.5667E–07	6.9042E–08
	150	1.8110E–04	6.3024E–05	1.4342E–08		4.4784E–05	1.2074E–06	1.0142E–07

[a]Data in this table represent cumulative gas production. The water sample with new resin that was irradiated to 50 Mrad did not have a gas sample analyzed because the gas sample was accidentally evacuated.

[b]New resin is virgin resin and has no known oxygen exposure. The 'old' resin was used in the hydraulic conductivity test loop and has a known oxygen exposure of 7 mmoles oxygen/g dry resin.

Table 5. Gas produced during Co-60 source sample radiolysis[a]

Co-60 source		Number of moles generated per gram dry resin					Number of moles generated per gram dry resin per Mrad	
	Dose (Mrad)	Total	Total	Methane	Nitrogen	Oxygen	Total	Hydrogen
Nitric acid	300			1.3069E–08	3.6302E–06	–9.4903E–06	2.6307E–06	7.7028E–07
	250	8.9537E–05	1.5400E–05	6.1833E–09	–7.9566E–06	–9.5989E–06	1.7907E–06	3.0801E–07
	200	4.7218E–05	2.4364E–06	4.6376E–09	–1.5470E–05	–6.4116E–06	9.4437E–07	4.8729E–08
	175	6.0486E–05			1.0730E–05	2.4805E–06	1.2097E–06	0.0000E+00
	150	3.4314E–05					6.8628E–07	0.0000E+00
Water	300	5.5560E–05	4.6948E–05	3.2311E–09	–3.7779E–05	–1.1084E–05	1.1112E–06	9.3896E–07
	250	4.3365E–05	3.1479E–05	2.9330E–09	–3.4662E–05	–1.1571E–05	8.6730E–07	6.2957E–07
SRS	300	–3.0547E–06	–5.0742E–07	–7.1380E–10	–4.6661E–05	–1.2494E–05	–6.1094E–08	–1.0148E–08
	250	–2.2209E–05	–3.3602E–06	–4.5447E–09	–5.8903E–05	–1.5116E–05	–4.4418E–07	–6.7205E–08
	200	–2.6359E–06	–1.9904E–07	–3.6645E–10	–4.6258E–05	–1.2530E–05	–5.2718E–08	–3.9809E–09
	175	2.5376E–06	3.5269E–07	–8.5095E–11	–4.3864E–05	–1.1625E–05	5.0752E–08	7.0538E–09
	150	2.8171E–05					5.6342E–07	0.0000E+00

[a]Data in this table represent gas produced during each 50 Mrad sample.

The stainless steel Co-60 source sample container for RF resin in water had a leaking weld that was not evident until collection of the 175 Mrad gas grab. The resin and water were removed from the container, and it was re-welded and placed back into the irradiator when the other samples reached 200 Mrad. This explains why there is no gas data until 250 Mrad. It can also be noted that for the higher doses, the SRS simulant consumes more gas than is produced. It seems that every sample either consumed oxygen or that there is an analytical error.

4.1.2 Analytical Results—Liquid

In addition to gas sample analyses, solutions used in radiolysis tests were also analyzed for SVOCs by Y-12 Analytical Services. No standard SVOCs were found with GC/MS; however, the 2-pentanone, 4-hydroxy-4-methyl compound was flagged on nearly every sample. We are unsure if this compound is a degradation product or if there is an unknown compound that has the same GC-MS profile. The raw data from the SVOC tests are presented in Appendix B.

The Co-60 source liquid samples were also tested for total organic carbon at the Y-12 Analytical Laboratory and for formaldehyde at TestAmerica Laboratories (Nashville, Tennessee). The latter analysis did not detect any formaldehyde in the nitric acid or in the SRS simulant samples but detected 61.4 μg/L in the water sample. The raw data from these analyses can be found in Appendix B.

The total organic carbon analysis results can be found in Table 6. Five different aliquots were tested and all results are reported with the average for the liquid. The raw data can be found in Appendix B.

Table 6. Total organic carbon analytical results (mg/L)

Liquid	Individual aliquots					Average
Nitric acid	27.2	27.31	26.61	28.3	26.65	27.21
Water	108	104.4	104.7	110.9	112.9	108.18
SRS	1760	1711	1754	1782	1784	1758.2

4.2 K_d DETERMINATIONS

4.2.1 Method Validation Testing

The objectives of validation testing were to demonstrate a procedure for determining reproducible cesium distribution results, to develop familiarity with the method, and to isolate procedural variables that may affect the ability to obtain accurate, reproducible results. To limit the number of variables present in testing, a simple simulant consisting of a combination of sodium hydroxide and sodium chloride at concentrations of 2 *M* and 3 *M*, respectively, was used. Stable cesium was added to the simulant at a nominal concentration of 4.95×10^{-5} *M*.

Sodium-form resin samples used in equilibrations and F-factor determinations were collected as described previously in Sect. 2.1.2. F-factor samples having damp masses of approximately 0.1 g each were placed into ceramic specimen containers for differential thermal analysis and thermogravimetric analysis (DTA/TGA). Containers were tared before receipt of resin samples. Samples were weighed again immediately prior to DTA/TGA, and were weighed intermittently during analysis to determine the point at which no additional mass loss was occurring. The first RF sample was placed in the DTA/TGA a few minutes after the sample was prepared. The sample was heated to 95°C in flowing nitrogen until a constant weight was achieved. The weight loss was 59.2 wt %. The second RF sample was prepared the following afternoon and stored overnight in a sealed plastic bottle. The sample was heated at 59°C in flowing nitrogen. The weight loss was 47.0 wt %. This sample was then heated to 92°C in flowing nitrogen. The total weight loss increased to 50.7 wt %.

Equilibration tests were performed at an approximate resin-to-simulant ratio of 1 g dry resin: 100 mL simulant. Transfer of resin into equilibration flasks was accomplished by sluicing resin from sample vials into flasks using premeasured volumes of simulant (Table 7).

Table 7. Values recorded during preparation of first equilibration samples (g)

Flask No.	Empty mass	Mass w/ simulant	Mass w/simulant and resin	Net mass simulant	Net mass resin[a]
1	90.81	207.76	209.48	116.95	1.72
2	91.68	208.57	210.86	116.89	2.29
3	92.59	209.62	211.84	117.03	2.22

[a]Sodium form resin

The flasks were placed onto an orbital shaker equipped with a temperature-controlled enclosure. The enclosure temperature set point was adjusted to 25°C. The enclosure temperature at the time the flasks were placed onto the shaker table was 25.3°C. The shaker table was set at an agitation speed of 150 rpm after determining that this rate provided thorough agitation of the resin without leaving residual resin on the flask wall above the liquid surface. The enclosure temperature was recorded at least twice daily. The equilibration temperature remained relatively constant at 25.3°C for the first 36 h of testing. When observed at 48 h, the equilibration temperature had increased to 25.5°C, at which point the shaker table temperature set point was reset to 24.7°C. However, the enclosure temperature remained at 25.5°C to 25.6°C throughout the remainder of the equilibration. Agitation was terminated after 72 h.

Equilibrations performed in this particular phase of testing were not performed under inert atmosphere.

Samples of the liquids (supernatants) were collected after allowing the resin beads to settle. Samples having a volume of 5-mL were pipetted into HDPE sample bottles. After collecting liquid samples the contents of each equilibration flask were transferred to a Buchner funnel for recovery of resin. Resin was collected in a manner similar to that used for dewatering the resin for water retention determinations; i.e., the resin was vacuum filtered under normal atmosphere with vacuum being maintained for approximately 2 min after the last drop of water was observed to fall from the funnel into the receiving flask. After dewatering, the resins samples were transferred into HDPE bottles. Sample bottle masses measured before and after transfer of samples are presented in Table 8. In addition to the samples listed above, a "blank" sample of the untreated, Cs-containing simple simulant was also collected.

Table 8. Masses of liquid and resin samples from method validation tests (g)

Sample No.	Description	Sample bottle tare mass	Mass w/sample	Net sample mass
R1	Simulant	12.520	18.325	5.805
R2	Simulant	12.531	18.400	5.869
R3	Simulant	12.536	18.380	5.844
S1	Resin	12.528	14.413	1.885
S2	Resin	12.537	14.780	2.243
S3	Resin	12.590	14.889	2.299

Resin samples were ashed and leached prior to being analyzed by inductively coupled plasma/mass spectrophotometry (ICP/MS). Simulant samples were analyzed by ICP/MS directly. Results are presented in Table 9. Distribution coefficients obtained were a factor of 2 to 3 less than predicted values using the most recent CERMOD isotherm.

Table 9. Cesium uptake results from method validation test

Equilibration	Raffinate Cs conc. (µg/mL)	Measured resin Cs conc., mmol/g resin	D_{Cs}[a,b]
1	1.36×10^{-1}	1.96×10^{-3}	1.92×10^{3}
2	1.24×10^{-1}	1.69×10^{-3}	1.81×10^{3}
3	1.34×10^{-1}	1.74×10^{-3}	1.72×10^{3}

[a]Simulant consisting of 2*M* NaOH, 3*M* NaCl, and containing stable cesium at a nominal concentration of 4.95×10^{-5} *M* was used.
[b]Values are based on resin mass in sodium form and on analysis of digested resin, not on gamma counting.

4.2.2 Second Equilibrations—Method Verification

In light of the lower-than-expected distribution coefficients obtained in the method validation test, a decision was made to perform a second test using the same simulant as was used previously (2 *M* NaOH, 3 *M* NaCl in DI water) containing cesium at a nominal concentration of 4.95×10^{-5} *M* as before. To address uncertainty concerning detection limits for cesium analysis by ICP/MS, a trace quantity of Cs-137 was added to the simulant in the second set of equilibrations to facilitate determination of cesium concentrations by gamma counting. Unlike the previous tests, resin/simulant slurries were blanketed with argon before being sealed and transferred to the orbital shaker for equilibration to mitigate against resin oxidation.

The resin was pretreated according to the procedure described previously, Sect. 2.1.2, for hydrogen-form material. Equilibrium distribution determinations were made at controlled temperatures of 25°C and 45°C. (During testing, the equilibration temperatures during the nominal 25°C test were observed to vary between 25°C and 26°C. During 45°C testing the actual temperature varied between 45°C and 45.5°C.) As before, the resin-to-simulant ratio used in testing was 1 g resin: 100 mL simulant. Resin/simulant contacts at both temperatures were performed for periods of 48, 72, and 96 h, and samples were analyzed to verify attainment of equilibrium. Duplicate tests were performed for each equilibration duration at both temperature conditions.

Equilibration results obtained were internally consistent; i.e., experimental values exhibited very low standard deviations (Table 10). The results were consistently lower than CERMOD predictions and previous experimental results obtained at SRNL by a factor of 2, as indicated in Fig. 9. In that regard, the results are consistent with results obtained in the previous test at ORNL.

4.2.3 Third Equilibrations—Method Diagnosis

Based on the results obtained to this point in the test program, it was speculated that the offset between ORNL experimental results and predicted values (based on previous SRNL results) could be due to differences in the location of the resin within the storage resin container as received from the manufacturer. Resin used at ORNL was taken from the top of the storage container and may have been more prone to oxidation than resin located deeper in the drum. It was decided that ORNL and SRNL would perform duplicate verification tests using resin and simulant that was prepared at SRNL in an attempt to isolate sources of the discrepancies between results from current experiments and the isotherms developed from prior data.

Resin preparation, F-factor determinations, and equilibrations were performed as in the immediately preceding test. Duplicate equilibrations using SRNL-provided materials were performed at 25°C and 45°C with contact times of 48 and 72 h. Additional duplicate equilibrations were performed using ORNL-prepared resin (same source as the previous test) at 25°C and 45°C with 72-h contact times.

Table 10. Results of second equilibrations (method verification)

Contact time (h)	Equilibration temperature (°C)	Raffinate Cs conc., *M*	Resin Cs conc., mmol/g resin	Cs Distribution coefficient, D_{Cs} [a,b]
48	25	2.31E–06	4.59E–03	1984.8
48	25	2.00E–06	4.78E–03	2387.0
72	25	1.53E–06	4.71E–03	3082.2
72	25	1.46E–06	4.63E–03	3177.5
96	25	1.58E–06	4.69E–03	2969.0
96	25	1.70E–06	4.83E–03	2833.6
48	45	3.68E–06	4.49E–03	1222.1
48	45	3.73E–06	4.53E–03	1214.4
72	45	3.95E–06	4.47E–03	1131.0
72	45	4.11E–06	4.57E–03	1113.2
96	45	4.03E–06	4.43E–03	1098.9
96	45	4.06E–06	4.41E–03	1084.4

[a]Simulant consisting of 2*M* NaOH, 3*M* NaCl, and containing stable cesium at a nominal concentration of 4.95×10^{-5} *M* was used.

[b]Values were determined based on analysis of initial and final cesium concentrations by gamma counting. Resin loadings were determined by mass balance. Resin was in hydrogen form, initially.

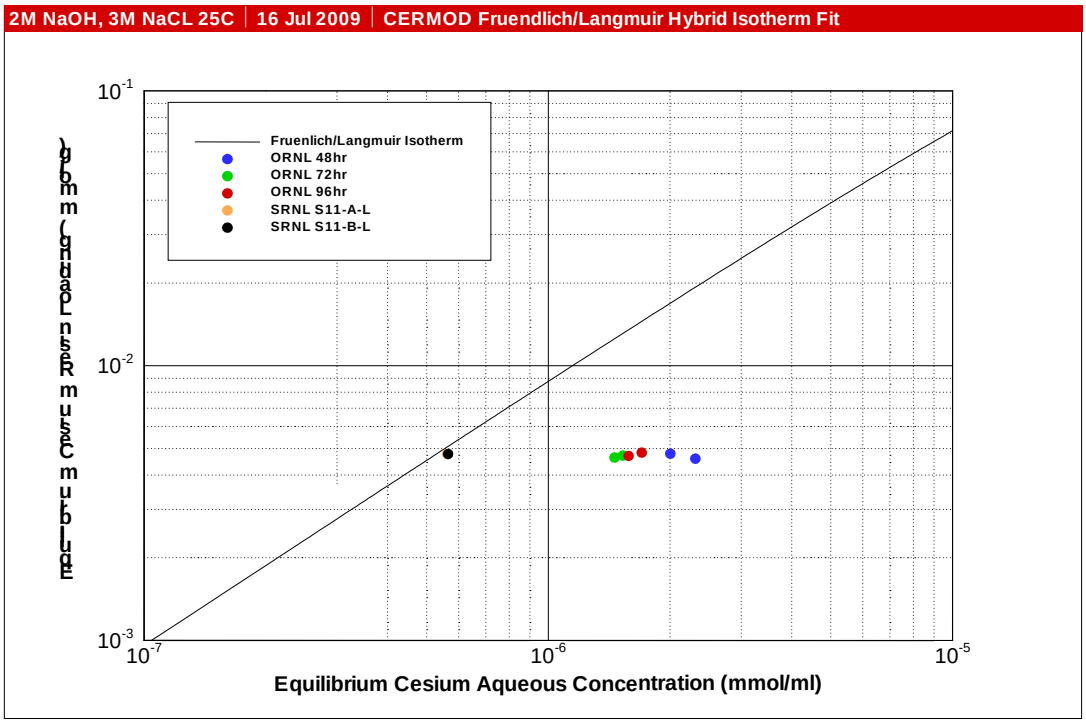

Fig. 9. Comparison of ORNL results from second equilibration test with prior data. (Figure provided by SRNL.)

Samples at four randomly-selected conditions were also analyzed by ICP/MS. The initial cesium concentration used in this test was 4.95×10^{-5} *M*. Simulant used in testing was provided by SRNL; its composition is given in Table 11.

Distribution coefficients obtained using SRNL-supplied materials are internally consistent, are lower than those obtained in previous tests at ORNL, and are 10%–15% less than the values obtained in the duplicate determinations using ORNL-prepared resin (Table 12). The reduction in cesium uptake in these tests relative to the previous two experiments can be attributed to the presence of potassium in the SRNL-provided simulant. The results are consistent with those obtained in the comparison tests performed at SRNL (Table 13). The hypothesized depression of D_{Cs} values due to a less-favorable location of ORNL-prepared resin within the storage drum is not supported by the test results, as distribution coefficients using this material are 10% to 15% higher than values obtained using SRNL-prepared resin. Results

Table 11. Composition of simulant used in method diagnosis test

Component	Target conc., *M*	Measured conc., *M*
Na	6.00	6.26
K	0.0070	0.0076
Rb	0.0063	0.0001
Free OH^-	0.760	0.800
Al	0.259	0.319
NO_3^-	4.190	4.935
NO_2^-	0.149	0.171
Cl^-	0.003	–
F^-	0.003	–
PO_4^{3-}	0.005	–
SO_4^{2-}	0.032	0.033
P	0.005	0.005
S	0.032	0.036

Table 12. Results of third equilibrations (method diagnosis)[a]

Contact time (h)	Equilibration temperature (°C)	Resin source	Analysis method	Cesium distribution
48	25	SRNL	γ-counting	1825.9
48	25	SRNL	γ-counting	1894.5
72	25	SRNL	ICP/MS	1423.8
72	25	SRNL	ICP/MS	1628.9
72	25	SRNL	γ-counting	1646.8
72	25	SRNL	γ-counting	1718.0
72	25	ORNL	γ-counting	2050.5
72	25	ORNL	γ-counting	2003.8
48	45	SRNL	γ-counting	948.9
48	45	SRNL	γ-counting	937.4
72	45	SRNL	γ-counting	906.0
72	45	SRNL	γ-counting	854.5
72	45	SRNL	ICP/MS	855.4
72	45	SRNL	ICP/MS	990.4
72	45	ORNL	γ-counting	1083.3
72	45	ORNL	γ-counting	1093.1

[a]Resin used was in hydrogen form.

Table 13. Comparative results from equilibrations performed at SRNL

Contact time (h)	Equilibration temperature (°C)	Resin source	Analysis method	Cesium distribution
48	25	SRNL	γ-counting	1710
48	25	SRNL	γ-counting	1679
72	25	SRNL	γ-counting	1563

obtained using ICP/MS for Cs analysis are in close agreement with values obtained by gamma counting under identical test conditions. Results for F-factor determinations performed in conjunction with the equilibrations performed at ORNL are presented in Table 14 and Table 15.

Table 14. F-factor data for resin used in third equilibrations at 25°C

Empty vial mass, g	Gross mass w/damp resin, g	Gross mass w/ dry resin, g	Damp resin mass, g	Dry resin mass, g	F-factor[a]
13.282	14.325	13.748	1.043	0.466	2.238
13.269	14.386	13.7708	1.117	0.5018	2.226
13.285	14.335	13.7785	1.050	0.4935	2.128
13.331	14.414	13.841	1.083	0.510	2.124
13.21	14.345	13.7441	1.135	0.5341	2.125
13.316	14.213	13.7376	0.897	0.4216	2.128
				Average	2.161

[a]First three samples are SRNL-supplied resin. Average of SRNL resin F-factors is 2.197. Average of ORNL resin F-factors is 2.125. All resins were in hydrogen form.

Table 15. F-factor data for resin used in third equilibrations at 45°C

Empty vial mass, g	Gross mass w/damp resin, g	Gross mass w/dry resin, g	Damp resin mass, g	Dry resin mass, g	F-factor[a]
13.224	14.493	13.7728	1.269	0.5488	2.312
13.286	14.495	13.8145	1.209	0.5285	2.288
13.344	14.254	13.7478	0.910	0.4038	2.254
13.314	14.343	13.7961	1.029	0.4821	2.134
13.229	14.31	13.7374	1.081	0.5084	2.126
13.387	14.411	13.8699	1.024	0.4829	2.121
				Average	2.206

[a]1st three samples are SRNL-supplied resin. Average of SRNL resin F-factors is 2.285. Average of ORNL resin F-factors is 2.127. All values are for resin in hydrogen form.

4.2.4 Fourth Equilibrations—Contacts with AP-101 Simulant

Having demonstrated considerable reproducibility in the experimental method, testing using a more realistic simulant commenced. The objective of this fourth set of equilibrations was to obtain data for verification and enhancement of the distribution isotherm using a simulant of waste stored in Tank AP-101 at the Hanford Site. Resin l pretreatment, sample collection, F-factor determination, and equilibrations were performed in the manners used in the previous two tests. Equilibrations were performed at 25°C and 45°C for periods of 72 h. Temperature fluctuations during equilibration were similar to those observed in the preceding test. The nominal composition of the background simulant

matrix is presented in Table 16. To evaluate the effect of ion exchange site loading on cesium uptake, equilibrations were performed at eight cesium concentrations ranging from 0.03 μ*M* to 50 m*M* (Table 17).

Of particular interest were partition coefficients obtained at low initial liquid-phase cesium concentrations. As in previous tests, duplicate equilibrations were performed at each combination of test conditions. The total number of samples collected was 36: 2 temperatures × 8 Cs concentrations × 2 samples per condition (duplicates) + 4 random control duplicates to confirm consistency between analytical methods. In addition, two flasks without resin were "equilibrated" at 25°C to evaluate cesium adsorption by the polymer (polypropylene) containers. All feed solutions in testing were spiked with the same amount of activity; i.e., the differences in cesium concentration were the result of differences in the levels of stable cesium used.

The gamma-counting results from the blank samples indicate some degree of cesium adsorption by the test vessels. The initial feed solutions used in testing counted 25,350 counts/mL/min compared with

Table 16. AP-101 background simulant composition (nominal)

Simulant component	Concentration, *M*	Concentration,[a] g/L
	Compounds	
$NaNO_3$	0.98	83.3
$NaNO_2$	0.70	48.3
NaOH	1.94	77.6
$NaAlO_2$	0.30	24.6
Na_2CO_3	0.40	42.4
Na_2SO_4	0.04	5.7
NaCl	0.04	2.3
KNO_3	0.70	70.8
	Ions	
Na	4.84	111.3
NO_3	1.68	104.2
NO_2	0.70	32.2
OH	1.94	33.0
Al	0.30	8.1
CO_3	0.4	24.0
SO_4	0.04	3.8
Cl	0.04	1.4
K	0.70	27.4

[a]Concentrations are calculated based on masses of reagents added.

Table 17. Initial simulant cesium concentration (nominal)

Cesium conc., *M*	Cesium conc., mg/L
5.0 E–02	6650
9.5 E–03	1260
1.6 E–03	213
2.6 E–04	34.6
4.5 E–05	5.98
5.0 E–06	0.665
8.1 E–07	0.108
3.0 E–08	3.99 E–03

an average of 23,606 counts/mL/min for the two blanks after 72 h equilibration at 25°C. The effects of a consistent shift of this magnitude on D_{Cs} values are shown in the corrected and uncorrected values tabulated in Table 18. Any cesium sorption by the test vessels containing resin should be lower than that

Table 18. Results of fourth equilibrations—AP-101 simulant at 25°C and 45°C

Simulant Cs conc., *M*	Equilibration temperature (C)	Cs distribution w/o flask adsorption correction	Cs distribution w/flask adsorption correction
5.00E–02	25	55.0	44.8
5.00E–02	25	59.0	48.5
5.00E–02	45	47.8	NA
5.00E–02	45	44.6	NA
9.50E–03	25	150.6	133.5
9.50E–03	25	155.45	138.1
9.50E–03	45	118.0	NA
9.50E–03	45	122.8	NA
1.60E–03	25	338.6	308.9
1.60E–03	25	332.7	303.6
1.60E–03	25	335.3	305.6
1.60E–03	45	242.2	NA
1.60E–03	45	208.5	NA
1.60E–03	45	242.9	NA
2.60E–04	25	558.2	513.6
2.60E–04	25	537.5	494.2
2.60E–04	45	330.4	NA
2.60E–04	45	323.1	NA
4.50E–05	25	647.7	597.1
4.50E–05	25	678.4	625.5
4.50E–05	25	619.6	571.1
4.50E–05	45	385.4	NA
4.50E–05	45	409.5	NA
4.50E–05	45	409.0	NA
5.00E–06	25	762.0	703.1
5.00E–06	25	743.4	686.4
5.00E–06	45	446.8	NA
5.00E–06	45	413.5	NA
8.10E–07	25	815.4	753.3
8.10E–07	25	759.0	700.7
8.10E–07	45	456.0	NA
8.10E–07	45	432.1	NA
3.00E–08	25	835.1	772.0
3.00E–08	25	790.4	730.3
3.00E–08	45	422.3	NA
3.00E–08	45	437.9	NA

for the blank vessels, due to cesium sorption by the resin; therefore the corrected values represent a worst-case change.

As in all previous tests, results from duplicate tests are in close agreement. Consistent reductions in D_{Cs} are observed with increasing initial cesium concentration. In addition, D_{Cs} depression with increasing temperature is indicated, as was the case in the previous test. The effect of temperature is considerably more pronounced at lower cesium concentrations. Cesium uptakes at the 4.5×10^{-5} *M* concentration from the AP-101 background at both temperature conditions are significantly less than those from the simple background matrix used in the third equilibrations (Table 12), which contained a similar initial concentration of cesium. This disparity is expected, based on the higher concentration of potassium in the AP-101 simulant. The data obtained are presented in Fig. 10 and Fig. 11, in which they are compared with SRNL data and a predicted isotherm for uptake from AP-101 simulant. As shown, the data sets and predicted results are in relatively close agreement. There is, however, clear deviation in both SRNL and

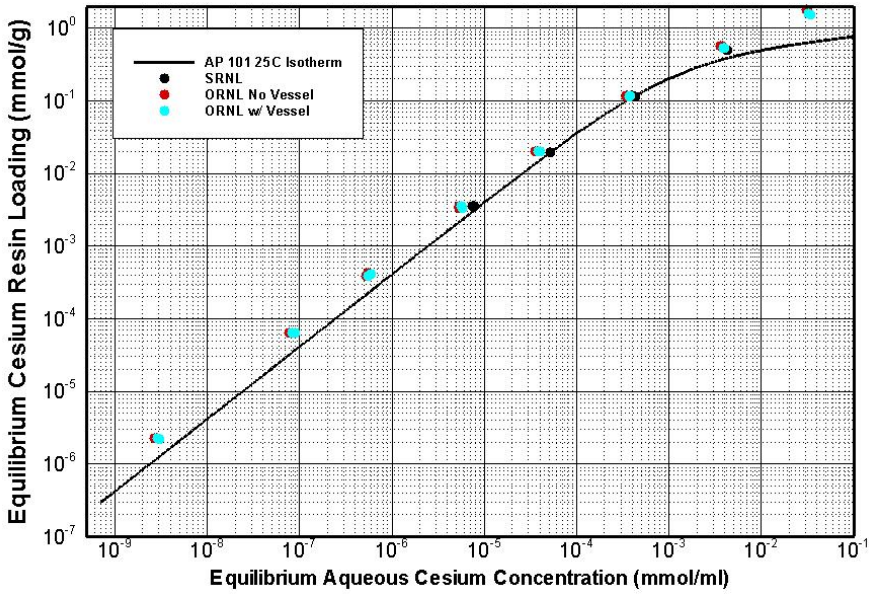

Fig. 10. Cesium loading results from AP-101 simulant at 25°C.

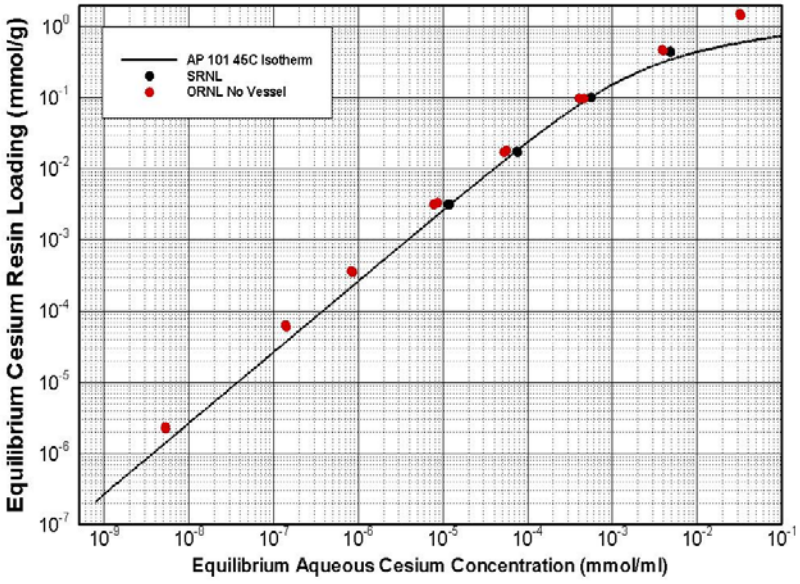

Fig. 11. Cesium loading results from AP-101 simulant at 45°C.

ORNL data from model predictions at low and high cesium concentrations, indicating that model refinements are necessary.

F-factors determined in conjunction with AP-101 equilibrations are presented in Table 19 and Table 20.

Table 19. F-factor data for resin used in 4th equilibrations at 25°C

Empty vial mass, g	Gross mass w/damp resin, g	Gross mass w/ dry resin, g	Damp resin mass, g	Dry resin mass, g	F-factor
13.2378	14.265	13.6979	1.0272	0.4601	2.234
13.2845	14.316	13.7612	1.0315	0.4767	2.164
13.3286	14.578	13.9359	1.2494	0.6073	2.057
				Average	2.151

Table 20. F-factor data for resin used in 4th equilibrations at 45°C

Empty vial mass, g	Gross mass w/damp resin, g	Gross mass w/ dry resin, g	Damp resin mass, g	Dry resin mass, g	F-factor
13.251	14.284	13.746	1.033	0.4950	2.087
13.342	14.475	13.8927	1.133	0.5507	2.057
13.301	14.474	13.8773	1.173	0.5763	2.035
13.327	14.486	13.8636	1.159	0.5366	2.160
				Average	2.085

4.2.5 Fifth Equilibrations—Extended Contact Test

The objective of this test was to perform equilibrations at controlled (and elevated) temperatures over extended periods of time (approximately 3 weeks) to examine resin degradation effects, if any, on ion exchange performance. Extended contact testing and baseline stability evaluations were performed using simulant formulations that were modified to include free OH^- at a concentration of 5*M* in order to accelerate degradation. The background simulant used was the AP-101 matrix described in Table 16, with the exception that the total Na ion concentration was 7.9 *M* due to the intentional increase in hydroxide concentration that was accomplished by increasing the quantity of NaOH used in simulant formulation. Simulants containing cesium at two concentrations, 9.5×10^{-3} *M* and 4.5×10^{-5}*M*, were used in this phase of testing. A preliminary test was performed prior to the equilibrations to confirm that increasing the OH^- concentration of the baseline AP-101 simulant to 5*M* by the addition of sodium hydroxide did not result in the formation of precipitates in the simulant solution.

Resin preparation and collection, and F-factor determinations were performed using the same methods as were applied in the previous three tests. In general, equilibrations were also performed in the manner used in these tests. However, resin/simulant contacts were conducted at temperature conditions different from those maintained in previous tests. Twenty-two resin samples were contacted with high-hydroxide simulant (AP-101 simulant with the NaOH concentration increased to 5 *M*) for 3 weeks. Subsets of the resin samples were contacted at 25°C, 45°C, and 65°C. These subsets were further divided into contacts at the "high" and "low" cesium concentrations stated above. Two additional samples were not contacted with simulant for an extended period but were equilibrated for 72 h in the lower-cesium simulant at 25°C to establish a baseline for comparison because partitioning data from high OH^- solutions at ambient temperature does not exist. Ten extended-contact samples (five test conditions, with duplicates) were allowed to re-equilibrate at 25°C for 72 h after the extended contact time, after which

samples were collected for analysis. The remaining 12 extended-contact samples (6 conditions, with duplicates) were allowed to equilibrate for 72 h at 45°C, after which samples were removed. Conditions for extended contact testing are summarized in Table 21. Results of F-factor determinations are given in Table 22.

Table 21. Conditions for extended resin contact testing

Extended contact temp. (°C)	Final equilibration temp. (°C)	Simulant Cs conc., *M*
25	25	4.5×10^{-5}
25	25	9.5×10^{-3}
45	25	4.5×10^{-5}
65	25	4.5×10^{-5}
65	25	9.5×10^{-3}
25	45	4.5×10^{-5}
25	45	9.5×10^{-3}
45	45	4.5×10^{-5}
45	45	9.5×10^{-3}
65	45	4.5×10^{-5}
65	45	9.5×10^{-3}

Table 22. F-factor data for resin used in extended contact equilibrations

Empty vial mass, g	Gross mass w/damp resin, g	Gross mass w/ dry resin, g	Damp resin mass, g	Dry resin mass, g	F-factor[a]
13.314	14.904	14.076	1.59	0.762	2.087
13.34	14.581	13.972	1.241	0.632	1.964
13.397	14.946	14.157	1.549	0.760	2.038
13.335	14.505	13.8754	1.17	0.5404	2.165
13.238	14.404	13.758	1.166	0.520	2.242
13.265	14.375	13.7596	1.11	0.4946	2.244

[a]Significant discrepancy existed from first three to second three samples due to the amount of time required to weigh all of the resin samples. The average of the first three and second three samples were applied to the appropriate equilibration samples. Average of first three F-factors is 2.029; average of second three F-factors is 2.217.

The test results (Table 23) exhibit the expected changes in cesium uptake in response to changes in equilibration temperature and initial cesium concentration. Increases in both result in decreases in D_{Cs}. In addition, significant changes in cesium uptake were generated by allowing samples to re-equilibrate with a temperature change after the extended contact periods.

Table 23. Extended contact test results (with AP-101 simulant)

3-week contact temperature, °C	3 day post-contact equilibration temperature, °C	Initial Cs conc., *M*	Raffinate Cs conc., mmol/mL	Calculated resin Cs conc., mmol/g resin	Cs distribution, D_{Cs}
25	25	4.50E–05	6.21E–06	3.47E–03	559.7
25	25	4.50E–05	5.96E–06	3.32E–03	556.6
25	45	4.50E–05	9.75E–06	3.03E–03	311.0
25	45	4.50E–05	9.29E–06	3.06E–03	329.5
45	25	4.50E–05	7.31E–06	2.31E–03	315.2
45	25	4.50E–05	6.88E–06	3.20E–03	465.8
45	45	4.50E–05	1.02E–05	3.07E–03	301.2
45	45	4.50E–05	1.02E–05	3.00E–03	292.5
65	25	4.50E–05	8.46E–06	3.37E–03	397.9
65	25	4.50E–05	8.91E–06	3.37E–03	378.5
65	45	4.50E–05	1.32E–05	3.02E–03	228.0
65	45	4.50E–05	1.35E–05	3.03E–03	224.6
25	25	9.50E–03	0.003672	5.04E–01	137.3
25	25	9.50E–03	0.003834	5.15E–01	134.4
25	45	9.50E–03	0.004354	4.72E–01	108.3
25	45	9.50E–03	0.004121	4.63E–01	112.2
45	45	9.50E–03	0.004451	4.29E–01	96.3
45	45	9.50E–03	0.004193	4.47E–01	106.6
65	25	9.50E–03	0.004396	4.87E–01	110.9
65	25	9.50E–03	0.00445	4.66E–01	104.7
65	45	9.50E–03	0.005185	4.07E–01	78.5
65	45	9.50E–03	0.004954	4.23E–01	85.5
a	25	4.50E–05	6.37E–06	3.68E–03	577.4
a	25	4.50E–05	6.61E–06	3.59E–03	542.4

[a]Results of control tests in which contact was limited to 3 days at 25°C.

Comparable data from 3-day testing (the fourth equilibration) and extended testing are presented in Table 24. The data from the extended contact test presented in this table is from equilibrations in which the extended contact and re-equilibration temperatures were unchanged. The results presented in this table indicate the difficulty in direct comparison of extended contact test results with equilibrations of shorter duration conducted in the reported work. This difficulty arises from the higher level of sodium present in the simulant used for extended contact tests. As the data in Table 24 indicate, cesium removal from the solution containing Na^+ at the lower concentration is approximately 14% greater (in terms of D_{Cs}) than removal from the simulant used in the extended contact test, when all other conditions (contact time and temperature) are equal (i.e., 3-day contacts at 25°C). The difference is indicative of sodium competition with cesium for bonding sites.

Table 24. Comparison of extended and standard contact results

Equilibration temperature, °C	Contact time	Initial Cs conc., *M*	OH^- conc., *M*	Cs distribution, D_{Cs}[a]
25	3 wk + 3 d	4.50E–05	5	560
25	3 wk + 3 d	4.50E–05	5	557
25	3 d	4.50E–05	1.94	648[b]
25	3 d	4.50E–05	1.94	678[b]
25	3 d	4.50E–05	1.94	620[b]
25	3 d	4.50E–05	5	577
25	3 d	4.50E–05	5	542
25	3 wk + 3 d	9.50E–03	5	137
25	3 wk + 3 d	9.50E–03	5	134
45	3 wk + 3 d	4.50E–05	5	301
45	3 wk + 3 d	4.50E–05	5	293
45	3 d	4.50E–05	1.94	385
45	3 d	4.50E–05	1.94	410
45	3 d	4.50E–05	1.94	409
45	3 wk + 3 d	9.50E–03	5	96
45	3 wk + 3 d	9.50E–03	5	107
45	3 d	9.50E–03	1.94	118
45	3 d	9.50E–03	1.94	123

[a]All resins used were initially in hydrogen form.
[b]Values from the fourth equilibration are not corrected for vessel adsorption.

In the one instance in which short and extended contact tests were performed with the same simulant containing the same initial cesium concentration (25°C contacts at 4.5×10^{-5} *M* Cs), the increased contact time had no significant effect on cesium uptake; D_{Cs} values for short and extended contacts are within experimental error. Similarly, when results from 3-day contacts (Table 18) are compared with extended contact results (Table 23), similar effects of temperature and initial cesium concentration are apparent. Increasing the cesium concentration from 4.5×10^{-5} *M* to 9.5×10^{-3} *M* results in greater than 60% decreases in D_{Cs}. Increasing the contact temperature from 25°C to 45°C resulted in a 25-30% decrease in cesium uptake at 9.5×10^{-3} *M* initial Cs and a decrease of approximately 40% in cesium removal resulting at 4.5×10^{-5} *M* initial cesium concentration, regardless of contact duration. The general conclusion drawn from the data is that the extended contact did not significantly alter resin performance.

While the observed reduction is Cs uptake over the contact periods used in this test was insignificant, there was an observed change in the physical appearance of the resin/simulant slurries during testing. The simulants took on a distinct purple color, seen in Fig. 12. No analysis of the simulants for resin degradation products was performed to determine the component(s) responsible for the color change. A photograph (Fig. 13) of resin that was equilibrated with the SRS simulant (Table 11) for 72 h is included for comparison.

Fig. 12. Resin and simulant after 3 week contact with AP-101 simulant in 5M OH^-.

Fig. 13. Resin and simulant after 3 day contact with SRS simulant.

4.2.6 Radiolysis K_d Tests

For the cesium distribution measurements of the resin samples from the radiolysis tests, the same procedures were followed as for the standard distribution tests. The standard AP-101 simulant (1.94 *M* NaOH) was used with a standard cesium concentration of 4.5E–5 *M* and the ratio of dry resin to simulant was 1:100 at a temperature of 25°C. All of the F-factors were performed in triplicate and the F-factors were averaged for each liquid/dose pair. The F-factors can be seen in Table 25 for the HFIR tests and in Table 26 for the Co-60 samples.

The cesium distributions were calculated in the same manner as for previous distribution tests. The simulant was spiked with radioactive cesium, and the gamma radiation was counted. The simulant was counted before and after contact with the resin. The amount of cesium deposited on the resin was calculated via subtraction. All distribution tests were performed in triplicate and the distributions were averaged for each liquid/dose pair.

Cesium distribution data from the HFIR and the Co-60 source experiments are compiled in Table 27 below. The 'liquid' column signifies the liquid the specific sample was irradiated in. After the irradiation, the resin was separated from the liquid and then converted to the hydrogen form. The resin was then dewatered and weighed for the distribution tests in AP-101 simulant.

One reason why the Co-60 source samples might have higher distribution coefficients than the HFIR samples is the temperature at which they were irradiated. The Co-60 source samples were at ambient temperature, while the HFIR samples were irradiated at temperatures ranging from 48°C to 51°C. The higher temperature in the HFIR samples could have degraded the resin.

Resin clumping was only seen with the used resin, which had reacted with 7 mmoles oxygen/g dry resin prior to irradiation; all other resin samples were free flowing.

4.3 TITRATIONS

Three sets of titrations were conducted. An initial scoping test was performed to evaluate, qualitatively, the effect of counter-ion (OH^-, Cl^-, and NO_3^-) on sodium uptake in order to determine the most effective sodium compound(s) with respect to resin loading. The results are also to be used to verify previously determined sodium capacities. The second test component comprised titrations using NaOH in a range of concentrations (0.001*M* to 6*M*) to evaluate the effect of sodium availability on uptake. During this phase of testing the resin-to-titrant ratio was adjusted to mitigate against sodium cation saturation effects on sodium uptake. The third phase of testing was performed with titrant consisting of NaOH and $NaNO_3$ at various concentration combinations yielding a total sodium concentration of 6*M* (except in one case where 11 M Na was used). The objective of the testing was to determine, quantitatively, the effect of counter-ion concentration from a neutral salt on sodium uptake. Selection of $NaNO_3$ for use in this phase of testing was made based on the lack of any significant effect when NaCl or $NaNO_3$ was used (in the scoping test) and the predominance of nitrate ion in the waste being treated.

All titration tests were performed at ambient temperature (nominally 25°C).

Table 25. F-factors for HFIR samples

Liquid	Dose (Mrad)	Empty vial tare (g)	Vial with damp RF (g)	Vial with dry RF (g)	damp RF (g)	dry RF (g)	F-factor	F-factor average
	300	6.419	7.088	6.703	0.669	0.284	2.3556	
HNO_3	300	6.337	7.478	6.847	1.141	0.510	2.2373	2.22
	300	6.339	7.530	6.913	1.191	0.574	2.0749	
	250	6.457	7.621	6.972	1.164	0.515	2.2602	
HNO_3	250	6.340	7.501	6.855	1.161	0.515	2.2544	2.25
	250	6.451	7.509	6.923	1.058	0.472	2.2415	
	200	6.317	7.682	6.931	1.365	0.614	2.2231	
HNO_3	200	6.371	7.891	7.059	1.520	0.688	2.2093	2.21
	200	6.374	7.626	6.948	1.252	0.574	2.1812	
	150	6.352	7.985	7.100	1.633	0.748	2.1832	
HNO_3	150	6.339	7.829	7.048	1.490	0.709	2.1016	2.13
	150	6.270	7.722	6.962	1.452	0.692	2.0983	
	300	6.290	7.522	6.822	1.232	0.532	2.3158	
Water	300	6.283	7.598	6.849	1.315	0.566	2.3233	2.33
	300	6.440	7.409	6.853	0.969	0.413	2.3462	
	250	6.387	7.556	6.900	1.169	0.513	2.2788	
Water	250	6.441	7.611	6.959	1.170	0.518	2.2587	2.27
	250	6.382	7.358	6.814	0.976	0.432	2.2593	
	200	6.428	7.545	6.872	1.117	0.444	2.5158	
Water	200	6.422	7.510	6.888	1.088	0.466	2.3348	2.43
	200	6.333	7.412					
	150	6.409	7.378	6.832	0.969	0.423	2.2908	
Water	150	6.456	7.558	6.934	1.102	0.478	2.3054	2.29
	150	6.304	7.218	6.704	0.914	0.400	2.2850	
	100	6.365	7.168	6.730	0.803	0.365	2.2000	

Table 25 (continued)

Liquid	Dose (Mrad)	Empty vial tare (g)	Vial with damp RF (g)	Vial with dry RF (g)	damp RF (g)	dry RF (g)	F-factor	F-factor average
Water—New	100	6.356	7.191	6.732	0.835	0.376	2.2207	2.19
	100	6.362	7.222	6.761	0.860	0.399	2.1554	
	50	6.266	6.915	6.556	0.649	0.290	2.2379	
Water—New	50	6.256	7.219	6.683	0.963	0.427	2.2553	2.23
	50	6.417	7.174	6.760	0.757	0.343	2.2070	
	100	6.361	7.695	6.887	1.334	0.526	2.5361	
Water—Used	100	6.351	7.810	6.925	1.459	0.574	2.5418	2.53
	100	6.396	7.705	6.915	1.309	0.519	2.5222	
	50	6.435	7.438	6.817	1.003	0.382	2.6257	
Water—Used	50	6.298	7.663	6.814	1.365	0.516	2.6453	2.63
	50	6.417	7.531	6.843	1.114	0.426	2.6150	
	300	6.377	7.625	6.892	1.248	0.515	2.4233	
Hanford	300	6.391	7.402	6.803	1.011	0.412	2.4539	2.44
	300	6.390	7.649	6.910	1.259	0.520	2.4212	
	250	6.343	7.469	6.818	1.126	0.475	2.3705	
Hanford	250	6.327	7.261	6.717	0.934	0.390	2.3949	2.36
	250	6.376	7.493	6.861	1.117	0.485	2.3031	
	200	6.354	7.573	6.873	1.219	0.519	2.3487	
Hanford	200	6.271	7.447	6.767	1.176	0.496	2.3710	2.36
	200	6.448	7.576	6.927	1.128	0.479	2.3549	
	150	6.424	7.651	6.957	1.227	0.533	2.3021	
Hanford	150	6.366	7.605	6.917	1.284	0.551	2.3303	2.32
	150	6.411	7.631	6.938	1.22	0.527	2.3150	
	300	6.400	7.599	6.897	1.199	0.497	2.4125	
SRS	300	6.422	7.138	6.728	0.716	0.306	2.3399	2.39
	300	6.380	7.252	6.740	0.872	0.360	2.4222	
	250	6.301	7.002	6.597	0.701	0.296	2.3682	

Table 25 (continued)

Liquid	Dose (Mrad)	Empty vial tare (g)	Vial with damp RF (g)	Vial with dry RF (g)	damp RF (g)	dry RF (g)	F-factor	F-factor average
SRS	250	6.434	7.392	6.850	0.958	0.416	2.3029	2.35
	250	6.379	7.347	6.785	0.968	0.406	2.3842	
	200	6.344	7.111	6.654	0.767	0.310	2.4742	
SRS	200	6.394	7.219	6.724	0.825	0.303	2.5000	2.48
	200	6.295	7.104	6.637	0.845	0.342	2.4708	
	150	6.449	7.001	6.738	0.651	0.289	2.2526	
SRS	150	6.378	7.170					2.26
	150	6.418	7.042	6.693	0.624	0.275	2.2691	

Table 26. F-factors for Co-60 source samples

Liquid	Dose [Mrad]	Empty vial tare (g)	Vial with damp RF (g)	Vial with dry RF (g)	damp RF (g)	dry RF (g)	F-factor	F-factor average
	300	6.414	7.123	6.771	0.709	0.357	1.9860	
HNO_3	300	6.343	7.264	6.806	0.921	0.463	1.9892	2.00
	300	6.364	7.394	6.807	1.003	0.506	2.0356	
	300	6.401	7.274	6.812	0.873	0.411	2.1241	
Water	300	6.403	7.147	6.765	0.744	0.362	2.0552	2.09
	300	6.372	7.116	6.726	0.744	0.354	2.1017	
	300	6.368	7.019	6.869	0.651	0.501	1.2994	
SRS	300	6.439	7.215	6.792	0.776	0.353	2.1983	1.89
	300	6.445	7.144	6.766	0.699	0.321	2.1776	
	0	6.394	7.041	6.727	0.647	0.333	1.9429	
HNO_3 control	0	6.375	7.140	6.756	0.765	0.381	2.0079	1.97
	0	6.352	7.198	6.782	0.846	0.430	1.9674	
	0	6.383	7.021	6.693	0.638	0.310	2.0581	
Water control	0	6.335	7.077	6.696	0.742	0.361	2.0554	2.06
	0	6.312	6.96	6.626	0.648	0.314	2.0637	
	0	6.509	7.259	6.872	0.75	0.363	2.0661	
SRS control	0	6.429	7.076	6.742	0.647	0.313	2.0671	2.07
	0	6.370	7.124	6.734	0.754	0.364	2.0714	

Table 27. Cesium distribution data from HFIR and Co-60 source

Liquid	Dose (Mrad)	HFIR samples D_{Cs}	Co-60 source samples D_{Cs}	Co-60 source controls D_{Cs}
Nitric Acid	300	3770	2575	6124
	250	3003		
	200	3000		
	150	4930		
Water	300	3271	7780	9914
	250	4773		
	200	1866		
	150	1755		
	100 (new)	14489		
	50 (new)	6580		
	100 (used)	8172		
	50 (used)	8105		
Hanford	300	4433	N/A	N/A
	250	2976		
	200	4894		
	150	5186		
SRS	300	2764	3164	12423
	250	3096		
	200	4331		
	150	4418		

4.3.1 Initial (Scoping) Test

Direct comparison of sodium uptake from NaOH, NaCl, and $NaNO_3$ solutions containing sodium at a total concentration of 6*M* was performed. All solutions contained a minimum NaOH concentration of 1.0*M* to ensure a pH of at least 14. Compositions of the three solutions used are listed in Table 28. Solutions were prepared by dissolving ACS grade reagents in water that was deionized suing a Barnstead Nanopure II deionizer. The hydroxide concentration of test solutions was determined prior to use and after equilibration using a pH meter. Samples were diluted as needed to bring the pH into the 2–12 range required for accurate analysis.

Table 28. Target compositions for scoping tests to evaluate anion effects

NaOH conc., *M*	NaCl conc., *M*	$NaNO_3$ conc., *M*
6.0	0.0	0.0
1.0	5.0	0.0
1.0	0.0	5.0

During the scoping tests (Table 29), agitation was suspended after 1 h and the pH of the slurry was determined using a Thermo Electron Corp. ORION 720A+ pH meter. Periods of agitation were repeated in one-hour increments until equilibrium was attained as indicated by identical pH measurements following two consecutive equilibration periods. Duplicate pH determinations were made for each testing at each titrant composition; one replicate test was performed at each test condition. Initial scoping test titrant compositions based on analytical results are presented in Table 30. There is a significant disparity

Table 29. Scoping test results

Test no.	Resin mass (dry), g	Titrant volume, mL	Final [OH^-], *M*	Final titrant [Na^+], µg/mL	Na^+ uptake based on Na^+ analysis, mmol/g resin	Na^+ uptake based on nominal Na^+, mmol/g resin	Na^+ uptake based on OH^- depletion, mmol/g resin
1	7.85	50	3.36	84500	5.12	14.81	10.86
2	7.84	50	3.44	83100	5.52	15.21	10.37
3	7.85	50	0.08	18400	5.01	33.12	5.49
4	7.86	50	0.06	17100	5.37	33.44	5.59
5	7.82	50	0.08	17800	5.40	33.41	5.55
6	7.85	50	0.08	18100	5.29	33.20	5.57

Table 30. Analytical results for titrants used in scoping test

Test no.	Nominal initial [OH^-], *M*	Nominal initial neutral salt, *M*	Measured initial [OH^-], *M*	Measured initial [Na^+], *M*
1	6.0	0.0	5.06	4.48
Duplicate	6.0	0.0		
2	6.0	0.0		
Duplicate	6.0	0.0		
3	1.0	5.0 Cl^-	0.94	1.59
Duplicate	1.0	5.0 Cl^-		
4	1.0	5.0 Cl^-		
Duplicate	1.0	5.0 Cl^-		
5	1.0	5.0 NO_3^-	0.95	1.62
Duplicate	1.0	5.0 NO_3^-		
6	1.0	5.0 NO_3^-		
Duplicate	1.0	5.0 NO_3^-		

between target sodium concentrations and analytical results. While inconsistencies in sodium analysis results from other tests were observed, none were of the magnitude shown in Table 30. The source of the error is not known.

Results of scoping titrations are presented in Table 31. All resin loading results have been derived by subtraction of post-equilibration titrant concentrations from initial titrant conditions. The large discrepancy between measured and nominal, initial sodium concentrations produces a similar discrepancy between results calculated by subtraction using the two different bases (analytical versus nominal feed values). However, comparison of results produced by titrations using NaCl or $NaNO_3$ calculated from the same basis indicate that the sodium counterion has no effect on sodium transfer, i.e. differences are within experimental error.

Table 31. Nominal compositions for tests without salt background matrix

Initial NaOH conc., *M*	Calculated initial pH	Phase ratio (mL liq:g dry solid)
6.0	14.8	4
1.0	14.0	15
0.1	13.0	100
0.01	12.0	750
0.001	11.0	5000

4.3.2 NaOH-only Titration Procedure

Solutions used in testing were prepared as in the previous test; nominal concentrations are presented in Table 31. Target titrant-to-resin ratios were selected so as to avoid saturation effects, provide measurable differences in sodium concentration, and provide final hydroxide concentrations in the desired range.

As in Sect. 4.3.1, resin/titrant slurries were agitated for periods of 1 h using an enclosed orbital shaker controlled at 25°C. (During testing, temperatures ranged from 25°C to 26°C.) Slurry pH was measured after 1-h agitation periods, with agitation cycles repeated until equilibrium was reached.

Analytical results for titrants used in the NaOH-only titrations are presented in Table 32. Titration results are shown in Table 33 and presented graphically in Fig. 14. As was the case in the scoping studies, sodium concentrations determined by ICP–atomic emission spectroscopy (AES) determinations at ORNL were not consistent with the target values (those based on mass of reagent used in solution preparation). Like the scoping study results, sodium concentrations in the titrants determined at ORNL were significantly lower than the target values in the case of higher Na levels, and are inconsistent with Na concentrations inferred from hydroxide determinations. At the higher initial Na concentration condition, ICP-AES results from the raffinate samples were also lower than the values inferred from the hydroxide analyses, causing the resin loading calculation results based on sodium and hydroxide concentrations to be similar.

Table 32. Analytical results for titrants used in NaOH-only titrations

Nominal $[OH^-]$, *M*	Avg. initial $[OH^-]$, *M*	ORNL measured initial $[Na^+]$, µg/mL	ORNL measured initial $[Na^+]$, *M*	SRNL measured initial $[Na^+]$, µg/mL	SRNL measured initial $[Na^+]$, *M*
6.0	6.2308	120000	5.2174	148000	6.4376
1.0	1.0720	17200	0.7478	29000	1.2614
0.1	0.0840	2190	0.0952	4180	0.1818
0.01	0.0094	853	0.0371	575	0.0250
0.001	0.0009	59.8	0.0026	No analysis	No analysis

Table 33. Results of NaOH-only titrations

Nominal initial [OH^-], *M*	Final [OH^-], *M*	Resin mass (dry), g	Phase ratio, mL titrant: g resin	Final titrant [Na^+], µg/mL	Na^+ uptake based on SRNL Na^+ analysis, mmol/g resin	Na^+ uptake based on ORNL Na^+ analysis and nominal feed, mmol/g resin	Na^+ uptake based on OH^- depletion, mmol/g resin
6.0	3.0148	7.860	3.82	58200	12.32	13.24	12.27
6.0	3.0360	7.880	3.81	60500	11.99	12.82	12.16
1.0	0.4361	5.540	13.54	7840	11.01	8.92	8.61
1.0	0.4002	5.550	13.51	8930	10.40	8.26	9.08
0.1	0.0256	1.110	90.09	1730	12.99	2.23	5.27
0.1	0.0268	1.130	88.50	652	12.93	6.34	5.07
0.01	0.0034	0.140	714.29	214	1.96	0.49	4.27
0.01	0.0031	0.150	666.67	161	7.68	2.00	4.22
0.001	0.0004	0.054	4629.63	42.4	Not analyzed	13.24	2.15
0.001	0.0004	0.058	4310.35	16.8	Not analyzed	12.82	2.00

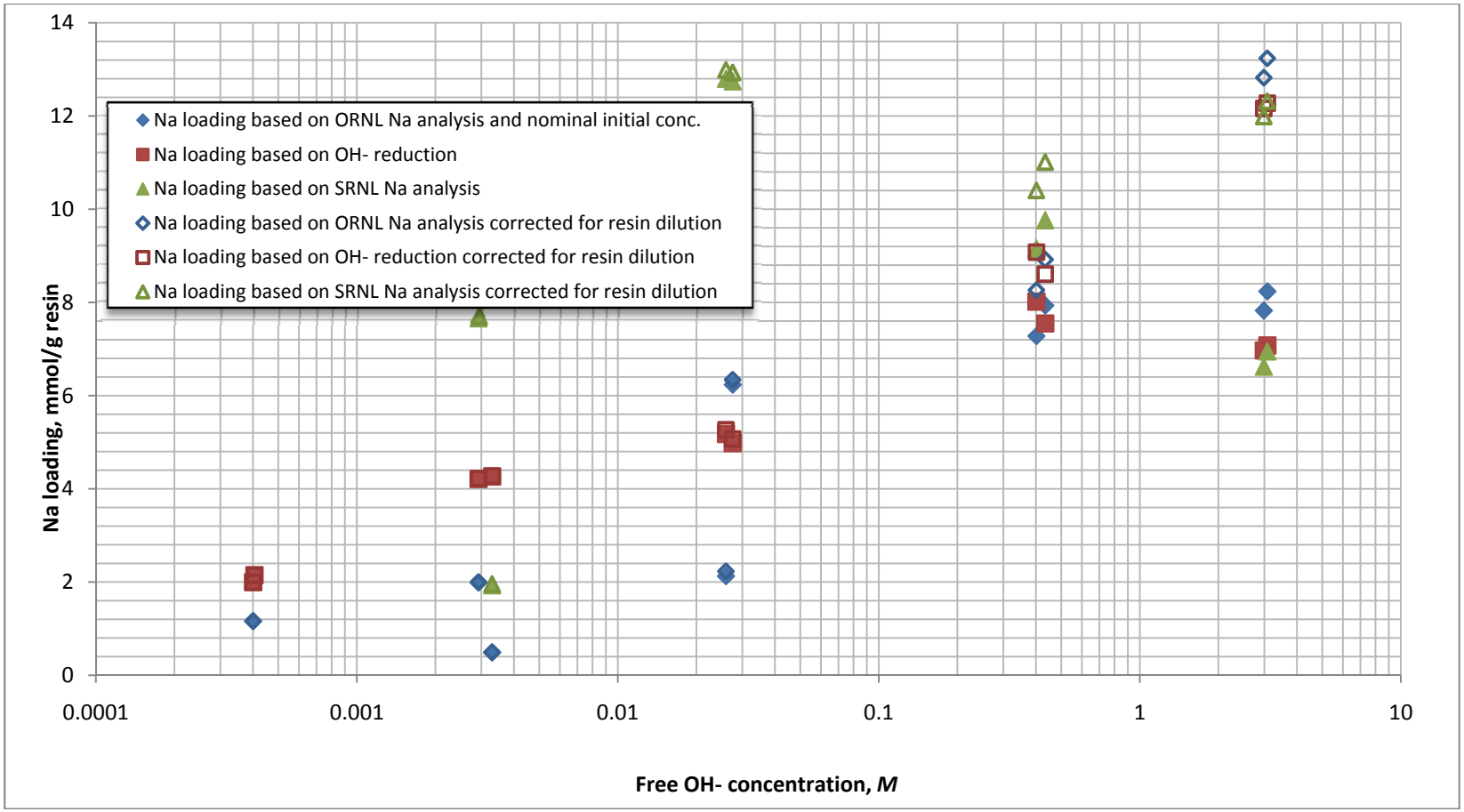

Fig. 14. Results of NaOH-only resin titration.

As a result of inconsistent ICP-AES results, replicate samples of titrants and raffinates were sent to SRNL for analysis (Table 33). At the two higher initial (titrant) Na concentration conditions, the SRNL analysis results are in closer agreement with target and hydroxide-inferred sodium results than are the ORNL Na analytical results. Similarly, SRNL raffinate results are similar to results from ORNL OH^- determinations at the higher Na condition; consequently, loading results are also similar. However, at the lower Na concentration conditions, both the titrant and raffinate sodium concentrations obtained at SRNL are elevated relative ORNL Na^+ and OH^- results. Because the disparity is between SRNL Na^+ results and ORNL hydroxide-inferred results is greater for titrants than raffinates, loadings calculated based on the former are higher than those from the latter.

All loading results have been calculated after adjusting the starting solution concentrations for dilution introduced the use of damp resin in the titrations. Results from all analyses are presented in Fig. 14. Values calculated with and without correction for water introduced with the damp resin are plotted to illustrate the effect of resin dilution.

4.3.3 Titrations with NaOH/Neutral Salt ($NaNO_3$)

Titrations were performed using solutions containing NaOH and $NaNO_3$ at the concentrations listed in Table 34. As indicated, all titrants had a nominal total sodium concentration of 6 *M*, with the exception of an NaOH-only titration using a nominal feed concentration of 11.5 *M*. Resin/titrant slurries were agitated as in the previous two tests. Initial and final samples of each titrant solution were collected and analyzed for total sodium. One additional test was also conducted to evaluate potassium uptake under high ionic strength conditions (6*M* KOH, nominally) for direct comparison to the results with sodium.

Table 34. Nominal compositions for neutral sodium salt tests

Initial NaOH conc., *M*	Calculated initial pH	$NaNO_3$ conc., *M*	Phase ratio (mL liq:g dry solid)
11.5	14.8	0.0	3
11.5	14.8	0.0	4
2.0	14.3	4.0	5
1.0	14.0	5.0	7
0.5	13.7	5.5	13
0.1	13.0	5.9	50

Results from analysis of titrants used in the neutral salt titration are presented in Table 35. As in the previous results, there is significant offset between nominal (target) sodium concentrations and the ICP-AES results; as in previous results the analysis values are depressed relative to the target Na^+ concentrations and the sodium values that can be inferred from the measured OH^- concentrations (where the only intended sodium contribution is from NaOH).

Table 35. Initial conditions for titrations using NaOH and NaOH/$NaNO_3$ blends

Test no.	Target [OH^-], *M*	Target [Na^+], *M*	Measured initial [OH^-], *M*	Measured initial [Na^+], *M*
1 (NaOH only)	11.50	11.50	10.8732	8.4348
2	2.00	6.00	1.9132	5.0000
3	1.00	6.00	0.8757	4.3913
4	0.50	6.00	0.3749	4.4783
5	0.10	6.00	0.0740	4.9130

Results of the neutral salt titrations are presented in Table 36 and Fig. 15. Values in Table 36 have been corrected for resin water dilution; corrected and uncorrected values are presented in Fig. 15. Due to

Table 36. Results of titrations using NaOH and NaOH/$NaNO_3$ blends

Test no.	Resin mass (dry), g	Titrant volume, mL	Phase ratio, mL titrant: g resin	Final [OH^-], *M*	Final titrant [Na^+], µg/mL	Na^+ uptake based on Na^+ nominal feed, mmol/g resin	Na^+ uptake based on OH^- depletion, mmol/g resin
1	8.408	25	2.9734	5.21	117000	2.85	7.68
1 replicate	6.329	25	3.9501	6.21	175000	–4.37	8.58
2	10.124	50	4.9388	0.29	72900	4.30	6.21
2 replicate	10.106	50	4.9476	0.38	88700	0.91	5.77
3	7.272	50	6.8757	0.02	92400	–1.83	4.97
3 replicate	7.245	50	6.9013	0.02	80800	1.65	5.05
4	5.879	75	12.7573	0.008	87500	3.78	4.28
4 replicate	5.869	75	12.7790	0.009	103000	–4.82	4.28
5	2.047	100	48.8520	0.001	98900	24.32	3.46
5 replicate	2.047	100	48.8520	0.001	103000	15.61	3.46

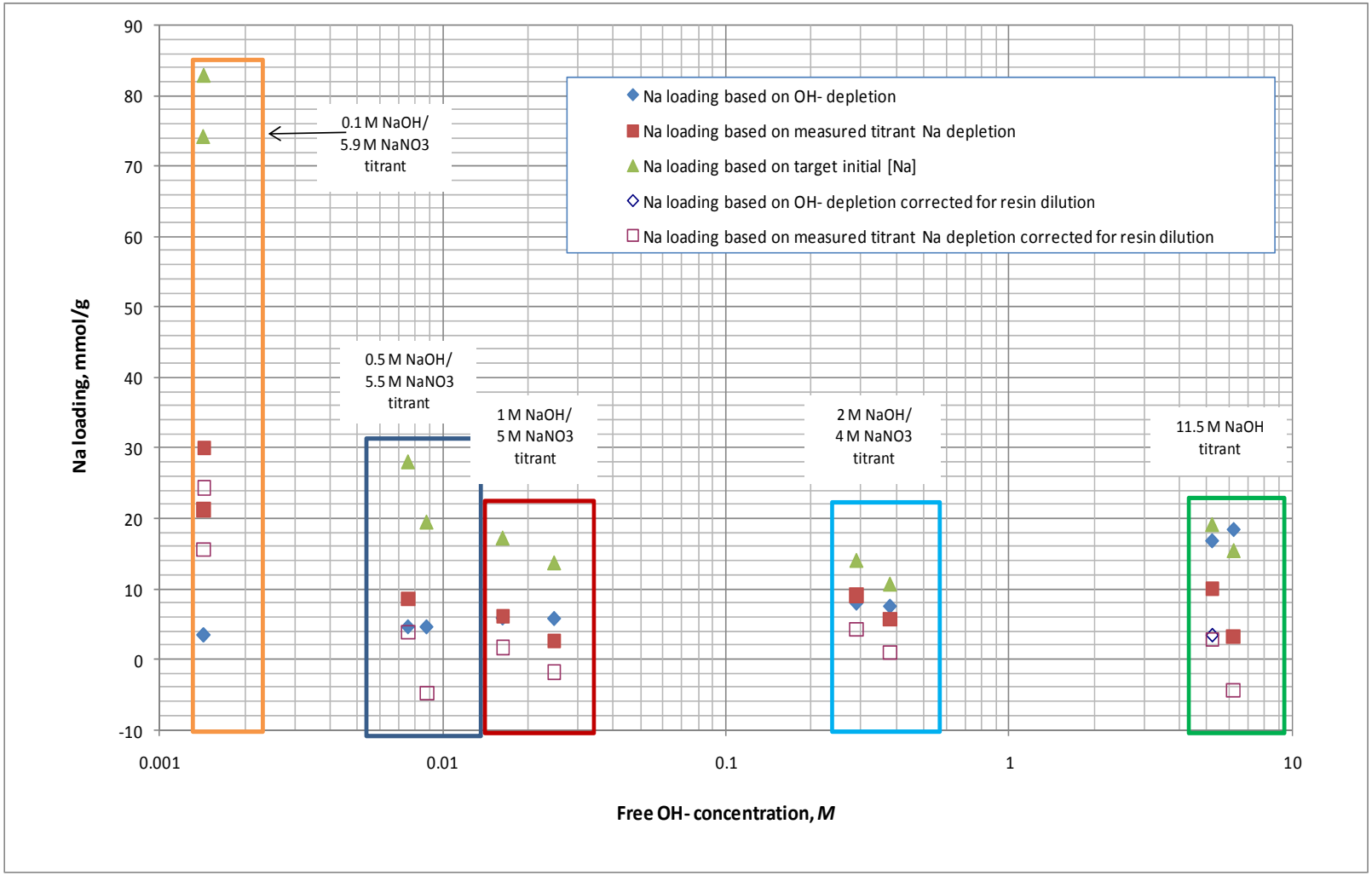

Fig. 15. Results of NaOH titrations with neutral salt ($NaNO_3$).

the severely depressed initial sodium values obtained by ICP-AES analysis, differences between nominal initial Na^+ concentration and final, measured values have been used to calculate the loading values listed in next-to-last column. Loadings calculated using nominal and measured initial Na^+ concentrations, and those inferred from OH^- concentrations (i.e., the loading contribution from NaOH), are presented in the figure. Results based on OH^- depletion alone are presented in Fig. 16, and indicate a high degree of consistency.

Comparison of the OH^- based results with NaOH-only titration results (Fig. 14) indicates similar sodium loading contributions from salt/hydroxide blends and hydroxide-only titrants. Relative to the effect of the neutral salt, the magnitude of the increase in adsorption with increasing OH^- concentration is minor. Results indicated a relatively small increase in sodium uptake at lower neutral salt concentrations and an exponential increase at concentrations between 5 and 6 *M*.

Hydroxide uptake results for solutions with and without 6 M sodium nitrate background are very similar. It appears that in the concentration of interest (≤2.5 M OH^-) the adsorption of neutral salts does not occur. Furthermore, under these conditions sodium loadings are similar to previously measured values of approximately 6 mmol/g resin.

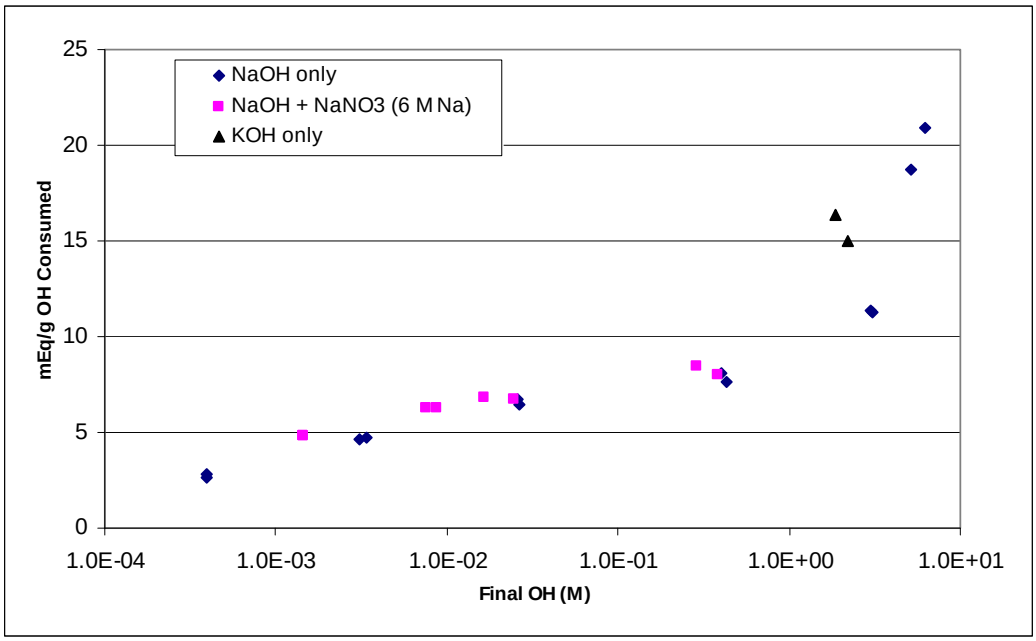

Fig. 16. Sodium loading (expressed as OH^- consumed) versus final OH^- concentration.

4.3.4 Potassium Loading Results

Titrant composition and loading results from a high ionic strength solution of KOH are presented in Table 37. Comparison of the potassium loading results with the NaOH test results (Fig. 15) at comparable metal cation concentration are indicative of the selectivity of RF resin for potassium. Hydroxide uptake from a titrant with a NaOH concentration of 6 *M* (~11 mmol/g) are lower than the loading observed with a 6 *M* KOH solution (~15 mmol/g).

Table 37. Conditions and results from high ionic strength test with potassium

Nominal initial $[OH^-]$, *M*	Nominal initial $[K^+]$, *M*	Resin mass (dry), g	Titrant volume, mL	Phase ratio, mL titrant: g resin	Final $[OH^-]$, *M*	Final titrant $[K^+]$, µg/mL	K^+ uptake based on K^+ nominal feed, mmol/g resin	K^+ uptake based on OH^- depletion, mmol/g resin
2	6	6.352	25	3.82	2.18	81500	9.96	5.26
2	6	6.325	25	3.81	1.87	85300	9.64	6.52

5. CONCLUSIONS

5.1 RADIOLYSIS

RF resin was irradiated under various conditions to determine if the resin degrades when exposed to a radiation field. The irradiated samples produced gas, which was then analyzed for gases and volatile organic compounds. The nitric acid sample from both irradiation facilities (C-60 source and HFIR) had the highest total gas generation. Hydrogen was generated the most while oxygen was consumed by the resin. The amount of hydrogen produced and oxygen consumed increased as the radiation exposure increased.

After irradiation, the resin and liquid were examined for degradation. The resin that was had a known oxygen exposure clumped more and was noticeably darker than the new resin. The liquid was also considerably more discolored when using the known oxygen exposure resin and when exposing the new resin to higher doses. The solutions were analyzed. No standard SVOCs were detected; formaldehyde was only detected in the water sample from the Co-60 source. The discoloration does not seem to have an effect on the resin performance, although it indicates that some sort of degradation is occurring

5.2 D_{Cs} DETERMINATIONS

Cesium partitioning results obtained in the various experiments exhibited considerable internal consistency, both in trends observed and in data collected under similar and identical test conditions. Throughout with simple simulants, D_{Cs} values obtained were significantly less than values obtained previously and were therefore below values predicted by the new isotherm. It remains unclear what the source of the discrepancy is; agreement between results obtained from experiments performed at ORNL and SRNL using the same starting materials indicate that the offset does not reflect experimental differences between the two sites. Data collected at SRNL and ORNL using AP-101 is in relatively good agreement with predicted values over a range of cesium concentrations.

Consistent reduction in cesium adsorption with increased equilibration temperature was observed. This result is consistent with previously reported results. Results from extended contact equilibrations exhibit minimal difference from 3-day contacts at equal temperatures.

5.3 TITRATIONS

Results of titrations performed using nitrate and chloride salts of sodium indicate no effect of anion species on sodium uptake. Results from NaOH/neutral salt combinations having equal total initial sodium indicate a slight preference for sodium supplied from the hydroxide, i.e., sodium loading is somewhat higher as a result of contact with 6M Na+ solutions having increasing proportions of NaOH. However, sodium partition results from NaOH and $NaOH/NaNO_3$ solutions having equal total sodium demonstrate high levels of consistency.

6. REFERENCES

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APPENDIX A. ANALYTICAL RESULTS FOR GAS SAMPLES FROM RADIOLYSIS TESTS

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
05/10/2010 07:52

Lab Smpl Id: A101230502
Cust Smpl Id: Co-60 300 SRS

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117947	81473	745A0221	04/26/2010 07:30	05/03/2010 15:19	05/17/2010 23:59	05/10/2010 07:52

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y50-AC-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 10/23/2010 23:59
Date Analyzed: 05/05/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.03			vol %
630080	Carbon monoxide				1		0.24			vol %
1333740	Hydrogen, molecular				1		>6			vol %
74828	Methane				1		0.017			vol %
7782447	Oxygen				1		>5			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 10/23/2010 23:59
Date Analyzed: 05/05/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		1.47			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		16.61			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		58.67			vol %
7782447	Oxygen				1		14.98			vol %

Sample Test Comments: N2O = 8.25% [051712 05/06/2010 10:46:02]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/10/2010 07:51

Official Report

Lab Smpl Id: A101230500
Cust Smpl Id: Co-60 300 water

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117947	81473	745A0221	04/26/2010 07:30	05/03/2010 15:19	05/17/2010 23:59	05/10/2010 07:51

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y50-AC-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 10/23/2010 23:59
Date Analyzed: 05/05/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.007			vol %
630080	Carbon monoxide				1		0.03			vol %
1333740	Hydrogen, molecular				1		>5			vol %
74828	Methane				1		0.005			vol %
7727379	Nitrogen, molecular				1		>5			vol %
7782447	Oxygen				1		>1.6			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 10/23/2010 23:59
Date Analyzed: 05/05/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		1.32			vol %
1333740	Hydrogen, molecular				1		84.50			vol %
74828	Methane				1		0.006			vol %
7727379	Nitrogen, molecular				1		12.52			vol %
7782447	Oxygen				1		1.65			vol %

Sample Test Comments: N2O = <.01% [051712 05/06/2010 10:39:10]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/10/2010 07:50

Official Report

Lab Smpl Id: A101230501
Cust Smpl Id: Co-60 300 nitric

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117947	81473	745A0221	04/26/2010 07:30	05/03/2010 15:19	05/17/2010 23:59	05/10/2010 07:50

Sample Description:
Location:
Sampler(s):
Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y50-AC-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 10/23/2010 23:59
Date Analyzed: 05/05/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		>2			vol %
124389	Carbon Dioxide (CO2)				1		>2			vol %
630080	Carbon monoxide				1		0.02			vol %
1333740	Hydrogen, molecular				1		>5			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		>6			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 10/23/2010 23:59
Date Analyzed: 05/05/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		2.38			vol %
124389	Carbon Dioxide (CO2)				1		33.7			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		29.28			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		30.70			vol %
7782447	Oxygen				1		0.28			vol %

Sample Test Comments: N2O = 3.65% [051712 05/06/2010 10:42:41]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/08/2010 13:36

Lab Smpl Id: A100550035
Cust Smpl Id: Co60 source 250 Mrad SRS

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117935	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/08/2010 13:36

Sample Description:
Location:
Sampler(s):
Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 YS9-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.01			vol %
630080	Carbon monoxide				1		0.33			vol %
1333740	Hydrogen, molecular				1		>6			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		>12			vol %
7782447	Oxygen				1		>6			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		3.75			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		15.13			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		63.19			vol %
7782447	Oxygen				1		13.87			vol %

Sample Test Comments: N2O+CO2= 4.02% [018053 03/08/2010 13:25:30]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/08/2010 13:34

Official Report

Lab Smpl Id: A100550032
Cust Smpl Id: Co60 source 250 H2o

Project: L MS MPO SCHUH GAS Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117935	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/08/2010 13:34

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT Lim Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon		1		>2			vol %
124389	Carbon Dioxide (CO2)		1		0.03			vol %
630080	Carbon monoxide		1		0.03			vol %
1333740	Hydrogen, molecular		1		>17			vol %
74828	Methane		1		0.004			vol %
7727379	Nitrogen, molecular		1		>17			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT Lim Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon		1		2.65			vol %
7440597	Helium		1		<0.1			vol %
1333740	Hydrogen, molecular		1		72.59			vol %
74828	Methane		1		0.007			vol %
7727379	Nitrogen, molecular		1		23.23			vol %
7782447	Oxygen		1		0.99			vol %

Sample Test Comments: N2O+CO2= .05% [018053 03/08/2010 13:22:02]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/08/2010 13:32

Lab Smpl Id: A100550031
Cust Smpl Id: Co60 source 250 Mrad
Nitric

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117935	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/08/2010 13:32

Sample Description: Nitric Acid
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		>0.4			vol %
124389	Carbon Dioxide (CO2)				1		>0.8			vol %
630080	Carbon monoxide				1		0.06			vol %
1333740	Hydrogen, molecular				1		>1.7			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		>5			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		4.78			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		17.2			vol %
74828	Methane				1		0.007			vol %
7727379	Nitrogen, molecular				1		32.16			vol %
7782447	Oxygen				1		0.29			vol %

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
02/17/2010 12:26

Lab Smpl Id: A100250138
Cust Smpl Id: Co-60 source 200MradSRSsm

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117931	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/17/2010 12:26

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 01/26/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit

Sample Test Comments: No gas in this section of sample tube. [018053 02/17/2010 10:11:58]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 01/26/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		19.46			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		7.55			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		52.71			vol %
7782447	Oxygen				1		18.73			vol %

Sample Test Comments: N20 = 1.53% [018053 02/17/2010 10:10:28]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
02/17/2010 12:28

Lab Smpl Id: A100250140
Cust Smpl Id: Co-60source 200Mrad

nitric

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117931	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/17/2010 12:28

Sample Description: 0.5M HNO3
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 02/16/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.07			vol %

Sample Test Comments: This section of sample contained air. O2 > 10% : N2 >39% [018053 02/17/2010 10:21:26]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 02/16/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		8.9			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		5.16			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		45.07			vol %
7782447	Oxygen				1		7.3			vol %

Sample Test Comments: N2O = 33.52% [018053 02/17/2010 10:20:19]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
12/09/2009 13:09

Lab Smpl Id: A093150073
Cust Smpl Id: ~175 Mrad SRS

Co-60

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117882	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/09/2009 13:09

Sample Description: Co-60 source
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		<0.01			vol %
630080	Carbon monoxide				1		0.12			vol %
1333740	Hydrogen, molecular				1		>6			vol %
74828	Methane				1		0.008			vol %
7727379	Nitrogen, molecular				1		>11			vol %
7782447	Oxygen				1		>4			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		29.05			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		13.9			vol %
74828	Methane				1		0.007			vol %
7727379	Nitrogen, molecular				1		39.6			vol %
7782447	Oxygen				1		16.19			vol %

Sample Test Comments: N2O estimate at 1.11% [018053 12/09/2009 12:57:36]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
12/09/2009 13:10

Lab Smpl Id: A093150074
Cust Smpl Id: ~175 Mrad 0.5M HNO3

Co-60

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117882	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/09/2009 13:10

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7727379	Nitrogen, molecular				1		>10			vol %
7782447	Oxygen				1		>5			vol %

Sample Test Comments: Sample has air in it. [018053 12/09/2009 13:04:55]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7727379	Nitrogen, molecular				1		78.5			vol %
7782447	Oxygen				1		20.4			vol %

Sample Test Comments: Sample has air in it. [018053 12/09/2009 13:04:08]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
02/17/2010 12:27

Lab Smpl Id: A100250139
Cust Smpl Id: HFIR 300Mrad SRS

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117931	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/17/2010 12:27

Sample Description:
Location:
Sampler(s):
Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 01/26/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		<0.01			vol %
630080	Carbon monoxide				1		0.32			vol %
1333740	Hydrogen, molecular				1		>30			vol %
74828	Methane				1		0.03			vol %
7727379	Nitrogen, molecular				1		>7			vol %
7782447	Oxygen				1		>25			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 01/26/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.16			vol %
7440597	Helium				1		20.11			vol %
1333740	Hydrogen, molecular				1		47.32			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		8.25			vol %
7782447	Oxygen				1		22.89			vol %

Sample Test Comments: N2O = 1.02% [018053 02/17/2010 10:14:35]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
02/17/2010 12:24

Lab Smpl Id: A100250137
Cust Smpl Id: HFIR 250Mrad SRS

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117931	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/17/2010 12:24

Sample Description:
Location:
Sampler(s):
Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 01/26/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.02			vol %
630080	Carbon monoxide				1		0.26			vol %
1333740	Hydrogen, molecular				1		>30			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		>5			vol %
7782447	Oxygen				1		>25			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 01/26/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.41			vol %
7440597	Helium				1		22.43			vol %
1333740	Hydrogen, molecular				1		32.66			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		16.99			vol %
7782447	Oxygen				1		26.54			vol %

Sample Test Comments: N20 = .91% [018053 02/17/2010 10:04:52]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
12/09/2009 13:08

Lab Smpl Id: A093150072
Cust Smpl Id: SRS 200 Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117882	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/09/2009 13:08

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		<0.1			vol %
630080	Carbon monoxide				1		<0.1			vol %
1333740	Hydrogen, molecular				1		<0.1			vol %
74828	Methane				1		<0.1			vol %
7727379	Nitrogen, molecular				1		>10			vol %
7782447	Oxygen				1		>10			vol %

Sample Test Comments: Sample had air in it [018053 12/09/2009 12:56:25]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.48			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		41.99			vol %
74828	Methane				1		0.01			vol %
7727379	Nitrogen, molecular				1		32.8			vol %
7782447	Oxygen				1		24.2			vol %

Sample Test Comments: N2O estimate .52% [018053 12/09/2009 12:53:54]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
12/09/2009 13:09

Official Report

Lab Smpl Id: A093150071
Cust Smpl Id: 150Mrad SRS

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117882	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/09/2009 13:09

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		<0.01			vol %
630080	Carbon monoxide				1		<0.01			vol %
1333740	Hydrogen, molecular				1		>10			vol %
74828	Methane				1		0.01			vol %
7727379	Nitrogen, molecular				1		>7			vol %
7782447	Oxygen				1		>3			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.65			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		34.8			vol %
74828	Methane				1		0.008			vol %
7727379	Nitrogen, molecular				1		29.9			vol %
7782447	Oxygen				1		34.15			vol %

Sample Test Comments: N2O estimate at .49% [018053 12/09/2009 12:46:57]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/08/2010 13:36

Lab Smpl Id: A100550036
Cust Smpl Id: HFIR Hanford 300 Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117935	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/08/2010 13:36

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.34			vol %
124389	Carbon Dioxide (CO2)				1		<0.01			vol %
630080	Carbon monoxide				1		0.05			vol %
1333740	Hydrogen, molecular				1		>5			vol %
74828	Methane				1		0.01			vol %
7727379	Nitrogen, molecular				1		>5			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.45			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		57.26			vol %
74828	Methane				1		0.01			vol %
7727379	Nitrogen, molecular				1		38.94			vol %
7782447	Oxygen				1		0.01			vol %

Sample Test Comments: N2O+CO2=3.07% [018053 03/08/2010 13:26:10]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/08/2010 13:35

Official Report

Lab Smpl Id: A100550034
Cust Smpl Id: HFIR Hanford 250 Mrad

Project: L MS MPO SCHUH GAS

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117935	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/08/2010 13:35

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.08			vol %
630080	Carbon monoxide				1		0.09			vol %
1333740	Hydrogen, molecular				1		>22			vol %
74828	Methane				1		0.015			vol %
7727379	Nitrogen, molecular				1		>18			vol %
7782447	Oxygen				1		>0.6			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.31			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		67.55			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		26.91			vol %
7782447	Oxygen				1		0.76			vol %

Sample Test Comments: N2O+CO2 = 4.0% [018053 03/08/2010 13:24:22]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/24/2010 10:59

Official Report

Lab Smpl Id: A100690175
Cust Smpl Id: HFIR HANFORD 200

Project: L MS MPO SCHUH GAS

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117945	81473	745A0221	03/09/2010 08:00	03/09/2010 14:10	03/23/2010 23:59	03/24/2010 10:59

Sample Description: GAS
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		<0.01			vol %
630080	Carbon monoxide				1		0.14			vol %
1333740	Hydrogen, molecular				1		>6			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		>6			vol %
7782447	Oxygen				1		0.6			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P6S-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.45			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		60.0			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		33.88			vol %
7782447	Oxygen				1		0.13			vol %

Sample Test Comments: N2O=5.18% [018053 03/24/2010 10:49:11]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
12/09/2009 12:47

Lab Smpl Id: A093150070
Cust Smpl Id: 150Mrad simulant
Hanford

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117882	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/09/2009 12:47

Sample Description: Hanford Simulant
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: C R HORTON/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: C R HORTON/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.009			vol %
630080	Carbon monoxide				1		0.11			vol %
1333740	Hydrogen, molecular				1		>13			vol %
74828	Methane				1		0.0096			vol %
7727379	Nitrogen, molecular				1		>10			vol %
7782447	Oxygen				1		>4			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: C R HORTON/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.44			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		44.01			vol %
74828	Methane				1		0.008			vol %
7727379	Nitrogen, molecular				1		34.8			vol %
7782447	Oxygen				1		19.77			vol %

Sample Test Comments: N2O estimate at .94% [018053 12/09/2009 12:42:37]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/24/2010 10:59

Lab Smpl Id: A100690174
Cust Smpl Id: HFIR H2O 300

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117945	81473	745A0221	03/09/2010 08:00	03/09/2010 14:10	03/23/2010 23:59	03/24/2010 10:59

Sample Description: GAS
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit

Sample Test Comments: No gas in this section of tube. [018053 03/24/2010 10:47:01]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.37			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		80.8			vol %
74828	Methane				1		0.04			vol %
7727379	Nitrogen, molecular				1		17.48			vol %
7782447	Oxygen				1		0.6			vol %

Sample Test Comments: N2O=.04% [018053 03/24/2010 10:48:22]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
02/17/2010 12:29

Official Report

Lab Smpl Id: A100250141
Cust Smpl Id: HFIR Water 250Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117931	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/17/2010 12:29

Sample Description:
Location:
Sampler(s):
Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 02/16/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.27			vol %
124389	Carbon Dioxide (CO2)				1		0.08			vol %
630080	Carbon monoxide				1		<0.01			vol %
1333740	Hydrogen, molecular				1		>30			vol %
74828	Methane				1		0.07			vol %
7727379	Nitrogen, molecular				1		>6			vol %

Sample Test Comments: C2H6 = .01% [018053 02/17/2010 12:21:59]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:
Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 02/16/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.22			vol %
7440597	Helium				1		32.48			vol %
1333740	Hydrogen, molecular				1		59.19			vol %
74828	Methane				1		0.06			vol %
7727379	Nitrogen, molecular				1		7.45			vol %
7782447	Oxygen				1		0.07			vol %

Sample Test Comments: N2O = .11% [018053 02/17/2010 12:20:02]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
12/09/2009 12:48

Official Report

Lab Smpl Id: A093150069
Cust Smpl Id: Water 200 Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117882	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/09/2009 12:48

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: C R HORTON/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: C R HORTON/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.4			vol %
124389	Carbon Dioxide (CO2)				1		0.002			vol %
630080	Carbon monoxide				1		0.004			vol %
1333740	Hydrogen, molecular				1		>5			vol %
74828	Methane				1		0.09			vol %
7727379	Nitrogen, molecular				1		>5			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: C R HORTON/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/09/2010 23:59
Date Analyzed: 12/02/2009 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.34			vol %
124389	Carbon Dioxide (CO2)				1		<0.01			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		72.04			vol %
74828	Methane				1		0.09			vol %
7727379	Nitrogen, molecular				1		27.47			vol %
7782447	Oxygen				1		<0.01			vol %

Sample Test Comments: NOx(N2O)=<.01% [018053 12/09/2009 12:38:30]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
02/17/2010 12:30

Lab Smpl Id: A100250142
Cust Smpl Id: HFIR Water 150Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117931	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/17/2010 12:30

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 02/16/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.28			vol %
124389	Carbon Dioxide (CO2)				1		<0.01			vol %
630080	Carbon monoxide				1		<0.01			vol %
1333740	Hydrogen, molecular				1		>6			vol %
74828	Methane				1		0.07			vol %
7727379	Nitrogen, molecular				1		>6			vol %

Sample Test Comments: C2H6 = .01% [018053 02/17/2010 12:17:44]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 07/20/2010 23:59
Date Analyzed: 02/16/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.3			vol %
7440597	Helium				1		32.04			vol %
1333740	Hydrogen, molecular				1		56.5			vol %
74828	Methane				1		0.06			vol %
7727379	Nitrogen, molecular				1		10.75			vol %
7782447	Oxygen				1		<0.01			vol %

Sample Test Comments: N2O is <.01% [018053 02/17/2010 12:15:45]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
04/15/2010 14:37

Lab Smpl Id: A100910401
Cust Smpl Id: HFIR Oldwater 100Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117946	81473	745A0221	03/31/2010 07:30	04/01/2010 14:15	04/15/2010 23:59	04/15/2010 14:37

Sample Description: GRAB
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments: Need stainless bottles by April 26th for time sensitive sample grab. [018254 04/01/2010 15:50:56]

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 YS9-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.01			vol %
630080	Carbon monoxide				1		0.18			vol %
1333740	Hydrogen, molecular				1		>4			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		>4.5			vol %
7782447	Oxygen				1		>1.5			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		1.14			vol %
124389	Carbon Dioxide (CO2)				1		<0.1			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		13.76			vol %
74828	Methane				1		0.03			vol %
7727379	Nitrogen, molecular				1		58.75			vol %
7782447	Oxygen				1		23.03			vol %

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
04/15/2010 14:36

Lab Smpl Id: A100910400
Cust Smpl Id: HFIR Oldwater 50Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117946	81473	745A0221	03/31/2010 07:30	04/01/2010 14:15	04/15/2010 23:59	04/15/2010 14:36

Sample Description: GRAB
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments: Need stainless bottles by April 26th for time sensitive sample grab. [018254 04/01/2010 15:50:56]

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.04			vol %
630080	Carbon monoxide				1		<0.01			vol %
1333740	Hydrogen, molecular				1		<0.01			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		>56			vol %
7782447	Oxygen				1		>17			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.94			vol %
7440597	Helium				1		<0.01			vol %
1333740	Hydrogen, molecular				1		<0.01			vol %
74828	Methane				1		<0.1			vol %
7727379	Nitrogen, molecular				1		77.34			vol %
7782447	Oxygen				1		21.56			vol %

Comment Objects:

****** The results relate only to the items tested. ******
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****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/24/2010 10:47

Lab Smpl Id: A100690173
Cust Smpl Id: HFIR H2O 100 NEW

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117945	81473	745A0221	03/09/2010 08:00	03/09/2010 14:10	03/23/2010 23:59	03/24/2010 10:47

Sample Description: GAS
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.04			vol %
630080	Carbon monoxide				1		0.01			vol %
1333740	Hydrogen, molecular				1		0.83			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		>8			vol %
7782447	Oxygen				1		>2			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.9			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		1.13			vol %
74828	Methane				1		0.01			vol %
7727379	Nitrogen, molecular				1		79.38			vol %
7782447	Oxygen				1		18.4			vol %

Sample Test Comments: N2O=.16% [018053 03/24/2010 10:46:37]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/24/2010 10:46

Lab Smpl Id: A100690172
Cust Smpl Id: HFIR H2O 50 NEW

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117945	81473	745A0221	03/09/2010 08:00	03/09/2010 14:10	03/23/2010 23:59	03/24/2010 10:46

Sample Description: GAS
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		0.05			vol %
630080	Carbon monoxide				1		<0.01			vol %
1333740	Hydrogen, molecular				1		<0.01			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		>65			vol %
7782447	Oxygen				1		>18			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.77			vol %
1333740	Hydrogen, molecular				1		43.34			vol %
74828	Methane				1		0.01			vol %
7727379	Nitrogen, molecular				1		50.1			vol %
7782447	Oxygen				1		5.3			vol %

Sample Test Comments: N2O=.31% [018053 03/24/2010 10:45:21]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/08/2010 13:33

Official Report

Lab Smpl Id: A100550033
Cust Smpl Id: HFIR 300 Mrad nitric

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117935	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/08/2010 13:33

Sample Description: Nitric Acid
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit

Sample Test Comments: There was no sample in this section of tube. [018053 03/08/2010 13:22:31]

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 08/22/2010 23:59
Date Analyzed: 03/04/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.26			vol %
7440597	Helium				1		0.02			vol %
1333740	Hydrogen, molecular				1		16.72			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		47.72			vol %
7782447	Oxygen				1		4.01			vol %

Sample Test Comments: N2O+CO2 = 31.25% [018053 03/08/2010 13:23:13]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/24/2010 10:43

Lab Smpl Id: A100690171
Cust Smpl Id: HFIR NITRIC 250Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117945	81473	745A0221	03/09/2010 08:00	03/09/2010 14:10	03/23/2010 23:59	03/24/2010 10:43

Sample Description: GAS
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		>2			vol %
630080	Carbon monoxide				1		0.21			vol %
1333740	Hydrogen, molecular				1		>4			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		>5			vol %
7782447	Oxygen				1		0.17			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/05/2010 23:59
Date Analyzed: 03/22/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.06			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		7.7			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		22.39			vol %
7782447	Oxygen				1		0.06			vol %

Sample Test Comments: N2O=69.68% [018053 03/24/2010 10:42:38]

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
04/15/2010 14:33

Lab Smpl Id: A100910398
Cust Smpl Id: HFIR Nitric 200Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117946	81473	745A0221	03/31/2010 07:30	04/01/2010 14:15	04/15/2010 23:59	04/15/2010 14:33

Sample Description: GRAB
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments: Need stainless bottles by April 26th for time sensitive sample grab. [018254 04/01/2010 15:50:56]

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.13			vol %
124389	Carbon Dioxide (CO2)				1		>11			vol %
630080	Carbon monoxide				1		0.45			vol %
1333740	Hydrogen, molecular				1		>12			vol %
74828	Methane				1		0.002			vol %
7727379	Nitrogen, molecular				1		>17			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.12			vol %
124389	Carbon Dioxide (CO2)				1		24.24			vol %
7440597	Helium				1		<0.1			vol %
1333740	Hydrogen, molecular				1		24.83			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		29.63			vol %
7782447	Oxygen				1		0.03			vol %

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
04/15/2010 14:34

Lab Smpl Id: A100910399
Cust Smpl Id: HFIR Nitric 150Mrad

Project: L MS MPO SCHUH GAS
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
GAS	117946	81473	745A0221	03/31/2010 07:30	04/01/2010 14:15	04/15/2010 23:59	04/15/2010 14:34

Sample Description: GRAB
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J L MARSHALL/Chemist

Customer Comments:
Lab Comments: Need stainless bottles by April 26th for time sensitive sample grab. [018254 04/01/2010 15:50:56]

Comment Objects:

<<<<< None >>>>>

Test: GAS-GC (GAS CHROMATOGRAPHY OF GAS SAMPLES)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: Y12 Y59-65-6002
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
124389	Carbon Dioxide (CO2)				1		>9			vol %
630080	Carbon monoxide				1		0.1			vol %
1333740	Hydrogen, molecular				1		>5			vol %
74828	Methane				1		<0.01			vol %
7727379	Nitrogen, molecular				1		>10			vol %
7782447	Oxygen				1		0.38			vol %

Comment Objects:

Test: GAS-MS (Mass Spec. Analysis of Gas by VG 3001)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: ASO Y/P65-6011
Approver: J L MARSHALL/Chemist
QC Batch/File:

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 09/27/2010 23:59
Date Analyzed: 04/07/2010 00:00
Lab Group: MYSSG1

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
7440371	Argon				1		0.46			vol %
124389	Carbon Dioxide (CO2)				1		19.8			vol %
7440597	Helium				1		0.27			vol %
1333740	Hydrogen, molecular				1		6.52			vol %
74828	Methane				1		0.02			vol %
7727379	Nitrogen, molecular				1		55.7			vol %
7782447	Oxygen				1		9.15			vol %

Comment Objects:

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

APPENDIX B. ANALYTICAL RESULTS FOR LIQUID SAMPLES FROM RADIOLYSIS TESTS

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
05/18/2010 14:02

Lab Smpl Id: A101230505
Cust Smpl Id: Co-60 300 SRS

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117947	81473	745A0221	04/28/2010 12:30	05/03/2010 15:19	05/17/2010 23:59	05/18/2010 14:02

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Inorganic* >>>>>

Test: TOC (Total Organic Carbon, 415.1)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: EPA 415.1 1983 (YSO-AC-65-7314)
Approver:
QC Batch/File:

Prep Method/Date:
Test Status: CANCELLED
HT Deadline: 05/26/2010 23:59
Date Analyzed:
Lab Group: IAWETC

Sample Test Comments:
Change to TOC 9060 [027645 05/06/2010 06:15:08]

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (YSO-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10138016/5385/53858

Prep Method/Date: SW846 3580A 05/05/2010 15:00
Test Status: APPROVED
HT Deadline: 06/14/2010 23:59
Date Analyzed: 05/13/2010 13:53
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	2500	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	1000	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	500	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	2500	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	500	U		ug/L
92875	Benzidine				1	120	2500	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L

50328	Benzo(a)pyrene	1	45	500	U	ug/L
205992	Benzo(b)fluoranthene	1	110	500	U	ug/L
191242	Benzo(ghi)perylene	1	150	500	U	ug/L
207089	Benzo(k)fluoranthene	1	150	500	U	ug/L
65850	Benzoic acid	1	190	2500	U	ug/L
111911	Bis(2-chloroethoxy)methane	1	53	500	U	ug/L
111444	Bis(2-chloroethyl) ether	1	140	500	U	ug/L
108601	Bis(2-chloroisopropyl) ether	1	70	500	U	ug/L
117817	Bis(2-ethylhexyl)phthalate	1	120	500	U	ug/L
85687	Butylbenzylphthalate	1	120	500	U	ug/L
86748	Carbazole	1	61	500	U	ug/L
218019	Chrysene	1	97	500	U	ug/L
84742	Di-n-butylphthalate	1	69	500	U	ug/L
117840	Di-n-octylphthalate	1	140	500	U	ug/L
53703	Dibenz(a,h)anthracene	1	160	500	U	ug/L
132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000078933	2-Butanone (CAS) $$ Methyl ethyl ketone		9.76	min	1900	JN	ug/L
	unknown alcohol/alkoxy cpd		11.38	min	67000	J	ug/L
	unknown		10.03	min	17000	J	ug/L
004161608	2-Pentanone, 4-hydroxy- $$ CH3CH(OH)CH2C		7.03	min	2200	JN	ug/L
	unknown alcohol		11.91	min	3200	J	ug/L
	unknown		10.19	min	1200	J	ug/L
	unknown		12.92	min	6500	J	ug/L
	unknown		13.29	min	2500	J	ug/L
	unknown		14.13	min	1300	J	ug/L
	unknown		14.54	min	2500	J	ug/L
	unknown		14.68	min	2200	J	ug/L
	unknown		17.76	min	2500	J	ug/L
	unknown		6.56	min	4300	J	ug/L
	unknown		7.56	min	45000	J	ug/L
	unknown		7.71	min	1500	J	ug/L
	unknown		7.87	min	7900	J	ug/L
	unknown		8.55	min	50000	J	ug/L
	unknown		8.79	min	7600	J	ug/L
	unknown		9.57	min	26000	J	ug/L
	unknown		9.93	min	8900	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:

65-85-0	Benzoic acid
90-13-1	1-Chloronaphthalene
51-28-5	2,4-Dinitrophenol
100-02-7	4-Nitrophenol
92-87-5	Benzidine

The mean Initial Calibration RSD = 10.6

Comment Objects:

Test: TOC9060 (Total Organic Carbon)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 9060 (Y50-AC-65-7314)
Approver: T J OATTS/Supervisor
QC Batch/File: QC10130012/10130A

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/26/2010 23:59
Date Analyzed: 05/06/2010 08:30
Lab Group: IAWETC

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/18/2010 14:02

Official Report

Lab Smpl Id: A101230505
Cust Smpl Id: Co-60 300 SRS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
N997	Total Organic Carbon (TOC)				200	200	1760			mg/L
	Aliquot				200		1711			mg/L
	Aliquot				200		1754			mg/L
	Aliquot				200		1782			mg/L
	Aliquot				200		1784			mg/L

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/18/2010 14:00

Official Report

Lab Smpl Id: A101230503
Cust Smpl Id: Co-60 300 water

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117947	81473	745A0221	04/28/2010 12:30	05/03/2010 15:19	05/17/2010 23:59	05/18/2010 14:00

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Inorganic* >>>>>

Test: TOC (Total Organic Carbon, 415.1)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: EPA 415.1 1983 (Y50-AC-65-7314)
Approver:
QC Batch/File:

Prep Method/Date:
Test Status: CANCELLED
HT Deadline: 05/26/2010 23:59
Date Analyzed:
Lab Group: IAWETC

Sample Test Comments:
Change to TOC 9060 [027645 05/06/2010 06:14:23]

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10138016/5385/53858

Prep Method/Date: SW846 3580A 05/05/2010 15:00
Test Status: APPROVED
HT Deadline: 06/14/2010 23:59
Date Analyzed: 05/13/2010 12:18
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	2500	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	1000	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	500	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	2500	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	500	U		ug/L
92875	Benzidine				1	120	2500	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/18/2010 14:00

Official Report

Lab Smpl Id: A101230503
Cust Smpl Id: Co-60 300 water

50328	Benzo(a)pyrene	1	45	500	U	ug/L
205992	Benzo(b)fluoranthene	1	110	500	U	ug/L
191242	Benzo(ghi)perylene	1	150	500	U	ug/L
207089	Benzo(k)fluoranthene	1	150	500	U	ug/L
65850	Benzoic acid	1	190	2500	U	ug/L
111911	Bis(2-chloroethoxy)methane	1	53	500	U	ug/L
111444	Bis(2-chloroethyl) ether	1	140	500	U	ug/L
108601	Bis(2-chloroisopropyl) ether	1	70	500	U	ug/L
117817	Bis(2-ethylhexyl)phthalate	1	120	500	U	ug/L
85687	Butylbenzylphthalate	1	120	500	U	ug/L
86748	Carbazole	1	61	500	U	ug/L
218019	Chrysene	1	97	500	U	ug/L
84742	Di-n-butylphthalate	1	69	500	U	ug/L
117840	Di-n-octylphthalate	1	140	500	U	ug/L
53703	Dibenz(a,h)anthracene	1	160	500	U	ug/L
132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
	unknown		6.44	min	240	J	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.3	min	330	JN	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:

65-85-0	Benzoic acid
90-13-1	1-Chloronaphthalene
51-28-5	2,4-Dinitrophenol
100-02-7	4-Nitrophenol
92-87-5	Benzidine

The mean Initial Calibration RSD = 10.6

Comment Objects:

Test: TOC9060 (Total Organic Carbon)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 9060 (Y50-AC-65-7314)
Approver: T J OATTS/Supervisor
QC Batch/File: QC10130012/10130A

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/26/2010 23:59
Date Analyzed: 05/06/2010 08:30
Lab Group: IAWETC

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
N997	Total Organic Carbon (TOC)				20	20	108			mg/L
	Aliquot				20		104.4			mg/L
	Aliquot				20		104.7			mg/L
	Aliquot				20		110.9			mg/L
	Aliquot				20		112.9			mg/L

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/18/2010 14:01

Official Report

Lab Smpl Id: A101230504
Cust Smpl Id: Co-60 300 nitric

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117947	81473	745A0221	04/28/2010 12:30	05/03/2010 15:19	05/17/2010 23:59	05/18/2010 14:01

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Inorganic* >>>>>

Test: TOC (Total Organic Carbon, 415.1)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: EPA 415.1 1983 (Y50-AC-65-7314)
Approver:
QC Batch/File:

Prep Method/Date:
Test Status: CANCELLED
HT Deadline: 05/26/2010 23:59
Date Analyzed:
Lab Group: IAWETC

Sample Test Comments:
Change to TOC 9060 [027645 05/06/2010 06:14:46]

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10138016/5385/53858

Prep Method/Date: SW846 3580A 05/05/2010 15:00
Test Status: APPROVED
HT Deadline: 06/14/2010 23:59
Date Analyzed: 05/13/2010 13:05
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	2500	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	1000	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	500	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	2500	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	500	U		ug/L
92875	Benzidine				1	120	2500	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L

50328	Benzo(a)pyrene	1	45	500	U	ug/L
205992	Benzo(b)fluoranthene	1	110	500	U	ug/L
191242	Benzo(ghi)perylene	1	150	500	U	ug/L
207089	Benzo(k)fluoranthene	1	150	500	U	ug/L
65850	Benzoic acid	1	190	2500	U	ug/L
111911	Bis(2-chloroethoxy)methane	1	53	500	U	ug/L
111444	Bis(2-chloroethyl) ether	1	140	500	U	ug/L
108601	Bis(2-chloroisopropyl) ether	1	70	500	U	ug/L
117817	Bis(2-ethylhexyl)phthalate	1	120	500	U	ug/L
85687	Butylbenzylphthalate	1	120	500	U	ug/L
86748	Carbazole	1	61	500	U	ug/L
218019	Chrysene	1	97	500	U	ug/L
84742	Di-n-butylphthalate	1	69	500	U	ug/L
117840	Di-n-octylphthalate	1	140	500	U	ug/L
53703	Dibenz(a,h)anthracene	1	160	500	U	ug/L
132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
	unknown		6.42	min	640	J	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.29	min	380	JN	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:

65-85-0	Benzoic acid
90-13-1	1-Chloronaphthalene
51-28-5	2,4-Dinitrophenol
100-02-7	4-Nitrophenol
92-87-5	Benzidine

The mean Initial Calibration RSD = 10.6

Comment Objects:

Test: TOC9060 (Total Organic Carbon)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 9060 (Y50-AC-65-7314)
Approver: T J OATTS/Supervisor
QC Batch/File: QC10130012/10130A

Prep Method/Date:
Test Status: APPROVED
HT Deadline: 05/26/2010 23:59
Date Analyzed: 05/06/2010 08:30
Lab Group: IAWETC

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
N997	Total Organic Carbon (TOC)				5	5	27.2			mg/L
	Aliquot				5		27.31			mg/L
	Aliquot				5		26.61			mg/L
	Aliquot				5		28.3			mg/L
	Aliquot				5		26.65			mg/L

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
2960 Foster Creighton Road Nashville, TN 37204 * 800-765-0980 * Fax 615-726-3404

Client	Oak Ridge National Laboratory (415880)	Work Order:	NTE1950
	1 Bethal Valley Road	Project Name:	SCIX
	Oak Ridge, TN 37931	Project Number:	[none]
Attn	Paul Allen Taylor	Received:	05/20/10 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NTE1950-01 (SRS Salt - Water) Sampled: 05/18/10 00:01								
Aldehydes by EPA Method 8315A								
Formaldehyde	ND		ug/L	50.0	1	05/23/10 19:07	SW846 8315A	10E3454
Surr: Butyraldehyde (10-150%)	*11 %*					*05/23/10 19:07*	*SW846 8315A*	*10E3454*
Sample ID: NTE1950-02 (Water - Water) Sampled: 05/18/10 00:01								
Aldehydes by EPA Method 8315A								
Formaldehyde	**61.4**		ug/L	50.0	1	05/23/10 19:26	SW846 8315A	10E3454
Surr: Butyraldehyde (10-150%)	*101 %*					*05/23/10 19:26*	*SW846 8315A*	*10E3454*

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
2960 Foster Creighton Road Nashville, TN 37204 * 800-765-0980 * Fax 615-726-3404

Client	Oak Ridge National Laboratory (415880)	Work Order:	NTE1822
	1 Bethal Valley Road	Project Name:	SCIX
	Oak Ridge, TN 37931	Project Number:	[none]
Attn	Paul Allen Taylor	Received:	05/19/10 08:00

ANALYTICAL REPORT

Analyte	Result	Flag	Units	MRL	Dilution Factor	Analysis Date/Time	Method	Batch
Sample ID: NTE1822-01 (Acid - Water) Sampled: 05/18/10 00:01								
Aldehydes by EPA Method 8315A								
Formaldehyde	ND		ug/L	50.0	1	05/23/10 04:51	SW846 8315A	10E3276
Surr: Butyraldehyde (10-150%)	*94 %*					*05/23/10 04:51*	*SW846 8315A*	*10E3276*

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
02/22/2010 07:01

Official Report

Lab Smpl Id: A100250073
Cust Smpl Id: HFIR SRS 300 Mrad~2MNaOH

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117929	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/22/2010 07:01

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (YSO-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10049010/5281/53758

Prep Method/Date: SW846 3580A 02/01/2010 13:00
Test Status: APPROVED
HT Deadline: 03/13/2010 23:59
Date Analyzed: 02/15/2010 17:24
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	300	1500	U		ug/L
95501	1,2-Dichlorobenzene				3	340	1500	U		ug/L
122667	1,2-Diphenylhydrazine				3	180	1500	U		ug/L
541731	1,3-Dichlorobenzene				3	510	1500	U		ug/L
106467	1,4-Dichlorobenzene				3	530	1500	U		ug/L
95954	2,4,5-Trichlorophenol				3	580	1500	U		ug/L
88062	2,4,6-Trichlorophenol				3	310	1500	U		ug/L
120832	2,4-Dichlorophenol				3	290	1500	U		ug/L
105679	2,4-Dimethylphenol				3	300	1500	U		ug/L
51285	2,4-Dinitrophenol				3	430	3000	U		ug/L
121142	2,4-Dinitrotoluene				3	390	1500	U		ug/L
606202	2,6-Dinitrotoluene				3	290	1500	U		ug/L
91587	2-Chloronaphthalene				3	260	1500	U		ug/L
95578	2-Chlorophenol				3	300	1500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	320	3000	U		ug/L
91576	2-Methylnaphthalene				3	200	1500	U		ug/L
95487	2-Methylphenol				3	290	1500	U		ug/L
88744	2-Nitrobenzenamine				3	340	1500	U		ug/L
88755	2-Nitrophenol				3	240	1500	U		ug/L
91941	3,3'-Dichlorobenzidine				3	150	3000	U		ug/L
N2799	3- and 4- Methylphenol				3	350	3000	U		ug/L
99092	3-Nitrobenzenamine				3	650	1500	U		ug/L
101553	4-Bromophenyl phenyl ether				3	200	1500	U		ug/L
59507	4-Chloro-3-methylphenol				3	160	1500	U		ug/L
106478	4-Chlorobenzenamine				3	300	1500	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	200	1500	U		ug/L
100016	4-Nitrobenzenamine				3	330	3000	U		ug/L
100027	4-Nitrophenol				3	300	3000	U		ug/L
83329	Acenaphthene				3	270	1500	U		ug/L
208968	Acenaphthylene				3	310	1500	U		ug/L
62533	Aniline				3	120	3000	U		ug/L
120127	Anthracene				3	160	1500	U		ug/L
100516	Benzenemethanol				3	180	3000	U		ug/L
92875	Benzidine				3	370	3000	U		ug/L
56553	Benzo(a)anthracene				3	170	1500	U		ug/L
50328	Benzo(a)pyrene				3	140	1500	U		ug/L
205992	Benzo(b)fluoranthene				3	330	1500	U		ug/L
191242	Benzo(ghi)perylene				3	450	1500	U		ug/L
207089	Benzo(k)fluoranthene				3	440	1500	U		ug/L
65850	Benzoic acid				3	570	3000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	160	1500	U		ug/L
111444	Bis(2-chloroethyl) ether				3	410	1500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	210	1500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	370	1500	U		ug/L
85687	Butylbenzylphthalate				3	370	1500	U		ug/L
86748	Carbazole				3	180	1500	U		ug/L
218019	Chrysene				3	290	1500	U		ug/L
84742	Di-n-butylphthalate				3	210	1500	U		ug/L
117840	Di-n-octylphthalate				3	420	1500	U		ug/L
53703	Dibenz(a,h)anthracene				3	480	1500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048 Lab Smpl Id: A100250073
02/22/2010 07:01 Official Report Cust Smpl Id: HFIR SRS 300 Mrad~2MNaOH

132649	Dibenzofuran	3	280	1500	U		ug/L
84662	Diethylphthalate	3	260	1500	U		ug/L
131113	Dimethylphthalate	3	300	1500	U		ug/L
206440	Fluoranthene	3	150	1500	U		ug/L
86737	Fluorene	3	220	1500	U		ug/L
118741	Hexachlorobenzene	3	200	1500	U		ug/L
77474	Hexachlorocyclopentadiene	3	780	1500	U		ug/L
67721	Hexachloroethane	3	450	1500	U		ug/L
193395	Indeno(1,2,3-cd)pyrene	3	300	1500	U		ug/L
78591	Isophorone	3	210	1500	U		ug/L
621647	N-Nitroso-di-n-propylamine	3	190	1500	U		ug/L
62759	N-Nitrosodimethylamine	3	450	1500	U		ug/L
86306	N-Nitrosodiphenylamine	3	180	1500	U		ug/L
91203	Naphthalene	3	290	1500	U		ug/L
98953	Nitrobenzene	3	140	1500	U		ug/L
87865	Pentachlorophenol	3	160	3000	U		ug/L
85018	Phenanthrene	3	190	1500	U		ug/L
108952	Phenol	3	280	1500	U		ug/L
129000	Pyrene	3	340	1500	U		ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000000000	2,4-DINITROPHENOL-D3		19.2	min	1000	JN	ug/L
000000000	2-NITROPHENOL-D4		13.06	min	2100	JN	ug/L
	unknown		11.22	min	2800	J	ug/L
001794861	Phosgene oxime $$ Phosgenox $$ CX $$ Hyd		8.41	min	2600	JN	ug/L
007119893	Methane, dichloronitro- $$ Dichloronitro		5.98	min	1200	JN	ug/L
	Diacetone Alcohol		7.48	min	2700	J	ug/L
002562370	Cyclohexene, 1-nitro- $$ 1-Nitrocyclohex		14.08	min	9700	JN	ug/L
007459714	3,5-Dimethylcyclopentene $$ 3,5-Dimethyl		12.71	min	5100	JN	ug/L
043080235	2-Propenoic acid, pentadecyl ester $$ 2-		27	min	3200	JN	ug/L
000999780	2-Pentyne, 4,4-dimethyl- $$ 4,4-Dimethyl		12.83	min	2100	JN	ug/L
	unknown		12.49	min	960	J	ug/L
	unknown		14.77	min	1600	J	ug/L
	unknown		14.85	min	3500	J	ug/L
	unknown		15.34	min	9300	J	ug/L
	unknown		15.61	min	1000	J	ug/L
	unknown		16.35	min	3500	J	ug/L
	unknown		17.65	min	6900	J	ug/L
	unknown		18.28	min	2500	J	ug/L
	unknown		18.71	min	1100	J	ug/L
	unknown		8.34	min	1300	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
02/22/2010 07:03

Official Report

Lab Smpl Id: A100250075
Cust Smpl Id: HFIR SRS 250 Mrad~2MNaOH

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117929	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/22/2010 07:03

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10049010/5281/53758

Prep Method/Date: SW846 3580A 02/01/2010 13:00
Test Status: APPROVED
HT Deadline: 03/13/2010 23:59
Date Analyzed: 02/15/2010 18:56
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	300	1500	U		ug/L
95501	1,2-Dichlorobenzene				3	340	1500	U		ug/L
122667	1,2-Diphenylhydrazine				3	180	1500	U		ug/L
541731	1,3-Dichlorobenzene				3	510	1500	U		ug/L
106467	1,4-Dichlorobenzene				3	530	1500	U		ug/L
95954	2,4,5-Trichlorophenol				3	580	1500	U		ug/L
88062	2,4,6-Trichlorophenol				3	310	1500	U		ug/L
120832	2,4-Dichlorophenol				3	290	1500	U		ug/L
105679	2,4-Dimethylphenol				3	300	1500	U		ug/L
51285	2,4-Dinitrophenol				3	430	3000	U		ug/L
121142	2,4-Dinitrotoluene				3	390	1500	U		ug/L
606202	2,6-Dinitrotoluene				3	290	1500	U		ug/L
91587	2-Chloronaphthalene				3	260	1500	U		ug/L
95578	2-Chlorophenol				3	300	1500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	320	3000	U		ug/L
91576	2-Methylnaphthalene				3	200	1500	U		ug/L
95487	2-Methylphenol				3	290	1500	U		ug/L
88744	2-Nitrobenzenamine				3	340	1500	U		ug/L
88755	2-Nitrophenol				3	240	1500	U		ug/L
91941	3,3'-Dichlorobenzidine				3	150	3000	U		ug/L
N2799	3- and 4- Methylphenol				3	350	3000	U		ug/L
99092	3-Nitrobenzenamine				3	650	1500	U		ug/L
101553	4-Bromophenyl phenyl ether				3	200	1500	U		ug/L
59507	4-Chloro-3-methylphenol				3	160	1500	U		ug/L
106478	4-Chlorobenzenamine				3	300	1500	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	200	1500	U		ug/L
100016	4-Nitrobenzenamine				3	330	3000	U		ug/L
100027	4-Nitrophenol				3	300	3000	U		ug/L
83329	Acenaphthene				3	270	1500	U		ug/L
208968	Acenaphthylene				3	310	1500	U		ug/L
62533	Aniline				3	120	3000	U		ug/L
120127	Anthracene				3	160	1500	U		ug/L
100516	Benzenemethanol				3	180	3000	U		ug/L
92875	Benzidine				3	370	3000	U		ug/L
56553	Benzo(a)anthracene				3	170	1500	U		ug/L
50328	Benzo(a)pyrene				3	140	1500	U		ug/L
205992	Benzo(b)fluoranthene				3	330	1500	U		ug/L
191242	Benzo(ghi)perylene				3	450	1500	U		ug/L
207089	Benzo(k)fluoranthene				3	440	1500	U		ug/L
65850	Benzoic acid				3	570	3000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	160	1500	U		ug/L
111444	Bis(2-chloroethyl) ether				3	410	1500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	210	1500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	370	1500	U		ug/L
85687	Butylbenzylphthalate				3	370	1500	U		ug/L
86748	Carbazole				3	180	1500	U		ug/L
218019	Chrysene				3	290	1500	U		ug/L
84742	Di-n-butylphthalate				3	210	1500	U		ug/L
117840	Di-n-octylphthalate				3	420	1500	U		ug/L
53703	Dibenz(a,h)anthracene				3	480	1500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
02/22/2010 07:03

Official Report

Lab Smpl Id: A100250075
Cust Smpl Id: HFIR SRS 250 Mrad~2MNaOH

132649	Dibenzofuran	3	280	1500	U	ug/L
84662	Diethylphthalate	3	260	1500	U	ug/L
131113	Dimethylphthalate	3	300	1500	U	ug/L
206440	Fluoranthene	3	150	1500	U	ug/L
86737	Fluorene	3	220	1500	U	ug/L
118741	Hexachlorobenzene	3	200	1500	U	ug/L
77474	Hexachlorocyclopentadiene	3	780	1500	U	ug/L
67721	Hexachloroethane	3	450	1500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	3	300	1500	U	ug/L
78591	Isophorone	3	210	1500	U	ug/L
621647	N-Nitroso-di-n-propylamine	3	190	1500	U	ug/L
62759	N-Nitrosodimethylamine	3	450	1500	U	ug/L
86306	N-Nitrosodiphenylamine	3	180	1500	U	ug/L
91203	Naphthalene	3	290	1500	U	ug/L
98953	Nitrobenzene	3	140	1500	U	ug/L
87865	Pentachlorophenol	3	160	3000	U	ug/L
85018	Phenanthrene	3	190	1500	U	ug/L
108952	Phenol	3	280	1500	U	ug/L
129000	Pyrene	3	340	1500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000000000	2,4-DINITROPHENOL-D3		19.2	min	950	JN	ug/L
000403190	2-Fluoro-4-nitrophenol $$ 4-Nitro-2-fluo		13.48	min	1000	JN	ug/L
	unknown		11.22	min	2200	J	ug/L
013402023	acrylic acid hexadecanyl ester $$ 2-Prop		27	min	3400	JN	ug/L
001794861	Phosgene oxime $$ Phosgenox $$ CX $$ Hyd		8.41	min	2700	JN	ug/L
074752946	Cyclopropane, 1-chloro-2-(1-propenyl)-		12.83	min	1400	JN	ug/L
002562370	Cyclohexene, 1-nitro- $$ 1-Nitrocyclohex		14.07	min	6800	JN	ug/L
007459714	3,5-Dimethylcyclopentene $$ 3,5-Dimethyl		12.69	min	3400	JN	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.48	min	2400	JN	ug/L
000000000	2-NITROPHENOL-D4		13.06	min	2300	JN	ug/L
	unknown		14.76	min	1200	J	ug/L
	unknown		14.84	min	2100	J	ug/L
	unknown		15.31	min	7200	J	ug/L
	unknown		15.48	min	920	J	ug/L
	unknown		16.35	min	2800	J	ug/L
	unknown		17.63	min	5500	J	ug/L
	unknown		18.26	min	1900	J	ug/L
	unknown		18.7	min	720	J	ug/L
	unknown		8.16	min	1100	J	ug/L
	unknown		8.34	min	1200	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
12/02/2009 13:48

Lab Smpl Id: A093150153
Cust Smpl Id: SRS 200 Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117883	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/02/2009 13:48

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SV0A8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC09336003/5206/53706

Prep Method/Date: SW846 3580A 11/18/2009 14:00
Test Status: APPROVED
HT Deadline: 12/28/2009 23:59
Date Analyzed: 11/30/2009 18:23
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	120	500	U		ug/L
95501	1,2-Dichlorobenzene				1	140	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	400	500	U		ug/L
541731	1,3-Dichlorobenzene				1	95	500	U		ug/L
106467	1,4-Dichlorobenzene				1	140	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	73	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	150	500	U		ug/L
120832	2,4-Dichlorophenol				1	400	500	U		ug/L
105679	2,4-Dimethylphenol				1	130	500	U		ug/L
51285	2,4-Dinitrophenol				1	170	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	150	500	U		ug/L
91587	2-Chloronaphthalene				1	190	500	U		ug/L
95578	2-Chlorophenol				1	95	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	240	1000	U		ug/L
91576	2-Methylnaphthalene				1	84	500	U		ug/L
95487	2-Methylphenol				1	84	500	U		ug/L
88744	2-Nitrobenzenamine				1	230	500	U		ug/L
88755	2-Nitrophenol				1	100	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	210	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	160	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	120	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	97	500	U		ug/L
106478	4-Chlorobenzenamine				1	160	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	120	500	U		ug/L
100016	4-Nitrobenzenamine				1	260	1000	U		ug/L
100027	4-Nitrophenol				1	210	2500	U		ug/L
83329	Acenaphthene				1	170	500	U		ug/L
208968	Acenaphthylene				1	120	500	U		ug/L
62533	Aniline				1	94	1000	U		ug/L
120127	Anthracene				1	83	500	U		ug/L
100516	Benzenemethanol				1	140	1000	U		ug/L
92875	Benzidine				1	84	1000	U		ug/L
56553	Benzo(a)anthracene				1	82	500	U		ug/L
50328	Benzo(a)pyrene				1	190	500	U		ug/L
205992	Benzo(b)fluoranthene				1	220	500	U		ug/L
191242	Benzo(ghi)perylene				1	160	500	U		ug/L
207089	Benzo(k)fluoranthene				1	380	500	U		ug/L
65850	Benzoic acid				1	220	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	60	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	130	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	170	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	110	500	U		ug/L
85687	Butylbenzylphthalate				1	61	500	U		ug/L
86748	Carbazole				1	52	500	U		ug/L
218019	Chrysene				1	74	500	U		ug/L
84742	Di-n-butylphthalate				1	66	500	U		ug/L
117840	Di-n-octylphthalate				1	86	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	120	500	U		ug/L

132649	Dibenzofuran	1	78	500	U	ug/L
84662	Diethylphthalate	1	120	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	120	500	U	ug/L
86737	Fluorene	1	100	500	U	ug/L
118741	Hexachlorobenzene	1	140	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	180	500	U	ug/L
67721	Hexachloroethane	1	60	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	110	500	U	ug/L
78591	Isophorone	1	76	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	160	500	U	ug/L
62759	N-Nitrosodimethylamine	1	290	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	130	500	U	ug/L
91203	Naphthalene	1	77	500	U	ug/L
98953	Nitrobenzene	1	110	500	U	ug/L
87865	Pentachlorophenol	1	180	1000	U	ug/L
85018	Phenanthrene	1	51	500	U	ug/L
108952	Phenol	1	65	500	U	ug/L
129000	Pyrene	1	130	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000870633	2-Butene, 1-bromo-3-methyl-		6.71	min	1700	JN	ug/L
000870633	2-Butene, 1-bromo-3-methyl- $$ .gamma.,.		7.17	min	2300	JN	ug/L
	unknown alcohol		9.36	min	1600	J	ug/L
	unknown		10.36	min	4600	J	ug/L
000870633	2-Butene, 1-bromo-3-methyl- (CAS) $$ .ga		6.02	min	16000	JN	ug/L
	unknown		11.23	min	7200	J	ug/L
	unknown alcohol		9.49	min	9500	J	ug/L
000870633	2-Butene, 1-bromo-3-methyl- (CAS) $$ .ga		7	min	16000	JN	ug/L
	unknown		11.59	min	2700	J	ug/L
	unknown		12.23	min	6800	J	ug/L
	unknown		12.35	min	1700	J	ug/L
	unknown		12.75	min	3400	J	ug/L
	unknown		13.09	min	3800	J	ug/L
	unknown		6.31	min	2300	J	ug/L
	unknown		7.7	min	2300	J	ug/L
	unknown		8.03	min	7900	J	ug/L
	unknown		8.13	min	2000	J	ug/L
	unknown		8.25	min	1300	J	ug/L
	unknown		8.48	min	8800	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
111-44-4 bis(2-Chloroethyl)ether
The mean Initial Calibration RSD = 9.3

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
12/02/2009 13:46

Lab Smpl Id: A093150152
Cust Smpl Id: SRS 150 Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117883	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/02/2009 13:46

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC09336003/5206/53706

Prep Method/Date: SW846 3580A 11/18/2009 14:00
Test Status: APPROVED
HT Deadline: 12/28/2009 23:59
Date Analyzed: 11/30/2009 17:39
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	120	500	U		ug/L
95501	1,2-Dichlorobenzene				1	140	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	400	500	U		ug/L
541731	1,3-Dichlorobenzene				1	95	500	U		ug/L
106467	1,4-Dichlorobenzene				1	140	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	73	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	150	500	U		ug/L
120832	2,4-Dichlorophenol				1	400	500	U		ug/L
105679	2,4-Dimethylphenol				1	130	500	U		ug/L
51285	2,4-Dinitrophenol				1	170	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	150	500	U		ug/L
91587	2-Chloronaphthalene				1	190	500	U		ug/L
95578	2-Chlorophenol				1	95	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	240	1000	U		ug/L
91576	2-Methylnaphthalene				1	84	500	U		ug/L
95487	2-Methylphenol				1	84	500	U		ug/L
88744	2-Nitrobenzenamine				1	230	500	U		ug/L
88755	2-Nitrophenol				1	100	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	210	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	160	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	120	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	97	500	U		ug/L
106478	4-Chlorobenzenamine				1	160	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	120	500	U		ug/L
100016	4-Nitrobenzenamine				1	260	1000	U		ug/L
100027	4-Nitrophenol				1	210	2500	U		ug/L
83329	Acenaphthene				1	170	500	U		ug/L
208968	Acenaphthylene				1	120	500	U		ug/L
62533	Aniline				1	94	1000	U		ug/L
120127	Anthracene				1	83	500	U		ug/L
100516	Benzenemethanol				1	140	1000	U		ug/L
92875	Benzidine				1	84	1000	U		ug/L
56553	Benzo(a)anthracene				1	82	500	U		ug/L
50328	Benzo(a)pyrene				1	190	500	U		ug/L
205992	Benzo(b)fluoranthene				1	220	500	U		ug/L
191242	Benzo(ghi)perylene				1	160	500	U		ug/L
207089	Benzo(k)fluoranthene				1	380	500	U		ug/L
65850	Benzoic acid				1	220	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	60	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	130	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	170	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	110	500	U		ug/L
85687	Butylbenzylphthalate				1	61	500	U		ug/L
86748	Carbazole				1	52	500	U		ug/L
218019	Chrysene				1	74	500	U		ug/L
84742	Di-n-butylphthalate				1	66	500	U		ug/L
117840	Di-n-octylphthalate				1	86	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	120	500	U		ug/L

132649	Dibenzofuran	1	78	500	U	ug/L
84662	Diethylphthalate	1	120	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	120	500	U	ug/L
86737	Fluorene	1	100	500	U	ug/L
118741	Hexachlorobenzene	1	140	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	180	500	U	ug/L
67721	Hexachloroethane	1	60	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	110	500	U	ug/L
78591	Isophorone	1	76	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	160	500	U	ug/L
62759	N-Nitrosodimethylamine	1	290	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	130	500	U	ug/L
91203	Naphthalene	1	77	500	U	ug/L
98953	Nitrobenzene	1	110	500	U	ug/L
87865	Pentachlorophenol	1	180	1000	U	ug/L
85018	Phenanthrene	1	51	500	U	ug/L
108952	Phenol	1	65	500	U	ug/L
129000	Pyrene	1	130	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000870633	2-Butene, 1-bromo-3-methyl-		6.69	min	1200	JN	ug/L
000870633	2-Butene, 1-bromo-3-methyl- $$ .gamma.,.		5.95	min	10000	JN	ug/L
	unknown alcohol/alkoxy cpd		9.55	min	3200	J	ug/L
	unknown alcohol		9.38	min	8100	J	ug/L
	unknown		10.31	min	2600	J	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		5.82	min	1900	JN	ug/L
	unknown		11.17	min	2200	J	ug/L
000870633	2-Butene, 1-bromo-3-methyl- $$ .gamma.,.		6.95	min	12000	JN	ug/L
	unknown alcohol/alkoxy cpd		9.64	min	1100	J	ug/L
	unknown		11.56	min	790	J	ug/L
000870633	2-Butene, 1-bromo-3-methyl- $$ .gamma.,.		7.13	min	1700	JN	ug/L
	unknown		12.17	min	2000	J	ug/L
	unknown		13.06	min	1600	J	ug/L
	unknown		13.18	min	1000	J	ug/L
	unknown		5.01	min	2400	J	ug/L
	unknown		6.29	min	1500	J	ug/L
	unknown		7.99	min	5500	J	ug/L
	unknown		8.12	min	1100	J	ug/L
	unknown		8.2	min	890	J	ug/L
	unknown		8.42	min	6200	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
111-44-4 bis(2-Chloroethyl)ether
The mean Initial Calibration RSD = 9.3

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/12/2010 16:03

Lab Smpl Id: A100550084
Cust Smpl Id: 300 Mrad Hanford Sim

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117936	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/12/2010 16:03

Sample Description: 2M NaOH
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10070010/5314/53787

Prep Method/Date: SW846 3580A 02/24/2010 13:00
Test Status: APPROVED
HT Deadline: 04/05/2010 23:59
Date Analyzed: 03/10/2010 19:22
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000000000	(E)-3,6-Dimethyl-6-vinylocta-1,3,7-trien		12.81	min	1700	JN	ug/L
000000000	2,4-DINITROPHENOL-D3		19.15	min	1400	JN	ug/L
	unknown		11.18	min	1100	J	ug/L
001794861	Phosgene oxime $$ Phosgenox $$ CX $$ Hyd		8.35	min	2300	JN	ug/L
002562370	Cyclohexene, 1-nitro- $$ 1-Nitrocyclohex		14.07	min	8100	JN	ug/L
017065188	Bicyclo[2.1.0]pentane, 1,4-dimethyl- $$		15.57	min	920	JN	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.47	min	4700	JN	ug/L
000000000	2-NITROPHENOL-D4		13.05	min	2000	JN	ug/L
001526176	2-Fluoro-6-nitrophenol $$ Phenol, 2-fluo		13.44	min	1100	JN	ug/L
001561860	2-Chlorocyclohexanol		11.05	min	1200	JN	ug/L
	unknown		12.45	min	950	J	ug/L
	unknown		12.68	min	3700	J	ug/L
	unknown		14.77	min	5300	J	ug/L
	unknown		15.34	min	5900	J	ug/L
	unknown		16.35	min	4300	J	ug/L
	unknown		16.44	min	1200	J	ug/L
	unknown		17.63	min	5200	J	ug/L
	unknown		18.24	min	1900	J	ug/L
	unknown		18.66	min	1200	J	ug/L
	unknown		6.81	min	20000	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/12/2010 16:02

Official Report

Lab Smpl Id: A100550083
Cust Smpl Id: 250 Mrad Hanford Sim

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117936	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/12/2010 16:02

Sample Description: 2M NaOH
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10070010/5314/53787

Prep Method/Date: SW846 3580A 02/24/2010 13:00
Test Status: APPROVED
HT Deadline: 04/05/2010 23:59
Date Analyzed: 03/10/2010 18:33
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
001561860	2-Chlorocyclohexanol $$ Cyclohexanol, 2-		11.06	min	950	JN	ug/L
001526176	2-Fluoro-6-nitrophenol $$ Phenol, 2-fluo		13.45	min	1000	JN	ug/L
000000000	2-NITROPHENOL-D4		13.06	min	2000	JN	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.47	min	4200	JN	ug/L
002562370	Cyclohexene, 1-nitro- $$ 1-Nitrocyclohex		14.1	min	13000	JN	ug/L
074752946	Cyclopropane, 1-chloro-2-(1-propenyl)-		12.82	min	2700	JN	ug/L
001794861	Phosgene oxime $$ Phosgenox $$ CX $$ Hyd		8.34	min	2900	JN	ug/L
	unknown		12.46	min	1500	J	ug/L
	unknown		12.69	min	7000	J	ug/L
	unknown		14.27	min	2900	J	ug/L
	unknown		14.77	min	3400	J	ug/L
	unknown		14.84	min	2200	J	ug/L
	unknown		15.36	min	7600	J	ug/L
	unknown		15.57	min	1100	J	ug/L
	unknown		16.35	min	3900	J	ug/L
	unknown		16.45	min	1600	J	ug/L
	unknown		17.66	min	6400	J	ug/L
	unknown		18.25	min	2400	J	ug/L
	unknown		18.67	min	1400	J	ug/L
	unknown		6.83	min	22000	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
04/12/2010 15:45

Official Report

Lab Smpl Id: A100690180
Cust Smpl Id: HANDORD 200 MRAD

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117945	81473	745A0221	03/09/2010 00:00	03/09/2010 14:10	03/23/2010 23:59	04/12/2010 15:45

Sample Description: 2M NaOH
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10102020/5332/53810

Prep Method/Date: SW846 3580A 03/16/2010 15:00
Test Status: APPROVED
HT Deadline: 04/25/2010 23:59
Date Analyzed: 03/30/2010 16:21
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	750	J		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048 Lab Smpl Id: A100690180
04/12/2010 15:45 Official Report Cust Smpl Id: HANDORD 200 MRAD

132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
004161608	2-Pentanone, 4-hydroxy- $$ CH3CH(OH)CH2C		7.17	min	1600	JN	ug/L
004461487	2-Pentene, 4-methyl- $$ 1,1-Dimethyl-2-b		7.84	min	4100	JN	ug/L
	unknown		10.1	min	17000	J	ug/L
	unknown alcohol		11.98	min	1800	J	ug/L
	unknown		12.99	min	7700	J	ug/L
	unknown		13.37	min	3100	J	ug/L
	unknown		14.21	min	1800	J	ug/L
	unknown		14.59	min	3200	J	ug/L
	unknown		14.82	min	3100	J	ug/L
	unknown		17.84	min	960	J	ug/L
	unknown		6.75	min	6600	J	ug/L
	unknown		7.65	min	30000	J	ug/L
	unknown		7.98	min	5300	J	ug/L
	unknown		8.28	min	3700	J	ug/L
	unknown		8.62	min	31000	J	ug/L
	unknown		8.87	min	4900	J	ug/L
	unknown		9.31	min	1200	J	ug/L
	unknown		9.65	min	17000	J	ug/L
	unknown		9.72	min	980	J	ug/L
	unknown		9.86	min	2100	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
12/02/2009 13:44

Official Report

Lab Smpl Id: A093150151
Cust Smpl Id: Hanford 150 Mrad

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117883	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/02/2009 13:44

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC09336003/5206/53706

Prep Method/Date: SW846 3580A 11/18/2009 14:00
Test Status: APPROVED
HT Deadline: 12/28/2009 23:59
Date Analyzed: 11/30/2009 16:56
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	160	670	U		ug/L
95501	1,2-Dichlorobenzene				1	190	670	U		ug/L
122667	1,2-Diphenylhydrazine				1	540	670	U		ug/L
541731	1,3-Dichlorobenzene				1	130	670	U		ug/L
106467	1,4-Dichlorobenzene				1	180	670	U		ug/L
95954	2,4,5-Trichlorophenol				1	98	670	U		ug/L
88062	2,4,6-Trichlorophenol				1	200	670	U		ug/L
120832	2,4-Dichlorophenol				1	530	670	U		ug/L
105679	2,4-Dimethylphenol				1	170	670	U		ug/L
51285	2,4-Dinitrophenol				1	230	1300	U		ug/L
121142	2,4-Dinitrotoluene				1	180	670	U		ug/L
606202	2,6-Dinitrotoluene				1	210	670	U		ug/L
91587	2-Chloronaphthalene				1	250	670	U		ug/L
95578	2-Chlorophenol				1	130	670	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	310	1300	U		ug/L
91576	2-Methylnaphthalene				1	110	670	U		ug/L
95487	2-Methylphenol				1	110	670	U		ug/L
88744	2-Nitrobenzenamine				1	300	670	U		ug/L
88755	2-Nitrophenol				1	140	670	U		ug/L
91941	3,3'-Dichlorobenzidine				1	270	1300	U		ug/L
N2799	3- and 4- Methylphenol				1	160	1300	U		ug/L
99092	3-Nitrobenzenamine				1	210	670	U		ug/L
101553	4-Bromophenyl phenyl ether				1	160	670	U		ug/L
59507	4-Chloro-3-methylphenol				1	130	670	U		ug/L
106478	4-Chlorobenzenamine				1	210	670	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	160	670	U		ug/L
100016	4-Nitrobenzenamine				1	350	1300	U		ug/L
100027	4-Nitrophenol				1	280	3300	U		ug/L
83329	Acenaphthene				1	230	670	U		ug/L
208968	Acenaphthylene				1	160	670	U		ug/L
62533	Aniline				1	130	1300	U		ug/L
120127	Anthracene				1	110	670	U		ug/L
100516	Benzenemethanol				1	180	1300	U		ug/L
92875	Benzidine				1	110	1300	U		ug/L
56553	Benzo(a)anthracene				1	110	670	U		ug/L
50328	Benzo(a)pyrene				1	250	670	U		ug/L
205992	Benzo(b)fluoranthene				1	290	670	U		ug/L
191242	Benzo(ghi)perylene				1	210	670	U		ug/L
207089	Benzo(k)fluoranthene				1	510	670	U		ug/L
65850	Benzoic acid				1	290	1300	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	80	670	U		ug/L
111444	Bis(2-chloroethyl) ether				1	170	670	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	230	670	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	140	670	U		ug/L
85687	Butylbenzylphthalate				1	81	670	U		ug/L
86748	Carbazole				1	70	670	U		ug/L
218019	Chrysene				1	98	670	U		ug/L
84742	Di-n-butylphthalate				1	88	670	U		ug/L
117840	Di-n-octylphthalate				1	120	670	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	670	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
12/02/2009 13:44

Official Report

Lab Smpl Id: A093150151
Cust Smpl Id: Hanford 150 Mrad

132649	Dibenzofuran	1	100	670	U	ug/L
84662	Diethylphthalate	1	160	670	U	ug/L
131113	Dimethylphthalate	1	140	670	U	ug/L
206440	Fluoranthene	1	170	670	U	ug/L
86737	Fluorene	1	130	670	U	ug/L
118741	Hexachlorobenzene	1	180	670	U	ug/L
77474	Hexachlorocyclopentadiene	1	240	670	U	ug/L
67721	Hexachloroethane	1	80	670	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	140	670	U	ug/L
78591	Isophorone	1	100	670	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	210	670	U	ug/L
62759	N-Nitrosodimethylamine	1	380	670	U	ug/L
86306	N-Nitrosodiphenylamine	1	170	670	U	ug/L
91203	Naphthalene	1	100	670	U	ug/L
98953	Nitrobenzene	1	150	670	U	ug/L
87865	Pentachlorophenol	1	240	1300	U	ug/L
85018	Phenanthrene	1	68	670	U	ug/L
108952	Phenol	1	86	670	U	ug/L
129000	Pyrene	1	170	670	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000815474	1-Pentene, 3-bromo-4-methyl-		6.69	min	1500	JN	ug/L
023542510	1-Pentene, 5-nitro- $$ 5-Nitro-1-pentene		6.28	min	1900	JN	ug/L
	unknown alcohol/alkoxy cpd		9.5	min	2800	J	ug/L
	unknown alcohol		9.4	min	14000	J	ug/L
	unknown		10.31	min	3700	J	ug/L
007119893	Methane, dichloronitro- $$ Dichloronitro		3.99	min	1600	JN	ug/L
017165558	Butanoic acid, heptafluoro-, 2-propenyl		7.13	min	2500	JN	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		5.82	min	3000	JN	ug/L
000870633	2-Butene, 1-bromo-3-methyl- (CAS) $$ .ga		6.94	min	15000	JN	ug/L
000870633	2-Butene, 1-bromo-3-methyl- $$ .gamma.,.		5.95	min	15000	JN	ug/L
	unknown		11.18	min	2000	J	ug/L
	unknown alcohol/alkoxy cpd		9.55	min	5600	J	ug/L
	unknown		12.17	min	2700	J	ug/L
	unknown		13.06	min	1200	J	ug/L
	unknown		4.88	min	1900	J	ug/L
	unknown		5	min	2900	J	ug/L
	unknown		7.65	min	1500	J	ug/L
	unknown		7.99	min	7500	J	ug/L
	unknown		8.1	min	1400	J	ug/L
	unknown		8.2	min	1800	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
111-44-4 bis(2-Chloroethyl)ether
The mean Initial Calibration RSD = 9.3

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
04/12/2010 15:44

Official Report

Lab Smpl Id: A100690179
Cust Smpl Id: H2O 300 NEW

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117945	81473	745A0221	03/09/2010 00:00	03/09/2010 14:10	03/23/2010 23:59	04/12/2010 15:44

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10102020/5332/53810

Prep Method/Date: SW846 3580A 03/16/2010 15:00
Test Status: APPROVED
HT Deadline: 04/25/2010 23:59
Date Analyzed: 03/30/2010 15:35
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
04/12/2010 15:44

Official Report

Lab Smpl Id: A100690179
Cust Smpl Id: H2O 300 NEW

132649	Dibenzofuran	1	92	500	U		ug/L
84662	Diethylphthalate	1	87	500	U		ug/L
131113	Dimethylphthalate	1	100	500	U		ug/L
206440	Fluoranthene	1	51	500	U		ug/L
86737	Fluorene	1	74	500	U		ug/L
118741	Hexachlorobenzene	1	66	500	U		ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U		ug/L
67721	Hexachloroethane	1	150	500	U		ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U		ug/L
78591	Isophorone	1	70	500	U		ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U		ug/L
62759	N-Nitrosodimethylamine	1	150	500	U		ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U		ug/L
91203	Naphthalene	1	97	500	U		ug/L
98953	Nitrobenzene	1	48	500	U		ug/L
87865	Pentachlorophenol	1	54	1000	U		ug/L
85018	Phenanthrene	1	62	500	U		ug/L
108952	Phenol	1	92	500	U		ug/L
129000	Pyrene	1	110	500	U		ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.4	min	1500	JN	ug/L
	unknown		32.08	min	740	J	ug/L
	unknown		33.74	min	5700	J	ug/L
	unknown		6.72	min	15000	J	ug/L
	unknown		8.71	min	400	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
02/22/2010 07:03

Lab Smpl Id: A100250076
Cust Smpl Id: HFIR Water 250 Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117929	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/22/2010 07:03

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< Organic >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (YSO-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10049010/5281/53758

Prep Method/Date: SW846 3580A 02/01/2010 13:00
Test Status: APPROVED
HT Deadline: 03/13/2010 23:59
Date Analyzed: 02/15/2010 19:42
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	300	1500	U		ug/L
95501	1,2-Dichlorobenzene				3	340	1500	U		ug/L
122667	1,2-Diphenylhydrazine				3	180	1500	U		ug/L
541731	1,3-Dichlorobenzene				3	510	1500	U		ug/L
106467	1,4-Dichlorobenzene				3	530	1500	U		ug/L
95954	2,4,5-Trichlorophenol				3	580	1500	U		ug/L
88062	2,4,6-Trichlorophenol				3	310	1500	U		ug/L
120832	2,4-Dichlorophenol				3	290	1500	U		ug/L
105679	2,4-Dimethylphenol				3	300	1500	U		ug/L
51285	2,4-Dinitrophenol				3	430	3000	U		ug/L
121142	2,4-Dinitrotoluene				3	390	1500	U		ug/L
606202	2,6-Dinitrotoluene				3	290	1500	U		ug/L
91587	2-Chloronaphthalene				3	260	1500	U		ug/L
95578	2-Chlorophenol				3	300	1500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	320	3000	U		ug/L
91576	2-Methylnaphthalene				3	200	1500	U		ug/L
95487	2-Methylphenol				3	290	1500	U		ug/L
88744	2-Nitrobenzenamine				3	340	1500	U		ug/L
88755	2-Nitrophenol				3	240	1500	U		ug/L
91941	3,3'-Dichlorobenzidine				3	150	3000	U		ug/L
N2799	3- and 4- Methylphenol				3	350	3000	U		ug/L
99092	3-Nitrobenzenamine				3	650	1500	U		ug/L
101553	4-Bromophenyl phenyl ether				3	200	1500	U		ug/L
59507	4-Chloro-3-methylphenol				3	160	1500	U		ug/L
106478	4-Chlorobenzenamine				3	300	1500	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	200	1500	U		ug/L
100016	4-Nitrobenzenamine				3	330	3000	U		ug/L
100027	4-Nitrophenol				3	300	3000	U		ug/L
83329	Acenaphthene				3	270	1500	U		ug/L
208968	Acenaphthylene				3	310	1500	U		ug/L
62533	Aniline				3	120	3000	U		ug/L
120127	Anthracene				3	160	1500	U		ug/L
100516	Benzenemethanol				3	180	3000	U		ug/L
92875	Benzidine				3	370	3000	U		ug/L
56553	Benzo(a)anthracene				3	170	1500	U		ug/L
50328	Benzo(a)pyrene				3	140	1500	U		ug/L
205992	Benzo(b)fluoranthene				3	330	1500	U		ug/L
191242	Benzo(ghi)perylene				3	450	1500	U		ug/L
207089	Benzo(k)fluoranthene				3	440	1500	U		ug/L
65850	Benzoic acid				3	570	3000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	160	1500	U		ug/L
111444	Bis(2-chloroethyl) ether				3	410	1500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	210	1500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	370	1500	U		ug/L
85687	Butylbenzylphthalate				3	370	1500	U		ug/L
86748	Carbazole				3	180	1500	U		ug/L
218019	Chrysene				3	290	1500	U		ug/L
84742	Di-n-butylphthalate				3	210	1500	U		ug/L
117840	Di-n-octylphthalate				3	420	1500	U		ug/L
53703	Dibenz(a,h)anthracene				3	480	1500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
02/22/2010 07:03

Official Report

Lab Smpl Id: A100250076
Cust Smpl Id: HFIR Water 250 Mrad

132649	Dibenzofuran	3	280	1500	U		ug/L
84662	Diethylphthalate	3	260	1500	U		ug/L
131113	Dimethylphthalate	3	300	1500	U		ug/L
206440	Fluoranthene	3	150	1500	U		ug/L
86737	Fluorene	3	220	1500	U		ug/L
118741	Hexachlorobenzene	3	200	1500	U		ug/L
77474	Hexachlorocyclopentadiene	3	780	1500	U		ug/L
67721	Hexachloroethane	3	450	1500	U		ug/L
193395	Indeno(1,2,3-cd)pyrene	3	300	1500	U		ug/L
78591	Isophorone	3	210	1500	U		ug/L
621647	N-Nitroso-di-n-propylamine	3	190	1500	U		ug/L
62759	N-Nitrosodimethylamine	3	450	1500	U		ug/L
86306	N-Nitrosodiphenylamine	3	180	1500	U		ug/L
91203	Naphthalene	3	290	1500	U		ug/L
98953	Nitrobenzene	3	140	1500	U		ug/L
87865	Pentachlorophenol	3	160	3000	U		ug/L
85018	Phenanthrene	3	190	1500	U		ug/L
108952	Phenol	3	280	1500	U		ug/L
129000	Pyrene	3	340	1500	U		ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
	unknown		6.73	min	4100	J	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.48	min	2500	JN	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
12/02/2009 13:50

Lab Smpl Id: A093150154
Cust Smpl Id: water 200 Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117883	81473	745A0221	11/10/2009 00:00	11/10/2009 15:30	12/09/2009 23:59	12/02/2009 13:50

Sample Description:
Location: ORNL
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< Organic >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC09336003/5206/53706

Prep Method/Date: SW846 3580A 11/18/2009 14:00
Test Status: APPROVED
HT Deadline: 12/28/2009 23:59
Date Analyzed: 11/30/2009 19:07
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	120	500	U		ug/L
95501	1,2-Dichlorobenzene				1	140	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	400	500	U		ug/L
541731	1,3-Dichlorobenzene				1	95	500	U		ug/L
106467	1,4-Dichlorobenzene				1	140	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	73	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	150	500	U		ug/L
120832	2,4-Dichlorophenol				1	400	500	U		ug/L
105679	2,4-Dimethylphenol				1	130	500	U		ug/L
51285	2,4-Dinitrophenol				1	170	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	150	500	U		ug/L
91587	2-Chloronaphthalene				1	190	500	U		ug/L
95578	2-Chlorophenol				1	95	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	240	1000	U		ug/L
91576	2-Methylnaphthalene				1	84	500	U		ug/L
95487	2-Methylphenol				1	84	500	U		ug/L
88744	2-Nitrobenzenamine				1	230	500	U		ug/L
88755	2-Nitrophenol				1	100	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	210	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	160	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	120	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	97	500	U		ug/L
106478	4-Chlorobenzenamine				1	160	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	120	500	U		ug/L
100016	4-Nitrobenzenamine				1	260	1000	U		ug/L
100027	4-Nitrophenol				1	210	2500	U		ug/L
83329	Acenaphthene				1	170	500	U		ug/L
208968	Acenaphthylene				1	120	500	U		ug/L
62533	Aniline				1	94	1000	U		ug/L
120127	Anthracene				1	83	500	U		ug/L
100516	Benzenemethanol				1	140	1000	U		ug/L
92875	Benzidine				1	84	1000	U		ug/L
56553	Benzo(a)anthracene				1	82	500	U		ug/L
50328	Benzo(a)pyrene				1	190	500	U		ug/L
205992	Benzo(b)fluoranthene				1	220	500	U		ug/L
191242	Benzo(ghi)perylene				1	160	500	U		ug/L
207089	Benzo(k)fluoranthene				1	380	500	U		ug/L
65850	Benzoic acid				1	220	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	60	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	130	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	170	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	110	500	U		ug/L
85687	Butylbenzylphthalate				1	61	500	U		ug/L
86748	Carbazole				1	52	500	U		ug/L
218019	Chrysene				1	74	500	U		ug/L
84742	Di-n-butylphthalate				1	66	500	U		ug/L
117840	Di-n-octylphthalate				1	86	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	120	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048 Lab Smpl Id: A093150154
12/02/2009 13:50 Official Report Cust Smpl Id: water 200 Mrad

132649	Dibenzofuran	1	78	500	U	ug/L
84662	Diethylphthalate	1	120	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	120	500	U	ug/L
86737	Fluorene	1	100	500	U	ug/L
118741	Hexachlorobenzene	1	140	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	180	500	U	ug/L
67721	Hexachloroethane	1	60	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	110	500	U	ug/L
78591	Isophorone	1	76	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	160	500	U	ug/L
62759	N-Nitrosodimethylamine	1	290	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	130	500	U	ug/L
91203	Naphthalene	1	77	500	U	ug/L
98953	Nitrobenzene	1	110	500	U	ug/L
87865	Pentachlorophenol	1	180	1000	U	ug/L
85018	Phenanthrene	1	51	500	U	ug/L
108952	Phenol	1	65	500	U	ug/L
129000	Pyrene	1	130	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
	unknown		4.88	min	2500	J	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		5.82	min	2000	JN	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
111-44-4 bis(2-Chloroethyl)ether
The mean Initial Calibration RSD = 9.3

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
02/22/2010 07:02

Official Report

Lab Smpl Id: A100250074
Cust Smpl Id: HFIR Water 150 Mrad

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117929	81473	745A0221	01/21/2010 00:00	01/21/2010 14:30	02/04/2010 23:59	02/22/2010 07:02

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10049010/5281/53758

Prep Method/Date: SW846 3580A 02/01/2010 13:00
Test Status: APPROVED
HT Deadline: 03/13/2010 23:59
Date Analyzed: 02/15/2010 18:10
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	300	1500	U		ug/L
95501	1,2-Dichlorobenzene				3	340	1500	U		ug/L
122667	1,2-Diphenylhydrazine				3	180	1500	U		ug/L
541731	1,3-Dichlorobenzene				3	510	1500	U		ug/L
106467	1,4-Dichlorobenzene				3	530	1500	U		ug/L
95954	2,4,5-Trichlorophenol				3	580	1500	U		ug/L
88062	2,4,6-Trichlorophenol				3	310	1500	U		ug/L
120832	2,4-Dichlorophenol				3	290	1500	U		ug/L
105679	2,4-Dimethylphenol				3	300	1500	U		ug/L
51285	2,4-Dinitrophenol				3	430	3000	U		ug/L
121142	2,4-Dinitrotoluene				3	390	1500	U		ug/L
606202	2,6-Dinitrotoluene				3	290	1500	U		ug/L
91587	2-Chloronaphthalene				3	260	1500	U		ug/L
95578	2-Chlorophenol				3	300	1500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	320	3000	U		ug/L
91576	2-Methylnaphthalene				3	200	1500	U		ug/L
95487	2-Methylphenol				3	290	1500	U		ug/L
88744	2-Nitrobenzenamine				3	340	1500	U		ug/L
88755	2-Nitrophenol				3	240	1500	U		ug/L
91941	3,3'-Dichlorobenzidine				3	150	3000	U		ug/L
N2799	3- and 4- Methylphenol				3	350	3000	U		ug/L
99092	3-Nitrobenzenamine				3	650	1500	U		ug/L
101553	4-Bromophenyl phenyl ether				3	200	1500	U		ug/L
59507	4-Chloro-3-methylphenol				3	160	1500	U		ug/L
106478	4-Chlorobenzenamine				3	300	1500	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	200	1500	U		ug/L
100016	4-Nitrobenzenamine				3	330	3000	U		ug/L
100027	4-Nitrophenol				3	300	3000	U		ug/L
83329	Acenaphthene				3	270	1500	U		ug/L
208968	Acenaphthylene				3	310	1500	U		ug/L
62533	Aniline				3	120	3000	U		ug/L
120127	Anthracene				3	160	1500	U		ug/L
100516	Benzenemethanol				3	180	3000	U		ug/L
92875	Benzidine				3	370	3000	U		ug/L
56553	Benzo(a)anthracene				3	170	1500	U		ug/L
50328	Benzo(a)pyrene				3	140	1500	U		ug/L
205992	Benzo(b)fluoranthene				3	330	1500	U		ug/L
191242	Benzo(ghi)perylene				3	450	1500	U		ug/L
207089	Benzo(k)fluoranthene				3	440	1500	U		ug/L
65850	Benzoic acid				3	570	3000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	160	1500	U		ug/L
111444	Bis(2-chloroethyl) ether				3	410	1500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	210	1500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	370	1500	U		ug/L
85687	Butylbenzylphthalate				3	370	1500	U		ug/L
86748	Carbazole				3	180	1500	U		ug/L
218019	Chrysene				3	290	1500	U		ug/L
84742	Di-n-butylphthalate				3	210	1500	U		ug/L
117840	Di-n-octylphthalate				3	420	1500	U		ug/L
53703	Dibenz(a,h)anthracene				3	480	1500	U		ug/L

LIMS 03.08.048 Lab Smpl Id: A100250074
02/22/2010 07:02 Official Report Cust Smpl Id: HFIR Water 150 Mrad

132649	Dibenzofuran	3	280	1500	U	ug/L
84662	Diethylphthalate	3	260	1500	U	ug/L
131113	Dimethylphthalate	3	300	1500	U	ug/L
206440	Fluoranthene	3	150	1500	U	ug/L
86737	Fluorene	3	220	1500	U	ug/L
118741	Hexachlorobenzene	3	200	1500	U	ug/L
77474	Hexachlorocyclopentadiene	3	780	1500	U	ug/L
67721	Hexachloroethane	3	450	1500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	3	300	1500	U	ug/L
78591	Isophorone	3	210	1500	U	ug/L
621647	N-Nitroso-di-n-propylamine	3	190	1500	U	ug/L
62759	N-Nitrosodimethylamine	3	450	1500	U	ug/L
86306	N-Nitrosodiphenylamine	3	180	1500	U	ug/L
91203	Naphthalene	3	290	1500	U	ug/L
98953	Nitrobenzene	3	140	1500	U	ug/L
87865	Pentachlorophenol	3	160	3000	U	ug/L
85018	Phenanthrene	3	190	1500	U	ug/L
108952	Phenol	3	280	1500	U	ug/L
129000	Pyrene	3	340	1500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
	unknown		6.74	min	2500	J	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.48	min	2100	JN	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
05/06/2010 06:22

Lab Smpl Id: A100910405
Cust Smpl Id: HFIR Oldwater 100Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117946	81473	745A0221	03/31/2010 08:00	04/01/2010 14:15	04/15/2010 23:59	05/06/2010 06:22

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10124002/5363/53833

Prep Method/Date: SW846 3580A 04/06/2010 10:00
Test Status: APPROVED
HT Deadline: 05/16/2010 23:59
Date Analyzed: 04/27/2010 23:10
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	240	1200	U		ug/L
95501	1,2-Dichlorobenzene				3	270	1200	U		ug/L
122667	1,2-Diphenylhydrazine				3	140	1200	U		ug/L
541731	1,3-Dichlorobenzene				3	410	1200	U		ug/L
106467	1,4-Dichlorobenzene				3	420	1200	U		ug/L
95954	2,4,5-Trichlorophenol				3	460	1200	U		ug/L
88062	2,4,6-Trichlorophenol				3	250	1200	U		ug/L
120832	2,4-Dichlorophenol				3	230	1200	U		ug/L
105679	2,4-Dimethylphenol				3	240	1200	U		ug/L
51285	2,4-Dinitrophenol				3	340	6000	U		ug/L
121142	2,4-Dinitrotoluene				3	320	1200	U		ug/L
606202	2,6-Dinitrotoluene				3	230	2400	U		ug/L
91587	2-Chloronaphthalene				3	210	1200	U		ug/L
95578	2-Chlorophenol				3	240	1200	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	250	1200	U		ug/L
91576	2-Methylnaphthalene				3	160	1200	U		ug/L
95487	2-Methylphenol				3	240	1200	U		ug/L
88744	2-Nitrobenzenamine				3	280	1200	U		ug/L
88755	2-Nitrophenol				3	190	1200	U		ug/L
91941	3,3'-Dichlorobenzidine				3	120	2400	U		ug/L
N2799	3- and 4- Methylphenol				3	280	2400	U		ug/L
99092	3-Nitrobenzenamine				3	520	1200	U		ug/L
101553	4-Bromophenyl phenyl ether				3	160	1200	U		ug/L
59507	4-Chloro-3-methylphenol				3	130	1200	U		ug/L
106478	4-Chlorobenzenamine				3	240	1200	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	160	1200	U		ug/L
100016	4-Nitrobenzenamine				3	260	2400	U		ug/L
100027	4-Nitrophenol				3	240	6000	U		ug/L
83329	Acenaphthene				3	220	1200	U		ug/L
208968	Acenaphthylene				3	250	1200	U		ug/L
62533	Aniline				3	96	2400	U		ug/L
120127	Anthracene				3	130	1200	U		ug/L
100516	Benzenemethanol				3	150	1200	U		ug/L
92875	Benzidine				3	300	6000	U		ug/L
56553	Benzo(a)anthracene				3	140	1200	U		ug/L
50328	Benzo(a)pyrene				3	110	1200	U		ug/L
205992	Benzo(b)fluoranthene				3	260	1200	U		ug/L
191242	Benzo(ghi)perylene				3	360	1200	U		ug/L
207089	Benzo(k)fluoranthene				3	350	1200	U		ug/L
65850	Benzoic acid				3	460	6000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	130	1200	U		ug/L
111444	Bis(2-chloroethyl) ether				3	330	1200	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	170	1200	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	290	1200	U		ug/L
85687	Butylbenzylphthalate				3	300	1200	U		ug/L
86748	Carbazole				3	150	1200	U		ug/L
218019	Chrysene				3	230	1200	U		ug/L
84742	Di-n-butylphthalate				3	160	1200	U		ug/L
117840	Di-n-octylphthalate				3	330	1200	U		ug/L
53703	Dibenz(a,h)anthracene				3	380	1200	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/06/2010 06:22

Official Report

Lab Smpl Id: A100910405
Cust Smpl Id: HFIR Oldwater 100Mrad

132649	Dibenzofuran	3	220	1200	U		ug/L
84662	Diethylphthalate	3	210	1200	U		ug/L
131113	Dimethylphthalate	3	240	1200	U		ug/L
206440	Fluoranthene	3	120	1200	U		ug/L
86737	Fluorene	3	180	1200	U		ug/L
118741	Hexachlorobenzene	3	160	1200	U		ug/L
77474	Hexachlorocyclopentadiene	3	620	1200	U		ug/L
67721	Hexachloroethane	3	360	1200	U		ug/L
193395	Indeno(1,2,3-cd)pyrene	3	240	1200	U		ug/L
78591	Isophorone	3	170	1200	U		ug/L
621647	N-Nitroso-di-n-propylamine	3	160	1200	U		ug/L
62759	N-Nitrosodimethylamine	3	360	1200	U		ug/L
86306	N-Nitrosodiphenylamine	3	140	1200	U		ug/L
91203	Naphthalene	3	230	1200	U		ug/L
98953	Nitrobenzene	3	120	1200	U		ug/L
87865	Pentachlorophenol	3	130	2400	U		ug/L
85018	Phenanthrene	3	150	1200	U		ug/L
108952	Phenol	3	220	1200	U		ug/L
129000	Pyrene	3	270	1200	U		ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000000000	2-NITROPHENOL-D4		13.06	min	1300	JN	ug/L
	unknown		15.5	min	580	J	ug/L
	unknown		7.34	min	510	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:

65-85-0	Benzoic acid
90-13-1	1-Chloronaphthalene
51-28-5	2,4-Dinitrophenol
100-02-7	4-Nitrophenol
92-87-5	Benzidine

The mean Initial Calibration RSD = 10.6

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/06/2010 06:21

Official Report

Lab Smpl Id: A100910404
Cust Smpl Id: HFIR Oldwater 50Mrad

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117946	81473	745A0221	03/31/2010 08:00	04/01/2010 14:15	04/15/2010 23:59	05/06/2010 06:21

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10124002/5363/53833

Prep Method/Date: SW846 3580A 04/06/2010 10:00
Test Status: APPROVED
HT Deadline: 05/16/2010 23:59
Date Analyzed: 04/27/2010 22:22
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	240	1200	U		ug/L
95501	1,2-Dichlorobenzene				3	270	1200	U		ug/L
122667	1,2-Diphenylhydrazine				3	140	1200	U		ug/L
541731	1,3-Dichlorobenzene				3	410	1200	U		ug/L
106467	1,4-Dichlorobenzene				3	420	1200	U		ug/L
95954	2,4,5-Trichlorophenol				3	460	1200	U		ug/L
88062	2,4,6-Trichlorophenol				3	250	1200	U		ug/L
120832	2,4-Dichlorophenol				3	230	1200	U		ug/L
105679	2,4-Dimethylphenol				3	240	1200	U		ug/L
51285	2,4-Dinitrophenol				3	340	6000	U		ug/L
121142	2,4-Dinitrotoluene				3	320	1200	U		ug/L
606202	2,6-Dinitrotoluene				3	230	2400	U		ug/L
91587	2-Chloronaphthalene				3	210	1200	U		ug/L
95578	2-Chlorophenol				3	240	1200	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	250	1200	U		ug/L
91576	2-Methylnaphthalene				3	160	1200	U		ug/L
95487	2-Methylphenol				3	240	1200	U		ug/L
88744	2-Nitrobenzenamine				3	280	1200	U		ug/L
88755	2-Nitrophenol				3	190	1200	U		ug/L
91941	3,3'-Dichlorobenzidine				3	120	2400	U		ug/L
N2799	3- and 4- Methylphenol				3	280	2400	U		ug/L
99092	3-Nitrobenzenamine				3	520	1200	U		ug/L
101553	4-Bromophenyl phenyl ether				3	160	1200	U		ug/L
59507	4-Chloro-3-methylphenol				3	130	1200	U		ug/L
106478	4-Chlorobenzenamine				3	240	1200	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	160	1200	U		ug/L
100016	4-Nitrobenzenamine				3	260	2400	U		ug/L
100027	4-Nitrophenol				3	240	6000	U		ug/L
83329	Acenaphthene				3	220	1200	U		ug/L
208968	Acenaphthylene				3	250	1200	U		ug/L
62533	Aniline				3	96	2400	U		ug/L
120127	Anthracene				3	130	1200	U		ug/L
100516	Benzenemethanol				3	150	1200	U		ug/L
92875	Benzidine				3	300	6000	U		ug/L
56553	Benzo(a)anthracene				3	140	1200	U		ug/L
50328	Benzo(a)pyrene				3	110	1200	U		ug/L
205992	Benzo(b)fluoranthene				3	260	1200	U		ug/L
191242	Benzo(ghi)perylene				3	360	1200	U		ug/L
207089	Benzo(k)fluoranthene				3	350	1200	U		ug/L
65850	Benzoic acid				3	460	6000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	130	1200	U		ug/L
111444	Bis(2-chloroethyl) ether				3	330	1200	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	170	1200	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	290	1200	U		ug/L
85687	Butylbenzylphthalate				3	300	1200	U		ug/L
86748	Carbazole				3	150	1200	U		ug/L
218019	Chrysene				3	230	1200	U		ug/L
84742	Di-n-butylphthalate				3	160	1200	U		ug/L
117840	Di-n-octylphthalate				3	330	1200	U		ug/L
53703	Dibenz(a,h)anthracene				3	380	1200	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
05/06/2010 06:21

Official Report

Lab Smpl Id: A100910404
Cust Smpl Id: HFIR Oldwater 50Mrad

132649	Dibenzofuran	3	220	1200	U	ug/L
84662	Diethylphthalate	3	210	1200	U	ug/L
131113	Dimethylphthalate	3	240	1200	U	ug/L
206440	Fluoranthene	3	120	1200	U	ug/L
86737	Fluorene	3	180	1200	U	ug/L
118741	Hexachlorobenzene	3	160	1200	U	ug/L
77474	Hexachlorocyclopentadiene	3	620	1200	U	ug/L
67721	Hexachloroethane	3	360	1200	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	3	240	1200	U	ug/L
78591	Isophorone	3	170	1200	U	ug/L
621647	N-Nitroso-di-n-propylamine	3	160	1200	U	ug/L
62759	N-Nitrosodimethylamine	3	360	1200	U	ug/L
86306	N-Nitrosodiphenylamine	3	140	1200	U	ug/L
91203	Naphthalene	3	230	1200	U	ug/L
98953	Nitrobenzene	3	120	1200	U	ug/L
87865	Pentachlorophenol	3	130	2400	U	ug/L
85018	Phenanthrene	3	150	1200	U	ug/L
108952	Phenol	3	220	1200	U	ug/L
129000	Pyrene	3	270	1200	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000000000	2-NITROPHENOL-D4		13.05	min	840	JN	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:

65-85-0	Benzoic acid
90-13-1	1-Chloronaphthalene
51-28-5	2,4-Dinitrophenol
100-02-7	4-Nitrophenol
92-87-5	Benzidine

The mean Initial Calibration RSD = 10.6

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/30/2010 08:53

Official Report

Lab Smpl Id: A100690178
Cust Smpl Id: H2O 100 NEW

Project: L MS MPO SCHUH SVOA

Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117945	81473	745A0221	03/09/2010 00:00	03/09/2010 14:10	03/23/2010 23:59	03/30/2010 08:53

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< Organic >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10089005/5329/53810

Prep Method/Date: SW846 3580A 03/16/2010 15:00
Test Status: APPROVED
HT Deadline: 04/25/2010 23:59
Date Analyzed: 03/25/2010 20:16
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Customer Lim	Customer Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/30/2010 08:53

Official Report

Lab Smpl Id: A100690178
Cust Smpl Id: H2O 100 NEW

132649	Dibenzofuran	1	92	500	U		ug/L
84662	Diethylphthalate	1	87	500	U		ug/L
131113	Dimethylphthalate	1	100	500	U		ug/L
206440	Fluoranthene	1	51	500	U		ug/L
86737	Fluorene	1	74	500	U		ug/L
118741	Hexachlorobenzene	1	66	500	U		ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U		ug/L
67721	Hexachloroethane	1	150	500	U		ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U		ug/L
78591	Isophorone	1	70	500	U		ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U		ug/L
62759	N-Nitrosodimethylamine	1	150	500	U		ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U		ug/L
91203	Naphthalene	1	97	500	U		ug/L
98953	Nitrobenzene	1	48	500	U		ug/L
87865	Pentachlorophenol	1	54	1000	U		ug/L
85018	Phenanthrene	1	62	500	U		ug/L
108952	Phenol	1	92	500	U		ug/L
129000	Pyrene	1	110	500	U		ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
	unknown		6.67	min	6800	J	ug/L
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.41	min	1200	JN	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/30/2010 08:53

Official Report

Lab Smpl Id: A100690177
Cust Smpl Id: H2O 50 NEW

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117945	81473	745A0221	03/09/2010 00:00	03/09/2010 14:10	03/23/2010 23:59	03/30/2010 08:53

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10089005/5329/53810

Prep Method/Date: SW846 3580A 03/16/2010 15:00
Test Status: APPROVED
HT Deadline: 04/25/2010 23:59
Date Analyzed: 03/25/2010 19:30
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/30/2010 08:53

Official Report

Lab Smpl Id: A100690177
Cust Smpl Id: H2O 50 NEW

132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.44	min	1700	JN	ug/L
	unknown		6.77	min	19000	J	ug/L
	unknown		8.38	min	370	J	ug/L
	unknown		8.71	min	950	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
03/12/2010 16:04

Lab Smpl Id: A100550085
Cust Smpl Id: 300 Mrad Nitric

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117936	81473	745A0221	02/23/2010 00:00	02/23/2010 14:30	03/09/2010 23:59	03/12/2010 16:04

Sample Description: 0.5M HNO3
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< Organic >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10070010/5314/53787

Prep Method/Date: SW846 3580A 02/24/2010 13:00
Test Status: APPROVED
HT Deadline: 04/05/2010 23:59
Date Analyzed: 03/10/2010 20:11
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/12/2010 16:04

Official Report

Lab Smpl Id: A100550085
Cust Smpl Id: 300 Mrad Nitric

132649	Dibenzofuran	1	92	500	U	ug/L
84662	Diethylphthalate	1	87	500	U	ug/L
131113	Dimethylphthalate	1	100	500	U	ug/L
206440	Fluoranthene	1	51	500	U	ug/L
86737	Fluorene	1	74	500	U	ug/L
118741	Hexachlorobenzene	1	66	500	U	ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U	ug/L
67721	Hexachloroethane	1	150	500	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U	ug/L
78591	Isophorone	1	70	500	U	ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U	ug/L
62759	N-Nitrosodimethylamine	1	150	500	U	ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U	ug/L
91203	Naphthalene	1	97	500	U	ug/L
98953	Nitrobenzene	1	48	500	U	ug/L
87865	Pentachlorophenol	1	54	1000	U	ug/L
85018	Phenanthrene	1	62	500	U	ug/L
108952	Phenol	1	92	500	U	ug/L
129000	Pyrene	1	110	500	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.47	min	2200	JN	ug/L
044970050	Pentanoic acid, 2,2-dimethyl-, ethenyl e		8.75	min	370	JN	ug/L
	unknown		6.84	min	23000	J	ug/L
	unknown		8.47	min	230	J	ug/L
	unknown		8.79	min	980	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

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****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/30/2010 08:53

Official Report

Lab Smpl Id: A100690176
Cust Smpl Id: NITRIC 250 Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117945	81473	745A0221	03/09/2010 00:00	03/09/2010 14:10	03/23/2010 23:59	03/30/2010 08:53

Sample Description: 0.5M HNO3
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10089005/5329/53810

Prep Method/Date: SW846 3580A 03/16/2010 15:00
Test Status: APPROVED
HT Deadline: 04/25/2010 23:59
Date Analyzed: 03/25/2010 18:43
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				1	99	500	U		ug/L
95501	1,2-Dichlorobenzene				1	110	500	U		ug/L
122667	1,2-Diphenylhydrazine				1	59	500	U		ug/L
541731	1,3-Dichlorobenzene				1	170	500	U		ug/L
106467	1,4-Dichlorobenzene				1	180	500	U		ug/L
95954	2,4,5-Trichlorophenol				1	190	500	U		ug/L
88062	2,4,6-Trichlorophenol				1	100	500	U		ug/L
120832	2,4-Dichlorophenol				1	98	500	U		ug/L
105679	2,4-Dimethylphenol				1	99	500	U		ug/L
51285	2,4-Dinitrophenol				1	140	1000	U		ug/L
121142	2,4-Dinitrotoluene				1	130	500	U		ug/L
606202	2,6-Dinitrotoluene				1	97	500	U		ug/L
91587	2-Chloronaphthalene				1	87	500	U		ug/L
95578	2-Chlorophenol				1	100	500	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				1	110	1000	U		ug/L
91576	2-Methylnaphthalene				1	66	500	U		ug/L
95487	2-Methylphenol				1	98	500	U		ug/L
88744	2-Nitrobenzenamine				1	110	500	U		ug/L
88755	2-Nitrophenol				1	81	500	U		ug/L
91941	3,3'-Dichlorobenzidine				1	49	1000	U		ug/L
N2799	3- and 4- Methylphenol				1	120	1000	U		ug/L
99092	3-Nitrobenzenamine				1	220	500	U		ug/L
101553	4-Bromophenyl phenyl ether				1	66	500	U		ug/L
59507	4-Chloro-3-methylphenol				1	55	500	U		ug/L
106478	4-Chlorobenzenamine				1	100	500	U		ug/L
7005723	4-Chlorophenylphenyl ether				1	67	500	U		ug/L
100016	4-Nitrobenzenamine				1	110	1000	U		ug/L
100027	4-Nitrophenol				1	100	1000	U		ug/L
83329	Acenaphthene				1	91	500	U		ug/L
208968	Acenaphthylene				1	100	500	U		ug/L
62533	Aniline				1	40	1000	U		ug/L
120127	Anthracene				1	52	500	U		ug/L
100516	Benzenemethanol				1	61	1000	U		ug/L
92875	Benzidine				1	120	1000	U		ug/L
56553	Benzo(a)anthracene				1	57	500	U		ug/L
50328	Benzo(a)pyrene				1	45	500	U		ug/L
205992	Benzo(b)fluoranthene				1	110	500	U		ug/L
191242	Benzo(ghi)perylene				1	150	500	U		ug/L
207089	Benzo(k)fluoranthene				1	150	500	U		ug/L
65850	Benzoic acid				1	190	1000	U		ug/L
111911	Bis(2-chloroethoxy)methane				1	53	500	U		ug/L
111444	Bis(2-chloroethyl) ether				1	140	500	U		ug/L
108601	Bis(2-chloroisopropyl) ether				1	70	500	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				1	120	500	U		ug/L
85687	Butylbenzylphthalate				1	120	500	U		ug/L
86748	Carbazole				1	61	500	U		ug/L
218019	Chrysene				1	97	500	U		ug/L
84742	Di-n-butylphthalate				1	69	500	U		ug/L
117840	Di-n-octylphthalate				1	140	500	U		ug/L
53703	Dibenz(a,h)anthracene				1	160	500	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
03/30/2010 08:53

Official Report

Lab Smpl Id: A100690176
Cust Smpl Id: NITRIC 250 Mrad

132649	Dibenzofuran	1	92	500	U		ug/L
84662	Diethylphthalate	1	87	500	U		ug/L
131113	Dimethylphthalate	1	100	500	U		ug/L
206440	Fluoranthene	1	51	500	U		ug/L
86737	Fluorene	1	74	500	U		ug/L
118741	Hexachlorobenzene	1	66	500	U		ug/L
77474	Hexachlorocyclopentadiene	1	260	500	U		ug/L
67721	Hexachloroethane	1	150	500	U		ug/L
193395	Indeno(1,2,3-cd)pyrene	1	100	500	U		ug/L
78591	Isophorone	1	70	500	U		ug/L
621647	N-Nitroso-di-n-propylamine	1	65	500	U		ug/L
62759	N-Nitrosodimethylamine	1	150	500	U		ug/L
86306	N-Nitrosodiphenylamine	1	59	500	U		ug/L
91203	Naphthalene	1	97	500	U		ug/L
98953	Nitrobenzene	1	48	500	U		ug/L
87865	Pentachlorophenol	1	54	1000	U		ug/L
85018	Phenanthrene	1	62	500	U		ug/L
108952	Phenol	1	92	500	U		ug/L
129000	Pyrene	1	110	500	U		ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
000123422	2-Pentanone, 4-hydroxy-4-methyl- (CAS) $		7.41	min	1200	JN	ug/L
	unknown		6.73	min	14000	J	ug/L
	unknown		8.72	min	480	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:
62-53-3 Aniline
207-08-9 Benzo[k]fluoranthene
The mean Initial Calibration RSD = 8.7

Comment Objects:

EPA Qualifiers:
J - Estimated value.
N - Presumptive evidence of a compound. (GC/MS flag)
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

****** The results relate only to the items tested. ******
****** Results contained within this report are not Blank Corrected unless specifically noted ******
****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
04/30/2010 13:21

Official Report

Lab Smpl Id: A100910402
Cust Smpl Id: HFIR Nitric 200Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117946	81473	745A0221	03/31/2010 08:00	04/01/2010 14:15	04/15/2010 23:59	04/30/2010 13:21

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< Organic >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10118031/5362/53833

Prep Method/Date: SW846 3580A 04/06/2010 10:00
Test Status: APPROVED
HT Deadline: 05/16/2010 23:59
Date Analyzed: 04/26/2010 22:35
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	240	1200	U		ug/L
95501	1,2-Dichlorobenzene				3	270	1200	U		ug/L
122667	1,2-Diphenylhydrazine				3	140	1200	U		ug/L
541731	1,3-Dichlorobenzene				3	410	1200	U		ug/L
106467	1,4-Dichlorobenzene				3	420	1200	U		ug/L
95954	2,4,5-Trichlorophenol				3	460	1200	U		ug/L
88062	2,4,6-Trichlorophenol				3	250	1200	U		ug/L
120832	2,4-Dichlorophenol				3	230	1200	U		ug/L
105679	2,4-Dimethylphenol				3	240	1200	U		ug/L
51285	2,4-Dinitrophenol				3	340	6000	U		ug/L
121142	2,4-Dinitrotoluene				3	320	1200	U		ug/L
606202	2,6-Dinitrotoluene				3	230	2400	U		ug/L
91587	2-Chloronaphthalene				3	210	1200	U		ug/L
95578	2-Chlorophenol				3	240	1200	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	250	1200	U		ug/L
91576	2-Methylnaphthalene				3	160	1200	U		ug/L
95487	2-Methylphenol				3	240	1200	U		ug/L
88744	2-Nitrobenzenamine				3	280	1200	U		ug/L
88755	2-Nitrophenol				3	190	1200	U		ug/L
91941	3,3'-Dichlorobenzidine				3	120	2400	U		ug/L
N2799	3- and 4- Methylphenol				3	280	2400	U		ug/L
99092	3-Nitrobenzenamine				3	520	1200	U		ug/L
101553	4-Bromophenyl phenyl ether				3	160	1200	U		ug/L
59507	4-Chloro-3-methylphenol				3	130	1200	U		ug/L
106478	4-Chlorobenzenamine				3	240	1200	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	160	1200	U		ug/L
100016	4-Nitrobenzenamine				3	260	2400	U		ug/L
100027	4-Nitrophenol				3	240	6000	U		ug/L
83329	Acenaphthene				3	220	1200	U		ug/L
208968	Acenaphthylene				3	250	1200	U		ug/L
62533	Aniline				3	96	2400	U		ug/L
120127	Anthracene				3	130	1200	U		ug/L
100516	Benzenemethanol				3	150	1200	U		ug/L
92875	Benzidine				3	300	6000	U		ug/L
56553	Benzo(a)anthracene				3	140	1200	U		ug/L
50328	Benzo(a)pyrene				3	110	1200	U		ug/L
205992	Benzo(b)fluoranthene				3	260	1200	U		ug/L
191242	Benzo(ghi)perylene				3	360	1200	U		ug/L
207089	Benzo(k)fluoranthene				3	350	1200	U		ug/L
65850	Benzoic acid				3	460	6000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	130	1200	U		ug/L
111444	Bis(2-chloroethyl) ether				3	330	1200	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	170	1200	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	290	1200	U		ug/L
85687	Butylbenzylphthalate				3	300	1200	U		ug/L
86748	Carbazole				3	150	1200	U		ug/L
218019	Chrysene				3	230	1200	U		ug/L
84742	Di-n-butylphthalate				3	160	1200	U		ug/L
117840	Di-n-octylphthalate				3	330	1200	U		ug/L
53703	Dibenz(a,h)anthracene				3	380	1200	U		ug/L

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284

LIMS 03.08.048
04/30/2010 13:21

Official Report

Lab Smpl Id: A100910402
Cust Smpl Id: HFIR Nitric 200Mrad

132649	Dibenzofuran	3	220	1200	U	ug/L
84662	Diethylphthalate	3	210	1200	U	ug/L
131113	Dimethylphthalate	3	240	1200	U	ug/L
206440	Fluoranthene	3	120	1200	U	ug/L
86737	Fluorene	3	180	1200	U	ug/L
118741	Hexachlorobenzene	3	160	1200	U	ug/L
77474	Hexachlorocyclopentadiene	3	620	1200	U	ug/L
67721	Hexachloroethane	3	360	1200	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	3	240	1200	U	ug/L
78591	Isophorone	3	170	1200	U	ug/L
621647	N-Nitroso-di-n-propylamine	3	160	1200	U	ug/L
62759	N-Nitrosodimethylamine	3	360	1200	U	ug/L
86306	N-Nitrosodiphenylamine	3	140	1200	U	ug/L
91203	Naphthalene	3	230	1200	U	ug/L
98953	Nitrobenzene	3	120	1200	U	ug/L
87865	Pentachlorophenol	3	130	2400	U	ug/L
85018	Phenanthrene	3	150	1200	U	ug/L
108952	Phenol	3	220	1200	U	ug/L
129000	Pyrene	3	270	1200	U	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:

65-85-0	Benzoic acid
90-13-1	1-Chloronaphthalene
51-28-5	2,4-Dinitrophenol
100-02-7	4-Nitrophenol
92-87-5	Benzidine

The mean Initial Calibration RSD = 10.6

Comment Objects:

EPA Qualifiers:
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

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****** END OF REPORT ******

Analytical Chemistry Organization (Quality Services)
P.O. Box 2009 Oak Ridge, TN 378318244 (865) 574-2284
Official Report

LIMS 03.08.048
04/30/2010 13:20

Lab Smpl Id: A100910403
Cust Smpl Id: HFIR Nitric ~~250Mrad~~ 150Mrad

Project: L MS MPO SCHUH SVOA
Proj Mgr: L P BURNETT (865) 576-9141

Customer: L P BURNETT Bldg 9995 MS-8189 (865) 576-9141

Matrix	Chain of Custody	Work Agreement Number	Charge Number	Date Sampled	Date Received	Date Needed	Date Approved
LIQUID	117946	81473	745A0221	03/31/2010 08:00	04/01/2010 14:15	04/15/2010 23:59	04/30/2010 13:20

Sample Description:
Location:
Sampler(s):

Sample Status: APPROVED
Sample Approver: J T HOFFARTH/Data Approver

Customer Comments:
Lab Comments:

Comment Objects:

<<<<< *Organic* >>>>>

Test: SVOA8270 (Semi-Volatile Organics by GC/MS)

Rpt Basis: AR
Test Req Cnt: 01
Analysis Method: SW846 8270C (Y50-AC-65-7316)
Approver: J T HOFFARTH/Data Approver
QC Batch/File: QC10118031/5362/53833

Prep Method/Date: SW846 3580A 04/06/2010 10:00
Test Status: APPROVED
HT Deadline: 05/16/2010 23:59
Date Analyzed: 04/26/2010 23:23
Lab Group: OYGCMS

Analyte Id	Analyte Name	Customer HT	Lim	Fn	Dilution Factor	Lower Limit	Result	EPA Qual	Confidence	Unit
120821	1,2,4-Trichlorobenzene				3	240	1200	U		ug/L
95501	1,2-Dichlorobenzene				3	270	1200	U		ug/L
122667	1,2-Diphenylhydrazine				3	140	1200	U		ug/L
541731	1,3-Dichlorobenzene				3	410	1200	U		ug/L
106467	1,4-Dichlorobenzene				3	420	1200	U		ug/L
95954	2,4,5-Trichlorophenol				3	460	1200	U		ug/L
88062	2,4,6-Trichlorophenol				3	250	1200	U		ug/L
120832	2,4-Dichlorophenol				3	230	1200	U		ug/L
105679	2,4-Dimethylphenol				3	240	1200	U		ug/L
51285	2,4-Dinitrophenol				3	340	6000	U		ug/L
121142	2,4-Dinitrotoluene				3	320	1200	U		ug/L
606202	2,6-Dinitrotoluene				3	230	2400	U		ug/L
91587	2-Chloronaphthalene				3	210	1200	U		ug/L
95578	2-Chlorophenol				3	240	1200	U		ug/L
534521	2-Methyl-4,6-dinitrophenol				3	250	1200	U		ug/L
91576	2-Methylnaphthalene				3	160	1200	U		ug/L
95487	2-Methylphenol				3	240	1200	U		ug/L
88744	2-Nitrobenzenamine				3	280	1200	U		ug/L
88755	2-Nitrophenol				3	190	1200	U		ug/L
91941	3,3'-Dichlorobenzidine				3	120	2400	U		ug/L
N2799	3- and 4- Methylphenol				3	280	2400	U		ug/L
99092	3-Nitrobenzenamine				3	520	1200	U		ug/L
101553	4-Bromophenyl phenyl ether				3	160	1200	U		ug/L
59507	4-Chloro-3-methylphenol				3	130	1200	U		ug/L
106478	4-Chlorobenzenamine				3	240	1200	U		ug/L
7005723	4-Chlorophenylphenyl ether				3	160	1200	U		ug/L
100016	4-Nitrobenzenamine				3	260	2400	U		ug/L
100027	4-Nitrophenol				3	240	6000	U		ug/L
83329	Acenaphthene				3	220	1200	U		ug/L
208968	Acenaphthylene				3	250	1200	U		ug/L
62533	Aniline				3	96	2400	U		ug/L
120127	Anthracene				3	130	1200	U		ug/L
100516	Benzenemethanol				3	150	1200	U		ug/L
92875	Benzidine				3	300	6000	U		ug/L
56553	Benzo(a)anthracene				3	140	1200	U		ug/L
50328	Benzo(a)pyrene				3	110	1200	U		ug/L
205992	Benzo(b)fluoranthene				3	260	1200	U		ug/L
191242	Benzo(ghi)perylene				3	360	1200	U		ug/L
207089	Benzo(k)fluoranthene				3	350	1200	U		ug/L
65850	Benzoic acid				3	460	6000	U		ug/L
111911	Bis(2-chloroethoxy)methane				3	130	1200	U		ug/L
111444	Bis(2-chloroethyl) ether				3	330	1200	U		ug/L
108601	Bis(2-chloroisopropyl) ether				3	170	1200	U		ug/L
117817	Bis(2-ethylhexyl)phthalate				3	290	1200	U		ug/L
85687	Butylbenzylphthalate				3	300	1200	U		ug/L
86748	Carbazole				3	150	1200	U		ug/L
218019	Chrysene				3	230	1200	U		ug/L
84742	Di-n-butylphthalate				3	160	1200	U		ug/L
117840	Di-n-octylphthalate				3	330	1200	U		ug/L
53703	Dibenz(a,h)anthracene				3	380	1200	U		ug/L

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132649	Dibenzofuran	3	220	1200	U	ug/L
84662	Diethylphthalate	3	210	1200	U	ug/L
131113	Dimethylphthalate	3	240	1200	U	ug/L
206440	Fluoranthene	3	120	1200	U	ug/L
86737	Fluorene	3	180	1200	U	ug/L
118741	Hexachlorobenzene	3	160	1200	U	ug/L
77474	Hexachlorocyclopentadiene	3	620	1200	U	ug/L
67721	Hexachloroethane	3	360	1200	U	ug/L
193395	Indeno(1,2,3-cd)pyrene	3	240	1200	U	ug/L
78591	Isophorone	3	170	1200	U	ug/L
621647	N-Nitroso-di-n-propylamine	3	160	1200	U	ug/L
62759	N-Nitrosodimethylamine	3	360	1200	U	ug/L
86306	N-Nitrosodiphenylamine	3	140	1200	U	ug/L
91203	Naphthalene	3	230	1200	U	ug/L
98953	Nitrobenzene	3	120	1200	U	ug/L
87865	Pentachlorophenol	3	130	2400	U	ug/L
85018	Phenanthrene	3	150	1200	U	ug/L
108952	Phenol	3	220	1200	U	ug/L
129000	Pyrene	3	270	1200	U	ug/L

TIC Id	TIC Name	Fn	Retention Time	Unit	Estimated Conc	EPA Qual	Unit
	unknown		6.59	min	620	J	ug/L

Sample Test Comments: Target Compound(s) Initial Calibration exceeding 15% RSD:

65-85-0	Benzoic acid
90-13-1	1-Chloronaphthalene
51-28-5	2,4-Dinitrophenol
100-02-7	4-Nitrophenol
92-87-5	Benzidine

The mean Initial Calibration RSD = 10.6

Comment Objects:

EPA Qualifiers:
J - Estimated value.
U - Analyte analyzed for but undetected. Analyte result was below the contract required quantitation limit (CRQL).

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