

Nevada  
Environmental  
Management  
Operations Activity

DOE/NV--1531



# Underground Test Area Fiscal Year 2014 Annual Quality Assurance Report Nevada National Security Site, Nevada

Revision No.: 0

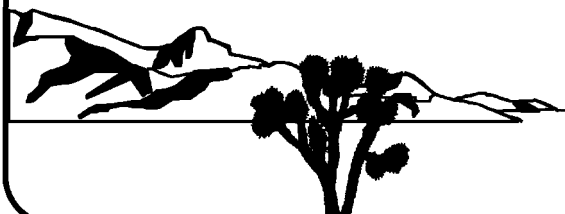
January 2015

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/s/ Joseph P. Johnston                      01/07/2015

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**UNDERGROUND TEST AREA  
FISCAL YEAR 2014  
ANNUAL QUALITY ASSURANCE REPORT  
NEVADA NATIONAL SECURITY SITE, NEVADA**

U.S. Department of Energy, National Nuclear Security Administration  
Nevada Field Office  
Las Vegas, Nevada

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FISCAL YEAR 2015  
ANNUAL QUALITY ASSURANCE REPORT  
NEVADA NATIONAL SECURITY SITE, NEVADA**

Approved by: /s/ Bill R. Wilborn

Date: 01/07/2015

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Bill R. Wilborn  
Underground Test Area Activity Lead

Approved by: /s/ Bill R. Wilborn

Date: 01/07/2015

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For Robert F. Boehlecke  
Environmental Management Operations Manager

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## ***List of Acronyms and Abbreviations***

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ACTS	Assessment and Condition Tracking System
ALS	ALS Laboratory Group
AR	Activity ratio
ARS	American Radiation Services, Inc.
BCWP	Budgeted cost of work performed
BMP	Best management practice
C	Carbon
CAIP	Corrective action investigation plan
CAU	Corrective action unit
CFR	<i>Code of Federal Regulations</i>
Cl	Chlorine
COC	Contaminant of concern
COPC	Contaminant of potential concern
CRAD	Criteria and review approach document
Cs	Cesium
DC	Derivative classifier
DIC	Dissolved inorganic carbon
DL	Detection limit
DOC	Dissolved organic carbon
DOE	U.S. Department of Energy
DRI	Desert Research Institute
E/I	Event/issue
EMIS	Environmental Management Information System
EPA	U.S. Environmental Protection Agency
ESH&Q	Environmental, Safety, Health, and Quality
FAWP	Field activity work package



## ***List of Acronyms and Abbreviations (Continued)***

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FEHM	Finite Element Heat and Mass Transfer
FFACO	<i>Federal Facility Agreement and Consent Order</i>
FY	Fiscal year
<sup>2</sup> H	Deuterium
<sup>3</sup> H	Tritium
HASP	Health and safety plan
HVAC	Heating, ventilating, and air conditioning
I	Iodine
ICP-MS	Inductively coupled plasma-mass spectrometry
IT	Information Technology
LANL	Los Alamos National Laboratory
LLNL	Lawrence Livermore National Laboratory
MAPEP	Mixed Analyte Performance Evaluation Program
MCL	Minimum contaminant level
MDL	Minimum detection level
M&O	Management and operating
MP	Measuring point
MR	Management reserve
N/A	Not applicable
NDEP	Nevada Division of Environmental Protection
NELAC	National Environmental Laboratory Accreditation Conference
N-I	Navarro-Intera, LLC
NIST	National Institute of Standards and Technology
NNSA/NFO	U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office
NNSS	Nevada National Security Site

## ***List of Acronyms and Abbreviations (Continued)***

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Np	Neptunium
NPTEC	Nonproliferation Test and Evaluation Complex
NSF	Nevada Support Facility
NSTec	National Security Technologies, LLC
NTID	Nuclear Test Information Database
NTTR	Nevada Test and Training Range
NWIS	National Water Information System
O	Oxygen
OAA	Operational awareness activity
OBS	Observation
OCC	Operations Command Center
OFI	Opportunity for improvement
pCi/L	Picocuries per liter
PEP	Performance evaluation program
PER	Preemptive review
ppm	Parts per million
Pu	Plutonium
QA	Quality assurance
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
ROTC	Record of Technical Change
RPD	Relative percent difference
S	Sulfur
SBMS	Standards-Based Management System
SME	Subject matter expert
SOP	Standard operating procedure

## ***List of Acronyms and Abbreviations (Continued)***

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Sr	Strontium
TBD	To be determined
Tc	Technetium
TDIC	Total dissolved inorganic carbon
TDOC	Total dissolved organic carbon
TDR	Technical Data Repository
TIC	Total inorganic carbon
U	Uranium
U of A	University of Arizona
UGTA	Underground Test Area
USGS	U.S. Geological Survey
YF/CM	Yucca Flat/Climax Mine
$\delta^{13}\text{C}$	Delta carbon-13
$\delta^2\text{H}$	Delta deuterium
$\delta^{18}\text{O}$	Delta oxygen-18

## **1.0 Introduction**

---

This report is required by the Underground Test Area (UGTA) Quality Assurance Plan (QAP) and identifies the UGTA quality assurance (QA) activities from October 1, 2013, through September 30, 2014 (fiscal year [FY] 2014). All UGTA organizations—U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Field Office (NNSA/NFO); Desert Research Institute (DRI); Lawrence Livermore National Laboratory (LLNL); Los Alamos National Laboratory (LANL); National Security Technologies, LLC (NSTec); Navarro-Intera, LLC (N-I); and the U.S. Geological Survey (USGS)—conducted QA activities in FY 2014. The activities included conducting oversight assessments for QAP compliance, identifying findings and completing corrective actions, evaluating laboratory performance, and publishing documents.

UGTA Activity participants conducted 25 assessments on topics including safe operations, QAP compliance, activity planning, and sampling. These assessments are summarized in [Section 2.0](#). Corrective actions tracked in FY 2014 are presented in [Appendix A](#).

Laboratory performance was evaluated based on three approaches: (1) established performance evaluation programs (PEPs), (2) interlaboratory comparisons, or (3) data review. The results of the laboratory performance evaluations, and interlaboratory comparison results are summarized in [Section 4.0](#).

The UGTA Activity published three public documents and a variety of other publications in FY 2014. The titles, dates, and main authors are identified in [Section 5.0](#).

The Contract Managers, Corrective Action Unit (CAU) Leads, Preemptive Review (PER) Committee members, and Topical Committee members are listed by name and organization in [Section 6.0](#). Other activities that affected UGTA quality are discussed in [Section 7.0](#).

[Section 8.0](#) provides the FY 2014 UGTA QA program conclusions, and [Section 9.0](#) lists the references not identified in [Section 5.0](#).

## **2.0 Assessments and Corrective Action Tracking**

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### **2.1 Assessments**

UGTA continued to conduct management and independent assessments in FY 2014. Management assessments are conducted by the responsible managers or a designee to identify process improvements or efficiencies. Independent assessments (also called oversight) are conducted by personnel independent of the work being done. Causal analyses are independent assessments that evaluate the underlying causes of an issue or event. Shadow assessments were conducted by NNSA/NFO and evaluated the participant's assessment process. Shadow assessments were deleted from NFO Order 226.X, Rev. 1, *Line Oversight*, in July 2014, and operational awareness activities (OAAs) will be documented instead. OAAs, documented as surveillance reports, are defined as an analysis or review of contractor programs, processes, or products conducted by NNSA/NFO federal staff. Assessments will continue throughout the UGTA Activity as part of normal operations.

### **2.2 UGTA QAP Implementation Assessments**

The UGTA QAP implementation plan, presented in the UGTA FY 2011 Annual Quality Assurance Report (QAR), consisted of conducting a gap analysis, filling the procedural gaps, working to the new/revised procedures, and evaluating QAP implementation. N-I conducted the first QAP implementation assessment in December 2013 with NNSA/NFO shadowing. The NNSA/NFO conducted QAP implementation assessments on NSTec in April 2014, USGS in June 2014, and LANL in August 2014. The DRI assessment is scheduled in December 2014 and LLNL's in January 2015. These assessments will close the QAP implementation plan, and this QAR will no longer contain procedure development or revision information. Outstanding procedures are captured in [Table A-1](#), and participant's procedures are available upon request.

NNSA/NFO assessed each organization using four Criteria and Review Approach Documents (CRADs) in accordance with NFO O 226.X, Rev. 1, *Line Oversight*. The CRADs mirrored the QAP sections (management, work processes, assessment and oversight, and corrective action). Each CRAD documents the objective, requirements, criteria, review approach, conclusions, records reviewed, personnel interviewed, work observed, results, and any issues identified. Each CRAD was further broken down in a checklist used by the assessors, where each item was addressed separately.

The assessments have resulted in 12 findings, 4 opportunities for improvement (OFIs), 3 observations (OBSs), and 2 best management practices (BMPs).

Based on recommended changes to the QAP identified during the assessments, NNSA/NFO delayed the biennial QAP review until all the assessments are complete. Therefore, the QAP revision was rescheduled for the second quarter of FY 2015. Some of the QAP changes are being implemented with NNSA/NFO consent.

### **2.3 Other Assessments**

NNSA/NFO also conducted oversight assessments of software quality assurance, modeling, a water chemistry analytical laboratory, and the Routine Radiological Environmental Monitoring Plan. All participants conducted at least one management assessment in FY 2014. [Table 2-1](#) lists the FY 2014 assessments.

### **2.4 Corrective Action Tracking**

UGTA participants provide UGTA-related issues (including those identified outside of assessments), assessment plans, assessment reports, corrective actions, and related closure documentation to N-I for tracking and summarization on the N-I UGTA SharePoint site. Items (findings, OFIs, OBSs, and BMPs) may be

- associated with an assessment, indicated by the assessment number followed by a sequential number (562.1, 562.2);
- found outside of an assessment, indicated by a zero before a sequential number (0.995); or
- an event/issue (E/I) indicated by EI-fiscal year-sequential number (EI-FY14-258).

Event/issues are conditions reported through an internal N-I system. If determined to be procedural violations, they are entered into the tracking system, and the E/I is closed. If not, they are tracked in the E/I database, and if UGTA related, reported on the SharePoint site. Not all items are found during UGTA assessments or assigned to UGTA personnel (i.e., safety); therefore, there are corrective actions in [Tables A-1](#) and [A-2](#) not associated with UGTA assessments and “missing” corrective actions that were assigned to non-UGTA personnel. For example, item 654.8 was identified during the UGTA QAP assessment, but the OFI and corrective actions were wholly Central Files

**Table 2-1**  
**UGTA Assessments**  
 (Page 1 of 2)

Date	Tracking #	Reference #	Assessing Org.	Type	Scope	Result			
						Finding	OFI	OBS	Other
10/01/2013	632	EI-FY14-256	N-I	Independent	Field Activities at ER-EC-15	0	2	0	0
01/10/2014	654	N/A	N-I	Independent	N-I UGTA QAP Compliance	5	2	2	2 BMP
01/10/2014	673	CS-14-AMEM-063	NNSA/NFO	Shadow	Shadow Assessment of N-I Independent Assessment 654	0	0	0	0
01/22/2014	657	OA-14-AMEM-217	NNSA/NFO	Oversight	DRI Modeling	0	0	0	0
01/29/2014	658	OA-14-AMEM-218	NNSA/NFO	Oversight	LLNL Software Quality Assurance and Modeling Software Documents	1	0	0	0
01/31/2014	682	EI-FY14-286	N-I	Causal Analysis	Pahute Mesa Source Term Change Control	0	3	0	0
02/06/2014	664	OA-14-AMEM-219	NNSA/NFO	Oversight	LLNL Water Chemistry Analytical Laboratory	5	0	0	0
02/07/2014	668	OA-14-AMEM-223	NNSA/NFO	Oversight	NSTec Routine Radiological Environmental Monitoring Plan	0	0	0	0
04/18/2014	669	N/A	N-I	Independent	Technical Data Repository Compliance with Electronic Records and Information Requirements	7	3	7	1 BMP
04/25/2014	721	OAA-14-AMEM-KSK-4/25/2014	NNSA/NFO	Surveillance	Well ER-EC-14 Development, Testing, Logging, and Groundwater Sampling Surveillance	0	0	0	0
04/30/2014	684	OA-14-AMEM-220	NNSA/NFO	Oversight	NSTec UGTA QAP Compliance	0	1	0	0
05/22/2014	678	N/A	N-I	Management	Effectiveness of Planning UGTA Cost and Schedule	0	4	0	0
05/22/2014	694	CS-14-AMEM-214	NNSA/NFO	Shadow	Shadow Assessment of N-I Management Assessment 678	0	0	0	0
06/06/2014	720	OAA-14-AMEM-WRW-06/19/2014	NNSA/NFO	Surveillance	Walk-Through of N-I Buildings 6-909 and 23-310 for Safety Stand Down	0	0	0	0

**Table 2-1**  
**UGTA Assessments**  
 (Page 2 of 2)

Date	Tracking #	Reference #	Assessing Org.	Type	Scope	Result			
						Finding	OFI	OBS	Other
06/11/2014	722	OAA-14-AMEM-KSK-6/11/2014	NNSA/NFO	Surveillance	Well PM-3 Groundwater Sampling	0	0	0	0
06/30/2014	690	N/A	N-I	Management	Use of Non-direct Data in Pahute Mesa CAU	0	0	0	0
06/30/2014	692	OA-14-AMEM-221	NNSA/NFO	Oversight	USGS UGTA QAP Compliance	5	0	0	1 BMP
07/28/2014	717	LLNL-TR-657855	LLNL	Management	QA of Nonisothermal Unsaturated Flow and Transport Code	0	0	0	0
08/15/2014	703	OA-14-AMEM-222	NNSA/NFO	Oversight	LANL UGTA QAP Compliance	2	0	1	1 BMP
08/20/2014	719	OAA-14-AMEM-WRW-08/20/2014	NNSA/NFO	Surveillance	Walk-Through of Well Site ER-EC-11 Sampling Operations	0	0	0	0
08/26/2014	713	MSA-14-USGS-001	USGS	Management	Barometer Installation	1	0	0	3 Rec
09/16/2014	707	N/A	N-I	Management	UGTA Well Sampling at ER-20-8	0	7	0	1 BMP
09/18/2014	714	MA-14-H000-008	NSTec	Management	Integrated Safety Management System Field Operations	0	1	0	0
09/30/2014	710	N/A	LANL	Management	Rainier Mesa Data Packages	1	0	0	1 BMP
09/30/2014	723	14-UGTA-QA-1	DRI	Management	Data Management for Timber Mountain Environmental Monitoring Station	2	0	0	0

N/A = Not applicable  
 Rec = Recommendation



responsibilities, so it is not listed in either [Tables A-1](#) or [A-2](#); however, these issues are tracked outside of UGTA processes. UGTA corrective actions are statused during the monthly Contract Managers meeting.

More than 120 corrective actions were tracked in FY 2014, and 87 were closed. The open corrective actions are presented in [Table A-1](#) of [Appendix A](#), and the closed corrective actions in [Table A-2](#). Some activities, identified in response to this report's data call, were received and entered after the fiscal year end.

### **3.0 Non-Certified Laboratory Use**

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This section identifies and justifies FY 2014 analyses performed by laboratories not certified by the State of Nevada. Sampling locations, location types (Characterization, Source/Plume, Inactive), and the associated analyses are presented in [Table 3-1](#). The analysis suite is dependent on the sampling location type and the CAU. The majority of the sampling locations are Characterization locations, and all but two Characterization locations are in Pahute Mesa; ER-6-2 and ER-7-1 are located in the Yucca Flat/Climax Mine (YF/CM) CAU. The analyses performed for characterization locations are dictated by the respective Corrective Action Investigation Plan (CAIP). The analyte list for the Pahute Mesa Characterization wells ([Table 3-1](#)) is more extensive to be consistent with the list for the Phase I Pahute Mesa well sampling. Several radioisotopes are analyzed when tritium ( $^3\text{H}$ ) is present above 5,000 picocuries per liter (pCi/L). This criterion is based on these radioisotopes not being present in samples without the simultaneous presence of high  $^3\text{H}$ . While a large amount of data exists to support this (the UGTA Geochemistry Database), it will be further verified by the Pahute Mesa analyses. Most analyses are also performed by a commercial laboratory certified by the State of Nevada.

All FY 2014 Source/Plume sampling locations are within the Frenchman Flat CAU. Source/Plume locations are analyzed for CAU-specific contaminants of potential concern (COPC). The COPC list was expanded to include two additional radioisotopes (plutonium [Pu] and neptunium-237 [ $^{237}\text{Np}$ ]) not identified in the *Nevada National Security Site (NNSS) Integrated Groundwater Sampling Plan*. These radionuclides were analyzed at the CAU Lead's request to determine whether they are present in samples from within (RNM-1) or near (RNM-2S) the nuclear test cavity at concentration near their *Safe Drinking Water Act* minimum contaminant level (MCL). WW-5a, a Frenchman Flat Inactive well, was sampled in FY 2014 to evaluate an unverifiable 2000 sample with a  $^3\text{H}$  activity of 1.5 pCi/L, equal to its detection limit. This  $^3\text{H}$  activity is inconsistent with the conceptual model of groundwater flow contaminant transport for this CAU.

Non-certified laboratory justification for each analyte and the analysis's purpose is presented in [Table 3-2](#). As shown in this table, LLNL provides specialized laboratory analyses with much lower minimum detection levels (MDLs) than the commercial laboratory. The majority of the sample results for the radioisotopes are reported as nondetects by the commercial laboratory. While this is satisfactory for ensuring radionuclides do not exceed the MCLs, it is insufficient for quantitatively

evaluating contaminant migration. Detection limits below those of the commercial laboratory are also required for other analytes ([Table 3-2](#)). In addition, confidence in the results is gained by using different methods by the two labs. Other analytes require specialized methodology and cannot be analyzed by a commercial laboratory certified by the State of Nevada. These analytes support groundwater source, flow path, and groundwater mixing evaluations.

**Table 3-1**  
**Non-Certified Laboratory Samples and Analytes**  
 (Page 1 of 2)

Location	Sample Date	<sup>3</sup> H <sup>a</sup>	<sup>14</sup> C	<sup>36</sup> Cl	<sup>99</sup> Tc <sup>b</sup>	<sup>129</sup> I <sup>b</sup>	<sup>237</sup> Np	Pu <sup>b</sup>	δ <sup>13</sup> C and TIC	Noble Gases <sup>a</sup>	δ <sup>2</sup> H and δ <sup>18</sup> O	<sup>87</sup> Sr/ <sup>86</sup> Sr <sup>c</sup>	<sup>234</sup> U/ <sup>238</sup> U AR <sup>c</sup>	DOC and DO <sup>14</sup> C	<sup>34</sup> S/ <sup>32</sup> S
<b>Characterization Sampling Location</b>															
ER-6-2	06/19/2014	X	X	X	--	--	--	--	X	X	X	--	--	--	--
ER-7-1	06/20/2014	X	X	X	--	--	--	--	X	X	X	--	--	--	--
ER-EC-11 Deep	07/25/2014	X	X	X	X	X	--	X	X	X	X	X	X	X	X
ER-EC-11 Intermediate	08/12/2014	X	X	X	X	X	--	X	X	X	X	X	X	X	X
ER-EC-11 Shallow	08/27/2014	--	X	X	X	X	--	X	X	--	X	X	X	--	--
ER-EC-14 Deep	05/12/2014	X	X	X	X	X	--	X	X	X	X	X	X	X	X
ER-EC-14 Shallow	04/06/2014	X	X	X	X	X	--	X	X	X	X	X	X	X	X
ER-EC-15 Shallow	11/05/2013	X	X	X	X	X	--	X	X	X	X	X	X	X	X
ER-EC-15 Intermediate	01/10/2014	X	X	X	X	X	--	X	X	X	X	X	X	X	X
ER-EC-15 Deep	02/17/2014	X	X	X	X	X	--	X	X	X	X	X	X	X	X
<b>Source/Plume Sampling Location</b>															
RNM-1	04/08/2014	--	X	X	X	X	X	X	--	--	--	--	X	--	--
RNM-2s	05/15/2014	--	X	X	X	X	X	X	--	--	--	--	X	--	--
UE-5n	06/12/2014	--	X	X	X	X	X	X	--	--	--	--	X	--	--

**Table 3-1**  
**Non-Certified Laboratory Samples and Analytes**  
 (Page 2 of 2)

Location	Sample Date	<sup>3</sup> H <sup>a</sup>	<sup>14</sup> C	<sup>36</sup> Cl	<sup>99</sup> Tc <sup>b</sup>	<sup>129</sup> I <sup>b</sup>	<sup>237</sup> Np	Pu <sup>b</sup>	δ <sup>13</sup> C and TIC	Noble Gases <sup>a</sup>	δ <sup>2</sup> H and δ <sup>18</sup> O	<sup>87</sup> Sr/ <sup>86</sup> Sr <sup>c</sup>	<sup>234</sup> U/ <sup>238</sup> U AR <sup>c</sup>	DOC and DO <sup>14</sup> C	<sup>34</sup> S/ <sup>32</sup> S
Inactive Sampling Location															
VWV-5A	07/02/2014	X	--	--	--	--	--	--	--	--	--	--	--	--	--

<sup>a</sup>Measured when <sup>3</sup>H is less than 300 pCi/L.

<sup>b</sup>Measured in YF/CM characterization samples when <sup>3</sup>H is greater than 5,000 pCi/L.

<sup>c</sup>Measured in Pahute Mesa characterization samples.

X = Parameter analyzed for sampling location.

-- = Parameter not analyzed for sampling location.

AR = Activity ratio

C = Carbon

Cl = Chlorine

DOC = Dissolved organic carbon

I = Iodine

S = Sulfur

Sr = Strontium

Tc = Technetium

TIC = Total inorganic carbon

U = Uranium

δ<sup>13</sup>C = Delta carbon-13

δ<sup>2</sup>H = Delta deuterium

δ<sup>18</sup>O = Delta oxygen-18

**Table 3-2**  
**Justification for Non-certified Laboratory Analyses**  
 (Page 1 of 3)

Analyte	Purpose	Justification for Use of Laboratory Other Than Commercial
<b>Lawrence Livermore National Laboratory</b>		
Low-Level <sup>3</sup> H	Currently, <sup>3</sup> H is the only COC identified in the Integrated NNSS Sampling Plan. Low-level measurements provide early detection of the contaminant plume and support groundwater velocity calculations. Also, these measurements provide estimates of the amount of recent recharge to the aquifer in those cases where the <sup>3</sup> H is not test related.	LLNL measures <sup>3</sup> H using a helium ingrowth measured by mass spectrometer and measures its concentration based on the mass intensity of its radiogenic daughter in the sample. Commercial labs use a sample pre-concentration method followed by liquid scintillation counting. LLNL achieves a slightly lower MDL (~1 vs ~4 pCi/L), but more importantly confidence in the low-level results is gained by using the two very different methods. Low-level <sup>3</sup> H is only measured when <sup>3</sup> H is less than 300 pCi/L.
<sup>14</sup> C	Identified as a COPC for all CAUs in the NNSS Integrated Sampling Plan, and analyzed to evaluate extent and trends in contamination resulting from underground nuclear testing (i.e., evaluate contaminant transport). Also used for evaluating groundwater flow paths, estimating groundwater travel times/velocities, and assessing local recharge extent in areas where no test-related <sup>14</sup> C is present.	LLNL provides specialized laboratory analyses that measure this analyte at much lower levels than the commercial laboratory without impacts from high <sup>3</sup> H activities. LLNL can measure natural <sup>14</sup> C levels (<0.05 pCi/L); the commercial laboratory's MDL is 500 pCi/L, and the analysis cannot be performed in the presence of high <sup>3</sup> H activities. Any NNSS groundwater samples with <sup>14</sup> C above the commercial laboratory's 500 pCi/L MDL also have high <sup>3</sup> H (~10 <sup>7</sup> pCi/L), and therefore commercial laboratories cannot measure <sup>14</sup> C in these samples. Therefore, commercial laboratories are useful for verifying non-detects below the 2,000 pCi/L MCL, and LLNL is required for the other sampling objectives.
<sup>36</sup> Cl	Identified as a COPC for all CAUs in the NNSS Integrated Sampling Plan, and analyzed to evaluate extent and trends in contamination resulting from underground nuclear testing. Also used for evaluating groundwater flow paths and estimating groundwater travel times/velocities, and used in chloride mass balance calculations.	LLNL provides specialized laboratory analyses that measure this analyte at much lower levels than the commercial laboratory. LLNL can measure natural <sup>36</sup> Cl levels (<0.004 pCi/L); the commercial laboratory's MDL is 4 pCi/L. Only five NNSS sampling locations have <sup>36</sup> Cl activities above the commercial laboratory MDL (U-19v PS#1d, U-19ad PS1A, U-4u PS#2A, U-3cn PS#2, U-12t Main drift), and all sampling locations are within a test cavity or tunnel. No samples exceed the 700 pCi/L MCL. Therefore, commercial laboratories are useful for verifying concentrations below the MCL and can be used to evaluate trends in a small number of NNSS locations, but LLNL lower detection capability is required for the other sampling objectives.
<sup>99</sup> Tc	Identified as a COPC for all CAUs in the NNSS Integrated Sampling Plan, and analyzed to evaluate extent and trends in contamination resulting from underground nuclear testing (i.e., evaluate contaminant transport).	LLNL provides specialized laboratory analyses that measure this analyte at much lower levels (<0.001 pCi/L) than the commercial laboratory (10 pCi/L.). Only seven NNSS sampling locations have reported <sup>99</sup> Tc above the commercial laboratory MDL (ER-20-7, U-20n PS 1 DD-H, U-19ad PS1A, U-19bh, U-3cn PS#2, U-4u PS#2A, UE-20n #1), and most are in a test cavity. No samples exceed the 900 pCi/L MCL. The majority of the sample results are reported as non-detects by the commercial laboratory. Therefore, the LLNL lower detection capability is required for a quantitative trend evaluation for the majority of the NNSS sampling locations where <sup>99</sup> Tc may exist but at concentrations well below the commercial laboratory's MDL. Also, confidence in the results is gained by using the different methods by the two labs. This analysis is performed when <sup>3</sup> H is present above 5,000 pCi/L.

**Table 3-2**  
**Justification for Non-certified Laboratory Analyses**  
 (Page 2 of 3)

Analyte	Purpose	Justification for Use of Laboratory Other Than Commercial
<b>Lawrence Livermore National Laboratory (continued)</b>		
<sup>129</sup> I	Identified as a COPC for all CAUs in the NNSS Integrated Sampling Plan, and analyzed to evaluate extent and trends in contamination resulting from underground nuclear testing (i.e., evaluate contaminant transport).	LLNL provides specialized laboratory analyses to measure this analyte at much lower levels (<0.001 pCi/L) than the commercial laboratory (1 pCi/L). Only four NNSS sampling locations have reported <sup>129</sup> I above the commercial laboratory MDL (ER-20-5-1, RNM-1, U-19ad PS1A, U-19v PS#1D), and most are in test cavities. The MCL is 1 pCi/L, which is the same as the MDL. The LLNL lower detection capability is required for a quantitative trend evaluation for the majority of the NNSS sampling locations where <sup>129</sup> I may exist but at concentrations well below the commercial laboratory's MDL. Also, the low-level measurement provides confidence in results and in any exceedances reported by the commercial laboratory. This analysis is performed when <sup>3</sup> H is present above 5,000 pCi/L.
<sup>237</sup> Np	Included in the Nevada Test Site Inventory, and analyzed in test cavity and nearby well samples to determine whether routine analysis in the future will be required.	LLNL provides specialized laboratory analyses that measure this analyte at lower levels (<0.0001 pCi/L) than the commercial laboratory. Measurement by two laboratories, using very different methodologies, provides confidence in the analytical results.
Pu isotopes	Identified as a COPC for the Rainier Mesa/Shoshone Mountain CAU in the NNSS Integrated Sampling Plan, and analyzed to evaluate extent and trends in contamination resulting from underground nuclear testing (i.e., evaluate contaminant transport). Also used for identifying the underground nuclear test that is responsible for its presence.	Samples from the test cavity or other location where contamination is from one specific nuclear test may be considered classified information, and therefore samples should not be analyzed by a commercial laboratory. This decision has not been finalized. LLNL also determines whether the Pu is in colloidal or aqueous form.
δ <sup>13</sup> C and TIC	Used for correcting <sup>14</sup> C measured values for reactions along the flow path to support groundwater age estimates. Also needed for calculating <sup>14</sup> C activities from measured values reported by the accelerator mass spectrometer.	δ <sup>13</sup> C analyses cannot be performed by a commercial laboratory certified by the State of Nevada. TIC analysis is performed in support of the <sup>14</sup> C and δ <sup>13</sup> C analysis and is best analyzed for the same sample.
Noble Gases	Provides information about groundwater sources, flow paths, and travel times. The composition of the dissolved noble gases (neon-xenon) is directly related to the temperature and altitude of the groundwater recharge location.	Noble gas analysis is highly specialized and cannot be performed by a commercial laboratory certified by the State of Nevada. Noble gases are only measured when <sup>3</sup> H is less than 300 pCi/L.
<sup>87</sup> Sr/ <sup>86</sup> Sr	Provides information about groundwater sources, flow paths, and groundwater mixing.	These are nonstandard analyses that require specialized instrumentation and are not performed by a commercial laboratory certified by the State of Nevada.

**Table 3-2**  
**Justification for Non-certified Laboratory Analyses**  
 (Page 3 of 3)

Analyte	Purpose	Justification for Use of Laboratory Other Than Commercial
<sup>234</sup> U/ <sup>238</sup> U AR	Provides information about groundwater sources, flow paths, and groundwater mixing. Isotopic U analyses also performed to distinguish between natural and test-related U sources in those cases that the U (30µg/L) MCL is exceeded.	These are nonstandard analyses that require specialized instrumentation and are not performed by a commercial laboratory certified by the State of Nevada.
<b>Desert Research Institute</b>		
DOC and DOC <sup>14</sup> C	Used in estimating groundwater travel time/flow velocities. DOC <sup>14</sup> C is thought to be less influenced by reactive processes along the flow path and may therefore allow more straightforward interpretations than DIC <sup>14</sup> C.	The required low detection limits required for DOC <sup>14</sup> C analyses cannot be achieved by a commercial laboratory certified by the State of Nevada.
<b>U.S. Geological Survey</b>		
<sup>34</sup> S/ <sup>32</sup> S	Provides information about groundwater sources, flow paths, and groundwater mixing.	These are nonstandard analyses that are not performed by a commercial laboratory certified by the State of Nevada.

COC = Contaminant of concern  
 DIC = Dissolved inorganic carbon  
 µg/L = Micrograms per liter



## **4.0 Performance Evaluation Programs**

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UGTA water chemistry data used to support groundwater characterization and model evaluation were provided by ALS Laboratory Group (ALS); American Radiation Services, Inc. (ARS); LLNL; and USGS. ALS and ARS use industry standard environmental chemistry methods to analyze samples, and are certified by the Nevada Division of Environmental Protection (NDEP) Bureau of Safe Drinking Water. They participate in various established PEP programs and document analyst performance with demonstrations of capabilities. LLNL and USGS perform nonstandard analyses used by the UGTA Activity to determine groundwater flow paths, travel times, and contaminant extent for developing and evaluating conceptual and numerical flow and transport models. Lower detection limits that these nonstandard methods provide are essential for evaluating the aforementioned processes. Because these methods are not standard and are performed by a limited number of laboratories, interlaboratory comparisons and/or data evaluations were performed.

Thirteen LLNL analytical procedures were updated in FY 2014 to ensure QA/QC protocols are documented and implemented before chemistry data are reported. Data verification and validation criteria were developed; sample and analytical tracking processes were implemented; and an analytical chemistry database was designed to store LLNL analytical data to facilitate automated transfer to the UGTA Chemistry Database.

### **4.1 Established PEPs**

ALS and ARS participated in the following PEPs:

- RadCheM and MRaD (trademarked programs), conducted by Environmental Resources Associates
- Mixed Analyte Performance Evaluation Program (MAPEP), conducted by the Radiological and Environmental Sciences Laboratory
- National Environmental Laboratory Accreditation Conference (NELAC) Fields of Testing for *Clean Water Act* and *Safe Drinking Water Act*, conducted by Sigma-Aldrich, Resource Technology Corporation

With two exceptions, laboratory results were within the acceptable limits. Unacceptable results were reported for silver and potassium in non-potable water by U.S. Environmental Protection Agency (EPA) *Method 200.7: Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry*, in the NELAC water pollution study WP207. Satisfactory results were obtained for all other formal performance testing studies. PEP reports are business proprietary information and can be provided to NDEP upon request.

#### 4.2 Interlaboratory Comparisons

Where available, laboratory performance for the non-standard analyses and low-level  $^3\text{H}$  were assessed by comparing analytical results to established acceptance criteria. LLNL data from FY 2013 Wells ER-11-2 and ER-5-5 were reported this fiscal year and used with PM-3, ER-EC-15, and ER-EC-11 in the comparison of low-level  $^3\text{H}$  and strontium and uranium isotopes. [Table 4-1](#) lists the wells sampled this year. The interlaboratory comparison results are presented in [Table 4-2](#). Absolute differences are reported for  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $^{234}\text{U}/^{238}\text{U}$  AR; and relative percent differences (RPDs) are reported for  $^3\text{H}$ .

**Table 4-1  
 Sampled Wells**

Sampling Location
PM-3-1 (Deep) <sup>a</sup>
PM-3-2 (Shallow) <sup>a</sup>
ER-EC-15 (Shallow)
ER-EC-15 (Intermediate)
ER-EC-15 (Deep)
ER-EC-14 (Shallow)
ER-EC-14 (Deep)
RMN-1
RMN-2s
UE-5n
ER-7-1
ER-6-2
WW-5a
ER-EC-11 (Intermediate)
ER-EC-11 (Deep)

<sup>a</sup>Two sets of samples were collected at PM-3-1 and PM-3-2.

**Table 4-2  
 Interlaboratory Comparison**

Analyte	Unit	Sample	LLNL	USGS	ARS	RPD	Criteria
$^{234}\text{U}/^{238}\text{U}$	AR	PM-3-1 (Deep)	3.255	3.264	--	0.01 <sup>a</sup>	±0.3
		PM-3-2 (Shallow)	3.787	3.801	--	0.01 <sup>a</sup>	
$^{87}\text{Sr}/^{86}\text{Sr}$	Ratio	PM-3-1 (Deep)	0.710573	0.710547	--	0.00003 <sup>a</sup>	±0.0005
		PM-3-2 (Shallow)	0.710615	0.710606	--	0.000009 <sup>a</sup>	
Low-level $^3\text{H}$	pCi/L	PM-3-1 (Deep)	87.7 ± 3.3	--	37.0 ± 11.1	81	±25% (if greater than 10X DL)
				--	43.7 ± 13.1	67	
		PM-3-2 (Shallow)	355.2 ± 12.6	--	224.7 ± 66.5	45	
				--	248.9 ± 73.6	35	
		ER-EC-15 (Intermediate)	<0.4	--	<2.1	--	
		ER-EC-11 (Deep)	11.8 ± 0.6	--	7.99 ± 2.7	38	
		ER-EC-11 (Deep)	9.9 ± 0.7	--	6.01 ± 2.2	49	
		ER-EC-11 (Intermediate)	10.9 ± 0.6	--	11.41 ± 3.8	4.6	
ER-11-2	<0.32	--	<2.1	--			
ER-5-5	<0.8	--	<2.4	--			

<sup>a</sup>Absolute difference (not percent difference)

DL = Detection limit

-- = No interlaboratory comparison performed.

For Wells ER-EC-11 and PM-3, low-level  $^3\text{H}$  RPDs were above the 25 percent acceptance criteria. While the RPDs between laboratories exceeded the acceptance criteria, the reported values trended well. For instance, when ARS reported higher values, LLNL reported higher values; and when ARS reported non-detects, LLNL reported non-detects. ARS consistently reported higher uncertainties and detection limits than LLNL. Due to the variability between laboratories and analytical methods, the appropriateness of this acceptance criteria is in question and will be reevaluated in FY 2015.

The LLNL and USGS  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $^{234}\text{U}/^{238}\text{U}$  AR results were within established criteria (Table 4-2). Therefore, the ratio data provided by these laboratories can be effectively used for flow path evaluations.

Commercial laboratory and LLNL detection limit differences precluded an interlaboratory comparison of  $^{14}\text{C}$ ,  $^{36}\text{Cl}$ , and  $^{129}\text{I}$ . To evaluate LLNL  $^{14}\text{C}$  performance, an ER-EC-14 sample was also submitted to the National Science Foundation-Arizona Accelerator Mass Spectrometry Laboratory at

the University of Arizona (U of A). However, LLNL has not yet reported the results; when the data become available, an evaluation will be performed.

Performance evaluation/comparison was not conducted for  $^{129}\text{I}$ . The analyses were conducted under procedures that had not yet been updated to include verification and validation requirements.

### **4.3 Data Evaluation**

Commercial laboratory  $^{14}\text{C}$ ,  $^{36}\text{Cl}$ , USGS  $^{34}\text{S}$ , and LLNL  $^{36}\text{Cl}$  data were evaluated. The data evaluations concluded appropriate standard operating procedures (SOPs), quality control samples, sample collection, and analytical methodology were used.

## **4.4 LLNL INVESTIGATIONS**

### **4.4.1 LLNL Stable isotope investigation**

The investigation into the stable isotope result differences observed between DRI and LLNL reported in the FY 2012 QAR was finalized in FY 2014. This was ACTS item 0.984. The investigation concluded that the  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  discrepancies were caused by instrument drift and inadequate standard checks. The  $\delta^{13}\text{C}$  discrepancy was caused by different preservation methods and hold times.

LLNL corrective actions include flagging sample results (including historical data) with hold times greater than two months as “biased high.” LLNL will analyze a performance evaluation sample twice a year to ensure any instrument drift is identified and corrected.

### **4.4.2 LLNL $^{14}\text{C}$ analyses investigation**

The investigation into the  $^{14}\text{C}$  results observed between U of A and LLNL reported in the FY 2012 and FY 2013 UGTA QARs was finalized in FY 2014. This was ACTS item 0.1273. The investigation concluded the following:

- Blanks were needed to monitor the analytical system for background contamination.
- Extended hold times affect  $^{14}\text{C}$  results (can be biased high and low).

- Preservation methods, vacuum lines, and Center for Accelerator Mass Spectrometer facilities used should be tracked for traceability.

LLNL corrective actions were implemented in a  $^{14}\text{C}$  analysis SOP revision. The revisions included ensuring that blanks are analyzed and that information regarding preservation methods, vacuum lines and facilities used are tracked. The hold times will be minimized as much as possible. An extent of condition was conducted on historical data and will be flagged when migrated to the UGTA Chemistry Database.

## **5.0 Published Documents (Public Released) with List of Authors**

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### **5.1 Publications by UGTA Activity**

Alderson, S.L., and R.W. Warren. 2014. *Human Health and Biota Dose Assessment for Underground Test Area Sumps, Nevada National Security Site Nye County, Nevada*, N-I/28091--094. Las Vegas, NV.

Krenzien, S.K., M.B. Watson-Garrett, and I.M. Farnham. 2014. *Underground Test Area Fiscal Year 2013 Annual Quality Assurance Report Nevada National Security Site, Nevada*, Rev. 0, DOE/NV-1514. Las Vegas, NV.

Ruskauff, G.J., N. DeNovio, L.B. Prothro, S.L. Drellack, M. Zavarin, and E. Kwicklis. 2014. *Model Evaluation Report for Corrective Action Unit 98: Frenchman Flat, Nevada National Security Site, Nye County, Nevada*, Rev. 1, N-I/28091-088. Las Vegas, NV.

### **5.2 Other Publications by UGTA Authors**

Carle, S.F., Y. Hao, and A. Tompson. 2014. *Quality Assurance of NUFT Code for Underground Test Area (UGTA) Activities*, LLNL-TR-657855. Livermore, CA: Lawrence Livermore National Laboratory.

Kwicklis, E., and I. Farnham. 2014. "Testing the <sup>14</sup>C Ages and Conservative Behavior of Dissolved <sup>14</sup>C in a Carbonate Aquifer in Yucca Flat, Nevada (USA), Using <sup>36</sup>Cl from Groundwater and Packrat Middens." In *Hydrogeology Journal*, Vol. 22(6): pp 1359–1381.

Lyles, B., G. McCurdy, C. Russell, and J. Healey. 2014. *Timber Mountain Precipitation Monitoring Station 2013 Annual Report*, DOE/NV/0000939-16. Las Vegas, NV: Desert Research Institute.

Paces, J.B., P. J. Nichols, L.A. Neymark, and H. Rajaram. 2013. "Evaluation of Pleistocene Groundwater Flow through Fractured Tuffs Using a U-Series Disequilibrium Approach, Pahute Mesa, Nevada, USA." In *Chemical Geology*, Vol. 358: pp 101–118.

Reeves, D.M., R. Parashar, K. Pohlmann, E.M. LaBolle, Y. Zhang, C.E. Russell, and J.B. Chapman. 2014. *Radionuclide Containment Properties of Fractured and Faulted Volcanic Tuff Units at the T-Tunnel Complex, Rainier Mesa, Nevada National Security Site*. Waste Management 2014 Symposia. Phoenix, AZ. 2–6 March.

Reeves, D.M., R. Parashar, K. Pohlmann, C. Russell, and J. Chapman. 2014. "Development and Calibration of Dual-Permeability Flow Models with Discontinuous Fault Networks." In *Vadose Zone Journal*, Vol. 13(8).

Wills, C., ed. 2014. *Nevada National Security Site Environmental Report 2013*, DOE/NV/25946--2182. Prepared for the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. Las Vegas, NV: National Security Technologies, LLC.

### **5.3 Technical Information Exchange**

The following posters were exhibited at the Technical Information Exchange on July 16, 2014, at the Nevada Support Facility in North Las Vegas, Nevada:

Carle, S. *Utilizing the UGTA Geochemistry Database from a Groundwater Hydrology Perspective.*

deBues, T., P. Martian, N. Bryant, and G. Ruskauff. *Mapping Flow Paths from Pahute Mesa Underground Tests.*

DeMeo, G., D. Pfeifer, R. Warren, and D. Wood. *Permanent Preservation of Historical NNSS Data and Images.*

DeNovio, D., S. Drellack, E. Kwicklis, G. Ruskauff, and M. Zavarin. *Frenchman Flat Model Evaluation.*

Farnham, I.M., J. Fenelon, R. Hershey, E. Kwicklis, J. Paces, T. Rose, and M. Zavarin. *Phase II Pahute Mesa Geochemistry Analysis.*

Finnegan, D.L., S.M. Bowen, J.L. Thompson, C.M. Miller, P.L. Baca, L. F. Olivas, and C.G. Geoffrion. *Nevada National Security Site Radionuclide Inventory, 1951-1992, Updated October, 2013.* LA-13859MS.

Fox, A., N. DeNovio, K. Benedek, K. Day, and G. Ruskauff. *Complementary Modeling Efforts Offer Insight into Aquifer Cross-Connectivity at Pahute Mesa.*

Jackson, T., A. Garcia, K. Halford, D. Sweetkind, and J. Fenelon. *Improving Regional Groundwater Models with Transmissivity Observations.*

Jackson, T.R., C.A. Garcia, K.J. Halford, N. Damar, and J. Fenelon. *Integrated Analysis of 10 Large-Scale Multi-Well Aquifer Tests at Pahute Mesa.*

Lu, Z., D. Harp, T. Miller, and K. Birdsell. *Flow Modeling for U-20WW Pumping Test Using Advanced Simulation Capability for Environmental Management (ASCEM) Tools.* LA-UF-14-24960.

Martian, P., and N. Bryant. *Ranking of Pahute Mesa Detonations for Contaminant Boundary Contribution and Fast Radionuclide Transport.*

Martian, P., T. deBues, and N. Bryant. *Development and Application of Streamtube Models for Assessing Pahute Mesa Detonations for Fast Radionuclide Transport to Oasis Valley.*

Middleton, R., E. Kwicklis, K. Birdsell, and D. Levitt. *Preliminary Infiltration Map for Pahute Mesa, Nevada National Security Site.* LA-UR-14-22556.

Parashar, R., D.M. Reeves, Y. Zhang, L. Pickman, K. Pohlmann, J.B.Chapman, and C.E. Russell. 2014. *Western Pahute Mesa Discrete Fracture Network Modeling and Upscaling.*

Pohlmann, K., C.E. Russell, and J. Healey. 2014. *Evaluations of Groundwater Purging and Sampling in Small-Diameter Wells and Piezometers at the Nevada National Security Site.*

Reimus, P.W., H. Boukhalfa, N. Wasserman, and B. Erdmann. *Scale Dependence of Colloid-Associated Radionuclide Transport.* LA-UR-14-24150.

Visser, A., M. Zavarin, A. Tompson, and B. Esser. *Interpretation of Low Level Tritium, Noble Gases and Helium Isotopes at the Underground Test Area.*

Zavarin, M., J.D. Begg, P. Zhao, M.A. Boggs, C. Joseph, Z. Dai, and A.B. Kersting. *Colloid-Facilitated Pu Transport Mechanisms at the Nevada National Security Site: Linking Field Evidence, Laboratory Desorption Kinetics, and Pu Desorption from Glass Alteration Products.*

Zhang, Y., K. Pohlmann, J.B.Chapman, C.E. Russell, and R. Parashar. *Capture Anomalous Dynamics Conservative and Reactive Contaminant Transport in Fractured Media from Centimeter Scales to Kilometer Scales.*



## **6.0 Key Personnel**

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In FY 2014, retirements and personnel reassignments changed UGTA committee memberships and responsibilities.

### **6.1 Participant Changes**

Chuck Russell (DRI) was named as a Science Advisor when Gayle Pawloski (LLNL) retired. Karl Pohlmann assumed the DRI Contract Manager responsibilities. Wayne Belcher (USGS) took over as the Central and Western Pahute Mesa PER Committee Chair. Kay Birdsell was appointed as the LANL Contract Manager.

### **6.2 NDEP Changes**

Tim Murphy retired, and Chris Andres was named the Bureau Chief. The UGTA Supervisor position was filled by Mark McLane.

### **6.3 NNSA/NFO Changes**

Bimal Mukhopadhyay retired. Kathryn Knapp and Bruce Stolte were assigned to other duties within the NNSA.

### **6.4 Contract Managers**

Each organization assigns a Contract Manager responsible for managing the participant's tasks. There is a monthly Contract Managers meeting with NNSA/NFO. [Table 6-1](#) lists each manager by organization.

### **6.5 CAU Leads and Science Advisors**

A Lead is assigned for each UGTA CAU, who coordinates CAU-specific technical scope and priorities with other CAU Leads, focuses PER Committee reviews, and communicates progress. There is a monthly CAU Lead meeting with NNSA/NFO. [Table 6-2](#) lists the CAU Leads and their respective organizations.

**Table 6-1  
 Contract Managers by Organization**

<b>Name</b>	<b>Organization</b>
<b>Karl Pohlmann</b>	DRI
<b>Kay Birdsell</b>	LANL
Andrew Tompson	LLNL
Sam Marutzky	N-I
Ken Ortego	NSTec
Robert Graves (Acting)	USGS

Note: Bold text denotes changes.

**Table 6-2  
 CAU Leads by Organization and CAU**

<b>Name</b>	<b>Organization</b>	<b>CAU</b>
Andrew Tompson	LLNL	Rainier Mesa/Shoshone Mountain
Greg Ruskauff	N-I	Frenchman Flat
Greg Ruskauff	N-I	Central and Western Pahute Mesa
Ed Kwicklis	LANL	Yucca Flat/Climax Mine

Science Advisors act as independent advisors for technical topics, activity strategies, and conceptual-model development; application of flow and transport models; uncertainty and sensitivity analyses; compliance with environmental standards; and data collection. There is one Science Advisor on every PER Committee.

### **6.6 Preemptive Review Committee Members**

The CAU-specific PER Committees provide internal technical review of ongoing work throughout the CAU life cycle. [Table 6-3](#) lists the members in each CAU committee.

### **6.7 Topical Committee Members**

Topical Committees may be formed on an *ad hoc* basis to address items such as non-CAU-specific issues, questions, concerns, and readiness. The committees may be disbanded when their scope is complete. [Table 6-4](#) lists the current committees and membership.

**Table 6-3  
 PER Committee Membership**

Name	Organization
<b>CAU 97, Yucca Flat/Climax Mine</b>	
<b>Nicole DeNovio</b>	Golder and Associates
Andrew Tompson, Chair	LLNL
Mavrik Zavarin	LLNL
Britt Jacobson, ex-officio	NDEP
Irene Farnham, Science Advisor	N-I
Keith Halford	USGS
<b>CAU 98, Frenchman Flat</b>	
Jenny Chapman	DRI
<b>Kay Birdsell</b>	LANL
Andrew Tompson	LLNL
Mark McLane, ex-officio	NDEP
Irene Farnham, Science Advisor	N-I
Margaret Townsend	NSTec
Joe Fenelon, Chair	USGS
<b>CAU 99, Rainier Mesa/Shoshone Mountain</b>	
<b>Chuck Russell, Science Advisor</b>	DRI
Kay Birdsell	LANL
Dave Finnegan	LANL
Mavrik Zavarin, Chair	LLNL
Britt Jacobson, ex-officio	NDEP
Bob Andrews	N-I
Margaret Townsend	NSTec
Joe Fenelon	USGS
Bill Wilborn	NNSA/NFO
<b>CAUs 101 and 102, Central and Western Pahute Mesa</b>	
Karl Pohlmann	DRI
<b>Chuck Russell, Science Advisor</b>	DRI
Elizabeth Keating	LANL
Tim Rose	LLNL
Mark McLane, ex-officio	NDEP
Bob Andrews	N-I
Margaret Townsend	NSTec
Wayne Belcher, Chair	USGS

Note: Bold text denotes changes in membership.

**Table 6-4  
 Topical Committee Membership**

<b>Name</b>	<b>Organization</b>
<b>Modeling</b>	
<b>Clay Cooper</b>	DRI
Ed Kwicklis	LANL
Andrew Tompson, Chair	LLNL
Bob Andrews	N-I
Keith Halford	USGS
<b>Well Purging and Sampling Methods</b>	
Chuck Russell, Chair	DRI
Mavrik Zavarin	LLNL
Jeff Wurtz	N-I
Ken Ortego	NSTec
Terry Sonnenburg	NSTec
Robert Graves	USGS
<b>Western Pahute Mesa Guidance</b>	
Chuck Russell, Chair	DRI
Ed Kwicklis	LANL
Mavrik Zavarin	LLNL
Mark McLane	NDEP
Irene Farnham, Science Advisor	N-I
Jeff Wurtz	N-I
Bill Wilborn	NNSA/NFO
Sig Drellack	NSTec
Ken Ortego	NSTec
Joe Fenelon	USGS

Note: Bold text denotes changes in membership.

## **6.8 Peer Review**

The UGTA strategy for CAU closure requires an external peer review of the flow and transport model before leaving the Corrective Action Investigation stage. The peer review report assists NDEP in reaching the regulatory decision on whether or not the model is acceptable to proceed to the Corrective Action Decision Document/Corrective Action Plan stage of the strategy.

A peer review panel was convened in April 2014 to review the YF/CM Phase I flow and transport model. The panel was composed of recognized experts in the fields of geology, geophysics, geochemistry, radiochemistry, hydrogeology, unsaturated zone hydrology, and groundwater flow and transport modeling. A five-day workshop presented the panel with overviews of the UGTA Activity, site characterization, and modeling studies for the YF/CM CAU. The panel attended a field trip to the NNSS to provide a perspective of the geology, hydrology, and geochemistry of the CAU and a history of nuclear testing. The peer review work is expected to be completed in early calendar year 2015.

Table 6-5 lists the peer review members.

**Table 6-5  
 YF/CM Peer Review Committee**

Name	Organization
John Klenke	Nuclear Waste Repository Project Office
F. Joseph Pearson	Consulting Geochemist
Eileen Poeter	Poeter Engineering and Colorado School of Mine
Jonathon Price	Nevada Bureau of Mines and University of Nevada, Reno
Daniel Stephens	Daniel B. Stephens and Associates
Scott Tyler	University of Nevada, Reno

## **7.0 Other Activities**

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### **7.1 Sampling Plan and NNSS Annual Environmental Report**

NNSA/NFO developed an NNSS Integrated Groundwater Sampling Plan to ensure coordinated sampling efforts between the UGTA activities under the *Federal Facility Agreement and Consent Order* (FFACO) and the environmental monitoring and surveillance requirements under DOE O 458.1. The plan was designed to provide a comprehensive, integrated approach for collecting and analyzing groundwater samples across organizations. The plan identifies 73 wells, categorized into 5 different types:

- *28 Characterization wells* (8 on the NTTR, 20 on the NNSS) used to support groundwater characterization and contaminant flow modeling
- *20 Source/Plume wells* that contain contaminated groundwater from NNSS underground nuclear testing
- *10 Early Detection wells* (2 on the NTTR, 8 on the NNSS) that contain no radiological contaminants above background levels but are downgradient of an underground nuclear test or a Source/Plume well
- *7 Distal wells* (1 on the NTTR, 6 on the NNSS) that are farther downgradient from Early Detection wells
- *8 Community water sources* that are either community, business, or private water sources or are near such sources

The plan establishes the sampling frequency and analytical procedures for each well type.

Increased efficiencies and cost savings are expected from the standardization of sampling methods and analyses.

The analytical results for the FY 2014 sampling events were reported in the NNSS Environmental Report. The UGTA chapter included a section on the QAP (Chapter 11.1.3); and Chapter 16, *Quality Assurance*, reported the UGTA QA sample statistics for the first time.

## **7.2 Sampling Technologies**

The Well Purging and Sampling methods committee evaluated several sampling methods to identify cost-effective alternatives for sampling wells with multiple completions. Sampling multiple completions involved setting and removing bridge plugs and pumps. The new methods were required to be used in small-diameter access tubing and lifting water from 600 meters or more.

A sampling method test plan was developed to identify sampling methods for each active well in the Sampling Plan. The testing plan's objectives were as follows:

- Determine the relative cost of three sampling technologies: bailer, jack pump, and submersible pump. Costs include deploying, operating, and maintaining each technology.
- Identify and assess the conditions and limitations for each technology, including usability and portability.
- Compare analytical results from a bailer sample to “pumped” samples for various  $^3\text{H}$  levels and time since purging. Recommend criteria for using bailers.
- Identify potential improvements for each technology to reduce costs, obtain more accurate results, and reduce risks.
- Recommend viable technologies for each well/zone in the Sampling Plan.
- Recommend a plan for testing/deploying additional technologies.

The testing plan report is due in the second quarter of FY 2015.

## **7.3 Chemistry Database**

The UGTA Geochemistry Database was redesigned to support compliance reporting; maintain data generated outside UGTA; and add a user-friendly interface. The redesign was conducted under N-I Standards-Based Management System (SBMS) subject area “Software Quality Assurance” and its associated procedures. It included a user manual for the interface. The new UGTA Chemistry Database focuses less on geochemical data and more on compliance chemistry data.

The update provides accurate and up-to-date chemistry data to the wide UGTA user base. The format was simplified and enables users to search both the Analytical Services database

(with commercial laboratory verified and validated data) and a new, smaller geochemistry database (named G2) that contains a more focused set of sampling locations and analytes pertinent to UGTA.

The effort standardized parameters, units, sample methods, sample types, sample purpose titles, and well locations. A new naming convention was developed for the well configurations that includes the well name and the sampling location. The piezometer(s) and main casing(s) were assigned starting with the lowest completion (1) and moving up the borehole. Samples taken from the discharge line are designated as o1. For instance, ER-20-8 has two main completions (m1 and m2), three piezometers (p1, p2, and p3) and one outfall (o1), so an example sample location is ER-20-8\_m1.

Electronic deliverable requirements were developed for LLNL to allow for easier data assessment by Analytical Services before being loaded into the G2 database.

The user interface was migrated to a SharePoint page that is available to all participants. It includes easy-to-use filters for data queries.



## **8.0 Conclusion**

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The UGTA Activity QA program concentrated on assessments. Management assessments identified many process improvements and the NNSA/NFO QAP implementation assessments identified not only participant BMPs but also improvements to the QAP. Closing the QAP implantation plan was a major accomplishment for the UGTA Activity in FY 2014.

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## **Appendix A**

### **Corrective Actions Tracked FY 2014**

**Table A-1**  
**Open Corrective Actions**  
(Page 1 of 6)

Tracking #	Reference #	Due Date <sup>a</sup>	Type	Participant	Deficient Condition	Corrective Actions
0.985	EI-FY13-163	12/30/2014	OFI	N-I	Underground test information not always reported consistently between investigators or consistent with the UGTA Nuclear Test Information Database (NTID). The NTID is not being kept current with updated information.	Science Advisors will form a committee to include the N-I Classification Officer and UGTA derivative classifier (DC) reviewers to determine and implement the best approach for maintaining consistency and keeping the database current.
0.988	UGTA Gap Analysis	02/27/2015	Finding	LLNL	QAP compliance for cation and trace element analyses not documented in procedure or process.	SOP will be revised, and a checklist will be developed for data verification and validation.
0.993	UGTA Gap Analysis	02/27/2015	Finding	LLNL	QAP compliance for iodine analysis not documented in procedure or process.	SOP will be revised, and a checklist will be developed for data verification and validation.
0.1006	UGTA Gap Analysis	02/27/2015	Finding	LLNL	QAP compliance to measuring and test equipment requirements, including calibrations and preventative maintenance, not documented in procedure or process.	LLNL will contribute to or maintain a SharePoint site with needed information.
0.1304	EI-FY14-331	01/30/2015	Finding	N-I	Errors were identified in two tables in appendices of the YF/CM Phase I Flow and Transport Model document. Table C-3 titled "Initial RST Fractions for Detonations in the Unsaturated Zone, Saturated Alluvial/Volcanic Aquifer System, and Saturated LCA Models" has several incorrect values in the column labeled "Unsaturated Zone" within the "Uniform-Concentration Inventory Fraction" group of columns.	Table C-3 was reformatted and checked for accuracy. LANL will also review Table D-2 and provide corrected data. Large tables transferred into FrameMaker will be checked. Changes will be made after Peer Review comments are resolved to prevent multiple changes.
0.1336	EI-FY14-367, EI-FY14-374	09/30/2014	Finding	N-I	Vehicle Inspection form also does not comply with 29 CFR 1926.	Personnel were given correct controlled form, and the correct form was associated with the active FAWPs.
0.1342	EI-FY14-368	09/30/2014	Finding	N-I	The Vehicle Inspection Checklist/Log sheet is not controlled.	The FAWP will be modified to meet requirements. The HASP will be reviewed for additional flexibility. The SBMS "Motor Vehicle Inspection" procedure will be revised to include updated form
0.1367	EI-FY14-372	10/02/2014	Finding	N-I	Incident of Security Concern.	Formal inquiry conducted. Actions being tracked.

**Table A-1**  
**Open Corrective Actions**  
 (Page 2 of 6)

Tracking #	Reference #	Due Date <sup>a</sup>	Type	Participant	Deficient Condition	Corrective Actions
631.1	OAA-13-AMEM-B M-82713/ CAweb 23902	10/30/2014	OFI	N-I	A significant number of unpublished drafts, short communications, and emails were referenced within a draft FFACO deliverable.	Migrate the uBib electronic library to the Technical Data Repository (TDR). Enter and verify references for the YF/CM and Frenchman Flat Flow and Transport Model Rev. 1 documents. 30 days from submittal of the Final Rev. 0, draft and personal communication references will be "packaged" as one entry with appropriate metadata.
654.5	--	09/30/2014	Finding	N-I	The Geochemistry Database does not contain the most recent analytical results.	Develop new process for updating the database that includes direct queries from the N-I Analytical Services database so that the data are accessible as soon as they are validated. Streamlined processes for non N-I data also being developed.
664.1	Finding 1-1	02/27/2015	Finding	LLNL	Laboratory procedures do not implement various laboratory control standard requirements.	Review relevant SOPs, and revise as necessary.
664.2	Finding 1-2	02/27/2015	Finding	LLNL	SOP-UGTA-120, Determination of Inorganic Anions by Ion Chromatography, Revision 4, and SOP-UGTA-134, Sample Analysis by Quadrupole ICP-MS, Revision 1 matrix spike requirements not implemented.	Purchase 1,000-ppm chloride standard for matrix spikes. Matrix spike samples will be analyzed with next set of unknowns.
664.3	Finding 1-3	02/27/2015	Finding	LLNL	Laboratory control samples are not independent of the NIST standards used for calibration.	For <sup>18</sup> O and <sup>2</sup> H analyses, a series of in-house water standards (that have been calibrated against NIST standards) have been developed and are analyzed with unknown samples and used as calibration standards. Unknown sample analysis does not usually include NIST standards in every batch. A new water check standard, LLNL-1, has been collected and characterized against in-house water standards. The initial LLNL-1 characterization for <sup>18</sup> O is outlined in current data packages. The initial LLNL-1 characterization for <sup>2</sup> H will be conducted once instrument is repaired.
664.4	Finding 2-1	02/27/2015	Finding	LLNL	A PEP sample or equivalent is not conducted on noble gas analyses.	ER-6-2 samples sent to USGS for noble gas analyses and interlaboratory comparison.

**Table A-1**  
**Open Corrective Actions**  
(Page 3 of 6)

Tracking #	Reference #	Due Date <sup>a</sup>	Type	Participant	Deficient Condition	Corrective Actions
664.5	Finding 2-2	02/27/2015	Finding	LLNL	Data evaluation documentation does not meet records requirements.	Will address relevant issues in QAP.
669.2	--	09/30/2014	Finding	N-I	TDR software and hardware needs evaluation not documented.	Responsible manager will coordinate with Records SME to prepare documentation required to comply with DR-RM-1 procedure.
669.7	EI-FY-14-325	09/30/2014	Finding	N-I	TDR implementing documents; UGTA Sub-Project Information/Data Management Plan (Rev. 0, January 2012) and N-I UGTA Sub-Project Information/Data Management Plan (Rev. 0, 01/21/2012) are not approved.	Documents will be revised and undergo formal review/approval.
703.1	OA-14-AMEM-222	11/10/2014	Finding	LANL	No formal process for distributing controlled documents and ensuring only current versions are in use.	Corrective action due to NNSA/NFO 11/10/2014.
703.2	OA-14-AMEM-222	11/10/2014	Finding	LANL	Approval for records transfer not evident.	Corrective action due to NNSA/NFO 11/10/2014.
684.1	OA-14-AMEM-220	N/A	OFI	NSTec	The delay between record generation and formal records management presents an unnecessary risk.	OFI, tracking only.
707.1	EI-FY-14-325	N/A	OFI	N-I	A short post-job briefing would be beneficial to ensure coordination before contractors departing well sites.	OFI, tracking only.
707.2	EI-FY-14-325	N/A	OFI	N-I	In-line monitoring of water quality may be of benefit for trends and comparison between the methods of analysis.	OFI, tracking only.
707.3	EI-FY-14-325	N/A	OFI	N-I	There have been a number of naming convention changes that are not reflected in the FAWP.	OFI, tracking only.
707.4	EI-FY-14-325	N/A	OFI	N-I	Recommend that a function test be performed before the auto-sampler to collect samples.	OFI, tracking only.
707.5	EI-FY-14-325	N/A	OFI	N-I	Telemetry could be modified to include parameters other than water-level measurements.	OFI, tracking only.

**Table A-1**  
**Open Corrective Actions**  
(Page 4 of 6)

Tracking #	Reference #	Due Date <sup>a</sup>	Type	Participant	Deficient Condition	Corrective Actions
707.6	EI-FY-14-325	N/A	OFI	N-I	More visits by supervision/management were beneficial to get a better perspective and understanding of the work.	OFI, tracking only.
707.7	EI-FY-14-325	N/A	OFI	N-I	The mounting of generators, fuel tanks, or other items on a trailer may reduce the cost of mobilizing multiple pieces of equipment to the site.	OFI, tracking only.
707.8	EI-FY-14-325	N/A	BMP	N-I	Have other work organized if delays are experienced in planned fieldwork.	OFI, tracking only.
710.1	--	TBD	Finding	LANL	Data package lacks detail for independent reproducibility.	TBD.
710.2	--	TBD	BMP	LANL	Recommend FEHM verification example be made a standard verification test case.	TBD.
714.1	MA-14-H00-008 CaWeb 25744	01/17/2015	OFI	NSTec	The current HASP should be reviewed and revised as necessary.	Documents will be revised and issued through NSTec document control system.
723.1	14-UGTA-QA-1	TBD	Finding	DRI	Some information fields on some of the FAWP worksheets have been left blank. Fields must be filled in or crossed out and initialed/dated.	TBD.
723.2	14-UGTA-QA-1	TBD	Finding	DRI	Sample identification numbers for precipitation samples are not consistently recorded in the field logbook and/or field worksheet, though the fact that samples were collected is noted.	TBD.
EI-FY14-295	--	12/01/2014	E/I	N-I	Some <sup>3</sup> H concentrations reported in the Geochemistry Database and the YF/CM Phase I Flow and Transport Model document are an order of magnitude greater than the amount reported in the 1994 Nevada Test Site Environmental Report.	The values were corrected in the Geochemistry Database, and the corrections were added in an ROTC to the document. LLNL data still being entered.
EI-FY14-342	--	09/30/2014	E/I	N-I	There is the potential for multiple versions of a USGS program to be used.	Remove outdated software from affected system. Discussed among users which versions were available. Designate code custodian to monitor USGS website for updates. Coordinate with IT to update users as necessary.



**Table A-1**  
**Open Corrective Actions**  
(Page 5 of 6)

Tracking #	Reference #	Due Date <sup>a</sup>	Type	Participant	Deficient Condition	Corrective Actions
EI-FY14-353	--	12/01/2014	E/I	N-I	The HASP is not being reviewed by signatories or their designees on an annual basis.	HASP to be reviewed within the first quarter of FY 2015.
EI-FY14-357	--	09/30/2014	E/I	N-I	Due to a safety incident at the NPTEC on 06/13/2014, N-I held an operational pause of field activities to discuss the incident with field deployed staffs; review hazardous chemical storage areas; and conduct safety inspections of Buildings 23-310 and 6-909.	<ol style="list-style-type: none"> <li>1. Facility Managers were informed not to access chemicals in the storage units; isopropyl alcohol in Building 12-210 was disposed of so access is granted for staff, Building 6-909 access to isopropyl alcohol must still be granted by ESH&amp;Q Manager or delegate.</li> <li>2. An operational pause of field activities was held on 06/19/2014, to review current processes/procedures; provide inspection training; and conduct inspections of Buildings 23-310 and 6-909.</li> <li>3. Action Items identified in the Operational Pause and assigned to responsible managers.</li> </ol>
EI-FY14-363	--	12/15/2014	E/I	N-I	NNSS Building 6-909 air-conditioning and heating issues.	Issue identified as part of monthly building inspection, communicated to M&O and placed on a priority list. Inspections and repairs were made to HVAC in Bay 1 and 2, the office HVAC unit was found to need replacement. Work with the M&O contractor to expedite the replacement of the office HVAC unit.
EI-FY14-383	--	10/06/2014	E/I	N-I	During a rain event on 08/04/2014, it was broadcast that personnel were to report to the cafeteria for accountability, but no one at that location was taking accountability information.	OCC was advised that N-I personnel were in Mercury and would be staying overnight. No further action was taken.
EI-FY14-388	--	10/28/2014	E/I	N-I	Well zone information was incorrect on analytical data results.	This affected the geochemical section of the PM-3 data report. The section was rewritten using the proper zone information.
EI-FY14-393	--	11/12/2014	E/I	N-I	Fabricated packer could not be installed on tubing.	NSTec working with fabricator on design.

**Table A-1**  
**Open Corrective Actions**  
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Tracking #	Reference #	Due Date <sup>a</sup>	Type	Participant	Deficient Condition	Corrective Actions
EI-FY14-399	--	11/17/2014	E/I	N-I	Analytical calculations in final data packages do not have the same values as earlier letter reports.	TBD; these may be undocumented unit conversions and background corrections.
EI-FY14-401	--	11/17/2014	E/I	N-I	A shade structure was damaged by high winds.	The shade canvas was removed from the frame structure to prevent any further damage, moved out of the work area, and staged for disposal. Manager notified. A portable tractor type shade was available and was used to provide shade for the wire-line hoist operator.
EI-FY14-402	--	11/24/2014	E/I	N-I	Pump assembly disconnected from crane during overhead work.	Immediately suspended all work, and advised personnel not to move or alter equipment position until the situation could be evaluated. Management notifications were made. Photo documentation was initiated.

<sup>a</sup>Corrective actions with due dates of or after 09/30/2014 will be dispositioned in the FY 2015 QAR.

CFR = Code of Federal Regulations

DC = Derivative classifier

ESH&Q = Environmental, Safety, Health, and Quality

FAWP = Field activity work package

FEHM = Finite Element Heat and Mass Transfer

<sup>2</sup>H = Deuterium

HASP = Health and safety plan

HVAC = Heating, ventilating, and air conditioning

ICP-MS = Inductively coupled plasma-mass spectrometer

IT = Information Technology

M&O = Management and operating

N/A = Not applicable

NIST = National Institute of Standards and Technology

NPTEC = Nonproliferation Test and Evaluation Complex

NTID = Nuclear Test Information Database

O = Oxygen

OCC = Operations Command Center

ppm = Parts per million

ROTC = Record of technical change

SME = Subject matter expert

TBD = To be determined

-- = Not required

**Table A-2**  
**Closed Corrective Actions**  
(Page 1 of 12)

Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
0.984	EI-FY13-162	07/23/2014	OBS	LLNL	Some interlaboratory stable isotope results do not agree within the acceptance criteria required by the UGTA QAP, Section 2.3.3.2.	LLNL causal analysis dated 07/22/2014 discussed in <a href="#">Section 3.0</a> of this report.
0.990	UGTA Gap Analysis	05/19/2014	Finding	LLNL	QAP compliance for TDIC/TDOC analysis not documented in a procedure or process.	SOP revised, and checklist developed for data verification and validation.
0.991	UGTA Gap Analysis	02/27/2014	Finding	LLNL	QAP compliance for $\delta^{13}\text{C}$ analysis not documented in a procedure or process.	SOP revised, and checklist developed for data verification and validation.
0.992	UGTA Gap Analysis	07/15/2014	Finding	LLNL	QAP compliance for $^{14}\text{C}$ analysis not documented in a procedure or process.	SOP revised, and checklist developed for data verification and validation.
0.1000	UGTA Gap Analysis	02/19/2014	Finding	LLNL	QAP compliance for $\delta^2\text{H}$ and $\delta^{18}\text{O}$ analyses not documented in a procedure or process.	SOP revised, and checklist developed for data verification and validation.
0.1008	UGTA Gap Analysis	02/19/2014	Finding	DRI	QAP compliance for $^{14}\text{C}$ analysis not documented in a procedure or process.	Procedures were retired, and participant not identified for future analytical work.
0.1009	UGTA Gap Analysis	10/24/2013	Finding	LANL	Numerous laboratory procedures not in compliance with QAP.	Participant not identified for future analytical work.
0.1114	--	10/28/2013	Finding	LANL	No Chain-of-Custody form present with Well ER-EC-13 groundwater samples when received at LANL.	Copy of paperwork is taped to drums. Participant not identified for future analytical work.
0.1164	EI-FY13-225	01/07/2014	Finding	N-I	Program Manager approval was not received for working more than 15 hours in a 24-hour period.	The Work Hours and Schedule Policy (effective 07/27/2012) was reviewed with the employee.
0.1202	EI-FY14-256	02/12/2014	Finding	N-I	Daily $^3\text{H}$ monitoring samples were removed from UGTA secure storage and transported to the NSF. The samples were placed in an N-I associate's cubicle. The samples remained unsecured overnight. There was no indication on the Chain-of-Custody form that the samples were to be disposed of.	Training was provided to UGTA field staff regarding sample handling, chain of custody, and unrestricted release from the NNSS.

**Table A-2**  
**Closed Corrective Actions**  
(Page 2 of 12)

Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
0.1206	EI-FY14-256	02/12/2014	Finding	N-I	Samples were removed from the NNSS without required release forms.	Training was prepared and delivered to UGTA field staff regarding the findings and circumstances; and reviewed the appropriate and compliant handling of samples under chain of custody and unrestricted release at the NNSS.
0.1207	EI-FY14-256	02/12/2014	OBS	N-I	Samples were brought into the NSF office environment, left uncontrolled, out of custody, and unattended on a desk inside the NSF facility overnight. This could have created a situation of concern for custodial staff or others.	Training was prepared and delivered to UGTA field staff regarding the findings and circumstances; and reviewed the appropriate and compliant handling of samples under chain of custody and unrestricted release at the NNSS.
0.1208	EI-FY14-256	02/12/2014	OFI	N-I	The associate removing the samples from the NNSS and transporting them to the NSF did not communicate with the supervisor or other associates involved.	Training was prepared and delivered to UGTA field staff regarding the findings and circumstances; and reviewed the appropriate and compliant handling of samples under chain of custody and unrestricted release at the NNSS.
0.1271	--	06/04/2014	OBS	USGS	Existing data are no longer consistent with the new, more-accurate, resurvey of Frenchman Flat wells.	Diagrams were created to describe the measuring point (MP), permanent reference point, and land surface for each well. The diagrams were submitted to the TDR and posted on the Field Ops SharePoint site. A recommendation was sent to NNSA/NFO to revise the QAP to state that future water-level measurements will be taken consistent with the diagrams. The NWIS was updated with land-surface elevation, MP heights, and depths-to-water. USGS procedure, USGS-WL-DATA-01, Procedure for Reviewing and Finalizing Water-Level Data, was updated to reflect timely changes to NWIS following notification of land-surface or MP changes.
0.1273	EI-FY13-239	07/15/2014	Finding	LLNL	Well ER-EC-13 groundwater samples results analyzed by two laboratories were almost an order of magnitude different.	LLNL causal analysis dated 07/15/2014 discussed in <a href="#">Section 3.0</a> of this report.
0.1303	EI-FY14-329	06/09/2014	Finding	N-I	NNSA/NFO presentation did not undergo Public Involvement review before presentation.	Affected personnel were briefed on procedure.

**Table A-2**  
**Closed Corrective Actions**  
(Page 3 of 12)

Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
562.1	DRI UGTA-FY12-3	02/19/2014	Finding	DRI	Laboratory analyses were conducted with interim procedures.	Procedures were finalized, and process for tracking changes established.
563.1	DRI UGTA-FY11-01	02/12/2014	Finding	DRI	Data qualifiers have not been assigned to data generated by DRI in the past.	Reviewed DRI data, and assigned quality and completeness flags. Developed Data/Information Implementation Plan, and Data and Field Management Plan.
564.1	DRI_UGTA_FY2011_02	02/12/2014	Finding	DRI	Project records have been intermittently and inconsistently transferred to the records filing system. Multiple records have been stored in offices and file cabinets and, as a result, numerous UGTA project files are incomplete.	Identified and compiled UGTA records, and assigned data documentation flags. Developed Information/Data Management Plan, Information/Data Implementation Plan, and Information/Data procedure.
578.9	--	02/04/2014	OFI	N-I	UGTA Information/Data Management Plan and the Information/Data Implementation Plan should be reviewed and updated.	OFI, tracking only.
632.1	--	02/25/2014	OFI	N-I	Controlled Chain-of-Custody form not used.	The form used in field was updated to look identical to the controlled form.
632.2	--	02/10/2014	OFI	N-I	The N-I Temporary Storage Access Log form is not controlled or proceduralized. Time in and time out entries on the form appeared to indicate that the cabinet remains unlocked for an extended period.	Controlled form N-I 015, "Temporary Storage Access/Temperature Log," is being used by personnel accessing the Building 23-310 secure storage. Rad Services personnel using this storage were advised via email from UGTA Activity Field Operations Manager of the proper protocols for the completion of the form with respect to time entered for removal/storage of samples.
634.1	ASM-AMEM-5.13.2013-511223 finding 1-1	02/19/2014	Finding	LLNL	Personnel could not locate already-analyzed samples by their UGTA or LLNL identification numbers. Samples are under chain-of-custody control from receipt through analysis, but not through disposal.	The sample tracking system changed to reflect the sample disposal along with analytical results.

**Table A-2**  
**Closed Corrective Actions**  
(Page 4 of 12)

Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
634.2	ASM-AMEM-5.13.2013-5112233 finding 1-2	11/22/2013	Finding	LLNL	Unused sample bottles are provided, but they are not certified as having been pre-cleaned.	Certified bottles were purchased, and certifications are stored in LLNL analytical database. Non-certified bottles will be used only when certified bottles are not available.
634.3	ASM-AMEM-5.13.2013-5112233 finding 1-3	05/21/2014	Finding	LLNL	Sample temperatures were monitored at arrival, and sample storage was maintained in storage refrigerators; however, documentation was not maintained.	Data loggers for the storage refrigerators were purchased. Arrival and storage temperature data collected and recorded in the LLNL analytical database. Sample condition is documented on the Chain-of-Custody forms in the "condition upon receipt" column.
649.1	13-UGTA-QA-1	06/05/2014	Finding	DRI	Numerous modifications to the work scope occurred, and maintaining revised schedules and QA documentation was delayed or incomplete.	DRI UGTA Activity Manager ensures that task personnel have reviewed all relevant responsibilities for QA documentation under the UGTA QAP, DRI's QA Plan, and DRI's modeling procedures. DRI UGTA Activity Manager and task Principle Investigators discuss proposed revisions to task schedules and confirm that time and funding resources are adequate.
649.2	13-UGTA-QA-1	06/05/2014	Finding	DRI	Original datasets were not centrally located on a computer or storage system, or effectively identified. Traceability and verification of the data was difficult.	Maintain a central area for storage and documentation of project datasets as received from external sources. DRI network storage provides easy access and backups that protect data from loss.
649.3	13-UGTA-QA-1	07/21/2014	Finding	DRI	The primary modeling codes 3DFrac, transport_preprocessor_v3, and RM_transport_postprocessor_v5 were developed at DRI, and are in various stages of documentation and missing information.	An internal review was conducted of the codes and documentation completed in accordance with DRI's modeling procedures.
649.4	13-UGTA-QA-1	07/21/2014	Finding	DRI	The primary modeling code NUFT was acquired with little documentation of the code or its verification, and no test problems were included. The installation process and the results were not documented in accordance with DRI modeling procedures.	The installation and testing of NUFT on DRI-GRID was documented, and cited the review and verification process undertaken of this code for DOE's Yucca Mountain Project.

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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
649.5	13-UGTA-QA-1	07/02/2014	Finding	DRI	DRI-developed code documentation lacks compilation, installation, and hardware/software platform information.	Installation, configuration and testing of DRI primary codes completed.
649.6	13-UGTA-QA-1	07/02/2014	Finding	DRI	Full description of the verification process, the files used, the results, and their location are not documented for non-primary DRI-developed code.	Verification process for DRI-developed code was documented.
649.7	13-UGTA-QA-1	06/05/2014	Finding	DRI	Code verification of nuft2mf3 was not documented.	Verification was documented.
649.8	13-UGTA-QA-1	06/05/2014	Finding	DRI	A central repository of developed code is not in place for version control, documentation, and backups.	Established a central area for storage and documentation where DRI's Information Services department provides maintenance and automated backups.
649.9	13-UGTA-QA-1	06/05/2014	Finding	DRI	Input files, associated datasets and codes, and information about their development and use in the models have not been documented and archived in a DRI data documentation package.	Documented input files, associated datasets and codes, and information about their development and use in the models. This information was included with the datasets in the data documentation package.
649.10	13-UGTA-QA-1	07/02/2014	Finding	DRI	Processes and results of model calibration, sensitivity, and uncertainty analysis have not been documented and archived in DRI documentation packages.	Completed the documentation of processes and results of model calibration, sensitivity analysis, and uncertainty analysis and included it in the documentation package.
649.11	13-UGTA-QA-1	07/21/2014	Finding	DRI	Models are not archived and placed under configuration control with documentation that ensures traceability and reproducibility.	Generated a model documentation package that includes everything needed to re-run the models and generate comparable results. UGTA Model Documentation Guidance document and DRI's modeling procedures were used to guide the documentation. Storage of the model archive on DRI's network-attached storage system, provided and supported by DRI's Information Services department, protects the archive from loss and provides ready access to authorized personnel.
654.1	--	04/28/2014	Finding	N-I	Drilling logbooks contained errors that were initialed but not dated.	Procedure was reviewed with field personnel.

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**Closed Corrective Actions**  
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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
654.2	--	04/28/2014	Finding	N-I	Records contained information in ink other than blue or black.	Procedure was changed to read "dark, indelible ink" and written recommendation submitted to NNSA/NFO to change UGTA QAP.
654.3	--	02/27/2014	Finding	N-I	Field documentation does not generally record the procedure used to conduct work or the revision number.	Additional supporting evidence that this was not a finding was submitted and accepted. This finding was closed without corrective action.
654.6	--	04/28/2014	OBS	N-I	The UGTA QAP references NNSA/NSO Central Files, which does not exist.	Written recommendation was submitted to NNSA/NFO to change UGTA QAP.
654.7	--	04/28/2014	OBS	N-I	When implementing requirements from multiple sources, the most stringent must be followed. (e.g., ink color).	Procedure was changed to read "dark, indelible ink" and written recommendation submitted to NNSA/NFO to change UGTA QAP.
654.9	--	08/06/2014	OFI	N-I	Calibrated equipment at Well ER-11-2 is not locked.	Tamper-indicating devices were installed at wells.
654.10	--	01/28/2014	BMP	N-I	UGTA maintains an exemplary system for tracking calibrated equipment. Items out of calibration are kept to a minimum, and are appropriately tagged and segregated when out of calibration.	BMP; no corrective action required.
654.11	--	01/28/2014	BMP	N-I	UGTA management and associates have self-reported numerous issues and deficiencies. This self-reporting ensures that issues are appropriately addressed in a timely fashion.	BMP; no corrective action required.
658.1	OA-14-AMEM-218; finding 2-1	05/08/2014	Finding	LLNL	Code installation testing was not documented.	Developed installation testing process and documentation. Documentation packages were developed for installed codes.
669.5	--	08/14/2014	OFI	N-I	The 30-day requirement for submitting files to the TDR is occasionally exceeded for non-N-I entries.	30-day requirement is only for N-I; the suggested timeframe was discussed by the Contract Managers on 07/16/2014.
669.6	--	08/14/2014	Finding	N-I	TDR entry did not have a DC review.	The TDR entry was not identified as a record because the DC review had not been performed or documented in the metadata. This was determined not to be a finding and was closed without corrective action.



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**Closed Corrective Actions**  
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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
669.9	--	08/19/2014	Finding	N-I	There are UGTA assessment records in the TDR that have not been submitted to N-I Central Files.	Procedure was revised to require TDR and Central Files submission for non-N-I assessment records. An extent of condition was conducted, and the appropriate files were submitted to Central Files.
669.13	--	07/07/2014	OBS	N-I	Minor discrepancies were found between TDR documents and their metadata.	There is a learning curve for TDR users with the metadata; these errors should diminish with time.
669.18	--	05/28/2014	BMP	N-I	The TDR provides a valuable tool by collecting data from all UGTA participants into one accessible system.	BMP; no corrective action required.
678.1	--	08/11/2014	OFI	N-I	Because delays in fieldwork are common, the schedule should include enough float to mitigate issues that affect schedule.	On 07/17/2014, a presentation on incorporating float into FY15 planning was distributed to UGTA Contract Managers.
678.2	--	08/11/2014	OFI	N-I	As the number of participants increase, the schedule should include contingencies to accommodate coordination of issues, availability conflicts, and the like. In addition, a determination from each participant of potential conflicts should be documented in advance with periodic reviews.	This issue was discussed at the 07/17/2014 UGTA Contract Managers meeting.
678.3	--	08/12/2014	OFI	N-I	As priorities and strategies change, effects on future tasks are not well predicted. A realistic assessment of impacts on future work should be made and documented.	This issue was discussed at the 07/17/2014 UGTA Contract Managers meeting.
678.4	--	08/12/2014	OFI	N-I	Tasks are scheduled/budgeted based on (1) needs of the project, (2) available resources, and (3) assumptions of labor and duration needed. When a task requires more resources than expected or is delayed, it is likely that another task is being impacted. These impacts are typically not well identified. A concerted effort to determine impacts when changes are contemplated would be beneficial.	This issue was discussed at the 07/17/2014 UGTA Contract Managers meeting.

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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
682.1	EI-FY14-286	04/07/2014	OFI	N-I	Prepare an analysis of the events leading up to the change control.	OFI; causal analysis was conducted on miscategorized change control.
682.2	EI-FY14-286	04/07/2014	OFI	N-I	Develop a list of potential Management Reserve (MR)/New Scope issues through the remainder of FY 2014.	OFI; causal analysis was conducted on miscategorized change control.
682.3	EI-FY14-286	04/07/2014	OFI	N-I	Review the list of MR/New Scope issues with NNSA/NFO at least monthly for the remainder of the contract.	OFI; causal analysis was conducted on miscategorized change control.
692.1	OA-14-AMEM-221; finding 1-1	08/29/2014	Finding	USGS	There is no formal process for distributing controlled documents and ensuring that only the current versions are in use.	Developed an electronic database for controlled documents and a controlled directory in the USGS/UGTA electronic project area with administrative controls. Only current versions of documents are maintained in the database, and users will be notified when any updates are made.
692.2	OA-14-AMEM-221; finding 1-2	08/20/2014	Finding	USGS	Two out-of-calibration measuring tapes were segregated but lacked tags indicating calibration status.	"Caution, Out of Service" tags were purchased and distributed to field personnel with instructions to inventory all measuring and monitoring equipment, and apply tags with explanation as needed.
692.3	OA-14-AMEM-221; finding 3-1	08/20/2014	Finding	USGS	The June 2013 management assessment did not include the required assessment plan.	Project Manager will confirm that procedure USGS-A-01 has been complied with before management assessments. Staff was reminded to review procedures to ensure that all procedure forms have been completed and all procedure requirements complied with. Assessment plan form USGS-A-frm-01 was updated.
692.4	OA-14-AMEM-221; finding 4-1	08/25/2014	Finding	USGS	There is no defined and documented stop work authority with respect to conditions adversely affecting ESH&Q.	USGS procedure existed but was not provided during assessment. Personnel were reminded of the procedure.

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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
692.5	OA-14-AMEM-221; finding 4-2	09/24/2014	Finding	USGS	There is no documented process for identifying, tracking, and resolving issues adverse to quality.	An Excel file was developed to identify, track, and document resolution of issues adverse to quality for UGTA activities. Only issues added to UGTA's Assessment and Condition Tracking System (ACTS) and assigned an ACTS tracking number will be tracked by USGS/DOE-UGTA Activity project personnel.
692.6	OA-14-AMEM-221; Noteworthy Practice 1-1	07/31/2014	BMP	USGS	USGS records and data are readily traceable to their sources.	BMP; no corrective action required.
703.3	OA-14-AMEM-222	08/14/2014	OBS	LANL	LANL management assessment ongoing during NNSA/NFO assessment.	N/A; observation only.
703.4	OA-14-AMEM-222 Noteworthy Practice 1-1	08/14/2014	BMP	LANL	LANL added a DC signature block to UGTA forms.	BMP; no corrective action required.
713.1	MSA-14-USGS-001	09/08/2014	Finding	USGS	Station barometer accuracy is not documented on USGS-BARO-INSTAL-frm- 01 as required per procedure.	USGS-BARO-INSTAL-frm-01 was provided to field personnel for each well where barometer data are collected and verified. Field personnel were instructed on how to document barometer accuracy on USGS-BARO-INSTAL-frm-01.
713.2	MSA-14-USGS-001	09/08/2014	OFI	USGS	Three recommended changes to procedure USGS-BARO-INSTAL-01, Rev. No: 0.	Procedure was revised as suggested.
EI-FY13-226	--	11/27/2013	E/I	N-I	Authors should relinquish electronic files to Document Production before the technical edit to assure version control.	Email sent to all UGTA personnel requiring any revisions to files after they have been sent to document production be either hardcopy markups, PDF or electronic media, avoiding multiple working copies.
EI-FY13-237	--	04/14/2014	E/I	N-I	The Draft NNS Integrated Sampling Plan analytical parameters are inconsistent with the NDEP-approved UGTA CAIPs, and those referred to under earlier versions of the UGTA QAP are not consistent with those identified in the NNS Integrated Sampling Plan for CAUs 101, 99, and 97.	ROTCs were developed for the CAIPs and field instructions.

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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
EI-FY13-253	--	12/04/2013	E/I	N-I	The Draft YF/CM Phase I Flow and Transport Model document had numerous tables (e.g., Table F-1) and figures (e.g., Figure F-1) produced by external authors for which there is no evidence that checkprinting has been completed.	The N-I checkprinting procedure does not apply to other participants, however, the data packages for the document should be submitted to the TDR.
EI-FY14-254	--	11/27/2013	E/I	N-I	The Chain-of-Custody form indicated that samples were collected on 08/15/2013 and relinquished to secured storage on 08/20/2013 without any information about where and how the samples were stored and if there was limited access to storage.	The samples were stored in a locked trailer that was not a formally designated secure sample facility. However, the trailer keys were in the custody of the sample team for the five days.
EI-FY14-258	--	12/04/2013	E/I	N-I	Water quality standards were purchased as an emergency purchase; however, the fieldwork was suspended, and there was no need for the standard, so an unnecessary expense was incurred.	Emergency purchases will be defined in the procurement procedures. This event happened during the possible government shutdown when most procurements were put on hold.
EI-FY14-264	--	01/15/2014	E/I	N-I	A concern was raised regarding documentation to substantiate that all QAPP requirements were met for the YF/CM Phase I Flow and Transport Model document.	The <i>Underground Test Area Fiscal Year 2013 Annual Quality Assurance Report Appendix C</i> contained the justifications of datasets and data sources used in the flow and transport models.
EI-FY14-265	--	06/18/2014	E/I	N-I	Depth-to-water data are stored in three places without coordination or configuration control. The data are in the Field Operations SharePoint site, UGTA Water Levels Database, and USGS National Water Information System (NWIS).	The UGTA Activity determined the official water level data are in the USGS NWIS; <a href="http://waterdata.usgs.gov/nwis">http://waterdata.usgs.gov/nwis</a> . A presentation from USGS on how to use NWISWeb to obtain hydrologic data is available in the TDR, UGTA-4-1101.
EI-FY14-268	--	02/05/2014	E/I	N-I	Using drilling information to estimate sustainable pumping rates may be insufficient because (1) additional fluids are introduced in the well, and (2) individual zones are not isolated.	The Pahute Mesa Guidance Committee determined the path forward for testing Well ER-EC-15 three zones.

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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
EI-FY14-270	--	06/09/2014	E/I	N-I	UGTA Stratigraphy Database updates are not consistent communicated to users. Additionally, not all columns in the database have data dictionaries (e.g., HGU Code, Alt Code, Strat Code, and Lith Code).	A system of alerts was established for all UGTA databases.
EI-FY14-283	--	06/18/2014	E/I	N-I	A discrepancy was identified on the legend on some figures of radionuclide concentrations at the base of the unsaturated zone transport model in the YF/CM Phase I Flow and Transport Model document Final Rev. 1 approved by NDEP in October 2013.	An ROTC (N-I/28091--080-Rev 1 ROTC-1) was submitted with corrected figures.
EI-FY14-285	--	06/23/2014	E/I	N-I	The current software does not automatically calculate the value or budgeted cost of work performed (BCWP) projected against the forecasted schedule. In order to project the BCWP over time, the remaining BCWP must be projected manually.	The software was programmed and tested to perform the requested calculations.
EI-FY14-287	--	05/12/2014	E/I	N-I	Personnel reported that wire grounding network established on Well ER-EC-2a, located on the EC-South Area of the NTTR, had been removed.	The U.S. Air Force secured the gate with a lock and constructed physical barriers and a perimeter fence.
EI-FY14-296	--	02/19/2014	E/I	N-I	Two false fire alarms in Building 6-909.	The NSTec Fire Department determined the false alarms were caused by an issue with the phone line outside the facility, and the problem was resolved.
EI-FY14-298	--	05/07/2014	E/I	N-I	Vehicle backing incident at Well ER-EC-15.	A joint fact-finding meeting was conducted with N-I and NSTec. A restart plan for ER-EC-15 was developed. NSTec and N-I cooperatively prepared and implemented a Site Supervisor Training session.
EI-FY14-325	--	08/04/2014	E/I	N-I	An apparent anomalous <sup>3</sup> H result was reported for Well ER-6-2.	The well was resampled with a validated analytical result of non-detect. A well sampling assessment (707) was also conducted.

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Tracking #	Reference #	Closure Date	Type	Participant	Deficient Condition	Corrective Actions
EI-FY14-334	--	07/14/2014	E/I	N-I	There is a discrepancy between the barometric pressures recorded on the Pressure Transducer Data Forms and those recorded by the Campbell Scientific electronic dataloggers. These discrepancies are on the order of tens of centimeters of water level elevation.	The datalogger was programmed with the slope and offset for a different barometer. The Depth-to-Water Data Forms and Pressure Transducer Data Forms were retrieved; the barometric pressures were recalculated; and the forms corrected, including an explanation of the corrections.
EI-FY14-338	--	06/16/2014	E/I	N-I	The access gate to the UGTA wells on EC-South (NTTR) was found to be unlocked and open.	All participants who require access were reminded of the shared responsibility for managing the DOE combination lock with the understanding of removing the DOE lock at the end of the day.
EI-FY14-352	--	09/15/2014	E/I	N-I	An UGTA presentation was not loaded into Environmental Management Information System (EMIS).	The process was changed to load presentations immediately into the EMIS after loading into the TDR.
EI-FY14-377	--	09/08/2014	E/I	N-I	Low concentrations of <sup>90</sup> Sr were reported for Wells ER-20-7, ER-5-5, ER-EC-12, ER-EC-14, RNM-2S, and UE-5n. These values are suspect because (1) The sample from ER-EC-12 with a <sup>90</sup> Sr detect is a rinsate, (2) The duplicate and sample results do not agree, and (3) <sup>90</sup> Sr is not expected because of its highly sorptive nature (and thus low mobility) in these aquifers.	Additional analyses were performed using more sensitive methods.
EI-FY14-380	--	09/29/2014	E/I	N-I	Well ER-EC-11 was sampled before the change in the well numbering convention, and consequently was not numbered using the new numbering convention.	Documentation was corrected to the new numbering convention.

ACTS = Assessment and Condition Tracking System  
MP = Measuring point  
MR = Management reserve  
NSF = Nevada Support Facility  
NTTR = Nevada Test and Training Range

NWIS = National Water Information System  
QAPP = Quality Assurance Project Plan  
TDIC = Total dissolved inorganic carbon  
TDOC = Total dissolved organic carbon