Nevada Site Specific Advisory Board
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Full Board Meeting Handouts for
Wednesday, April 19, 2016

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NSSAB MEETING ATTENDANCE

Full Board Meetings

October 2016 through September 2017 (FY 2017)

Name	11/9/16	1/18/17	3/15/17	4/19/17	6/21/17	8/16/17	9/20/17	Max Terms
MEMBERS								
Michael Anderson	E	√	E					2020
Amina Anderson	√	√	√					2020
Arcadio Bolanos	√	E	E					2022
Francis Bonesteel	√	√	√					2022
Michael D'Alessio	√	E	√					2020
Pennie Edmond	√	√	√					2020
Karen Eastman	√	√	√					2022
Raymond Elgin	√	√	U					2022
Charles Fullen	√	√	√					2022
Richard Gardner	√	√	√					2022
Donald Neill	√	√	E					2020
Autumn Pietras	√	√	√					2022
Edward Rosemark	√	√	√					2018
Steve Rosenbaum	√	√	√					2020
William Sears	√	√	√					2018
Cecilia Flores Snyder	E	√	E					2020
Richard Stephans	√	√	√					2022
Jack Sypolt	√	√	E					2018
Richard Twiddy	√	√	√					2022
Dina Williamson-Erdag	E	√	E					2022
LIAISONS								
Clark County	√	√	√					
Consolidated Group of Tribes & Organizations	E	√	√					
Esmeralda County Commission	E	√	U					
Nye County Commission	U	U	U					
Nye County Emergency Management	E	E	E					
Nye Co. Nuclear Waste Repository Project Office	√	√	√					
State of NV Division of Env Protection	√	√	√					
U.S. Natl Park Service	E	E	√					

KEY: √ - Present E - Excused V - Vacant U - Unexcused

Radioactive Waste Acceptance Program (RWAP) Assessment Improvement Opportunities Work Plan Item #4

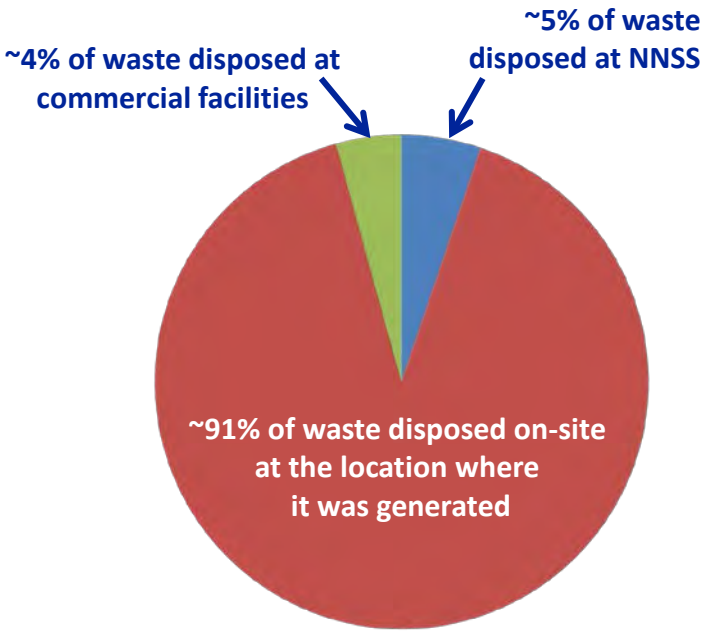
Jhon Carilli
Low-Level Waste Activity Lead
U.S. Department of Energy (DOE),
Environmental Management (EM) Nevada
Nevada Site Specific Advisory Board (NSSAB)
April 19, 2017

NSSAB Work Plan Item #4

- Provide a recommendation for ways to improve the RWAP assessment process during the September 20, 2017 Full Board meeting
  - Up to two NSSAB members are invited to observe a RWAP facility evaluation and present their observations to the Full Board

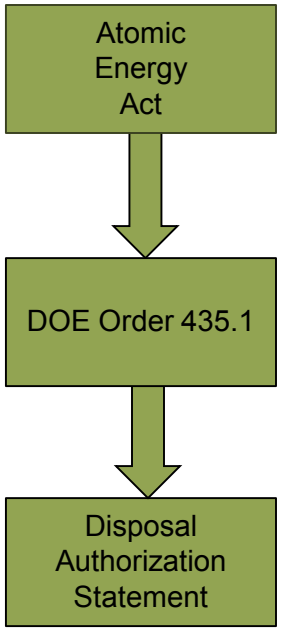
Background

- Cold War-related activities and nuclear research generated low-level waste (LLW) at sites across the country
- DOE is responsible for consolidating and disposing LLW generated by DOE clean-up activities
- Annually, the Nevada National Security Site (NNSS) historically disposes approximately 5% of the total waste generated in the EM Program



Regulatory Authority for LLW Disposal

- Atomic Energy Act of 1954, as amended
- DOE Order 435.1 and DOE Manual 435.1-1
  - Disposal Authorization Statement
    - Performance Assessment/ Composite Analysis (PA/CA) – analysis of the impacts to protect workers and public
    - Disposal Facility Monitoring Plan
    - Preliminary Closure Plan
    - Maintenance Plan
    - NNSS Waste Acceptance Criteria
    - Annual review of PA/CA
  - Independent review by LLW Disposal Facility Federal Review Group (LFRG)

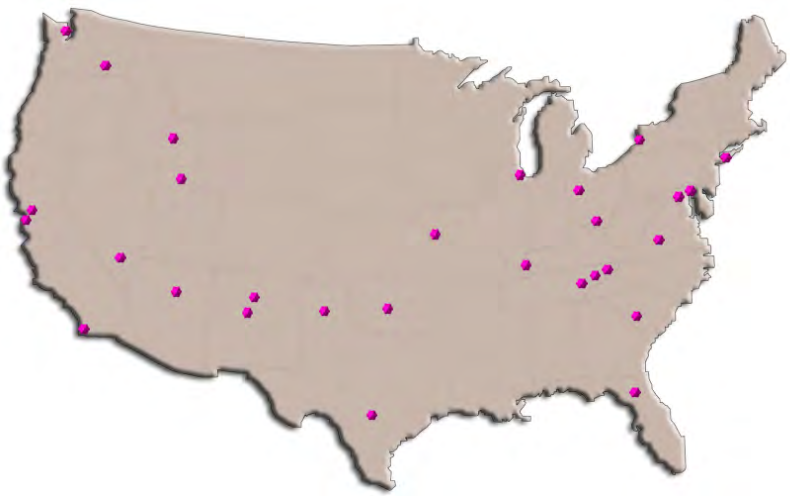


Advantages of LLW Disposal at the NNSS

- Low precipitation
- High evapotranspiration
- No surface water
- No pathway to groundwater
- Isolated location

Key Terminology

- Waste Generator Sites
  - DOE and some Department of Defense sites that generate LLW and mixed LLW radioactive waste
- Waste Stream
  - A waste or group of wastes with similar physical, chemical, and radiological properties from a process or a facility



Approved Waste Generator Locations*

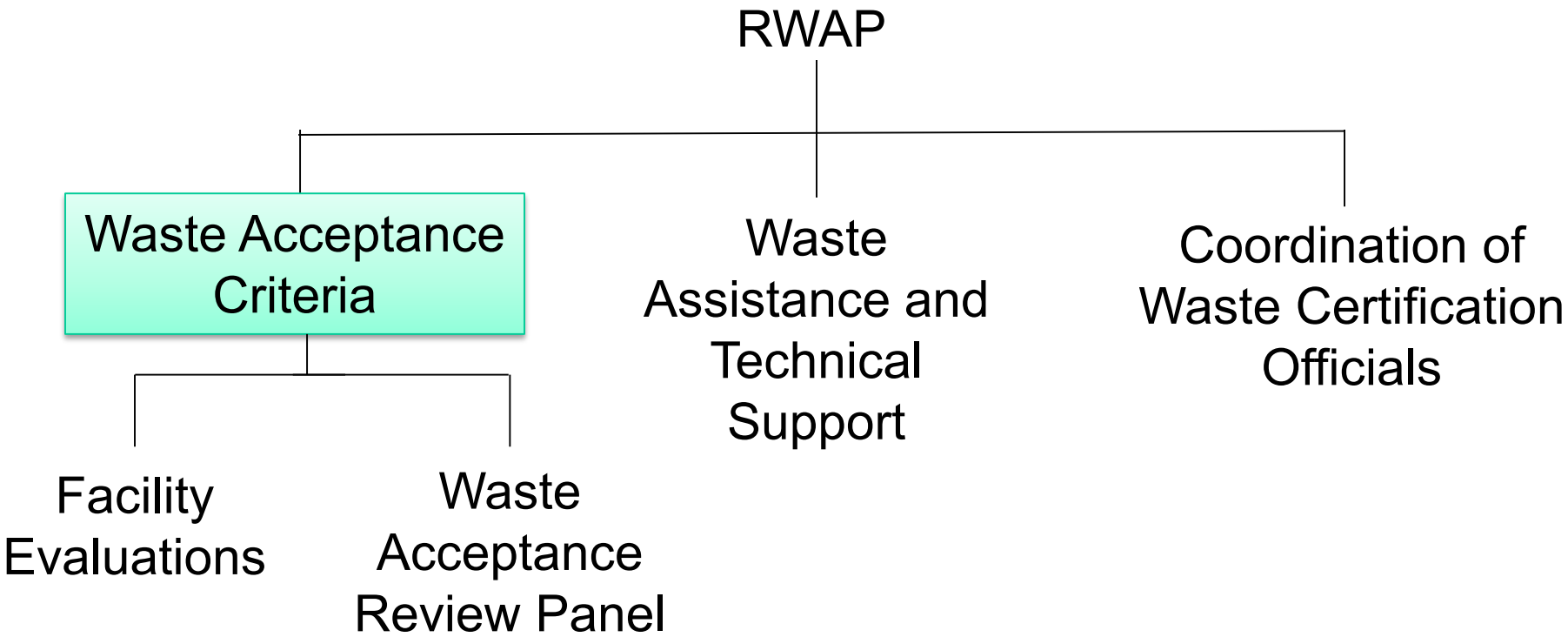
*some approved generators ship from multiple locations

Key Terminology
(continued)

- NNSS Waste Acceptance Criteria (NNSSWAC)
  - Document that establishes rigorous disposal acceptance criteria for waste generator sites and their proposed waste streams
- Waste Profile
  - Application by a generator to dispose a waste stream at the NNSS that demonstrates compliance with the NNSSWAC

Radioactive Waste Acceptance Program (RWAP)

The RWAP consists of three activities shown below:



Facility Evaluation Background

- Utilizing a schedule, the RWAP team reviews every active generator on an annual basis (generally with an on-site visit)

Facility Evaluation Background
(continued)

- Conducted by certified RWAP personnel at the generator's location:
  - Audit – *comprehensive* Waste Certification Program review
    - Review of entire program
    - Multiple day visit – 3 days on average
    - Planned – generator receives notification and provides requested program documents for RWAP review before on-site visit

Facility Evaluation Background
(continued)

- Surveillance – *focused* Waste Certification Program review
  - Review of a specific area with limited scope
  - Visit lasts 1-2 days on average
  - Generator receives minimal notification for security measures and logistical coordination

Purpose of RWAP Facility Evaluations

- Facility Evaluations evaluate compliance and implementation for the following program elements
  - Quality Assurance
  - Waste Traceability
  - Resource Conservation and Recovery Act (RCRA) Waste Characterization (hazardous waste characterization)
  - Radiological Characterization
  - Transportation

Quality Assurance (QA)

- Verify that generator has an approved site QA Plan demonstrating compliance to the NNSSWAC
- Verify that generator has an approved NNSSWAC Implementation Crosswalk and performed an annual review of referenced procedures, processes, and methods
  - Implementation Crosswalk - generator's description of how NNSSWAC requirements are met
- Verify that the generator has the required training to perform self assessments
- Verify waste disposal packaging and contents

Waste Traceability

- Verify waste containers are controlled to ensure integrity and packages are not compromised
- Verify inspections and acceptance testing are conducted
- Verify containers are properly stored, moved, and shipped
- Verify control of measuring and test equipment

RCRA Waste and Radiological Characterization

- Verify that waste characterization methods and procedures employed document the physical and chemical characteristics
- Verify that generator's waste characterization documentation matches the approved waste profile submitted to DOE
- Verify that controls are in place to verify and evaluate stabilization methods, packaging, labeling, sealing, separation, segregation, and prohibited item removal

Transportation

- Verify that drivers are U.S. citizens
- Verify that generators instruct drivers to use acceptable routes (i.e., avoid the Las Vegas metropolitan area and the O'Callaghan-Tillman Memorial Bridge)
- Verify that generators check packages before leaving their site
- Verify that generators are instructed to contact NNSS if shipment will be delayed

DOE Role

- Oversees waste acceptance and disposal and approve waste profiles
- Ensures environmental protection and worker and public safety
- Observes contractor during Facility Evaluations
- Documents observations and provides feedback to the contractor RWAP auditors and interfaces with the site Federal representatives

State of Nevada Division of Environmental Protection Role

- Oversees hazardous waste management as outlined in the State of Nevada RCRA permit (includes Federal Facility Agreement and Consent Order)
- Provides joint oversight with DOE by participating in RWAP processes per an Agreement in Principle
- Attends and observes DOE, NNSS Federal contractors, and generator during Facility Evaluations
- Reviews waste profiles for compliance with the NNSSWAC

Contractor Role

- Reviews waste profiles for compliance with the NNSSWAC
- Maintains and provides technical support for NNSSWAC
- Performs Facility Evaluations (audits, surveillances, and verifications) and oversees any corrective actions
- Recommends approval of waste streams that can be safely disposed at the NNSS
- Ensures the disposal facility will continue to meet requirements
- Ensures environmental protection and worker and public safety
- Ensures waste originated from DOE or Department of Defense

General Auditor Training

- Required Reading
  - RWAP procedures
  - NNSSWAC
  - Waste generator approval process
  - DOE Order 435.1 and Manual 435.1-1, “Radioactive Waste Management”
- On-the-job training
  - Checklist review and completion
  - Corrective action plan and objective evidence reviews
- Classroom training
  - Root cause analysis
  - Lead auditor classroom training; requires passing score on exam
- Proficient oral and written communication skills

Auditor Specific Training

- Auditor
  - Participate in a minimum of two RWAP Facility Evaluations under the guidance of a qualified Subject Matter Expert (SME)
- Lead Auditor
  - Participate in a minimum of two RWAP Facility Evaluations as Lead Auditor (LA) under the guidance of a qualified SME/LA
  - Required to undergo QA certification

Functional Specific Training

- Radiological Characterization Auditor
  - Participate in a formal training course in radiation detection, radiochemical analysis, or radioactive waste management
- Chemical Characterization Auditor
  - Participate in a formal RCRA training course
- Transportation Auditor
  - U.S. Department of Transportation Hazardous Transportation Training

Facility Evaluation Process

- Notify waste generator of Facility Evaluation
- Request program documents for review
- Review shipment discrepancy log
- Develop checklist

Facility Evaluation Process
(continued)

- Brief RWAP team of scope & responsibilities
- Perform interviews of generator personnel
- Observe work being performed
- Conduct in-briefing with generator personnel
- Evaluate and document objective evidence
- Issue report approximately 30 days after Facility Evaluation

Facility Evaluation Process (continued)

- Brief generator during exit meeting of any Observations and/or Finding(s)
  - Observation – a weakness in a generator's QA or waste certification program that, if left uncorrected, could result in a condition adverse to quality
    - Requires a written response by generator
    - Maintains approval to ship waste to NNSS
  - Finding – document that tracks deficient (requirement violation) conditions adverse to quality until satisfactorily resolved
    - Requires in-depth investigation by generator
    - May result in suspension of approval to ship waste to NNSS

Facility Evaluation Process
(continued)

- Formal Finding closeout process:
  - Generator determines a root cause based on its investigation
  - Generator provides a Corrective Action Plan (CAP) to RWAP that identifies the problem and the proposed solution
  - RWAP reviews the CAP and accepts or rejects until satisfied that generator has a viable solution
  - RWAP performs on-site verification once CAP is completed
  - If a suspension was put in place, it may be lifted once verification activities have been completed
  - Process takes approximately 60 days

NSSAB Path Forward

- Up to two NSSAB Members to observe an RWAP Facility Evaluation (surveillance) for Advanced Mixed Waste Treatment Plant, Idaho Falls, Idaho on August 28 - 31, 2017
- NSSAB Members report their observations to the Full Board at the September 20, 2017 meeting
- Full Board provides a recommendation for ways to improve the RWAP assessment process at the September 20, 2017 meeting

NSSAB Subcommittee Overview of Internal Peer Review Meeting

PER Review of Rainer Mesa/Shoshone Mountain
Interim Results of "Top Down" Streamline-Based Models using GoldSim

Meeting conducted 3/28/2017

Attendees: 9 committee members, (1 committee member was sick, not present),
11 interested parties, 3 from NSSAB (Overview)

Overview and conclusions:

The meeting was conducted in accordance with Agenda and Schedule. There was open discussion, with a multitude of questions and responses. At no time were there any extraneous activities. It was apparent that the subject matter presented was clear, understandable, and defendable. The Modelers and Presenters know their data. The meeting objectives were met. In conclusion, there are two recommendations and several observations.

Recommendations:

Overall, the NSSAB attendees were impressed with the professionalism and details provided by the meeting attendees. However, we recommend the following,

1. The presenters should be set up with voice enhancement system. It may even be helpful to include the committee members.
2. The chair (Mavrik Zavarin) should appoint someone from the committee to facilitate the meeting. The various breaks usually went too long and could have been reduced with some individual guidance. However, it should be noted that the meeting ended within the timeframe allowed with all business completed.

Observations:

The NSSAB members were tasked with observing the meeting process and not become involved with the technical aspects of the meeting. After the meeting, however, the three NSSAB members had some observations that may be helpful in the planning for the External PER review. They are:

1. The presentation materials, along with a list of final expectations should be sent to the external reviewers, in advance.
2. The presentation material should include a page of definitions
3. The package of materials, if sent to the external reviewers, should include a list of expectations.
4. The presentation slides should be boiled down to a few essential, while keeping the details limited and available.

Details:

Three members from NSSAB: Richard Twiddy, Bill Sears, and Ed Rosemark attended the meeting to evaluate the meeting efficiency with the goal of providing any suggestions or comments that could enhance any future meeting of a similar nature. In preparation, a detailed worksheet was developed and used to evaluate the various aspects of the meeting and its attendees (copy attached).

It was a very open meeting and quite clear, early in the meeting, that the chair was very interested in comments, suggestions, or questions regarding the subject matter from anyone who had an interest. There was never an incident whereby any individual question was censured or rejected for any reason. There was opportunity and plenty of open discussion. It appeared that all questions were adequately addressed and answered to most everyone's satisfaction. One of the biggest agreement from technical aspect was an agreement on terms, i.e. "conservative", "assume", "plausible". When to use and when not to use.

In the end the meeting did serve its purpose. There was achievement of the stated goals and objectives as well as future schedule of activities to complete the task.

Proposed Items to look for during the meeting of 3/28/17

Adequately facilitated?

All materials available?

Was there statement on original issue?

- Was meeting goals/objectives clearly stated in advance?
- Was there resolution eventually or agree to disagree?

Members Present?

- Were the decision makers in attendance?
- Authors?
- Stakeholders?
- Everyone in place on time?
- Anyone leave early?

Were there various and detailed questions asked and answered?

Was the atmosphere positive and open for all?

- Did anyone censor input?
- Is the atmosphere conducive for inclusion?

Did everyone have an opportunity to speak and question?

Were all discussions on point?

- Any extraneous discussion or wasted time?
- Anyone monopolizing the conversations?

Was there achievement of stated goals/objectives?

Final plan of action and schedule set before meeting ending?

Finish on time?

Groundwater Sampling Techniques Work Plan Item #5

C.E. Russell
Science Advisor, Desert Research Institute
Nevada Site Specific Advisory Board (NSSAB)
April 19, 2017

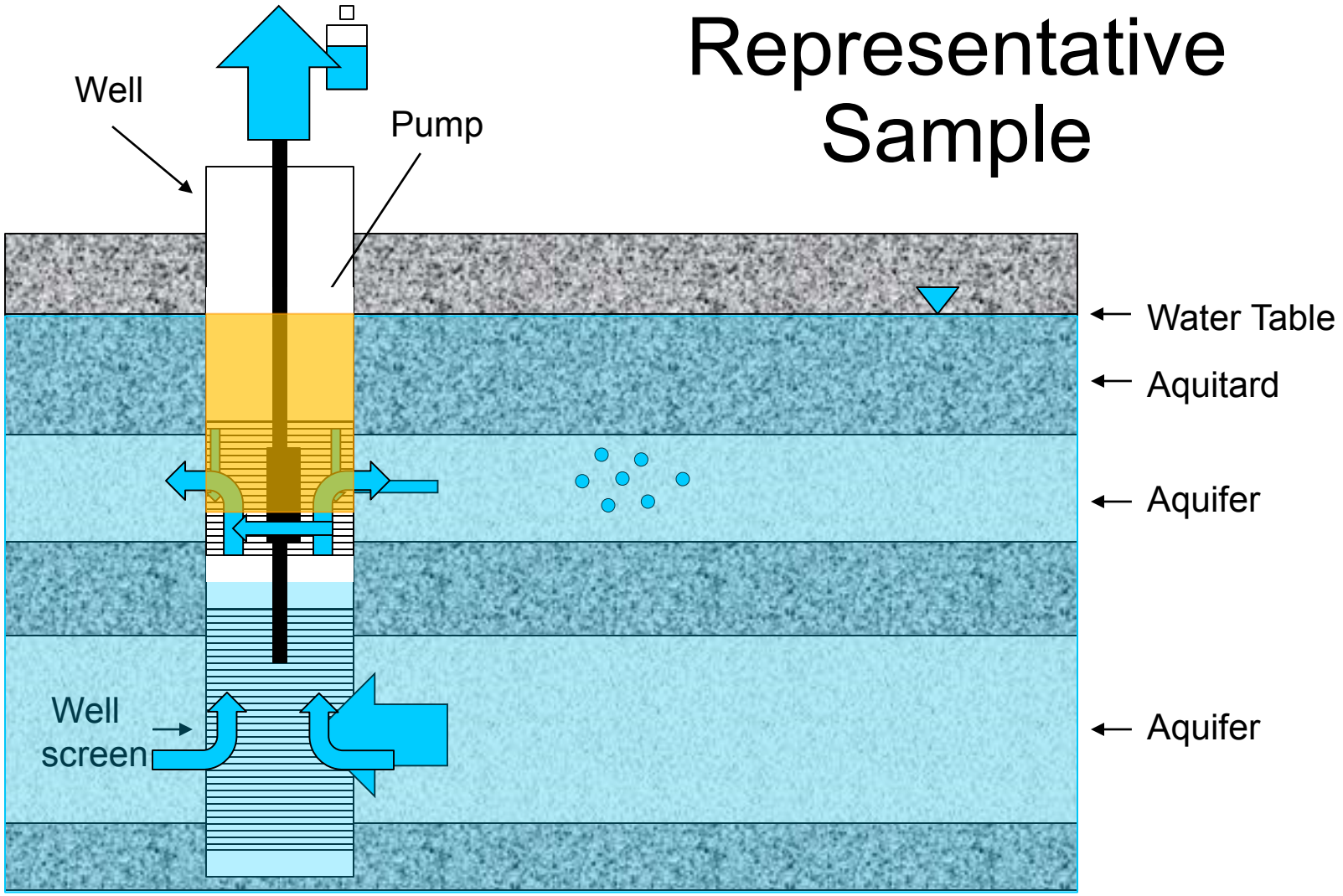
NSSAB Work Plan Item #5

From a community perspective, provide a recommendation to the Department of Energy (DOE), regarding use of existing and potential groundwater sampling techniques on the Nevada National Security Site (NNSS)

Objectives

- Inform NSSAB members of potential challenges that can be encountered during well purging and sampling
- Review work being conducted by the Underground Test Area (UGTA) Activity to evaluate alternative sampling technologies and to optimize existing processes
- Invite NSSAB members to participate in the process

Representative Sample



Considerations for Well Sampling

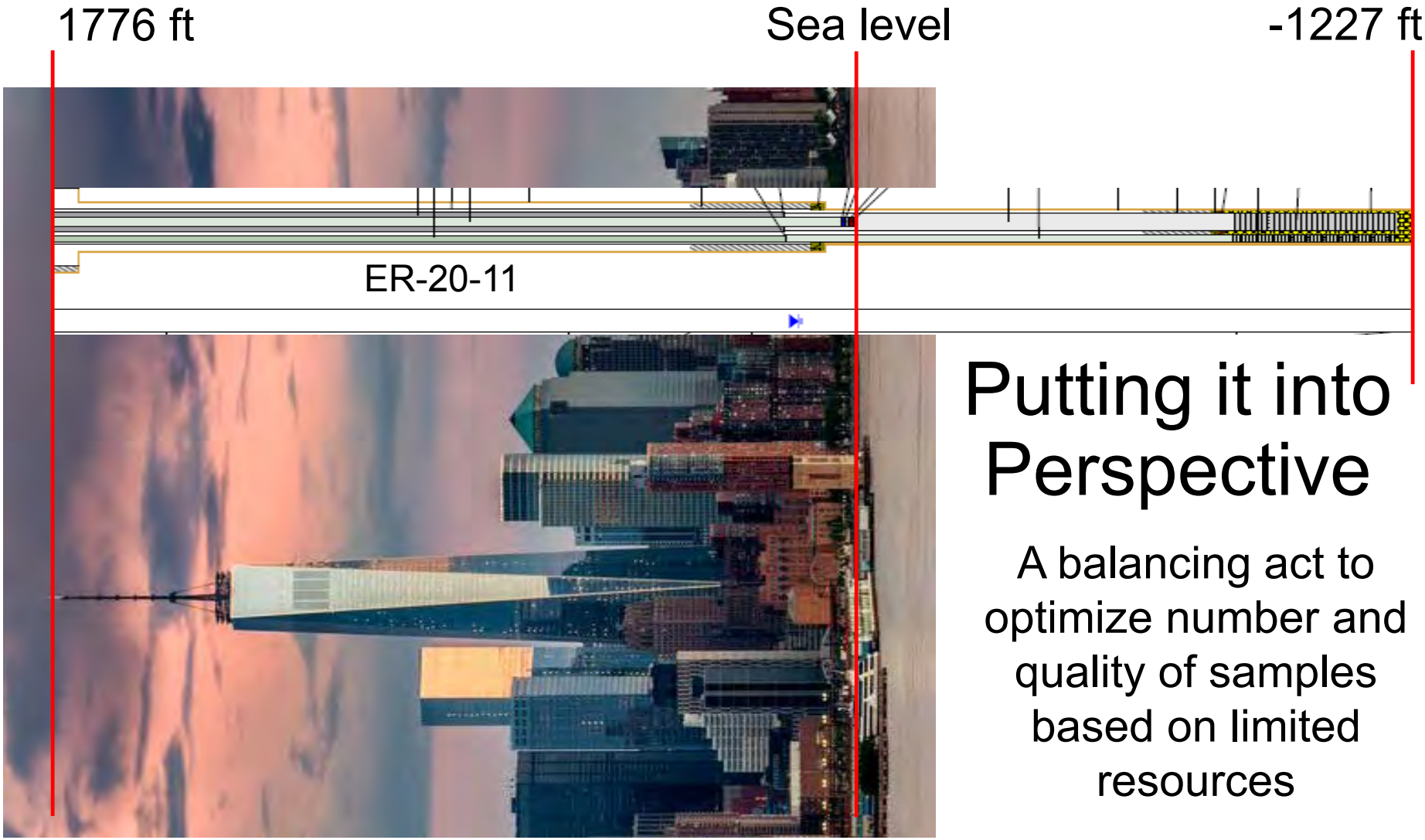
- Sample objective
- Analyte (contaminant) of concern and its properties
  - Volume of the sample
- Conceptual model of the site
- Aspects of well construction
  - Purge volume
- Frequency of sampling

NNSS Sampling Challenges

- Great depth to water
- Unique well completions
  - Limited technology options
  - Logistical difficulties when sampling wells with multiple zones
  - Deep wells store lots of stagnant water
    - One casing volume can be several thousand gallons

NNSS Sampling Challenges
(continued)

- Difficult and expensive to achieve large volume purge standards
  - Takes as much power as an average residential home uses in 3 days to lift 3 casing volumes to the surface
  - Remote and limited infrastructure
  - Storage of waste water at the surface



Putting it into Perspective

A balancing act to optimize number and quality of samples based on limited resources

Purging – Industry Standards

- Purge
  - Large Volume Purge – 3 to 5 casing volumes
  - Purge to Stabilization
  - Micro Purge (minimal drawdown)
- No Purge
  - Grab Samplers
  - Passive Samplers

UGTA Efforts to Increase Efficiencies and Decrease Costs

- Integrated Groundwater Sampling Plan
- Topical Committee on Well Development and Sampling
- Sampling Implementation Plan
- Field comparison of samples collected by bailing versus Jack Pump versus Submersible Pump
- Sample cost tracking
- Tritium bailer evaluation
- Panacea Pump

Integrated Groundwater Sampling Plan

- Comprehensive, integrated plan for collecting and analyzing groundwater samples to achieve UGTA objectives
  - Groups wells into categories based on sampling objectives
    - Category may change based on analytical results, modeling results, and/or other well-specific conditions
  - Identifies contaminants of concern and threshold concentrations that initiate specific actions per category (well type)
  - Integrates wells monitored under other programs if dual purpose
  - Standardizes analytical suite (radionuclides analyzed) and frequency per well type
  - Identifies suitable sample technologies based on well type and well construction

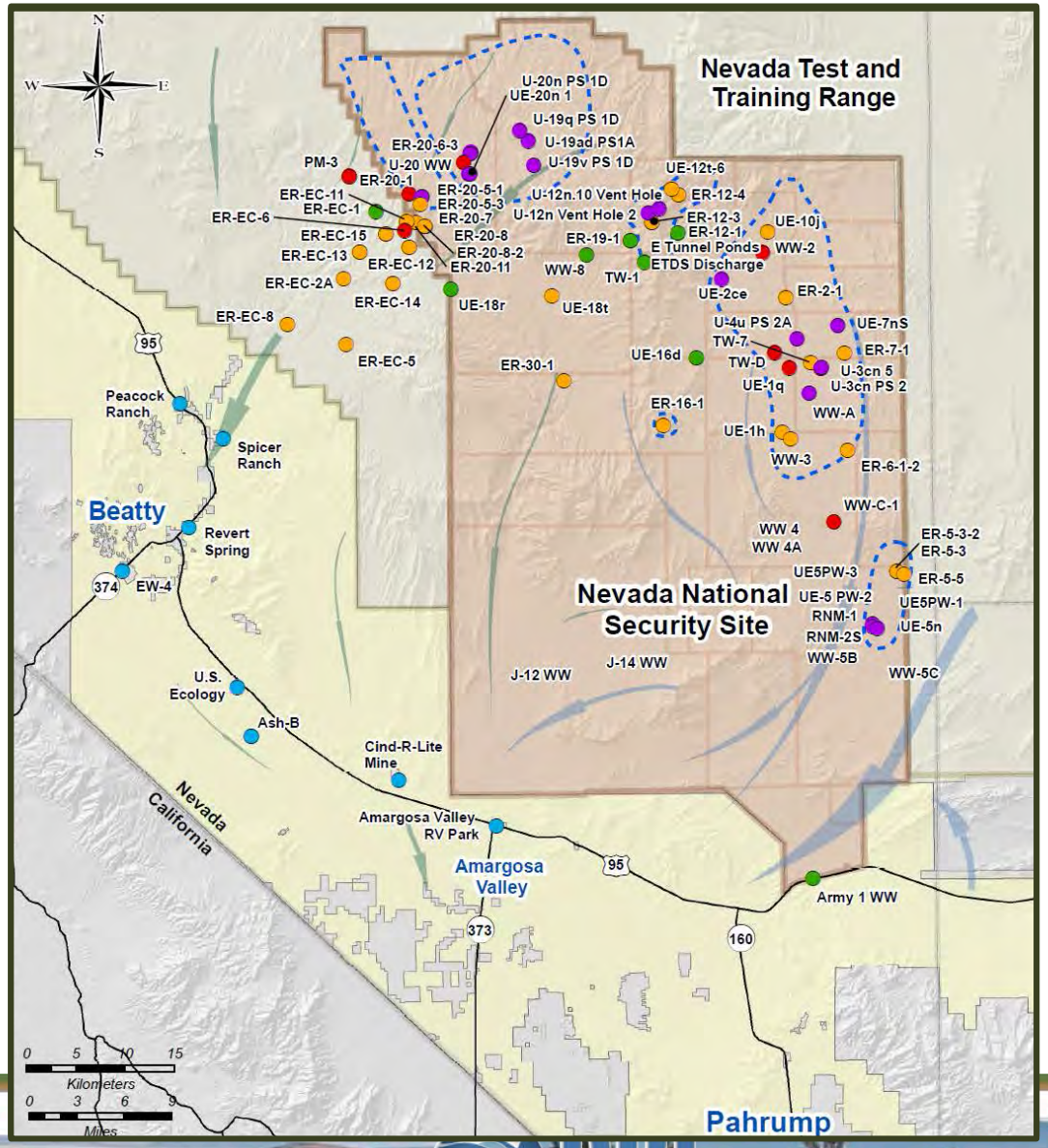
Well Sampling Locations by Types for Each Corrective Action Unit (CAU)

Type	Frenchman Flat	Pahute Mesa	Rainier Mesa/ Shoshone Mountain	Yucca Flat/ Climax Mine	Total
Characterization	2	21	8	8	39
Source/Plume	3	10	2	5	20
Early Detection	0	5	2	5	12
Distal	0	2	4	1	7
Community	0	9	0	0	9
Total Sampling Locations	**5**	**47**	**16**	**19**	**87**

NNSS Well Types

Explanation

- Characterization
- Source/Plume
- Early Detection
- Distal
- Community
- Underground Nuclear Test Location
- UGTA CAU
- U.S. Bureau of Land Management
- Groundwater flow direction – Arrow width indicates relative flow volume. Green and blue colors denote alluvial-volcanic and carbonate flow systems, respectively. Modified from Fenelon et al. (2010)



Topical Committee on Well Development and Sampling

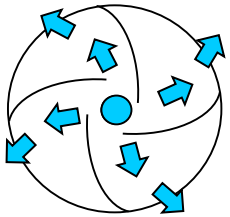
- Identified more cost-effective methods for collecting groundwater samples
  - Literature review of seven mobile and eight permanently deployed technologies for use in a variety of well designs found on the NNSS

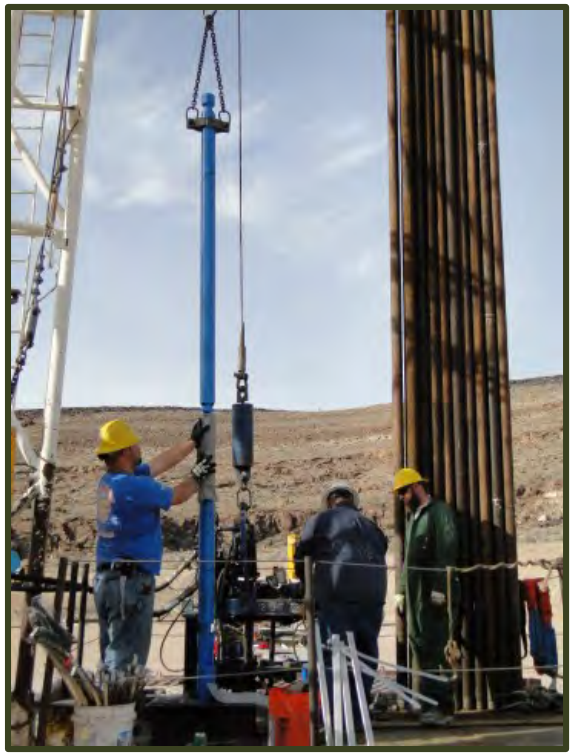
Topical Committee Recommended Technologies

- No Purge
  - Bailer (grab sampler)
  - Snap Sampler (passive sampler)

Topical Committee Recommended Technologies
(continued)

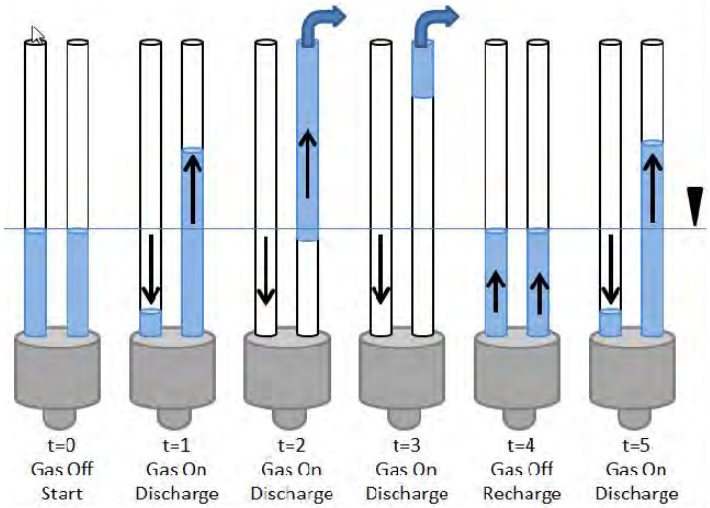
- Large Volume Purge/ Purge to Stabilization
  - Submersible Pump
  - Jack Pump



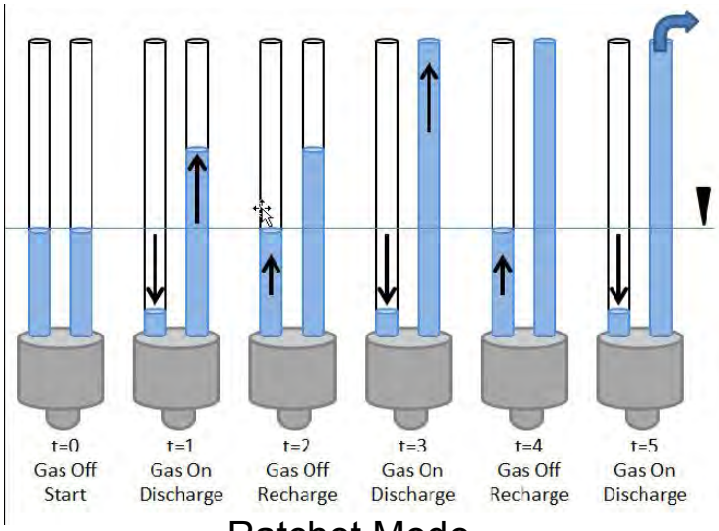


Topical Committee Recommended Technologies
(continued)

- Purge to Stabilization/Micro Purge
  - Bennett Pump
  - Panacea Pump



Purge Mode



Ratchet Mode

Sampling Implementation Plan

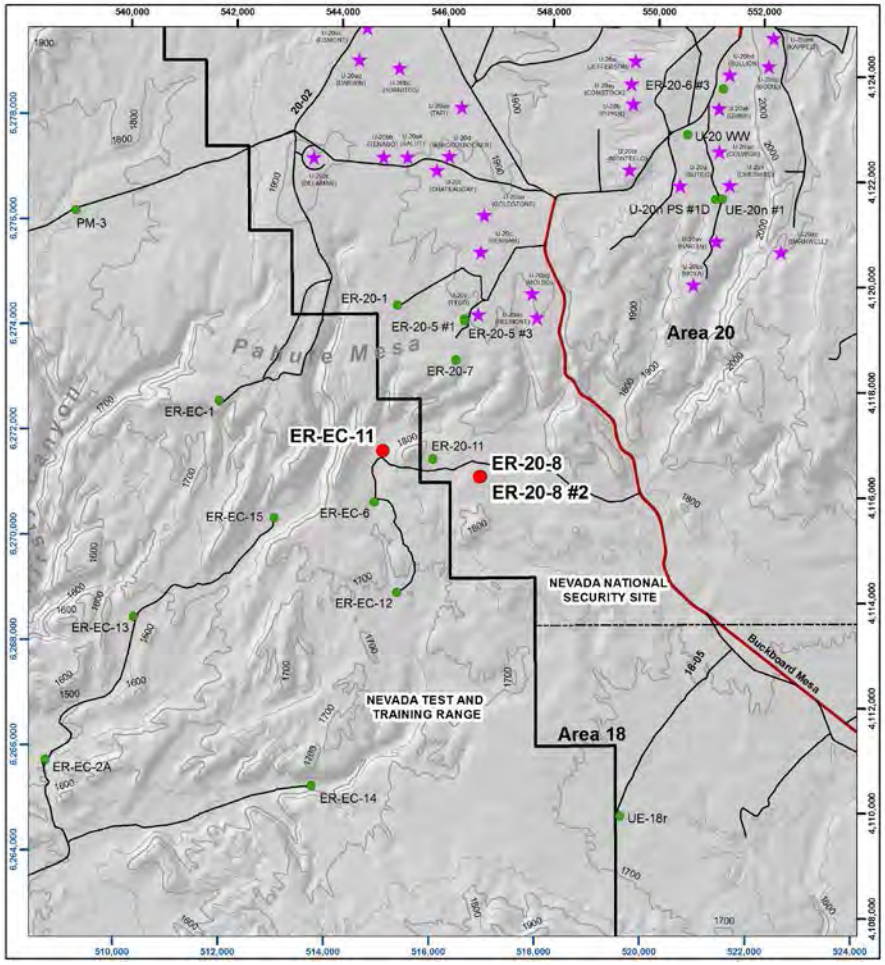
- Integrated Groundwater Sampling Plan partially implemented fiscal year (FY) 2015 – FY 2017 due to competing needs and limited resources
- Implementation plan prioritizes sampling efforts so that UGTA will be compliant by FY 2020
- Integrates ongoing water-level monitoring
- Recommends well-specific sampling technology
  - Use of bailer for early detection, distal and community monitoring wells where tritium is the only radionuclide
  - Recommends alternative analytical suites for characterization wells that cannot be purged using existing technology

Sampling Implementation Plan
(continued)

- Assigns organizational responsibility for sampling specific well types
- Improves quality assurance protocols

Field Comparison of Samples

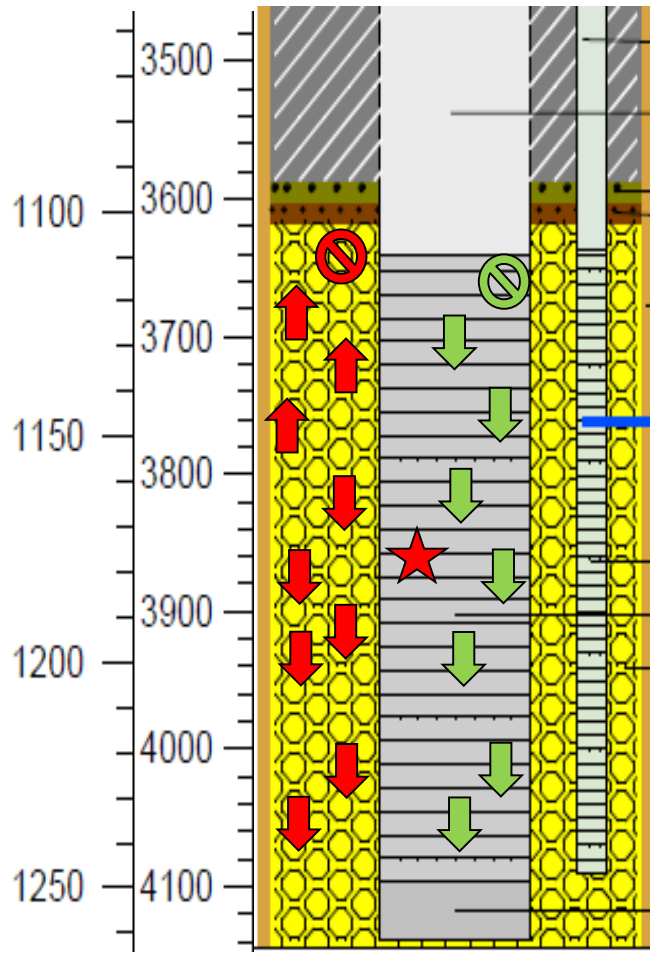
- Study conducted summer 2014 at ER-EC-11, ER-20-8, and ER-20-8 #2
- Compared relative costs, technology limitations, analytical results and appropriate purge volumes
- Collected multiple samples using a variety of techniques (Bailer, Submersible Pump, and Jack Pump)

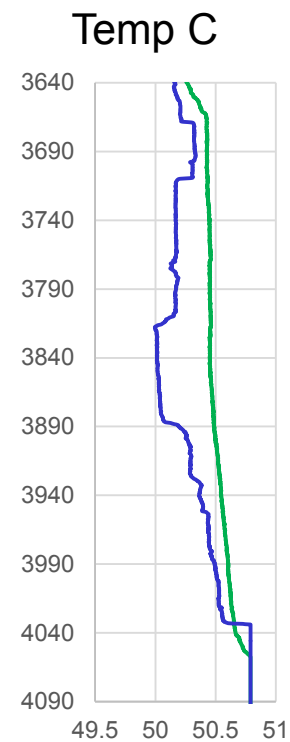


Field Comparison of Samples
(continued)

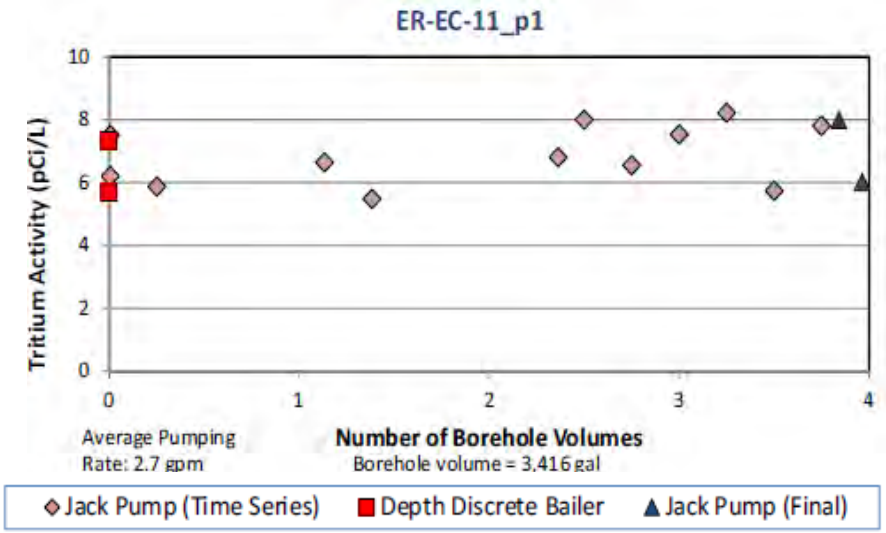
- Samples collected when appropriate purge volumes were reached and water-quality parameters (cloudiness, pH, electrical conductivity, dissolved oxygen and temperature) stabilized
- Tritium monitored over time to determine changes while purging
- Bailed samples depths selected based on analysis of previously collected flow logs

ER-EC-11 P1

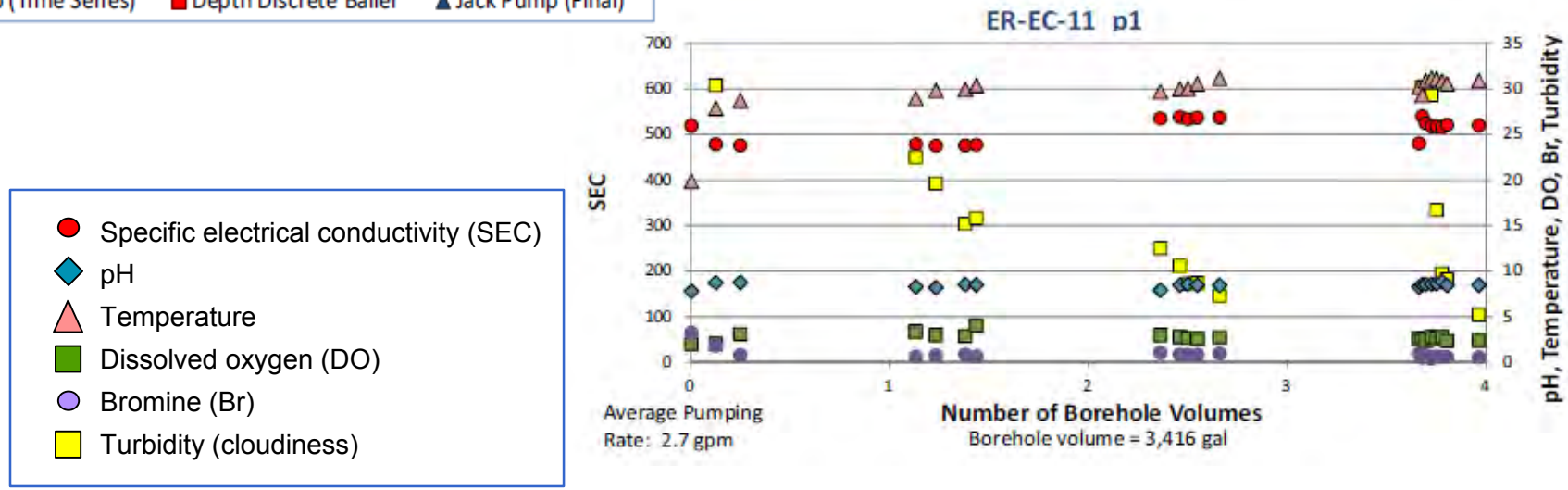




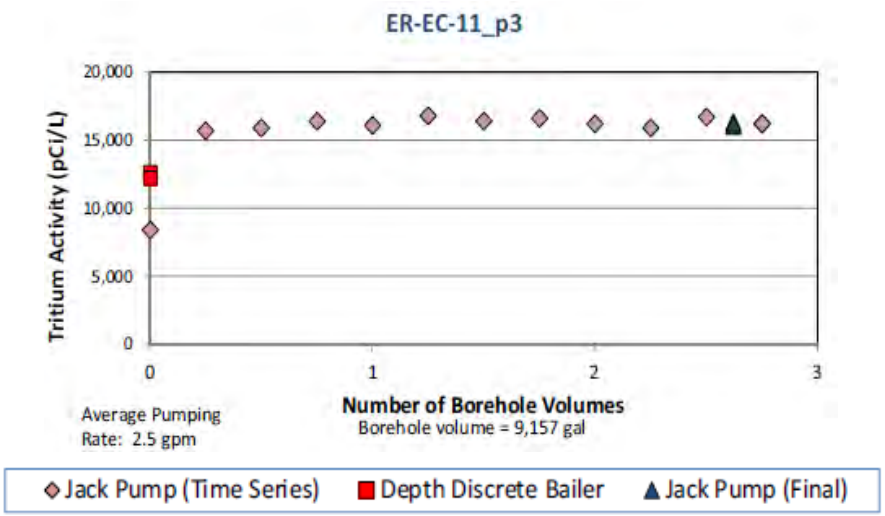
Field Comparison of Samples (continued)



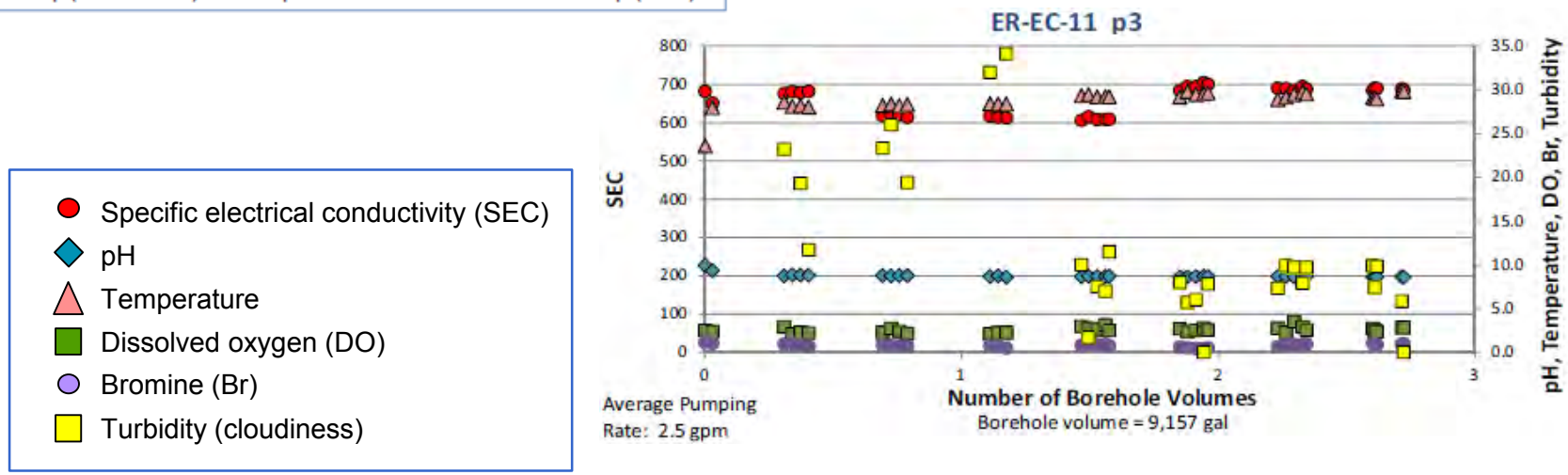
- Tritium stabilized more rapidly than all other parameters (0.25 well volumes)



Field Comparison of Samples (continued)



- All parameters but turbidity stabilized more rapidly than tritium (0.75 well volume)



Comparison Results

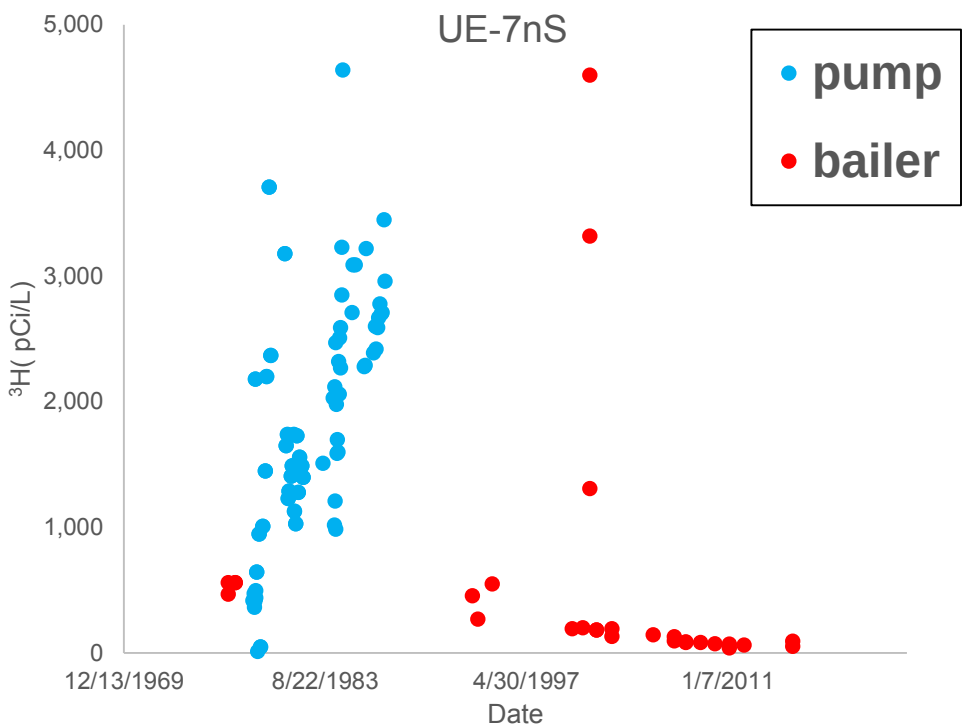
- Bailer sample depth should be identified based on temperature or flow logging
  - Limited volume samples
  - Results support bailing well types where the question focuses on "Is tritium present" (i.e. distal, early detection, and community wells)
- Jack Pump – resource intensive to deploy but only way to purge small diameter characterization or source plume wells
- Submersible Pump – resource intensive but the current technology of choice for large volume purge associated with characterization and source plume wells
- Characterization and source wells can be sampled after parameters stabilize or after three well volumes

Sample Cost Tracking

- Estimates of average labor hours required to deploy various technologies included in the field comparison report (Jack Pump 560 hours, Submersible Pump 305 hours, Bailer 90 hours)
  - These do not reflect a standardized cost/resource estimating methodology, nor was it cradle to grave
- UGTA is in process of developing a standardized method for capturing these costs to ensure future evaluations of appropriate technologies considers this important factor

Historical Evaluation of Pumped Versus Bailed Samples

- UGTA conducting evaluation of historical efforts where both bailed and pumped samples have been collected from the same well
  - Objective is to develop a greater body of evidence supporting the use of bailed samples (without purging) at distal, early detection, and community wells



BESST, Inc.

- Manufacturer of Panacea Pump
- Potential alternative to Jack Pump
- Demonstration of technology on the NNSS in September 2003
  - Depth to water was 1,650 feet
  - Pump deployed to 2,520 feet
  - 25 minutes to deploy to total depth, 9 minutes for water to reach surface once pump was pressurized
  - 1,250 pounds per square inch drive pressure – used 3 compressed bottles of nitrogen gas, discharge was 0.75 liters per minute

Purpose of Factory Visit to BESST, Inc.

- Observe and evaluate technology for health and safety concerns
- Discuss potential modifications to technology to optimize for use on NNSS
- Members of the Topical Committee who visited the factory will recommend “go” or “no go” to DOE for purchase

NSSAB Members Observe Panacea Pump – March 14, 2017

NSSAB Participation

- Updates tonight from Member Rosemark and Vice-Chair Bonesteel on their observations from the factory field trip to BESST, Inc.
- Provide recommendations/suggestions based on this presentation and member updates
- Continued updates to NSSAB at critical junctures
- Final NSSAB recommendation due at August 16, 2017 Full Board meeting

Factory Visit to BESST Inc.

Nevada Site Specific Advisory Board

Members
Amina Anderson
Michael Anderson
Arcadio Bolanos
Francis Bonesteel *(Vice-Chair)*
Michael D'Alessio
Karen Eastman
Pennie Edmond
Raymond Elgin
Charles Fullen
Richard Gardner
Donald Neill
Autumn Pietras
Edward Rosemark
Steve Rosenbaum *(Chair)*
William Sears
Cecilia Flores Snyder
Richard Stephans
Jack Sypolt
Richard Twiddy
Dina Williamson-Erdag

Liaisons
Clark County
Consolidated Group of Tribes and Organizations
Esmeralda County Commission
Nye County Commission
Nye County Emergency Management
Nye County Nuclear Waste Repository Project Office
State of Nevada Division of Environmental Protection
U.S. National Park Service

Administration
Barbara Ulmer, Administrator
Navarro
Kelly Snyder, DDFO
U.S. Department of Energy, Nevada Field Office

March 15, 2017

Ms. Catherine E. Hampton
Acting Program Manager for Environmental Management
U.S. Department of Energy, Nevada Field Office
P. O. Box 98518
Las Vegas, NV 89193-8518

SUBJECT: Nevada Site Specific Advisory Board (NSSAB) Recommendation for Fiscal Year (FY) 2019 Baseline Prioritization—Work Plan Item #8

Dear Ms. Hampton:

The NSSAB has completed its annual review and prioritization of the U.S. Department of Energy (DOE), Environmental Management (EM) Nevada activities for the FY 2019 budget submittal.

At the March 15 Full Board meeting, the NSSAB was provided a list of EM Nevada activities and was asked by DOE to prioritize them by related groupings. The items listed below were ranked by the Board from the highest to the lowest priority, as follows:

- Area 5 Radioactive Waste Management Disposal Operations
- Clean Slate III [Corrective Action Unit (CAU) 414]
- Rainier Mesa/Shoshone Mountain
- Yucca Flat/Climax Mine
- CAU 576
- Air Monitoring
- Central and Western Pahute Mesa

Thank you for the opportunity to participate in the annual budget prioritization process. The NSSAB would also like to thank the EM staff for their time to meet with the NSSAB to provide detailed information and answer questions.

We sincerely appreciate this support and look forward to your response regarding this year's budget submittal.

Sincerely,

Steven Rosenbaum, Chair

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Phone 702-630-0522 ◇ Fax: 702-295-2025
E-mail: NSSAB@nnsa.doe.gov ◇ Website Home Page: www.nnss.gov/NSSAB

Department of Energy
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MAR 2 2 2017

Steve Rosenbaum, Chair
Nevada Site Specific Advisory Board
232 Energy Way
North Las Vegas, NV 89030

RESPONSE TO THE NEVADA SITE SPECIFIC ADVISORY BOARD (NSSAB) FISCAL YEAR 2019 BASELINE PRIORITIZATION RECOMMENDATION – WORK PLAN ITEM #8

I would like to extend my gratitude to the NSSAB for taking the time to be briefed and to evaluate the tasks included in the fiscal year 2019 baseline for the U.S. Department of Energy, Environmental Management Nevada activities. The NSSAB's baseline prioritization recommendation is important to the Environmental Management Nevada program and will not only be considered in the development of our prioritized budget submission to Headquarters, but will also be sent directly to Headquarters in support of our fiscal year 2019 budget request.

I would also like to thank the NSSAB for the dialogue during the March 15, 2017, Full Board meeting on this work plan item. This discussion allows my staff to understand the board's perspectives and insights that will be utilized when making baseline prioritization decisions into the future.

If you have questions or comments regarding this recommendation, please contact Kelly K. Snyder at (702) 295-2836.

Catherine E. Hampton
Acting Program Manager
for Environmental Management

EMOS:12275.KKS

cc via e-mail:
D. A. Borak, DOE/HQ (EM-3.2)
M. R. Hudson, DOE/HQ (EM-3.2)
B. K. Ulmer, Navarro
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R. F. Boehlecke, NFO
J. T. Carilli, NFO
T. A. Lantow, NFO
K. K. Snyder, NFO
S. A. Wade, NFO
A. K. Weber, NFO
W. R. Wilborn, NFO
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