



Nevada Site Specific Advisory Board (NSSAB)

Full Board Meeting

**Frank H. Rogers Science & Technology Building
755 East Flamingo Road, Las Vegas, NV
4:00 p.m. – November 13, 2019**

Members Present: Amina Anderson, Frank Bonesteel (Chair), William DeWitt, Karen Eastman, Charles Fullen, Anthony Graham, Donald Neill, Steve Rosenbaum, Janice Six, Richard Stephans, Richard Twiddy

Members Absent: Pennie Edmond, Dick Gardner (Vice-Chair), Tanya Henderson, Dina Williamson-Erdag

Liaisons Present: Chris Andres (State of Nevada Division of Environmental Protection [NDEP]), John Klenke (Nye County Nuclear Waste Repository Project Office [NWRPO]), Phil Klevorick (Clark County), Patrick Lazenby (Nye County Emergency Management [NCEM])

Liaisons Absent: Richard Arnold (Consolidated Group of Tribes and Organizations [CGTO]), Leo Blundo (Nye County Commission), Jared Brackenbury (Lincoln County Commission), Delon Winsor (Esmeralda County Commission)

Department of Energy (DOE): Robert Boehlecke, Tiffany Gamero, Kelly Snyder (Deputy Designated Federal Officer [DDFO]), Bill Wilborn, Scott Wade and Carrie Stewart (National Nuclear Security Administration/Nevada Field Office [NNSA/NFO]),

Facilitator: Barbara Ulmer (Navarro)

Contractors/Government: Dona Merritt (by phone), Irene Farnham, and Ken Rehfeldt (Navarro), Ed Kwicklis (Los Alamos National Laboratory [LANL]), Maureen King and C.E. Russell (Desert Research Institute [DRI]), Ron Warren (Mission Support and Test Services, Inc. [MSTS])

Public Signed In: Chuck Baker, Rebecca Frus, Steve Reiner, Chip Winckler

Open Meeting/Chair's Opening Remarks

Chair Frank Bonesteel welcomed everyone to the meeting and thanked them for their attendance. He announced that Connie Wissmiller recently resigned from the Board. Member Richard Stephans made a motion to accept the agenda. The motion was seconded and passed unanimously.

Public Comment

There was no public comment.

U.S. DOE Update (*Robert Boehlecke, DOE*)

Mr. Robert Boehlecke opened that the Environmental Management (EM) Nevada Program is currently operating under a continuing resolution based on fiscal year (FY) 2019 funding of approximately \$60.1 million. The funding request for FY 2020 is approximately \$60.7 million, which is adequate to accomplish all planned EM activities at the Nevada National Security Site (NNSS).

Mr. Boehlecke reminded the Board that DOE issued the final Request for Proposals (RFP) for the Environmental Program Services (EPS) contract in July 2019. The final RFP is 100% set-aside for small business with a total estimated value of \$350 million over a ten-year ordering period. Proposals were due in September 2019. The current EPS contract with Navarro expires in January 2020.

Mr. Boehlecke updated that remediation of contaminated soil and debris was completed at Clean Slate III on the Tonopah Test Range (TTR) about a month ago. The EM Nevada Program worked closely to integrate tribal activities and blessings as an important part of the revegetation efforts. Reseeding activities began in November 2019 and should be complete by the end of the month. The EM Nevada Program is currently responding to NDEP comments on the draft Closure Report (CR) and anticipate submitting the final CR in December 2019.

Mr. Boehlecke reported on the transition of corrective action sites on the TTR to DOE's Office of Legacy Management (OLM). The OLM is a branch of DOE that has the mission of oversight and maintenance of the records associated with closed sites and any ongoing long-term monitoring and stewardship activities. The EM Nevada Program has completed environmental corrective actions at 70 sites on the TTR and Nevada Test and Training Range in accordance with the Federal Facility Agreement and Consent Order (FFACO). With completion of the last Soils site, EM Nevada Program is planning to transfer responsibility to OLM by September 2020.

Regarding the Underground Test Area (UGTA) Activity (groundwater), Mr. Boehlecke stated that approval was received from NDEP on the final Yucca Flat/Climax Mine Model Evaluation Report in August 2019. Approval was also received from NDEP to transition to the CR phase for Yucca Flat/Climax Mine in August 2019. Currently finalizing the CR for Rainier Mesa by incorporating comments received from NDEP in October 2019. During the last three months, the EM Nevada Program has completed sampling of three groundwater wells on Pahute Mesa and one more is scheduled for completion by the end of the month.

Mr. Boehlecke updated on the Classified Gaseous Diffusion Plant converters shipped to Paducah, KY for planned use as "spares." In October 2019, the first shipment was received at the NNSS

with eleven more planned during the next year under the currently approved profile. The shipments are over-dimensional and overweight that require travel during daylight hours and a pilot car under a permit issued by the Nevada Department of Transportation. The height of the shipment requires the load to travel along US-95 south past the NNSS exit to a turn-around point to enter NNSS from northbound US-95.

Mr. Boehlecke commented that France currently has four radioisotope thermoelectric generators (RTGs) with U.S. origin material requiring repatriation and disposition. As the RTGs have no further use, the U.S. has agreed to repatriate and to dispose at the NNSS. The RTGs would be required to comply with the NNSS Waste Acceptance Criteria (WAC) as any other waste and are similar to previously disposed RTGs. Shipment will be a Highway Route Controlled Quantity requiring a security plan and communications between carrier and transit states. The exact logistics have not been finalized, although plans are for the shipment to enter the U.S. at the Port of Charleston and trucked to the NNSS sometime in calendar year (CY) 2020.

Mr. Boehlecke noted that several experimental spheres generated by historic national security mission activities at the NNSS have been stored at the Area 5 Radioactive Waste Management Complex (RWMC) for a number of years. The spheres will be shipped to the Idaho National Laboratory in mid/late FY 2020 for repackaging to meet the Waste Isolation Pilot Plant (WIPP) waste acceptance requirements for transuranic waste.

Mr. Boehlecke informed the Board that closure activities began in October 2019 on the mixed low-level waste (MLLW) Cell 18 in Area 5 RWMC that reached capacity in August 2019. The replacement Cell 25 is operational and accepting MLLW.

Mr. Boehlecke updated on the Supplemental Environmental Project (SEP) that resulted from a Settlement Agreement with the State of Nevada due to waste sent by a generator to the NNSS that was not properly characterized and not in compliance with the Resource Conservation and Recovery Act (RCRA) permit. The SEP was fully executed in April 2019 and requires three tasks to be completed within a year of signing. Under the visual verification task, 46 of the minimum 40 required low-level waste (LLW) visual verifications at generator sites were performed in FY 2019. The real-time radiography task was completed with 103 of the minimum 100 required containers examined in FY 2019. Regarding the third task, the Radioactive Waste Acceptance Program (RWAP) has completed a deep dive review of all the waste profiles. A number of waste profiles remain that RWAP will re-review during onsite generator facility evaluations with completion expected in the next couple of months. These reviews will be followed-up with a report. Expenditures have slightly exceeded the \$430,000 required by the SEP. Completion of all requirements and reporting is anticipated in the spring timeframe.

Mr. Boehlecke mentioned recent events/stakeholders meetings conducted by EM Nevada Program staff (time period is September 19, 2019 - present):

- October 2 – NSSAB FY 2020 work plan tour of the NNSS (nine members of NSSAB attended)
- October 17 – Groundwater Open House at the community center in Beatty, NV (27 public attendees, including a girl scout troop who received a demonstration on a groundwater model)
- October 28-30 – EM Site-Specific Advisory Board (SSAB) National Chairs meeting in Sun Valley, ID
- November 6 – Low-Level Waste Stakeholders Forum meeting in Las Vegas, NV (28 attendees)

- November 13 – Intergovernmental Liaison meeting
- November 13 – Full Board NSSAB meeting

Mr. Boehlecke continued with upcoming presentations/meetings/conferences of interest to be conducted by the EM Nevada Program (time period is September 19 – present):

- November 19-21 – 2019 DOE EM Intergovernmental Meeting (IG) in Nashville, TN
 - November 20 - Panel discussion on communications at multi-user sites (including NNSS)
 - November 20 - Waste Coordination Leadership Group (6-month update) presentation to State of Nevada
 - November 20 - EM-1 and other EM Headquarters staff side-bar meeting with Nevada Intergovernmental Liaisons
- December 3 – RWAP participation in a NNSA Legacy Remediation Programs panel discussion at the PermaFix Nuclear Waste Management Forum in Nashville, TN
- January 15 – Intergovernmental Liaison meeting in Pahrump, NV
- January 15 – Full Board NSSAB meeting in Pahrump, NV
- January 21 - EM Nevada Program mission update at Nye County Commission meeting in Pahrump, NV
- February 5 - Low-Level Waste Stakeholders Forum meeting in Pahrump, NV

Mr. Boehlecke continued with an update regarding the Y-12 waste event that resulted from its contractor, Consolidated Nuclear Security, LLC (CNS), completing ten shipments containing 33 containers between January 2013 and December 2019 to the NNSS that were in violation of the NNSSWAC. After an investigation, CNS Y-12 submitted a corrective action plan that was accepted by the EM Nevada Program in October 2019. CNS Y-12 is currently working on the corrective actions. All shipments from CNS Y-12 have been suspended. Before shipments can resume, all corrective actions are required to be completed, all documentation must be accepted by the EM Nevada Program, and a full facility evaluation conducted by a RWAP Team to include validation of the corrective actions. RWAP performed a surveillance on the Pantex plant, also managed by CNS, to review the objective evidence and verified that Pantex did not have similar issues. It is expected that Pantex will be allowed to resume shipments to the NNSS in the coming weeks.

As a result of the Y-12 event, several other actions are being undertaken:

- Ongoing DOE-wide assessment by the DOE Office of Enterprise Assessment to evaluate generator sites across the complex for opportunities for improvement and lessons learned
- New lines of inquiry developed to more deeply interrogate waste profiles to ensure full understanding what is contained in a waste stream
- Prioritizing onsite verification of profiles with classified waste to ensure full understanding what is contained in a waste stream
- Continuing to evaluate lessons learned and potential improvements with additional actions expected as a result to further strengthen the program
- Completed an assessment required by the DOE Office of EM
- Conducting a causal analysis to identify additional ways to strengthen the program

Mr. Boehlecke noted that additional updates will be available on the Y-12 waste event as the EM Nevada Program works through the process. The EM Nevada Program has reviewed all the information provided by CNS Y-12 regarding the characterization of the waste has been provided to the State of Nevada for its review.

Mr. Boehlecke stated that the EM Nevada Program moved from the North Las Vegas Facility to the Molasky Corporate Center in downtown Las Vegas at the end of September 2019. The building is an energy-efficient building that is certified LEED gold. Office space was reduced from 40,000 to 15,000 square feet and provides flexibility to continue reducing space as the EM Nevada Program nears completion. Considering upfront costs and anticipated escalation rates, the move is estimated to save more than \$3 million over the life-cycle of the program.

Mr. Boehlecke concluded that transuranic shipments from the Lawrence Livermore National Laboratory (LLNL) to the WIPP in New Mexico are planned for transport through Nevada in April 2020. These are the first transuranic shipments made in a number of years by the Department through Nevada.

NNSA Update (*Scott Wade, NNSA*)

Mr. Scott Wade updated that the NNSA has a budget of approximately \$700 million for current NNSS missions, such as, stockpile stewardship, nonproliferation, and emergency response activities. The NNSS is a high nuclear experimentation location that requires the NNSA to field and be prepared to conduct activities safely. For example, the NNSA manages and sustains the 300 miles of paved roads, 300 miles of unpaved roads, 125 miles of power lines, water lines, waste water lines, and communication networks. There are over 500 surface facilities on the NNSS that were constructed in the 1960s or earlier; so they are antiquated. NNSA has convinced HQs that the budgets going forward to the U.S. Congress provide funding to begin replacing some of these structures. One of the first of these structures was just completed and is to be commissioned next month. Named the Mercury Modernization Effort, the NNSA is systematically working through the old base camp in Mercury to replace structures with modern attributes to attract a modern work force. There are plans for another seven buildings, and NNSA anticipates funding for the design for a second structure this fiscal year. Mr. Wade went on to note that there are activities underway in the field at the Device Assembly Facility and the U1A Facility. The U1A Facility is a major investment element for DOE and NNSA and almost a half a billion dollars is planned to greatly enhance the facility to support stockpile stewardship. Mr. Wade concluded that the NNSA work force numbers are increasing, and the NNSS management and operating contractor (MSTS) is promoting Science, Technology, Engineering and Mathematics (STEM) activities to attract the expertise and work force of tomorrow.

Liaison Updates

Clark County (*Phil Klevorick*)

Liaison Phil Klevorick reported that he participated in Western Governors' Association and Western Interstate Energy Board meetings held in Las Vegas, NV a couple of weeks ago. The meetings predominantly focused on transuranic waste and its transportation. He attended the Low-Level Waste Stakeholders Forum last week. Next week, he will be attending the intergovernmental meeting in Nashville, TN. During one of the side meetings, DOE EM and NNSA will meet with legislative, state, and county representatives from Nevada. Liaison Klevorick reiterated that LLNL will be shipping transuranic waste through Nevada to WIPP. Prior to shipments, there will be a road show for training and refreshers for emergency responders on the requirements for inspections. Liaison Klevorick concluded that he is on the STEM board for the Clark County School District (CCSD). He is working on skills development within the curricula for the high and middle schools; so students are better prepared for the work force. Liaison Klevorick has found that CCSD and centers for higher education do not consult with industry on future workforce needs; so he is involved with a program to bring industry to the educational component

to have discussions. A session is being planned for January 2020 on cybersecurity and software development that is one of the focuses for MSTs who is sponsoring the program.

NCEM (*Patrick Lazenby*)

Liaison Patrick Lazenby had nothing new to report.

NWRPO (*John Klenke*)

Liaison John Klenke reported that Nye County is in its fifth year of a seven-year DOE grant to conduct tritium sampling and participate in preemptive reviews of the UGTA corrective actions units (CAUS). Under the Tritium Sampling and Monitoring Program (TSaMP), Nye County samples springs and wells downgradient of the NNSS. In the past five years under the TSaMP, Nye County has detected no tritium. In early November 2019, Liaison Klenke continued that he presented at the Beatty Town Board meeting to provide TSaMP results and acquire potential sampling locations for CY 2019. He will be giving a similar presentation at the Amargosa Town Board meeting in late November 2019. Sixteen of the twenty well locations have been sampled to date with four locations remaining to be sampled by the end of CY 2019.

NDEP (*Christine Andres*)

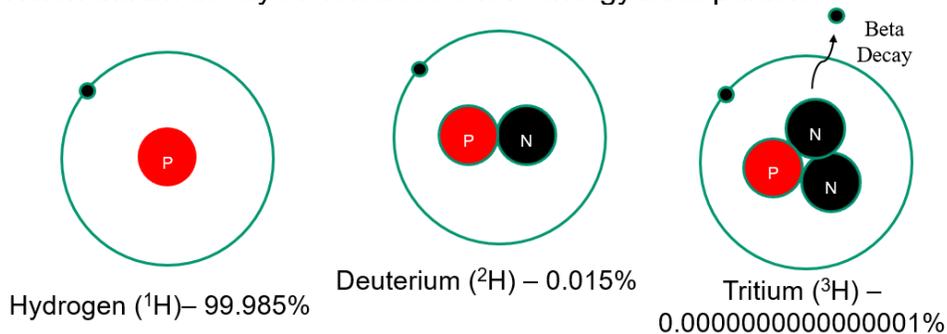
Liaison Christine Andres added to Mr. Boehlecke's update that NDEP participated in a comment resolution meeting yesterday on the CR for Clean Slate III. The final CR is due in December 2019 that will close all the Soils sites. In regard to the IG meeting, she was nominated to the planning committee several years ago. This year, she volunteered Nevada to host a panel discussion on the positive working relationship between the different organizations (Federal, State, and local governments) who work together toward a common goal of closure of sites and moving to long-term stewardship and also to share lessons learned. Liaison Andres noted that the MSTs president will be participating in a STEM and work force panel to share STEM activities happening in Nevada. Liaison Andres concluded that the State of Nevada is currently reviewing the Y-12 information before moving forward.

What Does 20,000 pCi/L of Tritium Actually Mean? and What is the Risk Associated with It?

(*C.E. Russell, DRI*)

- **The Basics – What is Tritium?**

- There are different types of hydrogen and the abundance varies
- Tritium is the radioactive form of hydrogen
- When tritium decays it releases a low energy beta particle



- **Sources and Inventory of Tritium**

- Tritium is produced naturally in the environment and by man primarily through nuclear testing and nuclear reactors
 - The natural production rate of tritium is about 0.33 to 0.44 pounds (lbs)/year

- Some tritium accumulates each year and a little decays away; the processes balance out eventually, resulting in a total of about six (6) to eight (8) lbs on earth due to natural processes
- The amount injected into the atmosphere by atmospheric nuclear testing during the 1950s to 1960s was about 1,036 to 1,486 lbs
 - As of 2019, approximately 44 lbs remain in the hydrosphere with the remainder decaying away to helium-3 (non-radioactive)
- As of 2019, the amount that remains in the subsurface of the NNSS due to underground nuclear testing is approximately 4.9 lbs (*NNSS Radionuclide Inventory, 1951-1992: Accounting for Radionuclide Decay through September 30, 2012, LA-UR-16-21749, Los Alamos, NM: Los Alamos National Laboratory*)
- Operation of a typical 900 megawatt pressurized reactor releases about 0.000066 lbs of tritium per year
- Other sources exist, however, their contributions are marginal

- **Tritium Can Be Detected in Amazingly Small Amounts**

- Lower detection limit for **specialized** analysis:

$$1 \text{ picocurie per liter} = \frac{3 \text{ Tritium Atoms}}{10,000,000,000,000,000,000 \text{ Hydrogen Atoms}}$$

or

0.3 parts per Quintillion

(Not parts per thousand, not parts per million, not parts per billion, not even parts per trillion, but a million times more accurate than that)

- Lower detection limit for **routine** analysis:

$$1,000 \text{ picocuries per liter} = \frac{310 \text{ Tritium Atoms}}{1,000,000,000,000,000,000 \text{ Hydrogen Atoms}}$$

or

310 parts per Quintillion

(Not parts per thousand, not parts per million, not parts per billion, not even parts per trillion, but a million times more accurate than that)

- **The Regulatory Standard**

- The U.S. Environmental Protection Agency's (EPA's) dose-based drinking water standard of four (4) millirem per year (more on this later) is assumed to be achieved by drinking water containing:
 - 20,000 picocuries per liter of tritium
 - Two liters per day
 - Every day for a year

- **So What is 20,000 pCi/L?**

- pCi/L stands for picocuries per liter
 - A liter is one (1) liter of water
 - A curie is the amount of any radioactive substance that produces 37 billion radioactive disintegrations every second
 - A disintegration is a process by which an unstable atomic nucleus loses energy by emitting radiation, such as an alpha or beta particle

- A pico is a **very very very** small portion of something (one trillionth) of that thing

$$\text{pico} = \frac{\text{Something}}{1,000,000,000,000}$$

- How Much Activity is Occurring in a Liter of Water Containing 20,000 pCi/L?

$$20,000 \text{ pCi/L} = 740 \text{ disintegrations per second}$$

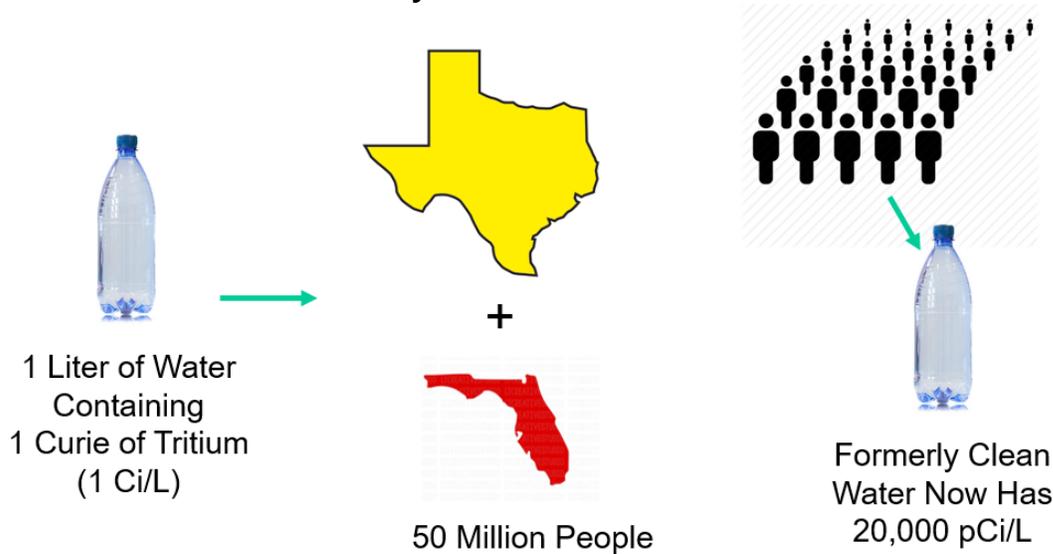


- How Much Tritium is in that Bottle?

$$20,000 \text{ pCi/L} = 2 \text{ trillionths of a gram (g) of tritium (0.000000000002 g)}$$



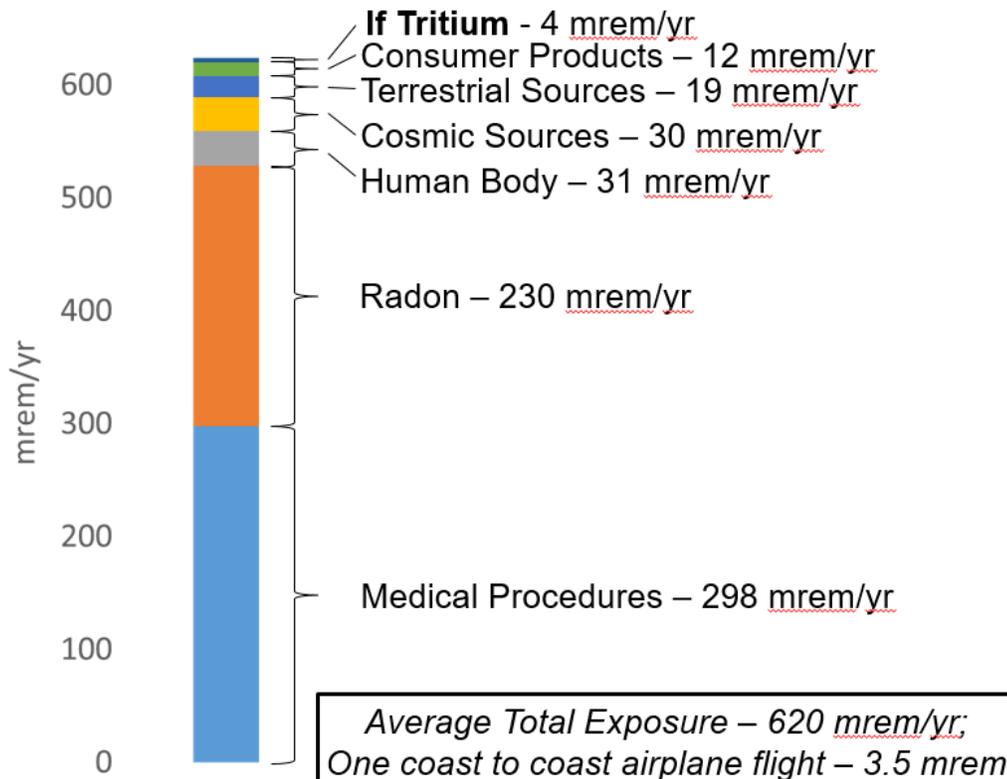
- **How Do I Relate to This Very Small Amount?**



- **What is a Four (4) Mrem Dose?**

- A rem is a unit of effective absorbed dose of ionizing radiation in human tissue
- 1/1,000 of a rem is called a mrem
- On average, a general member of the public receives 620 mrem/year (yr) from all sources, including medical
- According to the EPA, drinking two (2) liters of water that contains 20,000 pCi/L every day for a year will give a dose of four (4) mrem/yr
- How does that compare to the other sources of radiation that comprise the average total dose of 620 mrem/yr?

- **Putting It into Perspective**



- **The Risk of Chronic Exposure**

- Chronic radiation dose is a small amount of radiation received over a long period of time
- The principal effect of chronic radiation dose is an increased risk of contracting cancer
- Latent Cancer Fatality: The likelihood that a dose of radiation will result in death from cancer at some future time
- **Effects of Chronic Radiation**
 - The EPA has **estimated** that consumption of four (4) mrem of beta/photon emitters in drinking water over a lifetime may result in an individual fatal lifetime cancer risk of .000056 (5.6×10^{-5} or 1 out of 17,857 people)
 - To date, **no human studies have demonstrated that tritium causes cancer** (Canadian Nuclear Safety Commission, 2010)
 - Tritium has been shown to induce cancer in mice, but only at extremely high doses (i.e., in excess of 50 rem)
 - American Cancer Society estimates lifetime risk of an individual dying of cancer from all causes as 0.2 (one out of five)
- **Reference Doses in Other Countries**
 - Reference Dose: the level of radiation dose above which it is not appropriate to plan to allow exposures to occur and below which protection and safety are optimized
 - World Health Organization recommends a reference dose level of ten (10) mrem per year for assessing health risks to an individual from prolonged exposure to radionuclides in drinking water
 - International Atomic Energy Agency (IAEA) Basic Safety Standards (IAEA, 2014) recommends a reference level of 100 mrem per year
 - Most countries adopted standards along these guidelines
- **Tritium Drinking Water Guidelines by Country**

Country	Reference Dose Limit (mrem per year)	Tritium Standard (pCi/L)
Australia	100	2,056,838
Finland	50	810,811
Switzerland	10	270,270
World Health Organization	10	270,270
Russia	10	208,108
Canada	10	189,189
United States	4	20,000**
European Union (EU)	10	2,703*

*EU Dose Limit

**U.S. Standard adopted in 1976. 2003 update recommended 60,891 pCi/L -> old standard maintained as it was protective of human health.

- **NNSS Groundwater**
 - Distance to closest offsite receptor is 13.8 miles
 - Current models do not predict contaminants to reach offsite populations at levels that exceed regulatory thresholds
- **Take Homes Messages – Part 1**
 - There is a surprisingly small amount of tritium on earth

- It takes only a very, very, very small amount of tritium to be detected
- Two trillionths of a gram of tritium in a liter of water is equivalent to 20,000 pCi/L
- U.S. reference dose level for beta emitters is 2.5 to 25 times less than that of most other countries
- U.S. has purposely underestimated (by a factor of three [3]) the tritium activity that will yield a four (4) mrem dose
- The U.S. regulatory standard of 20,000 pCi/L is approximately a factor of ten (10) less than other countries
- **Take Homes Messages – Part 2**
 - Distance to the closest offsite receptor is 13.8 miles
 - Current estimates indicate contaminant transport off the NNSS and Nevada Test and Training Range will not exceed regulatory standards
 - Multiple monitoring wells lie between the NNSS and downgradient populations to track the movement of the tritium plume
 - Only one well of the NNSS (although located on restricted Federal land) contains tritium that is close to exceeding the regulatory standard
- **Questions**

In response to Board questions, the following clarifications were provided:

- One half-life of tritium is around 12.3 years. The rule of thumb is that it takes ten half-lives for the radioactivity of tritium to decay below the regulatory standard, including the water inside test cavities.
- The regulatory standard for tritium imposed by the EPA is a very conservative and protective approach. It is predicted that no tritium levels above the regulatory standard will reach any receptor. No person has access to NNSS groundwater in order to ingest a tritium dose elevated enough to result in some sort of cancer.
- Tritium is no longer produced on the NNSS. A small amount of tritium is produced annually by nuclear reactors.
- Biota (plants and animals) samples are collected on the NNSS and analyzed for radionuclides. The results are reported annually in *Chapter 8: Radiological Biota Monitoring* in the *NNSS Environmental Report* that is publicly accessible at <http://www.nnss.gov/pages/resources/library/NNSSER.html>
- Tritium is the most common radionuclide found in groundwater at the NNSS. Tritium is the most mobile in groundwater; therefore, a perfect tracer to indicate that other contaminants may be present. Tritium is also easy and economical to measure for concentrations. Without the presence of elevated levels of tritium, other radionuclides are unlikely to be found at elevated levels in groundwater.

Other NSSAB Business (*Frank Bonesteel, Chair*)

Chair Bonesteel asked Members Steve Rosenbaum and Don Neill for an update on the tour of Idaho National Laboratory and the fall EM SSAB National Chairs Meeting that they attended in Sun Valley, Idaho in October 2019. Member Rosenbaum reported that the draft recommendation on infrastructure improvements that he brought forward met with much discussion whether it was within the purview of EM. The draft recommendation ultimately was not passed by the EM SSAB. Member Neill noted that the draft recommendation letters underwent extensive wordsmithing by the EM SSAB during the meeting before going forward. He also commented that other EM sites received much larger budgets than Nevada.

During the meeting, the EM SSAB developed two draft recommendations for consideration by the eight local boards. The first draft recommendation focused on “Improving Public Involvement in the DOE EM Budget Process.” Member Charles Fullen made a motion to endorse this draft recommendation. The motion was seconded and passed unanimously. The second draft recommendation that was proposed was “Disposition and Transport of Nuclear Material.” Member Fullen made a motion to endorse this draft recommendation. The motion was seconded and did not pass. After much discussion, the Board felt that this issue was not within its purview in regard to spent nuclear fuel and high-level waste. The NSSAB Office will notify EM Headquarters of the status of the two draft EM SSAB recommendations acted on by the NSSAB.

Four letters were provided to Board members for informational purposes:

- NSSAB Recommendation to LLW Visual Verifications (Work Plan Item #5) – dated September 25, 2019
- DOE Response to NSSAB Recommendation to LLW Visual Verifications (Work Plan Item #5) – dated October 17, 2019
- NSSAB Recommendation to Additional National Environmental Policy Act Communication – dated August 14, 2019
- DOE Response to NSSAB Recommendation to Additional National Environmental Policy Act – dated October 2, 2019

Test Cell C (TCC) Path Forward ~ Work Plan Item #3 *(Tiffany Gamero, DOE)*

- **NSSAB Work Plan Item #3**
 - From a community perspective, the NSSAB will provide a recommendation on the Department’s planned end state for TCC or how the plan could be improved
 - NSSAB recommendation is due tonight
- **Nuclear Rocket Development Station (NRDS) History**
 - NRDS activities conducted in Area 25 on the NNSS
 - NNSS chosen due to the history of nuclear testing and the potential to release radioactive exhaust
 - NRDS facilities included:
 - Test Cell A (closed)
 - TCC (partially closed)
 - Engine Test Stand-1 (currently active)
 - Reactor Maintenance, Assembly, and Disassembly (RMAD) (closed)
 - Engine Maintenance, Assembly, and Disassembly (EMAD) (scheduled for closure)
 - Jackass and Western Railroad (closed)
 - NRDS mission was to support Project Rover by developing and testing nuclear rocket engines
 - Objective was to use atomic energy to propel a rocket for interplanetary travel and other terrestrial objectives
 - NRDS activities began in 1957 and ended in 1973
 - Jointly administered by the Atomic Energy Commission and the National Aeronautics and Space Administration (NASA)
 - Visited by President John F. Kennedy (still the only time a U.S. President has visited the NNSS)
- **TCC History**
 - Built in 1961, TCC was used to ground test nuclear reactors and engines for rockets
 - An upgrade from the earlier Test Cell A
 - Connected at that time by rail to the rest of the NRDS:

- ✓ Test Cell A
 - ✓ Engine Test Stand-1
 - ✓ RMAD
 - ✓ EMAD
- Operations ceased in 1973 with the cancellation of Project Rover
- **Completed Activities at TCC**
 - TCC is addressed under two (2) CAUs in the FFACO:
 - CAU 572, Ancillary Buildings and Structures
 - CAU 116
 - Closure work for CAU 116 was conducted from 2007 to 2011
 - CAU 116 included the main building, attached concrete shield wall, nuclear furnace piping, and a shed
 - All were demolished
 - Most debris was placed in the basement of the main building and grouted over with remaining disposed onsite at the NNSS
 - CAU 116 closed in place with use restrictions in 2011
 - Radiological and polychlorinated biphenyl (PCB)-impacted debris remains in the grouted basement of the main building
 - Radiological postings and use restriction signs were installed
 - Annual inspections required
 - Inspection results and maintenance reported annually
- **TCC Ancillary Buildings and Structures**
 - CAU 572 includes the remaining structures at TCC
 - Five (5) buildings, comprising approximately 18,550 square feet
 - Reactor cooling station
 - Three (3) water tanks
 - Four (4) hydrogen tanks
 - One (1) water tower
 - One (1) train shed
- **Planned Closure Activities**
 - TCC has no current or future mission
 - Scheduled for decontamination and decommissioning (D&D) starting in fiscal year (FY) 2023 and planned for completion by FY 2024
 - Remove and demolish structures and properly dispose of the generated waste
 - D&D at TCC limits the long-term cost of surveillance and maintenance
 - End state is anticipated to be demolition to slab of remaining facilities
- **Cultural Resource Documentation**
 - The National Historic Preservation Act requires federal agencies to consider the effects of federally-funded projects on historic properties and to provide the opportunity for comment regarding avoiding or mitigating adverse effects
 - A historic property is any property that is included in or eligible for inclusion in the National Register of Historic Places
 - An adverse effect occurs when a project may diminish the integrity of a historic property
 - If a historic property will be adversely effected, mitigation may be required. Mitigation can include:
 - Data recovery to preserve knowledge about the property
 - Preserving components of the property, if possible
 - Mitigation banking: preserving another historic property in lieu of the area of potential effect

- DRI archeologists recommended that the TCC district be determined eligible to the National Register of Historic Places
 - Recommendation made to the DOE, NNSA, and the Nevada State Historic Preservation Office (SHPO)
 - A cultural resources inventory and historical evaluation of TCC document will be sent to SHPO for review in the coming months
 - Response expected from SHPO after that
 - If determined eligible, any adverse effects to the facility due to the closure activities will require some form of mitigation agreed to by SHPO, NNSA, and DOE
- **Path Forward**
 - From a community perspective, the NSSAB will provide a recommendation on the Department's planned end state for TCC or how the plan could be improved
 - NSSAB recommendation is due tonight
- **Questions**

In response to Board questions, the following clarifications were provided:

- Historic American Buildings Survey (HABS) documentation is typically part of a mitigation effort. If NNSA/NFO, EM Nevada Program, and the SHPO determine that HABS documentation be conducted, DRI will complete and file with the NNSS Nuclear Testing Archive. The Jackass Flats area is not part of the Historic American Landscapes Survey, but the whole interconnected NRDS facility is being considered.
- HABS and Historic American Engineering Record (HAER) documentation were conducted on Building 3210 at the TCC complex in 2011. An identification and evaluation report was submitted to the SHPO. SHPO determined that demolition of Building 3210 would be an adverse effect and agreed to a mitigation for a HABS/HAER recording, which is publicly available online through the Library of Congress. The documentation contains the description, the historic context, and black-and-white photos of Building 3210.
- Although the buildings/structures on the TCC complex do not currently present a significant risk to public health as a physical hazard, any buildings/structures left standing will eventually pose a safety risk to personnel who oversee maintenance, to radiological workers who maintain the rad postings, and to inspectors who conduct the annual inspections. Other than physical hazards, there are chemical and radiological hazards that are required to be addressed under the FFACO. Additional investigation and characterization will be conducted to make a determination of the extent of contamination. Another consideration is that the expertise and the experienced employees are currently available, and delaying the D&D of structures/buildings into the future would require rehiring and retraining. Another important consideration is the overall costs increase over the long-term.
- Remaining structures/buildings at the TTC complex have not been fully characterized. The majority of the waste would be disposed onsite in the LLW facility or the solid waste landfill on the NNSS. Some waste may have to be disposed at an offsite facility as a hazardous waste. Due to the timeframe that these buildings were erected, there could be asbestos in significant quantities throughout the construction.
- Under mitigation banking, any decision is subject to consultation with SHPO. In some cases, the demolition of one building may be mitigation for preservation of another historic resource, although it does not have to be the same kind of resource or even from the same time period. Decisions regarding mitigation banking on the NNSS are made between NNSA/NFO, the EM Nevada Program, and the SHPO.
- Under separate CAUs under the FFACO, TCC and EMAD are the last remaining open Industrial Sites on the NNSS to be addressed by the EM Nevada Program.

- When conducting a corrective action alternatives analysis, cost is one of the factors considered when making a decision on corrective actions for a particular CAU.
- DRI completed an architectural recording of the TCC historical district that meets current architectural standards. The SHPO will review and concur with the sufficiency of the identification effort, the recommendations for eligibility to the National Register, and the assessment of finding of effect. After that review is complete and if SHPO concurs there is an adverse effect to D&D the remaining TCC structures, then NNSA/NFO and the EM Nevada Program, will enter into a discussion with SHPO on the mitigations to take place regarding the adverse effects. This is about a 30-day timeline for SHPO review, followed by a response, and then development of an agreement document.
- As a Federal agency, the NNSA/NFO and the EM Nevada Program are required to consult with SHPO regarding planned activities that affect facilities that could be considered historic.

Chair Bonesteel lead a group discussion to address any further thoughts, concerns, comments, suggestions, or questions related to the work plan item. After Board deliberation, Member Steve Rosenbaum made a motion to accept the plan for the end state for TCC as presented. The motion was seconded and passed with a majority vote.

Yucca Flat/Climax Mine Long-Term Monitoring Network ~ Work Plan #5 (Bill Wilborn, DOE)

- **NSSAB Work Plan Item #5**
 - From a community perspective, the NSSAB to provide a recommendation to the EM Nevada Program if they support the proposed Yucca Flat/Climax Mine (YF/CM) long-term monitoring network and recommend how it could be enhanced
 - NSSAB recommendation is due tonight
- **Outline**
 - 1. Key Messages
 - 2. YF/CM Background
 - 3. Why Monitor Groundwater During Closure
 - 4. Proposed Monitoring Network
 - 5. NSSAB Path Forward
- **Key Messages**
 - Groundwater contamination resulting from historic underground nuclear testing in YF/CM is not expected to leave the boundaries of the NNSS
 - Only potential (but unlikely) pathway out of the Yucca Flat basin is in the lower carbonate aquifer (LCA)
 - Contamination exceeding the *Safe Drinking Water Act* (SDWA) Maximum Contaminant Level (MCL) in the LCA has only been observed in a single isolated location at Well UE-2ce
 - Groundwater monitoring will provide early detection of contamination in the LCA
- **YF/CM Background**
 - 747 underground nuclear detonations
 - About 69% of the radionuclides inventory is near (within 330 feet) or below the water table
 - Detonations conducted in alluvium, volcanic, and carbonate rocks
 - LCA provides the only potential (but unlikely) flow path outside the basin
- **Why is the LCA so Important in Yucca Flat?**
 - LCA is the only pathway out of the Yucca Flat basin
 - No pathways in the alluvial and volcanic units directly lead outside the basin

- Volcanic confining units limit radionuclides movement down to the LCA
- **Groundwater Migration in YF/CM**
 - Groundwater within the **Contaminant Boundary** may exceed the safety standards at some time within 1,000 years
 - Contaminant boundary was revised based on recent model evaluation activities
 - Revised contaminant boundary (computer simulations augmented by historic data) indicates contamination remains within the Yucca Flat basin over the next 1,000 years
- **Why Monitor Groundwater During Closure**
 - Helps protect the public by providing a monitoring system designed to detect radionuclides from underground nuclear testing in groundwater
 - Provides baseline to establish existing conditions and identifies trends
 - Verifies compliance with regulatory standards
 - U.S. Environmental Protection Agency's SDWA MCLs
 - Regulatory Boundary Objective
- **Regulatory Boundary Objective**
 - Statements of specific objectives for each corrective action unit to protect the public and environment from exposure to groundwater contaminated by underground testing of nuclear weapons on the NNSS
 - Negotiated between EM Nevada Program and NDEP
 - Objective is to verify that radionuclide contamination from YF/CM is contained within the Yucca Flat basin, thus not impacting the Frenchman Flat LCA or downgradient receptors
- **Regulatory Boundary**
 - Provides protection for the public and the environment from the effects of radionuclide contamination
 - If radionuclides reach this boundary, a plan must be submitted to the State to ensure water resources downgradient are protected
 - Proposed boundary corresponds with the southern extent of the Yucca Flat hydrographic basin
- **Monitoring Network Criteria**
 - Monitor groundwater pathways leaving the Yucca Flat basin
 - Identify contamination in the LCA within the basin
 - Locations near or downgradient of testing areas
 - Locations hydraulically connected to testing areas
 - Continue to verify contamination has not reached the LCA in Frenchman Flat
- **Proposed Monitoring Well Network**
 - Monitor pathways out of the basin (WW C-1)
 - Early detection of contamination downgradient of testing (UE-1q, TW-D, and ER-6-1-2)
 - Monitor for radionuclides near test cavities (ER-3-3, ER-4-1, ER-7-1, U-3cn-5, and UE-2ce)
 - Monitor locations within Frenchman Flat (ER-5-3-2)
- **Sample Analysis**
 - All samples analyzed for tritium
 - Analyses performed by laboratory certified by the State of Nevada
 - Detection limit is approximately 300 pCi/L which is well below the 1,000-pCi/L detection limit required for SDWA
- **Why Analyze for Tritium**
 - Comprises more than 95% of the radionuclide inventory
 - Other longer-lived radionuclides will not be present unless increased levels of tritium are observed

- Tritium monitoring provides early detection of contaminant migration downgradient of testing (detection level is 1.5% of the 20,000 pCi/L SDWA MCL)
- With a single exception (UE-2ce), little to no tritium (less than 20 pCi/L) is currently detected in YF/CM monitoring wells
 - Well EU-2ce, located near the NASH cavity, was extensively pumped to accelerate and evaluate radionuclide migration; tritium is currently reported as 144,000 pCi/L (2016)
- **Radionuclide Migration Experiment at NASH**
 - Extensive information regarding radionuclide migration in the LCA was obtained
 - Supports monitoring for tritium
 - Tritium reached concentration over 1,000 (1E+03) times its MCL
 - Other radionuclides are well below their MCL
- **Sampling Frequency**
 - Samples will be collected every six years
 - Two samples collected within a tritium half-life (12.3 years)
- **Triggers for Further Actions**
 - Trigger set at 1,000 pCi/L of tritium (5% of SDWA MCL) for all sampling locations except Well UE-2ce
 - UE-2ce has already exceeded this trigger
 - Trigger value, if reached, requires the following actions:
 - Other long-lived radionuclides (carbon-14 and iodine-129) will be analyzed at the specific location for subsequent sampling events
 - Meeting will be held between NDEP and DOE to determine the path forward (e.g., additional sampling, evaluate model, communication)
- **Reporting**
 - Results reported in NNSS Environmental Annual Report at www.nnss.gov/pages/resources/library/NNSSER.html
 - Long-term monitoring reports completed, submitted to NDEP, and made publicly available
 - Periodic evaluation will be performed and documented every twelve years
 - Determine whether monitoring network is meeting expectations
 - Identify whether monitoring results are consistent with conceptual and/or numerical models
- **Key Messages (reiterated)**
 - Groundwater contamination resulting from historic underground nuclear testing in YF/CM is not expected to leave the boundaries of the NNSS
 - Only potential (but unlikely) pathway out of the Yucca Flat basin is in the LCA
 - Contamination exceeding the SDWA MCL in the LCA has only been observed in a single isolated location at Well UE-2ce
 - Groundwater monitoring will provide early detection of contamination in the LCA
- **Path Forward**
 - From a community perspective, the NSSAB to provide a recommendation to the EM Nevada Program if they support the proposed YF/CM long-term monitoring network and recommend how it could be enhanced
 - NSSAB recommendation is due tonight
- **Questions**

In response to Board questions, the following clarifications were provided:

- Once tritium is no longer found in the YF/CM long-term monitoring network, the well locations may need to be reevaluated and located closer to the test cavities to monitor the

longer-lived radionuclides. The expected lifetime of a well is around 50 years; so evaluation of the current network is needed to make decisions on siting replacement wells. Other long-term considerations include the dynamics of the contaminant boundary and the capability to adequately monitor migration of radionuclides.

- The proposed sampling frequency of every six years for the YF/CM long-term monitoring network is based on lessons learned from Frenchman Flat, the first groundwater CAU on the NNSS closed in 2010.
- Water measurements are conducted quarterly. There have been fluctuations in the water measurements due to seismic activity, although it is usually not permanent.
- Tritium levels are measured because of its mobility in groundwater, and any unusual changes are investigated for its cause.
- The analytical tools developed for understanding and constructing forecasts for the extent of contamination in the YF/CM basin have been archived and described in data packages in sufficient detail to allow a future generation of scientists to rerun and reanalyze the system; therefore the institutional knowledge will be available.

After all Board questions were answered, Chair Bonesteel initiated Board discussion on the proposed YF/CM long-term monitoring network work plan item. Member Fullen made a motion that the NSSAB support the proposed YF/CM long-term monitoring network. The motion was seconded and passed unanimously.

After further Board dialogue, the following suggestions were discussed as enhancements:

- Member Karen Eastman proposed an enhancement to record the institutional knowledge from subject matter experts (SME) for future generations.
- Member Rosenbaum proposed an enhancement to develop a planning framework that includes a technology review to document current SME knowledge.

Member Rosenbaum made a motion to include the preceding enhancements in the recommendation letter to DOE. The motion was seconded and passed unanimously.

Meeting Wrap-Up and Adjournment

Upcoming calendar of events:

- NSSAB Full Board meeting in Pahrump, NV – January 15, 2020
- Intergovernmental Meeting with NSSAB liaisons in Pahrump, NV – January 15, 2020
- Low-level Waste Stakeholders Forum meeting in Pahrump, NV (invite only) – February 5, 2020
- EM SSAB National Chairs Meeting in Las Vegas, NV – March 31 – April 2, 2020

Any questions on the calendar of events, please contact the NSSAB Office at 702-523-0894.

Member Eastman made a motion to adjourn the meeting. The motion was seconded and passed unanimously. The meeting was adjourned at 8:04 p.m.