Little Reason for Confidence in the Drinking Water on the Duck Valley Reservation

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By Tami Thatcher

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Brief Summary:

A review was conducted of the public drinking water supply and of available water data for the Shoshone-Paiute Tribes of the Duck Valley Reservation located in Owyhee county in southwestern Idaho and Elko county Nevada. Scant data is available for this area and when available has involved very limited selections of contaminant monitoring. The U.S. Geological Survey monitoring has not included radiological or chemical contaminant sampling. The limited data in the U.S. Environmental Protection Agencies STORET data for surface water has not been updated in over a decade and when available is for a very limited set of minerals and metals.

The Consumer Confidence Reports issued for the public drinking water supply have notable violations in sampling or reporting chemical sampling analysis which have produced an absence of chemical monitoring data for over three years. **The drinking water data found for 2015 and 2016 show significantly elevated levels of lead, arsenic, barium, and copper.** Monitoring violations for nitrate have occurred and careful monitoring of nitrate should be conducted.

The radionuclide sampling indicates low levels of radionuclides based on limited data. Neighboring Mountain City, Nevada public water drinking data was compared to the Duck Valley Consumer Confidence Reports.

Most notably is the presence of elevated levels of lead at 0.0115 mg/L (ppm) in Duck Valley water that is below the federal action level but exceeds reasonable health guidance of 0.0002 mg/L (ppm). In units of ppb, Duck Valley lead is 11.5 ppb which exceeds health guidance of 0.2 ppb. While federal maximum contaminant levels and action levels are stated to protect human health, often research has shown that federal levels are not protective, especially for consumption of water by children. It is typical that public water supply reports rely on federal standards. It is also typical that public water supply system reporting tends to minimize the appearance of issues with the water supply. Errors were found in the Consumer Confidence reporting for the Duck Valley Reservation that involved the wrong units being associated with analyte results.

Uranium levels exceed public health goals but are below the federal MCL.

Drinking this water is not recommended until water sampling and reporting of all important analytes is conducted and the levels are not only below federal MCLs but are also not exceeding reasonable public health guidelines.

Disclaimer: This report includes the best attempt by the author to be accurate based on the limited investigation of available data. The conclusions reached are the opinion of the author.

Little Reason for Confidence in the Drinking Water on the Duck Valley Reservation

Limited available water data and public drinking water data for the Shoshone-Paiute Tribes of the Duck Valley Reservation is presented in this report. The Duck Valley Reservation is located in southwest Owyhee county, Idaho and Elko county Nevada. Duck Valley public drinking water supplies are located in Nevada and are under jurisdiction of the tribe and overseen by the Environmental Protection Agency (EPA). The drinking water system is 093200067 in EPA region 9.

Non-tribal public drinking water in the State of Idaho and the State of Nevada can be viewed at their environmental quality websites drinking water "switchboards" for sample data. [1] [2] On tribal land, the federal Environmental Protection Agency rather than the state is involved with drinking water monitoring. [3] [4]

In addition to state drinking water monitoring, groundwater monitoring conducted by the U.S. Geological Survey can be found online at the USGS mapper. The USGS well data may include water level only or may include a wide range of water quality data including contaminant sampling data.[5]

Surface and groundwater data from the Environmental Protection Agency STORET data were also reviewed. [6]

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[1] Idaho Department of Environmental Quality, http://www.deq.idaho.gov/water-quality/drinking-water/pws-monitoring-reporting/ and http://www.deq.idaho.gov/water-quality/drinking-water/pws-switchboard/ and find sample results for all counties at http://dww.deq.idaho.gov/IDPDWW/ where you select your county or drinking water system, select the specific water system. For the specific water system, it may be helpful to select the link at the left called "Chem/Rad Sample/Result by Analyte." Then select the analyte of interest that the well has data for by clicking on its code. This brings up the applicable lab samples that included that contaminant. Note that non-community wells typically sample fewer contaminants.

[2] Nevada Division of Environmental Protection, https://ndep.nv.gov/water/drinking-water and general contaminants information at https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/chemical-monitoring . Find sample results for all Nevada counties at https://ndwis.ndep.nv.gov/DWW/

[3] United States Environmental Protection Agency, Safe Drinking Water on Tribal Lands at https://www.epa.gov/tribaldrinkingwater and https://www.epa.gov/enviro/sdwis-search and https://www.epa.gov/enviro/sdwis-search-indian-tribes

[4] Environmental Defense Institute newsletter for December 2017 "Where to Find Out More About Your Drinking Water." http://www.environmental-defense-institute.org/publications/News.17.Dec.pdf

[5] US Geological Survey website link: http://id.water.usgs.gov/projects/INL and INL bibliography at http://id.water.usgs.gov/INL/Pubs/INL_Bibliography.pdf . Select individual wells at the USGS mapper at http://maps.waterdata.usgs.gov/mapper/index.html **US Geological Survey Mapper Data**: See well data at http://maps.waterdata.usgs.gov/mapper/index.html.

[6] US Environmental Protection Agency surface and ground water observations at http://www.epa.gov/storet/ STORET contains 200 million water sample observations from about 700,000 sampling sites for both surface and ground waters. Reported data include stream flow information and measured concentrations for most of the metals of concern. For typical of all water data, STORET data may not have been screened for accuracy.

Federal Maximum Contaminant Guidelines (MCLs) for drinking water have been found by various people to be too permissive and allow contaminant levels that are not protective of health. The State of California has issues public health goals that are not enforceable but provide more information about the level of contamination in drinking water that if exceeded is probably harmful. [7] [8]

Numerous EPA Public Drinking Water Violations at the Duck Valley Reservation

The EPA website for safe drinking water (called SDWIS) does not provide the sampling results or identify the sampling performed. It does, however, list when sample results exceeded maximum contaminant levels (MCLs) and when sampling violations occurred.

For Duck Valley Owyhee tribal drinking water system, numerous violations between 2008 and 2017 are listed on the EPA website. As important as the number of violations are the length of time it has taken for violations of sampling or reporting to be resolved.

Maximum contaminant levels (MCLs) were exceeded for coliform seven times between 2008 and 2015. Coliform sampling was tardy four times between 2008 and 2015, but was resolved within 6 months except for the 2008 violation which took about 16 months to achieve compliance. Sampling for E. Coli was tardy four times, twice in 2011 and twice in 2016. These were resolved with 6 months except for the October 1, 2011 violation with took 10 months.

Nitrate was not sampled between January 2016 and June 2017 and this is another reported EPA violation. Agricultural chemicals were not reported as being in violation nor is radiological sampling.

The long list of monitoring violations mostly involved industrial chemicals. The required sampling was not conducted and was reported January 1, 2014. It was not resolved until June 5, 2017, according to the EPA website for SDWIS. No chemical monitoring data has been provided to the public.

The list of chemicals and nitrate that were listed as being out of compliance with monitoring, likely the absence of monitoring are as follows.

[7] California State Water Resources Control Board Comparison of federal maximum contaminant (MCLs) and public health goals (PHGs) for contaminants in drinking water. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.shtml

[8] Environmental Working Group at www.ewg.org and see their tap water database at https://www.ewg.org/tapwater/

Nitrate (common pollutant, but can be used in mining extraction techniques)
carbon tetrachloride
p-Dichlorobenzene
vinyl chloride
1,1-Dichloroethylene
trans-1,2-Dichloroethylene
1,2-Dichloroethane
cis-1,2-Dichloroethylene
1,1,1-Trichloroethane
1,2-Dichloropropane
Dichloromethane
Trichloroethylene
1,1,2-Trichloroethane
Tetrachloroethylene
1,2,4-Trichlorobenzene
chlorobenzene
o-Dichlorobenzene
benzene
ethylbenzene
styrene
toluene
xylenes

Of the chemicals listed above, certain mining techniques can involve ethylbenzene and di-(2-ethylhexyl) phthalate (phosphoric acid) as well as nitrate. Elevated levels of phosphate could be a sign of chemical solvent mining. Levels of phosphate range from about 0.04 mg/L (ppm) to 0.145 mg/L (ppm) according the U.S. Geological Survey data from 2002.

The USGS data from 2002 borehole sampling also indicates a range of levels of inorganic nitrate from 0.001 mg/L to 0.262 mg/L. The nitrate MCL is 10 mg/L. A health guide has been estimated at 5 mg/L (ppm). Nitrate is one of the most common contaminants in drinking water. Elevated levels can occur from fertilizer runoff, manure and sewage, or mining.

Ethylbenzene, a component of petroleum, is a volatile cancer-causing chemical primarily used for production of plastics and rubber. Ethylbenzene is also released from gasoline fuel emissions. Health concerns with ethylbenzene include cancer, harm to the lungs, liver, kidneys, and central nervous system. The federal drinking water MCL is 700 ppb or ug/L. The California public health guideline is 300 ppb (or ug/L). Di(2-ethylhexyl) phthalate may be used in mining and its MCL is 0.006 mg/L and health guideline is 0.003 mg/L. These and other chemicals should be carefully monitored.

Understanding the Health Implications of Reported Contaminant Levels

The federal maximum contaminant levels (MCLs), suggest health guidelines and brief health concerns associated with the contaminant are provided in Table 1. For a more complete listing of contaminants, see the federal Environmental Protection Agencies National Primary Drinking Water Regulations table of contaminants on the EPA website. [9] Health guideline information can be found at a non-profit organization called Environmental Working Group [10] which examined non-tribal state drinking water records.

Table 1. Federal maximum contaminant levels (MCLs) and suggested health guidelines for selected contaminants.

Analyte	**MCL (ppb = ug/L)**	**Public Health Concern (ppb = ug/L)**	**Comment**
Nitrate	10,000 ppb (10 ppm or mg/L)	5,000 ppb (5 ppm or mg/L)	Common pollutant from manure, sewage, fertilizer. Also used in some mining extraction processes. Health concerns for infants. May increase cancer risk.
Arsenic	10 ppb (0.01 ppm)	0.004 ppb (0.000004 ppm or mg/L)	High nitrate levels may cause more leaching of arsenic. Arsenic health concerns are cancer, harm to central nervous system and brain, skin damage, change to heart and blood vessels, and increased risk of heart disease, stroke and diabetes. Median value in the U.S. 1.4 ug/L.

[9] United States Environmental Protection Agency, National Primary Drinking Water Table of Contaminants at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations

[10] Environmental Working Group at www.ewg.org and see their tap water database at https://www.ewg.org/tapwater/

Analyte	MCL (ppb = ug/L)	Public Health Concern (ppb = ug/L)	Comment
Lead	15 ppb (0.015 ppm)	0.2 ppb (0.0002 ppm or mg/L)	Lead can leach from piping or tanks. Lead is also a decay product of uranium and thorium decay series. Health concerns include brain and nervous system, particularly affecting children. Median value in the U.S. 0.3 ug/L.
Barium	2000 ppb (2 ppm)	700 ppb (0.7 ppm or mg/L)	Heath concerns include harm to kidneys, high blood pressure, and harm to heart and blood vessels. Median value in U.S. 35 ug/L.
Fluoride	4000 ppb (4 ppm)	1000 ppb (1 ppm or mg/L)	May be harmful to bones and teeth. May have bone cancer risk.
Copper	1300 ppb (1.3 ppm) Action Level	300 ppb (0.3 ppm or mg/L)	Health guide to protect infants from copper toxicity. Median value in the U.S. 1.1 ug/L.
Sodium	Not available	Not available	U.S. median value of 9000 ppb [11]
Adjusted Gross Alpha (excludes radon and uranium)	15 pCi/L	Zero	The source of alpha emitters can be radium, thorium, plutonium or americium. All ionizing radiation is cancer-causing.

[11] Donald Langmuir et al., ERG to the EPA, "Issue Paper on the Environmental Chemistry of Metals, August 19, 2004. https://archive.epa.gov/raf/web/pdf/envchemfinal81904corr01-25-05.pdf This report discusses the natural background levels of metals and discusses the EPA's STORET (STOrage and RETrieval) and other data.

Analyte	MCL (ppb = ug/L)	Public Health Concern (ppb = ug/L)	Comment
Uranium	30 ppb or ug/L (0.030 ppm or mg/L) Equates to 20 pCi/L for natural uranium	0.64 ppb or ug/L (0.00064 ppm or mg/L) Equates to 0.43 pCi/L for natural uranium	The MCL of 30 ug/L corresponds to 20 pCi/L if using the EPA conversion factor of 0.67 pCi/ug which assumes natural uranium composition.
Combined radium-2226 and radium-228	5 pCi/L	Ra-226 0.05 pCi/L Ra-228 0.019 pCi/L	Radium ingestion or inhalation can cause lymphoma, bone cancer or diseases of blood formation such as leukemia and aplastic anemia. Radium-224 is typically not regulated and to do so would require gross alpha testing within 48 hours of sample collection.
Gross beta	4 millirem/yr		Units of millirem or pCi/L often used. The source of the emitter is often not identified, but proper evaluation of millirem dose would require knowing which nuclides are present
Ethylbenzene	700 ppb (0.7 ppm)	300 ppb (0.3 ppm)	Ethylbenzene, a component of petroleum, is a volatile cancer-causing chemical primarily used for production of plastics and rubber. Ethylbenzene is also released from gasoline fuel emissions. Health

Analyte	MCL (ppb = ug/L)	Public Health Concern (ppb = ug/L)	Comment
			concerns are cancer, harm to the lungs, liver, kidneys, and central nervous system
Di-(2-ethylhexyl) phthalate (may have been monitored but should be examined if being used near watersheds)	6 ppb (0.006 ppm)	3 ppb (0.003 ppm)	An oily liquid that could be used in mining extraction. A softener added to PVC plastics. Phthalates are hormone disruptors that target the male reproductive system. May harm fetal development. A hormone disruptor.
Benzo(a)pyrene (may have been monitored but note that levels far below the federal MCL are unhealthy)	0.2 ppb (0.0002 ppm)	0.007 ppb ().000007 ppm)	Benzo[a]pyrene is a polycyclic aromatic hydrocarbon, or PAH, released from combustion of fossil fuels and waste incinerators. It can also be involved in mining. PAHs increase the risk of cancer; damage the immune, nervous and reproductive systems; and can harm developing fetuses.

Table notes: Federal maximum contaminant levels (MCLs) set the state and federal levels requiring enforcement are based on EPA's 2012 edition of drinking water standards. The public health goals in the table are based on California's State Water Resources Control Board 2016 Groundwater Information Sheet on Radionuclides and are not enforceable. See https://oehha.ca.gov/water/public-health-goals-phgs and EWG Drinking Water database at https://www.ewg.org/tapwater/ Historical median values from Donald Langmuir et al., "Issue Paper on the Environmental Chemistry of Metals," August 19, 2004. Units are parts-per-million (ppm) which equals milligrams/liter, parts-per-billion (ppb) which equals micrograms/liter, and picocuries/liter. For information about uranium and thorium decay series, see Environmental Defense Institute newsletter for February 2018. http://www.environmental-defense-institute.org/publications/News.18.Feb.pdf

Duck Valley Water Data Review

Radiological sampling data of Duck Valley public drinking water are provided in Table 2 below.

Mountain City, Nevada is the nearest neighboring city with public drinking water data. The radiological samples reported in the State of Nevada drinking water database for Mountain City Water and Sewer (NV0000170) were reviewed and the levels of radioactivity are low. Highlights of the radiological sampling are provided in the Table 3 below. The Mountain City results indicate low levels of natural uranium and thorium and establish an expected baseline for Duck Valley water. Gross beta has not been sampled since 2007. The results are far below federal MLCs, are considerably lower than many parts of Idaho which are elevated beyond natural background levels and beyond nuclear weapons testing fallout.

Nitrate and selected minerals and metals reported for Duck Valley public water supplies, the Duck Valley area from various sources and for the Mountain City, NV public water supply are presented in Table 4.

While the levels of nitrate sampled in the Duck Valley public drinking water supply are not excessive, there is rather scant reporting. Problems with nitrate sampling include violations for either not sampling or not reporting the results twice in 2016. For the years 2012 to 2016, the only nitrate data available was for two wells in 2015.

The levels of lead in the Duck Valley public water drinking supply merit concern because the level appears to exceed reasonable public health guidelines. Even though the federal action level has not been exceeded, there is scant monitoring of lead and the level appears to be elevated. The level of lead in the Duck Valley Public Water Drinking Supply is about 10-fold higher than neighboring Mountain City.

The levels of other inorganics sampled in the Duck Valley public water drinking supply are also significantly elevated compared to Mountain City. These metals include arsenic, barium, fluoride, copper and sodium.

While elevated levels of lead can arise from metal piping and tanks, the elevated levels of arsenic, barium, fluoride, and copper suggest the possibility of chemical leaching or acid conditions in the rocks that water flows through to reach the Duck Valley public water drinking supply.

Chemical solvent mining or other mining activities may be involved. For this reason, it is particularly troubling that the chemical sampling of public water supplies on the Duck Valley reservation have been not been sampled or reported. Violations in failing to sample or to report chemical monitoring results have spanned nearly 3 years beginning in 2014. Yet while no violations are cited for 2017, no chemical data have been reported in the last four years. Chemical data for 2017 are required by EPA regulations to be reported by July of 2018.

Table 2. Radiological sample reporting for public drinking water on Duck Valley Reservation public water supplies.

Contaminant	MCL	Suggested Health Guideline	Measurement	Date Sampled
Combined Uranium				
• **Revision 1 corrections**	**30 ug/L** **0.030 mg/L** **20 pCi/L**	**0.64 ug/L** **0.00064 mg/L** **0.43 pCi/L**	**2 ug/L** **(est. 1.34 pCi/L)**	**2015**
Gross Alpha excluding Radon and Uranium				
	15 pCi/L	Zero	2.33 pCi/L	2012
			2 pCi/L	2013
			2.69 pCi/L *	2015
			0.64 pCi/L *	2015
Combined radium-226 and radium-228				
	5 pCi/L	Ra-226 0.05 pCi/L Ra-228 0.019 pCi/L	0.69 pCi/L	2012
			1 pCi/L	2013
			1.10 pCi/L	2015
Gross beta				
	4 mrem/yr, Radionuclide dependent	Zero	NS	2012 through 2016

Source: Shoshone-Paiute Tribes of the Duck Valley Reservation Public Water System Consumer Confidence Reports issued in 2016 and 2017. * Data for gross alpha for 2015 are assumed to be adjusted alpha rather than gross alpha including radon and uranium.

Table 3. Radiological sample reporting for public drinking water in neighboring upgradient Mountain City.

Contaminant	MCL	Suggested Health Guideline	Measurement	Date Sampled
Combined Uranium				
	0.030 mg/L	**0.00064 mg/L**	<0.001mg/L	2007
	20 pCi/L	**0.43 pCi/L**	0.447 pCi/L	2004
Gross Alpha Including Radon and Uranium				
	(15 pCi/L)	Zero	0.554 pCi/L	2004
			0.7 pCi/L	2016
			0.6 pCi/L	2007
Adjusted Gross Alpha excluding Radon and Uranium				
	15 pCi/L		0.1 pCi/L	2004
Radium-226 (Uranium-238 decay series)				
	Total Ra-226 and Ra-228 less than 5 pCi/L	Ra-226 0.05 pCi/L Ra-228 0.019 pCi/L	0.1 pCi/L	2007
Radium-228 (Thorium-232 decay series)				
	Total Ra-226 and Ra-228 less than 5 pCi/L	Ra-226 0.05 pCi/L Ra-228 0.019 pCi/L	0.2 pCi/L	2007
			0.4 pCi/L	2007

Contaminant	MCL	Suggested Health Guideline	Measurement	Date Sampled
Gross beta				
	Radionuclide dependent	Zero	1.92 pCi/L	2004
			0.7 pCi/L	2007
			1.2 pCi/L	2007

Source: https://ndep.nv.gov/water/drinking-water

Table 4. Measurements of Nitrate and Selected Minerals and Metals.

Contaminant	MCL (mg/L)	Suggested Health Guide (mg/L)	Measurement (mg/L)		
			Duck Valley Public Water	Duck Valley Area	Mountain City
Nitrate (mg/L)					
	10	5	0.3 (2015) 0.8 (2015)	0.07 0.32	0.74 0.84
Arsenic					
	0.01	0.000004	0.004 (2013)	NS	Below 0.001
Barium					
	2	0.7	0.07 (2012) 0.15 (2012)	NS	0.032
Fluoride					
	4.0 mg/L	**1.0 mg/L**	0.2 (2012) 0.25 (2013) 0.19 (2015)	NS	0.110
Copper					
	1.3 Action Level	0.3	0.23 (2015) 0.525 (2015)	0.03	0.02
Sodium					
	Not available	Not available	12.9 (2012) 13.1 (2013)	7 to 13.5	4
Lead					
	0.015	0.0002	0.0115 (2015)	NS	0.001

Table notes: Source: Shoshone-Paiute Tribes of the Duck Valley Reservation Public Water System Consumer Confidence Reports issued in 2016 and 2017. Drinking water data for Mountain City, Nevada available at e: https://ndep.nv.gov/water/drinking-water Drinking water data for Mountain City and non-public drinking water supply data highlight maximum values noted. Duck Valley area data from the USGS Mapper and EPA STORET https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=ada349b90c26496ea52aab66a092593b

While it is understandable that one gets blurry eyed looking at results in ppm and ppb, there are several errors in reporting results for the Duck Valley Consumer Confidence Reports. In the report for 2015 and 2016, only data from 2015 is provided. The data are presented in the wrong units in the report issued June 27, 2016. The table says nitrate and fluoride are given in parts-per-billion (ppb). The MCLs are given in ppb with the MCL as 10,000 ppb for nitrate and 4000 ppb for fluoride, yet the result for nitrate is given as 0.2, 0.3 and 0.8 from 2015 sampling. The report issued on June 15, 2017 reports the nitrate results as 0.3 and 0.8 parts-per-million (ppm) or milligram/liter and corresponding MCL of 10 mg/L. The report issued June 2017 lists one entry for lead sampling as 11.5 ppb (equal to 0.0115 ppm) from 2015. However, the June 2016 report issued for 2015 sampling does not include any lead sampling data. The maximum detection limits associated with laboratory testing capability are given as 0 for radiological sampling which appears to be incorrect as the levels would not be less than 0.01 pCi/L and are often as coarse as 1 pCi/L. And for uranium, oddly listed n the category of Volatile Organic Compounds, the units of the maximum contaminant level goal, the maximum contaminant level, and the maximum detection limit are inconsistent with the units used for the uranium measurement. No units are actually identified for the MCLG, MCL and MDL but the MCL for uranium is 30 ppb (or 30 ug/L), not the 32,000 displayed.

Understanding the Duck Valley Watershed

The watershed for the Duck Valley reservation was reviewed for possible contamination sources from National Priority List (NPL) facilities listed by the EPA. Maps of cleanup sites can be found on the EPA website from the “My Environment” page, “My Land” and “Cleanups in My Community.” [12]

The Mountain Home Air Force Base is a superfund site about 60 miles north of Duck Valley in Elmore County. [13]

The U.S. Ecology Site A in Bruneau, Idaho is a chemically contaminated site that the EPA website states that not enough is known about possible migration of chemicals to groundwater that may affect drinking water. The EPA ID number is IDD000773952 for the Bruneau site.

The U.S. Ecology Site B in Grandview, Idaho, (EPA ID number IDD073114654) is stated to have migration of contaminants to groundwater under control, on the EPA webpage regarding its RCRA Corrective Action Site Progress Profile. The Bruneau and Grandview U.S. Ecology sites are about 50 miles north of Duck Valley. (See EPA’s “Cleanups in My Community” page at https://www.epa.gov/cleanups/cleanups-my-community

[12] EPA Cleanups in my community map https://ofmpub.epa.gov/apex/cimc/f?p=cimc:MAP:0:::71:P71_WELSEARCH:NULL|Cleanup||||true|false|false|false|false|false|||sites|Y

[13] Mountain Home AFB superfund https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=1000302

Based on the watershed information by the U.S. Geological Survey and by the EPA for the Duck Valley Reservation, the Mountain Home Air Force Base, U.S. Ecology Site A site at Bruneau, Idaho and U.S. Ecology Site B at Grand View, if they have groundwater emissions, the effluent would not be flowing toward Duck Valley located at the Idaho-Nevada border. [14] [15]

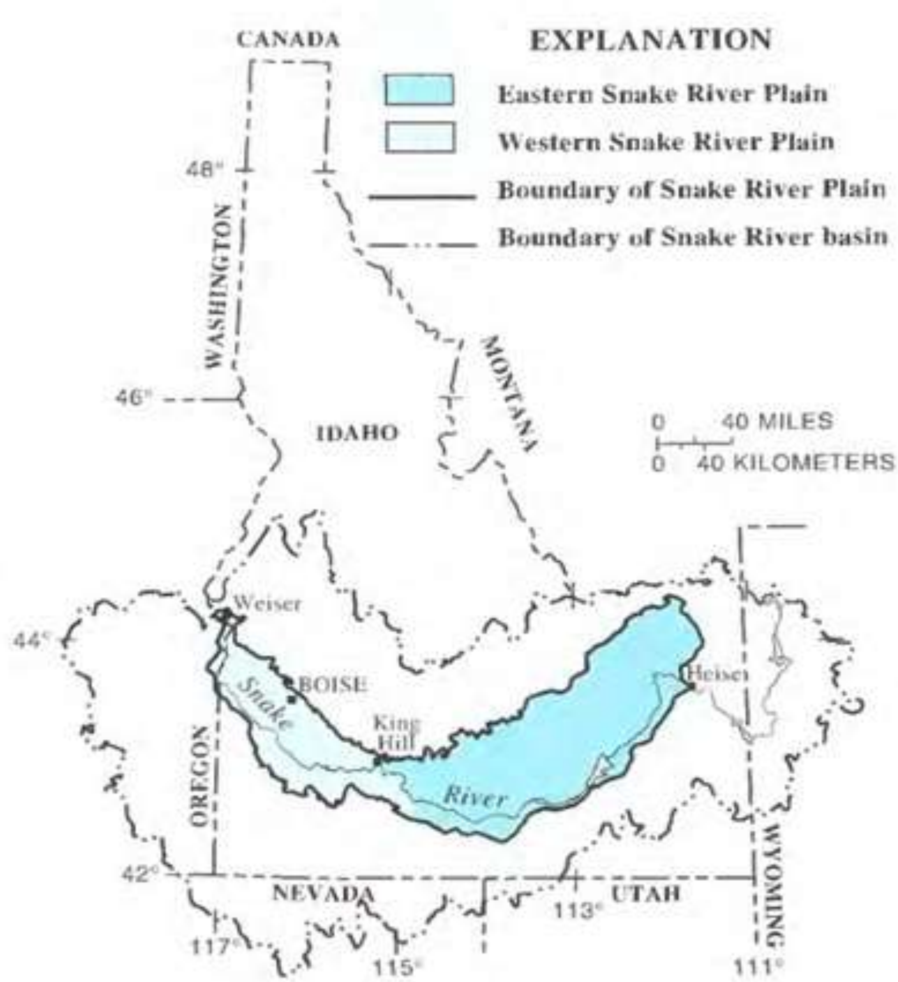

FIGURE 1.—Location of study area.

[14] Garth D. Newton, Regional Aquifer-System Analysis – Snake River Plain, Idaho, "Geohydrology of the Regional Aquifer System, Western Snake River Plain, Southwestern Idaho," U.S. Geological Survey Professional Paper 1408-G, 1991. https://pubs.er.usgs.gov/publication/pp1408G This shows analysis of the western Snake River Plain aquifer and includes Grand View and Bruneau, Idaho locations of known toxic waste sites. The general direction of groundwater flow is toward the Snake River and then in the direction of the Snake River that flows to the west.

[15] G. F. Lindholm, U.S. Geological Survey, Professional Paper 1408-A, "Summary of the Snake River plain Regional Aquifer-System Analysis in Idaho and eastern Oregon," 1996. https://pubs.er.usgs.gov/publication/pp1408A Regional aquifers underlying the 15,600-square-mile Snake River Plain in southern Idaho and eastern Oregon was studied as part of the U.S. Geological Survey's Regional Aquifer-System Analysis program.

Figure 1. U.S. Geological Survey map of the Snake River Plain Aquifer from 1996 Lindholm USGS Professional Paper 1408-A.

Figure 2. Duck Valley Reservation watershed downloaded from EPA Waters GeoViewer, Drainage Area Delineation feature.

Review of Potential Radionuclide Emissions

The 1965 Project Pre-Schooner II chemical explosive cratering experiment conducted east of Grasmere which is north of the Duck Valley Reservation was reviewed. [16] It was conducted as part of the joint Atomic Energy Commission-Corps of Engineers nuclear excavation research program. It involved a detonation on September 30, 1965. But while it was supportive of nuclear Plow-Shares use of nuclear explosives research, there is no indication that the explosion

[16] U.S Army Engineer Waterways Experiment Station, Project Pre-Schooner II, Bruneau Plateau, Idaho, September 30, 1965, “Design, Construction, and Postshot Evaluation of Concrete Stem For Access Hole,” Kenneth L. Saucier, Project Officer, Issued August 1967.

conducted in Idaho involved nuclear materials. The explosion left a crater and the location was 40 miles southwest of Bruneau, Idaho with coordinates stated as Longitude 115 deg 34’25.203”W and Latitude 42 deg 24’02.943”N.

The coordinates indicate the crater is northeast of Duck Valley Reservation and south of the Saylor Creek (Air Force) Bombing Range. It is roughly 15 miles east of Grasmere. This is also 5 miles NE of the Indian Hot Springs and the “Bruneau River Launch Site.

The partial nuclear weapons testing ban went into effect in 1963. But that only stopped, to a large degree, US above ground testing of nuclear weapons. Below ground testing continued.

And testing that was for “plow shares” was often excluded from reporting of weapons testing because it was not weapons testing, but “plow shares” — a ridiculous idea to use highly contaminating nuclear explosives for excavation.

While radiological monitoring data I’ve found so far have been sparse, I do not have any indication that the pre-Schooner II testing was anything other than a chemical explosion. It was not a nuclear detonation.

Also, the Final EA for the Mountain Home Air Force Base Operational Changes was reviewed which stated that no use of depleted uranium munitions was planned for the training ground which is near and over the Duck Valley Reservation. [17]

Idaho did have plenty of radioactivity from US nuclear weapons testing at Nevada and nuclear weapons testing fallout from US testing outside the US, and from tests conducted by other countries (Russia, France, China etc.) And Idaho had extensive radiation released from the Idaho National Laboratory. Regions of low precipitation received less radioactive fallout than regions of higher precipitation.

EDI report on the Snake River Plain aquifer “Tritium at 800 pCi/L in the Snake River Plain Aquifer in the Magic Valley at Kimama: Why This Matters” lists known nuclear weapons tests on the continental United States on page 20 and 21. [18] The nuclear Plow Shares test named Schooner was conducted December 8, 1968 on the Nevada Test Site.

A compilation of known underground tests that released radioactivity and additional tests from the Plowshares above ground tests is provided in the Kimama report. Plowshares research was to promote atomic bombs for excavation of soil, but it didn’t prove to be useful. The

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[17] U.S. Air Force Civil Engineer Center and 366th Fighter Wing Mountain Home Air Force Base, Idaho, “Final Environmental Assessment for Operational Changes and Range Improvements in the Mountain Home Range Complex,” Finding of No Significant Impact, May 2017. www.mountainhome.af.mil/Portals/102/Documents/environmental/MHRC%20Final%20EA_reduced.pdf?ver=2017-07-27-140452-300

[18] Tami Thatcher, Environmental Defense Institute Special Report, “Tritium at 800 pCi/L in the Snake River Plain Aquifer in the Magic Valley at Kimama: Why this Matters,” 2017. www.environmental-defense-institute.org/kimamareport.pdf

underground test iodine-131 release data is from the UNSCEAR 93 report. [19] The Plowshares tests that were after the 1963 partial test ban and were "crater" type are from FAS.org website compilation of Department of Energy report DOE/NV-209. More confirmation of the identification of Plowshares nuclear testing comes from a 1987 EPA report. [20]

Radionuclides in drinking water in southwest Idaho would include naturally occurring radionuclides, past nuclear weapons testing fallout and resuspension of radionuclides in the soil from historical releases. The levels of radionuclides in the public drinking water supply for the Duck Valley Reservation appear, from limited data, to be low, especially in comparison to areas of Idaho downgradient from the Idaho National Laboratory or within range of airborne emissions from the INL. The limited information found is not inconsistent with erosion of natural uranium and known past fallout from weapons testing primarily from the Nevada Test Site. But attention should be paid to radionuclides in the drinking water exceeding the much lower health guide values rather than very permissive federal maximum contaminant levels shown in Table 1.

[19] Federation of American Scientists, website containing United States Nuclear Tests July 1945 through September 1992, (DOE/NV-209 Rev. 14, December 1994) , https://fas.org/nuke/guide/usa/nuclear/usnuctests.htm United States Nuclear Tests by Date include date, yield, purpose, i.e., Plowshare, and type, i.e. crater, tower, or shaft.

[20] Off-Site Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas, Calendar Year 1986," EPA/600/4-87/017 May 1987. Find on nepis.epa.gov