LMS/SRE-SRW/S33494

2020 Verification Monitoring Report for the Slick Rock, Colorado, Processing Sites

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U.S. DEPARTMENT OF ENERGY | Legacy Management

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Abbreviations

ACL	alternate concentration limit
BTEX	benzene, toluene, ethylbenzene, and xylene
CCR	*Colorado Code of Regulations*
CDPHE	Colorado Department of Public Health and Environment
CFR	*Code of Federal Regulations*
COPC	constituent of potential concern
DOE	U.S. Department of Energy
ft	feet
GCAP	Groundwater Compliance Action Plan
IC	institutional control
LOESS	locally estimated scatterplot smoothing
MCL	maximum contaminant level (SDWA); maximum concentration limit (UMTRCA)
mg/L	milligrams per liter
NRC	U.S. Nuclear Regulatory Commission
pCi/L	picocuries per liter
^{226}Ra	radium-226
^{228}Ra	radium-228
SDWA	Safe Drinking Water Act
SOWP	Site Observational Work Plan
SRE	Slick Rock East
SRW	Slick Rock West
UMTRCA	Uranium Mill Tailings Radiation Control Act
USGS	U.S. Geological Survey
VMR	Verification Monitoring Report

Executive Summary

The Slick Rock, Colorado, Processing Sites consist of two former uranium-ore processing facilities—the Slick Rock East (SRE) site and the Slick Rock West (SRW) site. Both sites reside along the Dolores River in San Miguel County. This Verification Monitoring Report (VMR) for the Slick Rock sites summarizes monitoring data through calendar year 2020 and assesses the progress of aquifer restoration as it relates to the proposed compliance strategy of natural flushing combined with institutional controls and compliance monitoring. To assess the progress of natural flushing at the former mill tailings areas, temporal trends in constituents of potential concern (COPCs) concentrations in groundwater and surface water are compared relative to baseline conditions. COPCs at the SRE site are uranium and selenium, and COPCs at the SRW site include uranium, selenium, molybdenum, nitrate, and manganese. Several other COPCs—benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX); radium-226; and radium-228—are limited to a single SRW alluvial well (0319).

To achieve compliance with Subpart B of Title 40 *Code of Federal Regulations* Section 192 at the SRE site, the U.S. Department of Energy (DOE) proposed action is natural flushing in conjunction with institutional controls (ICs) and continued monitoring. At the SRW site, the DOE proposed action is also natural flushing in conjunction with ICs and continued monitoring. Additionally, an alternate concentration limit (ACL) of 0.18 milligrams per liter (mg/L) was proposed for selenium at the SRW site because initial flow and transport modeling predicted selenium concentrations will not naturally flush below the 0.01 mg/L maximum concentration limit (MCL) under the Uranium Mill Tailings Radiation Control Act (UMTRCA). Implementation of the proposed ICs is an ongoing negotiation at the time of this writing; therefore, the proposed compliance strategy for the Slick Rock sites has not yet been approved.

Concentrations in SRE site wells indicate natural flushing is effectively reducing selenium to below the UMTRCA MCL; however, uranium concentration trends in SRE site wells indicate natural flushing has not been an effective attenuation mechanism for uranium for the past 20 years. Increases in uranium concentration in offsite wells from the former tailings area at the SRE site are reported to be caused by the transport of milling-related uranium to these locations across the river.

Selenium and molybdenum concentrations within the alluvial aquifer at the SRW site indicate natural flushing has not been an effective attenuation mechanism for either COPC, which is consistent with conclusions drawn in the last several VMRs. Selenium concentrations in five SRW wells range from 1.2 to 2.8 mg/L in 2020. Well 0340 also had an increasing molybdenum concentration trend and had the highest concentration at the SRW site of 1.9 mg/L in 2020. Molybdenum was also the only COPC concentration above the benchmark level in SRW Entrada Sandstone well 0317 during the 2020 sampling; however, Mann-Kendall trend analysis indicated molybdenum had a decreasing trend in this well. Overall decreasing concentration trends in uranium, manganese, and nitrate in SRW site wells indicate that uranium, manganese and nitrate are flushing out of the alluvial aquifer at the SRW site.

All BTEX constituents had decreasing concentration trends in well 0319 with benzene the only aromatic hydrocarbon having a concentration higher than the benchmark level in 2020. Ra-226 + Ra-228 concentrations also had a statistically significant decreasing trend in well 0319

since 2000. Radium in well 0319 has been below the 5.0 picocuries per liter MCL since 2008, indicating that natural flushing has successfully reduced total radium to below benchmark levels.

Uranium concentrations at all surface water locations continue to be below the lower chronic Colorado Department of Public Health and Environment (CDPHE) benchmark of 0.0168 mg/L and indistinguishable from background levels. All COPC concentrations at SRW surface water locations also continue to sample below the respective acute and chronic CDPHE benchmarks.

1.0 Introduction

This Verification Monitoring Report (VMR) provides an update of natural flushing progress at the Slick Rock, Colorado, Processing Sites from the completion of surface remediation in 1996 to the present. The Slick Rock processing sites consist of two former uranium-ore processing facilities, referred to as the Slick Rock East (SRE) site (formerly the North Continent site) and the Slick Rock West (SRW) site (formerly the Union Carbide site). The processing sites are along the Dolores River in San Miguel County (Figure 1 and Figure 2); SRW is approximately 1 mile downstream from SRE. The processing sites are owned by Umetco Minerals Corporation but managed by the U.S. Department of Energy (DOE) Office of Legacy Management under the Uranium Mill Tailings Radiation Control Act (UMTRCA) Title 1 program and regulated by the U.S. Nuclear Regulatory Commission (NRC).

To achieve compliance at the SRE site, the DOE proposed action presented in the Groundwater Compliance Action Plan (GCAP) (DOE 2006) is natural flushing in conjunction with institutional controls (ICs) and continued monitoring. At the SRW site, the DOE proposed action is also natural flushing in conjunction with ICs and continued monitoring. Additionally, an alternate concentration limit (ACL) of 0.18 milligrams per liter (mg/L) was proposed for selenium at the SRW site because initial flow and transport modeling predicted selenium concentrations will not naturally flush below the 0.01 mg/L maximum concentration limit (MCL) under UMTRCA. ICs are pending for the Slick Rock sites until mineral rights issues are resolved. NRC will not concur with the GCAP until ICs are established.

The purpose of this VMR is to assess the progress of aquifer restoration as it relates to the current proposed compliance strategy of 100-year natural flushing and continued monitoring as permitted by Title 40 *Code of Federal Regulations* Section 192 (40 CFR 192) as described in the Site Observational Work Plan, hereafter called the SOWP (DOE 2002). Information related to site history, compliance strategies, hydrogeology, and remedial activities is provided as summaries. Details related to the Slick Rock sites can be found in the documents referenced throughout the report.

1.1 Site History and Current Water Use

From 1931 to 1942, the mill at SRE extracted vanadium from ore using a sulfuric acid leaching process. In 1942, the extraction techniques included an initial salt roast circuit with an acid-leach process to recover vanadium, uranium, and radium concentrates (Merritt 1971). Tailings and mill wastes were disposed of on the alluvial floodplain at the SRE site (Figure 3). The mill at the SRW site operated from 1957 to 1961 using a recirculated sulfuric acid solution and a sand-slime separation process, and ammonia neutralization to extract uranium from ore. The finer fraction of upgraded material was sent to the mill at Rifle, Colorado, and tailings were disposed of on the alluvial floodplain at the SRW site (Figure 4).

Surface remediation at the Slick Rock sites began in 1995 and was completed in 1996. As part of the remediation process, uranium mill tailings and other residual radioactive materials associated with the former milling operations were relocated to the Slick Rock disposal cell (formerly called the Burro Canyon disposal cell), approximately 5 miles east of the Slick Rock processing sites. Approximately 134,000 cubic yards of material was relocated from the SRE site, and

671,000 cubic yards of material was relocated from the SRW site. The sites were regraded with onsite material, and subsequent revegetation efforts have been successful.

Umetco Minerals Corporation currently owns the SRE and SRW sites and the land between the two sites is privately owned and used for alfalfa production (fields irrigated with water pumped from the Dolores River), livestock grazing, and gravel-mining operations. Groundwater for domestic or agricultural use in the Slick Rock sites area is primarily supplied by groundwater from the Navajo Sandstone. Historically, wells completed in the Navajo Sandstone provided water for the milling operations and for the mill community at the SRW site. There are no known uses of groundwater from either the alluvial aquifer or the underlying Entrada Sandstone beneath the former processing sites.

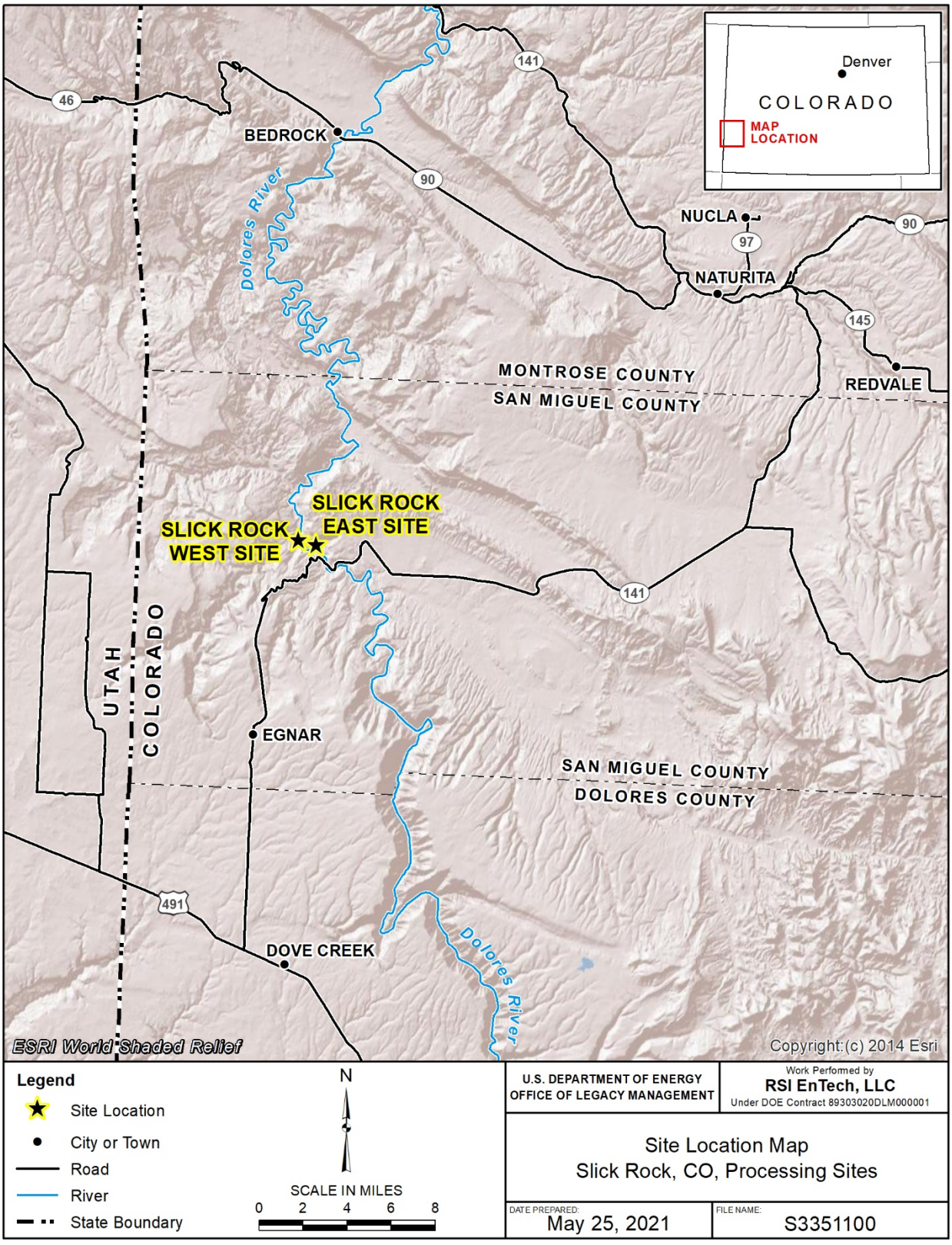


Figure 1. Slick Rock, Colorado, Processing Sites Location Map

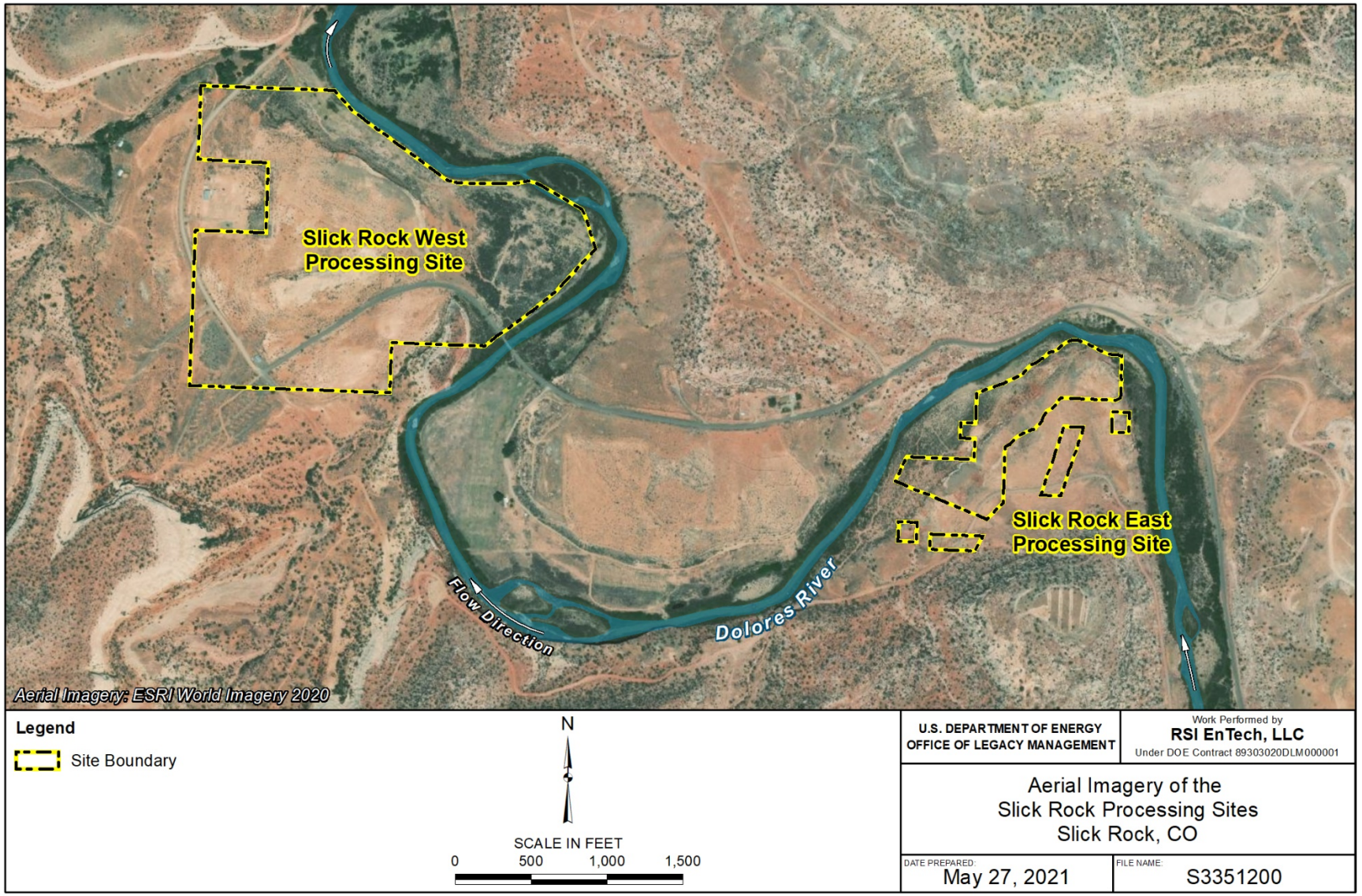


Figure 2. Aerial Photograph of the Slick Rock Processing Sites

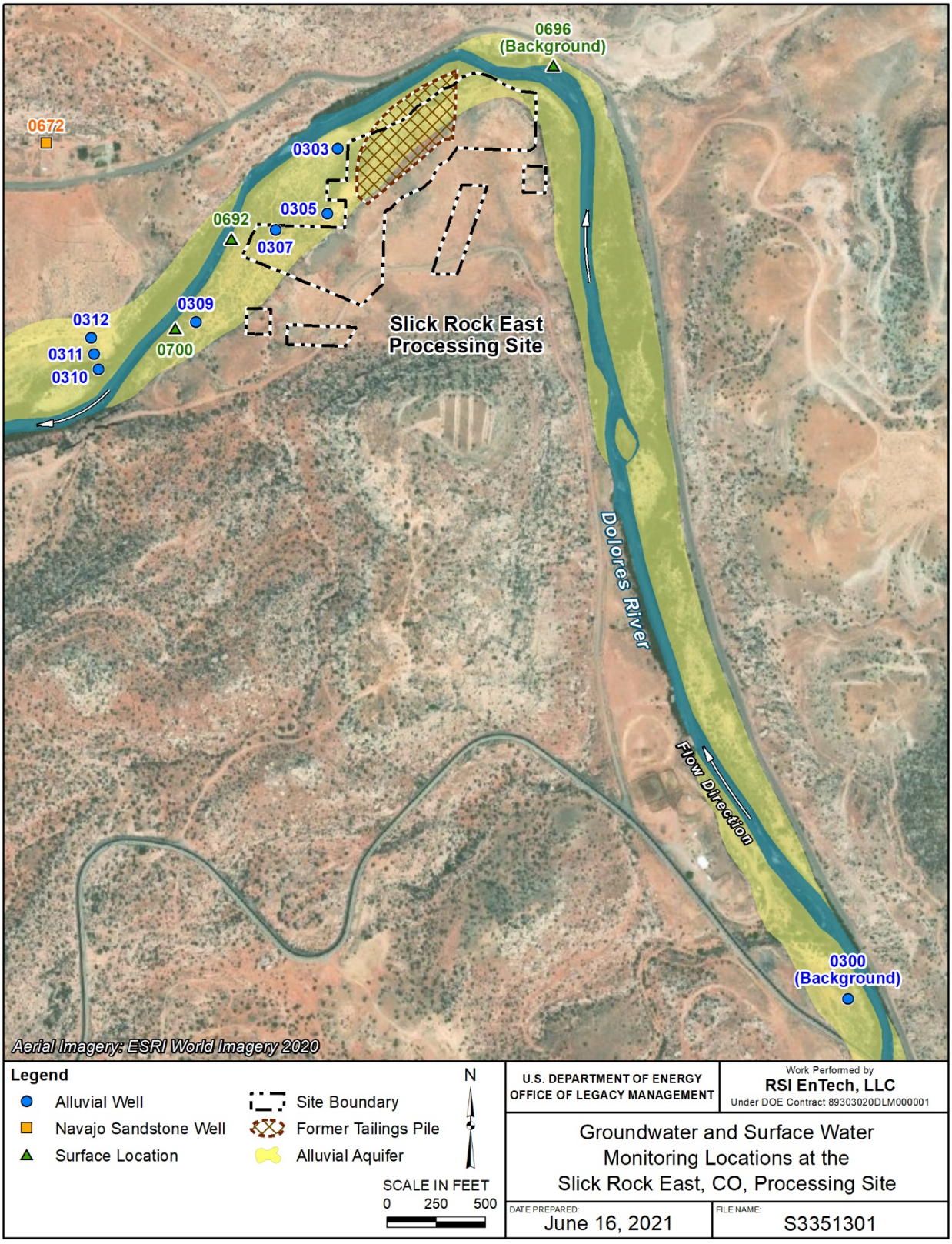


Figure 3. Groundwater and Surface Water Monitoring Locations at the SRE Site

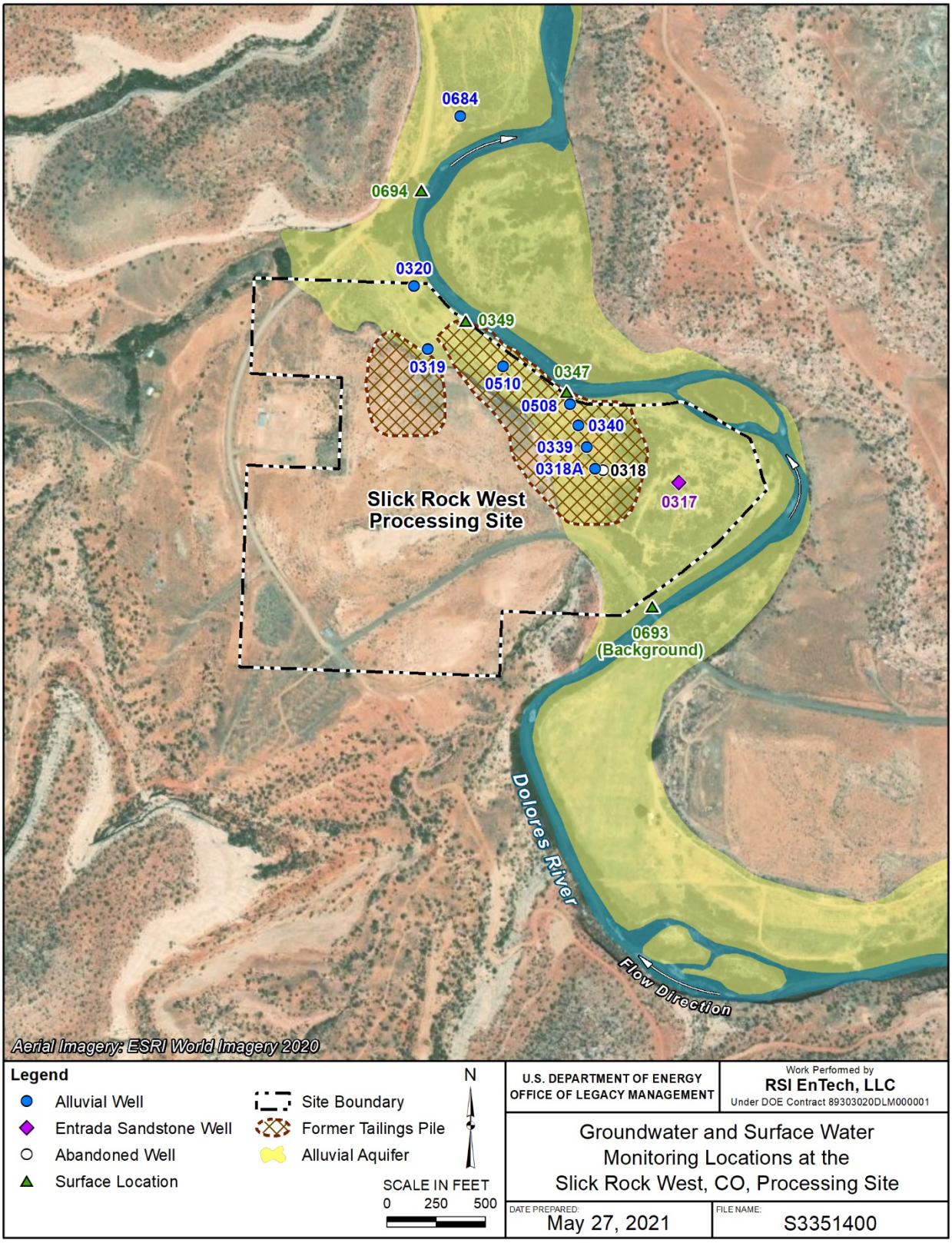


Figure 4. Groundwater and Surface Water Monitoring Locations at the SRW Site

1.2 Hydrologic Setting

The uppermost aquifer at both the SRE and SRW sites is the Dolores River alluvium, which ranges from 15 to 20 feet (ft) thick and is laterally restricted by the bedrock that forms the walls of the Dolores River canyon (Figure 5). The alluvial aquifer is discontinuous and pinches out in areas where the river meets the canyon wall. Alluvial deposits that also occur on the terraces adjacent to the river are typically unsaturated and hydrologically isolated from the Dolores River alluvial aquifer (DOE 2002). The alluvial aquifer consists primarily of silty sands and silty sandy gravels with an occasional interbedded clay lens (DOE 2002). Surface water inflow from the Dolores River provides the majority of recharge to the alluvial aquifer at both sites. Groundwater in the alluvial aquifer generally discharges back to the river.

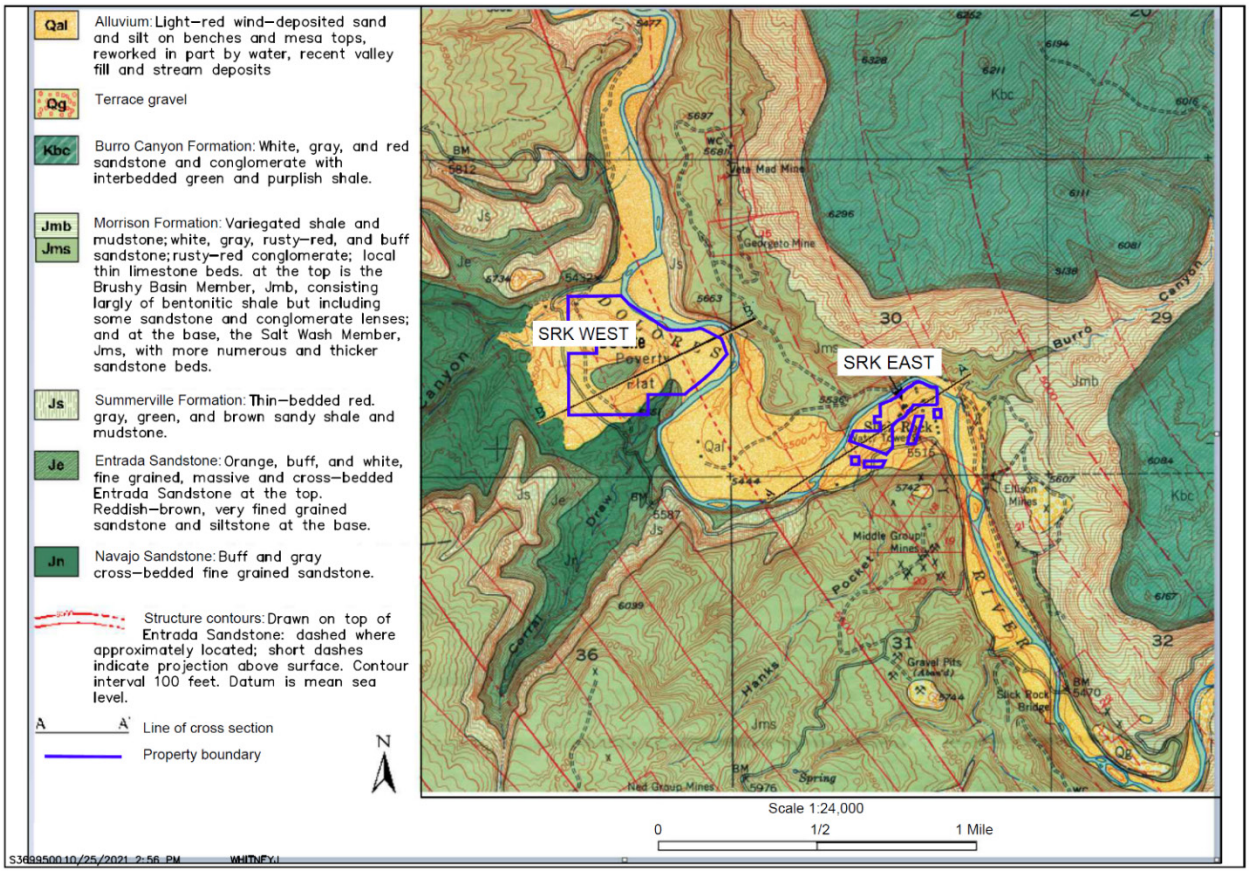


Figure 5. Geologic Diagram of the Slick Rock Processing Sites

The hydrostratigraphic units at the Slick Rock sites are, in descending stratigraphic order, the Dolores River alluvium, the Salt Wash Member of the Morrison Formation, the Summerville Formation, the Entrada Sandstone, and the Navajo Sandstone. The bedrock units dip approximately 6° to the northeast in the Slick Rock area. The Salt Wash Member of the Morrison Formation is composed of intercalated fine-grained sandstone and mudstone layers. The Summerville Formation is composed of evenly-bedded mudstone, siltstone, and very fine- to fine-grained sandstone. Because of the fine-grained layers in these two formations, they are not major water-bearing units and were interpreted to have a relatively low permeability that limit

vertical groundwater movement (DOE 2002). The Salt Wash Member and the Summerville Formation were not hydraulically characterized at the Slick Rock sites (DOE 2002).

The alluvial aquifer at the SRE site is bounded by the Dolores River to the east, north, and south. The Salt Wash Member of the Morrison Formation bounds the alluvial aquifer to south. The alluvial aquifer is underlain by both the Salt Wash Member, and the Summerville Formation at the site. Geologic cross section maps indicate the Entrada Sandstone is approximately 60 to 150 ft below the base of the alluvial aquifer at the SRE site. No other relevant borehole data was available for the site within the SRE site boundaries (Figure 6).

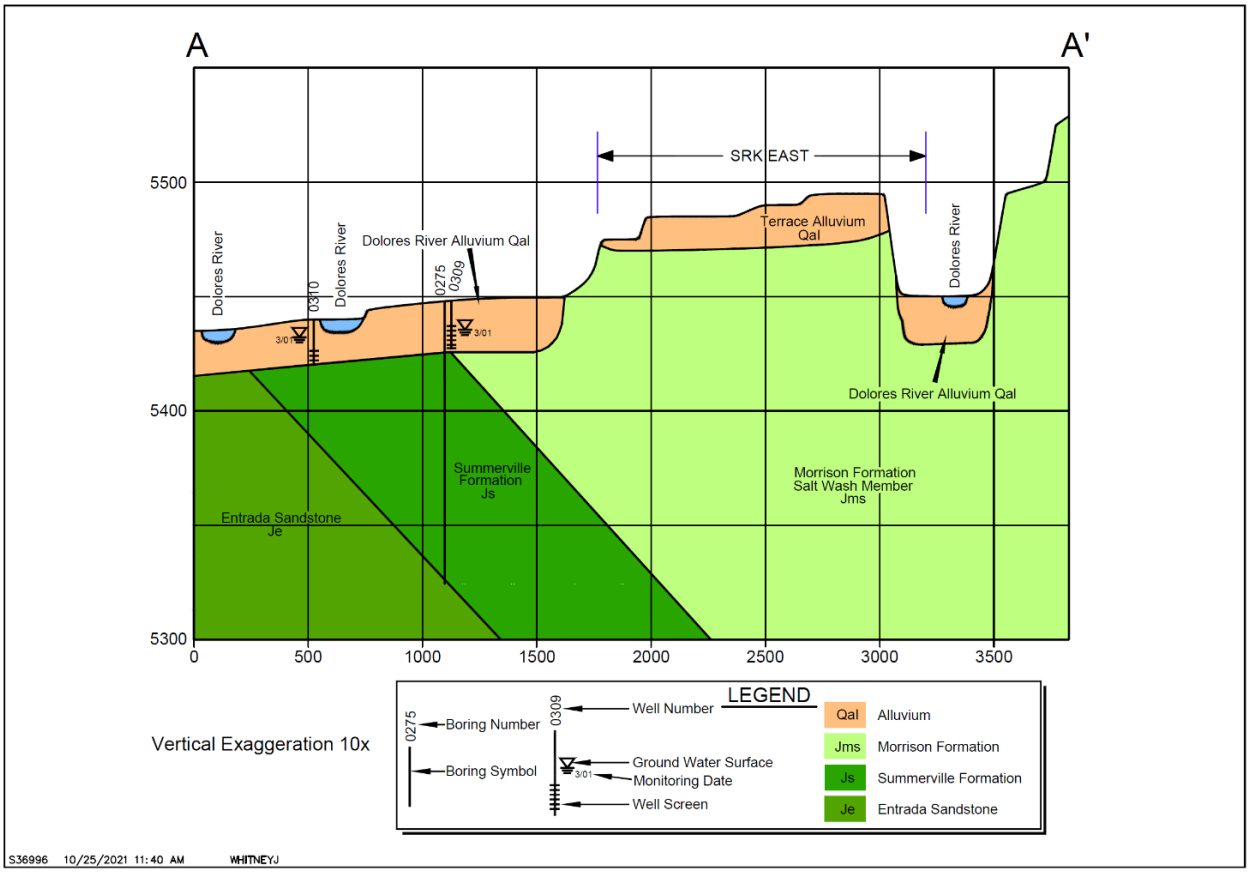


Figure 6. Hydrologic Cross Section of the Slick Rock East Processing Site

The Entrada Sandstone directly underlies the alluvial aquifer at the SRW site and is water-bearing. Groundwater use in the Entrada is limited to livestock via a collector system upgradient of the SRW site. The Entrada ranges from 40 to 60 ft thick in the SRW floodplain area, and is unconfined when in connection with the alluvial aquifer at the SRW site. The Entrada recharges from precipitation infiltration upgradient, and flow direction is generally to the east in the direction of regional dip (DOE 2002).

Domestic groundwater use in the Slick Rock sites area is primarily supplied by the Navajo Sandstone, which underlies the Entrada Sandstone and is estimated to be 180 ft thick at the SRW site (DOE 2002). The Navajo Sandstone recharges from infiltration upgradient from the site where it outcrops. Upward vertical gradients were measured from groundwater elevations

in wells screened in the Navajo Sandstone relative to those screened in the Entrada, and indicate that groundwater in the Navajo discharges upward into overlying units in the Slick Rock sites area (Figure 7).

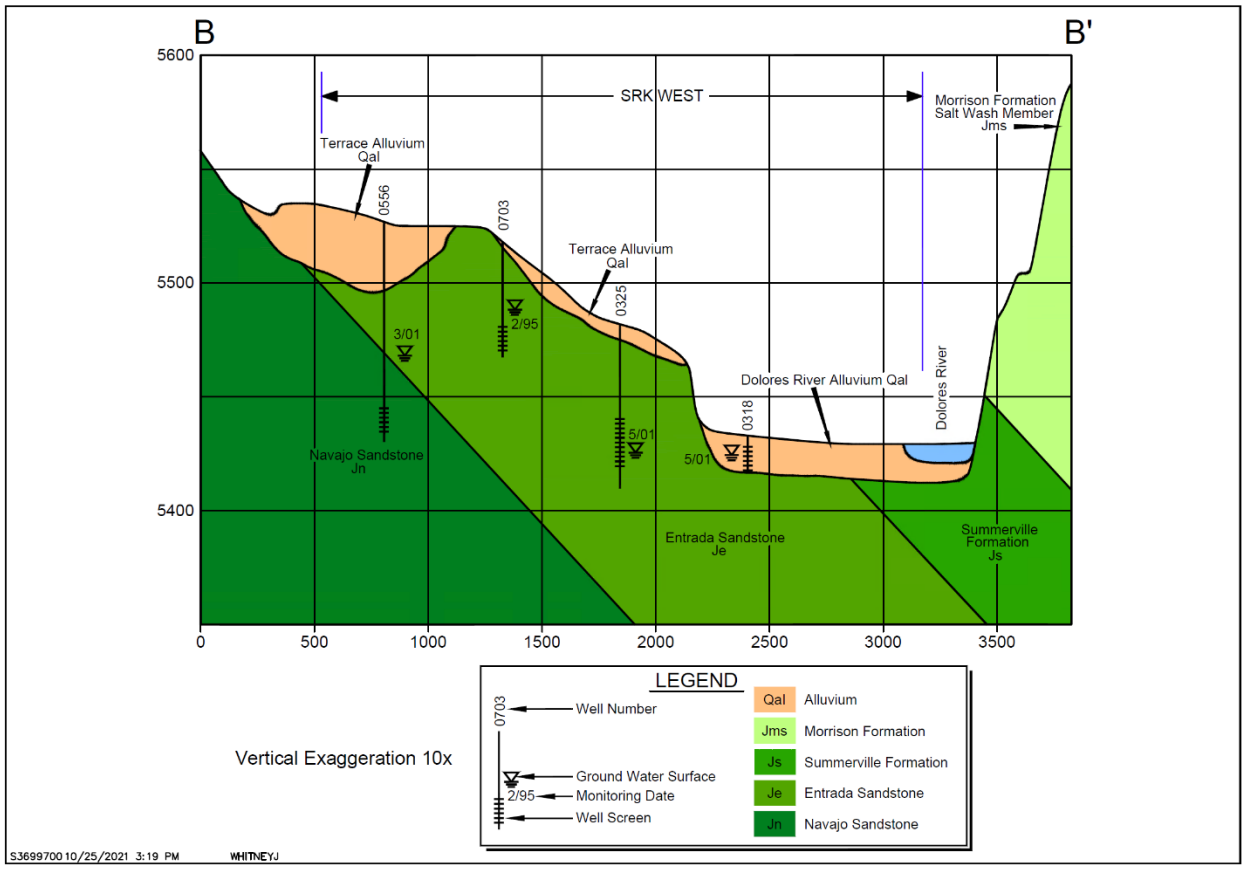


Figure 7. Hydrologic Cross Section of the Slick Rock West Processing Site

1.3 Site Remediation, Compliance Strategy, and Water Quality Monitoring

To achieve compliance at the SRE site, the DOE proposed action is natural flushing in conjunction with ICs and continued monitoring. At the SRW site, the DOE proposed action is also natural flushing in conjunction with ICs and continued monitoring. Additionally, an ACL of 0.18 mg/L was proposed for selenium at the SRW site because initial flow and transport modeling predicted selenium concentrations will not naturally flush below the 0.01 mg/L maximum concentration limit (MCL) for UMTRCA.

The GCAP (DOE 2006) for the Slick Rock sites states that public health will be protected during the natural flushing process through ICs that will restrict access to contaminated groundwater in the alluvial aquifer. The ICs proposed for the former Slick Rock processing sites are environmental covenants between the State of Colorado, represented by the Colorado Department of Public Health and Environment (CDPHE), and the landowner, Umetco Minerals Corporation. ICs are pending for the Slick Rock sites until mineral rights issues are resolved. NRC will not concur with the GCAP until ICs are established.

1.3.1 Constituents of Potential Concern and Remediation Goals

Constituents of potential concern (COPCs) at the Slick Rock sites are manganese, molybdenum, nitrate, selenium, and uranium (Table 1). Several other COPCs—benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX); radium-226 (^{226}Ra); and radium-228 (^{228}Ra)—are limited to a single SRW alluvial well (0319). Selenium and uranium are the only COPCs common to both the SRE and SRW sites. To assess the status of compliance, COPC concentrations are compared to the benchmark values listed in Table 1. Groundwater benchmarks for molybdenum, nitrate, ^{226}Ra, ^{228}Ra, selenium (at the SRE site only), and uranium are the MCLs established under UMTRCA and codified in 40 CFR 192.

Table 1. Groundwater Benchmarks for COPCs at the SRE and SRW Sites

COPC	Benchmark	Basis for Benchmark	Applicable Sites	Applicable Wells	Comment
Uranium	0.044 mg/L	UMTRCA MCL	SRE, SRW	All wells except SRW wells 0317 and 0319	The 0.044 mg/L standard is equivalent to the uranium standard of 30 pCi/L in 40 CFR 192.
Selenium	SRE: 0.01 mg/L SRW: 0.18 mg/L	SRE: UMTRCA MCL SRW: Proposed ACL (DOE 2002)	SRE, SRW	SRE wells 0305 and 0307 and all SRW wells	The UMTRCA MCL is less than the 0.05 mg/L SDWA MCL.
Manganese	3.5 mg/L	Maximum background (as of March 2001)	SRW	All SRW wells except 0317 and 0319	Since 2001, manganese levels in background well 0300 have exceeded the 3.5 mg/L benchmark four times. Results in 2017–2018 were 3.9 and 4 mg/L, respectively.
Molybdenum	0.10 mg/L	UMTRCA MCL	SRW	All SRW wells except 0319	Benchmark exceeded in six of the eight SRW wells currently sampled for molybdenum.
Nitrate as NO_3	44.3 mg/L	UMTRCA MCL (NO_3 equivalent)	SRW	All SRW wells except 0317 and 0319	The 44.3 mg/L standard is equivalent to the nitrate as nitrogen standard of 10 mg/L in 40 CFR 192.
Benzene	0.005 mg/L	SDWA MCL	SRW	SRW well 0319	The most recent (2018) result in well 0319 was 0.61 mg/L.
Toluene	1 mg/L	SDWA MCL	SRW	SRW well 0319	The most recent (2018) result, 0.047 mg/L, is below the MCL.
Ethylbenzene	0.7 mg/L	SDWA MCL	SRW	SRW well 0319	The 0.7 mg/L benchmark has never been exceeded in well 0319.
Xylene	10 mg/L	SDWA MCL	SRW	SRW well 0319	The 10 mg/L benchmark has never been exceeded in well 0319.
^{226}Ra + ^{228}Ra	5 pCi/L	UMTRCA MCL	SRW	SRW well 0319	Analysis for radium in other SRW wells was discontinued after 2001 because values were below 5 pCi/L.

At the SRW site, benchmarks for BTEX are MCLs established under the U.S. Environmental Protection Agency's Safe Drinking Water Act (SDWA). The benchmark for manganese was established as the maximum upgradient concentration measured at the designated background location, SRE well 0300.

Steady state contaminant transport modeling conducted for the SOWP (DOE 2002) predicted that, based on a natural flushing remedy, concentrations of most COPCs would decrease to values below UMTRCA MCLs within the 100-year regulatory time frame established in 40 CFR 192. The model also predicted that selenium concentrations in the uppermost, alluvial aquifer will not naturally flush to a level below the 0.01 mg/L UMTRCA MCL within 100 years. Consequently, a risk-based ACL of 0.18 mg/L, the EPA human health risk-based benchmark, was proposed for the SRW site (DOE 2002).

Concentration data and trends evaluated in previous Slick Rock VMRs showed that most site COPCs are not attenuating as initially predicted based on the groundwater modeling in the SOWP (DOE 2019). Given the inability of the model to predict measured concentrations, aquifer restoration progress evaluations will be made using actual data.

1.3.2 Groundwater and Surface Water Monitoring Schedule and Locations

Groundwater and surface water samples are collected annually at the Slick Rock sites. At the SRE site, the current monitoring network consists of eight monitoring wells and three surface water locations (Figure 3).

Table 2 lists each of these locations and describes the monitoring rationale and analytes measured. Uranium and selenium are the only COPCs currently monitored at the SRE site because levels of other COPCs have been below their respective benchmarks. Other tailings water indicator parameters such as specific conductance and pH are monitored at SRE in lieu of the full suite of COPCs. Wells 0310, 0311, and 0312 were installed in August 2000 to assess potential uranium migration offsite. Domestic supply well 0672 northwest of the SRE site is completed in the Navajo Sandstone and is monitored as a best management practice.

Table 2. Slick Rock East Processing Site Water Quality Monitoring Locations

ID	Matrix	Location	Rationale/Comment	Analytes
0300	Groundwater	Upgradient	Upgradient (background) monitoring location for both SRE and SRW sites.	Manganese, molybdenum, nitrate, selenium, and uranium
0303	Groundwater	Onsite	SRE uranium plume area.	Uranium
0305	Groundwater	Onsite	SRE uranium plume area; selenium also above the UMTRCA MCL.	Selenium and uranium
0307	Groundwater	Onsite	Uranium plume area; monitor selenium downgradient of well 0305.	Selenium and uranium
0309	Groundwater	Onsite	Farthest downgradient well onsite.	Uranium
0310	Groundwater	Offsite (north bank of the Dolores River)	Monitor migration of uranium between the SRE and SRW sites.	Uranium
0311	Groundwater	Offsite (north bank of the Dolores river)	Monitor migration of uranium between the SRE and SRW sites.	Uranium

Table 2. Slick Rock East Processing Site Water Quality Monitoring Locations (continued)

ID	Matrix	Location	Rationale/Comment	Analytes
0312	Groundwater	Offsite (north bank of the Dolores River)	This well was dry (at the time of annual September sampling) between 2012 and 2017. There was sufficient water to sample in 2018, however.	Uranium
0672	Groundwater	Offsite, north of Dolores River, NW of SRE	Navajo Sandstone well—best management practice monitoring of domestic supply well.	Selenium and uranium
0696	Surface water	Upstream	Surface water background (inlet area).	Uranium
0692	Surface water	Adjacent to site	Predicted location where the centroid of the uranium plume would intersect the river.	Uranium
0700	Surface water	Downstream	Location established in 2005, about 100 ft southwest of well 0309.	Uranium

The monitoring network at the SRW site consists of nine monitoring wells and four surface water locations (Figure 4). Table 3 lists each of these locations and describes the corresponding monitoring rationale and analytes measured. Due to a broken well screen, well 0318 was abandoned and replaced with well 0318A in September 2010. Well 0317 is east of the former tailings pile area and is completed in the Entrada Sandstone, but is analyzed for molybdenum and selenium only.

Table 3. Slick Rock West Processing Site Water Quality Monitoring Locations

ID	Matrix	Location[a]	Rationale	Analytes
0317	Groundwater	Onsite	Entrada Sandstone well—molybdenum exceeds UMTRCA MCL.	Molybdenum and selenium
0318, 0318A	Groundwater	Onsite	Area of highest measured concentrations for several COPCs.	Manganese, molybdenum, nitrate, selenium, and uranium
0339	Groundwater	Onsite	Installed in September 2010 to better characterize the extent of elevated selenium in the eastern area of the former tailings pile.	Manganese, molybdenum, nitrate, selenium, and uranium
0340	Groundwater	Onsite	Installed in September 2010 (same rationale as for well 0339).	Manganese, molybdenum, nitrate, selenium, and uranium
0508	Groundwater	Onsite	High selenium, nitrate, molybdenum, and uranium.	Manganese, molybdenum, nitrate, selenium, and uranium
0510	Groundwater	Onsite	Edge of former tailings pile; high COPC concentrations.	Manganese, molybdenum, nitrate, selenium, and uranium
0319	Groundwater	Onsite	Hot spot for BTEX and radium.	BTEX, ^{226}Ra, ^{228}Ra, and selenium
0320	Groundwater	Onsite	Farthest downgradient well onsite; monitor plume movement.	Manganese, molybdenum, nitrate, selenium, and uranium
0684	Groundwater	Offsite	Farthest downgradient well; purpose is to verify that contaminants are not migrating offsite.	Manganese, molybdenum, nitrate, selenium, and uranium
0693	Surface water	Upstream	Upstream SRW surface water location (but downstream of SRE).	Manganese, molybdenum, nitrate, selenium, and uranium
0347	Surface water	Adjacent to site	Predicted location where the centroid of the selenium plume intersects the river; potential point of exposure for selenium (DOE 2006).	Manganese, molybdenum, nitrate, selenium, and uranium
0349	Surface water	Adjacent to site	Predicted location where the centroids of contaminant plumes intersect the river. Potential point of exposure.	Manganese, molybdenum, nitrate, selenium, and uranium
0694	Surface water	Downstream	Potential for contaminant plumes to discharge to the river at this location.	Manganese, molybdenum, nitrate, selenium, and uranium

Note:
[a] Sampling locations are listed first in order of matrix then by general downstream flow direction (upstream are listed first).

2.0 Compliance Remedy Performance

To assess the effectiveness of the compliance strategy at both the SRE and SRW sites, temporal trends in groundwater levels and COPC concentrations in groundwater and surface water are compared relative to baseline conditions. Baseline conditions for the Slick Rock sites correspond to the earliest recorded sample in each well following the completion of surface remediation and establishment of the current monitoring network. Groundwater and surface water quality data collected in 2019 and 2020 for compliance and best management practice monitoring are presented in Appendix A.

2.1 Slick Rock East and Slick Rock West Groundwater Levels

Groundwater elevations for the SRE site wells are shown in Figure 4 for the alluvial aquifer in 2020. Groundwater elevations generally decreased with distance downstream and downgradient in the alluvial aquifer, as expected and consistent with groundwater flow direction evaluation in the SOWP (DOE 2002). Historically, groundwater levels in site wells fluctuated only 2–3 ft with river stage, also as expected (DOE 2002). No groundwater elevation data was available for Navajo Sandstone well 0672 because it is an active domestic supply well.

Water table contours were not generated because SRE alluvial aquifer wells 0310, 0311, and 0312 are on the north side of the river, and alluvial aquifer wells 0303, 0305, 0307, and 0309 are on the south side of the river. Reliable Dolores River stage elevation data was required to accurately interpolate stream elevations between the U.S. Geological Survey (USGS) gage and surface water gradient measurement locations taken in 2001 (DOE 2002). The USGS stream gage (09168730) at the bridge just south of the SRW site had a datum with measurement accuracy of ~10ft (USGS 2021). The range in groundwater elevations for the SRW site in 2020 was ~8 ft. Additionally, there is currently no ground surface digital elevation model data available for the Slick Rock sites. Therefore, reliable stream elevation data was not available for the Slick Rock sites. Future planned resurveying of the USGS stream gage upstream of the SRE site at the Dolores River (USGS 2021) along with steam gradient calculations already provided in the SOWP will facilitate future piezometric surface evaluations connecting the alluvial aquifer water table with the Dolores River.

Three-point estimators for hydraulic gradient calculation between sets of three water level locations was also not calculated. McKenna and Wahi (2006) demonstrated that three-point estimators in the form of triangles with very small or large base-to-height ratios provide poor estimates of magnitude or orientation, or both, of hydraulic gradient. The current configuration of the monitoring well network at the SRE site does not allow for accurate hydraulic gradient estimation by the three-point estimator method. As a result, horizontal groundwater gradients in the alluvial aquifer were generalized by groundwater elevations only.

Groundwater elevations are shown in Figure 8 for the SRW site during the 2020 sampling. As with the SRE site, piezometric surface contours for the SRW site were not generated and three-point estimators of hydraulic gradient were not calculated. Groundwater elevations in the alluvial aquifer generally decreased with position downstream. Similar to SRE, wells onsite in the alluvial aquifer exhibit groundwater elevation fluctuations on the order of ~2–3 ft (Appendix A).

Entrada Sandstone well 0317 historically showed upward vertical gradients with nearby abandoned alluvial aquifer wells of about -0.01 ft/ft (DOE 2002). Data from the SOWP also indicate upward vertical gradients were greater (~-0.08 ft/ft) between wells screened in the Entrada and the Navajo Sandstones (DOE 2002). The upward vertical gradients suggest groundwater has an upward flowing component from the Entrada and underlying Navajo Sandstones to the alluvial aquifer and the Dolores River.

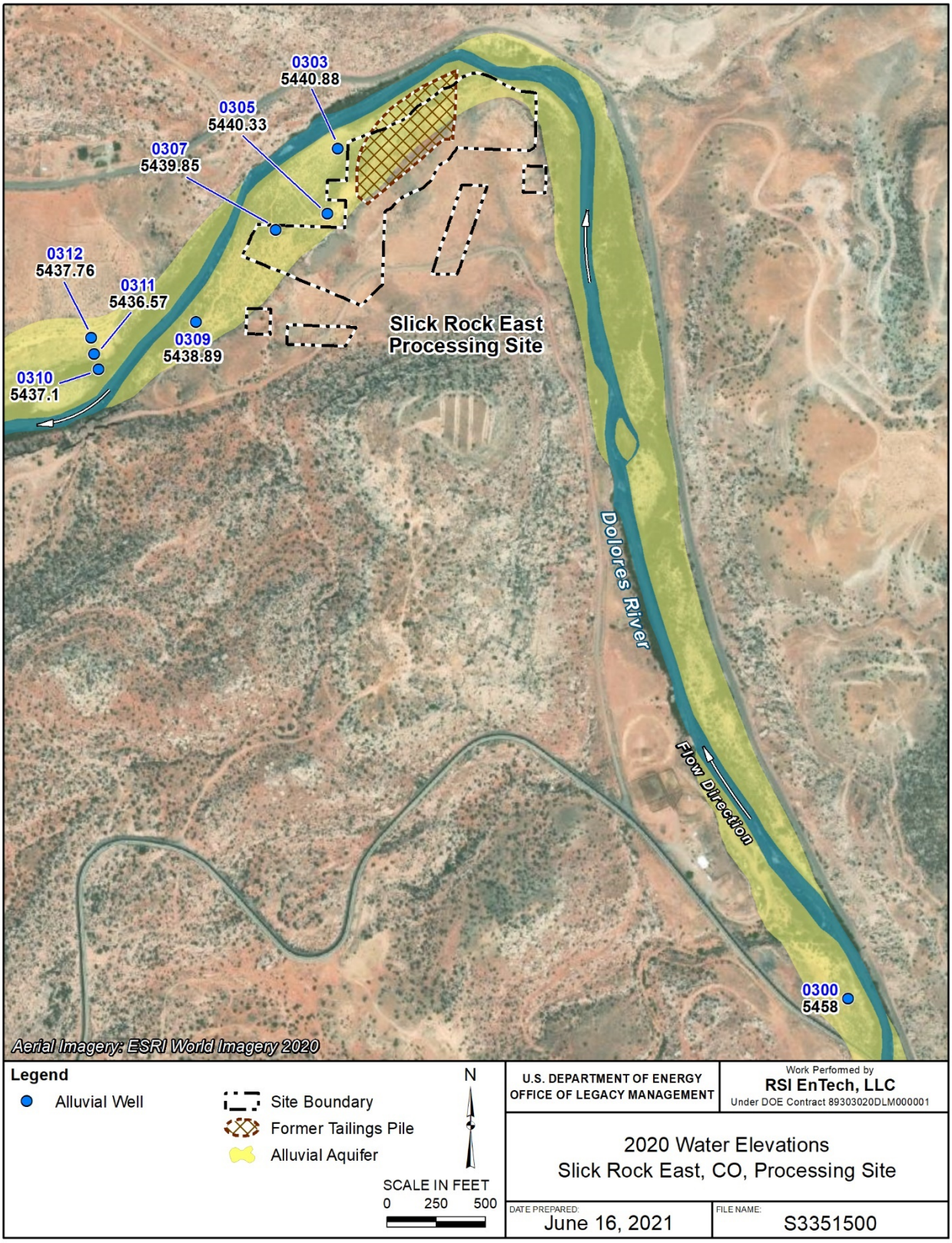


Figure 8. 2020 Groundwater Elevation Heads in Slick Rock East Monitoring Wells

2.2 Monitoring Well COPC Trends

Time-concentration trends (Figure 10 through Figure 18) for wells listed in Table 2 and Table 3 were calculated to evaluate natural flushing progress in the SRE and SRW sites. Mann-Kendall trend analysis with a 0.05 significance level, meaning a calculated p-value of less than 0.05 indicates the null-hypothesis is rejected and a significant trend in the time series exists, was used to characterize the direction of concentration trends (Table 4 through Table 11) (McLeod 2011). The Kendall rank correlation coefficient, or tau-value, determines the strength of association between time series data. Perfectly strong association between the time series for increasing trends have a tau value of 1.0. Similarly, a perfect association in the negative direction (for decreasing trends) will have a tau value of -1.0. Time series data with no statistically significant trend will have a tau value closer to 0.0.

The Mann-Kendall analyses began in 2000 to reflect the period of the most consistent monitoring data across the sites' monitoring networks. It is important to note that wells currently having stable (no trend) or increasing concentration trends may develop, with time, downward concentration trends, and vice versa. The trends merely indicate the present, statistically significant state of the natural flushing progress.

The blue line on each plot in Figure 9 through Figure 18 represents the locally estimated scatterplot smoothing (LOESS) line with a 95% confidence interval shaded around the LOESS line. The dashed lines represent the corresponding COPC benchmark concentration as portrayed in Table 1 for each of the SRE and SRW sites. Open circles represent a nondetect for that particular sampling date and were not considered for both the calculation of the LOESS line or the Mann-Kendall trend analyses.

2.2.1 Slick Rock East

2.2.1.1 Uranium

Monitored uranium concentrations for SRE wells are shown in Figure 10 from 2000 to 2020 and Mann-Kendall trends for uranium are shown in Table 4. Well 0305 had a decreasing uranium trend, and background well 0300 and well 0309 had statistically significant increasing uranium trends. Well 0300 uranium concentrations below the UMTRCA MCL of 0.044 mg/L. No other wells had a statistically significant trend. Navajo Sandstone well 0672 had consistent uranium concentrations below the MCL. Given the doubling of uranium concentrations in well 0311 between 2001 and 2004 (from 0.04 to 0.08 mg/L), sampling at wells 0310 and 0312 resumed in 2005 after a 4-year hiatus.

Wells 0303, 0305, 0307, 0309, 0311, and 0312 continue have uranium concentrations above the 0.044 MCL. The uranium concentration trends in SRE site wells indicate natural flushing has not been an effective attenuation mechanism for uranium for the past 20 years.

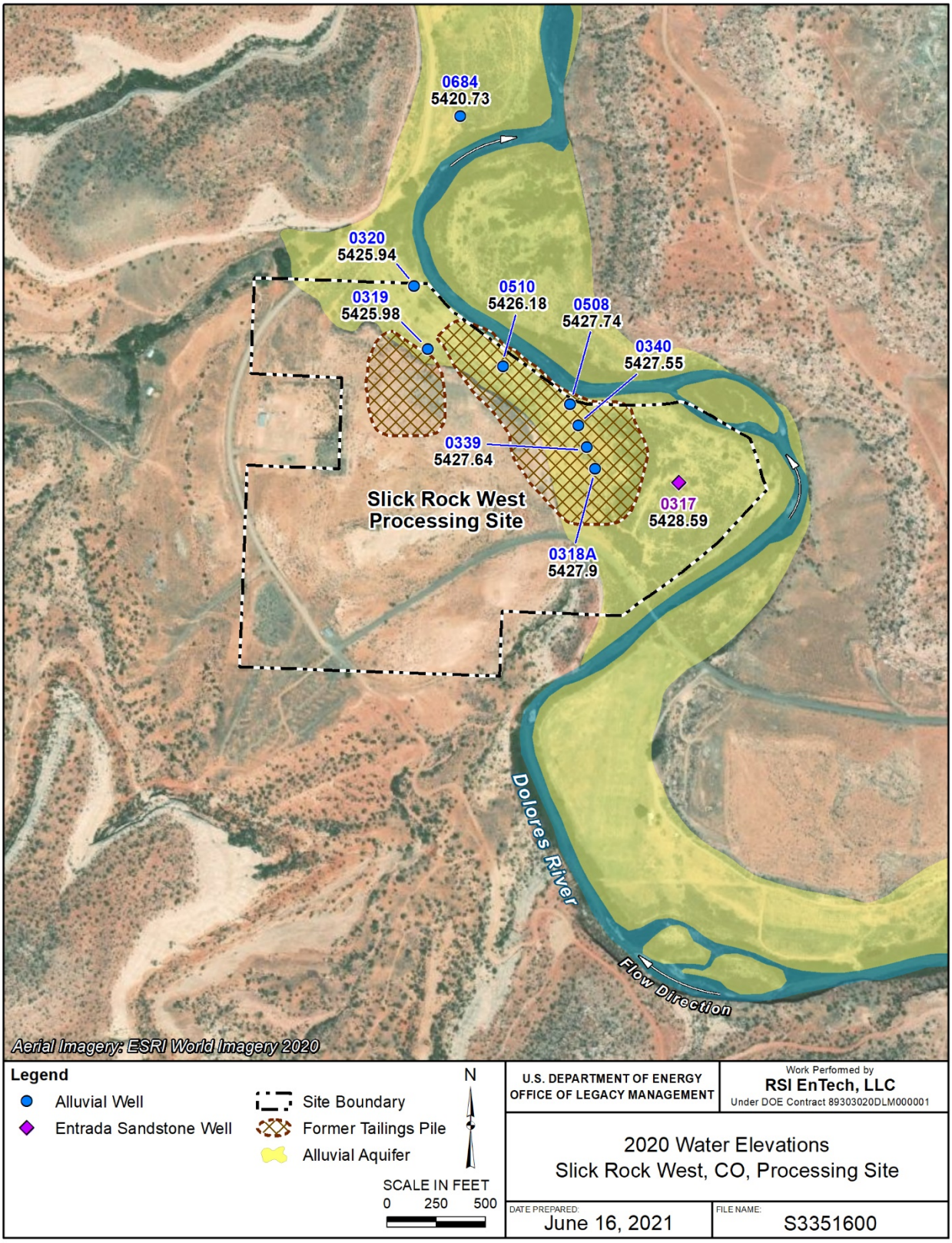


Figure 9. 2020 Groundwater Elevation Heads in Slick Rock West Monitoring Wells

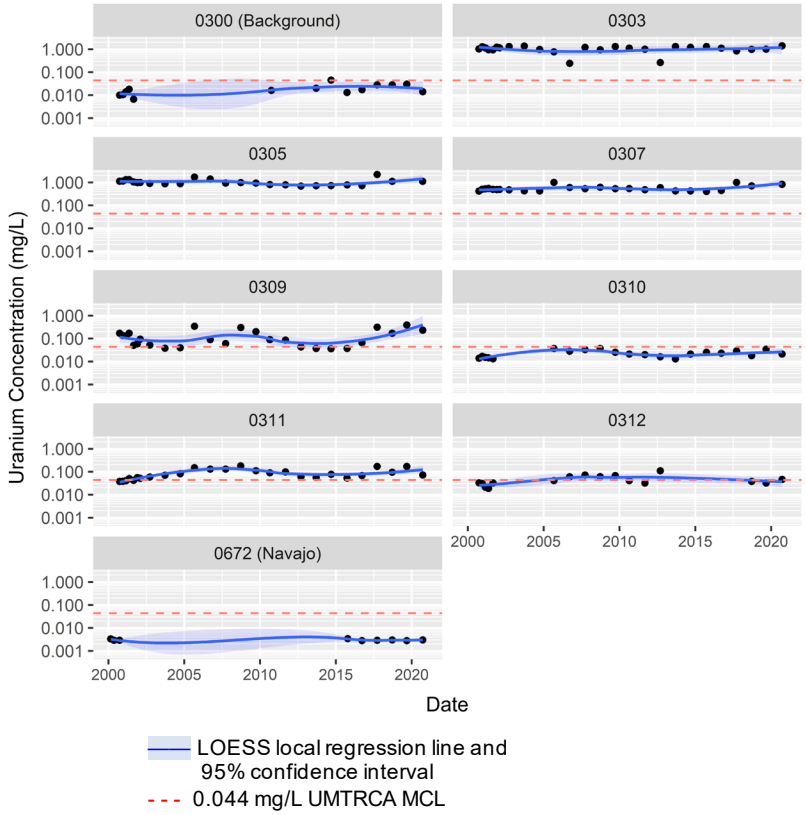


Figure 10. Time-Concentration Plots of Uranium Concentrations in SRE Wells, 2000–2020

Table 4. Mann-Kendall Trend Results for Uranium Concentrations in SRE Wells, 2000–2020

Well ID	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
0300 (Background)	09/27/2000	09/23/2020	14	0.014	Increasing	0.02	0.46
0303	09/26/2000	09/21/2020	26	1.40	None	0.91	0.02
0305	09/26/2000	09/21/2020	25	1.10	Decreasing	0.02	-0.33
0307	09/26/2000	09/21/2020	25	0.820	None	0.48	0.10
0309	09/26/2000	09/23/2020	26	0.230	None	1.00	0.00
0310	09/27/2000	09/23/2020	21	0.021	None	0.30	0.17
0311	09/27/2000	09/23/2020	26	0.072	Increasing	2.0E-3	0.44
0312	09/27/2000	09/23/2020	16	0.046	None	0.16	0.27
0672 (Navajo)	02/25/2000	09/23/2020	9	0.003	None	0.67	-0.15

Note:
p-value < 0.05 denotes a statistically significant trend.

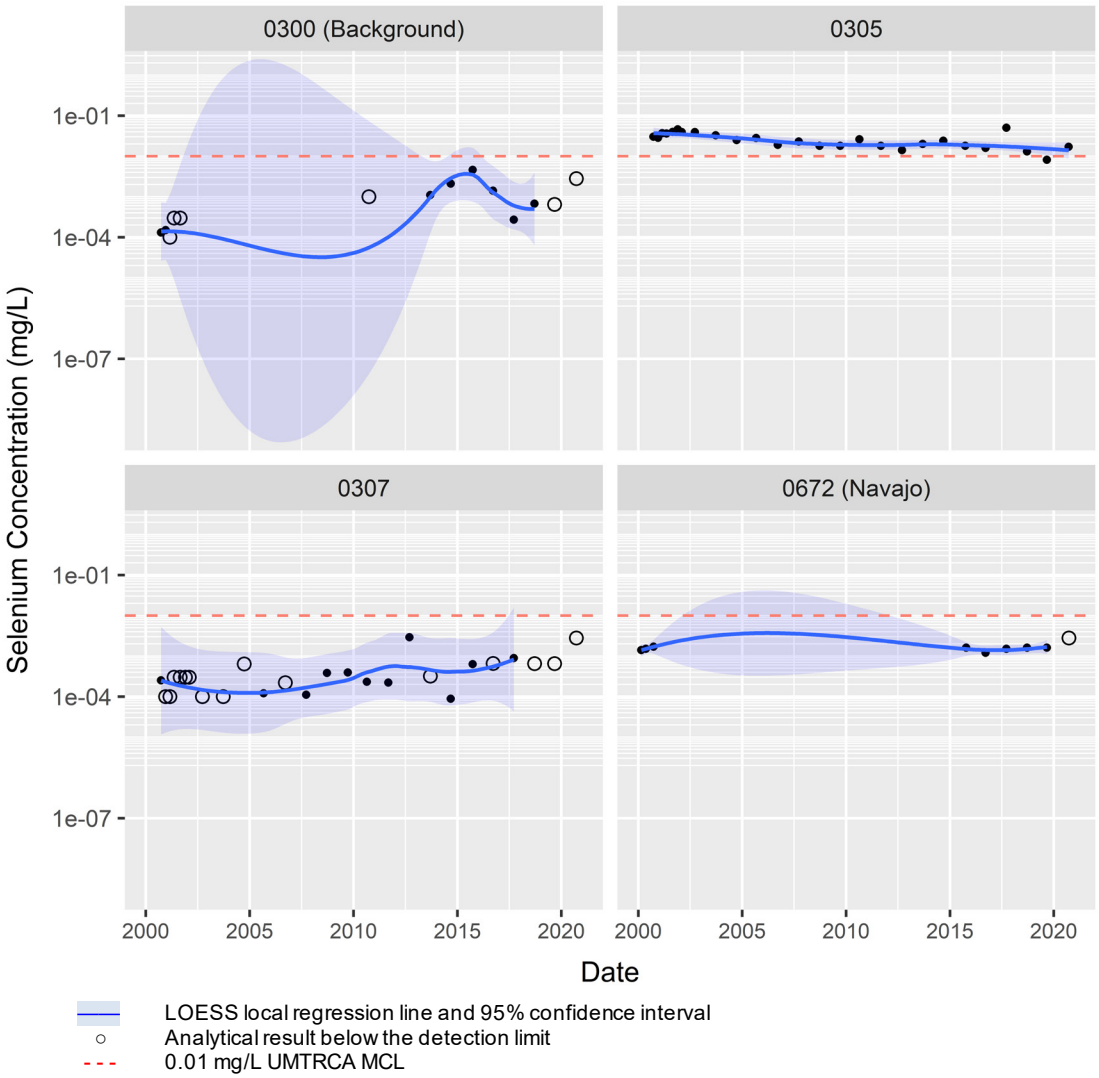


Figure 11. Time-Concentration Plots of Selenium Concentrations in SRE Wells, 2000–2020

Table 5. Mann-Kendall Trend Results for Selenium Concentrations in SRE Wells, 2000–2020

Well ID	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
0300 (Background)	09/27/2000	09/23/2020	14	Nondetect	Insufficient detections		
0305	09/26/2000	09/21/2020	26	0.017	Decreasing	1.0E-4	-0.55
0307	09/26/2000	09/21/2020	11	Nondetect	None	0.28	0.27
0672 (Navajo)	02/25/2000	09/23/2020	8	Nondetect	None	0.52	0.23

Note:
p-value < 0.05 denotes a statistically significant trend.

2.2.1.2 Selenium

Selenium is monitored in four wells at the SRE site, and selenium concentrations are shown in Figure 11 and Mann-Kendall trends for selenium are shown in Table 5. Well 0305 had a selenium concentration of 0.017 mg/L in 2020 and had a significant decreasing selenium trend since 2000. All other SRE wells had no significant trends with no detectable concentration of selenium in 2020. The intervals with relatively high confidence intervals in wells 0300 and 0672 correspond to periods with limited data. In summary, selenium concentration trends in SRE site wells indicate natural flushing is effectively reducing selenium to benchmark levels.

2.2.2 Slick Rock West

2.2.2.1 Uranium

Uranium concentrations for SRW wells are shown in Figure 12 and Mann-Kendall trends for uranium are shown in Table 6. Wells 0320 and 0340 had significant decreasing trends, and well 0340 uranium concentrations are now below the 0.044 mg/L MCL. Uranium levels in well 318/318A together had a significant decreasing trend since 2000, although uranium concentrations in well 318A alone had no significant trend since 2010, and have also been below the MCL since 2010. All other wells had no significant uranium trends since 2000. Entrada Sandstone well 0317 had a uranium concentration of 0.021 mg/L when it was last sampled for uranium in 2002. Uranium concentrations in wells 0508 and 0510 were 0.076 and 0.078 mg/L, respectively, and continue to be above the MCL.

2.2.2.2 Selenium

Selenium concentrations for SRW wells are shown in Figure 13 and Mann-Kendall trends for selenium are shown in Table 7. The pink dashed line shows the benchmark of 0.18 mg/L according to the ACL proposed in the SOWP, and the blue dashed line shows the 0.01 mg/L UMTRCA MCL. Well 0319 had an increasing selenium trend since 2000, but had a concentration below the detection limit in 2020. Well 0510 also had an increasing selenium trend and has been above 0.18 mg/L since 2004. All other wells had no significant selenium concentration trends. Entrada Sandstone well 0317 had a selenium concentration of 0.004 mg/L in 2020 and continues to be well below the MCL.

Several SRW wells continue to exceed the UMTRCA MCL for selenium, including wells 0318A, 0339, 0340, 0508, and 0510. The latest measured concentrations for these wells ranged from 1.2 to 2.8 mg/L in 2020, which is about one order of magnitude higher than the ACL proposed in the GCAP. Selenium concentration trends in SRW site wells continue to indicate natural flushing has not been an effective attenuation mechanism for selenium, and that selenium concentrations have, in fact, been increasing since 2000. Because of the magnitudes and increasing trends of selenium in site wells, the proposed ACL of 0.18 mg/L may no longer be applicable or protective at the SRW site.

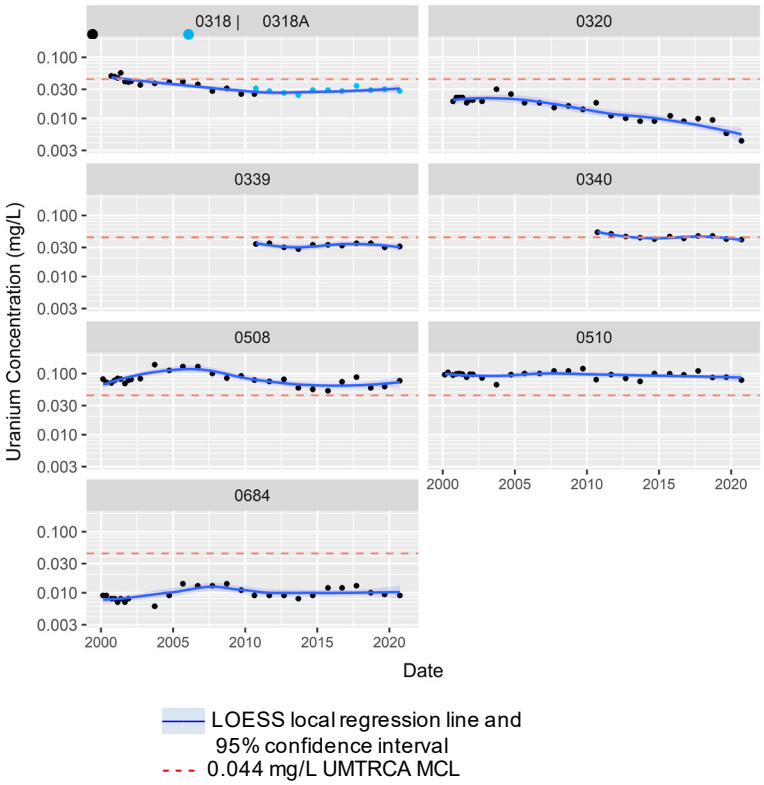


Figure 12. Time-Concentration Plots of Uranium Concentrations in SRW Wells, 2000–2020

Table 6. Mann-Kendall Trend Results for Uranium Concentrations in SRW Wells, 2000–2020

Well ID	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
0318/0318A	09/19/2000	09/22/2020	14	0.028	Decreasing	2.6E-5	-0.59
0318A	09/29/2010	09/22/2020	11	0.028	None	0.63	0.14
0320	09/20/2000	09/22/2020	26	0.004	Decreasing	2.0E-7	-0.74
0339	09/29/2010	09/22/2020	11	0.031	None	0.81	-0.08
0340	09/29/2010	09/22/2020	11	0.040	Decreasing	0.05[a]	-0.49
0508	02/23/2000	09/22/2020	28	0.076	None	0.20	-0.18
0510	02/24/2000	09/22/2020	28	0.078	None	0.43	-0.11
0684	02/23/2000	09/23/2020	26	0.009	None	0.06	0.28

Notes:
p-value < 0.05 denotes a statistically significant trend.
[a] Calculated p-value = 0.0495.

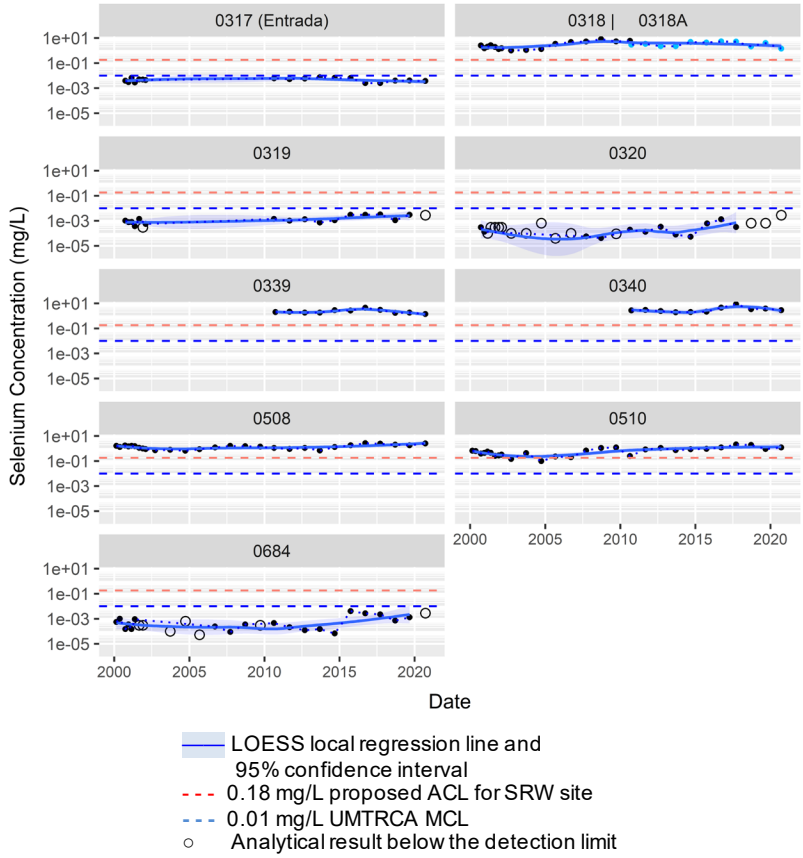


Figure 13. Time-Concentration Plots of Selenium Concentrations in SRW Wells, 2000–2020

Table 7. Mann-Kendall Trend Results for Selenium Concentrations in SRW Wells, 2000–2020

Well ID	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
0317 (Entrada)	09/28/2000	09/22/2020	18	0.004	None	0.85	-0.04
0318/0318A	09/19/2000	09/22/2020	27	1.4	None	0.08	0.24
0318A	09/29/2010	09/22/2020	11	1.4	None	0.94	-0.04
0319	09/28/2000	09/22/2020	16	Nondetect	Increasing	0.02	0.46
0320	09/20/2000	09/22/2020	12	Nondetect	None	0.27	0.26
0339	09/29/2010	09/22/2020	11	1.4	None	0.58	-0.15
0340	09/29/2010	09/22/2020	11	2.8	None	0.28	0.27
0508	02/23/2000	09/22/2020	28	2.5	None	0.22	0.17
0510	02/24/2000	09/22/2020	28	1.2	Increasing	2.5E-3	0.41
0684	02/23/2000	09/23/2020	19	Nondetect	None	0.53	0.11

Note:
p-value < 0.05 denotes a statistically significant trend.

2.2.2.3 Manganese

Manganese concentrations for SRW wells are shown in Figure 14 and Mann-Kendall trends for manganese are shown in Table 8. Five wells had decreasing manganese trends: wells 0318/0318A, 0318A, 0340, 0508, and 0510. The 3.5 mg/L manganese concentration benchmark was established in 2003 to reflect the highest manganese levels measured in SRE background well 0300. However, manganese concentration of 4.5 mg/L was measured in well 0300 in 2015. Therefore, both the 3.5 mg/L and the 4.5 mg/L benchmarks are plotted as dashed lines in Figure 14. None of the SRW wells had a manganese concentration above the 4.5 mg/L benchmark in 2020. Manganese concentration trends in SRW site wells indicate natural flushing has effectively reduced manganese to below benchmark levels.

2.2.2.4 Molybdenum

Molybdenum concentrations for SRW wells are shown in Figure 15 and Mann-Kendall trends for molybdenum are shown in Table 9. Entrada Sandstone well 0317 and well 0510 had decreasing molybdenum trends, although both wells still remained above the 0.1 mg/L MCL in 2020. Wells 0320 and 0684 had increasing molybdenum trends, but both had molybdenum concentrations below the MCL in 2020. Well 0340 also had an increasing molybdenum concentration trend, and had the highest concentration at the SRW site of 1.9 mg/L in 2020. In summary, molybdenum levels within the alluvial aquifer at the SRW site continue to exceed the MCL with no apparent or statistically significant reductions since 2000, indicating that natural flushing has not been effective at reducing molybdenum levels at the SRW site.

2.2.2.5 Nitrate

Nitrate concentrations for SRW wells are shown in Figure 16 and Mann-Kendall trends for nitrate are shown in Table 10. Nitrate was last measured in the Entrada Sandstone well 0317 in 2002 with a concentration of 5.5 mg/L; there was no monitoring data since 2002 and no trend calculated for well 0317. Five SRW wells had decreasing nitrate trends since 2000: wells 0318/0318A, 0340, 0508, 0510, and 684. Well 0684 and 0320 (no trend) had nitrate levels historically around the detection limit and lower than the 44.3 mg/L MCL. Nitrate concentrations in the other SRW wells remained above the MCL in 2020, with the highest concentrations in wells 0340 and 0508 of 708 mg/L and 753 mg/L, respectively. The decreasing nitrate trends within the alluvial aquifer at the SRW site indicate attenuation due to natural flushing is occurring.

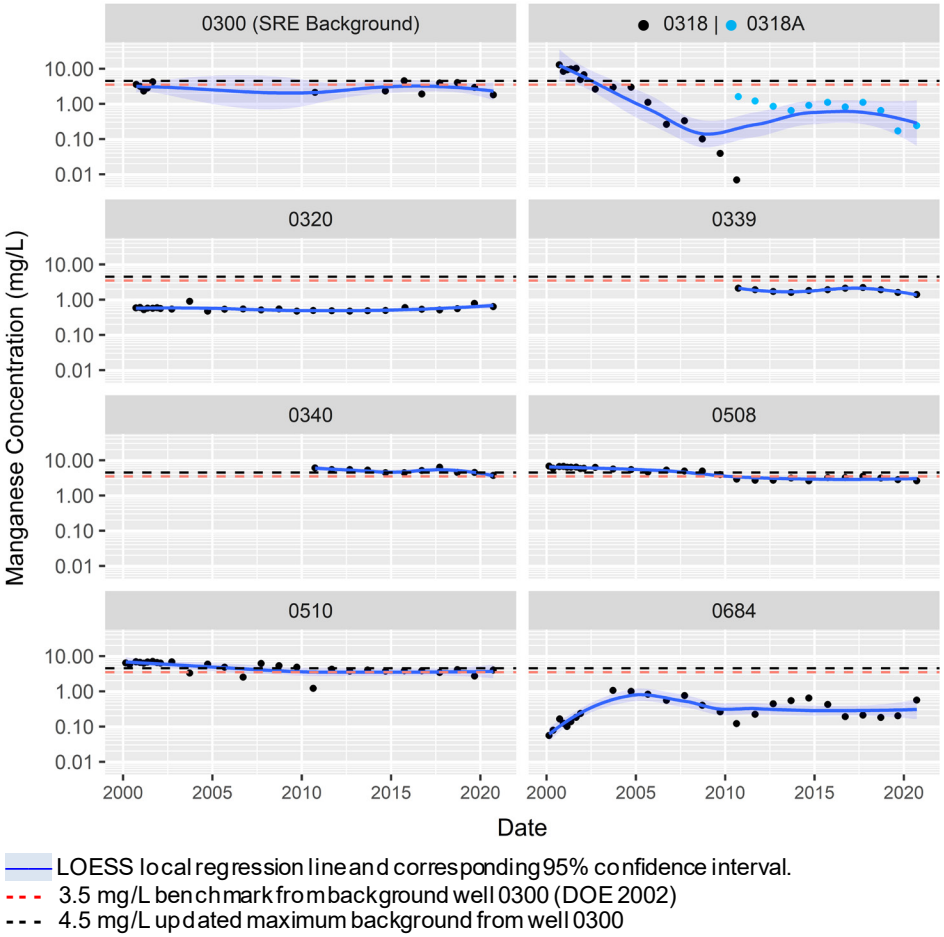
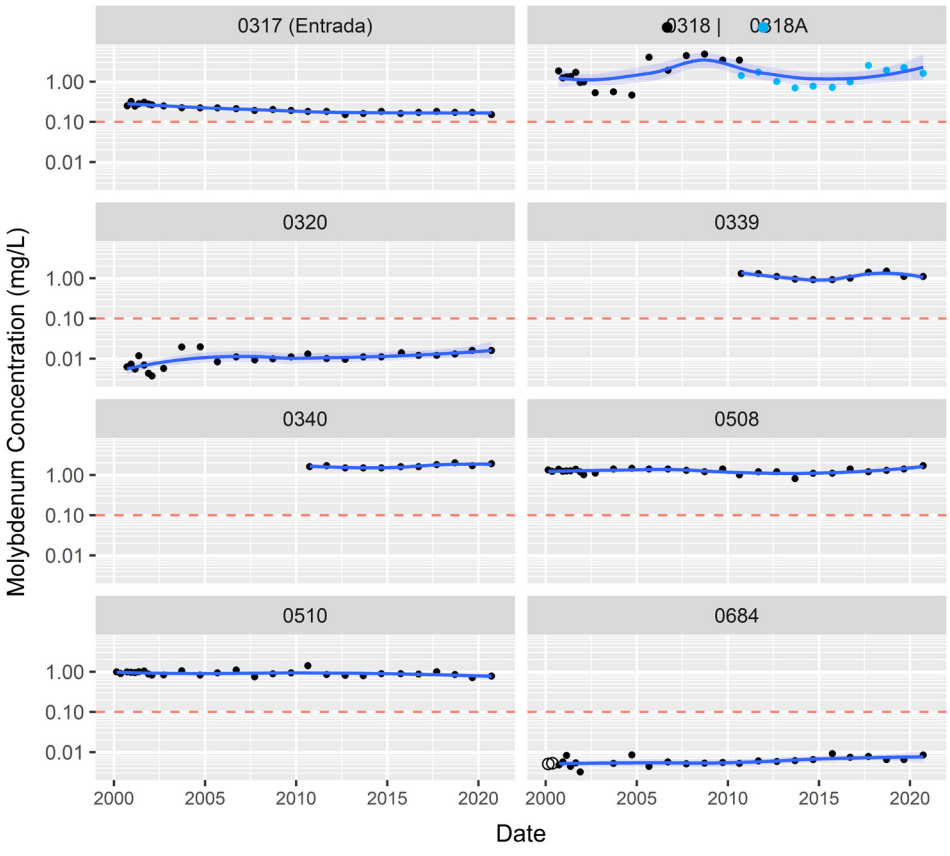


Figure 14. Time-Concentration Plots of Manganese Concentrations in SRW Wells and SRE Background Well 0300, 2000–2020

Table 8. Mann-Kendall Trend Results for Manganese Concentrations in SRW Wells and SRE Background Well 0300, 2000–2020

Well ID	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
0300 (SRE Background)	09/27/2000	09/23/2020	13	1.8	None	0.54	-0.14
0318/0318A	09/19/2000	09/22/2020	27	0.24	Decreasing	4.3E-5	-0.56
0318A	09/29/2010	09/22/2020	11	0.24	Decreasing	0.02	-0.57
0320	09/20/2000	09/22/2020	26	0.63	None	0.33	-0.14
0339	09/29/2010	09/22/2020	11	1.4	None	0.48	-0.19
0340	09/29/2010	09/22/2020	11	3.7	Decreasing	0.05[a]	-0.49
0508	02/23/2000	09/22/2020	28	2.6	Decreasing	1.6E-8	-0.76
0510	02/24/2000	09/22/2020	28	4.0	Decreasing	7.1E-5	-0.54
0684	02/23/2000	09/23/2020	26	0.56	None	0.12	0.22

Notes:
p-value < 0.05 denotes a statistically significant trend.
[a] Calculated p-value = 0.0496.



LOESS local regression line and corresponding 95% confidence interval.
0.1 mg/L UMTRCA MCL
○ Analytical result below the detection limit

Figure 15. Time-Concentration Plots of Molybdenum Concentrations in SRW Wells, 2000–2020
Table 9. Mann-Kendall Trend Results for Molybdenum Concentrations in SRW Wells, 2000–2020

Well ID	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
0317 (Entrada)	09/28/2000	09/23/2020	26	0.15	Decreasing	2.2E-8	-0.80
0318/0318A	09/19/2000	09/22/2020	27	1.6	None	0.71	0.05
0318A	09/29/2010	09/22/2020	11	1.6	None	0.35	0.24
0320	09/20/2000	09/22/2020	26	0.016	Increasing	3.7E-4	0.51
0339	09/29/2010	09/22/2020	11	1.1	None	0.94	0.04
0340	09/29/2010	09/22/2020	11	1.9	Increasing	0.05[a]	0.51
0508	02/23/2000	09/22/2020	28	1.7	None	1.00	2.7E-3
0510	02/24/2000	09/22/2020	28	0.77	Decreasing	0.03	-0.30
0684	02/23/2000	09/23/2020	24	0.008	Increasing	1.3E-3	0.48

Notes:
p-value < 0.05 denotes a statistically significant trend.
[a] Calculated p-value = 0.0496.

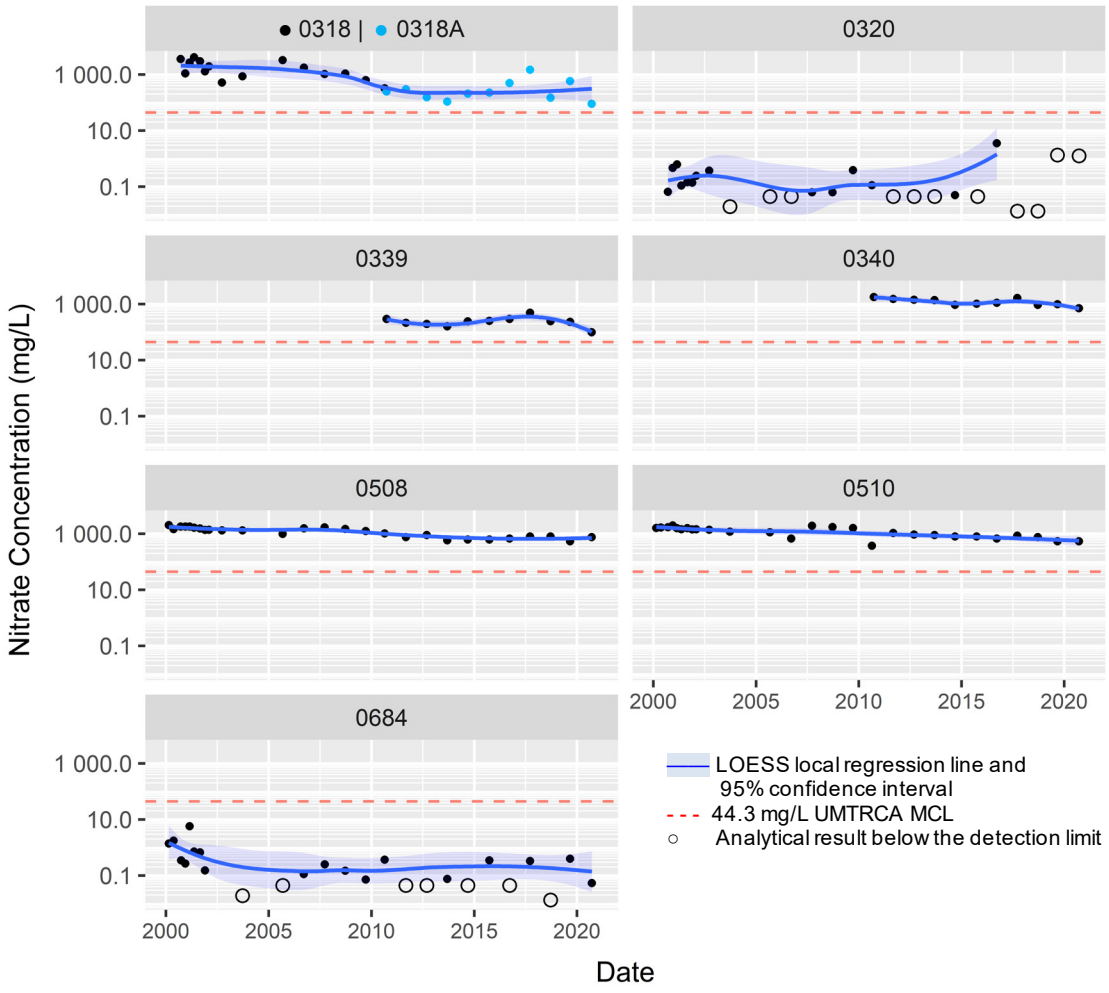


Figure 16. Time-Concentration Plots of Nitrate Concentrations in SRW Wells, 2000–2020

Table 10. Mann-Kendall Trend Results for Nitrate Concentrations in SRW Wells, 2000–2020

Well ID	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
0318/0318A	09/19/2000	09/22/2020	26	88.5	Decreasing	2.3E-5	-0.59
0318A	09/29/2010	09/22/2020	11	88.5	None	1.0	0.02
0320	09/20/2000	09/22/2020	14	Nondetect	None	0.78	-0.07
0339	09/29/2010	09/22/2020	11	97.4	None	0.94	-0.04
0340	09/29/2010	09/22/2020	11	708	Decreasing	0.02	-0.59
0508	02/23/2000	09/22/2020	27	753	Decreasing	4.4E-7	-0.70
0510	02/24/2000	09/22/2020	27	531	Decreasing	4.0E-6	-0.64
0684	02/23/2000	09/23/2020	18	0.053	Decreasing	0.02	-0.41

Note:
p-value < 0.05 denotes a statistically significant trend.

2.2.2.6 BTEX (Well 0319)

During site characterization activities conducted for the SOWP (DOE 2002), a localized aromatic hydrocarbon plume was identified in the area of alluvial well 0319 (Figure 4). BTEX concentrations for well 0319 are shown in Figure 17 and Mann-Kendall trends for BTEX constituents are shown in Table 11. Each BTEX constituent had statistically significant decreasing trends since 2000, and benzene is the only constituent that was above its respective SDWA MCL in 2020. Toluene has been below the SDWA of 1.0 mg/L since 2015, and both ethylbenzene and total xylenes never exceeded their respective SDWA MCL. The concentration trends suggest that aromatic hydrocarbons are continuing to be flushed out of the vicinity of well 0319.

2.2.2.7 Radium (Well 0319)

Although ^{226}Ra and ^{228}Ra have been detected in other wells, their presence above the 5 picocuries per liter (pCi/L) UMTRCA MCL has historically been limited to well 0319. The sum of the measured ^{226}Ra and ^{228}Ra concentrations is plotted in Figure 18 and the Mann-Kendall trend for the aggregate radium concentration in well 0319 is in Table 12. Total radium has a statistically significant decreasing trend since 2000 and has been below the 5.0 picocuries per liter (pCi/L) MCL since 2008, indicating that natural flushing has successfully reduced total radium to below benchmark levels.

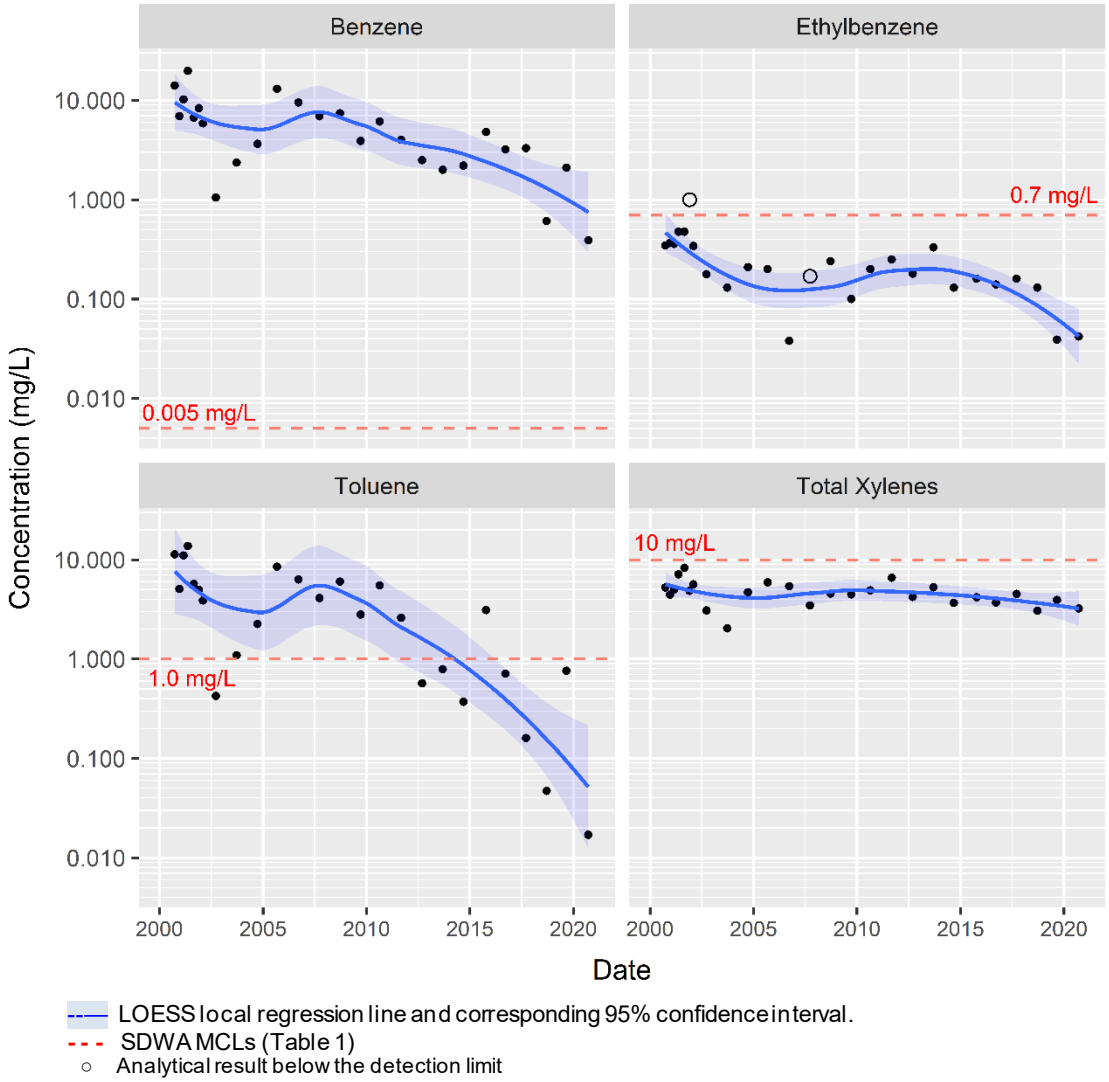


Figure 17. Time-Concentration Plots of BTEX Concentrations in SRW Well 0319, 2000–2020

Table 11. Mann-Kendall Trend Results for BTEX Concentrations in SRW Well 0319, 2000–2020

Constituent	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (mg/L)	Mann-Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
Benzene	09/28/2000	09/22/2020	26	0.39	Decreasing	1.2E-4	-0.54
Ethylbenzene	09/28/2000	09/22/2020	24	0.042	Decreasing	3.4E-5	-0.58
Toluene	09/28/2000	09/22/2020	26	0.017	Decreasing	4.6E-4	-0.52
Total Xylenes	09/28/2000	09/22/2020	26	3.22	Decreasing	0.02	-0.34

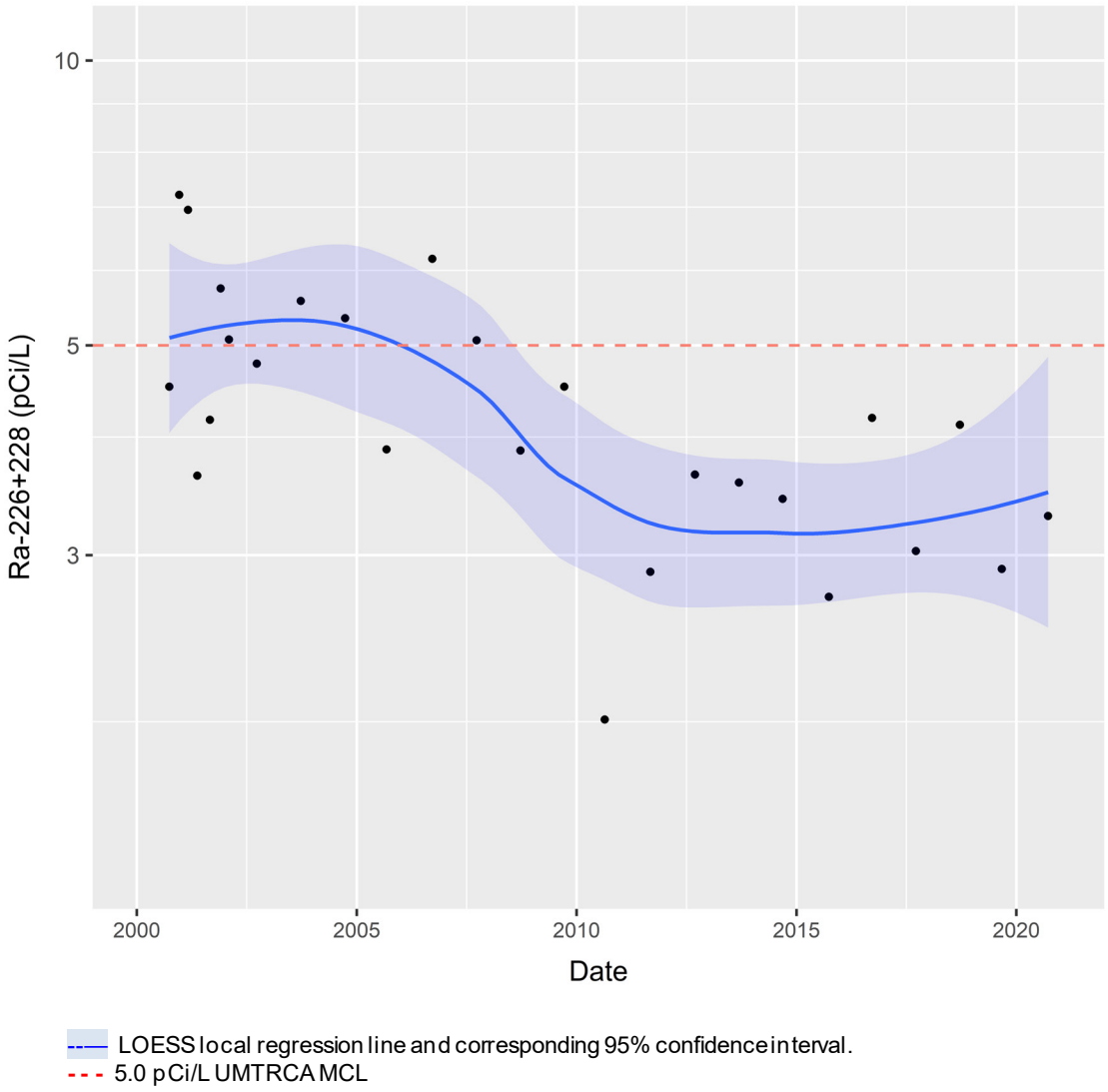


Figure 18. Time-Concentration Plots of ^{226}Ra + ^{228}Ra (Combined) Concentrations in SRW Well 0319, 2000–2020

Table 12. Mann-Kendall Trend Results for ^{226}Ra + ^{228}Ra (Combined) Concentrations in SRW Well 0319, 2000–2020

Constituent	Initial Trend Analysis Date	Final Trend Analysis Date	Number of Samples	Last Concentration Sampled (pCi/L)	Mann Kendall Trend Analysis		
					Concentration Trend	p-value	Tau Value
Ra-226 + Ra-228	09/28/2000	09/22/2020	26	3.3	Decreasing	4.6E-4	-0.49

2.3 Slick Rock East COPC Plume Geometry and Concentrations

Individual well concentrations at SRE for uranium and selenium are spatially shown in Figure 19 for the years 2000 and 2020. Defensible plume maps and contouring of concentration data was not possible to be generated for the SRE site because of the limited number of wells on either side of the discharge boundary (Dolores River). Increases in uranium concentrations in wells 0309, 0311, and 0312, and the statistically significant increasing uranium trend in well 0311, indicate that uranium is moving downgradient within the alluvial aquifer from the former tailings area. Increases in uranium concentration in wells 0311 and 0312 across the river during the 2000 to 2020 samplings support the previously reported transport of milling-related uranium to these locations (DOE 2002).

Selenium concentrations above the MCL were constrained only to well 0305 in 2000 and 2020. In 2020, well 0307 was the only well monitored for selenium downgradient of well 0305. Well 0307 had a selenium concentration below the detectable limit in 2020, but indication of selenium transport in a different direction to well 0307 from the former tailings area is not currently known.

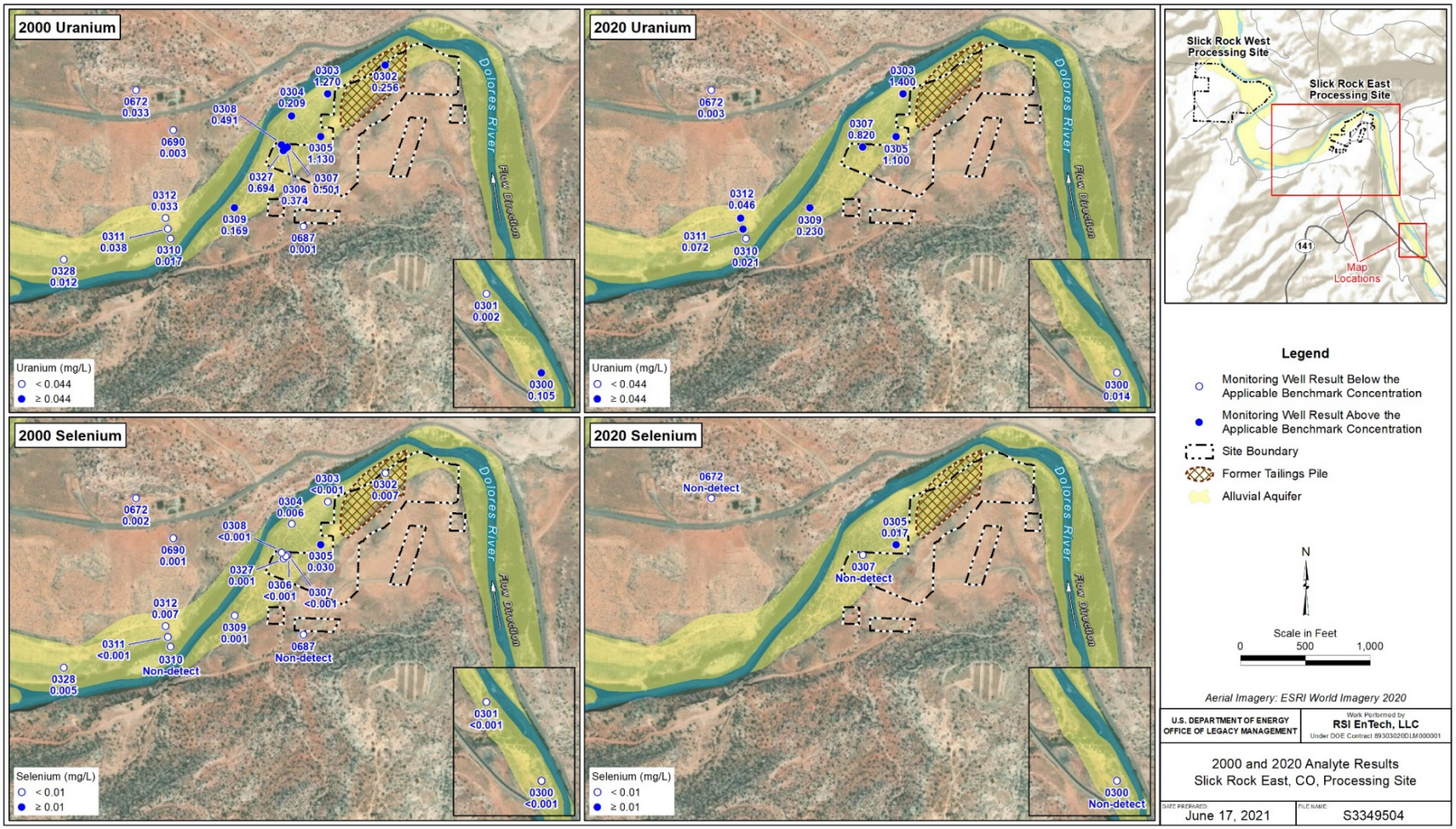


Figure 19. Uranium and Selenium Concentrations in Monitoring Wells at the SRE Site, 2000 and 2020

2.4 Slick Rock West COPC Plume Geometry and Concentrations

Spatial COPC concentrations at monitoring wells around the SRW site are shown in Figure 20 through Figure 24. Defensible plume maps and contouring of concentration data was not possible to be generated for the SRW site because of the limited number of wells within the current, onsite monitoring network.

2.4.1 Uranium

Individual well concentrations at SRW for uranium are spatially shown in Figure 20 for the years 2000 and 2020. Uranium concentrations above the MCL are limited to wells 0508 and 0510 screened in the alluvial aquifer within the area of the former tailings pile. Decreasing trends in site wells, as well as the lack of increasing trends in downgradient wells suggest that uranium is flushing out of the alluvial aquifer in the vicinity of the site.

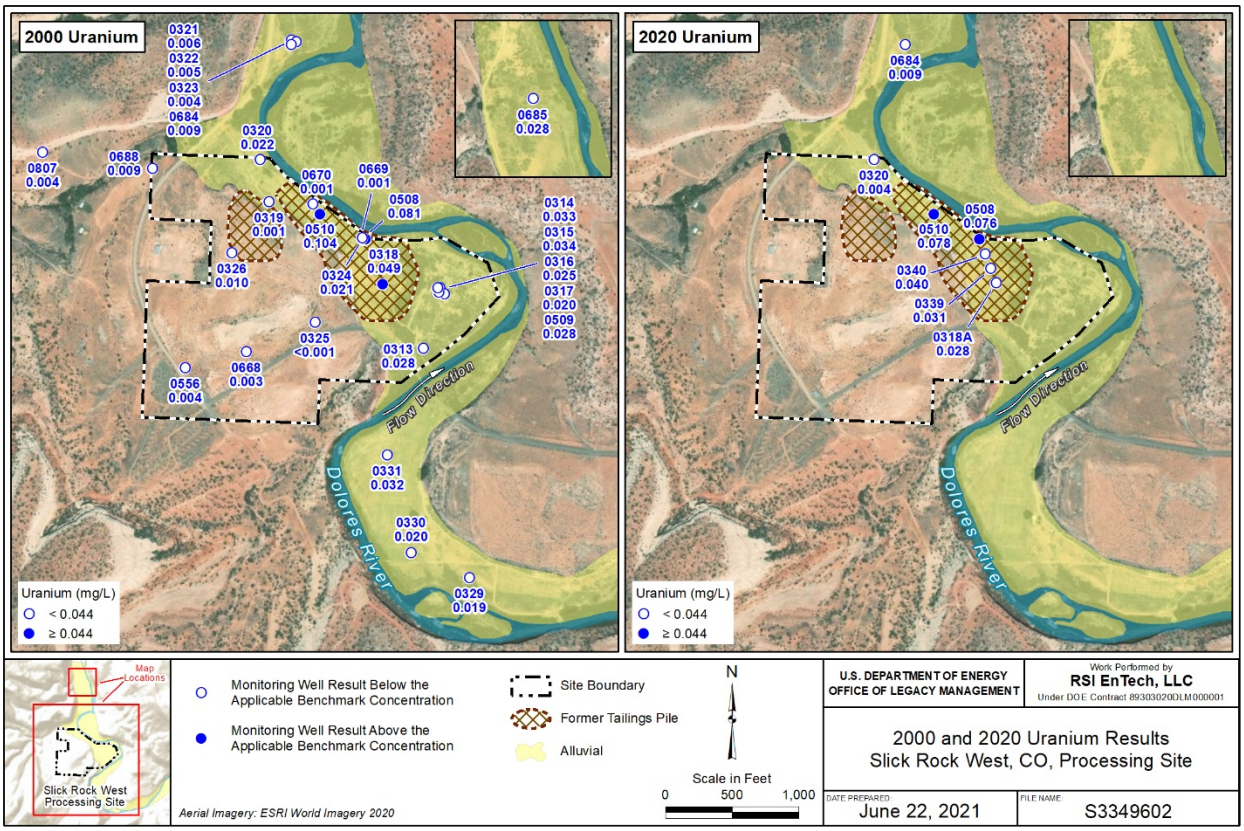


Figure 20. Uranium Concentrations in Monitoring Wells at the SRW Site, 2000 and 2020

2.4.2 Selenium

Individual well concentrations at SRW for selenium are spatially shown in Figure 21 for the years 2000 and 2020. Selenium concentrations above the 0.18 mg/L benchmark have been limited to wells screened in the alluvial aquifer within the area of the former tailings pile. In addition to well 0510 having a statistically significant increasing Mann-Kendall trend, selenium concentration in well 0510 nearly doubled, from 0.654 mg/L in 2000 to 1.2 mg/L in 2020.

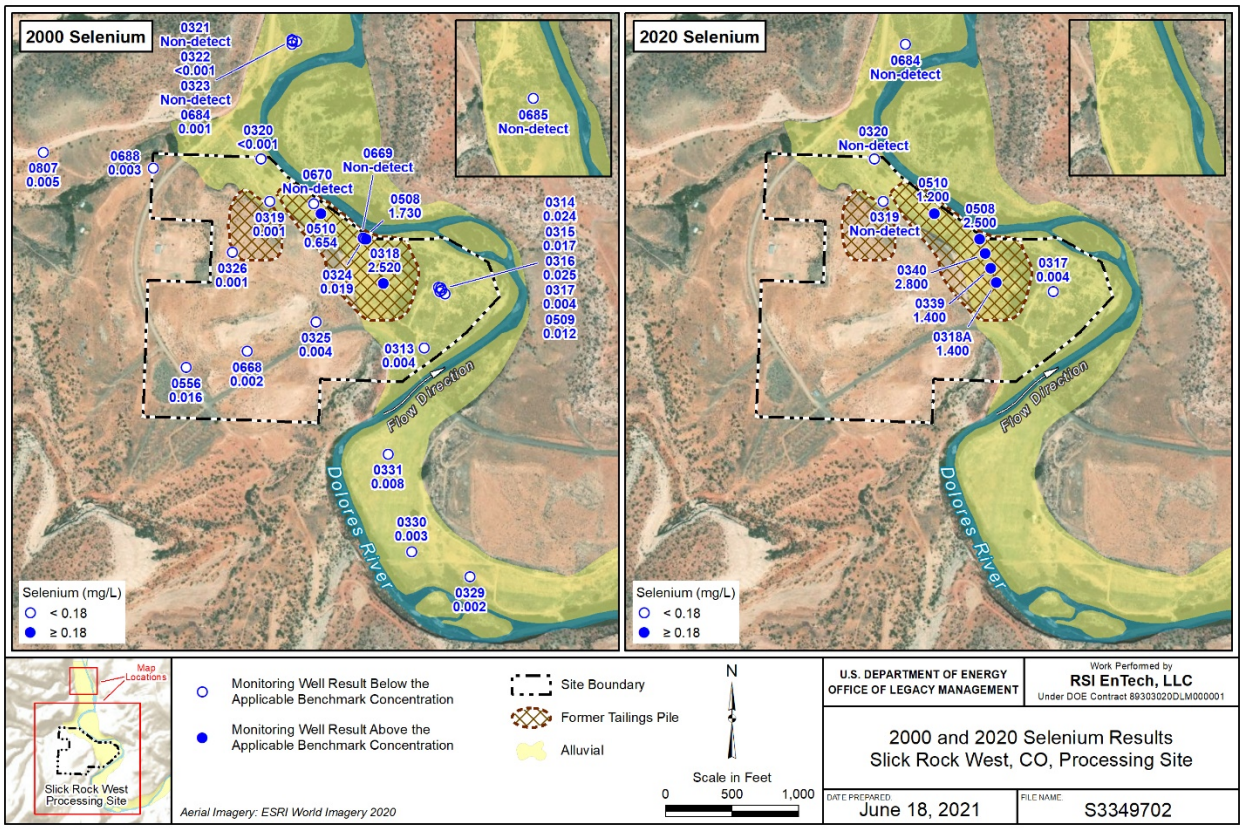


Figure 21. Selenium Concentrations in Monitoring Wells at the SRW Site, 2000 and 2020

Entrada Sandstone well 0317 had a selenium concentration of 0.004 mg/L in both 2000 and 2020. Groundwater elevation in well 0317 relative to groundwater elevations in surrounding alluvial aquifer wells suggests that alluvial aquifer water is flowing away from well 0317 toward the Dolores River and the former tailings pile area, which is consistent with the conceptual flow model for the Entrada Sandstone presented in the SOWP (DOE 2002). Increases in selenium within the tailings pile area and no detected increases outside of the tailings pile area suggest that either selenium is not flushing out of the alluvial aquifer at this location, or it is flushing toward a location not captured by the current monitoring network.

2.4.3 Manganese

Individual well concentrations at SRW for manganese are spatially shown in Figure 22 for the years 2000 and 2020. Wells 0340 and 0510 were the only two wells above the 3.5 mg/L benchmark in 2020, but both had less than the updated maximum manganese concentration of 4.5 mg/L measured at SRE background well 0300. Therefore, manganese derived from site activities seems to have effectively flushed from the area of the former tailings pile at the SRW site.

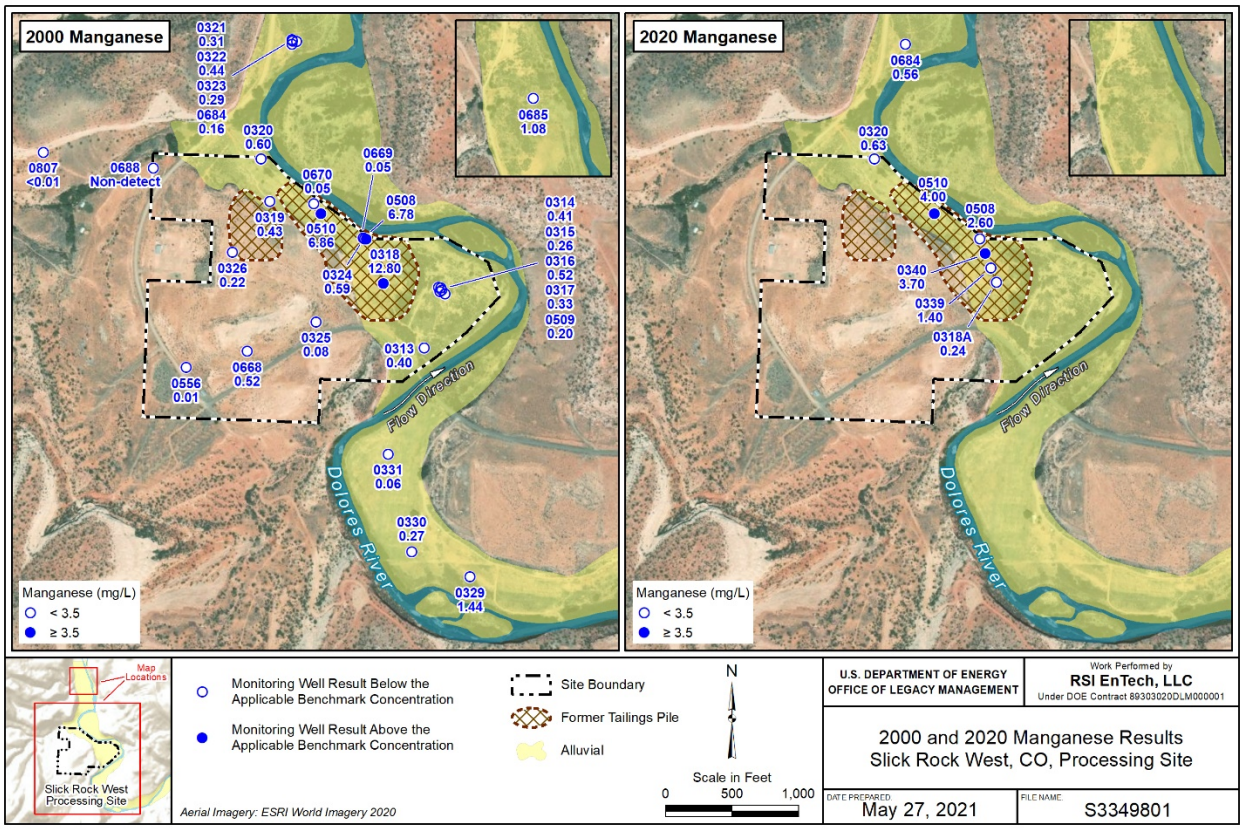


Figure 22. Manganese Concentrations in Monitoring Wells at the SRW Site, 2000 and 2020

2.4.4 Molybdenum

Individual well concentrations at SRW for molybdenum are spatially shown in Figure 23 for the years 2000 and 2020. Molybdenum concentrations above the MCL were present in wells screened in the alluvial aquifer within the area of the former tailings pile, and immediately east of the former tailings pile. With the exception of Entrada Sandstone well 0317, the wells east of the tailings pile were abandoned between 2000 and 2020. Entrada well 0317 had a statistically significant decreasing trend, but was still above the MCL with a concentration of 0.15 mg/L in 2020. Well 0340 had a statistically significant increasing molybdenum trend, and the other wells with molybdenum concentrations in excess of the MCL within the former tailings pile area had relatively stable molybdenum trends. Similar to selenium at SRW, increases or stable trends in molybdenum within the tailings pile area suggest that molybdenum is not flushing out of the alluvial aquifer at this location, or it is flushing toward a location not captured by the current monitoring network.

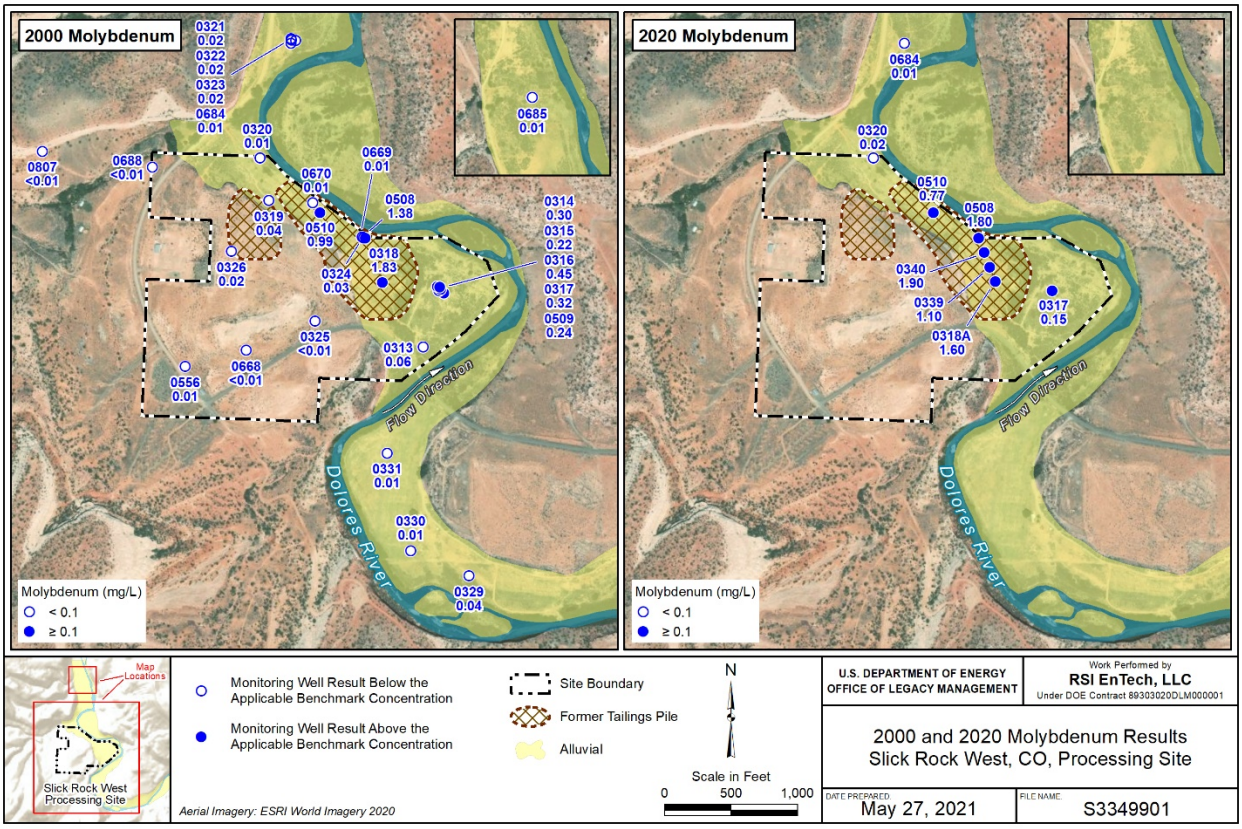


Figure 23. Molybdenum Concentrations in Monitoring Wells at the SRW Site, 2000 and 2020

2.4.5 Nitrate

Individual well concentrations at SRW for nitrate are spatially shown in Figure 24 for the years 2000 and 2020. Nitrate concentrations above the MCL were present in wells screened in the alluvial aquifer within the area of the former tailings pile, and immediately east of the former tailings pile. With the exception of Entrada Sandstone well 0317, the wells east of the tailings pile were abandoned between 2000 and 2020. Nitrate concentrations in the Entrada Sandstone well 0317 were below the MCL in 2000, but were not measured in 2020. Contrary to trends in selenium and molybdenum within the tailings pile area, four wells within that area had significant decreasing nitrate trends since 2000. The spatial and temporal trends indicate nitrate is flushing out of the alluvial aquifer at this location to either the Dolores River, or a location not captured by the current monitoring network.

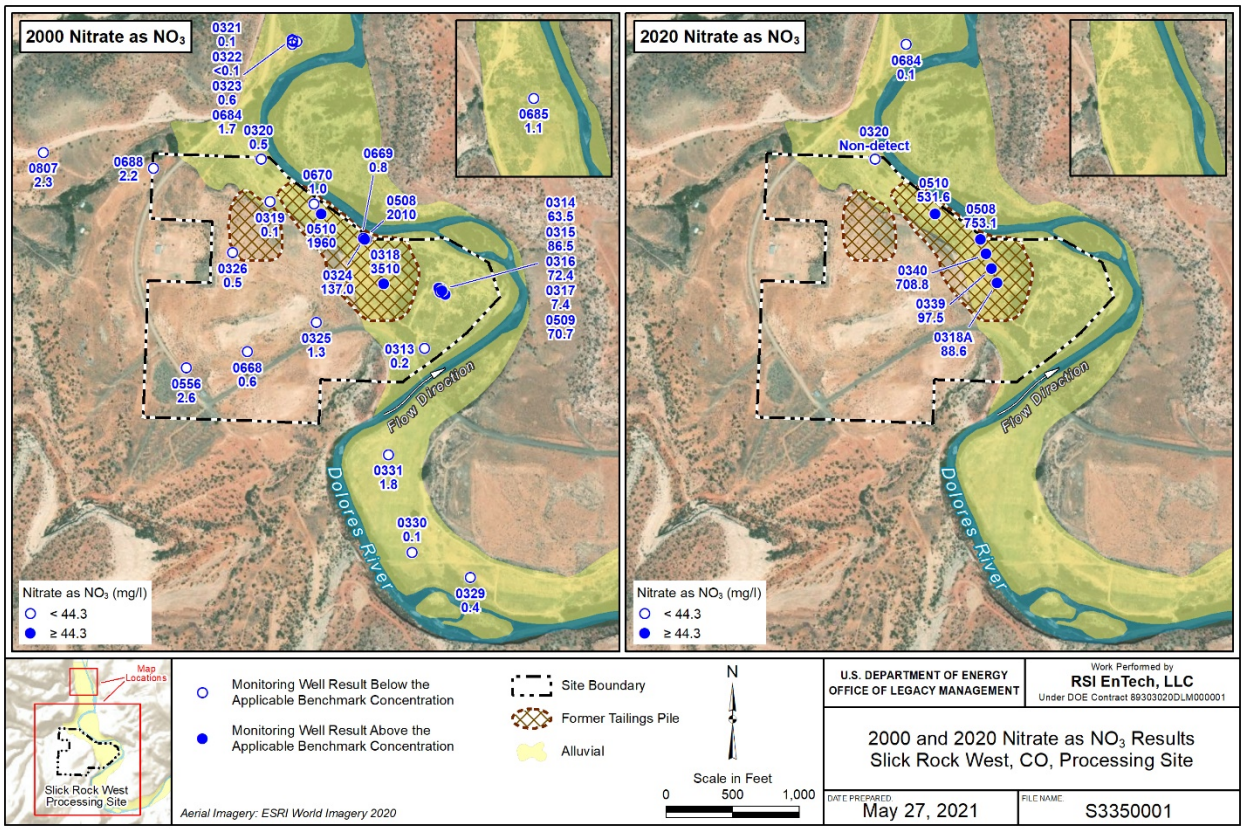


Figure 24. Nitrate as NO_3 Concentrations in Monitoring Wells at the SRW Site, 2000 and 2020

2.5 Surface Water COPC Concentration Trends (Both SRE and SRW Site)

Surface water was sampled in the Dolores River from three locations at the SRE site and four locations at the SRW site (Figure 3 and Figure 4). Wells 0692 and 700 at the SRE site were sampled for uranium only, and SRE background well 0696 and all locations at the SRW site were sampled for manganese, molybdenum, nitrate, selenium, and uranium. Results from the latest sampling in 2020 at both sites are shown in Table 13, as well as the CDPHE water quality benchmarks for each COPC. All surface locations samples were below the CDPHE benchmarks in 2020. All surface location samples were below the detectable limit for selenium in 2020, and all SRW locations were below the detectable limit for nitrate.

Uranium concentration trends for the SRE Dolores River locations from 2000–2020 are shown in Figure 25. Trends in other COPCs were not shown because the last time they were tested for SRE locations was 2002, with the exception of SRE background location 0696, which was tested in 2020 for the first time since 2002. Uranium concentrations at all locations continue to be below the lower chronic CDPHE benchmark of 0.0168 mg/L and indistinguishable from background levels.

Trends for all COPCs in SRW locations from 2000–2020 are shown in Figure 26. COPC concentrations at all SRW locations continue to sample below the respective acute and chronic CDPHE benchmarks. Historical COPC concentrations at location 0349 are slightly elevated compared to upgradient location 0693, which is expected since location 0349 is adjacent to, and

downgradient from the former tailings pile area in the alluvial aquifer. COPC concentrations at locations 0347 and 0694 continue to be indistinguishable from upgradient levels.

Table 13. Dolores River Surface Water Sampling Benchmarks near the SRE and SRW Sites and 2019–2020 Sampling Results

COPC	CDPHE Benchmark[a] (mg/L)		Lower Dolores River Location						
			SRE Site			SRW Site			
			0696 Bkgd	0692	0700	0693 Bkgd	0347	0349	0694
	Acute	Chronic	2020 Result (mg/L)						
Manganese[b]	2.0 (TVS)[c]	1.1 (TVS/WS)[c]	0.006	–	–	Nondetect	0.006	Nondetect	Nondetect
Molybdenum	–	0.15 (T)	0.001	–	–	0.001	0.003	0.002	0.001
Nitrate as NO_3	44.3[d]	–	0.816	–	–	Nondetect	Nondetect	Nondetect	Nondetect
Selenium[b]	0.0184 (TVS)	0.0046 (TVS)	Nondetect	–	–	Nondetect	Nondetect	Nondetect	Nondetect
Uranium	TVS[b]	0.0168–0.03 (SWDA) (T)[e]	5.7E-4	6.0E-4	5.5E-4	5.7E-4	5.9E-4	6.0E-4	5.5E-4

Notes:

[a] From Volume 5 *Code of Colorado Regulations* Section 1002-35.[1] Applicable segment is Lower Dolores River, Segment 2 (COGULD02): Mainstem of the Dolores River from the Colorado Highway 141 road crossing near the Slick Rock sites to the Colorado/Utah border.

[b] Table value standard (TVS) basis; refers to numerical criteria set forth in CDPHE's Regulation 31, "The Basic Standards and Methodologies for Surface Water."

[c] According to CDPHE regulations, for all surface waters with a "water supply" classification that are not in actual use as a water supply (a condition that applies to this segment of the Dolores River), no water supply standards are applied for iron, manganese, or sulfate unless the State of Colorado Water Quality Control Commission determines as the result of a site-specific rulemaking hearing that such standards are appropriate. As such, the most stringent water supply standard of 0.05 mg/L does not apply. Remaining TVS standards for manganese are calculated as a function of hardness, which is not analyzed in site surface water samples. Assuming a conservative hardness value of 30 mg/L (soft water) yields acute and chronic TVS values for manganese of 2 and 1.1 mg/L, respectively.

[d] CDPHE benchmark is 10 mg/L nitrate as N; the value in the table is converted to 44.3 mg/L to express nitrate as NO_3.

[e] The uranium standard is a range, from the CDPHE Water Quality Control Commission's health-based value (0.0168 mg/L) to the SDWA MCL (0.03 mg/L). Because the acute TVS value for uranium is a function of hardness, the chronic criterion is used.

Abbreviations:

– = not applicable or not sampled for that analyte
Bkgd = background
N = nitrogen
T = total recoverable
TVS = table value standard
WS = water supply

[1] Although the most recent CDPHE Regulation 35 (5 CCR 1002-35), effective June 30, 2019, postdates the 2017–2018 sampling period addressed in this report, it is cited because the Dolores River benchmarks have not changed since the preceding updates to 5 CCR 1002-35 (June 30, 2017, and December 31, 2017). The only exception is that the chronic benchmark for molybdenum decreased by 0.01 mg/L, from 0.16 mg/L to 0.15 mg/L.

Note:
Extreme outlier (0.055 mg/L) measured in background location 0696 on September 20, 2006, is not plotted.

Figure 25. Uranium Concentrations in Dolores River Surface Water Monitoring Locations at the SRE Site, 2000–2020

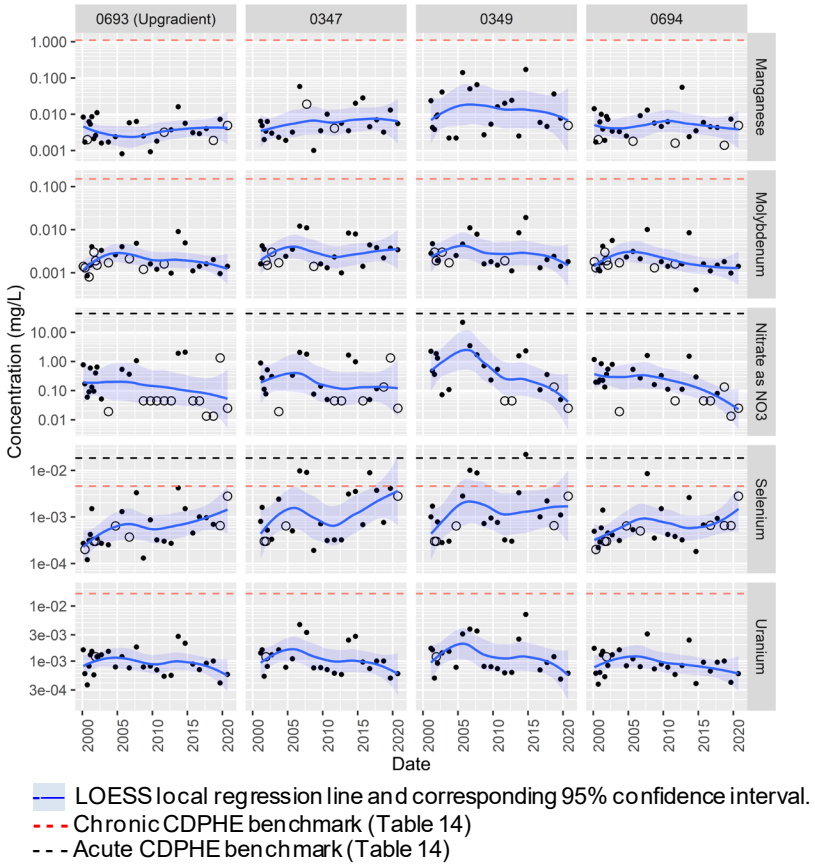


Figure 26. COPC Concentrations in Dolores River Surface Water Monitoring Locations at the SRW Site, 2000–2020

3.0 Compliance Remedy Performance Summary

Based on the evaluation included in this report, the following observations and recommendations are made:

With respect to SRE site COPC concentrations:

- Selenium concentration trends in SRE site wells indicate natural flushing is effectively reducing selenium to benchmark levels; however, uranium concentration trends in SRE site wells indicate natural flushing has not been an effective attenuation mechanism for uranium for the past 20 years. Uranium concentrations in wells 0303, 0305, and 0307 remain to be about an order of magnitude higher than the steady-state model from the SOWP predicted after 20 years of natural flushing.
- Increases in uranium concentrations in SRE wells 0309, 0311, and 0312, as well as the statistically significant increasing uranium trend in well 0311, indicate that uranium is moving downgradient within the alluvial aquifer from the former tailings area. Increases in uranium concentration in wells 0311 and 0312 across the river during the 2000 to 2020 samplings support the previously reported transport of milling-related uranium to these locations.

With respect to SRW site COPC concentrations:

- Decreasing trends in uranium, manganese, and nitrate in SRW site wells, and no statistically significant trends in downgradient wells suggest that uranium, manganese, and nitrate are still flushing out of the alluvial aquifer at the SRW site.
- Selenium concentrations within the alluvial aquifer at the SRW site continue to exceed the UMTRCA MCL of 0.01 mg/L, and the ACL proposed in the SOWP of 0.18 mg/L in wells 0318A, 0339, 0340, 0508, and 0510. The latest measured selenium concentrations for these wells ranged from 1.2 to 2.8 mg/L in 2020. An increasing selenium concentration trend in well 0510 within the former tailings pile, and no trends in downgradient SRW site wells indicate natural flushing has not been an effective attenuation mechanism for selenium. Because of the magnitudes and increasing trends of selenium in site wells, the proposed ACL of 0.18 mg/L may no longer be applicable or protective at the SRW site.
- Molybdenum concentrations within the alluvial aquifer at the SRW site continue to exceed the MCL with no apparent or statistically significant reductions since 2000, indicating that natural flushing has not been effective at reducing molybdenum levels at the SRW site. Wells 0320 and 0684 had increasing molybdenum trends, but both had molybdenum concentrations below the 0.1 mg/L MCL in 2020. Well 0340 also had an increasing molybdenum concentration trend and had the highest concentration at the SRW site of 1.9 mg/L in 2020.
- Molybdenum was the only COPC concentration above the benchmark level in SRW Entrada Sandstone well 0317 during the 2020 sampling. Mann-Kendall trend analysis indicated molybdenum had a decreasing trend in this well.
- All BTEX constituents had decreasing concentration trends from 2000–2020, suggesting that aromatic hydrocarbons are continuing to be naturally flushed out of the vicinity of well 0319. Benzene continued to be the only aromatic hydrocarbon above the benchmark level in 2020.
- Ra-226 + Ra-228 concentrations in well 0319 had a statistically significant decreasing trend since 2000 and has been below the 5.0 pCi/L MCL since 2008, indicating that natural flushing has successfully reduced total radium to below benchmark levels.

With respect to both SRE and SRW sites:

- Estimated groundwater flow directions are consistent with the conceptual site model presented in the SOWP (DOE 2002). Because of the uncertainty in the USGS stream gage vertical datum, comparison between Dolores River stage elevations and alluvial aquifer well groundwater elevations were difficult. Current geometry of the monitoring well networks at SRE and SRW also made horizontal gradient estimation difficult. Future planned resurveying of the USGS stream gage upstream of the SRE site at the Dolores River along with steam gradient calculations already provided in the SOWP will facilitate future piezometric surface evaluations connecting the alluvial aquifer water table with the Dolores River.
- Uranium concentrations at all surface water locations continue to be below the lower chronic CDPHE benchmark of 0.0168 mg/L and indistinguishable from background levels. All COPC concentrations at SRW surface water locations continue to sample below the respective acute and chronic CDPHE benchmarks.

4.0 References

5 CCR 1002-35. Colorado Department of Public Health and Environment, "Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins," *Code of Colorado Regulations*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations.*

DOE (U.S. Department of Energy), 2002. *Site Observational Work Plan for the Slick Rock, Colorado, UMTRA Project Site*, GJO-2001-257-TAR, MAC-GWSKR 1.1, Grand Junction Office, Grand Junction, Colorado, April.

DOE (U.S. Department of Energy), 2006. *Draft Final Groundwater Compliance Action Plan for the Slick Rock, Colorado, UMTRA Project Sites*, DOE-LM/1327-2006, Office of Legacy Management, September.

DOE (U.S. Department of Energy), 2019. *2018 Verification Monitoring Report for the Slick Rock, Colorado, Processing Sites*, LMS/SRE-SRW/S20001, Office of Legacy Management, November.

McKenna, S.A. and A. Wahi, 2006. "Local Hydraulic Gradient Estimator Analysis of Long-Term Monitoring Networks," *Groundwater* 44(5):723–731.

McLeod, A.I., 2011. "Kendall: Kendall Rank Correlation and Mann-Kendall Trend Test," R package version 2.2, https://CRAN.R-project.org/package=Kendall, accessed September 5, 2019.

Merritt, R. C., 1971. *The Extractive Metallurgy of Uranium,* Colorado School of Mines Research Institute, Golden, Colorado.

USGS (U.S. Geological Survey), 2021. E. Kushner, hydrologic technician, email communication (about checking datum elevation of USGS stream gage site No. 09168730) to M. Morse, hydrogeologist, RSI EnTech, LLC, contractor to the U.S. Department of Energy Office of Legacy Management, June 10.

Appendix A

Groundwater and Surface Water Quality Data for the Slick Rock East Processing Site

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Appendix A-1

Groundwater Quality Data for Slick Rock East

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GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK06, Slick Rock East Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Alkalinity, Total (As CaCO3)	0300	WL	9/4/2019	(N)F		F		618	mg/L	#
Alkalinity, Total (As CaCO3)	0300	WL	9/23/2020	(N)F		F		610	mg/L	#
Alkalinity, Total (As CaCO3)	0303	WL	9/4/2019	(N)F		F		355	mg/L	#
Alkalinity, Total (As CaCO3)	0303	WL	9/21/2020	(N)F		F		608	mg/L	#
Alkalinity, Total (As CaCO3)	0305	WL	9/4/2019	(N)F		F		528	mg/L	#
Alkalinity, Total (As CaCO3)	0305	WL	9/21/2020	(N)F		F		410	mg/L	#
Alkalinity, Total (As CaCO3)	0307	WL	9/4/2019	(N)F		F		654	mg/L	#
Alkalinity, Total (As CaCO3)	0307	WL	9/21/2020	(N)F		F		752	mg/L	#
Alkalinity, Total (As CaCO3)	0309	WL	9/4/2019	(N)F		F		940	mg/L	#
Alkalinity, Total (As CaCO3)	0309	WL	9/23/2020	(N)F		F		910	mg/L	#
Alkalinity, Total (As CaCO3)	0310	WL	9/4/2019	(N)F		F		278	mg/L	#
Alkalinity, Total (As CaCO3)	0310	WL	9/23/2020	(N)F		F		230	mg/L	#
Alkalinity, Total (As CaCO3)	0311	WL	9/4/2019	(N)F		F		400	mg/L	#
Alkalinity, Total (As CaCO3)	0311	WL	9/23/2020	(N)F		F		278	mg/L	#
Alkalinity, Total (As CaCO3)	0312	WL	9/4/2019	(N)F		F		344	mg/L	#
Alkalinity, Total (As CaCO3)	0312	WL	9/23/2020	(N)F		F		336	mg/L	#
Alkalinity, Total (As CaCO3)	0672	WL	9/4/2019	(N)F				260	mg/L	#
Alkalinity, Total (As CaCO3)	0672	WL	9/23/2020	(N)F				244	mg/L	#
Manganese	0300	WL	9/4/2019	(T)F		F	0.00036	2.9	mg/L	#
Manganese	0300	WL	9/23/2020	(T)F		F	0.0049	1.8	mg/L	#
Manganese	0672	WL	9/4/2019	(T)F	J	U	0.00036	0.001	mg/L	#
Manganese	0672	WL	9/23/2020	(T)F	U		0.0049	0.0049	mg/L	#
Molybdenum	0300	WL	9/4/2019	(T)F		F	0.000079	0.0072	mg/L	#
Molybdenum	0300	WL	9/23/2020	(T)F		F	0.00046	0.0079	mg/L	#
Molybdenum	0305	WL	9/4/2019	(T)F		F	0.000079	0.015	mg/L	#
Molybdenum	0307	WL	9/4/2019	(T)F		F	0.000079	0.008	mg/L	#
Molybdenum	0672	WL	9/4/2019	(T)F	J		0.000079	0.00065	mg/L	#
Molybdenum	0672	WL	9/23/2020	(T)F	J		0.00046	0.00073	mg/L	#
Nitrate + Nitrite as Nitrogen	0300	WL	9/4/2019	(N)F	U	F	0.3	0.3	mg/L	#
Nitrate + Nitrite as Nitrogen	0300	WL	9/23/2020	(N)F	U	FJ	0.28	0.28	mg/L	#

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PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Oxidation Reduction Potential	0300	WL	9/4/2019	(N)F		F		-71.2	mV	#
Oxidation Reduction Potential	0300	WL	9/23/2020	(N)F		F		-93.7	mV	#
Oxidation Reduction Potential	0303	WL	9/4/2019	(N)F		F		-37.7	mV	#
Oxidation Reduction Potential	0303	WL	9/21/2020	(N)F		F		-87.4	mV	#
Oxidation Reduction Potential	0305	WL	9/4/2019	(N)F		F		50.1	mV	#
Oxidation Reduction Potential	0305	WL	9/21/2020	(N)F		F		173.6	mV	#
Oxidation Reduction Potential	0307	WL	9/4/2019	(N)F		F		-72.2	mV	#
Oxidation Reduction Potential	0307	WL	9/21/2020	(N)F		F		-68.9	mV	#
Oxidation Reduction Potential	0309	WL	9/4/2019	(N)F		F		-46.6	mV	#
Oxidation Reduction Potential	0309	WL	9/23/2020	(N)F		F		-17.6	mV	#
Oxidation Reduction Potential	0310	WL	9/4/2019	(N)F		F		-68	mV	#
Oxidation Reduction Potential	0310	WL	9/23/2020	(N)F		F		-99	mV	#
Oxidation Reduction Potential	0311	WL	9/4/2019	(N)F		F		166.4	mV	#
Oxidation Reduction Potential	0311	WL	9/23/2020	(N)F		F		100.2	mV	#
Oxidation Reduction Potential	0312	WL	9/4/2019	(N)F		F		-97.2	mV	#
Oxidation Reduction Potential	0312	WL	9/23/2020	(N)F		F		-47.6	mV	#
Oxidation Reduction Potential	0672	WL	9/4/2019	(N)F				15.1	mV	#
Oxidation Reduction Potential	0672	WL	9/23/2020	(N)F				230	mV	#
pH	0300	WL	9/4/2019	(N)F		F		6.8	s.u.	#
pH	0300	WL	9/23/2020	(N)F		F		7.03	s.u.	#
pH	0303	WL	9/4/2019	(N)F		F		7.19	s.u.	#
pH	0303	WL	9/21/2020	(N)F		F		7.21	s.u.	#
pH	0305	WL	9/4/2019	(N)F		F		7.04	s.u.	#
pH	0305	WL	9/21/2020	(N)F		F		7.18	s.u.	#
pH	0307	WL	9/4/2019	(N)F		F		7.08	s.u.	#
pH	0307	WL	9/21/2020	(N)F		F		7.12	s.u.	#
pH	0309	WL	9/4/2019	(N)F		F		7.48	s.u.	#
pH	0309	WL	9/23/2020	(N)F		F		7.56	s.u.	#
pH	0310	WL	9/4/2019	(N)F		F		7.04	s.u.	#
pH	0310	WL	9/23/2020	(N)F		F		7.35	s.u.	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK06, Slick Rock East Processing Site
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PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
pH	0311	WL	9/4/2019	(N)F		F		6.87	s.u.	#
pH	0311	WL	9/23/2020	(N)F		F		6.92	s.u.	#
pH	0312	WL	9/4/2019	(N)F		F		7.11	s.u.	#
pH	0312	WL	9/23/2020	(N)F		F		7.11	s.u.	#
pH	0672	WL	9/4/2019	(N)F				7.82	s.u.	#
pH	0672	WL	9/23/2020	(N)F				7.87	s.u.	#
Radium-226	0300	WL	9/4/2019	(N)F		FU	0.39	0.463	pCi/L	#
Radium-226	0300	WL	9/23/2020	(N)F		FU	0.19	0.314	pCi/L	#
Radium-228	0300	WL	9/4/2019	(N)F		FJ	0.55	0.627	pCi/L	#
Radium-228	0300	WL	9/23/2020	(N)F		FJ	0.53	0.642	pCi/L	#
Selenium	0300	WL	9/4/2019	(T)F	U	F	0.00065	0.00065	mg/L	#
Selenium	0300	WL	9/23/2020	(T)F	U	F	0.0028	0.0028	mg/L	#
Selenium	0305	WL	9/4/2019	(T)F	J	F	0.00065	0.0081	mg/L	#
Selenium	0305	WL	9/21/2020	(T)F		F	0.0028	0.017	mg/L	#
Selenium	0307	WL	9/4/2019	(T)F	U	F	0.00065	0.00065	mg/L	#
Selenium	0307	WL	9/21/2020	(T)F	U	F	0.0028	0.0028	mg/L	#
Selenium	0672	WL	9/4/2019	(T)F	J		0.00065	0.0016	mg/L	#
Selenium	0672	WL	9/23/2020	(T)F	U		0.0028	0.0028	mg/L	#
Specific Conductance	0300	WL	9/4/2019	(N)F		F		12100	umhos/cm	#
Specific Conductance	0300	WL	9/23/2020	(N)F		F		8013	umhos/cm	#
Specific Conductance	0303	WL	9/4/2019	(N)F		F		2478	umhos/cm	#
Specific Conductance	0303	WL	9/21/2020	(N)F		F		3870	umhos/cm	#
Specific Conductance	0305	WL	9/4/2019	(N)F		F		6469	umhos/cm	#
Specific Conductance	0305	WL	9/21/2020	(N)F		F		4040	umhos/cm	#
Specific Conductance	0307	WL	9/4/2019	(N)F		F		8514	umhos/cm	#
Specific Conductance	0307	WL	9/21/2020	(N)F		F		7897	umhos/cm	#
Specific Conductance	0309	WL	9/4/2019	(N)F		F		6012	umhos/cm	#
Specific Conductance	0309	WL	9/23/2020	(N)F		F		7125	umhos/cm	#
Specific Conductance	0310	WL	9/4/2019	(N)F		F		1712	umhos/cm	#
Specific Conductance	0310	WL	9/23/2020	(N)F		F		908	umhos/cm	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK06, Slick Rock East Processing Site
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PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Specific Conductance	0311	WL	9/4/2019	(N)F		F		3695	umhos/cm	#
Specific Conductance	0311	WL	9/23/2020	(N)F		F		1987	umhos/cm	#
Specific Conductance	0312	WL	9/4/2019	(N)F		F		2483	umhos/cm	#
Specific Conductance	0312	WL	9/23/2020	(N)F		F		3414	umhos/cm	#
Specific Conductance	0672	WL	9/4/2019	(N)F				580	umhos/cm	#
Specific Conductance	0672	WL	9/23/2020	(N)F				528	umhos/cm	#
Temperature	0300	WL	9/4/2019	(N)F		F		16.1	C	#
Temperature	0300	WL	9/23/2020	(N)F		F		17.96	C	#
Temperature	0303	WL	9/4/2019	(N)F		F		19.17	C	#
Temperature	0303	WL	9/21/2020	(N)F		F		20.31	C	#
Temperature	0305	WL	9/4/2019	(N)F		F		16.77	C	#
Temperature	0305	WL	9/21/2020	(N)F		F		20.27	C	#
Temperature	0307	WL	9/4/2019	(N)F		F		15.25	C	#
Temperature	0307	WL	9/21/2020	(N)F		F		19	C	#
Temperature	0309	WL	9/4/2019	(N)F		F		14.68	C	#
Temperature	0309	WL	9/23/2020	(N)F		F		17.72	C	#
Temperature	0310	WL	9/4/2019	(N)F		F		15.64	C	#
Temperature	0310	WL	9/23/2020	(N)F		F		15.63	C	#
Temperature	0311	WL	9/4/2019	(N)F		F		17.69	C	#
Temperature	0311	WL	9/23/2020	(N)F		F		18.22	C	#
Temperature	0312	WL	9/4/2019	(N)F		F		17.18	C	#
Temperature	0312	WL	9/23/2020	(N)F		F		17.67	C	#
Temperature	0672	WL	9/4/2019	(N)F				24.62	C	#
Temperature	0672	WL	9/23/2020	(N)F				19.97	C	#
Turbidity	0300	WL	9/4/2019	(N)F		F		1.48	NTU	#
Turbidity	0300	WL	9/23/2020	(N)F		F		2.87	NTU	#
Turbidity	0303	WL	9/4/2019	(N)F		F		5.32	NTU	#
Turbidity	0303	WL	9/21/2020	(N)F		F		3.65	NTU	#
Turbidity	0305	WL	9/4/2019	(N)F		F		8.79	NTU	#
Turbidity	0305	WL	9/21/2020	(N)F		F		7.24	NTU	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK06, Slick Rock East Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Turbidity	0307	WL	9/4/2019	(N)F		F		2.04	NTU	#
Turbidity	0307	WL	9/21/2020	(N)F		F		9.54	NTU	#
Turbidity	0309	WL	9/4/2019	(N)F		F		9.33	NTU	#
Turbidity	0309	WL	9/23/2020	(N)F		F		9.54	NTU	#
Turbidity	0310	WL	9/4/2019	(N)F		F		0.71	NTU	#
Turbidity	0310	WL	9/23/2020	(N)F		F		9.73	NTU	#
Turbidity	0311	WL	9/4/2019	(N)F		F		8.25	NTU	#
Turbidity	0311	WL	9/23/2020	(N)F		F		6.95	NTU	#
Turbidity	0312	WL	9/4/2019	(N)F		F		3.93	NTU	#
Turbidity	0312	WL	9/23/2020	(N)F		F		4.89	NTU	#
Turbidity	0672	WL	9/4/2019	(N)F				0.69	NTU	#
Turbidity	0672	WL	9/23/2020	(N)F				1.19	NTU	#
Uranium	0300	WL	9/4/2019	(T)F		F	0.0000049	0.03	mg/L	#
Uranium	0300	WL	9/23/2020	(T)F		F	0.00004	0.014	mg/L	#
Uranium	0303	WL	9/4/2019	(T)F		F	0.0000049	1	mg/L	#
Uranium	0303	WL	9/21/2020	(T)F		F	0.00004	1.4	mg/L	#
Uranium	0305	WL	9/21/2020	(T)F		F	0.00004	1.1	mg/L	#
Uranium	0307	WL	9/21/2020	(T)F		F	0.00004	0.82	mg/L	#
Uranium	0309	WL	9/4/2019	(T)F		F	0.0000049	0.39	mg/L	#
Uranium	0309	WL	9/23/2020	(T)F		F	0.00004	0.23	mg/L	#
Uranium	0310	WL	9/4/2019	(T)F		F	0.0000049	0.034	mg/L	#
Uranium	0310	WL	9/23/2020	(T)F		F	0.00004	0.021	mg/L	#
Uranium	0311	WL	9/4/2019	(T)F		F	0.0000049	0.17	mg/L	#
Uranium	0311	WL	9/23/2020	(T)F		F	0.00004	0.072	mg/L	#
Uranium	0312	WL	9/4/2019	(T)F		F	0.0000049	0.032	mg/L	#
Uranium	0312	WL	9/23/2020	(T)F		F	0.00004	0.046	mg/L	#
Uranium	0672	WL	9/4/2019	(T)F			0.0000049	0.0028	mg/L	#
Uranium	0672	WL	9/23/2020	(T)F			0.00004	0.003	mg/L	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK06, Slick Rock East Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA	DETECTION LIMIT	RESULT	UNIT	QA

LOCATION TYPE
WL - Well

SAMPLE TYPES:

Fraction:

(T) Total (for metal concentrations)
(D) Dissolved (for dissolved or filtered metal concentrations)
(N) Organic (or other) constituents for which neither total nor dissolved is applicable

Type Codes:
F-Field Sample R-Replicate FR-Field Sample with Replicates
D-Duplicate N-Not Known S-Split Sample

LAB QUALIFIERS:
J Estimated Value.
U Parameter analyzed for but was not detected.

DATA QUALIFIERS:
F Low flow sampling method used.
Q Qualitative result due to sampling technique.
U Parameter analyzed for but was not detected.

QA QUALIFIER:
Validated according to Quality Assurance guidelines.

Appendix A-2

Surface Water Quality Data for Slick Rock East

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SURFACE WATER QUALITY DATA BY PARAMETER FOR SITE SRK06, Slick Rock East Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Alkalinity, Total (As CaCO3)	0692	SL	9/4/2019	(N)F				80	mg/L	#
Alkalinity, Total (As CaCO3)	0692	SL	9/23/2020	(N)F				10	mg/L	#
Alkalinity, Total (As CaCO3)	0696	SL	9/4/2019	(N)F				83	mg/L	#
Alkalinity, Total (As CaCO3)	0696	SL	9/22/2020	(N)F				89	mg/L	#
Alkalinity, Total (As CaCO3)	0700	SL	9/21/2020	(N)F				149	mg/L	#
Manganese	0696	SL	9/22/2020	(D)D	J		0.0049	0.0055	mg/L	#
Molybdenum	0696	SL	9/22/2020	(D)D	J		0.00046	0.0011	mg/L	#
Oxidation Reduction Potential	0692	SL	9/4/2019	(N)F				-53.2	mV	#
Oxidation Reduction Potential	0692	SL	9/23/2020	(N)F				60	mV	#
Oxidation Reduction Potential	0696	SL	9/4/2019	(N)F				65.9	mV	#
Oxidation Reduction Potential	0696	SL	9/22/2020	(N)F				228.6	mV	#
Oxidation Reduction Potential	0700	SL	9/21/2020	(N)F				130.3	mV	#
pH	0692	SL	9/4/2019	(N)F				8.12	s.u.	#
pH	0692	SL	9/23/2020	(N)F				8.18	s.u.	#
pH	0696	SL	9/4/2019	(N)F				8.21	s.u.	#
pH	0696	SL	9/22/2020	(N)F				7.74	s.u.	#
pH	0700	SL	9/21/2020	(N)F				8.22	s.u.	#
Selenium	0696	SL	9/22/2020	(D)D	U		0.0028	0.0028	mg/L	#
Specific Conductance	0692	SL	9/4/2019	(N)F				492	umhos/cm	#
Specific Conductance	0692	SL	9/23/2020	(N)F				457	umhos/cm	#
Specific Conductance	0696	SL	9/4/2019	(N)F				331	umhos/cm	#
Specific Conductance	0696	SL	9/22/2020	(N)F				321	umhos/cm	#
Specific Conductance	0700	SL	9/21/2020	(N)F				327	umhos/cm	#
Temperature	0692	SL	9/4/2019	(N)F				21.59	C	#
Temperature	0692	SL	9/23/2020	(N)F				21.42	C	#
Temperature	0696	SL	9/4/2019	(N)F				29.23	C	#
Temperature	0696	SL	9/22/2020	(N)F				16.54	C	#
Temperature	0700	SL	9/21/2020	(N)F				22.35	C	#
Turbidity	0692	SL	9/4/2019	(N)F				7.86	NTU	#

SURFACE WATER QUALITY DATA BY PARAMETER FOR SITE SRK06, Slick Rock East Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Turbidity	0692	SL	9/23/2020	(N)F				14.5	NTU	#
Turbidity	0696	SL	9/4/2019	(N)F				9.25	NTU	#
Turbidity	0696	SL	9/22/2020	(N)F				14.2	NTU	#
Turbidity	0700	SL	9/21/2020	(N)F				12.8	NTU	#
Uranium	0692	SL	9/4/2019	(T)F			0.0000049	0.00044	mg/L	#
Uranium	0692	SL	9/23/2020	(D)F			0.00004	0.0006	mg/L	#
Uranium	0696	SL	9/4/2019	(T)F			0.0000049	0.00039	mg/L	#
Uranium	0696	SL	9/22/2020	(D)F			0.00004	0.00055	mg/L	#
Uranium	0696	SL	9/22/2020	(D)D			0.00004	0.00057	mg/L	#
Uranium	0700	SL	9/21/2020	(D)F			0.00004	0.00055	mg/L	#

LOCATION TYPE
SL - Surface Location

SAMPLE TYPES:

Fraction:
(T) Total (for metal concentrations)
(D) Dissolved (for dissolved or filtered metal concentrations)
(N) Organic (or other) constituents for which neither total nor dissolved is applicable

Type Codes:
F-Field Sample R-Replicate FR-Field Sample with Replicates
D-Duplicate N-Not Known S-Split Sample

LAB QUALIFIERS:
J Estimated Value.
U Parameter analyzed for but was not detected.

DATA QUALIFIERS:
F Low flow sampling method used.
Q Qualitative result due to sampling technique.
U Parameter analyzed for but was not detected.

QA QUALIFIER:
Validated according to Quality Assurance guidelines.

Appendix B

Groundwater and Surface Water Quality Data for the Slick Rock West Processing Site

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Appendix B-1

Groundwater Quality Data for Slick Rock West

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GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Alkalinity, Total (As CaCO3)	0317	WL	9/4/2019	(N)F		F		293	mg/L	#
Alkalinity, Total (As CaCO3)	0317	WL	9/23/2020	(N)F		F		260	mg/L	#
Alkalinity, Total (As CaCO3)	0319	WL	9/3/2019	(D)F		F		874	mg/L	#
Alkalinity, Total (As CaCO3)	0319	WL	9/22/2020	(N)F		F		862	mg/L	#
Alkalinity, Total (As CaCO3)	0320	WL	9/3/2019	(N)F		F		352	mg/L	#
Alkalinity, Total (As CaCO3)	0320	WL	9/22/2020	(N)F		F		379	mg/L	#
Alkalinity, Total (As CaCO3)	0339	WL	9/4/2019	(N)F		F		d	mg/L	#
Alkalinity, Total (As CaCO3)	0339	WL	9/22/2020	(N)F		F		299	mg/L	#
Alkalinity, Total (As CaCO3)	0340	WL	9/4/2019	(N)F		F		282	mg/L	#
Alkalinity, Total (As CaCO3)	0340	WL	9/22/2020	(N)F		F		310	mg/L	#
Alkalinity, Total (As CaCO3)	0508	WL	9/4/2019	(N)F		F		299	mg/L	#
Alkalinity, Total (As CaCO3)	0508	WL	9/22/2020	(N)F		F		257	mg/L	#
Alkalinity, Total (As CaCO3)	0510	WL	9/4/2019	(N)F		F		276	mg/L	#
Alkalinity, Total (As CaCO3)	0510	WL	9/22/2020	(N)F		F		319	mg/L	#
Alkalinity, Total (As CaCO3)	0684	WL	9/3/2019	(N)F		F		227	mg/L	#
Alkalinity, Total (As CaCO3)	0684	WL	9/23/2020	(N)F		F		235	mg/L	#
Alkalinity, Total (As CaCO3)	0318A	WL	9/22/2020	(N)F		F		345	mg/L	#
Benzene	0319	WL	9/3/2019	(N)F		F	15	2100	ug/L	#
Benzene	0319	WL	9/22/2020	(N)F		F	15	390	ug/L	#
Ethylbenzene	0319	WL	9/3/2019	(N)F	J	F	15	39	ug/L	#
Ethylbenzene	0319	WL	9/3/2019	(N)F		F	6	43	ug/L	#
Ethylbenzene	0319	WL	9/22/2020	(N)F	J	F	16	42	ug/L	#
m,p-Xylene	0319	WL	9/3/2019	(N)F		F	15	3100	ug/L	#
m,p-Xylene	0319	WL	9/22/2020	(N)F		F	28	2700	ug/L	#
Manganese	0320	WL	9/3/2019	(T)F		F	0.00036	0.78	mg/L	#
Manganese	0320	WL	9/22/2020	(T)F		F	0.0049	0.63	mg/L	#
Manganese	0339	WL	9/4/2019	(T)F		F	0.00036	1.6	mg/L	#
Manganese	0339	WL	9/22/2020	(T)F		F	0.0049	1.4	mg/L	#
Manganese	0340	WL	9/4/2019	(T)F		F	0.00036	4.5	mg/L	#
Manganese	0340	WL	9/22/2020	(T)F		F	0.0049	3.7	mg/L	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB	QUALIFIERS DATA	DETECTION LIMIT	RESULT	UNIT	QA
Manganese	0508	WL	9/4/2019	(T)F		F	0.00036	2.8	mg/L	#
Manganese	0508	WL	9/22/2020	(T)D		F	0.0049	2.6	mg/L	#
Manganese	0508	WL	9/22/2020	(T)F		F	0.0049	2.6	mg/L	#
Manganese	0510	WL	9/4/2019	(T)F		F	0.00036	2.7	mg/L	#
Manganese	0510	WL	9/22/2020	(T)F		F	0.0049	4	mg/L	#
Manganese	0684	WL	9/3/2019	(T)D		F	0.00036	0.2	mg/L	#
Manganese	0684	WL	9/3/2019	(T)F		F	0.00036	0.2	mg/L	#
Manganese	0684	WL	9/23/2020	(T)F		F	0.0049	0.56	mg/L	#
Manganese	0318A	WL	9/4/2019	(T)F		F	0.00036	0.17	mg/L	#
Manganese	0318A	WL	9/22/2020	(T)F		F	0.0049	0.24	mg/L	#
Molybdenum	0317	WL	9/4/2019	(T)F		F	0.000079	0.17	mg/L	#
Molybdenum	0317	WL	9/23/2020	(T)F		F	0.00046	0.15	mg/L	#
Molybdenum	0320	WL	9/3/2019	(T)F		F	0.000079	0.016	mg/L	#
Molybdenum	0320	WL	9/22/2020	(T)F		F	0.00046	0.016	mg/L	#
Molybdenum	0339	WL	9/4/2019	(T)F		F	0.000079	1.1	mg/L	#
Molybdenum	0339	WL	9/22/2020	(T)F		F	0.00046	1.1	mg/L	#
Molybdenum	0340	WL	9/4/2019	(T)F		F	0.000079	1.7	mg/L	#
Molybdenum	0340	WL	9/22/2020	(T)F		F	0.00046	1.9	mg/L	#
Molybdenum	0508	WL	9/4/2019	(T)F		F	0.000079	1.4	mg/L	#
Molybdenum	0508	WL	9/22/2020	(T)D		F	0.00046	1.7	mg/L	#
Molybdenum	0508	WL	9/22/2020	(T)F		F	0.00046	1.8	mg/L	#
Molybdenum	0510	WL	9/4/2019	(T)F		F	0.000079	0.71	mg/L	#
Molybdenum	0510	WL	9/22/2020	(T)F		F	0.00046	0.77	mg/L	#
Molybdenum	0684	WL	9/3/2019	(T)D		F	0.000079	0.0056	mg/L	#
Molybdenum	0684	WL	9/3/2019	(T)F		F	0.000079	0.0065	mg/L	#
Molybdenum	0684	WL	9/23/2020	(T)F		F	0.00046	0.0084	mg/L	#
Molybdenum	0318A	WL	9/4/2019	(T)F		F	0.000079	2.2	mg/L	#
Molybdenum	0318A	WL	9/22/2020	(T)F		F	0.00046	1.6	mg/L	#
Nitrate + Nitrite as Nitrogen	0320	WL	9/3/2019	(N)F	U	F	0.3	0.3	mg/L	#
Nitrate + Nitrite as Nitrogen	0320	WL	9/22/2020	(N)F	U	F	0.28	0.28	mg/L	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Nitrate + Nitrite as Nitrogen	0339	WL	9/4/2019	(N)F		F	0.3	52	mg/L	#
Nitrate + Nitrite as Nitrogen	0339	WL	9/22/2020	(N)F		F	0.28	22	mg/L	#
Nitrate + Nitrite as Nitrogen	0340	WL	9/4/2019	(N)F		F	3	220	mg/L	#
Nitrate + Nitrite as Nitrogen	0340	WL	9/22/2020	(N)F		F	0.56	160	mg/L	#
Nitrate + Nitrite as Nitrogen	0508	WL	9/4/2019	(N)F		F	0.3	120	mg/L	#
Nitrate + Nitrite as Nitrogen	0508	WL	9/22/2020	(N)D		F	0.56	170	mg/L	#
Nitrate + Nitrite as Nitrogen	0508	WL	9/22/2020	(N)F		F	0.56	170	mg/L	#
Nitrate + Nitrite as Nitrogen	0510	WL	9/4/2019	(N)F		F	0.3	120	mg/L	#
Nitrate + Nitrite as Nitrogen	0510	WL	9/22/2020	(N)F		F	0.56	120	mg/L	#
Nitrate + Nitrite as Nitrogen	0684	WL	9/3/2019	(N)D		F	0.003	0.089	mg/L	#
Nitrate + Nitrite as Nitrogen	0684	WL	9/3/2019	(N)F	U	F	0.3	0.3	mg/L	#
Nitrate + Nitrite as Nitrogen	0684	WL	9/23/2020	(N)F	J	F	0.0056	0.012	mg/L	#
Nitrate + Nitrite as Nitrogen	0318A	WL	9/4/2019	(N)F		F	0.3	130	mg/L	#
Nitrate + Nitrite as Nitrogen	0318A	WL	9/22/2020	(N)F		F	0.11	20	mg/L	#
Oxidation Reduction Potential	0317	WL	9/4/2019	(N)F		F		99.3	mV	#
Oxidation Reduction Potential	0317	WL	9/23/2020	(N)F		F		239.5	mV	#
Oxidation Reduction Potential	0319	WL	9/3/2019	(N)F		F		-111.1	mV	#
Oxidation Reduction Potential	0319	WL	9/22/2020	(N)F		F		-106	mV	#
Oxidation Reduction Potential	0320	WL	9/3/2019	(N)F		F		-129.2	mV	#
Oxidation Reduction Potential	0320	WL	9/22/2020	(N)F		F		-132.9	mV	#
Oxidation Reduction Potential	0339	WL	9/4/2019	(N)F		F		128.7	mV	#
Oxidation Reduction Potential	0339	WL	9/22/2020	(N)F		F		241.2	mV	#
Oxidation Reduction Potential	0340	WL	9/4/2019	(N)F		F		154.7	mV	#
Oxidation Reduction Potential	0340	WL	9/22/2020	(N)F		F		245.7	mV	#
Oxidation Reduction Potential	0508	WL	9/4/2019	(N)F		F		150	mV	#
Oxidation Reduction Potential	0508	WL	9/22/2020	(N)F		F		243	mV	#
Oxidation Reduction Potential	0510	WL	9/4/2019	(N)F		F		158.1	mV	#
Oxidation Reduction Potential	0510	WL	9/22/2020	(N)F		F		140.9	mV	#
Oxidation Reduction Potential	0684	WL	9/3/2019	(N)F		F		11.6	mV	#
Oxidation Reduction Potential	0684	WL	9/23/2020	(N)F		F		201.7	mV	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Oxidation Reduction Potential	0318A	WL	9/4/2019	(N)F		F		97.2	mV	#
Oxidation Reduction Potential	0318A	WL	9/22/2020	(N)F		F		234.1	mV	#
o-Xylene	0319	WL	9/3/2019	(N)F		F	6	930	ug/L	#
o-Xylene	0319	WL	9/3/2019	(N)F		F	15	820	ug/L	#
o-Xylene	0319	WL	9/22/2020	(N)F		F	17	520	ug/L	#
pH	0317	WL	9/4/2019	(N)F		F		7.21	s.u.	#
pH	0317	WL	9/23/2020	(N)F		F		7.34	s.u.	#
pH	0319	WL	9/3/2019	(N)F		F		6.81	s.u.	#
pH	0319	WL	9/22/2020	(N)F		F		7.06	s.u.	#
pH	0320	WL	9/3/2019	(N)F		F		6.97	s.u.	#
pH	0320	WL	9/22/2020	(N)F		F		7.26	s.u.	#
pH	0339	WL	9/4/2019	(N)F		F		6.93	s.u.	#
pH	0339	WL	9/22/2020	(N)F		F		7.07	s.u.	#
pH	0340	WL	9/4/2019	(N)F		F		6.72	s.u.	#
pH	0340	WL	9/22/2020	(N)F		F		6.75	s.u.	#
pH	0508	WL	9/4/2019	(N)F		F		6.87	s.u.	#
pH	0508	WL	9/22/2020	(N)F		F		6.62	s.u.	#
pH	0510	WL	9/4/2019	(N)F		F		6.79	s.u.	#
pH	0510	WL	9/22/2020	(N)F		F		6.7	s.u.	#
pH	0684	WL	9/3/2019	(N)F		F		7.17	s.u.	#
pH	0684	WL	9/23/2020	(N)F		F		7.35	s.u.	#
pH	0318A	WL	9/4/2019	(N)F		F		6.85	s.u.	#
pH	0318A	WL	9/22/2020	(N)F		F		7.08	s.u.	#
Radium-226	0319	WL	9/3/2019	(N)F		FJ	0.57	1.65	pCi/L	#
Radium-226	0319	WL	9/22/2020	(N)F		F	0.23	1.19	pCi/L	#
Radium-228	0319	WL	9/3/2019	(N)F		FJ	0.64	1.25	pCi/L	#
Radium-228	0319	WL	9/22/2020	(N)F		FJ	0.68	2.11	pCi/L	#
Selenium	0317	WL	9/4/2019	(T)F	J	F	0.00065	0.004	mg/L	#
Selenium	0317	WL	9/23/2020	(T)F	J	F	0.0028	0.0037	mg/L	#
Selenium	0319	WL	9/3/2019	(D)F	J	F	0.00065	0.003	mg/L	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Selenium	0319	WL	9/22/2020	(T)F	U	F	0.0028	0.0028	mg/L	#
Selenium	0320	WL	9/3/2019	(T)F	U	F	0.00065	0.00065	mg/L	#
Selenium	0320	WL	9/22/2020	(T)F	U	F	0.0028	0.0028	mg/L	#
Selenium	0339	WL	9/4/2019	(T)F		F	0.00065	1.8	mg/L	#
Selenium	0339	WL	9/22/2020	(T)F		F	0.0028	1.4	mg/L	#
Selenium	0340	WL	9/4/2019	(T)F		F	0.00065	3.8	mg/L	#
Selenium	0340	WL	9/22/2020	(T)F		F	0.0028	2.8	mg/L	#
Selenium	0508	WL	9/4/2019	(T)F		F	0.00065	1.8	mg/L	#
Selenium	0508	WL	9/22/2020	(T)D		F	0.0028	2.3	mg/L	#
Selenium	0508	WL	9/22/2020	(T)F		F	0.0028	2.5	mg/L	#
Selenium	0510	WL	9/4/2019	(T)F		F	0.00065	0.91	mg/L	#
Selenium	0510	WL	9/22/2020	(T)F		F	0.0028	1.2	mg/L	#
Selenium	0684	WL	9/3/2019	(T)D	J	F	0.00065	0.00086	mg/L	#
Selenium	0684	WL	9/3/2019	(T)F	J	F	0.00065	0.0013	mg/L	#
Selenium	0684	WL	9/23/2020	(T)F	U	F	0.0028	0.0028	mg/L	#
Selenium	0318A	WL	9/4/2019	(T)F		F	0.00065	3.9	mg/L	#
Selenium	0318A	WL	9/22/2020	(T)F		F	0.0028	1.4	mg/L	#
Specific Conductance	0317	WL	9/4/2019	(N)F		F		3059	umhos/cm	#
Specific Conductance	0317	WL	9/23/2020	(N)F		F		2667	umhos/cm	#
Specific Conductance	0319	WL	9/3/2019	(N)F		F		2142	umhos/cm	#
Specific Conductance	0319	WL	9/22/2020	(N)F		F		2780	umhos/cm	#
Specific Conductance	0320	WL	9/3/2019	(N)F		F		974	umhos/cm	#
Specific Conductance	0320	WL	9/22/2020	(N)F		F		857	umhos/cm	#
Specific Conductance	0339	WL	9/4/2019	(N)F		F		2122	umhos/cm	#
Specific Conductance	0339	WL	9/22/2020	(N)F		F		1912	umhos/cm	#
Specific Conductance	0340	WL	9/4/2019	(N)F		F		3789	umhos/cm	#
Specific Conductance	0340	WL	9/22/2020	(N)F		F		3294	umhos/cm	#
Specific Conductance	0508	WL	9/4/2019	(N)F		F		2963	umhos/cm	#
Specific Conductance	0508		9/22/2020	(N)F		F		4219	umhos/cm	#
Specific Conductance	0510		9/4/2019	(N)F		F		3064	umhos/cm	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Specific Conductance	0510		9/22/2020	(N)F		F		3256	umhos/cm	#
Specific Conductance	0684		9/3/2019	(N)F		F		834	umhos/cm	#
Specific Conductance	0684		9/23/2020	(N)F		F		788	umhos/cm	#
Specific Conductance	0318A		9/4/2019	(N)F		F		2831	umhos/cm	#
Specific Conductance	0318A		9/22/2020	(N)F		F		1973	umhos/cm	#
Temperature	0317		9/4/2019	(N)F		F		15.73	C	#
Temperature	0317		9/23/2020	(N)F		F		17.37	C	#
Temperature	0319		9/3/2019	(N)F		F		19.32	C	#
Temperature	0319		9/22/2020	(N)F		F		18.6	C	#
Temperature	0320		9/3/2019	(N)F		F		16.77	C	#
Temperature	0320		9/22/2020	(N)F		F		18.46	C	#
Temperature	0339		9/4/2019	(N)F		F		18.26	C	#
Temperature	0339		9/22/2020	(N)F		F		20.01	C	#
Temperature	0340		9/4/2019	(N)F		F		18.8	C	#
Temperature	0340		9/22/2020	(N)F		F		20.81	C	#
Temperature	0508		9/4/2019	(N)F		F		18.9	C	#
Temperature	0508		9/22/2020	(N)F		F		19.59	C	#
Temperature	0510		9/4/2019	(N)F		F		17.63	C	#
Temperature	0510		9/22/2020	(N)F		F		19.6	C	#
Temperature	0684		9/3/2019	(N)F		F		16.36	C	#
Temperature	0684		9/23/2020	(N)F		F		14.38	C	#
Temperature	0318A		9/4/2019	(N)F		F		19.32	C	#
Temperature	0318A		9/22/2020	(N)F		F		19.31	C	#
Toluene	0319		9/3/2019	(N)F		F	15	720	ug/L	#
Toluene	0319		9/3/2019	(N)F		F	6	760	ug/L	#
Toluene	0319		9/22/2020	(N)F	U	F	17	17	ug/L	#
Turbidity	0317		9/4/2019	(N)F		F		0.65	NTU	#
Turbidity	0317		9/23/2020	(N)F		F		2.12	NTU	#
Turbidity	0319		9/3/2019	(N)F		F		14.2	NTU	#
Turbidity	0319		9/22/2020	(N)F		F		8.18	NTU	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Turbidity	0320		9/3/2019	(N)F		F		8.75	NTU	#
Turbidity	0320		9/22/2020	(N)F		F		9.35	NTU	#
Turbidity	0339		9/4/2019	(N)F		F		9.16	NTU	#
Turbidity	0339		9/22/2020	(N)F		F		8.26	NTU	#
Turbidity	0340		9/4/2019	(N)F		F		7.95	NTU	#
Turbidity	0340		9/22/2020	(N)F		F		5.28	NTU	#
Turbidity	0508		9/4/2019	(N)F		F		1.29	NTU	#
Turbidity	0508		9/22/2020	(N)F		F		4.37	NTU	#
Turbidity	0510		9/4/2019	(N)F		F		9.08	NTU	#
Turbidity	0510		9/22/2020	(N)F		F		6.16	NTU	#
Turbidity	0684		9/3/2019	(N)F		F		2.21	NTU	#
Turbidity	0684		9/23/2020	(N)F		F		4.22	NTU	#
Turbidity	0318A		9/4/2019	(N)F		F		8.71	NTU	#
Turbidity	0318A		9/22/2020	(N)F		F		8.24	NTU	#
Uranium	0320		9/3/2019	(T)F		F	0.0000049	0.0057	mg/L	#
Uranium	0320		9/22/2020	(T)F		F	0.00004	0.0043	mg/L	#
Uranium	0339		9/4/2019	(T)F		F	0.0000049	0.03	mg/L	#
Uranium	0339		9/22/2020	(T)F		F	0.00004	0.031	mg/L	#
Uranium	0340		9/4/2019	(T)F		F	0.0000049	0.041	mg/L	#
Uranium	0340		9/22/2020	(T)F		F	0.00004	0.04	mg/L	#
Uranium	0508		9/4/2019	(T)F		F	0.0000049	0.061	mg/L	#
Uranium	0508		9/22/2020	(T)D		F	0.00004	0.075	mg/L	#
Uranium	0508		9/22/2020	(T)F		F	0.00004	0.076	mg/L	#
Uranium	0510		9/4/2019	(T)F		F	0.0000049	0.087	mg/L	#
Uranium	0510		9/22/2020	(T)F		F	0.00004	0.078	mg/L	#
Uranium	0684		9/3/2019	(T)D		F	0.0000049	0.0092	mg/L	#
Uranium	0684		9/3/2019	(T)F		F	0.0000049	0.0094	mg/L	#
Uranium	0684		9/23/2020	(T)F		F	0.00004	0.009	mg/L	#
Uranium	0318A		9/4/2019	(T)F		F	0.0000049	0.03	mg/L	#
Uranium	0318A		9/22/2020	(T)F		F	0.00004	0.028	mg/L	#

GROUNDWATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA	DETECTION LIMIT	RESULT	UNIT	QA

LOCATION TYPE
WL - Well

SAMPLE TYPES:
Fraction:

(T) Total (for metal concentrations)
(D) Dissolved (for dissolved or filtered metal concentrations)
(N) Organic (or other) constituents for which neither total nor dissolved is applicable

Type Codes:
F-Field Sample R-Replicate FR-Field Sample with Replicates
D-Duplicate N-Not Known S-Split Sample

LAB QUALIFIERS:
J Estimated Value.
U Parameter analyzed for but was not detected.

DATA QUALIFIERS:
F Low flow sampling method used.
Q Qualitative result due to sampling technique.
U Parameter analyzed for but was not detected.

QA QUALIFIER:
Validated according to Quality Assurance guidelines.

Appendix B-2

Surface Water Quality Data for Slick Rock West

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SURFACE WATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Alkalinity, Total (As CaCO3)	0347	SL	9/4/2019	(N)F				95	mg/L	#
Alkalinity, Total (As CaCO3)	0347	SL	9/22/2020	(N)F				124	mg/L	#
Alkalinity, Total (As CaCO3)	0349	SL	9/3/2019	(N)F				91	mg/L	#
Alkalinity, Total (As CaCO3)	0349	SL	9/22/2020	(N)F				28	mg/L	#
Alkalinity, Total (As CaCO3)	0693	SL	9/4/2019	(N)F				86	mg/L	#
Alkalinity, Total (As CaCO3)	0693	SL	9/22/2020	(N)F				115	mg/L	#
Alkalinity, Total (As CaCO3)	0694	SL	9/3/2019	(N)F				70	mg/L	#
Alkalinity, Total (As CaCO3)	0694	SL	9/23/2020	(N)F				78	mg/L	#
Manganese	0347	SL	9/4/2019	(T)F			0.00036	0.013	mg/L	#
Manganese	0347	SL	9/22/2020	(D)F	J		0.0049	0.0055	mg/L	#
Manganese	0349	SL	9/3/2019	(T)F			0.00036	0.0077	mg/L	#
Manganese	0349	SL	9/22/2020	(D)F	U		0.0049	0.0049	mg/L	#
Manganese	0693	SL	9/4/2019	(T)F			0.00036	0.0072	mg/L	#
Manganese	0693	SL	9/22/2020	(D)F	U		0.0049	0.0049	mg/L	#
Manganese	0694	SL	9/3/2019	(T)F			0.00036	0.0073	mg/L	#
Manganese	0694	SL	9/23/2020	(D)F	U		0.0049	0.0049	mg/L	#
Molybdenum	0347	SL	9/4/2019	(T)F			0.000079	0.0037	mg/L	#
Molybdenum	0347	SL	9/22/2020	(D)F			0.00046	0.0034	mg/L	#
Molybdenum	0349	SL	9/3/2019	(T)F	J		0.000079	0.0014	mg/L	#
Molybdenum	0349	SL	9/22/2020	(D)F	J		0.00046	0.0018	mg/L	#
Molybdenum	0693	SL	9/4/2019	(T)F	J		0.000079	0.00095	mg/L	#
Molybdenum	0693	SL	9/22/2020	(D)F	J		0.00046	0.0014	mg/L	#
Molybdenum	0694	SL	9/3/2019	(T)F	J		0.000079	0.00098	mg/L	#
Molybdenum	0694	SL	9/23/2020	(D)F	J		0.00046	0.0014	mg/L	#
Nitrate + Nitrite as Nitrogen	0347	SL	9/4/2019	(N)F	U		0.3	0.3	mg/L	#
Nitrate + Nitrite as Nitrogen	0347	SL	9/22/2020	(N)F	U	J	0.0056	0.0056	mg/L	#
Nitrate + Nitrite as Nitrogen	0349	SL	9/3/2019	(N)F			0.003	0.011	mg/L	#
Nitrate + Nitrite as Nitrogen	0349	SL	9/22/2020	(N)F	U	J	0.0056	0.0056	mg/L	#
Nitrate + Nitrite as Nitrogen	0693	SL	9/4/2019	(N)F	U		0.3	0.3	mg/L	#

SURFACE WATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Nitrate + Nitrite as Nitrogen	0693	SL	9/22/2020	(N)F	U	J	0.0056	0.0056	mg/L	#
Nitrate + Nitrite as Nitrogen	0694	SL	9/3/2019	(N)F	U		0.003	0.003	mg/L	#
Nitrate + Nitrite as Nitrogen	0694	SL	9/23/2020	(N)F	U	J	0.0056	0.0056	mg/L	#
Oxidation Reduction Potential	0347	SL	9/4/2019	(N)F				114.2	mV	#
Oxidation Reduction Potential	0347	SL	9/22/2020	(N)F				254.3	mV	#
Oxidation Reduction Potential	0349	SL	9/3/2019	(N)F				-102.4	mV	#
Oxidation Reduction Potential	0349	SL	9/22/2020	(N)F				184.8	mV	#
Oxidation Reduction Potential	0693	SL	9/4/2019	(N)F				80.6	mV	#
Oxidation Reduction Potential	0693	SL	9/22/2020	(N)F				262.8	mV	#
Oxidation Reduction Potential	0694	SL	9/3/2019	(N)F				17.9	mV	#
Oxidation Reduction Potential	0694	SL	9/23/2020	(N)F				215.6	mV	#
pH	0347	SL	9/4/2019	(N)F				8.29	s.u.	#
pH	0347	SL	9/22/2020	(N)F				8.21	s.u.	#
pH	0349	SL	9/3/2019	(N)F				8.05	s.u.	#
pH	0349	SL	9/22/2020	(N)F				7.97	s.u.	#
pH	0693	SL	9/4/2019	(N)F				8.33	s.u.	#
pH	0693	SL	9/22/2020	(N)F				8.14	s.u.	#
pH	0694	SL	9/3/2019	(N)F				7.86	s.u.	#
pH	0694	SL	9/23/2020	(N)F				7.97	s.u.	#
Selenium	0347	SL	9/4/2019	(T)F	J		0.00065	0.0041	mg/L	#
Selenium	0347	SL	9/22/2020	(D)F	U		0.0028	0.0028	mg/L	#
Selenium	0349	SL	9/3/2019	(T)F	J		0.00065	0.0011	mg/L	#
Selenium	0349	SL	9/22/2020	(D)F	U		0.0028	0.0028	mg/L	#
Selenium	0693	SL	9/4/2019	(T)F	U		0.00065	0.00065	mg/L	#
Selenium	0693	SL	9/22/2020	(D)F	U		0.0028	0.0028	mg/L	#
Selenium	0694	SL	9/3/2019	(T)F	U		0.00065	0.00065	mg/L	#
Selenium	0694	SL	9/23/2020	(D)F	U		0.0028	0.0028	mg/L	#
Specific Conductance	0347	SL	9/4/2019	(N)F				359	umhos/cm	#
Specific Conductance	0347	SL	9/22/2020	(N)F				321	umhos/cm	#

SURFACE WATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Specific Conductance	0349	SL	9/3/2019	(N)F				287	umhos/cm	#
Specific Conductance	0349	SL	9/22/2020	(N)F				324	umhos/cm	#
Specific Conductance	0693	SL	9/4/2019	(N)F				305	umhos/cm	#
Specific Conductance	0693	SL	9/22/2020	(N)F				325	umhos/cm	#
Specific Conductance	0694	SL	9/3/2019	(N)F				291	umhos/cm	#
Specific Conductance	0694	SL	9/23/2020	(N)F				345	umhos/cm	#
Temperature	0347	SL	9/4/2019	(N)F				23.88	C	#
Temperature	0347	SL	9/22/2020	(N)F				16.99	C	#
Temperature	0349	SL	9/3/2019	(N)F				25.12	C	#
Temperature	0349	SL	9/22/2020	(N)F				20.54	C	#
Temperature	0693	SL	9/4/2019	(N)F				28.21	C	#
Temperature	0693	SL	9/22/2020	(N)F				15.64	C	#
Temperature	0694	SL	9/3/2019	(N)F				23.54	C	#
Temperature	0694	SL	9/23/2020	(N)F				16.34	C	#
Turbidity	0347	SL	9/4/2019	(N)F				9.53	NTU	#
Turbidity	0347	SL	9/22/2020	(N)F				18.6	NTU	#
Turbidity	0349	SL	9/3/2019	(N)F				9.1	NTU	#
Turbidity	0349	SL	9/22/2020	(N)F				16.5	NTU	#
Turbidity	0693	SL	9/4/2019	(N)F				7.44	NTU	#
Turbidity	0693	SL	9/22/2020	(N)F				15.2	NTU	#
Turbidity	0694	SL	9/3/2019	(N)F				9.21	NTU	#
Turbidity	0694	SL	9/23/2020	(N)F				17.6	NTU	#
Uranium	0347	SL	9/4/2019	(T)F			0.0000049	0.00049	mg/L	#
Uranium	0347	SL	9/22/2020	(D)F			0.00004	0.00059	mg/L	#
Uranium	0349	SL	9/3/2019	(T)F			0.0000049	0.00047	mg/L	#
Uranium	0349	SL	9/22/2020	(D)F			0.00004	0.0006	mg/L	#
Uranium	0693	SL	9/4/2019	(T)F			0.0000049	0.0004	mg/L	#
Uranium	0693	SL	9/22/2020	(D)F			0.00004	0.00057	mg/L	#
Uranium	0694	SL	9/3/2019	(T)F			0.0000049	0.00041	mg/L	#

SURFACE WATER QUALITY DATA BY PARAMETER FOR SITE SRK05, Slick Rock West Processing Site
Report Date 06/22/2021

PARAMETER	LOCATION CODE	LOCATION TYPE	SAMPLE DATE	SAMPLE TYPE	QUALIFIERS LAB | DATA		DETECTION LIMIT	RESULT	UNIT	QA
Uranium	0694	SL	9/23/2020	(D)F			0.00004	0.00059	mg/L	#

LOCATION TYPE
SL - Surface Location

SAMPLE TYPES:
Fraction:
(T) Total (for metal concentrations)
(D) Dissolved (for dissolved or filtered metal concentrations)
(N) Organic (or other) constituents for which neither total nor dissolved is applicable

Type Codes:
F-Field Sample R-Replicate FR-Field Sample with Replicates
D-Duplicate N-Not Known S-Split Sample

LAB QUALIFIERS:
J Estimated Value.
U Parameter analyzed for but was not detected.

DATA QUALIFIERS:
F Low flow sampling method used.
Q Qualitative result due to sampling technique.
U Parameter analyzed for but was not detected.

QA QUALIFIER:
Validated according to Quality Assurance guidelines.