



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 23, 2020

David Pierce
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P.O. Box 98/Highway 605
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SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION REVIEW OF HOMESTAKE MINING COMPANY OF CALIFORNIA'S REPLY TO "RESPONSE TO THE HOMESTAKE MINING COMPANY OF CALIFORNIA LETTER, DATED JULY 26, 2018: PROPOSED ADJUSTMENT IN GROUNDWATER MONITORING OF THE SAN ANDRES-GLORIETA AQUIFER NEAR THE GRANTS RECLAMATION PROJECT", DATED MAY 10, 2019, DOCKET NO. 040-08903, LICENSE NO. SUA-1471

Dear Mr. Pierce:

By letter dated May 10, 2018,¹ the U.S. Nuclear Regulatory Commission (NRC) staff, in coordination with the New Mexico Environment Department (NMED), the New Mexico Office of the State Engineer (OSE), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE) staff (collectively "the Agencies"), stated that well 943 should be plugged and abandoned as recommended in the letter dated April 3, 2018,² by Homestake Mining Company of California (HMC). By letter dated July 26, 2018,³ HMC reported that well 943 was abandoned in July 2018 and proposed additional groundwater monitoring of the San Andres-Glorieta (SAG) Aquifer at wells near well 943. By letter dated January 24, 2019,⁴ the NRC staff, in coordination with the Agencies, requested additional information to demonstrate that any contamination from well 943 is not capable of posing a substantial present or potential hazard to human health or the environment. By letter dated May 10, 2019, HMC provided an analysis of predicted uranium concentrations in the SAG Aquifer due to leakage from well 943.⁵

The NRC staff, in coordination with the Agencies, has determined that additional information is required regarding the source of the contamination observed at well 943 and that additional monitoring, as proposed by HMC, should be implemented. The NRC staff review is enclosed. The NRC staff requests a response within 90 days of the date of this letter.

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML18120A331.

² ADAMS Accession No. ML18117A230.

³ ADAMS Accession No. ML18236A552.

⁴ ADAMS Accession No. ML19002A503.

⁵ ADAMS Accession No. ML19143A097.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions regarding this matter, please contact me at 301-415-7777, or via email at ron.linton@nrc.gov.

Sincerely,

/RA/

Ron C. Linton, Project Manager
Uranium Recovery and Materials
Decommissioning Branch
Division of Decommissioning, Uranium Recovery
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Office of Nuclear Material Safety
and Safeguards

Docket No.: 040-08903

License No.: SUA-1471

Enclosure: NRC staff review

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SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION REVIEW OF HOMESTAKE MINING COMPANY OF CALIFORNIA'S REPLY TO "RESPONSE TO THE HOMESTAKE MINING COMPANY OF CALIFORNIA LETTER, DATED JULY 26, 2018: PROPOSED ADJUSTMENT IN GROUNDWATER MONITORING OF THE SAN ANDRES-GLORIETA AQUIFER NEAR THE GRANTS RECLAMATION PROJECT", DATED MAY 10, 2019, DOCKET NO. 040-08903, LICENSE NO. SUA-1471 **DATE January 23, 2020**

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RESULTS OF U.S. NUCLEAR REGULATORY COMMISSION STAFF REVIEW OF THE MAY 10, 2019, "RESPONSE TO THE HOMESTAKE MINING COMPANY OF CALIFORNIA LETTER, DATED JULY 26, 2018: PROPOSED ADJUSTMENT IN GROUNDWATER MONITORING OF THE SAN ANDRES-GLORIETA AQUIFER NEAR THE GRANTS RECLAMATION PROJECT"

HOMESTAKE MINING COMPANY OF CALIFORNIA
GRANTS RECLAMATION PROJECT

DOCKET NO: 040-08903
LICENSE NO: SUA-1471

1.0 BACKGROUND

By letter dated April 3, 2018,¹ the Homestake Mining Company of California (HMC) proposed that well 943 be abandoned because leakage of elevated concentrations of contaminants into the San Andres aquifer was occurring. HMC determined that leakage into the San Andres from overlying aquifers occurred since San Andres well 943M, located 217 feet northwest of well 943 and hydraulically upgradient, was not affected by HMC's operations. HMC stated:

San Andres monitoring well 943M shows that the San Andres aquifer near well 943 has not been affected by operations in this area and therefore the elevated concentrations in well 943 are from leakage into the well from an overlying aquifer. This pump test did not determine which overlying aquifer is causing the elevated concentrations in well 943 but the Middle Chinle or the Lower Chinle are thought to be the likely source of the leakage.

By letter dated May 10, 2018,² the U.S. Nuclear Regulatory Commission (NRC) staff, in coordination with the New Mexico Environment Department (NMED) staff and the U.S. Environmental Protection Agency (EPA) staff (collectively "the Agencies"), stated that well 943 should be plugged and abandoned as recommended in HMC's April 3, 2018, letter. The NRC response on May 10, 2018, stated in part:

In the Well 943 Hydrologic Test Report, HMC stated that well 943 would not have been able to affect the water quality in the SAG [San Andres Glorieta] when it was being pumped continuously. Specifically, it was noted that contamination could be occurring now that well 943 is no longer being used as a source for fresh-water supply. However, it is not clear that well 943 did not impact the water quality of the SAG while in operation as a fresh water supply source in addition to the time period after pumping of well 943 ceased on May 18, 2017.

The Well 943 Hydrologic Test was conducted at an average of 272 gallons per minute (gpm). As shown in Figure 6.3 in the Hydrologic Test Report, uranium and selenium concentrations did decrease slightly but not to concentrations comparable to those from well 943M during pumping. Accordingly, it is not clear that a well pumping rate of

¹ Agencywide Documents Access and Management System (ADAMS) Accession No. ML18117A230.

² ADAMS Accession No. ML18120A331.

272 gpm is sufficient to capture all of the seepage from the overlying aquifer(s). NRC staff reviewed the 2017 Annual Monitoring Report to determine if pumping rates during operation of the fresh water supply system were significantly greater than during the pump test. Section 2.1.8 listed an average total groundwater collection rate from the SAG of 440 gpm for 2017. Section 8.1 of the 2017 Annual Monitoring Report indicates that this fresh water was produced from wells Deep #1R, Deep #2, 951R, and 943 in 2017.³ As the flowrate from the pump test, which may have been insufficient to capture all of the seepage from the overlying aquifer(s), is similar to the total flowrate from all of the SAG fresh water supply wells, it is not clear to NRC staff that pumping during operations was sufficient to capture all of the seepage from the overlying aquifer(s).

In that letter, the NRC staff, in coordination with the Agencies, further commented that HMC should provide additional supporting information to demonstrate that seepage from the overlying aquifer(s) did not contaminate the SAG Aquifer. By letter dated July 26, 2018,⁴ HMC provided a response that discussed the SAG groundwater flow direction, groundwater usage and proposed to adjust groundwater monitoring by adding existing SAG wells to the monitoring well network in the area of well 943. However, by letter dated January 24, 2019,⁵ the NRC staff, in coordination with the Agencies, concluded that neither water quality or depth to groundwater preclude the use of groundwater from the SAG Aquifer downgradient from well 943 nor did HMC demonstrate that contamination from well 943 could not impact undocumented SAG wells or SAG wells downgradient from well 943 that could be completed in the future. The NRC staff, in coordination with Agencies, requested additional information to demonstrate that any contamination from well 943 is not capable of posing a substantial present or potential hazard to human health or the environment. It was further discussed that this could be demonstrated by additional monitoring of the SAG Aquifer downgradient from well 943 or an analysis demonstrating that contamination from well 943 is not risk significant, or both. Lastly, the NRC, in coordination with the Agencies, requested that HMC provide additional information regarding the disposal of contaminated water from well 943.

2.0 DISCUSSION

By letter dated May 10, 2019,⁶ HMC provided an analysis of predicted uranium concentrations in the SAG Aquifer due to leakage from well 943. HMC's analysis assumed a flowrate of 50 gallons per minute (gpm), because a cone of depression was previously observed at a flowrate of 54 gpm from the Middle Chinle Aquifer and no cone of depression was detected during the pumping test reported on April 3, 2018. HMC also noted that the Lower Chinle Aquifer has similar transmissivity and storage properties to the Middle Chinle Aquifer, so a cone of depression would also have been expected to be observed in the Lower Chinle if the flow rates were greater than 50 gpm. HMC then calculated a uranium concentration of 0.296 mg/L for the leakage based on: (1) a well 943 pumping rate of 272 gpm, including 50 gpm from leakage and 222 gpm from the SAG Aquifer and (2) uranium concentrations of 0.061 and 0.008 mg/L for the well 943 pumped water at the end of the pump test and the SAG Aquifer water at well 943M, respectively. Then, based on a uranium concentration of 0.088 mg/L near the start of the well 943 pump test, HMC estimated an average uranium concentration of 0.04 mg/L in the SAG

³ Deep #1 was not used in 2017 and Deep #1R was used in late 2017. Well 943 was only operated until May 18, 2017.

⁴ ADAMS Accession No. ML18236A552.

⁵ ADAMS Accession No. ML19002A503.

⁶ ADAMS Accession No. ML19143A097.

Aquifer near well 943 due to a combination of leakage from overlying aquifers and dilution from the SAG Aquifer.

HMC discussed that the predicted concentrations were only slightly larger than the EPA's uranium drinking water maximum contaminant level of 0.03 mg/L and that the impact to the SAG Aquifer would have further declined since plugging and abandonment of well 943. Based on that calculated concentration and the characteristics of the SAG Aquifer, HMC concluded that the impact to the SAG Aquifer from well 943 leakage is not expected to pose a substantial present or potential hazard to human health or the environment.

In review of HMC's analysis, the NRC staff, in coordination with the Agencies notes that the analysis provides important risk insights. However, HMC's analysis also indicates uncertainty in the source of the contamination observed at well 943. Prior to evaluation of the risk from the contamination observed at well 943, additional information is needed to verify that leakage from the overlying aquifers into well 943 was the source of contamination.

Although HMC had concluded in its letter dated April 3, 2018, that the contamination observed at well 943 was due to leakage from an overlying aquifer, HMC's analysis in its May 10, 2019, letter is inconsistent with that conclusion. In their analysis, HMC assumed a maximum leakage rate of 50 gpm from the overlying aquifers based on no observations of a cone of depression in either the Middle or Lower Chinle Aquifers. Even at that flow rate, HMC calculated that the uranium concentration from overlying aquifers would have to be approximately 0.3 mg/L to yield the observed concentrations at well 943. However, this concentration is significantly greater than uranium concentrations observed in any of the overlying aquifers in the vicinity of well 943. In addition, Table 1 (reprinted below) from HMC's June 2, 2017, letter, showed sulfate, total dissolved solids (TDS), and selenium (Se) concentrations that are all lower in the Middle and Lower Chinle Aquifers than for well 943. In particular, the Se concentration at well 943 was higher than that of any of the overlying aquifers. Based on the concentrations in the overlying aquifers, almost all of the water produced from well 943 would have had to have been derived from the overlying aquifers to yield the concentrations observed at well 943. However, the observed drawdown in well 943 during the pump test showed that a significant amount of water was being drawn from the SAG Aquifer. In addition to almost all of the water from well 943 having had to have been derived from the overlying aquifers, environmental variability would also be necessary to explain the concentrations, because greater concentrations of contaminants were observed at well 943 than from the overlying aquifers. Accordingly, it is not clear that the contamination observed in the SAG Aquifer at well 943 was derived from the overlying aquifers.

Table 1. Aquifer data compared to well 943 Data (adapted from June 2, 2017,⁷ submittal, “Potential Sources to San Andres Glorieta Aquifer well 943 (B-28-S-329), Condition 4.”)

Aquifer	Hydraulic Head Elevation (ft. msl)	SO4 (mg/L)	TDS (mg/L)	U (mg/L)	Se (mg/L)
SAG (943)	6414.16	1000	2000	0.09	0.07
Alluvial	~6,519	1200	2600	0.07	0.04
Upper Chinle	NA	800 ¹	1900 ¹	0.04 ¹	0.05 ¹
Middle Chinle	~6,490	670	1700	0.09	0.05
Lower Chinle	~6,453	900	1800	0.03	0.05
Bluewater ²	>6419.4 ³	700	1800	0.01	0.01

Note: ¹ = Not Applicable. Aquifer does not exist in the area of 943.

² = Bluewater Mill SAG Plume Data, DOE Site Status Report, 2014.

³ = Hydraulic head elevation in the SAG at the Bluewater is greater than this value measured in HMC SAG well 951.

In review of the potential for far-upgradient sources of contamination, such as the Bluewater site, to be responsible for the concentrations observed at well 943, the NRC staff, in coordination with the Agencies, agrees with HMC’s assessment. By letter dated June 2, 2017, HMC discussed that although the Bluewater site has the potential for water to flow in the SAG Aquifer to well 943, the concentrations of constituents of concern are not high enough to be a source of contamination observed at well 943. There are also a series of wells in the SAG Aquifer that are upgradient from well 943 (e.g., 806R, 951, 951R) that would likely detect contamination that may have migrated from sources such as Bluewater. Lastly, although the SAG Aquifer contains solution channels and has the potential for bypass flow, the well 943 hydrologic pump test showed communication between well 943M and well 943. Well 943M was installed as a sentinel well 217 ft upgradient from well 943 and has not shown evidence of contamination.

In review of any other potential sources of the contamination observed at well 943, the NRC staff, in coordination with the Agencies, reviewed additional groundwater monitoring data. Figure 1 and Figure 2 of this report show water level elevations from the April 3, 2018, Well 943 Pump Test Report for the Alluvial and Middle Chinle Aquifers, respectively. As shown in Figure 1 and Figure 2, the pump test stopped on January 23, 2018, and the well monitoring data stopped on January 30, 2018. The pump test data shown in Figure 1 and Figure 2 did not show any drawdown in the Alluvial⁸ or Middle Chinle Aquifers during the pump test. However, the water elevations measured on February 6, 2018, and shown in Figure 3 and Figure 4 of this report, which were adapted from the 2018 Annual Monitoring Report, showed drawdown for several Alluvial wells and Middle Chinle well CW76, which are in the vicinity of well 943. In addition, a similar trend in well drawdown was observed during the February 6, 2018, sampling event for several Alluvial wells located further away in the 100-Acre Center Pivot area, as shown in Figure 5 of this report. It is not clear if the drawdown in these wells was related to other HMC activities (e.g., well sampling, groundwater extraction) or if the drawdown was delayed and was related to the well 943 pump test. The NRC staff, in coordination with the Agencies, note that there is the potential for an additional source(s) of contamination into the SAG Aquifer that has

⁷ ADAMS Accession No. ML17163A342.

⁸ The brief drawdown events shown in Figure 1 and Figure 2 for well 845 and CW76 are due to sampling events.

not been detected at the other monitoring wells. For example, by letter dated January 27, 2009⁹, HMC concluded that Alluvial water may be leaking into SAG well 986 based on pump test results for well 986. Although HMC concluded at the time that the suspected leakage was not significantly affecting the SAG water quality, it is not clear if leakage of Alluvial water into the SAG may have increased at well 986 or if other SAG wells in the area may have leakage from overlying aquifers. There are a number of other SAG wells in the vicinity of well 943 whose integrity has not recently been verified. Because of the uncertainty in the source of the contamination previously observed at well 943 and the importance of the SAG Aquifer as a regional resource, the NRC staff, in coordination with the Agencies, have determined that additional information is needed to understand the source of the well 943 contamination.

3.0 REQUEST FOR ADDITIONAL INFORMATION

The NRC staff, in coordination with the Agencies, requests additional information regarding the source of the contamination observed at well 943.

If additional information is available to support the hypothesis that the contamination observed at well 943 was due to leakage from the overlying aquifers, that information should be provided. If additional information is not available, then additional information is needed to understand the source of contamination, including:

1. Provide clarification as to the cause of the well drawdown observed in wells 555, 556, 844, and 845 as well as the wells located in the 100-Acre Center Pivot area (i.e., wells 881, 882, 884, 886, 893). In the 2018 Annual Monitoring Report, HMC did not discuss the decreases observed in these wells during the February 6, 2018, well sampling event. If the observed delayed well drawdown in could be related to the 943 well pump test, HMC should investigate and report on the potential pathway(s) from the Alluvial Aquifer to the SAG Aquifer during the pump test.
2. As discussed above, uncertainty exists as to potential sources for the uranium contamination found in well 943. Please provide an analysis and map identifying zones within aquifers stratigraphically above the SAG that contain uranium concentrations high enough to result in the uranium contamination observed in the SAG Aquifer at well 943 during the pump test (i.e., uranium concentrations greater than or equal to 0.12 mg/L).

Additionally, HMC could conduct a pump test on well 943M to verify that contamination in the SAG Aquifer is not occurring in the vicinity or near-upgradient from well 943M, provided that the pump test water does not adversely impact ongoing restoration activities. This could include measurement of water elevations in the Alluvial Aquifer near well 943M and the Alluvial wells listed above during the pump test. If the pump test is conducted, the period of measurement of water elevations should be of sufficient time to detect well drawdown that is potentially delayed for a period of time after cessation of pumping, as described above.

The NRC staff, in coordination with the Agencies, agrees with the monitoring proposed by HMC in Table 1 of its July 26, 2018, letter. The NRC staff notes that monitoring for Deep #1R and Deep #2R, 943M, and 951R were recently approved on November 12, 2019, as part of HMC groundwater monitoring plan in material license SUA-1471, Condition 35A.¹⁰ HMC indicated

⁹ ADAMS Accession No. ML090350115

¹⁰ ADAMS Accession No. ML19217A352

that SAG wells 806R, 822, 949, 955, 986, 991 are not owned by HMC. However, these wells should be monitored for the constituents and at the frequency proposed by HMC, provided HMC can get access for sampling these wells.

To the extent practicable, HMC should evaluate well integrity for SAG wells that have not previously been tested.

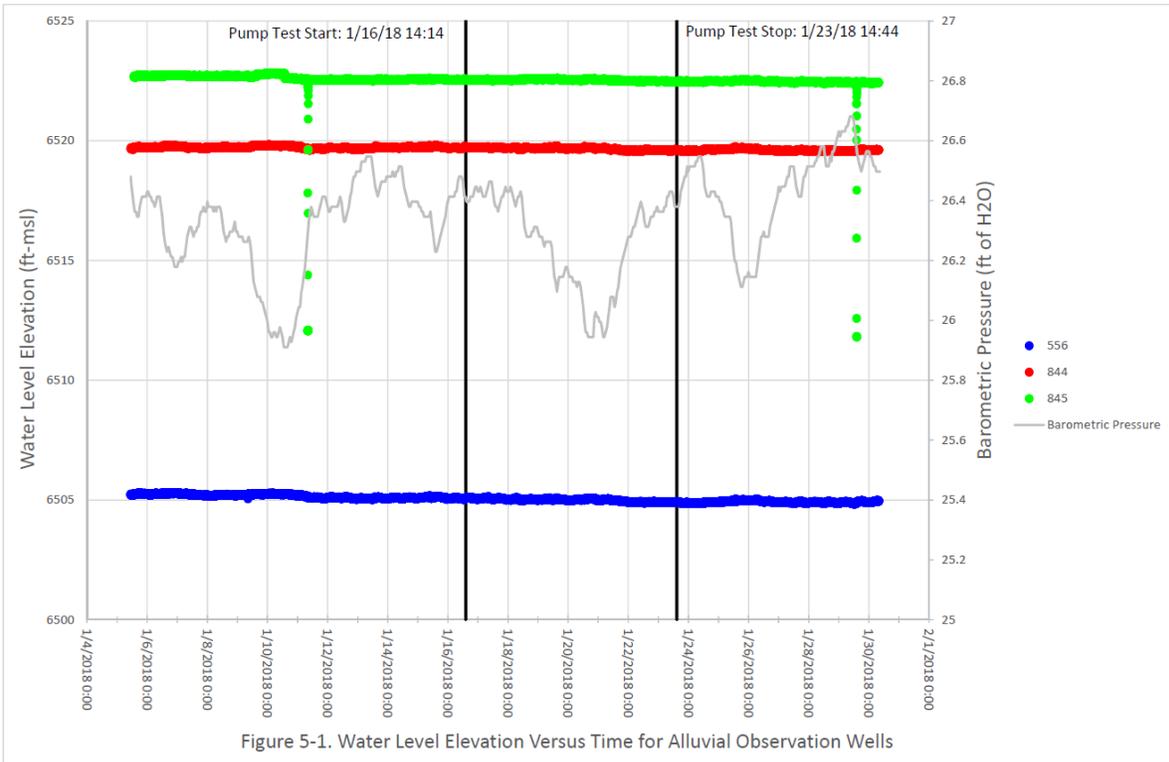


Figure 1. Water level elevations for Alluvial wells 556, 844, and 845 (adapted from April 3, 2018, Well 943 Hydrologic Test Report)

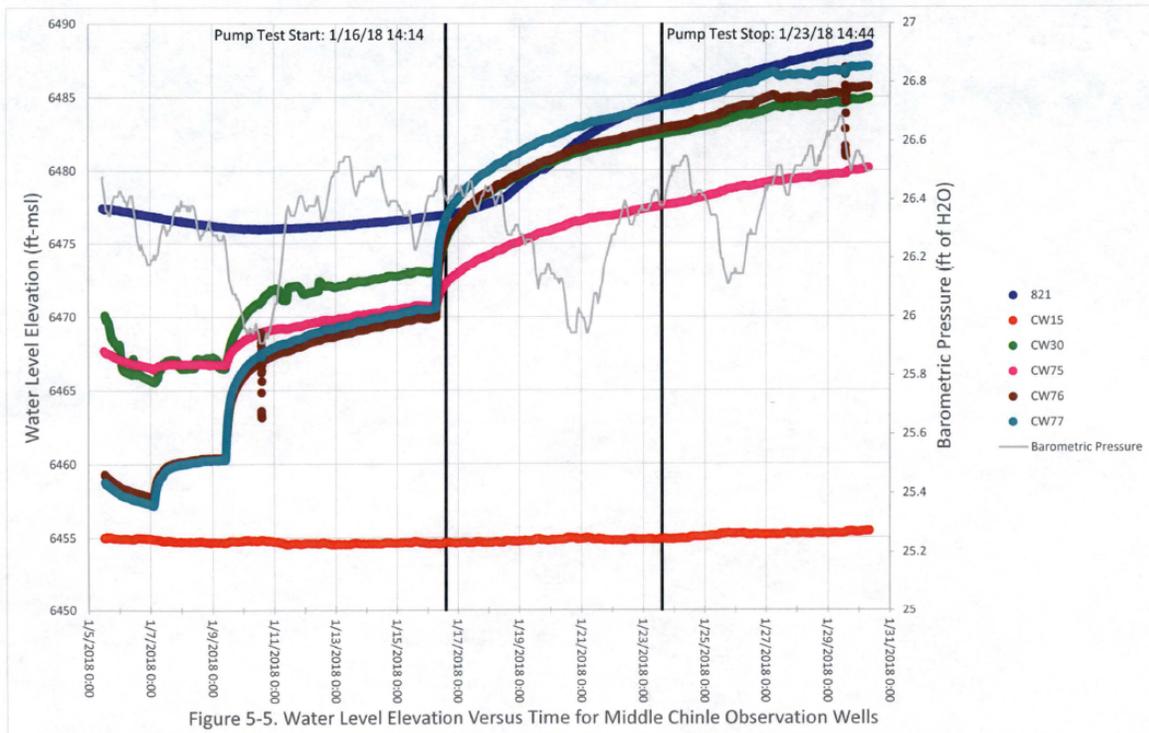


Figure 2. Water level elevations for Middle Chinle wells 821, CW15, CW30, CW75, CW76, and CW77¹¹ (adapted from April 3, 2018, Well 943 Hydrologic Test Report)

¹¹ In the report dated April 3, 2018, HMC described the rise in water level elevations for these Middle Chinle wells as being due to a series of collection wells being turned off.

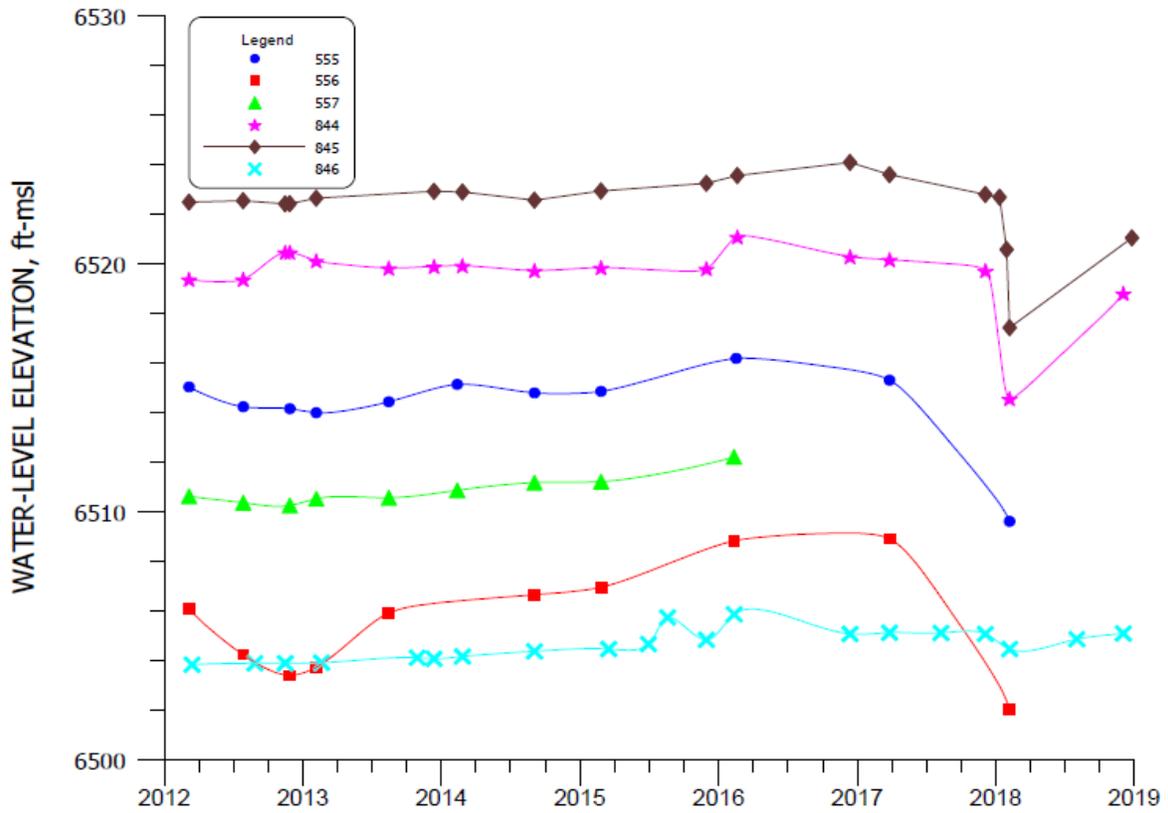


FIGURE 4.2-14. WATER-LEVEL ELEVATION FOR WELLS 555, 556, 557, 844, 845, AND 846.

Figure 3. Water level elevations for Alluvial wells (adapted from 2018 HMC Annual Monitoring Report)

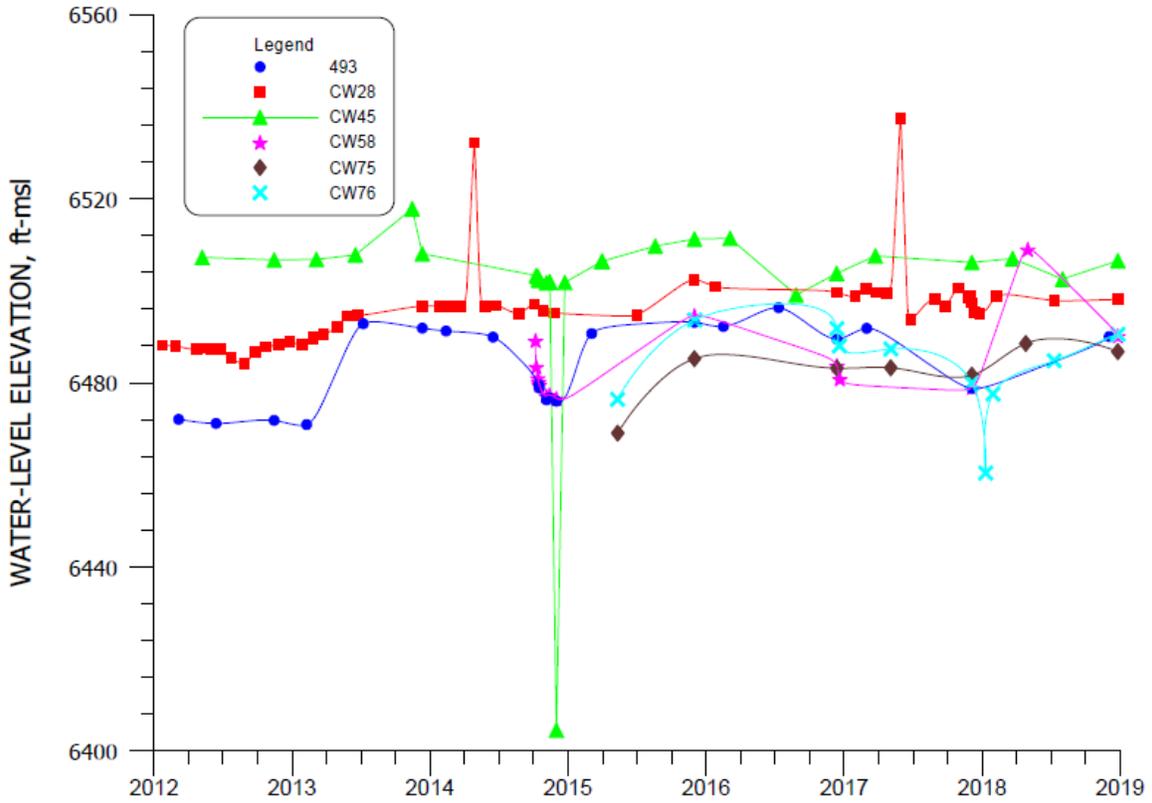


FIGURE 6.2-3. WATER-LEVEL ELEVATION FOR WELLS 493, CW28, CW45, CW58, CW75 AND CW76

Figure 4. Water level elevations for Middle Chinle wells (adapted from 2018 HMC Annual Monitoring Report)

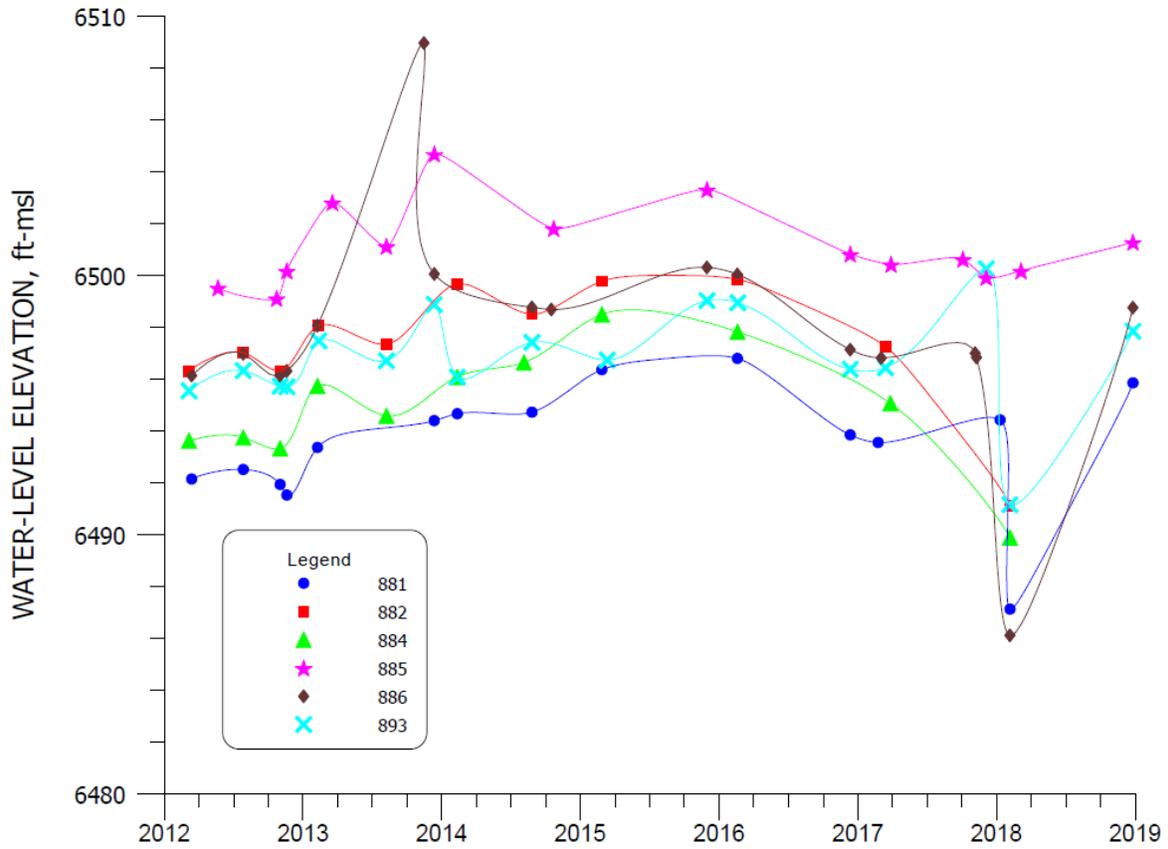


FIGURE 4.2-16. WATER-LEVEL ELEVATION FOR WELLS 881, 882, 884, 885, 886, AND 893.

Figure 5. Water level elevations for Alluvial wells (adapted from 2018 HMC Annual Monitoring Report)