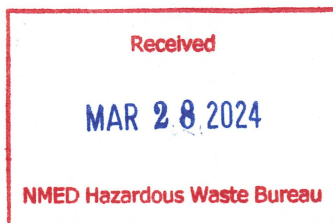




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*Date:* March 28, 2024  
*Refer To:* N3B-2024-0087

Ricardo Maestas, Acting Bureau Chief  
 Hazardous Waste Bureau  
 New Mexico Environment Department  
 2905 Rodeo Park Drive East, Building 1  
 Santa Fe, NM 87505-6313

**Subject: Notification to the New Mexico Environment Department Hazardous Waste Bureau of Three Anomalous Events Resulting in Erroneous Groundwater Quality Data Uploaded to the IntellusNM Database**

- Reference(s):
1. N3B/EM-LA Letter N3B-2023-0311, T. Thomson and B. Harcek to R. Maestas, "Notification to the New Mexico Environment Department Hazardous Waste Bureau of Erroneous R-35a Data in IntellusNM Database," dated August 23, 2023.
  2. N3B/EM-LA Letter N3B-2023-0441, T. Thomson and B. Harcek to R. Maestas, "Notification to the New Mexico Environment Department Hazardous Waste Bureau of Anomalous Data Collected at Groundwater Regional Aquifer Monitoring Well R-70 Screen 1 and Screen 2," dated November 27, 2023.

Dear Mr. Maestas:

This letter describes three anomalous events that occurred in the U.S. Department of Energy (DOE) Groundwater Monitoring Program that resulted in data being uploaded to the Intellus New Mexico (IntellusNM) database (<https://intellusnm.com>) and subsequently flagged as erroneous through the Newport News Nuclear BWXT-Los Alamos, LLC (N3B) focused validation process. The data will continue to reside in the database in accordance with Section XXVI of the 2016 Compliance Order on Consent, which states, "DOE commits to maintaining a publicly accessible database containing all data from analysis of environmental media samples collected by DOE as part of environmental investigations and monitoring." N3B's mission entails effectively identifying erroneous groundwater quality data and ensuring all data are properly reported. This letter summarizes each occurrence and its cause, as well as the corrective actions that N3B has taken to prevent these types of events from occurring in the future.

This notification presents for each of the three events discussed below (1) a summary of data quality issues that have occurred over the past year, (2) how the issues were corrected, and (3) N3B actions to prevent their recurrence. A summary of the data management processes currently in use by the N3B Sample and Data Management (SDM) organization, provided at the end of this letter, addresses topics related to data review processes, data validation, focused validation, data transparency, and decision-level quality versus non-decision-level quality (i.e., screening) data.

**Event #1: Erroneous Chromium Concentration Data at R-35a**

Screening-level data from an extended purge conducted on May 19, 2023, at well R-35a was reported in the IntellusNM database and subsequently flagged as rejected because of an instrumentation error at the analytical laboratory. These exceedances were initially reported to the New Mexico Environment Department Hazardous Waste Bureau (NMED-HWB) on August 23, 2023, in a letter titled, “Notification to the New Mexico Environment Department Hazardous Waste Bureau of Erroneous R-35a Data in IntellusNM Database” (Reference 1). The chromium concentration data showed an inconsistent trend during the extended purge, and some values exceeded the groundwater standard (Enclosure 1).

The May 19, 2023, extended purge was the second conducted at R-35a to identify the cause for increases in manganese and iron concentrations observed beginning in 2022. The first extended purge, conducted on August 25, 2022, confirmed that more representative water quality samples could be obtained by removal of the volume of water affected by localized reducing conditions near the wellbore. N3B hypothesized that since pumping at Los Alamos County well PM-3 ceased in April 2022, groundwater flow through R-35a has decreased, leading to minor reducing conditions that produce elevated iron and manganese concentrations. These extended purges were intended to confirm or refute this hypothesis and support annual updates to the Interim Facility-Wide Groundwater Monitoring Plan (IFGMP) so that representative groundwater samples could be obtained.

At the time the May 2023 extended purge was conducted, water quality samples supporting non-decision-level activities were analyzed at Los Alamos National Laboratory’s Geochemistry and Geomaterials Research Laboratory (GGRL). GGRL uploaded the data to the EIM (Environmental Information Management) database, and after the data were reviewed for appropriate detection status, they were uploaded to IntellusNM. N3B later identified the data uploaded to IntellusNM as anomalous. GGRL identified an inductively coupled plasma mass spectrometry (ICP-MS) instrumentation error as the cause for the erroneous high chromium concentration data that were uploaded into IntellusNM. Customary QA review of these data by N3B did not identify the issue because GGRL data do not contain sufficient information for N3B’s SDM to perform a standard Level 1 (examination) and Level 2 (verification) review, as SDM does for other data from third-party DOE Consolidated Audit Program– (DOECAP-) certified analytical laboratories.

Immediately following the notification of this event, these data were flagged as rejected in IntellusNM. Samples from R-35a were then sent to GEL Laboratories, LLC, Division of the GEL Group, LLC, Charleston, South Carolina, a DOECAP-certified laboratory, where they were reanalyzed and the data validated by N3B chemists. The reanalyzed data were consistent with historical background concentrations measured at R-35a and have been uploaded into the IntellusNM database. As a short-term corrective action to identify any additional events, N3B’s SDM implemented an automatic alert system that flags exceedances for all non-decision-level data when uploaded to IntellusNM. Although GGRL has made changes in their quality assurance (QA) procedures to prevent recurrence, N3B has updated its processes so that DOECAP-certified laboratories will be used for non-decision-level sampling events whenever possible.

Following the actions taken to resolve the erroneous data reported in IntellusNM, N3B initiated a formal apparent-cause analysis to confirm the significance and extent of the condition and apply corrective actions to the condition. N3B identified, established, and applied the following corrective actions to prevent similar events from happening in the future:

1. Coordinate with GGRL to produce a quality assessment report associated with erroneous data GGRL sends to N3B. The report produced for the May 2023 event addressed mitigation strategies to prevent reoccurrence, including an action for GGRL personnel to follow proper procedures when sharing analytical data with N3B’s SDM.

2. Create a permanent notification system that alerts appropriate N3B and technical subcontractor personnel when non–decision-level analytical data exceed the action limit for appropriate water quality standards. The final notification system has been developed and is currently in operation.
3. Review the applicability of using analytical laboratories that do not provide Level 4 electronic data deliverables and data packages. Use alternative laboratories such as GGRL only when an analysis cannot be performed or a necessary turnaround time cannot be met at a DOECAP-accredited analytical laboratory providing Level 4 data packages. The review is currently being conducted with an estimated completion date of March 2024.
4. Update the IntellusNM database to more clearly define non–decision-level data to a broad public audience as noncompliance and nonregulatory by adding an explicit flag, present in all query results, that designates records as non–decision-level. The update is in progress with an estimated implementation date of summer 2024.

### **Event #2: Anomalous Data Collected at Groundwater Regional Aquifer Monitoring Well R-70 Screen 1 and Screen 2**

Anomalous chromium concentrations were measured in groundwater regional aquifer monitoring well R-70 in the lower screen (screen 2) during the August 2023 sampling event and in the upper screen (screen 1) during the September 2023 sampling event (Enclosure 2). The concentration of 74 µg/L in the sample collected from R-70 screen 2 on August 3, 2023, is approximately one-third of previously recorded measurements. The concentration of 137 µg/L in the sample collected from R-70 screen 1 on September 21, 2023, is several times the highest concentration previously recorded. N3B identified both of these concentrations as anomalous in IntellusNM because mixing of screen 1 and screen 2 groundwater within the sampling system was suspected. A summary of these events was initially reported to NMED-HWB on November 27, 2023, in a letter titled “Notification to the New Mexico Environment Department Hazardous Waste Bureau of Anomalous Data Collected at Groundwater Regional Aquifer Monitoring Well R-70 Screen 1 and Screen 2” (Reference 2).

Following these events, N3B reviewed water-level data for potential cross-flow, completed a Level 3 validation of the analytical data, conducted a geochemical analysis of potential mixing between screen 1 and screen 2, reviewed the sampling notes and procedures, evaluated the sampling system condition, and accelerated laboratory analysis for R-70 samples. The inflatable packer between the screens is currently holding pressure and does not appear to be allowing passive cross-flow between screens. However, geochemical calculations do support the mixing of the water between the two screens, suggesting that the mixing may be occurring within the sampling system rather than within the well. These calculations and focused validation of the fixed laboratory analytical results contraindicate a potential laboratory error. Operator error or sampling system malfunction resulting in an ineffective actuation of the access port valves (APVs) is the most likely cause of these anomalous chromium concentrations, effectively allowing the system to pump from both screens simultaneously.

Diagnostic tests on the sampling system APVs were conducted at R-70 in December 2023. Testing found that there were no problems with APV operation, and that any mixing that occurred in the August and September sampling events occurred only within the sampling system. No passive cross-flow has occurred between the screened intervals. However, during well diagnostic tests, a leak in the 2-in. Johnson spline lock (JSL) drop pipe O-ring was identified. To avoid mixing and obtain representative samples from each screen, sampling protocol has been changed to sample the lower zone first. If the lower zone is sampled first, any water remaining in the drop pipe will be rapidly removed during the purge since withdrawing water from the upper screen occurs more quickly than from the lower screen.

Additional testing was performed to determine if both APVs could be open at the same time and cause mixing within the sampling system. In the August sampling event, N3B hypothesizes that the upper APV

was unintentionally left open during sampling of the lower screen, resulting in mixing within the sampling system and a subsequent anomalously low concentration of chromium in screen 2. In September, the lower APV was still open from the August sampling event when the upper screen was sampled. This resulted in mixing within the sampling system and an anomalously high measure of chromium in screen 1. Testing confirmed that this was the likely cause of mixing, since once APVs were closed, no further mixing has occurred.

Since October 2023, N3B has been closely monitoring the conditions at R-70 to ensure representative water quality data are collected and analyzed from screen 1 and screen 2. Field personnel closely monitor the following field parameters throughout the purge: dissolved oxygen, flow rate (in gallons per minute), oxidation-reduction potential, pH, specific conductance, temperature, and turbidity. Following the completion of the purge but before sampling, Hach test kits, which provide real-time non-decision-level concentrations, are used to determine if chromium concentrations at both screens are representative. Additionally, quick (5-day) turnarounds on metals analyses and focused validation have been used to ensure the data reported by the fixed laboratory are validated and representative of water quality data from both screens. Training has also been updated to reinforce the process of sampling Baski dual-valve pumping systems.

Given the demonstration of potential sample mixing and inconsistent APV operation, it is not possible to rule out intermittent mechanical issues with the APV valves as the root of the R-70 sampling issue. N3B will be pulling the sampling system at R-70 to address these issues and is prioritizing R-70 for well maintenance as soon as possible, including replacement of the JSL drop pipe and APVs.

### **Event #3: Analytical Laboratory Error in Analyzing Water Quality Samples from CrEX-3 and CrEX-4**

As part of Chromium Interim Measure monitoring, separate from IFGMP monitoring, samples were collected from CrEX-3 and CrEX-4 on November 20, 2023. The samples were shipped to GEL Laboratories the following day and N3B received the data on December 18, 2023. The initial SDM review did not identify any data anomalies. The data quality was deemed acceptable, and the EIM database did not flag a “new maximum” or “first detect” for any of the parameters. The data were then pushed into the final EIM tables. On January 16, 2024, the data steward alerted the SDM that the chromium results were much lower than expected based on the historical trends and requested a Level 3 validation by the SDM chemists.

The chemist reviewed the raw data and noted that the chromium results that were in the data package from the unreported inductively coupled plasma atomic emission spectrometry analysis did not match the reported values from the ICP-MS data package. N3B requested a reanalysis of the chromium samples by ICP-MS on January 17, 2024, and received the reanalysis results on January 25, 2024. The reanalysis confirmed there was an error at GEL Laboratories on the initial analysis, and the data were subsequently flagged as rejected in IntellusNM. The new results were reported to IntellusNM and are in line with the historical trends at these locations. Although GEL Laboratories erroneously reported these results, the identification and resolution of this issue is an example of the effective implementation of N3B’s sample and data management processes.

During a broad review of all laboratory issues that are tracked by N3B’s SDM, a related issue with chromium results being much higher than expected at R-76 was found to have the same analysis date as the CrEX-3 and CrEX-4 samples in question. N3B received these R-76 results on December 8, 2023. A review of both sets of data, referenced back to the preparation and analytical batches at the analytical laboratory, revealed that these

samples were all analyzed together. Enclosure 3 suggests that on December 1, 2023, there was a 3-way sample swap by personnel at GEL Laboratories.

- CAMO-24-303765 (an R-76 sample ID) was actually CrEX4-24-304150
- CrEX4-24-304150 was actually CrEX3-24-304149
- CrEX3-24-304149 was actually CAMO-24-303765

Since most metals in these samples analyzed by U.S. Environmental Protection Agency method SW-846:6020 are low-level detections or nondetections, it is difficult to confirm this with other metals results. Molybdenum results support the conclusion as shown in Enclosure 3.

### **N3B Sample and Data Management Processes**

N3B's contracted analytical laboratories (including GEL Laboratories) are DOECAP certified to perform the analyses that N3B requests and, as such, have comprehensive QA programs to ensure data quality. Nonetheless, the process of analytical chemistry involves significant human input, and errors occasionally do occur. While N3B has no capability to prevent these laboratory errors, data review processes have been developed to detect, identify, and correct these errors.

Receipt of the electronic results from the analytical laboratory occurs in N3B's data management system, EIM. Following receipt, N3B chemists begin review of the data through a three-tiered process. Level 1, examination, and Level 2, verification, are conducted according to the most recent revision of "Examination and Verification of Analytical Data," N3B-AP-SDM-3014. While this procedure is used as an aid in the formal examination and verification process, other sources of guidance and information, as well as professional judgment, are used to determine the ultimate quality of data. Accordingly, any N3B project personnel may request a Level 3, focused validation when results are identified that may be anomalous during project data assessment. Data that have been flagged for manual Level 3 validation are loaded into EIM/IntellusNM at the time of Level 1 and 2 review to satisfy the DOE Los Alamos Field Office's (EM-LA's) requirement for rapid public data transparency. The data are thus available for viewing before validation. Should any changes be made to the data as a result of Level 3 review, they are noted on N3B Form 6046, Data Validation Report, and updated in the EIM/IntellusNM database. The data validation report is also included in the final data package when it is published to IntellusNM.

In addition to this data review process, N3B is working to better indicate decision-level versus non-decision-level (i.e., screening) data present in the IntellusNM system. The definition of decision-level data is as follows:

Decision-level data include data produced by N3B's contracted and accredited analytical laboratories for environmental regulatory compliance, which meet the minimum requirements of N3B-PLN-SDM-1000, "Sample and Data Management Plan (SDMP)."

The minimum data quality objectives (DQOs) summarized in SDMP Section 5.1 are:

- 100% of the data undergo Level 1 examination;
- 100% of the data undergo Level 2 verification (composed of manual examination plus EIM database's automated data review module); and
- 10% of the data undergo Level 3 validation (if applicable to the method). Projects can request that a higher percentage of data be validated, depending on the intended use of the data or at the direction of EM-LA.

Analytical data that meet SDMP minimum DQOs may be used for decision-making by the individual project to the extent that the data fulfill project-specific DQOs. As specified in SDMP Section 4.6,

each project's project manager is responsible for establishing, implementing, and retaining records related to project-specific DQOs. Analytical data that meet the SDMP's minimum DQOs, but do not meet project specific-DQOs, may or may not be used by the project as decision-level data, at the project's discretion.

Decision-level analytical data are data that meet both the minimum SDMP DQOs and the project specific DQOs as established for each project.

N3B is preparing an upcoming enhancement to the IntellusNM system that will clearly mark non-decision-level data in all queries in the system to provide clarity as to the known quality and representativeness of the associated data. This enhancement is expected to be in place on IntellusNM by the middle of 2024.

Data quality, management, and review continue to be principal components of the N3B SDM process to provide high-quality environmental data to a diverse group of end users. In the effort to meet the current transparency and quality standards, N3B is continuously evaluating how to improve the management of environmental data to more clearly report qualified data to IntellusNM. Three discrete events discussed above provide examples of the diversity of issues facing N3B's Groundwater Monitoring Program and detail N3B's corrective actions to prevent similar events from happening in the future.

If you have any questions, please contact Tanner Bonham at (505) 412-8968 (tanner.bonham@em-la.doe.gov) or Susan Wacaster at (505) 709-8704 (susan.wacaster@em.doe.gov).

Sincerely,



Troy Thomson  
Program Manager  
Environmental Remediation  
N3B-Los Alamos

Sincerely,



Digitally signed by Brian  
G. Harcek  
Date: 2024.03.28  
12:00:57 -06'00'

Brian Harcek, Director  
Office of Quality and Regulatory Compliance  
U.S. Department of Energy  
Environmental Management  
Los Alamos Field Office

Enclosure(s): One hard copy with electronic file:

1. Data in IntellusNM from R-35a Sampling Event on May 5, 2023
2. Time-Series Plot of Chromium Concentrations at Regional Well R-70
3. Molybdenum and Chromium Results from CrEX-3, CrEX-4, and R-76

cc (letter and enclosure[s] emailed):

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# **Enclosure 1**

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*Data in IntellusNM from R-35a Sampling Event on May 5, 2023*





**Table 1**  
**Data in Intellus NM from R-35a sampling event on May 19, 2023**

Location ID	Field Sample ID	Parameter Name	Sample Date	Sample Time	Report Result	Report Unit	Lab Qualifier	Detected	Filtered	Lab Method	Report Detection Limit	Lab ID	Validation Qualifier	Sample Result Comments
R-35a	CASA-23-280670	Chromium	5/19/2023	09:00	0.2	µg/L	U <sup>a</sup>	No	No	EPA:200.8 <sup>b</sup>	—	EES6 <sup>c</sup>	R <sup>d</sup>	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280671	Chromium	5/19/2023	10:43	16.529	µg/L	—	Yes	No	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280673	Chromium	5/19/2023	13:01	0.2	µg/L	U	No	No	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280674	Chromium	5/19/2023	15:18	13.148	µg/L	—	Yes	No	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280675	Chromium	5/19/2023	09:00	53.177	µg/L	—	Yes	Yes	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280676	Chromium	5/19/2023	10:43	13.536	µg/L	—	Yes	Yes	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280677	Chromium	5/19/2023	11:52	38.848	µg/L	—	Yes	Yes	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280678	Chromium	5/19/2023	13:01	53.784	µg/L	—	Yes	Yes	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-280679	Chromium	5/19/2023	15:18	1.6311	µg/L	—	Yes	Yes	EPA:200.8	—	EES6	R	Data rejected because of an ICP-MS instrumentation error.
R-35a	CASA-23-282067	Chromium	5/19/2023	11:52	4.37	µg/L	J <sup>e</sup>	Yes	Yes	SW-846:6020B <sup>f</sup>	10.0	GELC <sup>g</sup>	J	

Note: Both the screening-level data measured at Los Alamos National Laboratory's (LANL's) Geochemistry and Geomaterials Research Laboratory during the extended purge and the regulatory compliance sample measured at the U.S. Environmental Protection Agency-certified laboratory (final row in the table) are presented.

<sup>a</sup> U (lab qualifier) = Analyte was not detected above method detection limit.

<sup>b</sup> EPA:200.8 (lab method) = Inductively coupled plasma mass spectrometry (ICP-MS) method.

<sup>c</sup> EES6 (lab ID) = LANL's Geology & Geochemistry Research Laboratory.

<sup>d</sup> R (lab qualifier) = The reported sample result is classified as rejected because of serious noncompliances regarding quality control acceptance criteria. The presence or absence of the analyte cannot be verified based on routine validation alone.

<sup>e</sup> J (lab qualifier) = Analyte was detected below quantitation limit.

<sup>f</sup> SW-846:6020B (lab method) = ICP-MS method.

<sup>g</sup> GELC (lab ID) = GEL Laboratories, LLC.



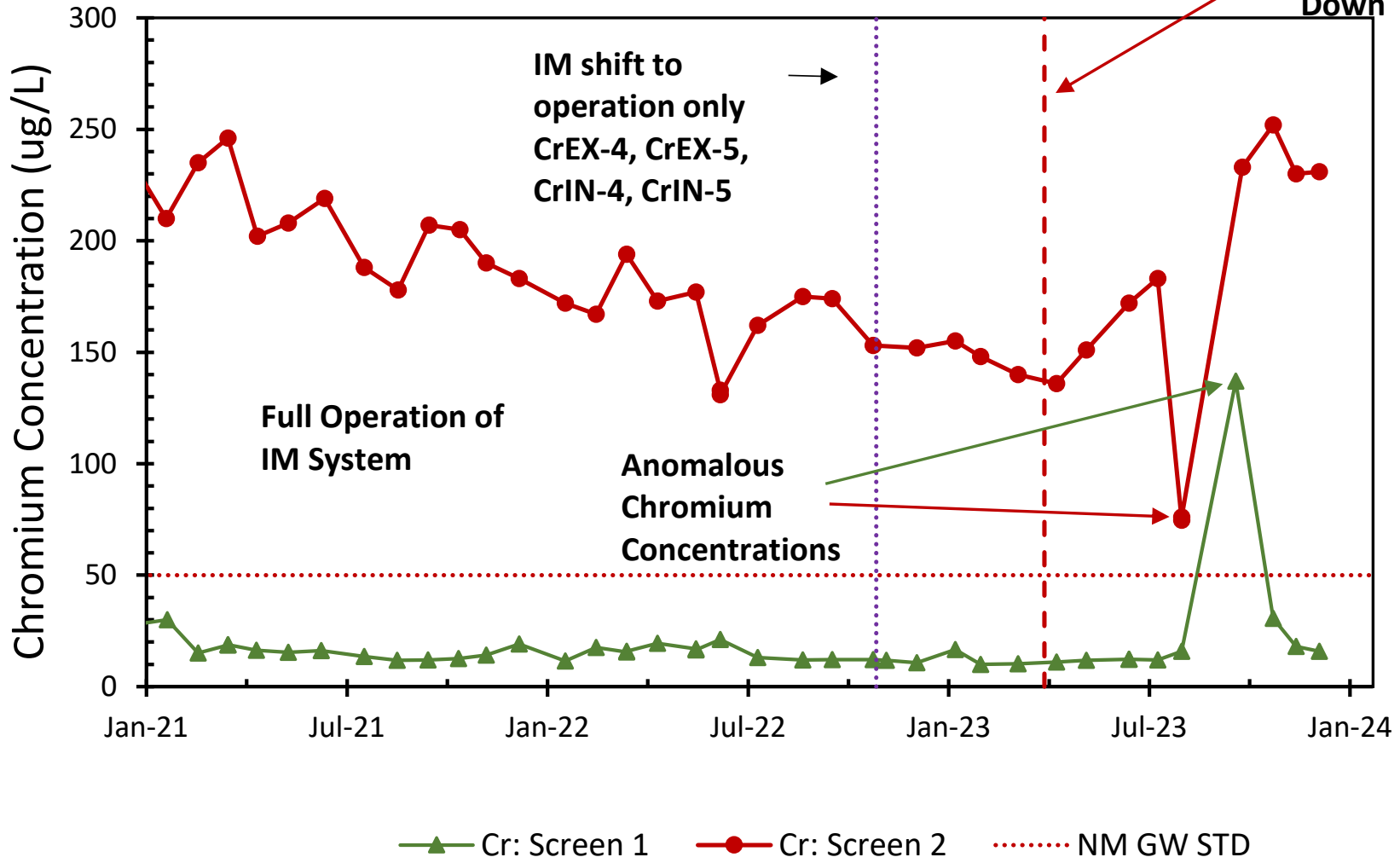
## **Enclosure 2**

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*Time-Series Plot of Chromium Concentrations  
at Regional Well R-70*



# Chromium Trends at Regional Well R-70





## **Enclosure 3**

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*Molybdenum and Chromium Results  
from CrEX-3, CrEX-4, and R-76*





**Table 1**  
**Chromium Results from CrEX-3, CrEX-4, and R-76**

Location ID	Field Sample ID	Sample Date	Parameter Name	Analysis Type Code	Analysis Date	Report Result	Report Unit	Lab Qualifier	Detected	Filtered	Chain of Custody #	Lab Method	Best Value	Validation Qualifier
R-76	CAMO-24-303764	11/19/2023	Chromium	INIT <sup>a</sup>	12/1/2023	5.06	µg/L	J <sup>b</sup>	Yes	Yes	N3B-2024-782	SW-846:6020B <sup>c</sup>	Yes	J
R-76	CAMO-24-303764	11/19/2023	Chromium	n/a <sup>d</sup>	12/1/2023	5.24	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6010D <sup>e</sup>	n/a	n/a
R-76	CAMO-24-303765	11/19/2023	Chromium	INIT	12/1/2023	375	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6020B	No	R <sup>f</sup>
R-76	CAMO-24-303765	11/19/2023	Chromium	RE <sup>g</sup>	12/8/2023	12.3	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6020B	No	NQ <sup>h</sup>
R-76	CAMO-24-303765	11/19/2023	Chromium	RE2 <sup>i</sup>	2/6/2024	12.5	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6020B	Yes	NQ
R-76	CAMO-24-303765	11/20/2023	Chromium	n/a	12/1/2023	12.3	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6010D	n/a	n/a
CrEX-3	CrEX3-24-304149	11/20/2023	Chromium	INIT	12/1/2023	12.4	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6020B	No	NQ
CrEX-3	CrEX3-24-304149	11/20/2023	Chromium	RE	1/22/2024	188	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6020B	Yes	NQ
CrEX-3	CrEX3-24-304149	11/20/2023	Chromium	RE2	2/6/2024	184	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6020B	No	NQ
CrEX-3	CrEX3-24-304149	11/20/2023	Chromium	n/a	12/1/2023	179	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6010D	n/a	n/a
CrEX-3	CrEX3-24-304159	11/20/2023	Chromium	INIT	12/1/2023	179	µg/L	n/a	Yes	No	N3B-2024-784	SW-846:6020B	Yes	NQ
CrEX-3	CrEX3-24-304159	11/20/2023	Chromium	n/a	12/1/2023	184	µg/L	n/a	Yes	No	N3B-2024-784	SW-846:6010D	n/a	n/a
CrEX-4	CrEX4-24-304150	11/20/2023	Chromium	INIT	12/1/2023	180	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6020B	No	NQ
CrEX-4	CrEX4-24-304150	11/20/2023	Chromium	RE	1/22/2024	377	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6020B	No	NQ
CrEX-4	CrEX4-24-304150	11/20/2023	Chromium	RE2	2/6/2024	396	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6020B	Yes	NQ
CrEX-4	CrEX4-24-304150	11/20/2023	Chromium	n/a	1/22/2024	358	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6010D	n/a	n/a
CrEX-4	CrEX4-24-304160	11/20/2023	Chromium	INIT	12/1/2023	366	µg/L	n/a	Yes	No	N3B-2024-784	SW-846:6020B	Yes	NQ
CrEX-4	CrEX4-24-304160	11/20/2023	Chromium	n/a	12/1/2023	392	µg/L	n/a	Yes	No	N3B-2024-784	SW-846:6010D	n/a	n/a

Notes: Initial, reanalysis, and unreported methods suggest a three-way sample swap within the analytical laboratory on 12/1/2023 by Method SW-846:6020B (by which chromium is reported), where

- CAMO-24-303765 was actually CrEX4-24-304150
- CrEX4-24-304150 was actually CrEX3-24-304149
- CrEX3-24-304149 was actually CAMO-24-303765

Reanalyzed results from SW846:6020B and unreported results from SW-846:6010D align with historical trends at each location for the color-coded samples.

<sup>a</sup> INIT (analysis type code) = Initial analysis at the analytical laboratory.

<sup>b</sup> J (lab qualifier) = Analyte was detected below quantitation limit.

<sup>c</sup> SW-846:6020B (lab method) = Inductively coupled plasma mass spectrometry method.

<sup>d</sup> n/a = Not applicable. This is not an official result because data were not reported from this method.

<sup>e</sup> SW-846:6010D (lab method) = Inductively coupled plasma optical emission spectrometry method.

<sup>f</sup> R (lab qualifier) = The reported sample result is classified as rejected because of serious noncompliances regarding quality control acceptance criteria. The presence or absence of the analyte cannot be verified based on routine validation alone.

<sup>g</sup> RE (analysis type code) = First reanalysis at the analytical laboratory.

<sup>h</sup> NQ (lab qualifier) = The analyte was detected at or above the required detection level; no qualification is necessary.

<sup>i</sup> RE2 (analysis type code) = Second reanalysis at the analytical laboratory.

**Table 2**  
**Molybdenum Results from CrEX-3, CrEX-4, and R-76**

Location ID	Field Sample ID	Sample Date	Parameter Name	Analysis Type Code	Analysis Date	Report Result	Report Unit	Lab Qualifier	Detected	Filtered	COC #	Lab Method	Best Value	Validation Qualifier
R-76	CAMO-24-303764	11/19/2023	Molybdenum	INIT <sup>a</sup>	12/1/2023	3.35	µg/L	n/a <sup>b</sup>	Yes	Yes	N3B-2024-782	SW-846:6020B <sup>c</sup>	Yes	NQ <sup>d</sup>
R-76	CAMO-24-303764	11/19/2023	Molybdenum	n/a	12/1/2023	3.09	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6010D <sup>e</sup>	n/a	n/a
R-76	CAMO-24-303765	11/19/2023	Molybdenum	INIT	12/1/2023	0.591	µg/L	J <sup>f</sup>	Yes	Yes	N3B-2024-782	SW-846:6020B	No	R <sup>g</sup>
R-76	CAMO-24-303765	11/19/2023	Molybdenum	RE <sup>h</sup>	12/8/2023	3.18	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6020B	Yes	NQ
R-76	CAMO-24-303765	11/19/2023	Molybdenum	n/a	12/1/2023	2.21	µg/L	n/a	Yes	Yes	N3B-2024-782	SW-846:6010D	n/a	n/a
CrEX-3	CrEX3-24-304149	11/20/2023	Molybdenum	INIT	12/1/2023	2.82	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6020B	Yes	NQ
CrEX-3	CrEX3-24-304149	11/20/2023	Molybdenum	n/a	12/1/2023	0.587	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6010D	n/a	n/a
CrEX-3	CrEX3-24-304159	11/20/2023	Molybdenum	INIT	12/1/2023	0.892	µg/L	J	Yes	No	N3B-2024-784	SW-846:6020B	Yes	J
CrEX-3	CrEX3-24-304159	11/20/2023	Molybdenum	n/a	12/1/2023	0.248	µg/L	n/a	Yes	No	N3B-2024-784	SW-846:6010D	n/a	n/a
CrEX-4	CrEX4-24-304150	11/20/2023	Molybdenum	INIT	12/1/2023	0.922	µg/L	J	Yes	Yes	N3B-2024-784	SW-846:6020B	Yes	J
CrEX-4	CrEX4-24-304150	11/20/2023	Molybdenum	n/a	12/1/2023	0.366	µg/L	n/a	Yes	Yes	N3B-2024-784	SW-846:6010D	n/a	n/a
CrEX-4	CrEX4-24-304160	11/20/2023	Molybdenum	INIT	12/1/2023	0.623	µg/L	J	Yes	No	N3B-2024-784	SW-846:6020B	Yes	J
CrEX-4	CrEX4-24-304160	11/20/2023	Molybdenum	INIT	12/1/2023	0.805	µg/L	n/a	Yes	No	N3B-2024-784	SW-846:6010D	n/a	n/a

Notes: Highlighted molybdenum results support the hypothesis in Table 1 of the three-way sample swap within the analytical laboratory on 12/1/2023 by method SW-846:6020B (by which chromium is reported), where

- CAMO-24-303765 was actually CrEX4-24-304150
- CrEX4-24-304150 was actually CrEX3-24-304149
- CrEX3-24-304149 was actually CAMO-24-303765

Molybdenum is the only other metal from SW-846:6020B Analysis Lot ID 2531581 that was detected at a level at which this sample swap signature can be seen.

<sup>a</sup> INIT (analysis type code) = Initial analysis at the analytical laboratory.

<sup>b</sup> n/a = Not applicable. this is not an official result because data were not reported from this method.

<sup>c</sup> SW-846:6020B (lab method) = Inductively coupled plasma mass spectrometry method.

<sup>d</sup> NQ (lab qualifier) = The analyte was detected at or above the required detection level; no qualification is necessary.

<sup>e</sup> SW-846:6010D (lab method) = Inductively coupled plasma optical emission spectrometry method.

<sup>f</sup> J (lab qualifier) = Analyte was detected below quantitation limit.

<sup>g</sup> R (lab qualifier) = The reported sample result is classified as rejected because of serious noncompliances regarding quality control acceptance criteria. The presence or absence of the analyte cannot be verified based on routine validation alone.

<sup>h</sup> RE (analysis type code) = First reanalysis at the analytical laboratory.