



May 22, 2018

Mr. Dominick Orlando, Senior Project Manager
Materials Decommissioning Branch
Division of Decommissioning, Uranium Recovery and Waste Management Programs
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
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Rockville, Maryland 20852

Subject: **Umetco Minerals Corporation, Gas Hills, Wyoming, Site**
1. Response to Nuclear Regulatory Commission Letter dated April 18, 2018,
2. License Amendment Request

Reference: **Radioactive Materials License SUA-648; Docket No. 40-0299**

Dear Mr. Orlando:

The purpose of this letter is twofold; firstly, to respond to U.S. Nuclear Regulatory Commission's (NRC's) letter dated April 18, 2018, and secondly, to request amendments to three License Conditions in Umetco Minerals Corporation's (Umetco's) Radioactive Materials License SUA-648 (License).

1. Response to NRC's concerns detailed in the letter of April 18, 2018

The April 18, 2018, letter detailed the NRC staff's review of Umetco's *July 2016 through June 2017 Annual Report* and indicted concerns that (1) there were a number of analytical results reported as being "estimated", (2) some of the results were potentially questionable because detection limits were not met, and (3) the use of estimated sample results was not addressed in the report.

By way of explanation, Umetco provides the following response.

Umetco's validation activities result in the qualification of analytical data, so that future data users are informed as to the limitations, if any, on the use of the data. Data validation may result in the assignment of data qualifiers. Umetco uses the data qualifiers defined in U.S. Environmental Protection Agency's *Guidance on Environmental Data Verification and Data Validation, EPA QA/G-8*.

In the future, Umetco will provide an "Environmental Data Verification and Validation Report" in the annual reports.

2. Request for amendments to Umetco's Radioactive Materials License

The following provides rationale and proposed wording changes for three License Conditions in Umetco's Radioactive Materials License. Each License Condition is addressed separately below.

A. License Condition 32 – Land Use Survey

Umetco would like to modify the License Condition 32 requirement to perform Land Use Surveys within the five-mile radius of the Umetco's Gas Hills, Wyoming, Site.

The Department of Energy's (DOE's) *Draft Long Term Surveillance Plan for the Gas Hills East (UMTRCA Title II) Disposal Site Fremont and Natrona Counties, Wyoming*, (Draft LTSP), dated November 2010, proposes surveying the 0.25-mile zone beyond the site boundary for changes in land use. This reduced area is consistent with NRC-approved land use surveys conducted at other Title I and transferred Title II sites. Furthermore, since all licensed material has been encapsulated, the completed reclamation has reduced direct gamma exposures from tailings and waste to background levels. Historic dose assessment data for the Gas Hills Site indicate that doses to individual members of the public did not exceed the NRC annual dose limit of 100 millirems even while the repositories were open and reclamation was occurring. The gamma dose to the public has historically been approximately 58 millirems.

To be consistent with DOE's Draft LTSP, and because reclamation is complete, no licensed materials are exposed, and radiation levels have been reduced to essentially background levels, Umetco proposes to reduce the land use survey area to the 0.25-mile zone around the site boundary.

Umetco proposes the following change (underlined/strike through) to License Condition 32:

The licensee shall conduct an annual survey of land use (private residences, grazing areas, private and public potable water and agricultural wells, and non-residential structures and uses) in the area within one quarter (0.25) five (5) miles (0.48 km) of any portion of the restricted area boundary and submit a report of this survey to the NRC. This report shall indicate any differences in land use from that described in the last report.

B. License Condition 35 – Iron Springs Sampling Point

Umetco would like to revise the April 2015 *Groundwater Monitoring Plan* referenced by License Condition 35 to delete the sampling location known as Iron Springs.

The deletion of the Iron Springs sampling point will align the License's groundwater monitoring requirements with the requirements contained in DOE's Draft LTSP. Iron Springs is not a Point of Compliance (POC) location nor is it required to be monitored for Alternate Concentration Limit (ACL) constituents. In addition, Iron Springs is located over 6900 feet west of monitoring well MW77, the western most Western Flow Regime well which, as yet, is still unaffected by the mill-related groundwater plume. Based on Umetco's current estimation of a 0.33 feet per day groundwater velocity for the Western Flow Regime, it would take over 57 years for the water now seen in MW77 to reach Iron Springs. Monitoring well MW28, the most western well where radium has been detected over background concentrations, is approximately 8400 feet away and therefore the water seen at MW28 will not reach Iron Springs until even later.

To be consistent with DOE's Draft LTSP, and because Iron Springs is so far west of the plume and the Point of Exposure, Umetco proposes to remove Iron Springs as a sampling location from the *Groundwater Monitoring Plan*. The revised *Groundwater Monitoring Plan* is attached with and without edits.

Umetco proposes the following wording (underlined/strike through) to License Condition 35:

The Alternate Concentration Limits (ACL) for ground water contained in Umetco's application dated May 11 and May 18, 2001, as revised by submittals of July 30, ~~2001~~, and December 3, 2001, March 4 and October 2, 2002, June 17, 2005, October 31, 2011, January 22, ~~2015~~ and April 8, 2015, and April 27, 2018 have been approved for this site. The licensee shall implement a ground water compliance monitoring program that includes the following:

A. Conduct monitoring as described in the Ground Water Monitoring Plan and as discussed in Umetco's January 22, ~~2015~~ and April 8, 2015 and April 27, 2018 requests. The licensee shall submit this monitoring data, in the form of a Ground Water Conditions report, to the NRC by September 30th of each year and include ground water contour maps, contamination iso-concentration maps, and trend graphs. The licensee shall include a thorough description of all model simulations and any further revisions to the geochemical model in the evaluation in the Ground Water Conditions report. The licensee shall provide electronic copies of all model input files used in the evaluation. The licensee shall submit to the NRC a final Ground Water Conditions report for verification once the licensee validates the model predictions for a time period that has been approved by the NRC. The final, as built, completion reports for the new monitoring wells shall be included in the first Ground Water Conditions report following completion of well installation.

C. License Condition 35 – Monitoring Well MW70A

Umetco would like to delete monitoring well MW70A from the April 2015 *Groundwater Monitoring Plan* referenced by License Condition 35 and abandon the well.

As detailed in Umetco's April 8, 2015 letter, Umetco proposed a monitoring well location to replace MW70A in order to address NRC's concerns of November 6, 2014, relating to uranium migration from MW1 and its non-concurrent decrease at MW70A, as well as Umetco's concern that MW70A appears to be providing consistent but perhaps erroneous data. Long-term monitoring of MW70A has indicated stagnant conditions which are not representative of either local groundwater conditions or upgradient groundwater conditions. As detailed in Umetco's April 2015 response letter, Umetco's evaluation of the historic uranium, chloride, and sulfate trends at MW1 and MW70A was inconclusive in determining evidence of groundwater migration from MW1 to MW70A, as seen by the inconsistent major ion signatures and expected travel times for the indicator constituent concentrations between the two wells. Additionally, trends in uranium and other constituents at MW70A have historically been uncharacteristic of site groundwater which leads Umetco to suspect stagnant conditions exist at MW70A and not representative of either local groundwater conditions, or of groundwater migrating from MW1.

Since the replacement well, MW84, approved for construction by License Amendment 74 dated January 19, 2017, was completed on October 17, 2017, and since MW84 has been screened in the same groundwater horizon as MW70A, i.e. in the upper portion of the aquifer and located in

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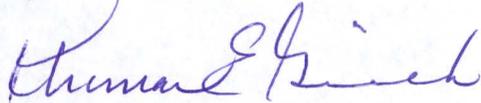
Mr. Orlando

a manner better suited to provide evaluation of radium attenuation, Umetco requests NRC concurrence to abandon MW70A.

Umetco proposes the same wording changes to License Condition 35, as shown by the underlined/strike through in Item B above, for this item along with the revisions to the *Groundwater Monitoring Plan* which are attached.

If you have any questions concerning this request, please contact me at 970-243-3260, or by e-mail at gieckte@dow.com.

Regards,



Thomas E. Gieck

Attachment: Revised *Groundwater Monitoring Plan, Gas Hills, Wyoming*, April 2018 with and without edits

Groundwater Monitoring Plan Gas Hills, Wyoming

Umetco Minerals Corporation
~~2754-2764~~ Compass Drive, Suite ~~280114~~
Grand Junction, Colorado 81506

~~April 2015~~ May 2018

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1.0 INTRODUCTION

This plan has been developed by Umetco Minerals Corporation (Umetco) to detail a groundwater compliance monitoring program as required by License Condition (LC) 35 of U.S. Nuclear Regulatory Commission (NRC) Materials License SUA-648 (license). This plan identifies the monitoring locations for each groundwater flow regime and associated monitoring requirements, and describes how Umetco will define and address potential exceedances of Alternate Concentration Limits (ACLs). This plan was developed from recommendations and commitments described in NRC and Umetco correspondence dated between September 2012 and April 2015 (i.e., NRC letter of September 24, 2012, Umetco letter of March 7, 2013, NRC letter of April 24, 2013, Umetco letter of September 17, 2013, NRC letter of March 11, 2014, Umetco letter of April 15, 2014, NRC letter of May 8, 2014, NRC letter of November 6, 2014, Umetco letter of January 22, 2015, ~~and~~ Umetco letter of April 8, 2015, NRC letter and License Amendment of January 19, 2017, and Umetco letter of April 24, 2018).

2.0 MONITORING APPROACH

Two types of monitoring locations are to be sampled as part of the Gas Hills groundwater compliance monitoring program:

- (1) Point Of Compliance (POC) wells required by the license; and
- (2) Non-POC wells ~~and spring~~ used to ensure that ACL constituents will meet background concentrations at the Point Of Exposure (POE).

Table 1 lists the POC and non-POC monitoring locations and details their corresponding monitoring requirements. Groundwater monitoring locations are shown on Figure 1 for both the Western and Southwestern flow regimes.

2.1 Point of Compliance Wells

The four POC monitoring wells, specified in LC 35B and LC 35C (i.e., Western Flow Regime (WFR) wells MW1 and MW21A and Southwestern Flow Regime (SWFR) wells GW7 and GW8), will be sampled annually, between May 1st and July 31st, for the ACL constituents (i.e. arsenic, beryllium, lead-210, nickel, combined radium-226 and -228, selenium, thorium-230 and uranium-natural). Concentrations of the ACL constituents in these wells must meet the levels dictated in LC 35B and LC 35C. These wells will also be sampled annually for sulfate and chloride.

2.2 Non-POC Monitoring Locations

The non-POC monitoring locations (~~twelve wells and one spring~~), listed in Table 1 by flow regime, will be sampled for the ACL constituents annually at the same time that sampling is performed at the POC wells. Sampling will be conducted with analyses for the ACL constituents, sulfate and chloride as indicated in Table 1. These wells were selected to provide early detection of downgradient or vertical contaminant migration, to verify predicted groundwater flow and geochemical attenuation modeling presented in the ACL application, and to ensure that ACL constituent concentrations will be reduced to background levels at the POE. These locations were selected on the basis of one or more of the following criteria, with input from the NRC:

- location within the plume and in “hot spot” locations;
- location proximal to historic extraction wells;
- location at the downgradient edge of the plume; and
- location downgradient of site impacts; and/or
- ~~location of discharge points for groundwater (e.g. Iron Springs).~~

Rationales supporting the selection of sampling locations are documented in Table 2.

Table 1 Summary of Groundwater Compliance Monitoring

| Well Type | Western Flow Regime Wells ¹ | Southwestern Flow Regime Wells ² | Monitoring Requirements ³ |
|---------------------------------|--|---|---|
| Point of Compliance (POC) Wells | MW1 MW21A | GW7 GW8 | Wells to be sampled annually for Alternate Concentration Limit (ACL) constituents ^{1,2} . Sampling to be conducted between May 1st and July 31st until license termination. The results to be used in tandem with results from non-POC wells in a groundwater conditions report submitted to the NRC, annually. Wells to be sampled annually for sulfate and chloride. |
| Non-POC Wells | MW25 MW28 MWI64 MW70A MW71B MW77 MW83 MW84 MW85 MW86 Iron Springs ⁴ | MW72 MW82 | Wells to be sampled annually for ACL constituents ^{1,2} , chloride and sulfate. Sampling to be conducted between May 1 st and July 31 st until license termination. The results to be used in tandem with results from POC wells in a groundwater conditions report submitted to the NRC, annually. |

¹ Alternate Concentration Limits (ACLs) established for the Western Flow Regime Point of Compliance (POC) wells MW1 and MW21A are as follows: arsenic = 1.8 milligrams per liter (mg/L); beryllium = 1.64 mg/L; lead-210 = 35.4 picocuries per liter (pCi/L); nickel = 13.0 mg/L; combined radium-226 and -228 = 250 pCi/L; selenium = 0.161 mg/L; thorium-230 = 57.4 pCi/L; and uranium-natural = 11.9 mg/L.

² ACLs established for the Southwestern Flow Regime POC wells GW7 and GW8 are as follows: arsenic = 1.36 mg/L; beryllium = 1.70 mg/L; lead-210 = 189 pCi/L; nickel = 9.34 mg/L; combined radium-226 and -228 = 353 pCi/L; selenium = 0.53 mg/L; thorium-230 = 44.8 pCi/L; and uranium-natural = 34.1 mg/L.

³ Results of monitoring to be provided to the Nuclear Regulatory Commission (NRC) by September 30 of the same year as required by License Condition 35A of Materials License SUA-648.

⁴ ~~Iron Springs is the surface water sample point required by Wyoming Department of Environmental Quality.~~

Table 2 Rationales Supporting Selection of Non-Point of Compliance Monitoring Wells

| WESTERN FLOW REGIME | |
|---------------------|---|
| Monitoring Location | Basis for Selection |
| MWI64 | This well is located at the downgradient edge of the Above-Grade Tailings Impoundment (AGTI). Since 2000, concentrations of the ACL constituents in this well have declined and are all below background concentrations, indicating that the tailings-impacted groundwater has migrated past the well. Continued sampling of this well will verify that groundwater in this area is uncontaminated and remains uncontaminated, thus confirming that there is no leakage from the AGTI to the west, and demonstrate that only uncontaminated groundwater is moving in from upgradient. |
| MW70A | This location is approximately 1,700 feet to the northwest of the restricted area. This well is screened in the upper portion of the Western Flow Regime and will monitor radial flow from the AGTI. Since 2000, concentrations of most ACL constituents in this well have stayed the same or declined, however several ACL constituents are above background concentrations. Monitoring at this well will be continued to verify generally decreasing trends in groundwater to the northwest of the AGTI. |
| MW25 | Water quality data and isoconcentration plots indicate this well, located approximately 1,500 feet hydraulically downgradient of the AGTI, is appropriately located to monitor the leading edge of the plume. Since 2000, only concentrations of arsenic and nickel have increased in this well and are above background concentrations. |
| MW71B | This well is approximately 2,500 feet downgradient of the AGTI. It is screened in the lower portion of the Western Flow Regime and will indicate potential vertical migration. Since 2000, concentrations of the ACL constituents in this well have stayed the same or declined and are all below background concentrations. Continued sampling of this well will monitor the increasing trends in sulfate which are currently within the range of background concentrations. |
| MW28 | This well is located 2,500 feet hydraulically downgradient of the AGTI. This location appears to be at the leading edge of the groundwater plume. Since 2000, concentrations of most ACL constituents in this well have increased however most are still below background concentrations with the exception of radium 226+228. |
| MW77 | This location is near the proposed land transfer boundary, 4,000 feet hydraulically downgradient of the AGTI, and is representative of water quality at the Point of Exposure (POE). Since this well is the furthest downgradient, continued monitoring will provide an indication of ACL concentrations and indicate constituent attenuation upgradient of the POE. |
| MW83 | This well is located approximately 300 feet downgradient (west) of MW28. This well is intended to intercept peak radium-226+228 activities from upgradient and evaluate radium attenuation along the groundwater flow path. |
| MW84 | This well is located approximately 1300 feet downgradient (northwest) of MW21A. This well will be used to refine the groundwater flow direction, provide a point on the north side of the plume for evaluating plume migration, and delineating the northern extent of the plume. |
| MW85 | This well is located approximately 1400 feet northwest of MW28. This well is intended to intercept the leading edge of sulfate-impacted groundwater from the AGTI, and will provide an early indication of downgradient contaminant movement. |

Table 2 Rationales Supporting Selection of Non-Point of Compliance Monitoring Wells, continued

| WESTERN FLOW REGIME | |
|--------------------------|--|
| Monitoring Location | Basis for Selection |
| MW86 | This well is located approximately 500 feet northwest of MW71B and is screened in the upper portion of the aquifer. This well is intended to provide an early indication of downgradient contaminant movement and provide a shallower monitoring point to complement the deeper MW71B. |
| Iron Spring | This spring, approximately 10,000 feet from the AGTI, is the closest discharge point for groundwater migrating from the site. Groundwater modeling indicates no significant impacts to water quality resulting from site derived constituents. |
| SOUTHWESTERN FLOW REGIME | |
| Monitoring Location | Basis for Selection |
| MW72 | Water quality data and isoconcentration plots indicate this well, located 1,000 feet southwest of the A-9 Repository, may be impacted from site derived constituents and is located near the downgradient edge of the groundwater plume migrating from the site. |
| MW82 | This well is the furthest downgradient location from the A-9 repository (approximately 1,300 feet). The well location was selected based on its position along the modeled axis of the plume and also because it is upgradient of Power Resources, Inc.'s proposed Mine Unit 5. |

3.0 EXCEEDANCE IDENTIFICATION AND VERIFICATION RESAMPLING

The monitoring approach described above and in Table 1 was developed to ensure that the groundwater ACLs are met, as well as to provide early detection of downgradient or vertical migration of site contaminants. As such, a mechanism for identifying exceedances and implementing appropriate responses to those exceedances must be identified.

3.1 General Approach to Identifying Exceedances

In identifying exceedances, the overall intent is to allow early detection of potential ACL exceedances, while minimizing the probability of false positive results - e.g., exceedances attributable to laboratory error or transient anomalous increases. Prediction limits are already built into the ACLs. Therefore, comparison of the single values (e.g., ACL vs. monitoring result) should suffice. However, several factors must be accounted for when evaluating results and identifying exceedances. These factors are discussed below.

Significant Figures

Significant figures must be accounted for when comparing predicted values with measured values. The following general approach should be employed. For results less than 1,000 mg/L, comparisons between measured values and predicted values should be based on 2 significant figures. For results exceeding 1,000 mg/L, comparisons should be made on the basis of 3 significant figures.

Verification Sampling

Verification sampling is an integral component of exceedance identification. To avoid "false positives" due to laboratory error and/or transient increases, a statistically significant exceedance will not be declared or reported until the results of verification sampling are known. Umetco's proposed approach to verification sampling is discussed below and in Table 3.

3.2 ACL Constituents at Point of Compliance Wells

If any POC sample exceeds the ACL for one or more constituents, a second (verification) sample will be collected and analyzed within 3 months of obtaining the original sample to rule out laboratory error or transient increase. Analysis will only be necessary for constituents that exceed their ACLs. If the analyses of this first verification sample also results in an exceedance of the same ACL, Umetco will notify the NRC within 30 days of receiving the verification result. Contingent upon NRC approval, a second verification sample may be collected before corrective action measures are considered; this sample will be collected within 3 months of obtaining the results from the first verification sample.

If the second verification sample also results in an exceedance, Umetco will provide an "action plan" to the NRC within 60 days of receiving the results of the second verification sample. This action plan will describe appropriate corrective action(s), if necessary, and/or further analysis to ensure that no risk will be incurred at the POE. Such an analysis may require reassessment of model simulations and assumptions. This approach is detailed in Table 3.

3.3 ACL Constituents at Non-POC Wells

If any Non-POC sample exceeds the ACL for one or more constituents, the exceedance will be handled on a case-by-case basis through correspondence with NRC.

Table 3 Exceedance Identification and Action Approaches

| Monitoring Endpoint | Exceedance Identification and Verification Sampling Approach | Actions to be Implemented if Exceedances are Verified |
|-------------------------------|---|--|
| ACL Constituents at POC Wells | <p>If any POC sample exceeds the ACL for one or more constituents (accounting for significant figures), a verification sample will be analyzed <u>within 3 months</u> of obtaining the initial exceedance result(s).</p> <p><i>[Re-analysis is only necessary for the constituent(s) exceeding the ACLs.]</i></p> | <p>If the first verification sample also results in an exceedance of the same ACL, Umetco will notify the NRC within 30 days of receiving the first verification result. Contingent upon NRC approval, a second verification sample may be collected before corrective action measures are considered. The second verification sample will be analyzed within 3 months of obtaining the result(s) of the first verification sample.</p> <p>If the second verification sample also results in an exceedance, Umetco will provide an "action plan" to the NRC within 60 days of receiving the results of the second verification sample. This action plan will describe appropriate corrective action(s), <i>if necessary</i>, and/or further analysis to ensure that no risk will be incurred at Point of Exposure (POE) locations. Such an analysis may require reassessment of model simulations and assumptions.</p> |

**Groundwater Monitoring Plan
Gas Hills, Wyoming**

Umetco Minerals Corporation
2764 Compass Drive, Suite 114
Grand Junction, Colorado 81506

May 2018

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1.0 INTRODUCTION

This plan has been developed by Umetco Minerals Corporation (Umetco) to detail a groundwater compliance monitoring program as required by License Condition (LC) 35 of U.S. Nuclear Regulatory Commission (NRC) Materials License SUA-648 (license). This plan identifies the monitoring locations for each groundwater flow regime and associated monitoring requirements, and describes how Umetco will define and address potential exceedances of Alternate Concentration Limits (ACLs). This plan was developed from recommendations and commitments described in NRC and Umetco correspondence dated between September 2012 and April 2015 (i.e., NRC letter of September 24, 2012, Umetco letter of March 7, 2013, NRC letter of April 24, 2013, Umetco letter of September 17, 2013, NRC letter of March 11, 2014, Umetco letter of April 15, 2014, NRC letter of May 8, 2014, NRC letter of November 6, 2014, Umetco letter of January 22, 2015, Umetco letter of April 8, 2015, NRC letter and License Amendment of January 19, 2017, and Umetco letter of April 24, 2018).

2.0 MONITORING APPROACH

Two types of monitoring locations are to be sampled as part of the Gas Hills groundwater compliance monitoring program:

- (1) Point Of Compliance (POC) wells required by the license; and
- (2) Non-POC wells used to ensure that ACL constituents will meet background concentrations at the Point Of Exposure (POE).

Table 1 lists the POC and non-POC monitoring locations and details their corresponding monitoring requirements. Groundwater monitoring locations are shown on Figure 1 for both the Western and Southwestern flow regimes.

2.1 Point of Compliance Wells

The four POC monitoring wells, specified in LC 35B and LC 35C (i.e., Western Flow Regime (WFR) wells MW1 and MW21A and Southwestern Flow Regime (SWFR) wells GW7 and GW8), will be sampled annually, between May 1st and July 31st, for the ACL constituents (i.e. arsenic, beryllium, lead-210, nickel, combined radium-226 and -228, selenium, thorium-230 and uranium-natural). Concentrations of the ACL constituents in these wells must meet the levels dictated in LC 35B and LC 35C. These wells will also be sampled annually for sulfate and chloride.

2.2 Non-POC Monitoring Locations

The non-POC monitoring locations, listed in Table 1 by flow regime, will be sampled for the ACL constituents annually at the same time that sampling is performed at the POC wells. Sampling will be conducted with analyses for the ACL constituents, sulfate and chloride as indicated in Table 1. These wells were selected to provide early detection of downgradient or vertical contaminant migration, to verify predicted groundwater flow and geochemical attenuation modeling presented in the ACL application, and to ensure that ACL constituent concentrations will be reduced to background levels at the POE. These locations were selected on the basis of one or more of the following criteria, with input from the NRC:

- location within the plume and in “hot spot” locations;
- location proximal to historic extraction wells;
- location at the downgradient edge of the plume; and
- location downgradient of site impacts.
-

Rationales supporting the selection of sampling locations are documented in Table 2.

Table 1 Summary of Groundwater Compliance Monitoring

| Well Type | Western Flow Regime Wells ¹ | Southwestern Flow Regime Wells ² | Monitoring Requirements ³ |
|---------------------------------|--|---|---|
| Point of Compliance (POC) Wells | MW1 MW21A | GW7 GW8 | Wells to be sampled annually for Alternate Concentration Limit (ACL) constituents ^{1,2} . Sampling to be conducted between May 1st and July 31st until license termination. The results to be used in tandem with results from non-POC wells in a groundwater conditions report submitted to the NRC, annually. Wells to be sampled annually for sulfate and chloride. |
| Non-POC Wells | MW25 MW28 MWI64 MW71B MW77 MW83 MW84 MW85 MW86 | MW72 MW82 | Wells to be sampled annually for ACL constituents ^{1,2} , chloride and sulfate. Sampling to be conducted between May 1 st and July 31 st until license termination. The results to be used in tandem with results from POC wells in a groundwater conditions report submitted to the NRC, annually. |

¹ Alternate Concentration Limits (ACLs) established for the Western Flow Regime Point of Compliance (POC) wells MW1 and MW21A are as follows: arsenic = 1.8 milligrams per liter (mg/L); beryllium = 1.64 mg/L; lead-210 = 35.4 picocuries per liter (pCi/L); nickel = 13.0 mg/L; combined radium-226 and -228 = 250 pCi/L; selenium = 0.161 mg/L; thorium-230 = 57.4 pCi/L; and uranium-natural = 11.9 mg/L.

² ACLs established for the Southwestern Flow Regime POC wells GW7 and GW8 are as follows: arsenic = 1.36 mg/L; beryllium = 1.70 mg/L; lead-210 = 189 pCi/L; nickel = 9.34 mg/L; combined radium-226 and -228 = 353 pCi/L; selenium = 0.53 mg/L; thorium-230 = 44.8 pCi/L; and uranium-natural = 34.1 mg/L.

³ Results of monitoring to be provided to the Nuclear Regulatory Commission (NRC) by September 30 of the same year as required by License Condition 35A of Materials License SUA-648.

Table 2 Rationales Supporting Selection of Non-Point of Compliance Monitoring Wells

| WESTERN FLOW REGIME | |
|---------------------|---|
| Monitoring Location | Basis for Selection |
| MWI64 | This well is located at the downgradient edge of the Above-Grade Tailings Impoundment (AGTI). Since 2000, concentrations of the ACL constituents in this well have declined and are all below background concentrations, indicating that the tailings-impacted groundwater has migrated past the well. Continued sampling of this well will verify that groundwater in this area is uncontaminated and remains uncontaminated, thus confirming that there is no leakage from the AGTI to the west, and demonstrate that only uncontaminated groundwater is moving in from upgradient. |
| MW25 | Water quality data and isoconcentration plots indicate this well, located approximately 1,500 feet hydraulically downgradient of the AGTI, is appropriately located to monitor the leading edge of the plume. Since 2000, only concentrations of arsenic and nickel have increased in this well and are above background concentrations. |
| MW71B | This well is approximately 2,500 feet downgradient of the AGTI. It is screened in the lower portion of the Western Flow Regime and will indicate potential vertical migration. Since 2000, concentrations of the ACL constituents in this well have stayed the same or declined and are all below background concentrations. Continued sampling of this well will monitor the increasing trends in sulfate which are currently within the range of background concentrations. |
| MW28 | This well is located 2,500 feet hydraulically downgradient of the AGTI. This location appears to be at the leading edge of the groundwater plume. Since 2000, concentrations of most ACL constituents in this well have increased however most are still below background concentrations with the exception of radium 226+228. |
| MW77 | This location is near the proposed land transfer boundary, 4,000 feet hydraulically downgradient of the AGTI, and is representative of water quality at the Point of Exposure (POE). Since this well is the furthest downgradient, continued monitoring will provide an indication of ACL concentrations and indicate constituent attenuation upgradient of the POE. |
| MW83 | This well is located approximately 300 feet downgradient (west) of MW28. This well is intended to intercept peak radium-226+228 activities from upgradient and evaluate radium attenuation along the groundwater flow path. |
| MW84 | This well is located approximately 1300 feet downgradient (northwest) of MW21A. This well will be used to refine the groundwater flow direction, provide a point on the north side of the plume for evaluating plume migration, and delineating the northern extent of the plume. |
| MW85 | This well is located approximately 1400 feet northwest of MW28. This well is intended to intercept the leading edge of sulfate-impacted groundwater from the AGTI, and will provide an early indication of downgradient contaminant movement. |

Table 2 Rationales Supporting Selection of Non-Point of Compliance Monitoring Wells, continued

| WESTERN FLOW REGIME | |
|---------------------|---------------------|
| Monitoring Location | Basis for Selection |

| | |
|----------------------------|--|
| MW86 | This well is located approximately 500 feet northwest of MW71B and is screened in the upper portion of the aquifer. This well is intended to provide an early indication of downgradient contaminant movement and provide a shallower monitoring point to complement the deeper MW71B. |
| SOUTHWESTERN FLOW REGIME | |
| Monitoring Location | Basis for Selection |
| MW72 | Water quality data and isoconcentration plots indicate this well, located 1,000 feet southwest of the A-9 Repository, may be impacted from site derived constituents and is located near the downgradient edge of the groundwater plume migrating from the site. |
| MW82 | This well is the furthest downgradient location from the A-9 repository (approximately 1,300 feet). The well location was selected based on its position along the modeled axis of the plume and also because it is upgradient of Power Resources, Inc.'s proposed Mine Unit 5. |

3.0 EXCEEDANCE IDENTIFICATION AND VERIFICATION RESAMPLING

The monitoring approach described above and in Table 1 was developed to ensure that the groundwater ACLs are met, as well as to provide early detection of downgradient or vertical migration of site contaminants. As such, a mechanism for identifying exceedances and implementing appropriate responses to those exceedances must be identified.

3.1 General Approach to Identifying Exceedances

In identifying exceedances, the overall intent is to allow early detection of potential ACL exceedances, while minimizing the probability of false positive results - e.g., exceedances attributable to laboratory error or transient anomalous increases. Prediction limits are already built into the ACLs. Therefore, comparison of the single values (e.g., ACL vs. monitoring result) should suffice. However, several factors must be accounted for when evaluating results and identifying exceedances. These factors are discussed below.

Significant Figures

Significant figures must be accounted for when comparing predicted values with measured values. The following general approach should be employed. For results less than 1,000 mg/L, comparisons between measured values and predicted values should be based on 2 significant figures. For results exceeding 1,000 mg/L, comparisons should be made on the basis of 3 significant figures.

Verification Sampling

Verification sampling is an integral component of exceedance identification. To avoid "false positives" due to laboratory error and/or transient increases, a statistically significant exceedance will not be declared or reported until the results of verification sampling are known. Umetco's proposed approach to verification sampling is discussed below and in Table 3.

3.2 ACL Constituents at Point of Compliance Wells

If any POC sample exceeds the ACL for one or more constituents, a second (verification) sample will be collected and analyzed within 3 months of obtaining the original sample to rule out

laboratory error or transient increase. Analysis will only be necessary for constituents that exceed their ACLs. If the analyses of this first verification sample also results in an exceedance of the same ACL, Umetco will notify the NRC within 30 days of receiving the verification result. Contingent upon NRC approval, a second verification sample may be collected before corrective action measures are considered; this sample will be collected within 3 months of obtaining the results from the first verification sample.

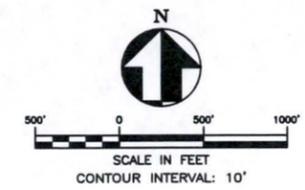
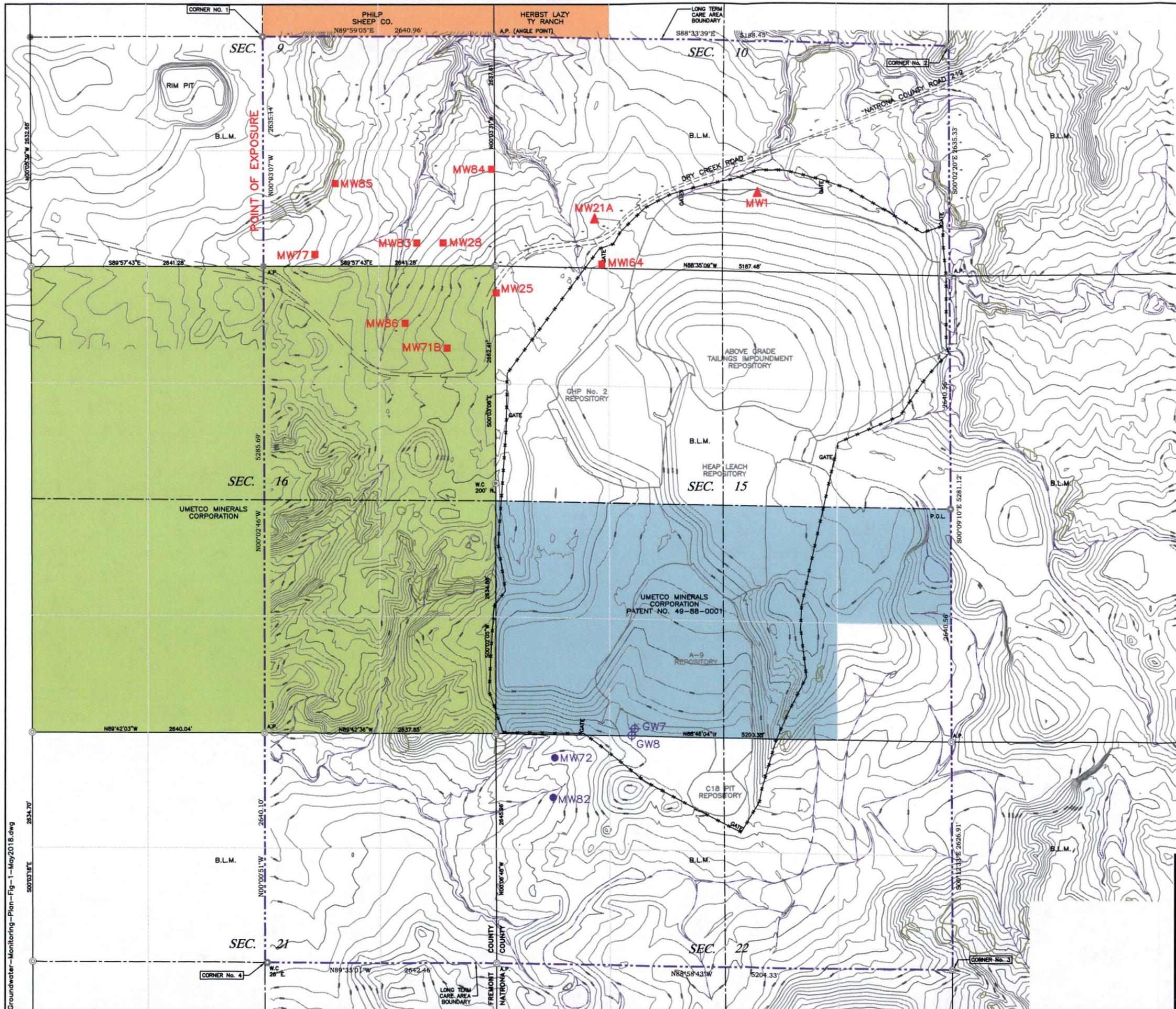
If the second verification sample also results in an exceedance, Umetco will provide an "action plan" to the NRC within 60 days of receiving the results of the second verification sample. This action plan will describe appropriate corrective action(s), if necessary, and/or further analysis to ensure that no risk will be incurred at the POE. Such an analysis may require reassessment of model simulations and assumptions. This approach is detailed in Table 3.

3.3 ACL Constituents at Non-POC Wells

If any Non-POC sample exceeds the ACL for one or more constituents, the exceedance will be handled on a case-by-case basis through correspondence with NRC.

Table 3 Exceedance Identification and Action Approaches

| Monitoring Endpoint | Exceedance Identification and Verification Sampling Approach | Actions to be Implemented if Exceedances are Verified |
|-------------------------------|---|--|
| ACL Constituents at POC Wells | <p>If any POC sample exceeds the ACL for one or more constituents (accounting for significant figures), a verification sample will be analyzed <u>within 3 months</u> of obtaining the initial exceedance result(s).</p> <p><i>[Re-analysis is only necessary for the constituent(s) exceeding the ACLs.]</i></p> | <p>If the first verification sample also results in an exceedance of the same ACL, Umetco will notify the NRC within 30 days of receiving the first verification result. Contingent upon NRC approval, a second verification sample may be collected before corrective action measures are considered. The second verification sample will be analyzed within 3 months of obtaining the result(s) of the first verification sample.</p> <p>If the second verification sample also results in an exceedance, Umetco will provide an "action plan" to the NRC within 60 days of receiving the results of the second verification sample. This action plan will describe appropriate corrective action(s), <i>if necessary</i>, and/or further analysis to ensure that no risk will be incurred at Point of Exposure (POE) locations. Such an analysis may require reassessment of model simulations and assumptions.</p> |



LEGEND:

- MW25 WESTERN FLOW REGIME WELL
- ▲ MW1 WESTERN FLOW REGIME POINT OF COMPLIANCE WELL
- MW72 SOUTHWESTERN FLOW REGIME WELL
- ⊕ GW7 SOUTHWESTERN FLOW REGIME POINT OF COMPLIANCE WELL
- RESTRICTED AREA BOUNDARY (FENCE)
- REPOSITORY OUTLINES
- PROPOSED TRANSFER BOUNDARY
- B.L.M. LANDS
- UMETCO LANDS W/ MINERAL RIGHTS
- UMETCO SURFACE LANDS STATE OF WYOMING MINERAL RIGHTS
- PRIVATELY OWNED LAND (AS NOTED)
- SECTION LINE LOCATION
- CONTOUR LINE (50', 10')
- PONDED WATER/DRAINAGE PATH
- EXISTING UNPAVED NATRONA COUNTY ROAD (DRY CREEK ROAD, COUNTY ROAD 212)
- EXISTING UNPAVED ROAD (FREEMONT COUNTY)
- BRUSH/TREE LINE

NOTES:

- 1). UMETCO LANDS INCLUDE THE SW1/4, THE SW1/4 SE1/4, THE NW1/4 SE1/4 AND THE NE1/4 SE1/4 OF SECTION 15 AND ALL OF SECTION 16 EXCEPT THE MINERAL RIGHTS FOR SECTION 16 WHICH BELONG TO THE STATE OF WYOMING. ALL IN TOWNSHIP 33 NORTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN. UMETCO'S SECTION 15 LAND HELD UNDER PATENT NO. 49-88-0001.
- 2). THE PROPOSED TRANSFER BOUNDARY TO THE D.O.E. INCLUDES THE SE1/4 OF SECTION 9, THE S1/2 OF SECTION 10, ALL OF SECTION 15, THE EAST 1/2 OF SECTION 16, THE NE1/4 OF SECTION 21 AND THE N1/2 OF SECTION 22 ALL IN TOWNSHIP 33 NORTH, RANGE 89 WEST OF THE SIXTH PRINCIPAL MERIDIAN.
- 3). SURFACE CONTOURS FROM UMETCO'S 2000 AERIAL MAPPING BY A.M.I. ENGINEERING, INC. AND FROM AS BUILT CONSTRUCTION SURVEYS FROM 2001 THROUGH 2006.

UMETCO MINERALS CORPORATION

MONITORING LOCATIONS

GAS HILLS, WYOMING

MAY 2018

FIGURE 1

Groundwater-Monitoring-Plan-Fig-1-May2018.dwg