

**PITCH RECLAMATION PROJECT**  
**COLORADO MINED LAND RECLAMATION BOARD**  
**2021 ANNUAL RECLAMATION REPORT**

RECLAMATION PERMIT NUMBER M-1977-004



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<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>1. INTRODUCTION</b>	<b>4</b>
<b>2. LAND DISTURBED IN 2021</b>	<b>5</b>
<b>3. RECLAMATION ACTIVITIES IN 2021</b>	<b>6</b>
3.1 Drainage and Erosion Control – North Pit and South Mine Area	6
3.1.1 North Pit	6
3.1.2 South Pit	6
3.2 Drainage and Erosion Control – Indian and Tie Camp Rock Dumps	6
3.2.1 Tie Camp Rock Dump	6
3.2.2 Indian Rock Dump	6
3.3 Noxious Weed Control	7
3.4 Observation of Access Road Revegetation	7
3.5 Inspection of Constructed Marsh Areas	7
3.6 Monitoring of Tie Camp Disposal Cell	7
<b>4. MONITORING AND ANNUAL REPORTING</b>	<b>8</b>
4.1 Slope Movement Vector Analysis	8
4.2 Inclinometer Evaluation	8
4.3 Pinnacle Underground Mine Workings Monitoring	8
4.3.1 Spring and Seep Monitoring	9
4.3.2 Groundwater Levels	9
4.3.3 Pinnacle Adit Flow and Water Quality	10
4.4 Sediment Control Pond	11
4.4.1 Embankment Monitoring	11
4.4.2 Sediment Control Pond Silt/Turbidity Curtain Installation	11
4.5 Rock Dumps	11
4.5.1 Rock Dump Water Levels	12
4.6 Establishing the Lowest Practical Level for Uranium	13
4.6.1 Phosphate Injection Systems	13
4.6.2 Engineered Treatment Cells	13
4.6.3 Treatment Residuals Management System	14
4.6.4 Ion Exchange Systems	14
4.6.5 Surface Water Management	14
4.7 Colorado Discharge Permit System Monitoring	14
4.8 Radioactive Materials License	15
<b>5. INSPECTIONS</b>	<b>15</b>
<b>6. SURETY</b>	<b>16</b>
<b>7. Monitoring and Reclamation Activities Planned for 2022</b>	<b>17</b>

**Tables**

Table 1	Springs and Seeps Summary of Activity (1995-2021)
Table 2	Seasonal Water Level Readings in Rock Dump Piezometers

**Figures**

Figure 1	Location Map
Figure 2	Reclamation Areas
Figure 3	Systems and Monitoring Locations
Figure 4a	Water Level Elevation Data in P – Wells 1995-2021
Figure 4b	Water Level Elevation Data in P – Wells 2012-2021
Figure 5	Hydrograph of Pinnacle Adit Discharge
Figure 6	Pinnacle Adit Discharge, Uranium, and Radium Concentrations
Figure 7	Historic Water Levels in Piezometers at the Toe of Indian Rock Dump
Figure 8	Historic Water Levels in Piezometers at the 10300 Level of Indian Rock Dump
Figure 9	Historic Water Levels in Piezometers at Indian Rock Dump and Tie Camp Rock Dump

**Appendices**

Appendix A	2021 Photo Log
Appendix B	Annual Inclinometer Monitoring Report
Appendix C	2021 Sediment Embankment Report
Appendix D	Radioactive Materials License #150-01 Amendment 21
Appendix E	DRMS Inspection Report
Appendix F	Letter of Surety

## EXECUTIVE SUMMARY

Homestake Mining Company of California (HMC) operated the Pitch Uranium Mine (mine) located in Saguache County, Colorado, from 1979 until 1984. The mine extracted uranium ore and trucked it to their mill in Grants, New Mexico. In 1984, operations were suspended, and the mine was placed into care and maintenance. Mine site disturbances were incrementally reclaimed and revegetated from 1985 to 1993. In 1993, HMC initiated permanent closure of the mine.

Since 1993, closure and reclamation has included pit wall grade-down and partial backfilling of the North Pit to improve pit wall stability, contouring, and revegetation of the approximately 230 acres of disturbed area; construction of a plug in the historical Pinnacle underground mine adit to reduce seepage and improve water quality; monitoring of slope stability in the North Pit and South Mine area; monitoring of the phreatic surface in the Indian Rock Dump (IRD) and Tie Camp Rock Dump (TCRD); construction of surface water controls; dismantling and removal of the Radium Treatment Plant and associated foundation materials and soils that were placed in the Tie Camp Disposal Cell; and dismantling and removal of the sand filter plant that was placed in the sandstone quarry.

HMC submitted a 112d-3 Reclamation Plan amendment to Permit Number (No.) M-1977-004 in June 2019. The amendment package included a comprehensive update of the site reclamation plan and addresses the existing conditions and remaining work to be performed to adequately reclaim and close the mine. The Colorado Division of Reclamation, Mining, and Safety (DRMS) approved the amendment application in a letter dated January 6, 2020.

During 2021, HMC maintained the remaining mine facilities and fulfilled permit- and license-related compliance programs, which included the following tasks:

- Installation of a diversion channel, lined with geosynthetic clay liner (GCL), from the TCRD to the Mine Shop; installation of plunge pool and catchment features at the TCRD, Mine Shop, and the bottom of the TCRD; and redirection of Indian drainage surface water flow pathways, including outflow from the North Pit Lake, to converge with the new TCRD channel, running through a 3-foot-diameter pipe to the plunge pool at the bottom of the TCRD below the TCRD Culvert. The existing IRD culvert was decommissioned, with surface water being diverted to the TCRD diversion channel.
- Demolition of the Sand Filtration (water treatment) Plant in July.
- Regrading of the Limestone Quarry area to the approximate slopes of the surrounding areas.
- Regrading of IRD low areas to prevent ponding.
- Reseeding and monitoring of the South Pit Area.
- Monitoring of water quality at the Colorado Discharge Permit System (CDPS) permit (No. CO0022756) compliance point Outfall 001A (also known as SW-33) and submittal of monthly and quarterly discharge monitoring reports to the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) in accordance with the requirements of the Colorado Discharge Permit System permit, effective January 1, 2010, and extended under timely renewal.
- Inspection and reporting in accordance with the terms and conditions of the Radioactive Materials License (RML) issued by the CDPHE – Hazardous Materials and Waste Management Division (HMWMD) (Permit No. 150-01). HMC submitted a License Amendment Application on June 7, 2021. It was approved by HMWMD on September 21, 2021, and Amendment No. 21 renewed the license through April 30, 2023.

- Monitoring of the drainage, stabilization, and reclamation in the constructed marsh areas near the location of the former Radium Treatment Plant and the drainages upstream from the sediment control pond.
- Monitoring of pit wall slopes on the south and east walls of the North Pit, the east wall of the South Pit Area, and the IRD and TCRD.
- Monitoring of the drainage channel constructed in 2013 between the 10,800 and 10,600 benches on the east wall of the North Pit.
- Monitoring of erosion and drainage repairs on the northwestern side of the IRD above the clay and low-grade ore stockpiles.
- Monitoring of the continued effectiveness of grading on the top three benches and slope face of the TCRD to reduce sedimentation on the benches, facilitate movement of stormwater and snowmelt off the benches, and reduce rill erosion on the dump slope.
- Inspection of cover repair completed in 2011 on the drainage channel on the Tie Camp Low Grade Ore Stockpile/Disposal Cell.
- Monitoring of precipitation at the mine. Precipitation at the site weather station during Water Year 2021 (monitoring period from October 1, 2020 through September 30, 2021), totaled 10.08 inches. Precipitation is also monitored at the Porphyry Creek SNOTEL site (701). During Water Year 2021, 23.3 inches of precipitation were recorded, which includes snow water equivalent precipitation.
- Monitoring of groundwater levels in monitoring wells within and adjacent to the underground mine workings and monitored springs and seeps potentially influenced by the re-saturation of the underground mine workings.
- Monitoring of groundwater levels in monitoring wells and piezometers in both the IRD and TCRD.
- Continuation of noxious weed control.
- Monitoring of monuments and piezometers on the sediment control pond embankment in accordance with the requirements of the Colorado Division of Water Resources.

Best management practices (BMPs) continued to be evaluated to achieve surface water uranium load reduction at the mine to define and establish the Lowest Practical Level water quality standard on Indian Creek. Field work in 2021 focused on continued operation and expansion of the passive treatment BMPs. Specific field work included the following:

- Continued operation and monitoring of the field-scale bioreactor engineered treatment cell, constructed in 2020 (ETC3) and containing organic based media (woodchips, manure, hay), for continued evaluation of uranium removal via passive treatment.
- Operation and monitoring of six drum-scale biochemical reactors to evaluate media amendments to prolong lifetime and effectiveness of the bioreactor ETCs in potential future large reactor construction.
- Construction and operation of a Field Demonstration Ion-Exchange pilot system as an additional BMP to evaluate the effectiveness of uranium removal via passive treatment.
- Construction and operation of nine ion-exchange columns to evaluate resin types and longevity to optimize effectiveness of the ion-exchange system in potential future full-scale construction.
- Installation of ten groundwater piezometers in the North Pit Lake (NPL), beneath the lake surface into underlying sediment/fill material, to quantify hydraulic gradients and uranium concentrations of groundwater discharging into the lake.

Most surface disturbance associated with the LPL advancement was approved by DRMS in June 2019, under the Reclamation Plan submitted on June 28, 2019, and approved on January 6, 2020. Construction

of the IX system pad in 2021 did not require a Technical Revision, as documented in the May 28, 2021 e-mail from Dustin Czapla (DRMS) to Dave Wykoff (HMC) (Czapla, D. to Wykoff, D. Re: Pitch question).

## 1. INTRODUCTION

This 2021 Annual Reclamation Report (report) has been prepared to fulfill the Homestake Mining Company of California (HMC) annual reclamation reporting requirements to the Colorado Division of Reclamation, Mining, and Safety (DRMS) for Reclamation Permit Number (No.) M-1977-004 for the Pitch Reclamation Project. The Pitch Reclamation Project is in Township 48 North, Range 6 East, Saguache County, Colorado (Figure 1). It consists of approximately 230 disturbed acres situated at 10,000 to 11,000 feet above mean sea level (amsl) on fee land owned by HMC. Reclamation activities conducted in 2021 at the Pitch Reclamation Project are shown on Figure 2 and photographs of 2021 site activities are presented in Appendix A. This report focuses on reclamation, monitoring, and remediation performed at the Pitch Reclamation Project during the 2021 calendar year. Documentation of reclamation conducted in previous years is provided in previous annual reports.

## 2. LAND DISTURBED IN 2021

Surface disturbances in 2021 were associated with regrading and diversion of water around the Tie Camp Rock Dump (TCRD), the Mine Shop, and the Indian Rock Dump (IRD); demolition of the Sand Filter Plant; and regrading of the limestone and sandstone quarries. Additional surface disturbances in 2021 were associated with uranium load reduction best management practices (BMPs) being implemented to establish the lowest practical level (LPL) for uranium at the Colorado Discharge Permit System (CDPS) permit (No. CO0022756) compliance point, Outfall 001A (also known as SW-33). Associated work included pad construction at the bottom of the IRD, installation of monitoring wells in North Pit Lake (NPL), and long-term reagent storage as described below. The work summarized below was approved by DRMS under the Reclamation Plan submitted on June 28, 2019, and approved on January 6, 2020.

The following work resulted in surface disturbances of less than 19 acres of previously disturbed or reclaimed ground:

- Regrading of portions of the TCRD and the upper IRD to promote surface flow and reduce ponding/infiltration
- Extraction of material from the limestone and sandstone quarries, which were used as part of diversion channel work
- Reconstruction of the diversion channel at the TCRD to direct water towards the Mine Shop
- Rerouting and connection of the Indian drainage to the Tie Camp drainage and plugging of the existing IRD culvert near the Mine Shop and Tie Camp culvert
- Installation of a catchment and culvert from the Mine Shop area to the bottom of the TCRD, completed with a concrete channel at the bottom
- Construction of a level pad and dug footers around the bottom of the IRD to support the Ion Exchange (IX) building, which was constructed under building permit No. 2021149
- Installation of 10 new wells in the NPL to facilitate source zone characterization and conceptual site model updates.

The areas associated with uranium load reduction systems will continue to be used in the future. The areas will be reclaimed once the infrastructure, wells and piezometers/inclinometers are no longer being used as part of the passive treatment feasibility evaluation or long-term monitoring program. Areas determined to no longer need uranium load reduction will be reclaimed. Eventual closure and reclamation will include plugging and abandonment of wells, piezometers, and inclinometers in accordance with Rule 16 of the Colorado Water Well Construction Rules. Following removal of piping and engineered structures associated with uranium load reduction BMPs, disturbed ground will be recontoured and revegetated, with grading for drainage, scarifying/harrowing, and fertilizing to be conducted as necessary for proper reclamation.

### **3. RECLAMATION ACTIVITIES IN 2021**

During 2021, reclamation efforts focused on the regrading and diversion of surface water around the TCRD, the Mine Shop, and the IRD; demolition of the Sand Filter Plant; reseeding of the South Pit Area; and regrading of the limestone and sandstone quarries. Additionally, maintenance and regrading of roads to repair seasonal damage and maintain positive drainage to minimize erosion and noxious weed control were completed. This work is described in the following subsections and depicted on Figure 2. Several areas that were not reclaimed in 2021 are also discussed to describe current conditions following previous reclamation activities and to summarize planned activities.

#### **3.1 Drainage and Erosion Control – North Pit and South Mine Area**

##### **3.1.1 North Pit**

Earthwork was performed to reconstruct the diversion channel at the 10,500-foot level in the North Pit in 2020. The channel, lined with geosynthetic clay liner (GCL) and rip rap, was reestablished to reduce infiltration into the slope and extended to the north to divert water from upper Indian drainage around the pit lake. Water captured by the channel diverts to the marsh area at the former Radium Treatment Plant (RTP) location. Construction was completed in July 2020. The diversion channel, installed in July 2020, was maintained and repaired, as needed, to prevent erosion in 2021. Additional repairs and GCL lining of the channel are planned for 2022 to reduce infiltration and promote drainage to the combined IRD/TCRD drainage channel.

##### **3.1.2 South Pit**

Earthwork was completed in 2020 to stabilize slope degradation associated with tension cracks in the South Mine. Previous slope creep and cracking was removed and refilled while incorporating drainage features at two benches along the South Pit slope. Earthwork was completed in October 2020. The disturbed areas were reseeded during 2021, and the area will continue to be monitored.

#### **3.2 Drainage and Erosion Control – Indian and Tie Camp Rock Dumps**

##### **3.2.1 Tie Camp Rock Dump**

In 2012, repair work was completed on the top three benches and dump slope faces between benches of the TCRD to remove sediment buildup that was directing snowmelt and stormwater down the dump face and creating rill erosion. Site reconnaissance performed during the field season showed that the repairs completed in 2012 have resolved issues on the top three benches and that the repairs continue to function as planned. The DRMS inspection in October 2021 noted no problems with the area.

The TCRD above the Mine Shop access road was regraded and seeded to match surrounding land contours. A flow capture structure was constructed diverting flow into a lined channel to the Mine Shop. A plunge pool was constructed next to the Mine Shop, and a culvert was installed from the plunge pool to the bottom of TCRD. The culvert daylighted to a concrete channel that joins the Tie Camp drainage.

##### **3.2.2 Indian Rock Dump**

Erosion on the IRD was identified in 2010. Repairs were completed in 2012 that included grading and placement of boulders and riprap in the groin areas west of the IRD. The repairs continue to be effective in 2021.

The IRD culvert was diverted to the TCRD culvert near the Mine Shop. The former culvert was plugged.

Regrading of low areas in the IRD was conducted in 2021 to promote surface water flow and reduce ponding and infiltration in these areas.

### **3.3 Noxious Weed Control**

Noxious weed control was undertaken on isolated occurrences of Canadian thistle (*Cirsium arvense*) and scentless chamomile (*Matricaria perforata*) on the mine site. Pest Away has assisted with noxious weed control since 2012, resulting in a large reduction in both noxious weeds. On July 21, 2021, Pest Away sprayed approximately 85 gallons of Milestone with Telar XP at 7 ounces per acre, Escort XP w/R-11 Activator at 2 ounces per acre, and Bio 90 at 1 quart/100 gallons near roads and reclaimed areas.

### **3.4 Observation of Access Road Revegetation**

The Pitch Reclamation Project access road was graded and reseeded in 2016 because of sloughing that occurred in 2015. In 2017, the revegetation adjacent to the road was not well established; however, in 2019, vegetation cover was noted by DRMS as becoming well established. No additional work was conducted in 2021.

### **3.5 Inspection of Constructed Marsh Areas**

In 2021, the constructed marsh area near the location of the former RTP and the drainages above the sediment control pond were inspected. Growth of cattails and sedges were still apparent in the marsh area in 2021.

### **3.6 Monitoring of Tie Camp Disposal Cell**

Work completed in 2020 on the Tie Camp Disposal Cell was monitored in 2021. No issues were noted in the DRMS inspection completed in October 2021.

## **4. MONITORING AND ANNUAL REPORTING**

Monitoring of slope movement across the mine site; water levels in the underground mine workings, sediment control pond embankment, and rock dumps; and sitewide water quality relevant to establishing the LPL for uranium was conducted in 2021.

Installation of an internet-connected weather station was completed in 2020. The station monitors air temperature, relative humidity, wind speed and direction, solar radiation, barometric pressure, snow depth, and rainfall. The weather station recorded 7.95 inches of precipitation during Water Year 2021 (the monitoring period from October 1, 2020 through September 30, 2021).

### **4.1 Slope Movement Vector Analysis**

Survey monuments (monitoring points) have been installed at the Pitch Reclamation Project to monitor surficial slope displacement in the North Pit and South Mine areas. The area east of the North Pit and south of northing 113,500 is referred to as the south wall of the North Pit, and the area east of the Pit Lake and north of northing 113,500 is referred to as the east wall of the North Pit. Monitoring points are also present on the east wall of the South Mine area.

There are currently 59 monitoring points in the North Pit and South Mine areas to monitor surficial slope movement. From 2020 to 2021, three monitoring points were discontinued because movements measured in past years were less than the survey equipment error. Ten new monitoring points were added to the South Mine area in 2021. Of these, nine were surveyed, and one was damaged by site activities and was not surveyed. Surveys are conducted as close to 1-year intervals as possible, allowing the magnitude of total displacement to be reported as a velocity in terms of feet per year.

None of the monitoring points showed values greater than the established movement threshold. This is consistent with the 2020 survey results.

A detailed discussion of historical and 2021 monitoring point displacement data is presented in the 2021 Annual Inclinometer Monitoring Report in Appendix B.

### **4.2 Inclinometer Evaluation**

In 2017, three additional inclinometers were installed in the IRD to monitor the potential for movement (IN-1, IN-2, and IN-3; Figure 3). These inclinometers supplement three slope inclinometers that were installed in 1998 to monitor areas of the North Pit (I98-1, I98-2, and I98-3). Inclinometer readings in 2021 for IN-1, IN-2, and IN-3 did not indicate excessive movement for the monitoring cycle. Data for I98-3 was not gathered because of snow accumulation at the time of the survey. The I98-2 inclinometer data was not evaluated because of erroneous data. Inclinometer I98-1 indicates similar incremental displacement to that observed in previous years back to 2017. A detailed discussion of inclinometer data is presented in the 2021 Annual Inclinometer Monitoring Report included in Appendix B.

### **4.3 Pinnacle Underground Mine Workings Monitoring**

A concrete plug was constructed in the Pinnacle adit in September 1995. Authorization for the placement of the Pinnacle adit plug was requested by HMC in April 1995, and conditional approval was granted by the Colorado Division of Minerals and Geology (now DRMS) as TR-3 in May 1995. The intention of the plug was to seal the Pinnacle adit and allow the underground mine workings and adjacent country rock to resaturate. The resaturation of the underground mine workings was expected to re-establish a geochemically reducing environment and lower the solubility of uranium and radium within the underground mine workings.

The Colorado Division of Minerals and Geology approval required HMC to monitor the effects of resaturation in the underground mine workings for 5 years or until hydrologic conditions stabilized. Components in the Monitoring Plan outlined in TR-3 included continuation of discharge water quality monitoring at SW-33, monitoring of groundwater resaturation levels, annual spring and seep surveys in areas downgradient from the underground mine workings, and monitoring for changes in water quality that could be attributable to resaturation. The stated purpose of the monitoring program is to verify the intended effectiveness of the adit plug. In accordance with the requirements of TR-3, the following types of monitoring were performed in 2021 and are described in the subsections below:

- Survey of springs and seeps
- Groundwater levels in monitoring wells installed in and adjacent to the underground mine workings
- Water quality and flow from the Pinnacle adit at sampling point PP-01
- Discharges from the property at SW-33.

#### **4.3.1 Spring and Seep Monitoring**

Spring and seep surveys were conducted to monitor changes in shallow groundwater conditions due to construction of the Pinnacle adit plug. These surveys have been conducted annually since July 1995 and were repeated in 2021. In general, flow from some springs and seeps increased for a brief period after the adit plug installation and have declined to a steady state since the spring of 1997. Small variances noted since 1997 can be attributable to a variety of conditions, including precipitation, depth of snowpack, timing of snowmelt, and the potential for infiltration with respect to frozen ground. The “active” spring and seep locations are shown on Figure 3. Spring and seep flow measurements since monitoring was initiated are presented in Table 1. Typically, the springs flow in the early summer months and then decrease rapidly to a point where there is little to no flow in the fall. In 2021, no phosphate injections were conducted; however, flows at Spring CFS-2 were still higher later in the season than in the spring.

#### **4.3.2 Groundwater Levels**

Monitoring wells and piezometers have been installed across the mine for multiple purposes, including water level monitoring and water quality sampling. From approximately 2017 to 2020, wells and piezometers were also used for injection and/or extraction as part of the chemical reagent injection program for uranium load reduction. For the purposes of this report, cased borings installed for water level monitoring that are not known to have been completed with well screens are referred to as piezometers, while monitoring installations completed with well screens for water level and water quality monitoring are referred to as wells.

There are currently 13 wells installed in or near the underground mine workings (P-4 through P-16). The locations of these wells are provided on Figure 3. These wells are used to monitor water levels throughout the underground mine workings area formerly used to inject reagents (phosphate and tracers) and recirculate water as part of the uranium load reduction BMP infrastructure to further support LPL establishment. The wells are described as follows:

- Former recirculation wells P-4, P-5, P-11, and P-12 are located within or in immediate hydraulic connection to the underground mine workings. P-4 and P-5 were installed in 1995 prior to installation of the adit plug, whereas P-11 and P-12 were installed in 2015.
- Monitoring wells P-7, P-8, P-9, and P-10 are located outside of the underground mine workings, with P-7 located immediately upgradient of the adit plug. P-7 was installed as a replacement for P-6, which was monitored until approximately 1 year after plug grouting/construction. P-8 lies just to the north of the underground mine workings and was also constructed to monitor bedrock water levels upgradient of the Pinnacle adit plug. This is also the closest monitoring well to the Chester

Fault Zone. P-8 was converted to a dual-purpose inclinometer in 1999 by installing inclinometer casing inside the well casing. P-10 has not been sampled since 2018 because of a blockage and is no longer monitored for water levels.

- Recirculation wells P-13, P-14, P-15, and P-16 are screened outside of, but adjacent to, the 10,300 drift and were installed in 2017 and 2018 as additional uranium load reduction BMP infrastructure.

Water levels in the wells fluctuate seasonally, with the highest levels observed in late May or early June, coinciding with snowmelt (Figure 4a). During phosphate injection events, water levels fluctuated more strongly in response to active water recirculation. Water levels in Figure 4b represent the data obtained during low- and high-flow sampling events (i.e., not collected during active phosphate injection) from 2012 to 2021 to provide additional clarity. Spring and summertime water levels vary from year to year because of the magnitude and timing of snowmelt and heavy summer precipitation events; however, water levels under low-flow or “base-flow” conditions can be used to assess long-term trends. Overall, the base-flow water levels indicate a groundwater gradient to the north/northwest. This gradient is steepest on the southern end of the North Pit, as demonstrated by the decrease in water levels moving from wells P-4/P-11 toward P-7, and further to P-8.

The following additional observations have been noted since the adit plug was installed in 1995:

- Base-flow water levels in recirculation well P-7 have stabilized at just under 10,385 feet above mean sea level. This value has not changed substantially since 2002, indicating that water levels behind the Pinnacle adit plug are stable.
- Water levels in recirculation wells P-4 and P-5, which are in direct hydraulic connection with the underground mine workings, have been very similar in low flow since 1997. Since the installation of wells P-11 and P-12 in 2015, the water levels in the wells have been comparable to each other and comparable to P-4 and P-5. Recirculation wells P-5 and P-12 exhibited higher water levels during summer months during the operation of the phosphate injection systems in 2015 through 2020; water levels in 2021 (without phosphate injections) were similar to water levels prior to the initiation of injections in 2017 (Figure 4a).
- Recirculation wells in hydraulic connection with the underground mine workings (P-4, P-5, P-11, and P-12) show a stronger sensitivity to seasonal snowmelt (i.e., greater water level rise) compared to monitoring wells P-8, P-9, and P-10, suggesting more connection with infiltrating water. Seasonal response in recirculation well P-7 is generally greater than that in P-8 and P-9, but less than that observed in P-4, P-5, P-11, and P-12.
- Base-flow water levels in recirculation well P-4 have been generally stable since 1997. Monitoring well P-8 has consistently displayed the lowest water level in the mine vicinity, although it has increased since the adit was plugged.

Water level measurements during 2021 are similar to water levels observed in previous years, when injections were not occurring.

#### **4.3.3 Pinnacle Adit Flow and Water Quality**

The flow rate from the Pinnacle adit at PP-01 has been monitored since November 1993. The flow generally consists of a seasonal pattern of high flows during the short period of spring melt in late May or early June and stable flows of less than 10 gallons per minute throughout the year (Figure 5). The spike in flows observed at PP-01 each spring are a result of snowmelt and runoff, likely from sources originating between the Pinnacle plug and the PP-01 monitoring point. Once the snowmelt is over, the flow rate at PP-01 decreases and stabilizes at normal levels. In 2021, average amounts of snowpack were observed, and flows at PP-01 remained similar to the flows in 2019 and 2020.

Dissolved radium 226 and total uranium have been monitored at PP-01 since March 1994. After construction of the Pinnacle adit plug in September 1995, both dissolved radium 226 and total uranium concentrations have stabilized at reduced concentrations (Figure 6). Total uranium and dissolved radium 226 results in 2021 were consistent with these reduced, stabilized concentrations. These observed concentrations in PP-01 appear lower than concentrations in the underground mine workings; for comparison, uranium concentrations in monitoring well P-7 upgradient of the adit plug were historically greater than 1 milligram per liter (2016 and earlier; prior to the initiation of phosphate injections, which have reduced uranium concentrations at P-7). This indicates that the seepage reporting at PP-01 represents a mixture of low-concentration surrounding groundwater with minimal adit discharge, confirming that water seepage past the adit plug is minimal.

#### **4.4 Sediment Control Pond**

Runoff from snowmelt and precipitation primarily flows across the property via the Indian and Tie Camp drainages. In 1980, an approximately 80-foot-high earthen embankment was constructed at the confluence of the Indian and Tie Camp drainages to allow settlement of suspended solids from surface water prior to its release to Indian Creek. The embankment is a jurisdictional structure under the Colorado Division of Water Resources (Permit No. 280110). A Sediment Control Pond Embankment Report is submitted annually to the Colorado Division of Water Resources, providing the results of the embankment-monitoring program. The 2021 Sediment Embankment report is provided in Appendix C.

##### **4.4.1 Embankment Monitoring**

The safety and efficiency of the sediment control pond embankment is monitored with a network of surface and subsurface systems. Following construction of the embankment in 1981, five permanent survey monuments and five piezometers were installed to monitor physical movement of the embankment and changes in phreatic surface within the embankment, respectively. In 2000, four additional piezometers were completed in the core of the embankment.

The 2021 monument survey was performed on August 24<sup>th</sup> and indicated minimal total vertical movement in the embankment. Results were consistent with previous measurements and within the range of survey error. Specifically, differences between the 2018 and 2021 surveys were between -0.02 and +0.01 foot. There was no significant vertical displacement since the initial settlement (1981 to 1984). Water level trends measured in the piezometers between 2016 and 2021 are consistent with historical readings. A detailed discussion of piezometer monitoring is included in the 2021 Sediment Control Embankment Report provided in Appendix C.

##### **4.4.2 Sediment Control Pond Silt/Turbidity Curtain Installation**

A new silt/turbidity curtain was installed at the sediment control pond in early July 2017 and has been maintained since installation to further control potential suspended solids associated with treatment residuals management (TRM) (described in Section 4.6.3). During dewatering of the pond for the 2020 Sediment Control Pond projects, the silt curtain was temporarily removed. Upon refilling of the sediment control pond, the silt curtain was reinstalled similar to the previous position. The curtain remained in place throughout 2021.

#### **4.5 Rock Dumps**

Monitoring and annual reporting associated with the IRD and TCRD are discussed in the following subsections.

#### **4.5.1 Rock Dump Water Levels**

Historically, the water levels in rock dump piezometers and newer monitoring wells show little fluctuation in the fall and winter months, with a temporary rise in response to the spring snowmelt or summer rain events. The extent that water levels rise each year depends on the fluctuation in snowpack and summer precipitation and the location of the piezometers within the rock dumps. Historical piezometers were installed to monitor water levels in the deeper portions of the IRD that correspond to the former drainages that run along the original valley bottoms. The IRD is separated into bench levels corresponding to ground surface elevation. Water levels within the rock dump are presented in Table 2. Figures 7 through 9 show the historical variation of water levels at each location, and Figure 3 depicts the IRD well and piezometer locations.

##### **10100-10300 Level**

- Water levels in this level were subject to the source zone treatment program from 2017 through 2020; however, no areas of surficial instability have been observed from 1996 through 2021.
- Water levels in recirculation wells used for extraction (RD-01, RD-03, and RD-05) fluctuated 3 to 12 feet (Figure 7). RD-02 and RD-04 are wells at the same ground surface elevation and fluctuated approximately 2 to 4 feet. Short-term water level variations between approximately 2015 and 2020 reflect changes during injection activities and appeared to have little influence on the overall subsurface water level. Variation in water level since injections stopped reflect seasonal water level fluctuations.
- Recirculation wells at the 10300 level are former injection wells that have not been used for injection since 2018. Water levels in these wells (RD-06, RD-07, RD-08, RD-09, and 10300R) decreased roughly 2 to 6 feet from the spring snowmelt in the spring to low-flow conditions in the fall (Figure 8).

##### **10370-10400 Level**

- Monitoring well IC10370R intersects the former Indian drainage running along the valley bottom beneath the IRD and exhibits strong response to seasonal snowmelt and drainout (Figure 9). Piezometer IC10360 is also near IC10370R but does not intersect the former Indian drainage. An obstruction approximately 155 feet below the well collar has prevented water levels from being observed at this location.

##### **“10525-10725” Level**

- Piezometers IC10600 and IC10525 are used to monitor subsurface water in this area. IC10600 water levels were not measured during 2021 because of an obstruction in the well. Piezometer IC10525, which is also representative of the 10400-10600 level of the rock dump, had similar water levels to those in both 2019 and 2020, decreasing 6 feet over the high- to low-flow sampling events (Figure 9)

##### **“10600-10650” Level**

- Piezometers IC10630 and IC10600 monitor subsurface water in this area of the IRD. The 2021 IC10360 water level during high flow was similar to that in 2020. No measurements were collected at IC10600 because of an obstruction in the well. Water levels only stayed consistent over the course of the high- to low-flow events.

##### **“10650-10780” Level**

- No piezometers are present in this area. Visual inspection of the area revealed no evidence of settling or slumping of the rock dump material. The drainage channels are functioning as designed.

#### **“10800” Level**

- No piezometers are present in this area. Visual inspection of the area in 2021 revealed no evidence of settling or slumping of the rock dump material, and the drainage channels are functioning as designed. Repairs made in 2012 just above the sericite stockpile continue to minimize erosion in this area, as observed in 2021.

#### **Tie Camp Rock Dump**

The TCRD is separated into bench levels corresponding to ground surface elevation. The rock dump was regraded in 1994 and approved in TR #1. It has one piezometer at an elevation of 10,375 feet.

Piezometer TC10375 monitors subsurface water in the TCRD. Water levels varied throughout 2021 but remained generally consistent with historical water levels (Figure 9).

In 2021, the IRD and TCRD were inspected monthly in accordance with the recommended monitoring program. The inspections and monitoring conducted in 2021 indicate stable conditions for the IRD and TCRD.

### **4.6 Establishing the Lowest Practical Level for Uranium**

Field implementation in 2021 focused on maintenance and continued operation of passive systems to facilitate uranium load reduction, including engineered treatment cell (ETC) biochemical reactors (BCRs) and pilot/field-scale IX systems. In addition, maintenance of the TRM system in stand-by mode continued in 2021 in the event of an increase in phosphorus concentrations in site surface water resulting from the phosphate injections from 2017 to 2020. Phosphate injections were discontinued following the 2020 field season.

A License Amendment Application for Permit No. 150-01 to the Colorado Department of Public Health and Environment (CDPHE) Hazardous Materials and Waste Management Division was submitted on June 7, 2021, to incorporate the use of IX technology at the site. The amendment (No. 21), which was approved on September 21, 2021, focused on management and handling of licensed radiological materials (Appendix D). Compliance with the conditions of the radioactive materials license (RML) and CDPS permit conditions were maintained during and following the 2021 field activities. Field work is summarized in the following subsections.

#### **4.6.1 Phosphate Injection Systems**

No phosphate injection/recirculation activities were conducted in 2021.

#### **4.6.2 Engineered Treatment Cells**

Five drum-scale bioreactors were constructed in 2021 and operated to optimize residence time, evaluate media longevity, evaluate response to emulsified vegetable oil (EVO) amendment, and evaluate the effect of low temperatures on uranium removal kinetics. A sixth drum-scale bioreactor was reused from the 2019 and 2020 operating seasons. The bioreactors had two content configurations. The first consisted of woodchips, manure, and hay; the second consisted of sand and ChitoRem. Select drums were also dosed with EVO and/or sediment from the NPL. These six drum-scale bioreactors combined removed approximately 25.5 milligrams per gallon per reactor per day of uranium during 2021 operation.

In 2020, a pilot-scale ETC (ETC3) was constructed and operated similarly to the existing ETCs. ETC3 tested modified cell dimensions, post treatment processes, and a roll-off construction concept. The ETC resumed operation in 2021; it treated 84,729 gallons of water from the Chester Fault Springs and removed approximately 65% of uranium from the source water between June and October 2021.

#### **4.6.3 Treatment Residuals Management System**

The TRM system is located on the Indian drainage between the toe of the IRD and the sediment control pond (Figure 3). The system is intended to mitigate any residual phosphate that may remain in surface water downgradient of the 2017 to 2020 injection zones. The system is designed to dose iron and aluminum (ferric chloride and sodium aluminate) and polymer flocculant (Mineral Master MM-2480). Phosphate and secondary treatment byproducts were successfully controlled during load reduction field activities from 2015 through 2020. Field implementation of the TRM system was not necessary in 2021 or in any previous years.

#### **4.6.4 Ion Exchange Systems**

IX continued to be evaluated as a potential passive BMP for uranium reduction in 2021. A column was installed and operated near SW-33 beginning in November 2020 to quantify uranium uptake capacity, uptake kinetics/contact times, and fouling potential. The column was operated through July 2021, when influent and effluent uranium concentrations were equal, indicating that the resin was fully loaded.

During the 2021 field season, nine additional columns were constructed and operated to evaluate differences in the treatability of three potential water sources: NPL surface water, groundwater from IC10000 at the toe of IRD, and TC-10105 groundwater at the toe of TCRD. Additionally, these columns tested multiple resins to identify the best performing resin for the site. The columns were constructed based on uptake capacities observed in the column constructed at Outfall-001 and were not anticipated to reach saturation in 2021. Additional uranium uptake capacity likely remains in these columns. Additionally, in 2021, a field demonstration IX system was constructed and started up with the objectives of evaluating passive treatment ability and year-round operation, optimizing influent filtration to maximize bed life and minimize operation and maintenance, and obtaining performance data on resin capacity and associated resin changeout frequency specific to NPL surface water. Operation of the field demonstration IX system began in late September 2021. Initial data show greater than 99% uranium reduction in the system relative to influent concentrations. The field demonstration IX system will continue to operate through the winter and into the 2022 field season to build a robust understanding of the value of data automation, flow rate optimization, resin capacity, and resin lifetime.

#### **4.6.5 Surface Water Management**

In 2021, surface water management focused on advancing water segregation approaches and the associated implications. As part of this effort, continued monitoring of NPL stratification and potential turnover was conducted, including continual monitoring of temperature and conductivity via data loggers placed on a mooring line anchored to the lake bottom.

### **4.7 Colorado Discharge Permit System Monitoring**

Monthly discharge monitoring reports (DMRs), pursuant to CDPS Permit No. CO0022756, were submitted to the CDPHE WQCD throughout 2021. Analytical tests conducted for the DMRs at SW-33 consist of flow, dissolved radium 226, total radium 226/228, total uranium, pH, total suspended solids, total dissolved solids, oil and grease (visual only), potentially dissolved zinc, and whole effluent toxicity (WET). During 2021, analytical results were below the CDPS permit 30-day average or daily maximum limitations, and WET tests passed consistent with historical results. The 2021 DMRs are on file with the WQCD.

#### **4.8 Radioactive Materials License**

The RTP building, foundation, and sediments excavated from the upper portion of the Indian drainage below the former RTP area were placed in the Tie Camp Disposal Cell in 2001. Final grading and revegetation of the former RTP area was completed in 2003. With the removal of the RTP, radioactive source material and the associated treatment capacity were removed. HMC is authorized by the RML and associated license amendments to manage the Tie Camp Low-Grade Stockpile and Disposal Cell and the sediment upstream of the sediment control pond embankment within the applicable guidelines. HMC is also authorized to possess, handle, and store natural uranium in water treatment media and residuals collected through the phosphate injection system, ETC, and TRM system. The current license was renewed in 2013 and amended (No. 21) by the CDPHE Hazardous Materials and Waste Management Division in September 2021. The 2021 Annual RML Letter Report will be submitted to CDPHE by May 31, 2022, in accordance with RML Condition 15.F. A copy of this report will be provided to DRMS upon request.

#### **5. INSPECTIONS**

DRMS representative Dustin Czapla conducted the annual inspection on October 13, 2021. No violations were noted during the inspection. No issues were noted in the DRMS inspection report, which is included in Appendix E. In addition to observations noted in previous sections, specific observations included the following:

- General Inspection Topics were inspected and given a categorical evaluation:
  - Records
  - Hydrologic Balance
  - Backfill and Grading
  - Erosion/Sedimentation
  - Reclamation Plan/Compliance.
- South Pit: Inspection of reseeded at the Landslide Crest Mitigation Area was completed. No problems were noted.
- Limestone Quarry: Inspection was completed after grading and seeding was completed. No problems were noted.
- An inspection was completed at the laydown area above the TCRD after grading and seeding. No problems were noted.
- Drainage improvements around the site were inspected and documented.
- The Sericite stockpile was noted to have been removed, and the area regraded and reseeded.
- The sand filter plant was noted to have been removed, and the area regraded and reseeded.

## **6. SURETY**

HMC maintains a reclamation surety performance bond for the Pitch Reclamation Project in the form of a financial guarantee bond with Liberty Mutual Insurance Company. The financial guarantee bond was re-evaluated as part of the mine reclamation plan amendment and increased in 2019 to \$24,451,940. A copy of the notification and surety form to DRMS is provided as Appendix F.

## 7. MONITORING AND RECLAMATION ACTIVITIES PLANNED FOR 2022

HMC submitted a 112d-3 amendment to Permit No. M-1977-004 in June 2019. The amendment package includes a comprehensive update of the mine reclamation plan and addresses the existing conditions and remaining work to be performed to adequately reclaim and close the site. The reclamation plan amendment was approved by DRMS on January 6, 2020.

The following monitoring and reclamation activities are tentatively scheduled or planned for 2022, but will be dependent upon site access:

### North Pit Slide Upper Repair

- Remove and chip trees and root balls in the head scarp area of the 1980's North Pit landslide adjacent to tension cracks and scarps (approximately 40 acres)
- Conduct annual surveys of the slope monitoring monuments and inclinometers
- Continue to monitor the drainage channels on the east and south walls of the North Pit, the east wall of the South Mine area, and other areas throughout the property, and make improvements as necessary.

### U.S. Forest Service Access Road Improvements

- Partially regrade and reclaim Forest Road 243.2A from Marshall Pass Road to the Pitch Mine private property line.
- Perform reclamation of road portions. Reclamation will follow U.S. Forest Service road specifications. Reclaimed road portions will be removed and regraded. Culvert crossings will be added as needed.
- Monitor the Tie Camp Disposal Cell for depressions where water could pond and manage the drainage off and around the cell.
- Monitor revegetation and reseed or fertilize, as necessary.

### Reinforce and Extend North Pit Diversion

- Extend the outfall channel from the end of the North Pit Diversion approximately 1,650 feet to the plunge pool by the Mine Shop. This includes removing and reusing existing rip rap, regrading the channel, lining the channel with GCL, and replacing the rip rap.
- Clean sediment traps in the Indian and Tie Camp drainages above the sediment control pond.
- Inspect and monitor the sediment control pond embankment, including surveying the monuments, inspecting for seepage, removing tree seedlings on the upstream and downstream face of the embankment, monitoring the outlet pipe, cleaning the debris trap above the outlet pipe, and repairing rill erosion as need.
- Monitor the sediment control pond embankment piezometers quarterly or more often if it is necessary to store water above the clay blanket located on the upstream side of the sediment control pond embankment.
- Inspect the piezometers for silt buildup and pressure flush the piezometers as necessary to eliminate buildup of debris and silt.

### Underground Mine Workings

- Collect water level readings in the piezometers in and near the underground mine workings. No phosphate injections/recirculation activities are planned for 2022.

Revegetation and Weed Control

- Continue noxious weed control management using Milestone with Telar XP and Escort XP w/R-11 Activator.

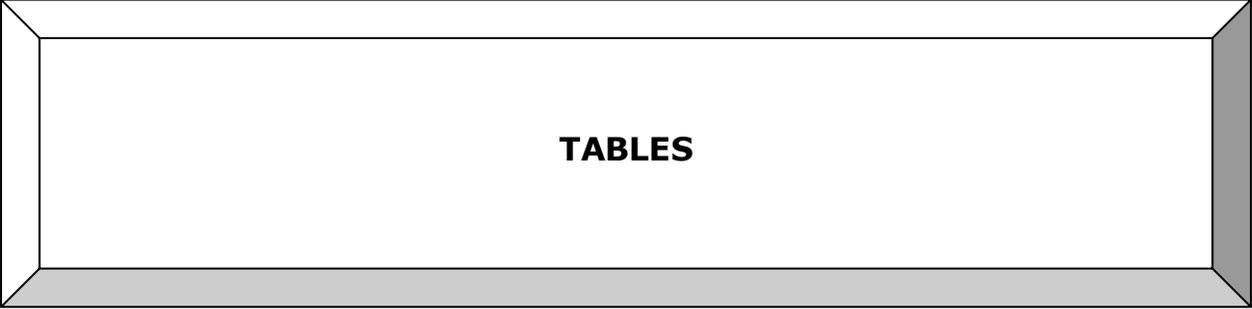
General Maintenance and Permit Compliance Activities

- Grade roads for safe travel into and around mine.
- Excavate localized sediment in sections of the north and South Pit diversions.
- Conduct monthly and quarterly monitoring and reporting in accordance with the CDPS permit. Water quality monitoring will continue in 2022.
- Continue to monitor the constructed marsh area located in the drainage area near the former RTP and on the small sediment settling basins constructed upgradient from the sediment control pond, including placement of additional organic material (e.g., peat) and other enhancements to further promote sediment control, as necessary.

Optimization of Source Control and Treatment BMPs

The following additional BMP advancement activities are proposed for 2022:

- Continued surface water and shallow groundwater investigations.
- Continued operation of the field demonstration IX system to evaluate uranium removal efficiencies and water quality improvements.



**TABLES**

Table 1  
Springs and Seeps Summary of Activity 1995-2021  
Pitch Reclamation Project  
Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report



Station	Current Designation	Spring 1995	Spring 1996	Spring 1997	Spring 1998	Fall 1998	Spring 1999	Fall 1999	Spring 2000	Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003	
TC-1	Inactive	*<1	No Flow	*<1	No Flow	*<1	No Flow	N-O	*<1	*<1	No Flow	No Flow	N-O	N-O	N-O	
TC-2	Spring	*5	*5	*5	*5	*5	*1	N-O	0.6	*<1	0.8	0.3	No Flow	0.2	1.5	
TC-3	Spring	*5	*5	*5	*5	*5	*1	N-O	0.5	*<1	0.8	0.5	No Flow	0.4	3.8	
TC-4	Seep	*<1	No Flow	*5	No Flow	*5	No Flow	N-O	1.2	No Flow	0.4	No Flow	No Flow	No Flow	4.3	
TC-5	Seep	*<1	No Flow	*5	No Flow	*5	No Flow	N-O	0.5	No Flow	0.4	No Flow	No Flow	No Flow	1.7	
TC-6	Inactive	*5	No Flow	No Flow	N-O	N-O	N-O	N-O	N-O	No Flow	No Flow	No Flow	N-O	N-O	N-O	
TC-7	Inactive	No Flow	*20	No Flow	No Flow	No Flow	No Flow	N-O	No Flow	No Flow	No Flow	No Flow	N-O	N-O	N-O	
TC-8	Inactive	No Flow	No Flow	*<1	*<1	*<1	*<1	N-O	*<1	No Flow	No Flow	No Flow	N-O	N-O	N-O	
TC-9	Seep	No Flow	No Flow	No Flow	*<1	*<1	0.1	N-O	0.2	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	
TC-10	Spring	First monitored in spring 1999						*1	N-O	1.5	0.9	0.5	0.5	0.4	0.6	1.2
TC-11	Inactive	First monitored in spring 2000							*<1	No Flow	No Flow	No Flow	N-O	N-O	N-O	
TC-12	Inactive	First monitored in spring 2000							No Flow	No Flow	N-O	N-O	N-O	N-O	N-O	
IC-1	Inactive	*2	No Flow	No Flow	*<1	No Flow	N-O	N-O	N-O	N-O	No Flow	No Flow	N-O	N-O	N-O	
IC-2	Spring/Seep	*<1	*<1	*<1	*<1	*<1	0.7	N-O	1.2	No Flow	0.5	No Flow	No Flow	No Flow	2.1	
IC-3	Seep	*2	*2	*2-5	*<1	*<1	No Flow	N-O	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	
IC-4	Spring/Seep	*10	*5	*20	*15	*1	*2.5	N-O	8.6	No Flow	3.8	No Flow	No Flow	No Flow	28.4	
IC-5	Inactive	No Flow	No Flow	No Flow	*<1	No Flow	No Flow	N-O	*<1	*<1	No Flow	No Flow	N-O	N-O	N-O	
IC-6	Seep	*5	No Flow	No Flow	*2	*<1	No Flow	N-O	1.3	No Flow	0.5	no flow	0.5	no flow or dry	0.7	
IC-7	Inactive	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	N-O	*<1	*<1	No Flow	No Flow	N-O	N-O	N-O	
IC-8	Inactive	3	No Flow	No Flow	*<1	No Flow	No Flow	N-O	*<1	No Flow	No Flow	No Flow	N-O	N-O	N-O	
IC-9	Inactive	No Flow	*<1	*<1	*<1	No Flow	No Flow	N-O	*<1	No Flow	No Flow	No Flow	N-O	N-O	N-O	

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 Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report



Station	Current Designation	Spring 1995	Spring 1996	Spring 1997	Spring 1998	Fall 1998	Spring 1999	Fall 1999	Spring 2000	Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003
IC-10	Spring	First monitored in spring 2003													16.8
IC-11	Inactive	First monitored in spring 2003													5.2
IC-12	Seep	First monitored in spring 2008													
CF-1	Re-named as CFS and CFS-2	N-O	Variable	Variable	No Flow	*<1	Re-named as CFS and CFS-2								
CF-2		N-O	Variable	Variable	No Flow	*<1	Re-named as CFS and CFS-2								
NP-1	Inactive	First monitored in fall 1998				*<1	No Flow	N-O	No Flow	No Flow	No Flow	No Flow	N-O	N-O	N-O
CFS	Spring	First monitored in fall 1999						1.8	2.6	N-O	2.3	N-O	0.6	0.5	N-O
CFS-2	Spring	First monitored in fall 2002												0.4	N-O
RD-SEEP	Spring	First monitored in spring 2019													
TC-13	Spring	First monitored in spring 2019													
EWS-01	Spring	First monitored in spring 2019													

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Station	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007	Spring 2008	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010
TC-1	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-2	0.3	0.6	No Flow	Flow observed	No Flow	Flow observed	No Flow								
TC-3	0.4	0.9	No Flow	Flow observed	No Flow	Flow observed	No Flow								
TC-4	No Flow	0.4	No Flow	Flow observed	No Flow	Flow observed	No Flow								
TC-5	No Flow	No Flow	No Flow	Flow observed	No Flow	Flow observed	No Flow								
TC-6	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-7	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-8	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-9	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow
TC-10	0.6	1.7	0.6	0.9	0.5	0.7	0.5	0.9	0.5	1	0.5	0.9	0.4	0.8	0.5
TC-11	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-12	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-1	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-2	0.3	0.9	No Flow	Flow observed	No Flow	Flow observed	No Flow								
IC-3	No Flow	No Flow	No Flow	Flow observed	no flow or dry	Flow observed	No Flow								
IC-4	No Flow	1.9	No Flow	20.9	No Flow	15.4	No Flow	37.2	0.4	44.8	0.6	25	0.2	20.3	No Flow
IC-5	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-6	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
IC-7	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-8	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-9	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O

Table 1  
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Station	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007	Spring 2008	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010
IC-10	4.2	13.4	4.9	14.5	4.1	11.9	5.6	15.3	5.7	18.2	4.4	13.6	5.1	13.2	4.6
IC-11	No Flow	No Flow	No Flow	N-O	N-O										
IC-12	First monitored in spring 2008									33.3	0.4	14.3	0.3	6.4	No Flow
CF-1	Re-named as CFS and CFS-2														
CF-2	Re-named as CFS and CFS-2														
NP-1	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
CFS	1.5	3.1	1.7	4.6	1.6	3.4	1.8	2.8	2.5	7.2	3.1	5.7	1.9	5.4	2
CFS-2	0.7	1.1	0.6	2.1	0.6	1.2	0.9	0.4	0.7	4.4	1.6	2.8	1.3	1.6	0.7
RD-SEEP	First monitored in spring 2019														
TC-13	First monitored in spring 2019														
EWS-01	First monitored in spring 2019														

**Table 1**  
**Springs and Seeps Summary of Activity 1995-2021**  
**Pitch Reclamation Project**  
**Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report**



Station	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018
TC-1	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-2	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	Flow observed	N-O	N-O	N-O
TC-3	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	Flow observed	N-O	N-O	N-O
TC-4	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	N-O	N-O	N-O
TC-5	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	N-O	N-O	N-O
TC-6	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-7	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-8	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-9	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	Flow observed	No Flow	N-O	N-O	N-O
TC-10	0.9	0.4	0.6	0.5	0.5	0.6	1	0.5	1.1	0.4	0.5	0.4	0.7	0.3	0.9
TC-11	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
TC-12	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-1	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-2	Flow observed		Flow observed	0.6	N-O	N-O									
IC-3	Flow observed		Flow observed	N-O	N-O										
IC-4	40	No Flow	No Flow	No Flow	3.3	No Flow	37.5	No Flow	30	No Flow	20	0.7	18.5	0.6	2.31
IC-5	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-6	No Flow	No Flow	No Flow	No Flow	0.7	No Flow	1.4	No Flow	N-O	N-O	N-O				
IC-7	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-8	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-9	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O

Table 1  
 Springs and Seeps Summary of Activity 1995-2021  
 Pitch Reclamation Project  
 Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report

Station	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018
IC-10	17.4	5.5	6.3	3.2	10	5	14	5.5	37.5	5	12.5	4.6	5.5	5	5
IC-11	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
IC-12	17.6	0.4	No Flow	No Flow	4	No Flow	33.3	No Flow	14	No Flow	42.3	1.4	12.9	1.2	1.67
CF-1	Re-named as CFS and CFS-2														
CF-2	Re-named as CFS and CFS-2														
NP-1	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O	N-O
CFS	5.7	0.1	1.9	1.2	3	1.2	3.1	1.7	5	1.6	4.8	1.2	3.6	1.3	0.64
CFS-2	2.7	0.8	0.8	0.5	2	0.8	3.9	0.9	3	1.1	5.2	Flow observed	3.9	1.5	0.94
RD-SEEP	First monitored in spring 2019														
TC-13	First monitored in spring 2019														
EWS-01	First monitored in spring 2019														

Table 1  
 Springs and Seeps Summary of Activity 1995-2021  
 Pitch Reclamation Project  
 Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report

Station	Fall 2018	Spring 2019	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021
TC-1	N-O	N-O	N-O	No Flow	N-O	N-O	New Drainage Ditch
TC-2	N-O	N-O	N-O	Flow observed	N-O	N-O	No Flow
TC-3	N-O	N-O	N-O	Flow observed	N-O	N-O	No Flow
TC-4	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
TC-5	N-O	Flow observed	N-O	Flow observed	N-O	0.078	No Flow
TC-6	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
TC-7	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
TC-8	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
TC-9	N-O	Flow observed	N-O	Flow observed	N-O	0.065	No Flow
TC-10	0.48	1	N-O	0.5	0.21	0.43316	0.375
TC-11	N-O	N-O	N-O	No Flow	N-O	N-O	N-O
TC-12	N-O	N-O	N-O	No Flow	N-O	N-O	N-O
IC-1	N-O	N-O	N-O	Flow observed	N-O	N-O	No Flow
IC-2	N-O	Flow observed	N-O	Flow observed	N-O	Flow observed	Flow observed
IC-3	N-O	N-O	N-O	Flow observed	N-O	0.0156	Flow observed
IC-4	No Flow	3	N-O	Flow observed	N-O	2.34	0.6
IC-5	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
IC-6	N-O	Flow observed	N-O	No Flow	N-O	N-O	No Flow
IC-7	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
IC-8	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
IC-9	N-O	N-O	N-O	Flow observed	N-O	N-O	No Flow

Table 1  
 Springs and Seeps Summary of Activity 1995-2021  
 Pitch Reclamation Project  
 Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report



Station	Fall 2018	Spring 2019	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021
IC-10	3.18	10	2	10.8	4.58	6.864	2.12
IC-11	N-O	N-O	N-O	No Flow	N-O	N-O	No Flow
IC-12	Flow observed	7.69	Flow observed	8.25	0.125	0.78	0.47
CF-1	Re-named as CFS and CFS-2						
CF-2	Re-named as CFS and CFS-2						
NP-1	N-O	N-O	N-O	N-O	N-O		No Flow
CFS	2.27	N-O	1.5	2.7	1.44	1.3	0.5
CFS-2	1.15	N-O	3.4	1.4	2.53	0.39	1.06
RD-SEEP	First monitored in 2019	Flow observed	No flow	No Flow	No Flow	Flow observed	No Flow
TC-13		Flow observed	N-O	No Flow	N-O	0.0195	No Flow
EWS-01		N-O	Flow observed	Flow observed	N-O	Flow observed	Flow observed

**Table 1**  
**Springs and Seeps Summary of Activity 1995-2021**  
**Pitch Reclamation Project**  
**Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report**



**Notes:**

1. Flow is presented in gallons per minute.
2. \* indicates that flows are visually estimated.
3. The words "Flow observed" indicate flow is below measurable quantity or not accessible for measurement.
4. The words "No flow" indicate the feature was observed with no flow.

**Acronyms and Abbreviations:**

CF/CFS = feature located at south wall of North Pit Lake within the Chester Fault Zone

IC = feature located in Indian Creek drainage

N-O = feature not observed or accessible

NP = feature located at south wall of North Pit Lake

TC = feature located in the Tie Camp Creek drainage

**Table 2**  
**Seasonal Water Level Readings in Rock Dump Piezometers**  
**Pitch Reclamation Project**  
**Colorado Mined Land Reclamation Board - 2021 Annual Reclamation Report**



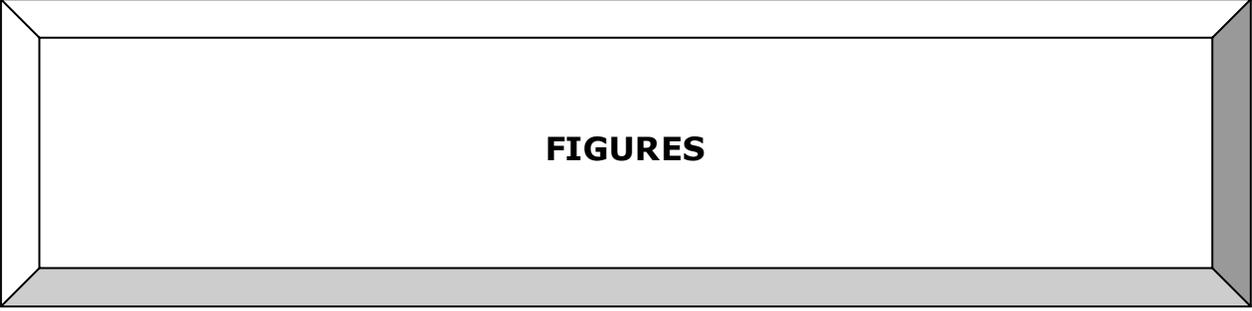
Ground Surface Elevation (ft amsl)	10631.50	10603.80	10523.60	10379.95	10373.40	10304.72	10305.55	10305.39	10304.64	10304.09	10043.60	10043.40	10043.29	10040.85	10044.42	10373.00
Location	10630	10600 <sup>a</sup>	10525 <sup>a</sup>	10370R	10360 <sup>a</sup>	10300R	RD-06	RD-07	RD-08	RD-09	RD-01	RD-02	RD-03	RD-04	RD-05	TC10375 <sup>a</sup>
Piezometer Type	M	M	M	M	M	I/M <sup>(c)</sup>	E	E	E	M	E	M				
High Flow 2017	10436.5	10363.8	10301.2	10185.7	10156.2	10125.0	<i>10114.2</i>	<i>10115.0</i>	<i>10115.7</i>	<i>10100.1</i>	10028.3	10027.3	10028.7	10025.2	<i>10025.8</i>	10210.1
Low Flow 2017	10431.1	10356.7	10297.6	10184.1	10154.9	10116.4	10110.4	10117.2	10119.8	10116.5	10024.5	10027.3	10024.7	10021.4	10027.9	10206.6
High Flow 2018	10451.5	10357.3	10303.2	10183.7	<sup>b</sup>	10117.7	10114.6	10113.6	10118.6	10117.5	10030.0	10024.6	10025.1	10022.5	10025.6	10207.3
Low Flow 2018	10432.7	10355.7	10296.6	10177.6	<sup>b</sup>	10116.0	10119.7	10113.7	10158.0	10115.5	10022.0	10022.7	10022.0	10020.5	10026.7	10205.2
High Flow 2019	10431.9	10357.4	10304.2	10184.2	<sup>b</sup>	10120.8	10124.2	10123.5	10122.3	10118.7	10038.7	10027.9	10029.3	10024.9	10040.4	10210.7
Low Flow 2019	10430.5	10355.3	10300.8	10183.6	<sup>b</sup>	10117.2	--	10112.4	10116.2	10115.5	10028.1	10024.5	10024.6	10022.5	10029.3	10211.2
High Flow 2020	10430.8	10359.4	10305.9	10194.6	<sup>b</sup>	10119.8	10120.7	10119.9	10118.6	10115.0	10027.7	10026.2	10028.2	10023.0	10038.1	10207.6
Low Flow 2020	10431.6	10353.0	10298.3	10180.5	<sup>b</sup>	10119.4	10115.0	10113.2	10116.2	10117.5	10024.1	10024.0	10024.1	10022.6	10022.8	10204.5
High Flow 2021	10429.6	<sup>b</sup>	10301.4	10181.4	<sup>b</sup>	10116.7	10115.6	10106.9	10113.9	10113.5	10022.4	10022.2	10024.5	10021.2	10031.2	NO WL data collected
Low Flow 2021	No WL data	<sup>b</sup>	10295.4	10177.2	<sup>b</sup>	10116.2	10112.6	10111.9	10113.2	10113.0	10022.4	10021.5	10022.8	10020.3	10027.9	10204.3

**Notes:**

- <sup>a</sup> Estimated casing height of piezometer used because of a lack of survey data.
- <sup>b</sup> Water level not taken because of obstruction in the piezometer.
- <sup>c</sup> Operated as injection well from 2017-2018 and a monitoring well from 2019-2020
- 1. High-flow monitoring typically occurs in late May of each year.
- 2. Low-flow monitoring typically occurs in early October of each year.
- 3. *Italics indicates injection wells were monitored outside of typical high-flow monitoring period.*

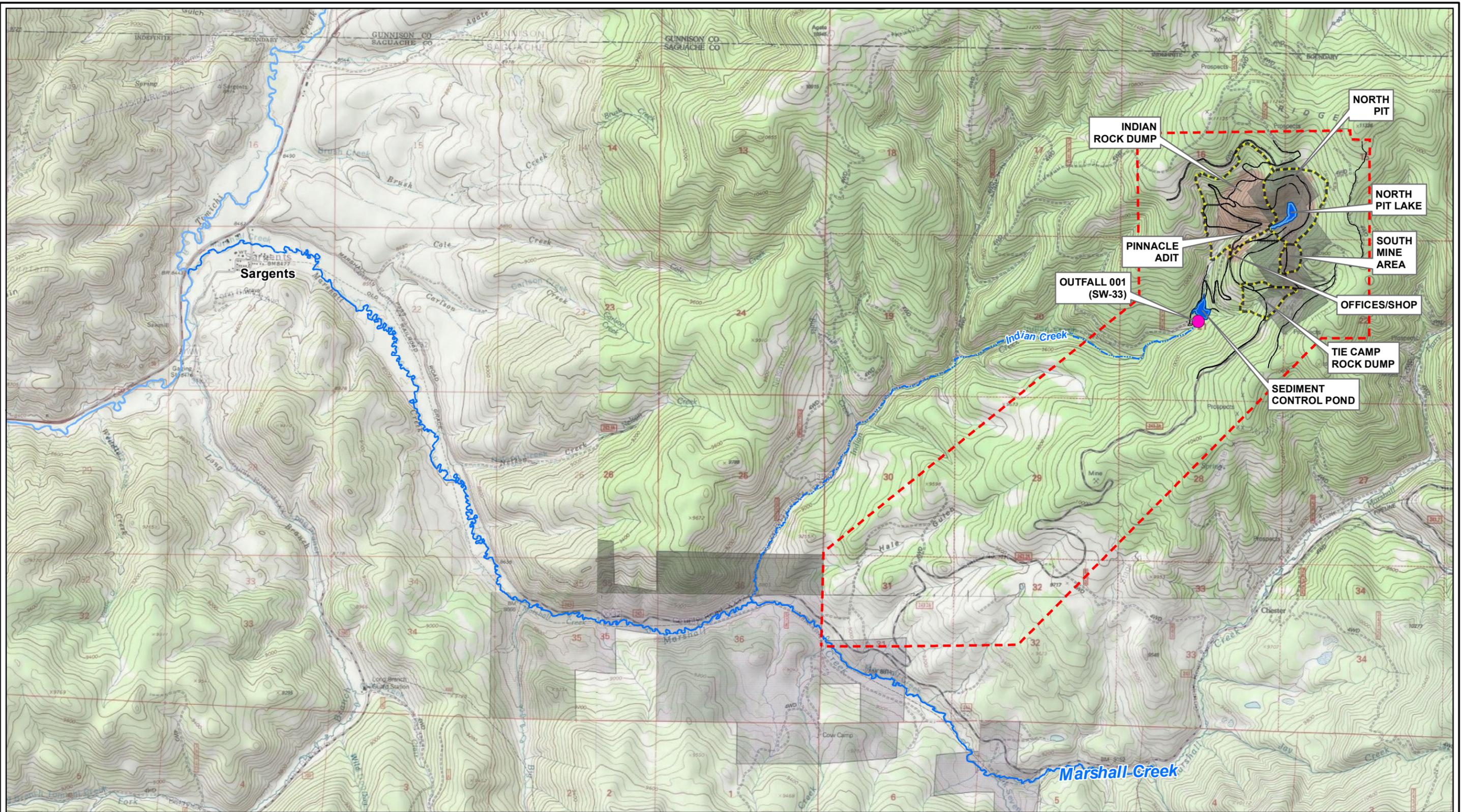
**Acronyms and Abbreviations:**

- =
- E = extraction
- ft amsl = feet above mean sealevel
- I = injection
- M = monitoring
- WL =



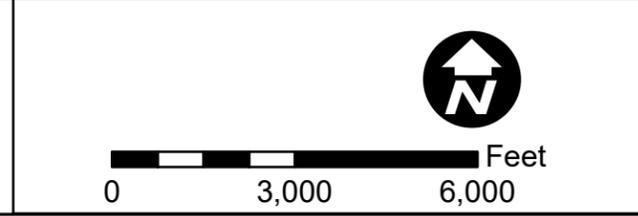
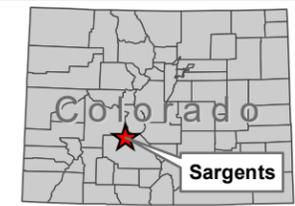
**FIGURES**

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- Legend**
- Sample Points
  - Colorado Division of Reclamation, Mining, and Safety Permit Boundary
  - Facility Areas
  - Marshall Creek
  - - - Indian Creek
  - Tomichi Creek

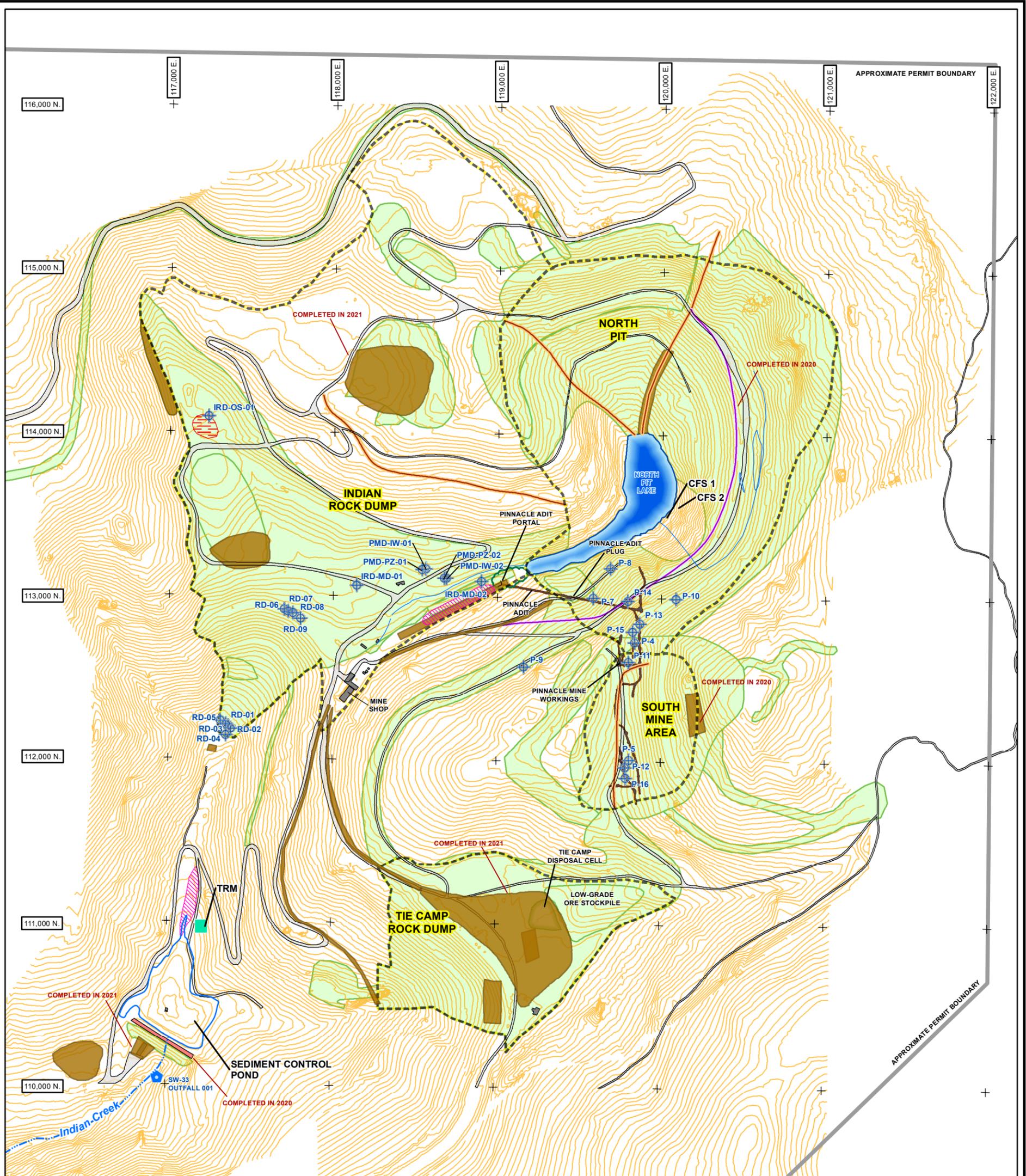
**Notes:**  
 Source: USGS 7.5' Quadrangles of Sargents, Chester, Sargents Peak, and Paholone Peak, Colorado



**Legend**  
 HOMESTAKE  
 PITCH RECLAMATION PROJECT  
 HOMESTAKE MINING COMPANY  
 SARGENTS, COLORADO

**LOCATION MAP**

**ARCADIS** | **FIGURE 1**



**Legend**

- |  |   |  |                                     |
|--|---|--|-------------------------------------|
|  | Piezometers                                       |  | Marsh Area                          |
|  | Colorado Discharge Permit System Compliance Point |  | Clay Stockpile                      |
|  | Facility Areas                                    |  | Drainage Improvement                |
|  | Buildings   |  | Underground Workings                |
|  | Clay-Fabric-Rock Lined Channel                    |  | Sediment Pond Embankment            |
|  | Riprap Lined Channel                              |  | Disposal Cell Tie Camp              |
|  | Approximate Permit Boundary                       |  | Road                                |
|  | Areas of Earth Structure Repair                   |  | Treatment Residuals Management Area |
|  | Areas Revegetated                                 |  |                                     |



**Notes:**

1. Base topography provided by Homestake Mining Company established in 1994.
2. Revegetated areas prior to 1998 provided by Golder Associates.
3. For illustrative purposes.

**PITCH RECLAMATION PROJECT**  
 HOMESTAKE MINING COMPANY  
 SARGENTS, COLORADO

**RECLAMATION AREAS**

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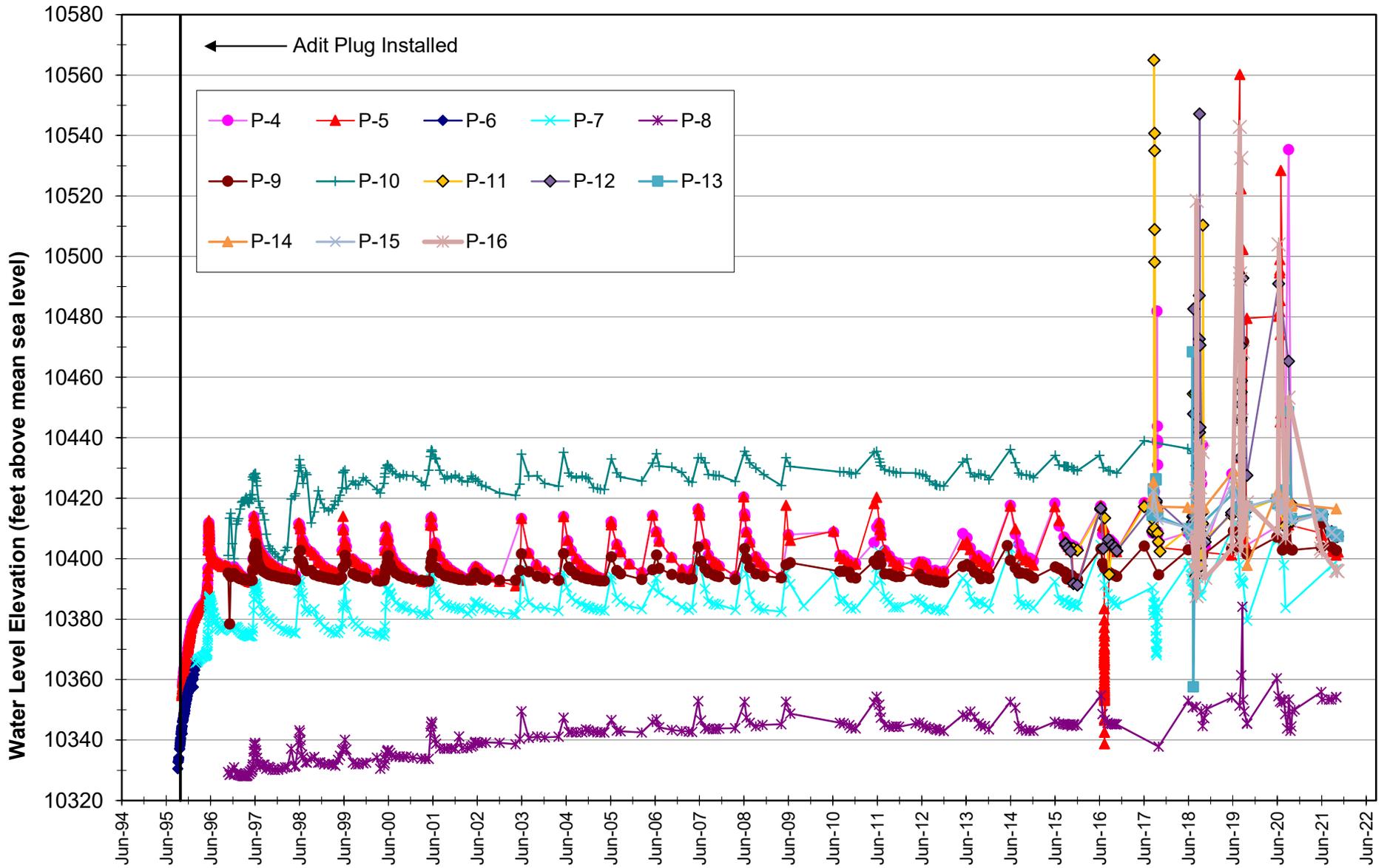
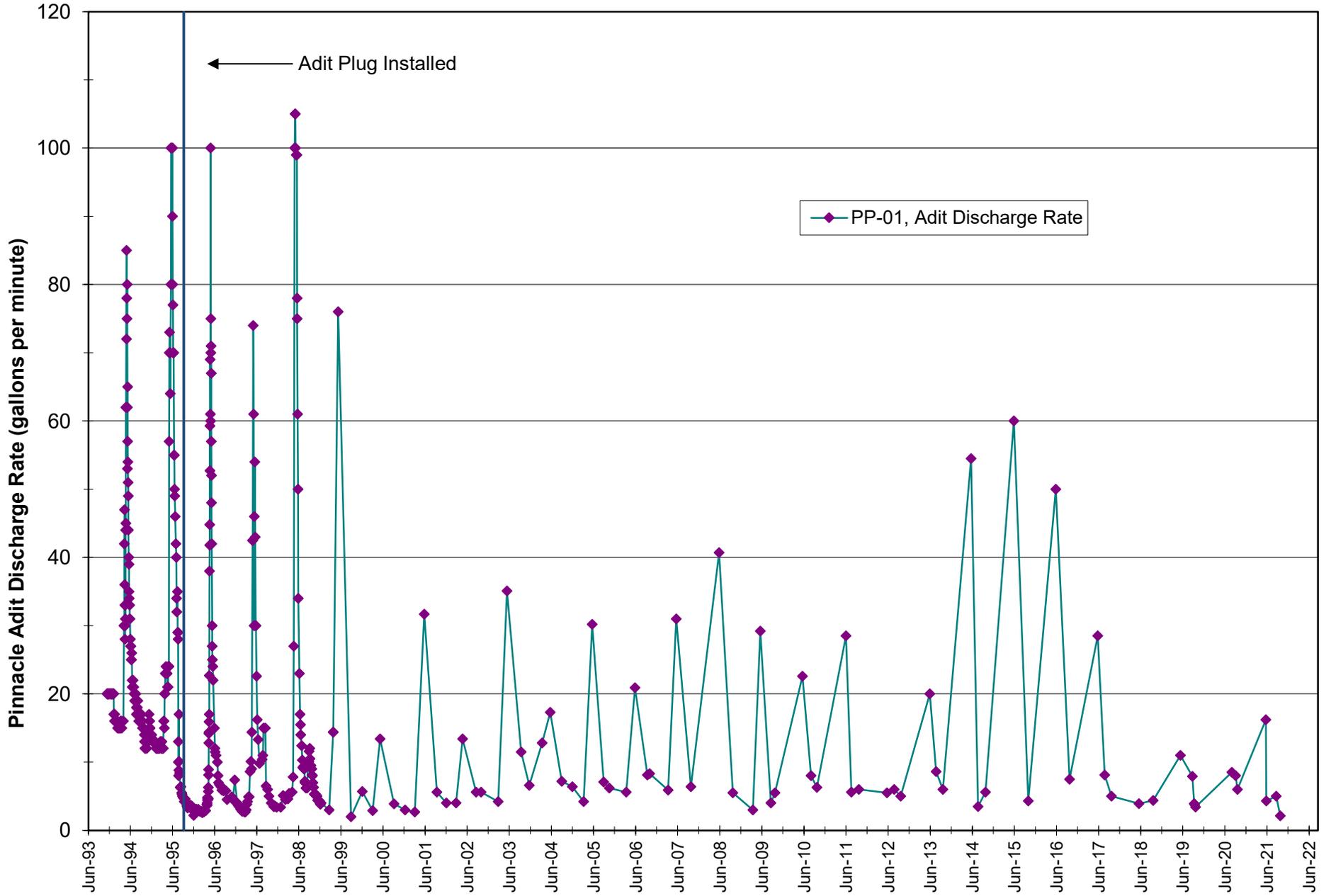


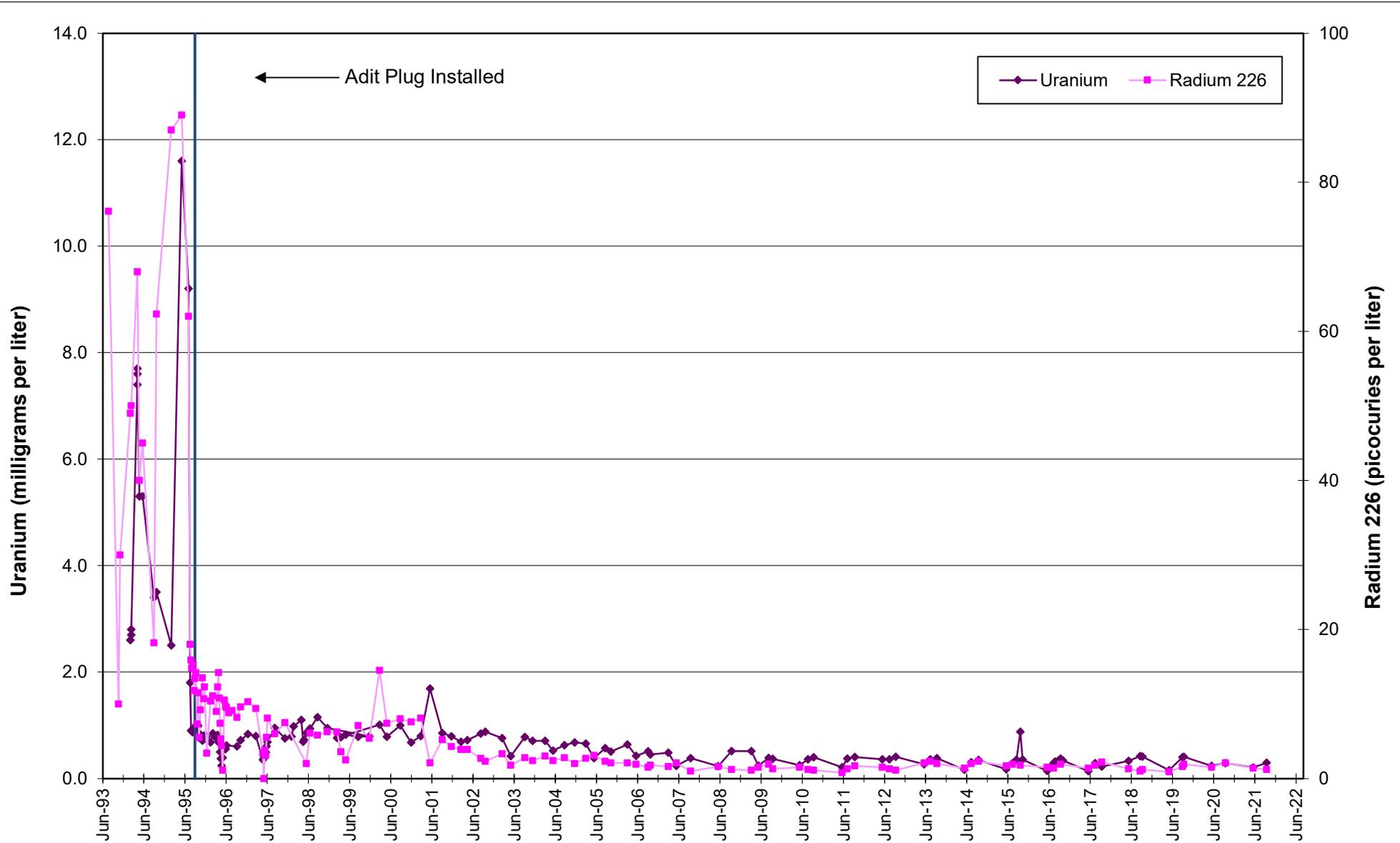
Figure 4a: Water Level Elevation Data in P - Wells 1995-2021





**PITCH RECLAMATION PROJECT  
HOMESTAKE MINING COMPANY  
2021 Annual Reclamation Report**

**Figure 5: Hydrograph of Pinnacle Adit Discharge**



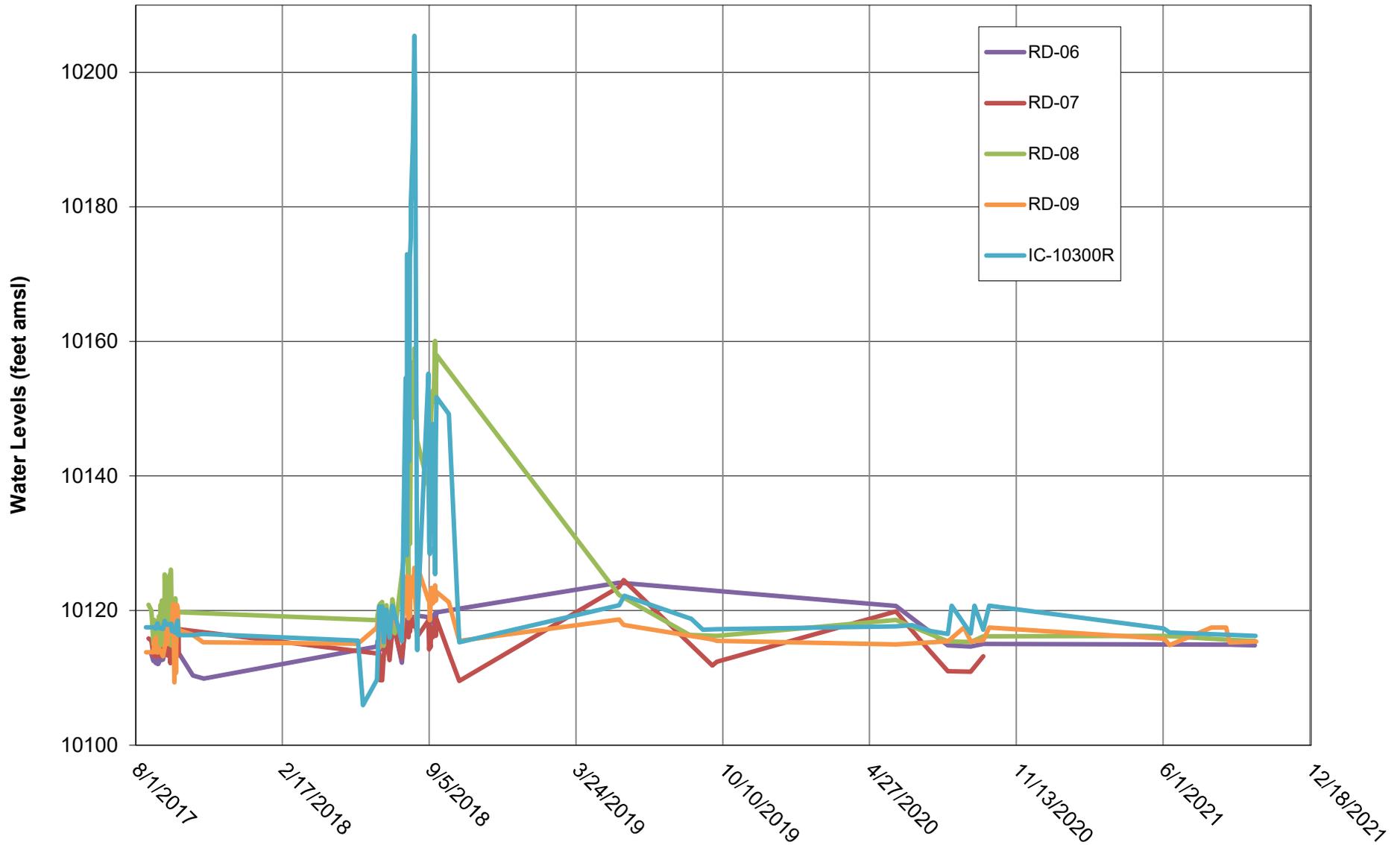
PITCH RECLAMATION PROJECT  
 HOMESTAKE MINING COMPANY  
 2021 Annual Reclamation Report

**Figure 6: Pinnacle Adit Discharge, Uranium and Radium Concentrations**



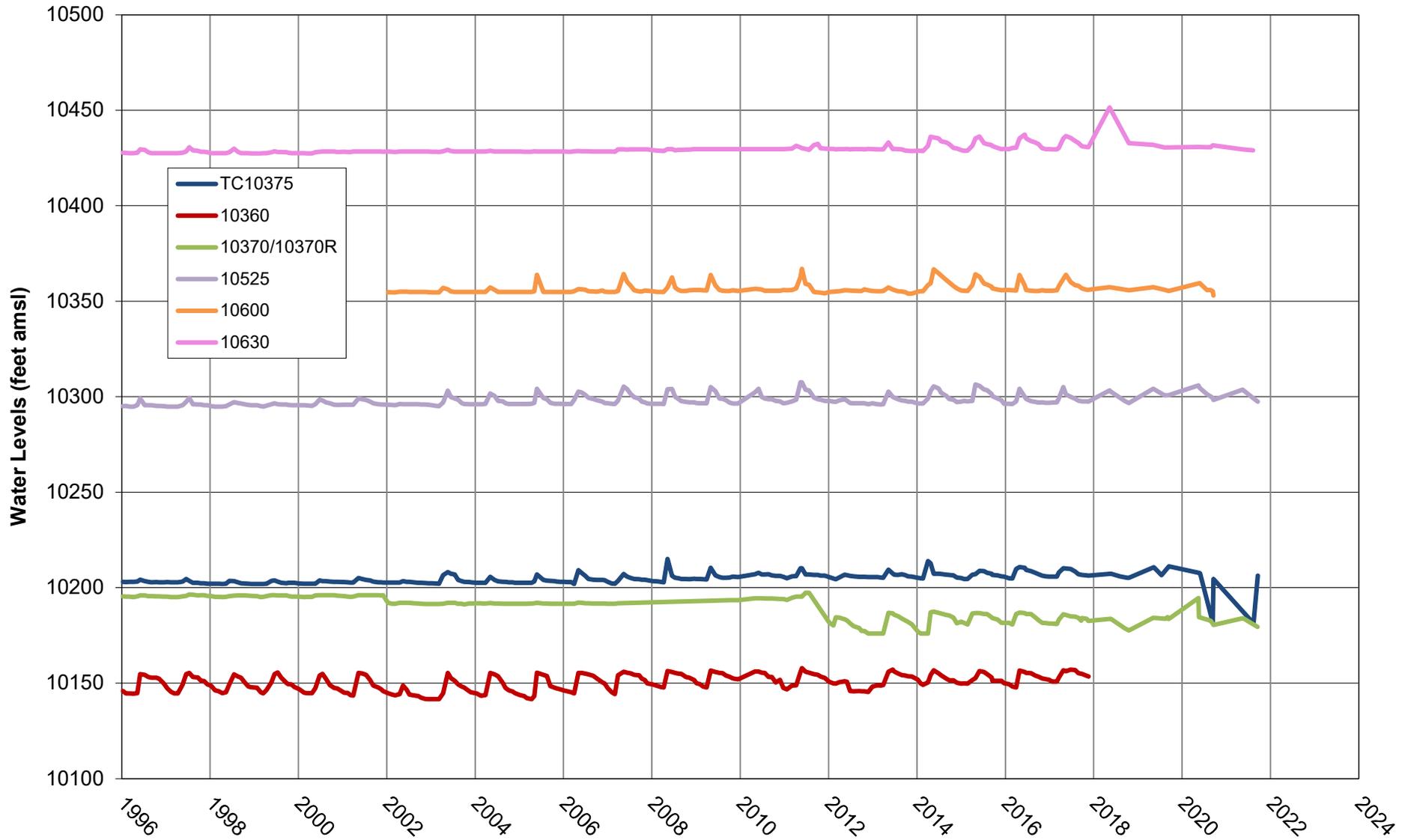
PITCH RECLAMATION PROJECT  
 HOMESTAKE MINING COMPANY  
 2021 Annual Reclamation Report

**Figure 7: Historical Water Levels in Piezometers at the Toe of Indian Rock Dump**



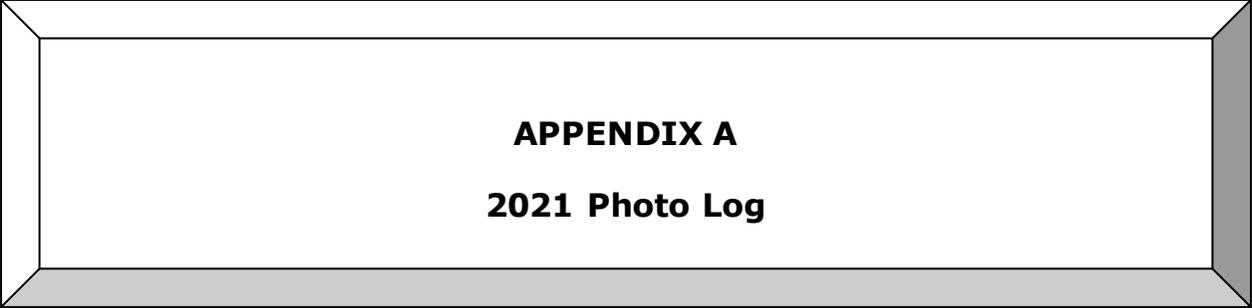
PITCH RECLAMATION PROJECT  
 HOMESTAKE MINING COMPANY  
 2021 Annual Reclamation Report

**Figure 8: Historical Water Levels in Piezometers at the 10300 Level of Indian Rock Dump**



**PITCH RECLAMATION PROJECT**  
**HOMESTAKE MINING COMPANY**  
**2021 Annual Reclamation Report**

**Figure 9: Historical Water Levels in Piezometers at Indian Rock Dump and Tie Camp Rock Dump**



**APPENDIX A**  
**2021 Photo Log**

**APPENDIX A - SITE PHOTOGRAPH LOG**

Pitch Reclamation Project  
Sargents, CO

	<p><b>Photograph: 1</b></p> <p><b>Description:</b> Drone photograph of Pitch Mine Site, facing north</p> <p><b>Location:</b> Site</p> <p><b>Date:</b> 9/18/2021</p>
	<p><b>Photograph: 2</b></p> <p><b>Description:</b> Limestone quarry sorting and borrow activity</p> <p><b>Location:</b> Limestone quarry</p> <p><b>Date:</b> 6/18/2021</p>

## APPENDIX A - SITE PHOTOGRAPH LOG

Pitch Reclamation Project  
Sargents, CO



**Photograph: 3**

**Description:**  
Limestone quarry activity

**Location:**  
Limestone quarry

**Date:** 6/18/2020



**Photograph: 4**

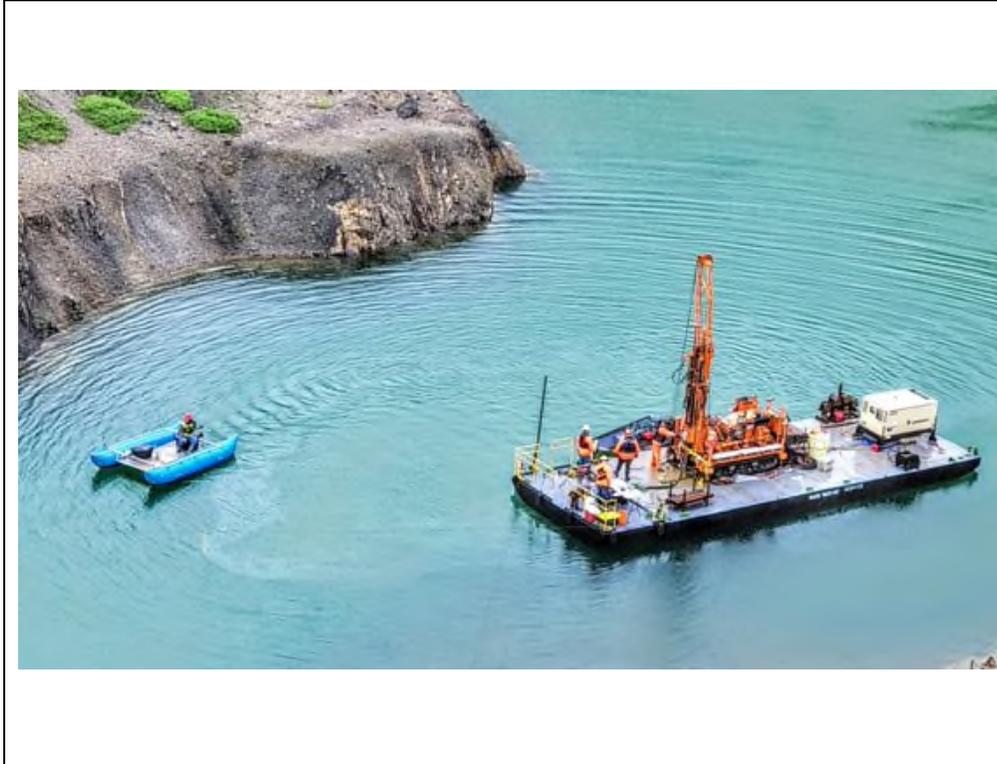
**Description:**  
IRD earthwork

**Location:**  
IRD

**Date:** 7/13/2020

**APPENDIX A - SITE PHOTOGRAPH LOG**

Pitch Reclamation Project  
Sargents, CO

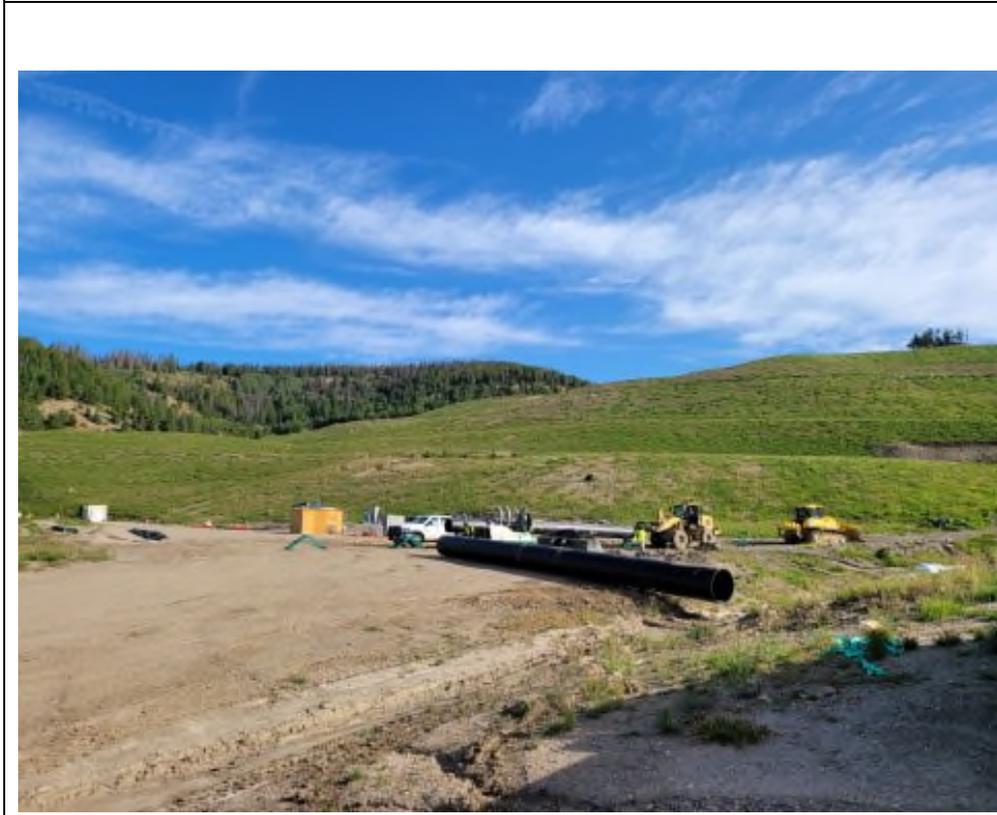


**Photograph: 5**

**Description:**  
NPL well installations

**Location:**  
NPL

**Date:** 7/14/2020



**Photograph: 6**

**Description:**  
Mine shop to Tie Camp  
Drainage culvert

**Location:**  
Mine shop looking at  
IRD

**Date:** 8/10/2020

**APPENDIX A - SITE PHOTOGRAPH LOG**

Pitch Reclamation Project  
Sargents, CO

	<p><b>Photograph: 7</b></p> <p><b>Description:</b> North Pit Diversion (right) maintenance area and constructed marsh areas.</p> <p><b>Location:</b> NPL</p> <p><b>Date:</b> 8/13/2020</p>
	<p><b>Photograph: 8</b></p> <p><b>Description:</b> Tie Camp stormwater control modification</p> <p><b>Location:</b> Tie Camp Disposal area</p> <p><b>Date:</b> 8/13/2020</p>

**APPENDIX A - SITE PHOTOGRAPH LOG**

Pitch Reclamation Project  
Sargents, CO

	<p><b>Photograph: 9</b></p> <p><b>Description:</b> New IRD Culvert pipe staged at mine shop</p> <p><b>Location:</b> NPL</p> <p><b>Date:</b> 8/18/2020</p>
	<p><b>Photograph: 10</b></p> <p><b>Description:</b> Tie Camp stormwater control modification</p> <p><b>Location:</b> Tie Camp Disposal area</p> <p><b>Date:</b> 8/18/2020</p>

**APPENDIX A - SITE PHOTOGRAPH LOG**

Pitch Reclamation Project  
Sargents, CO

	<p><b>Photograph: 11</b></p> <p><b>Description:</b> South mine reseeding</p> <p><b>Location:</b> South mine area</p> <p><b>Date:</b> 9/14/2020</p>
	<p><b>Photograph: 12</b></p> <p><b>Description:</b> New area of disturbance. Tie Camp Drainage concrete modification.</p> <p><b>Location:</b> Tie Camp Drainage</p> <p><b>Date:</b> 9/23/2020</p>

## APPENDIX A - SITE PHOTOGRAPH LOG

Pitch Reclamation Project  
Sargents, CO



**Photograph: 13**

**Description:**  
Mine Shop catchment

**Location:**  
Mine Shop

**Date:** 10/4/2020



**Photograph: 14**

**Description:**  
Tie Camp to Mine Shop  
drainage

**Location:**  
Southeast of Mine  
Shop

**Date:** 10/4/2020

**APPENDIX B**

**Annual Inclinator Monitoring Report**

Strata-Geo LLC  
590 Oak Road  
Ridgway, CO 81432  
Phone (970) 901-2263

November 30, 2021  
Project No.: File

Dave Wykoff  
Homestake Mining Company  
112 Marshall Street  
PO Box 40  
Sargents, CO 81248

Dear Mr. Wykoff,

**Re: 2021 Annual Inclinometer Monitoring Report**

Please find attached the 2021 annual inclinometer and geotechnical monitoring report associated with the Pitch Reclamation Project for your review and comment.

We trust it this meets your current requirements.

Yours sincerely,

**Strata-Geo**

**per:**

*Mike Henderson*



Michael Henderson, PE, P. Eng.  
Principal Engineer – Strata-Geo



**Homestake Mining Company  
Pitch Mine  
2021 Annual Inclinometer Monitoring Report  
Project No. 171001**

---



*Prepared by:*

**FORTE DYNAMICS, INC**  
120 Commerce Drive  
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Revision	Date	Status	Prepared By	Checked By	Approved By
REV 0	113021	Draft	G. Horn	R.Morlan	M.Henderson

---

## Statement of Report

The report enclosed entitled “2021 Annual Inclinometer Monitoring Report” has been prepared for the exclusive use of Homestake Mining Company (HMC). No third party shall be entitled to use this report without written consent of HMC, Strata-Geo LLC and Forte Dynamics, Inc (Forte). The use of any and all information contained herein shall be at the sole risk of the user regardless of any fault or negligence of HMC, Strata-Geo, or Forte.

This report has been prepared under the direct supervision of Michael Henderson, P.E. of Strata-Geo, LLC (Strata-Geo), with the assistance of Roy Morlan, P.G. and Geoff Horn of Forte. The analyses presented have been completed according to the project information provided by Strata-Geo.

## Table of Contents

<b>1. Introduction</b> .....	<b>5</b>
1.1 Location and Ownership .....	5
1.2 Site Background.....	6
1.3 Scope .....	6
<b>2. Field Methodology</b> .....	<b>7</b>
2.1 Inclinometer Overview .....	7
2.2 2.3 Inclinometer Readings .....	8
2.3 Survey Monument Readings .....	8
<b>3. Data Validation</b> .....	<b>9</b>
3.1 Checksums .....	9
3.2 Checksums Standard Deviation .....	9
3.2.1 Baseline Standard Deviations.....	9
3.2.2 2021 Standard Deviations.....	9
<b>4. Data Corrections</b> .....	<b>10</b>
4.1 Conventional Survey Methodology .....	10
4.2 Depth Positioning and Measurement Technique Errors.....	10
4.3 Unimplemented Corrections .....	11
<b>5. Data Analysis</b> .....	<b>11</b>
5.1 Inclinometer I98-1 .....	11
5.2 Inclinometer I98-2 .....	11
5.3 Inclinometer I98-3 .....	11
5.4 Inclinometer IN-1.....	12
5.5 Inclinometer IN-2.....	12
5.6 Inclinometer IN-3.....	12
5.7 Survey Monuments.....	12
<b>6. Conclusions and Recommendations</b> .....	<b>12</b>
<b>7. Closure</b> .....	<b>13</b>

## Figures

Figure 1-1: Site Location and Inclinometers.....	5
Figure 2-1: Inclinometer Probe and Casing Directions.....	7

## Tables

Table 2-1: Inclinometer Installation Details.....	8
Table 3-1: Manufacturer Recommended Standard Deviations.....	8
Table 3-1: Measured Standard Diviations.....	8
Table 2-1: Inclinometer Installation Details.....	8

## Appendicies

Appendix A: Inclinometer Plots

Appendix B: Inclinometer Photographs

Appendix C: Survey Data Provided by North Star

# 1. Introduction

## 1.1 Location and Ownership

The Pitch Mine is owned and operated by Homestake Mining Company (HMC) as a subsidiary of Barrick Gold Corporation. The site is located in Saguache County within the Gunnison National Forest. It is located five miles East of Sargents, Colorado. Site Location is shown on Figure 1-1.

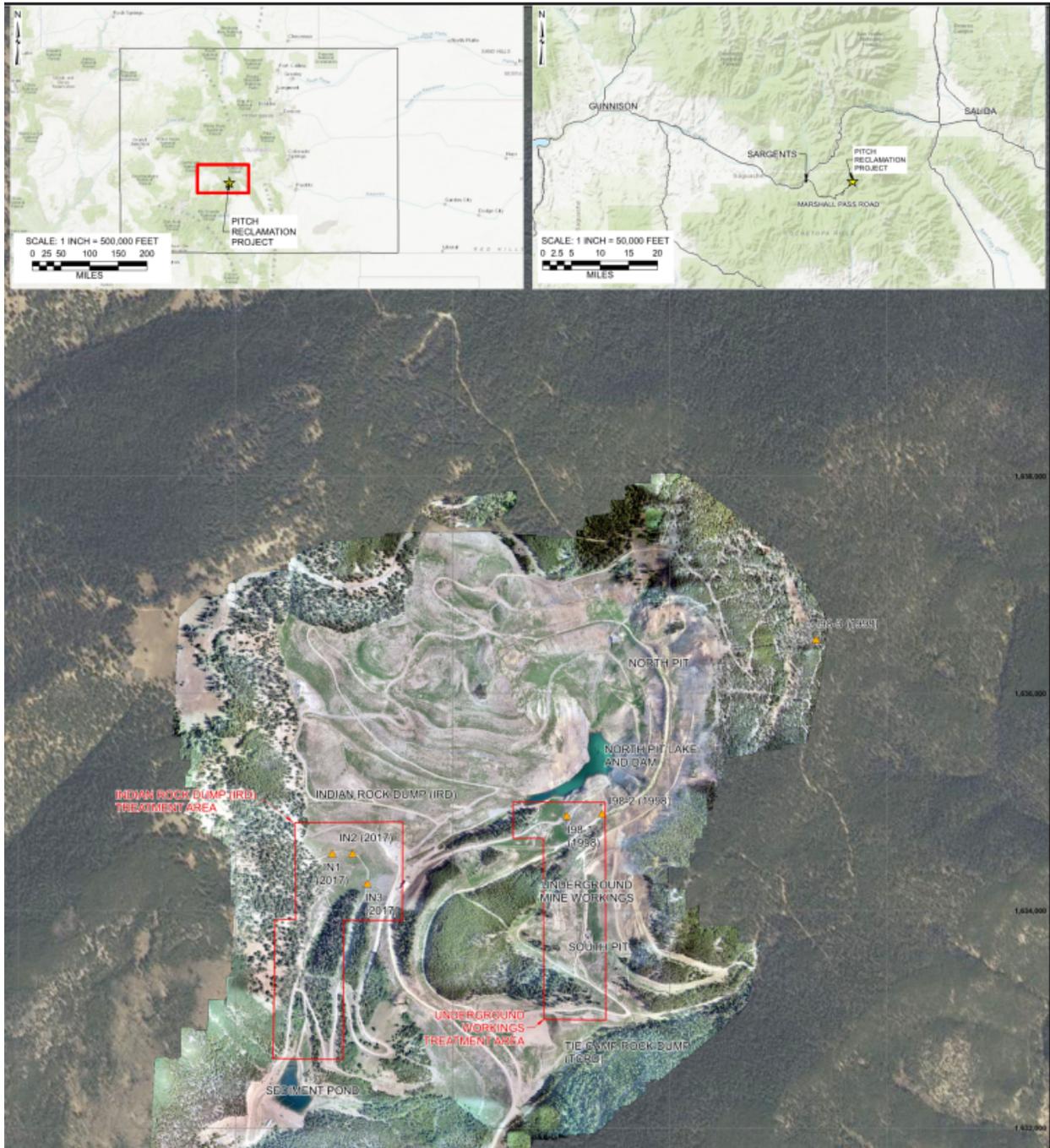


Figure 1-1: Site Location and Location of Inclinometers

## 1.2 Site Background

Mineral extraction began in 1957 using underground mining techniques. Tunnel mining took place from 1958–1962. Production from the Pitch Mine continued from 1968 to 1972 (BGC, 2016). HMC acquired the Pitch Mine site from Pinnacle in 1972. Pitch Mine was mined with open pit extraction techniques from 1979 to 1984 from the North and South Pits. The North Pit was developed during open pit operations and allowed to fill with groundwater after mining ceased, whereas South Pit never created a lake. Signs of slope instability began in 1980 within the East Wall of the North Pit. The most significant ground movement occurred in October 1983 (AAI, 1999). Mining was halted at the Pitch Mine in 1984 due to low economic factors (BGC, 2016). The facility has been undertaking reclamation activities since 1984.

The Pitch Mine is located on the western flank of the Sawatch Range within the Southern Rocky Mountains physiographic province. The site stratigraphy includes Precambrian high-grade metamorphic rocks and younger granitic and pegmatite intrusive dikes and veins which cross-cut the older bedrock, Paleozoic sedimentary rocks (late Cambrian to Pennsylvanian), and Cenozoic volcanic rocks (Olsen, 1988; Nash, 1988; Olson, 1983; Goodknight and Ludlum, 1981). Surficial geology is a mixture of colluvium from Oligocene-aged water laid and welded volcanic tuffs, Pleistocene glacial deposits (till and moraines) and Holocene age colluvium, talus, landslide, and fluvial deposits (AAI, 1999). The main geologic structure at the site is the Chester fault zone and associated syncline associated with Laramide Orogeny deformation (USGS, 2011). The North Chester fault zone is a steeply dipping reverse fault that trends roughly north-south with approximately 1,400 ft of vertical displacement along the western flank of the southern Sawatch Range. Uranium mineralization at the Project occurs within a zone of fractured and brecciated Belden Formation and Leadville Dolomite on the footwall of the Chester fault (Olsen, 1988). Subsequent transverse-normal faults cut the Chester fault along a northeast-southwest trend (AAI, 1999).

Engineered structures remain on the premises though production has ceased. Some of these structures include:

- North Pit
- North Pit Lake and Dam
- South Pit
- Underground Mine Workings
- Indian Rock Dump
- Tie Camp Rock Dump
- Sediment Pond

## 1.3 Scope

Strata-Geo is the Engineer of Record (EOR) for the site, assisting HMC in their ongoing reclamation efforts at the Pitch Mine in compliance with applicable state, local, federal, and enterprise requirements. As part of the EOR role, Strata-Geo provides routine geotechnical monitoring and engineering services as needed. The EOR will coordinate and collaborate with the local company representative and prime vendors, following the current Lowest Practical Limit (LPL) and Best Management Practices (BMP) programs, relevant to the Project based on the Colorado discharge Permit System permit (Arcadis, 2017).

For the 2021 instrument report Forte as a sub-contractor to Strata-Geo, provided on-site readings of the inclinometers on October 22. North Star Surveying, Inc (North Star) collected reading of survey monument points. North Star compiled a table with the monitoring data comparing it to the 2020 readings. This table was provided to Forte for inclusion in this report on November 18. A copy of this table is included in Appendix C.

Inclinometer and survey monument locations are shown on Figure 1-1.

## 2. Field Methodology

### 2.1 Inclinometer Overview

The inclinometer casings at site were installed in a near-vertical borehole. The inclinometer probe used was provided by HMC and employs two force-balanced servo-accelerometers to measure tilt in two planes of the inclinometer wheels (“A” axis) and perpendicular to the wheels (“B” axis) (Slope Indicator, 2011). The drawings in Figure 2-1 show the probe from the side, top, and in the casing.

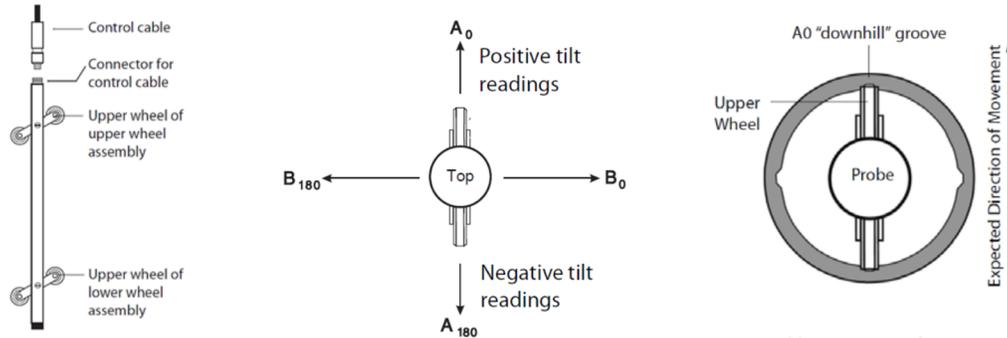


Figure 2-1: Inclinometer Probe and Casing directions

There are six inclinometer casings installed at the Pitch Mine that are actively being surveyed. Three were installed in 1998 to monitor deformation in the east and south walls of the North Pit (Knight Piesold, 2017). These three survey locations are:

- 198-1 is positioned on the lower bench of the south wall
- 198-2 is positioned on the upper bench of the south wall
- 198-3 is positioned behind the head scarp above the east wall

At the time of surveying (10/29/2021), Forte Dynamics was unable to access 198-3 due to excessive snow. 198-3 will be surveyed in 2022.

Three inclinometer casings were installed in 2017 in the IRD. These three survey locations are:

- IN-1 is positioned on the western side of the IRD
- IN-2 is positioned in the middle of the IRD
- IN-3 is positioned on the eastern side of the IRD

The installation details for each inclinometer are included in Table 2-1. The installation details were verified by a desktop review and field measurements in 2017 (BGC, 2017).

Inclinometer Name	Depth of Hole (ft)	Inclinometer Probe Starting Depth (ft)	Inclinometer Probe Ending Depth (ft)	Stickup Height of Casing Above Ground Surface (ft)	Length of Casing (ft)	Depth Read on Cable when Starting (ft)	Depth Read on Cable when Ending (ft)	Error (in)	A0 Azimuth (°)
198-1	148	146.5	6.5	3.5	151.5	150	10	0.5	300
198-2	256	253	1	3	259	256	4	0.8	315
198-3	300	299	1	3	303	302	4	0.9	255
IN-1	63	61	11	4	67	64	14	0.2	176
IN-2	137.5	136.5	10.5	2.5	139	138	12	0.4	196
IN-3	24	22	10	3	26	24	12	0.1	268

Table 2-1: Inclinometer Installation Details

## 2.2 Inclinometer Readings

A Durham Geo-Enterprises Inc. (Durham) Digitilt Classic Inclinometer System was used to obtain inclinometer readings. This system includes a Digitilt DataMate II (P/N: 50310900, S/N: 1730028) readout computer for data collection, a Digitilt Classic Control cable (cable), and a Digitilt probe (probe). HMC has maintained use of a Digitilt Classic Inclinometer system since the first inclinometer readings and during all subsequent annual readings. Prior to 2017, an older-model Digitilt DataMate I was used as the readout device for annual readings. Inclinometers I98-1, I98-2, and I98-3 had past data retained in the original data logger since the inclinometer casings installation in 1998. However, data corruption in 2003 resulted in the inability to use this data prior to August 8, 2007 (I98-1) and August 1, 2006 (I98-2 and I98-3). Surveys performed on these dates therefore comprise the current baseline surveys (Knight Piesold, 2017). HMC switched to a Digitilt DataMate II in 2017 to avoid future data corruption and to be compatible with newer operating systems for data processing purposes. The most recent survey on all inclinometers was collected on October 29<sup>th</sup>, 2021. DigiPro 2 (version 2.12.4) software was used to process and plot inclinometer data.

A manufacturer-approved pulley assembly was used to lower and raise the inclinometer probe during readings of I98-1 and I98-2 (Appendix B, Photo 04). The pulley assembly rests on top of the inclinometer casing and is clamped to the top of the casing using two wingnuts. A quarter inch of potential movement is possible between readings if the pulley assembly is not well-seated on the casing during surveys.

The tops of the inclinometer casings are below the top of the standpipe for IN-1, IN-2 and IN-3. This spacing does not allow for the use of the pulley assembly for lowering and raising the inclinometer probe. Prior to Forte Dynamics’s involvement with the project, a cable-catch was made with the inclinometer casing cap (cap) from IN-1 in place of the pulley assembly (Appendix B, Photo 01). A hand-saw and drill were used to cut a v-notch in the cap of IN-1 to catch cable interval marks during retrieval of the inclinometer probe. Without the pulley assembly, the cable makes the even-marked measurements along the cable offset by 1.25 ft. cable measurements were adjusted by adding one foot (round from 1.25 ft to 1 ft for simplicity of reporting numbers) to each measurement to account for this change (i.e., a cable measurement of 110 ft corresponds to a depth of 111 ft from the top of casing).

## 2.3 Inclinometer Calibration

The inclinometer probe was sent for recalibration in April 2021. The calibration was performed by Durham, the manufacturer of the equipment. The calibration was performed in their Mukilteo, Washington facility.

## 2.4 Survey Monument Readings

Table 2-2 provides the number of monitoring points read since 2012 as well as how many have been added or removed each year.

Year	Number of Monitoring Points	Number of Points Decommissioned from Previous Year	Monitoring Points Installed from Previous Year
2012	87	0	0
2013	87	0	0
2014	88	1	0
2015	91	3	0
2016	94	4	1
2017	94	2	2
2018	107	15	2
2019	91	2	18
2020	52	39	0
2021	59	3	9

Table 2-1: Inclinometer Installation Details

### 3. Data Validation

For each inclinometer reading, data can show significant changes year to year both from movement as well as error. This error can be systematic and lead to large cumulative differences that obscure areas of real movements in the data.

#### 3.1 Checksums

Checksums are the sum of the 0- and 180-degree readings for individual intervals. For an idealized survey, the 0- and 180-degree readings are equal in magnitude and opposite in direction, creating a zero checksum. The application of checksums compares a range of values to determine the validity of surveys. Large checksums are indicative of reading errors. Inclinometer reading error can come from several sources including debris caught in the inclinometer casing grooves, deformed casing segments and malfunctioning probe wheels and depth control accuracy (DGSI, 2013).

#### 3.2 Checksums Standard Deviation

Checksums standard deviation combines the checksums into a single value that defines the reading error for each axis (A-axis and B-axis) of an inclinometer reading. Subsequent standard deviations are compared to the baseline values taken during the inclinometer casing’s baseline survey. Differences in A-axis standard deviation values are typically between three and five degrees, and differences in B-axis deviation values are typically between seven and nine degrees according to manufacturer specifications. These values can indicate potential error and have greater ranges when an inclinometer casing is incorrectly installed, survey methodology is modified, or the inclinometer casing is shallower in depth (DGSI, 2013).

##### 3.2.1 Baseline Standard Deviations

The baseline standard deviations for inclinometer casings I98-1, I98-2, and I98-3 were defined by the baseline inclinometer surveys from 2006 and 2007 (Table 3-1). The baseline standard deviation values observed in the older inclinometer surveys indicate a deviation from manufacturer specification for I98-1 in the A-axis and B-axis and for I98-3 in the A-axis. Due to the very large errors in the initial baseline survey for I98-1 (standard deviation greater than 15), the data were removed, and the next following data set in 2008 were used as the baseline. The baseline standard deviations for inclinometer casings IN-1, IN-2, and IN-3 were defined by the first inclinometer surveys completed on August 22, 2017 (Table 3-1). The baseline standard deviation values for the newest inclinometer surveys were at or below manufacturer-prescribed standard deviations for the A-axis and B-axis.

Inclinometer Name	Survey Date	A-axis Mean (degrees)	Typical A-axis Standard Deviation (degrees)	B-axis Mean (degrees)	Typical B-axis Standard Deviation (degrees)
I98-1	11/24/2008	-6.8	3.4	-6.9	5.8
I98-2	8/1/2006	-6.5	2.8	-3.9	5.1
I98-3	8/1/2006	-5.7	6.3	-7.6	8.6
IN-1	8/22/2017	-0.7	3.0	6.4	3.9
IN-2	8/22/2017	-7.0	1.6	9.8	4.7
IN-3	8/22/2017	-3.6	1.6	10.7	3.6

Table 3-1: Manufacturer Recommended Standard Deviations

##### 3.2.2 2021 Standard Deviations

Standard deviations for inclinometer casings I98-1, I98-2, IN-1, IN-2, and IN-3 were calculated from surveys taken on October 29<sup>th</sup>, 2021 (Table 3-2). The 2021 standard deviation values were vastly different than manufacturer-prescribed standard deviations for the A-axis and B-axis of many inclinometer readings, as discussed in the following paragraph.

Due to the very large errors in the survey for IN-2 (standard deviations of 8.28 and 13.3), the data was considered unreliable and not evaluated. This error was identified to occur around 46 ft bgs. This potential error may be from a change in the casing at a specific point and should be checked in future readings.

Inclinometer Name	Survey Date	A-axis Mean (degrees)	Typical A-axis Standard Deviation (degrees)	B-axis Mean (degrees)	Typical B-axis Standard Deviation (degrees)
I98-1	10/29/2021	-6.8	3.4	-3.3	5.8
I98-2	10/29/2021	-8.5	2.8	2.6	5.1
I98-3	10/29/2021	NA	6.3	NA	8.6
IN-1	10/29/2021	-2.08	3.0	2.57	3.9
IN-2	10/29/2021	8.28	1.6	13.3	4.7
IN-3	10/29/2021	-4.7	1.6	10	3.6

Table 3-2: Measured Standard Deviations

## 4. Data Corrections

Potential sources of error associated with the Digitilt Classic Inclinometer system include limitations in the performance of equipment, anomalous installation characteristics, movement alterations to the installation characteristics, casing spiraling, and varied measurement techniques (DGSI, 2013). The combination of errors within datasets can alter associated data plots and create exaggerated displacements and false directions of movement.

Probes typically require annual calibration due to natural conditions such as transportation and handling. Without calibration, the data are likely to contain more and more error with each year. This probe came directly from the manufacturer, so it theoretically should have been perfectly calibrated. Additionally, Forte took care to keep the probe protected in transportation. However, natural error will occur.

### 4.1 Conventional Survey Methodology

The conventional alignment of inclinometer casing grooves and associated A-axes and B-axes is defined with respect to the anticipated direction of movement. The A0 groove is conventionally defined as the anticipated downslope movement direction (DGSI, 2013). Conventional groove alignment was observed for the older and newer inclinometer casings; however, survey readings were obtained with an unconventional probe orientation in the older sets of inclinometer casings. The unconventional probe orientation manifests within inclinometer plots as flipped signage that creates plots that are opposite and equal in terms of displacement values (A0 and B0 values are negative).

### 4.2 Depth Positioning and Measurement Technique Errors

Depth positioning and measurement technique errors occur from inconsistency in measurement technique and casing shortening (Mikkelson, 2003). Depth positioning and measurement technique errors occur when readings are not taken at the same depth as the baseline survey or the probe is not allowed sufficient time to equilibrate at each reading location. Data sets taken from incorrectly obtained surveys can be visually identified in inclinometer plots and either removed or taken into consideration (Choi and Stark, 2008).

Depth positioning and measurement technique errors were identified from recordings for I98-1 and I98-2 received before BGC began taking readings. Several datasets had columns or entire sets with values of zero (indicating values were not properly recorded). These readings were significantly different from all other data sets and excluded from the analysis. Depths displayed on the inclinometer plots for I98-1 and I98-2 represent cable measurements and not depths below ground surface. Stickup height must be subtracted from a given inclinometer plot depth to obtain a measurement referenced from ground surface. Depths displayed on the inclinometer plots for IN-1, IN-2, and IN-3 represent depths referenced from ground surface. This difference in reference for the two sets of inclinometer readings (IN's and I98's) occurred due to different methods used to record the data of the first reading of the inclinometer surveys.

When reading values from the cable (for IN-1, IN-2, and IN-3), a modified stickup is subtracted from a given cable measurement to obtain a depth below ground surface. The modified stickup is one foot less

that the stickup height to account for an additional foot from measuring from the top of casing, and not from the top of the traditional cable pulley assembly.

### 4.3 Unimplemented Corrections

Bias-shift error is a systematic error that creates a re-occurring non-real shift in inclinometer plots (DGS1, 2013). Inclinometer casings are theoretically installed in stable ground beneath suspected movement zones. This installation protocol is based on borehole log assessments and creates a fixed base. Subsequent surveys generate a near-vertical plot in the lower portions of the inclinometer plots (Choi and Stark, 2008). Bias-shift error is the most common error and is identifiable in the deepest portions of the inclinometer plots where deviations from verticality and error-generating phenomena are most likely to occur such as from insufficient probe warm-up or long spans of time between calibrations by the manufacturer (Mikkelson, 2003).

To correct for this, a bias shift correction was made for each year by manually increasing the correction factor until the lower portions of the plot were near vertical. Rotation error is generated by the combination of inclinometer casing inclination and sensor axis alignment shift (Mikkelson, 2003). Rotation errors can also occur when a different probe is used to take measurements and can be identified graphically by comparing A-axis and B-axis inclinometer profile plots. A resemblance in graph shape and corresponding inclinometer casing profile indicates a reduction in rotation error prevalence. A difference in graph shape indicates rotation error may be prevalent (Choi and Stark, 2008). Rotation error was not suspected in any of the plots. Due to the probe coming directly from the manufacturer for calibration, we should not have had either error, however the data certainly shows anomalous behavior in certain surveys.

## 5. Data Analysis

Inclinometer data is plotted in the A-axis and B-axis. Because movement typically does not occur directly in line with these axes, the resultant of the two is used to determine the full magnitude of movement and direction.

Upon viewing all plots, there is a substantial amount of error assumed due to the amount of movement indicated in the data. Each inclinometer will be discussed below.

### 5.1 Inclinometer I98-1

Historically, I98-1 appears to have moved significantly in 2020 as compared to in 2019. The data taken in 2021, while significantly less linear than previous data, appears to follow nearly the same path, on average, as the 2020 data.

Forte has concluded that, as the data follows the same general trend as the 2020 data, is reliable. The data points do not follow a smooth trendline, which is attributed to user error in the data collection process, as listed in Section 4. However, the data leads to the conclusion that I98-1 has moved significantly between 2019 and 2020, but has not moved significantly between 2020 and 2021. Immediate action is not needed, but attention should be paid to this site.

### 5.2 Inclinometer I98-2

Historical readings for I98-2 appear to be unreliable. From 2017-2018, the top 200 feet of the inclinometer shifted approximately 2 inches, yet the 4 years since, the readings have shifted 3-4 inches back the opposite direction. However, 2021 data aligns with the data from 2017 and 2018. Therefore, this data is inconclusive.

If we are to analyze the data, however, it appears that there has been significant movement at this site for the past 4 years, and this site should be closely monitored.

### 5.3 Inclinometer I98-3

At the time of reading, I98-3 was unreachable due to excessive snow. Readings will be taken in 2022.

## 5.4 Inclinometer IN-1

IN-1 has not seen significant movement in the past 3 years. Between 2017 and 2018, the profile shifted a few inches, and has remained relatively consistent since 2018. What little movement there was appears to have continued this past year. However, there is not enough movement to cause concern. No action is needed here.

## 5.5 Inclinometer IN-2

IN-2 has not seen significant movement in the past 3 years. Between 2017 and 2018, the profile shifted a few feet, which is very significant. However, it has remained consistent since 2018. What little movement there was appears to have continued this past year.

In the past year, there has not been a large movement, but due to the massive shift in the past, this site should be monitored closely.

## 5.6 Inclinometer IN-3

IN-3 has not seen significant movement in the past 4 years. Forte's readings show a shift of approximately half of an inch in the top half of the profile. However, there is not enough movement to cause concern. No action is needed immediately, however if movement continues, more action will be needed.

## 5.7 Survey Monuments

There were 59 monitoring points surveyed in 2020 in the North Pit and South Pit zones. Every monitoring point surveyed in 2021 had data from 2020 to compare with and determine annual displacement values. From 2021 to 2020, 3 monitoring points were discontinued because movements measured in past years were less than the survey equipment error. Ten new monitoring points were added to the South Pit area in 2021. Of these 9 were surveyed. One was damaged by site activities and was not surveyed.

Potential survey error, the error from measurements using a total station to survey, is estimated by North Star to be 0.1 ft for every 1,000 ft of distance from the control point to the monitoring point.

The threshold for the annual rate of local or global slope movement has been previously reported as 0.5 ft per year (BGC 2019). Slope movements below this amount are considered typical of ongoing landform deformation in the area.

None of monuments surveyed reported movement greater than the established movement threshold. This is consistent with what was reported for the 2020 survey. The greatest displacement observed was 0.25 feet from C94-1.

A table showing survey data and a comparison to the 2020 survey is included in Appendix C.

## 6. Conclusions and Recommendations

Inclinometer readings for IN-1, IN-2 and IN-3 did not indicate excessive movement during the annual monitoring cycle. Inclinometer I98-2 showed erroneous data and was not useful. The I98-2 inclinometer will be attempted to be read in 2022 to determine if the error is a repeating event or if a reading can be obtained without the same type of error. However, this issue has appeared to persist for the past few years. It may be necessary to re-evaluate how this reading is obtained.

The inclinometer reading for I98-1 indicates similar incremental movement observed in previous years back to 2017.

Additionally, inclinometer borehole logs should be obtained from the installation report from 1998 and be compared with inclinometer surveys to identify potential discrete geologic structures and geologic material types that may be contributing to or influencing movements. Strain rates associated with geologic material types should be considered during subsequent reviews of inclinometer data.

The total number of monitoring points with displacements above the established movement threshold in the Pitch Mine is 0, which is consistent with the 2020 survey results.

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## 7. Closure

We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

**Forte Dynamics**

**Per:**

Geoffrey Horn

Staff Engineer

Roy Morlan, P.G.

Senior Engineering Geologist

Reviewed by:

Michael Henderson, PE, P.Eng.

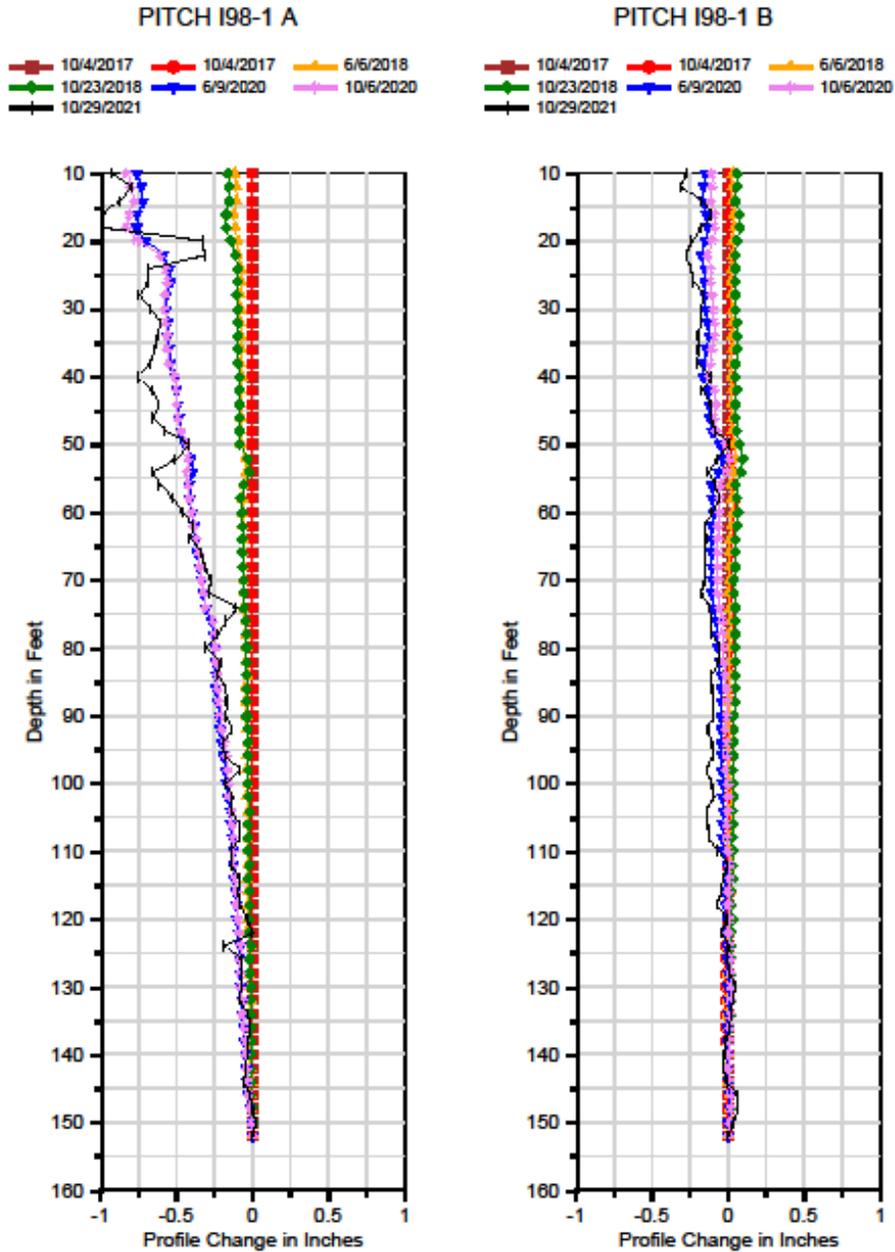
Principal Engineer

## References

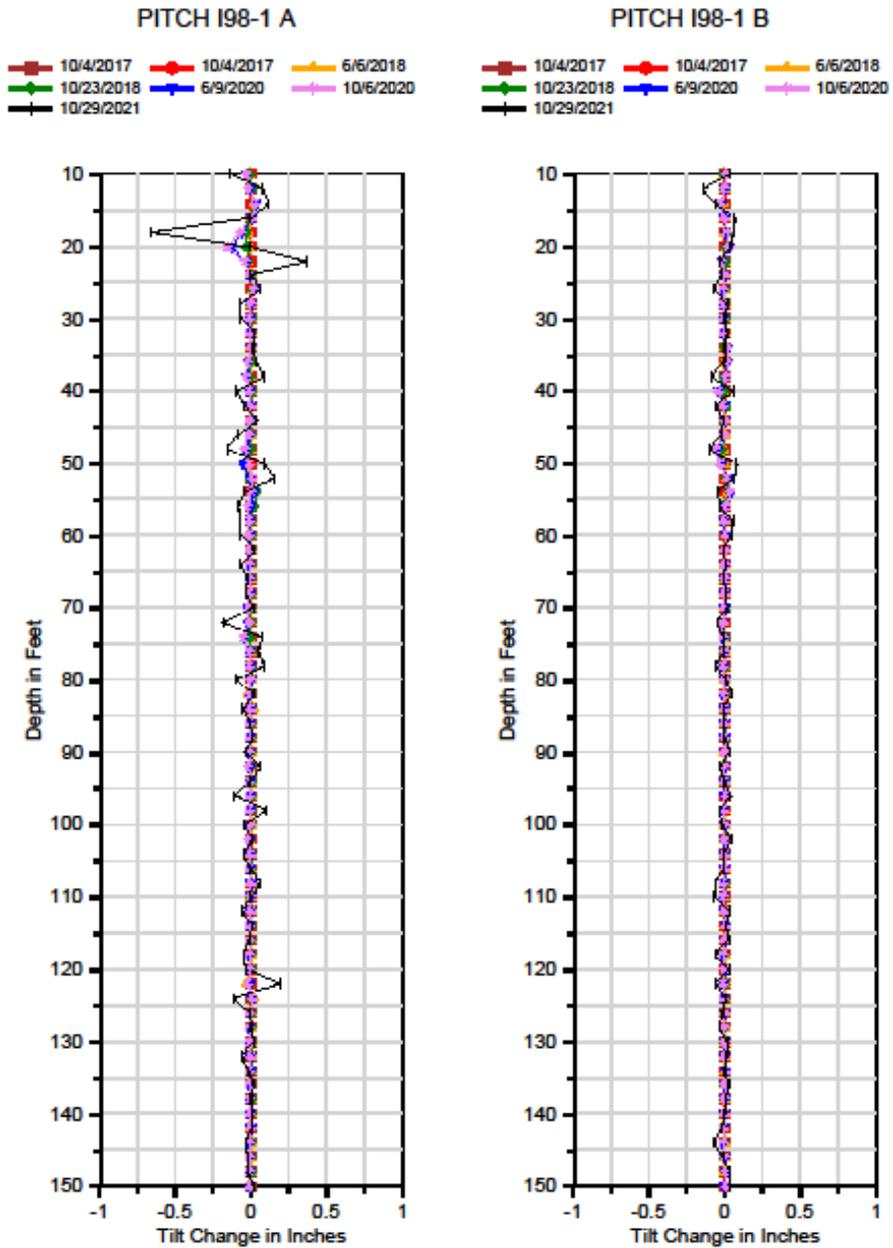
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## Appendix A Inclinometer Plots

## Cumulative Displacement Plots

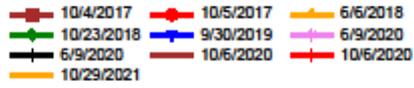


## Incremental Displacement Plots

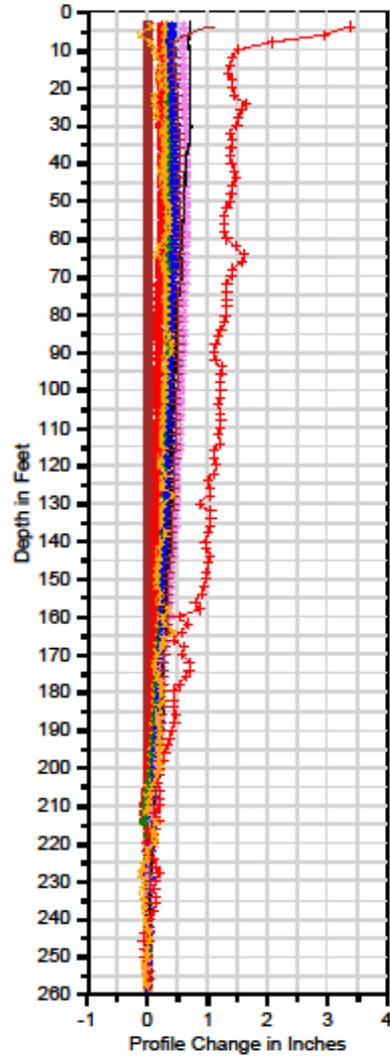
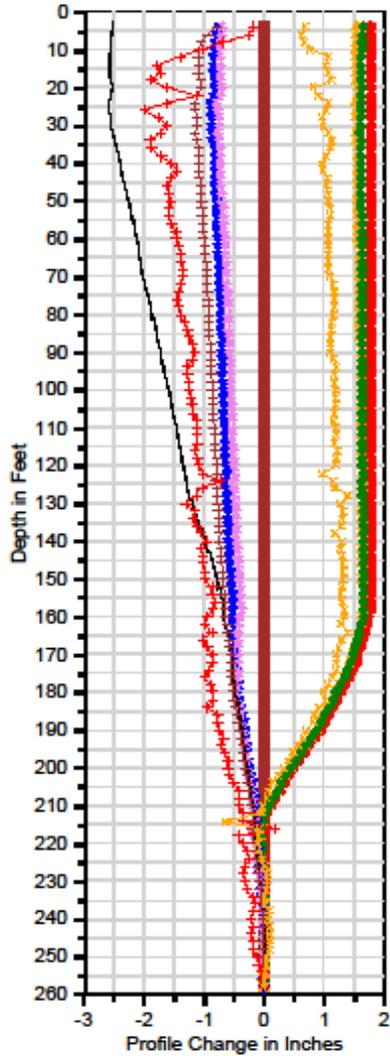
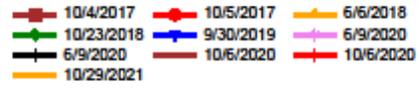


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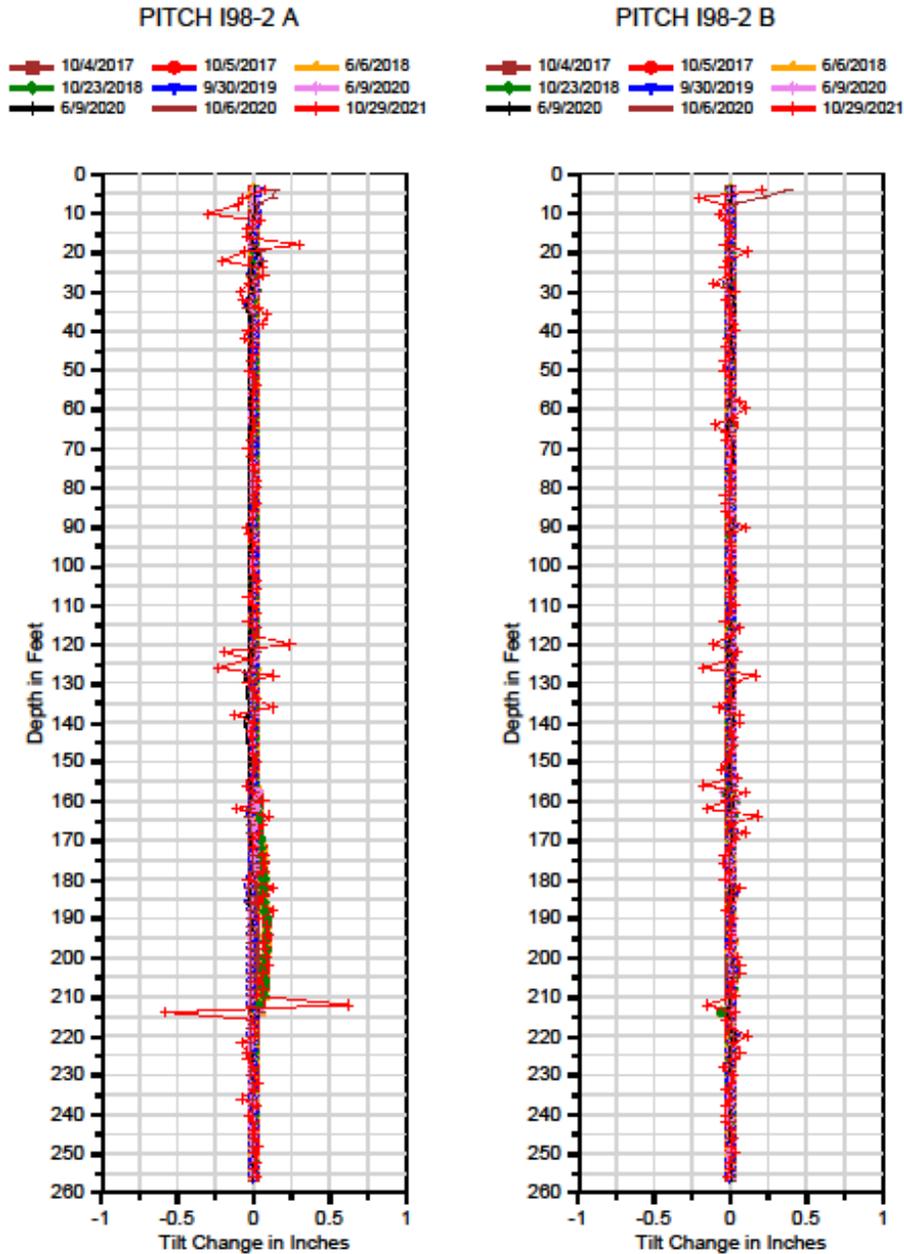
PITCH I98-2 A



PITCH I98-2 B

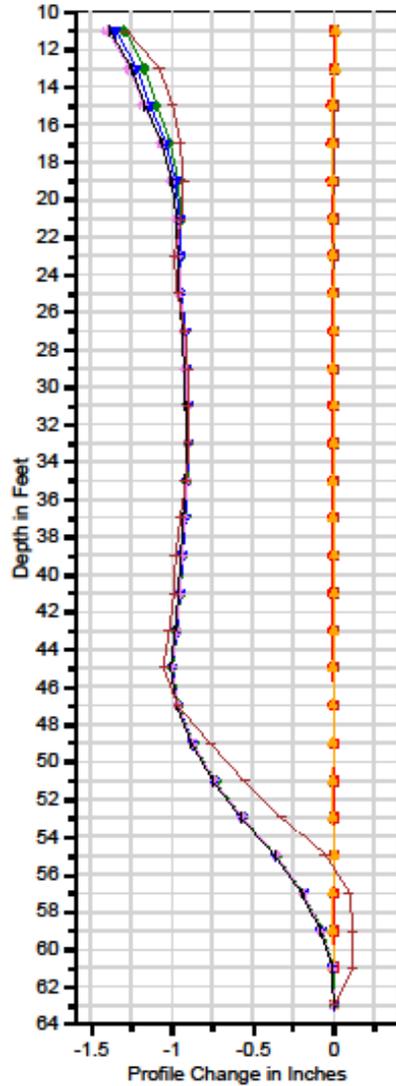
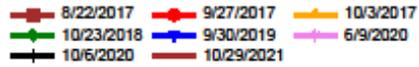


## Incremental Displacement Plots

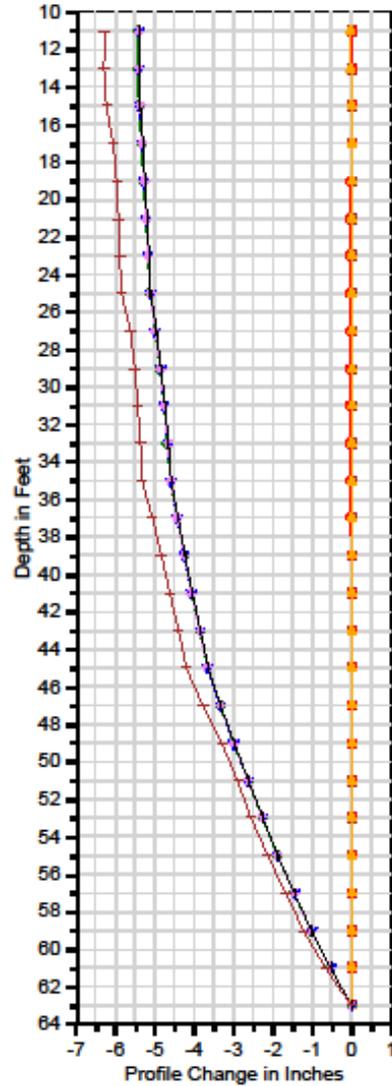
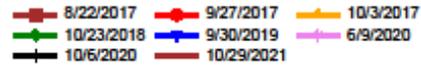


## Cumulative Displacement Plots

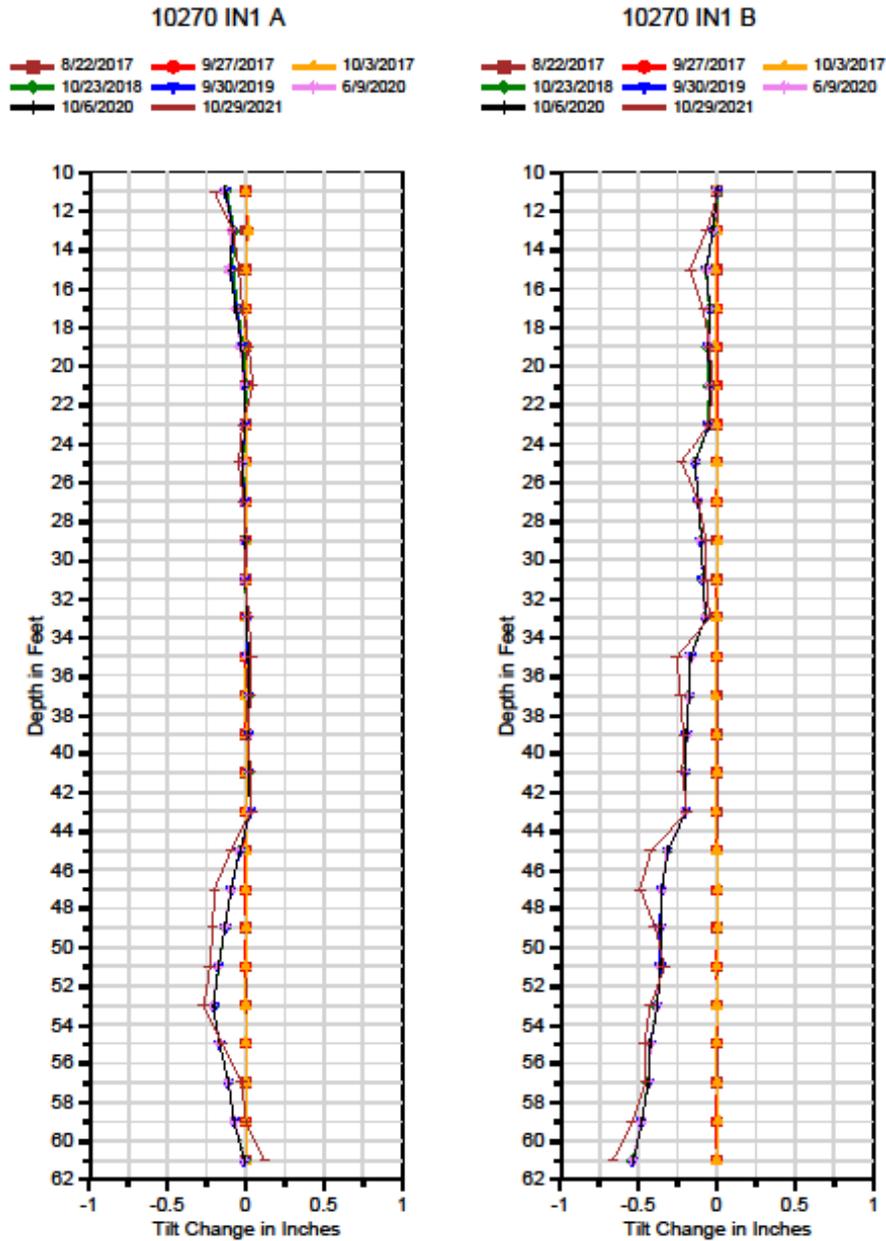
10270 IN1 A



10270 IN1 B

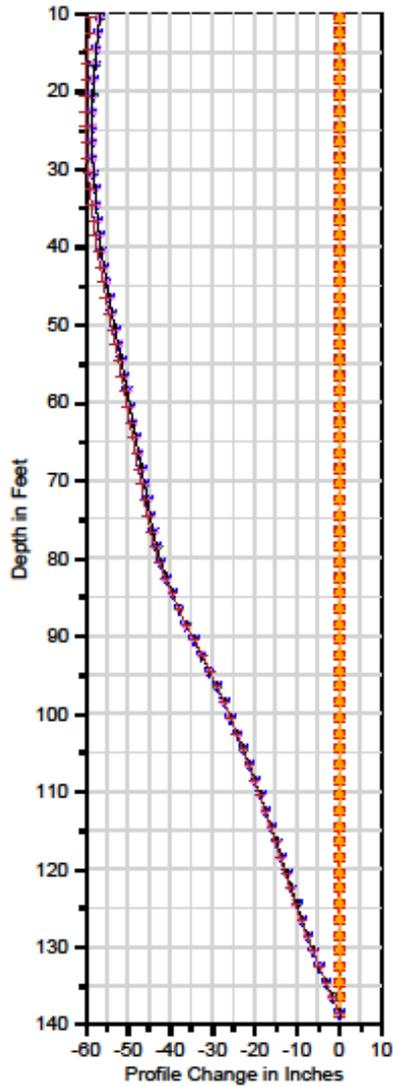
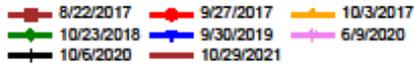


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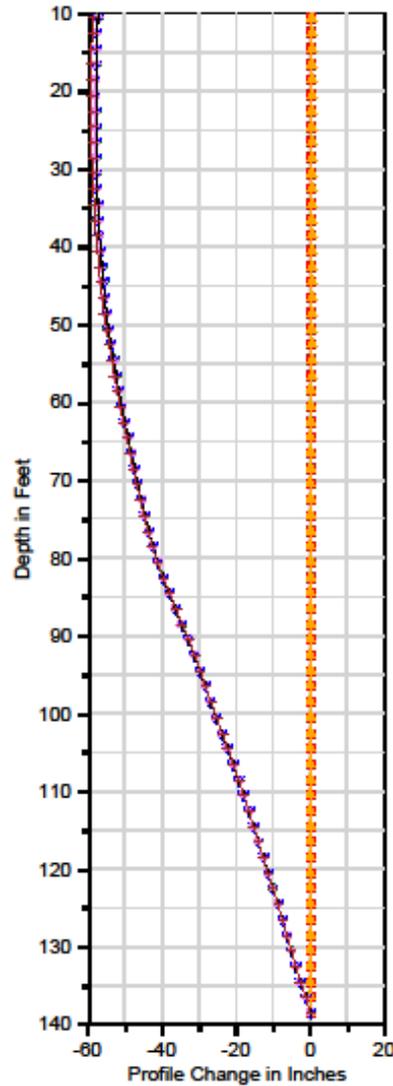


## Cumulative Displacement Plots

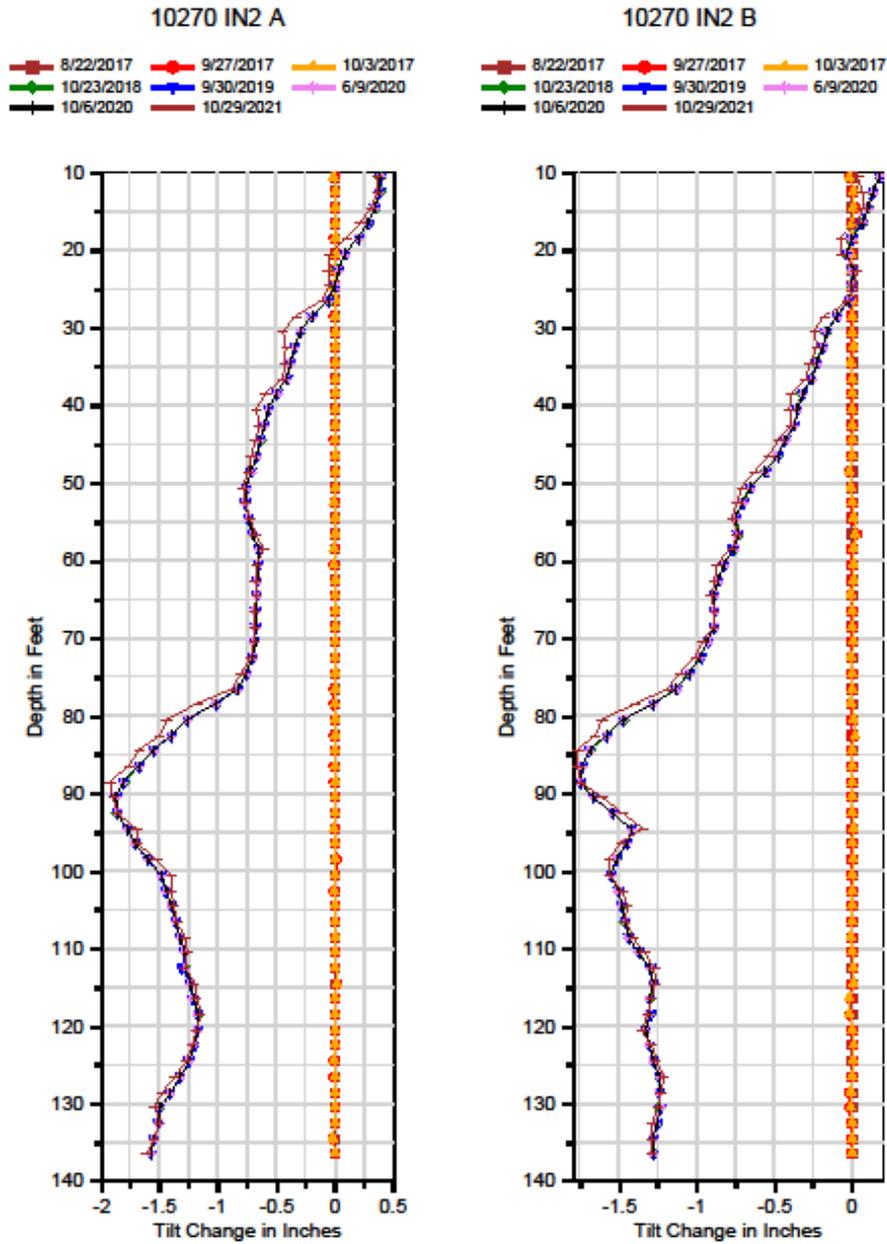
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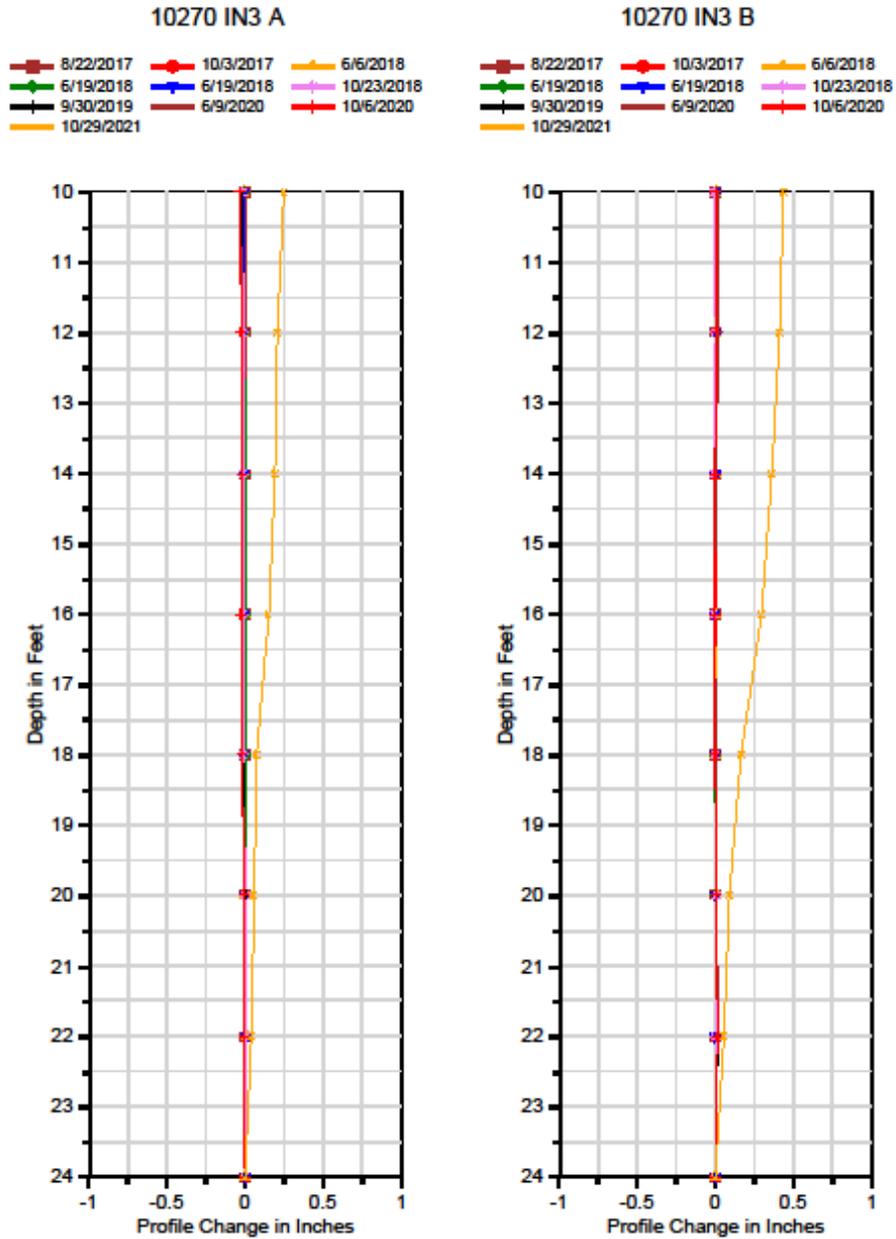
10270 IN2 B



## Incremental Displacement Plots



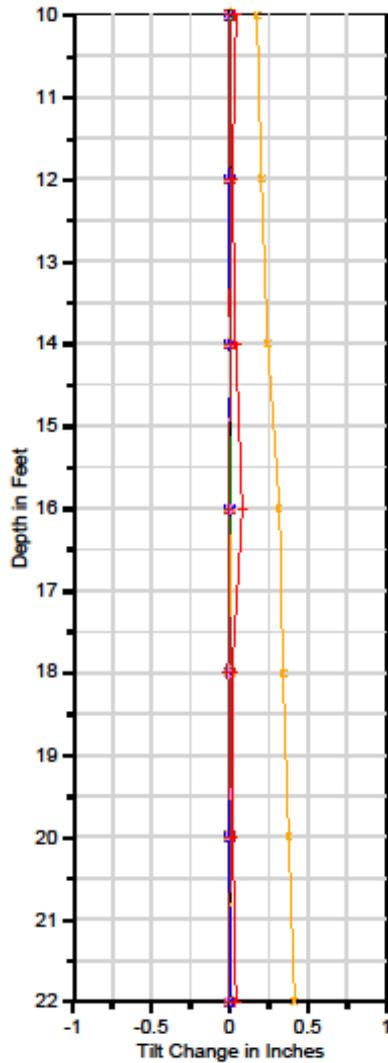
## Cumulative Displacement Plots



## Incremental Displacement Plots

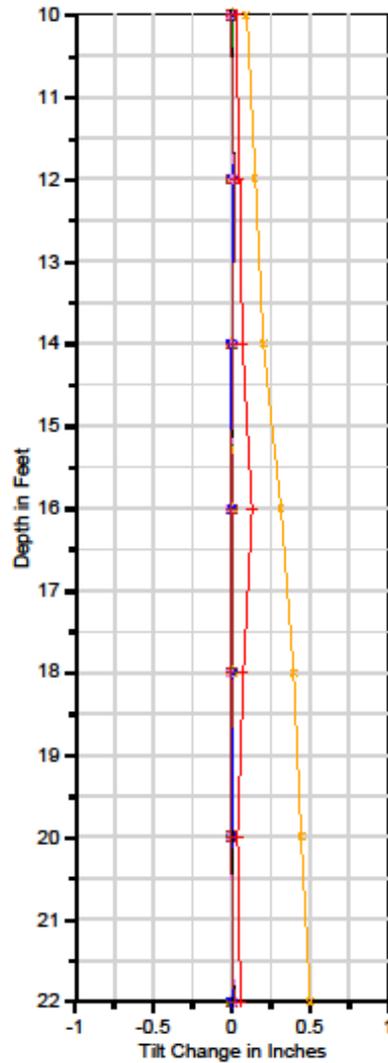
10270 IN3 A

■ 8/22/2017	● 6/6/2018	▲ 6/19/2018
◆ 6/19/2018	■ 10/23/2018	◆ 9/30/2019
■ 6/9/2020	■ 10/6/2020	■ 10/29/2021
■ 10/29/2021		



10270 IN3 B

■ 8/22/2017	● 6/6/2018	▲ 6/19/2018
◆ 6/19/2018	■ 10/23/2018	◆ 9/30/2019
■ 6/9/2020	■ 10/6/2020	■ 10/29/2021
■ 10/29/2021		



## Appendix B

### Inclinometer Photographs



**Photo 1: Handmade cable catch used when pulley could not be used**



**Photo 2: Probe length of 15 inches**



**Photo 3: Stickup of casing, measured from concrete base**



**Photo 4: Pulley mechanism used for accessible casings**

## Appendix C

### Survey Point Data Provided by North Star





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**APPENDIX C**

**2021 Sediment Embankment Report**



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Phone (970) 901-2263

April 6, 2022  
Project No.: File

Mr. David Wykoff, Site Supervisor  
Homestake Mining Company  
Pitch Reclamation Project  
112 Marshall Street  
Sargents, Co, 81249

Dear Mr. Wykoff,

**Re: Pitch Reclamation Project – 2021 Annual Report  
Sediment Control Embankment – Permit ID 280110**

The Pitch Mine is owned and operated by Homestake Mining Company (HMC) as a subsidiary of Barrick Gold Corporation. The site is in the Sawatch Range of Saguache County within the Gunnison National Forest. It is located five miles east of Sargents, Colorado and 18 miles southwest of Salida, Colorado.

HMC operated the site as an open pit mine for the extraction of uranium ore from 1979 to 1984. Since 1984 to present, the project has been maintained by HMC as it progressed into the final stages of closure and reclamation.

The sediment control embankment was constructed in 1980. The embankment was constructed below the confluence of the Indian and Tie Camp drainages to allow settlement of suspended solids from surface water prior releasing to Indian Creek. The embankment is a jurisdictional structure under the Colorado Division of Water Resources, with permit ID 280110.

The embankment is approximately 80 feet (ft) high at the maximum section and has a crest elevation of 9905.0 feet (ft) above mean sea level (amsl). The structure was designed as a zoned embankment with a 15.0 ft thick clay core and both upstream and downstream rockfill shells constructed with compacted weathered sandstone. The pond area has a surface area of approximately 5.4 acres with a corresponding capacity of 88.3 acre-feet. An emergency overflow spillway exists through the right abutment with an outfall weir elevation of 9900.0 ft amsl (Glasgow, 2002).

Following completion of construction in 1981, five piezometers and five permanent survey monuments were installed to monitor both changes in phreatic surface within the embankment

and physical movements of the embankment, respectively. In 2000, four additional piezometers were installed along the crest of the embankment.

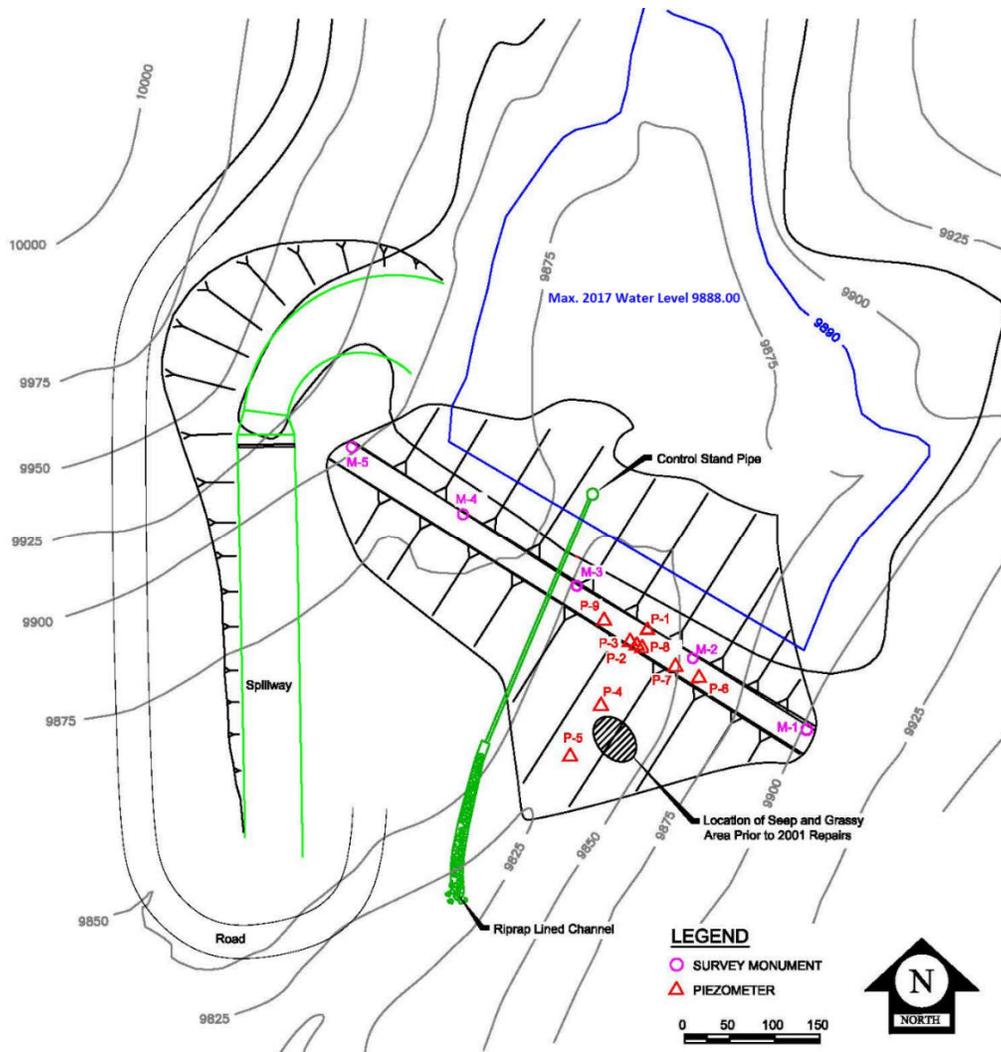
Seepage was observed on the downstream face of the embankment in June 2000 and discussed in both 2000 and 2001 annual reports. This seepage has not reappeared following the repair work conducted in 2001.

Significant construction was undertaken in 2020 to improve seepage control on the reservoir and to replace the outlet system which was reaching its original design life. The construction in 2020 included removing riprap from the face of the embankment, installation of a new seepage barrier system which extended to the crest of the embankment, removal and replacement of the primary outlet works, and grout filling of small pipelines which extended from the reservoir to the water treatment plant.

This 2021 annual monitoring report is a component of the continuing Engineer of Record (EOR) role established by HMC and uses survey data provided by North Star Surveying Inc. (North Star) and piezometric data provided by HMC. This monitoring report includes a physical inspection of the structure was conducted on July 8, 2021, by Mr. Michael Henderson, PE, who is the EOR for the facility.

## **1.0 EMBANKMENT DISPLACEMENT MONUMENTS**

The survey monuments (M1 to M5) measure vertical displacement and are located near the upstream side of the embankment crest level, as shown on **Figure 1-1**. The five permanent survey monuments have been surveyed annually since 1981.



**Figure 1-1. Monitoring station locations (Glasgow, 2002).**

The 2021 annual survey was conducted on August 24, 2021, and the results of survey monitoring since the installation of the monuments are presented in **Table 2-1**.

As shown in **Table 2-1**, differences between the 2018 survey and the 2021 survey of embankment monitoring points are between -0.02 ft and +0.01 ft, which is consistent with previous measurements and within the range of survey error.

**Table 2-1 Crest Monitoring Elevations<sup>1</sup>**

Date	Monument 1	Monument 2	Monument 3	Monument 4	Monument 5
3-Sep-81	9905.94	9905.26	9904.85	9906.06	9905.15
15-Sep-81	9905.93	9905.27	9904.85	9906.05	9905.17

<sup>1</sup> Original mine coordinate system

Date	Monument 1	Monument 2	Monument 3	Monument 4	Monument 5
1-Oct-81	9905.92	9905.24	9904.83	9906.02	9905.14
8-Oct-81	9905.92	9905.26	9904.85	9906.04	9905.18
16-Nov-81	9905.92	9905.25	9904.84	9906.06	9905.19
2-Dec-81	9905.91	9905.24	9904.83	9906.07	9905.10
17-Dec-81	9905.94	9905.27	9904.85	9906.05	9905.22
19-Jan-82	9905.90	9905.23	9904.82	9906.06	9905.16
2-Feb-82	9905.93	9905.25	9904.85	9906.09	9905.23
18-May-82	9905.87	9905.13	9904.66	9905.97	9905.21
3-Jun-82	9905.85	9905.09	9904.59	9905.94	9905.19
1-Jul-82	9905.83	9905.05	9904.55	9905.90	9905.16
6-Aug-82	9905.83	9905.05	9904.55	9905.71	9905.19
18-Nov-82	9905.78	9905.01	9904.53	9905.87	9905.20
7-Jun-83	9905.66	9904.87	9904.43	9905.82	9905.19
27-Sep-83	9905.43	9904.70	9904.31	9905.68	9905.17
2-Aug-84	9905.48	9904.71	9904.27	9905.64	9905.08
28-Jun-85	9905.48	9904.72	9904.34	9905.77	9905.23
16-Jul-86	9905.63	9904.90	9904.47	9905.79	9905.12
9-Sep-87	9905.67	9904.86	9904.46	9905.82	9905.03
20-Sep-88	9905.51	9904.72	9904.36	9905.75	9905.34
7-Sep-89	9905.51	9904.73	9904.34	9905.68	9905.20
20-Sep-90	9905.45	9904.65	9904.25	9905.63	9905.15
25-Sep-91	9905.49	9904.70	9904.31	9905.66	9905.26
30-Sep-92	9905.47	9904.67	9904.29	9905.64	9905.23
23-Sep-93	9905.46	9904.67	9904.29	9905.62	9905.24
29-Jul-94	9905.47	9904.67	9904.27	9905.62	9905.24
27-Sep-95	9905.46	9904.66	9904.27	9905.62	9905.25
17-Sep-96	9905.46	9904.65	9904.26	9905.60	9905.26
13-Oct-97	9905.46	9904.67	9904.29	9905.63	9905.27
29-Sep-98	9905.45	9904.64	9904.26	9905.61	9905.27
7-Nov-99	9905.44	9904.64	9904.25	9905.60	9905.26
26-Oct-00	9905.45	9904.64	9904.26	9905.62	9905.29
15-Oct-01	9905.43	9904.64	9904.26	9905.59	9905.24
24-Sep-02	9905.46	9904.65	9904.26	9905.62	9905.27
8-Sep-03	9905.43	9904.62	9904.23	9905.58	9905.24

Date	Monument 1	Monument 2	Monument 3	Monument 4	Monument 5
24-Sep-04	9905.44	9904.64	9904.27	9905.61	9905.27
23-Oct-05	9905.43	9904.63	9904.25	9905.58	9905.26
1-Oct-06	9905.44	9904.63	9904.25	9905.59	9905.27
20-Oct-07	9905.44	9904.62	9904.24	9905.59	9905.25
17-Oct-08	9905.44	9904.63	9904.24	9905.60	9905.27
23-Oct-09	9905.43	9904.61	9904.24	9905.57	9905.24
12-Sep-10	9905.44	9904.62	9904.24	9905.58	9905.24
24-Sep-11	9905.44	9904.62	9904.24	9905.59	9905.27
30-Sep-12	9905.43	9904.61	9904.24	9905.58	9905.27
23-Jul-13	9905.43	9904.61	9904.23	9905.58	9905.27
30-Jul-14	9905.41	9904.60	9904.22	9905.55	9905.26
25-Aug-15	9905.42	9904.60	9904.22	9905.56	9905.22
30-Aug-16	9905.43	9904.62	9904.22	9905.57	9905.27
5-Oct-17	9905.42	9904.61	9904.24	9905.58	9905.26
23-Oct-18	9905.43	9904.62	9904.24	9905.57	9905.28
17 Oct-19	9905.43	9904.62	9904.23	9905.57	9905.27
24-Aug 2020 <sup>2</sup>	9905.43	9904.61	9904.23	9905.58	9905.26
<b>Differential 2018-2020</b>	+0.00	-0.01	-0.01	+0.01	-0.02

Key:

Maximum Elevation (Blue highlight)

Minimum Elevation (Green highlight)

<sup>2</sup> Original survey monuments were removed during 2020 construction of the dam and replaced with new monuments on the crest of the embankment on Oct 15, 2020. This is the last set of readings before removal.

## 2.0 PIEZOMETER EVALUATION

There are currently nine piezometers monitoring water levels in the embankment. The first five were installed when the embankment was completed in 1981. Four additional piezometers were installed along the crest of the embankment in 2000. The piezometers are named P1 through P9 on **Figure 1-1** (presented in **Section 1**) and called P-1 through P-9 on tables below. This section will discuss the history and the evaluation of piezometers for 2021.

### 2.1. Piezometric History of the Sediment Control Embankment

In June 2000, seepage was observed on the downstream face of the embankment. Subsequent evaluations during 2000 determined there was a localized elevated phreatic surface within the embankment and the downstream shell. Remediation work was conducted in 2001 to identify the cause and repair the embankment. The repair consisted of installing a cutoff trench and clay blanket on the upstream face over the seepage area.

The top of the inclined clay blanket constructed in 2001 is at elevation 9885.5 ft amsl. A final engineering report detailing the repairs and performance was provided to the Colorado Division of Water Resources on January 7, 2003 (Glasgow, 2002). In May 2004, the operating pond level was increased by 10 ft. to an elevation of 9888.5 ft amsl. In May 2005, the water level in the pond reached a maximum elevation of 9893.5 ft amsl. This water level was the highest in the pond since the repair work performed in 2001, and it was seven feet below the spillway crest elevation of 9900.0 ft amsl. The water levels in P1, P4 and P8 responded with a quick rise in their piezometric levels corresponding to the water being temporarily stored above the repair level but the water levels in the piezometers dropped back quickly to normal levels as the pond water level dropped below 9885.5 ft. amsl.

The response to the 2005 reservoir level indicated that the seepage through the embankment was effectively controlled to the elevation of the 2001 inclined clay blanket, but that storage above that elevation would result in increasing phreatic levels in the embankment. HMC set the top of the inclined clay blanket as a maximum desired operating level, and then undertook an additional construction in 2020 to improve seepage control.

The major components of the sediment pond facility were rehabilitated in 2020, which consisted of:

- Removal of the upstream riprap from the embankment
- Placement of a bituminous geomembrane liner on the upstream face of the embankment extending to the crest elevation of 9905 feet amsl
- Removal and replacement of the primary outlet riser, including valves and access walkway
- Replacement of the upstream riprap

## 2.2. Piezometer Data Evaluation for 2021

The total precipitation for 2021 was 10.8 inches measured at the Pitch weather station<sup>3</sup>. The total precipitation for the period the January 2020 through December 2020 was 7.36 inches. For January 2018 through December 2018 was total precipitation was approximately 360 mm (14.2 inches). This compares with precipitation from January 2017 to December 2017 of 439 mm (17.3 inches) and from January 2016 to December 2016 of 482 mm (19.0 inches).

Piezometers P1, P2, P3, P6, P7, P8 and P9 are located on the Sediment Pond embankment crest, while Piezometers P4 and P5 are located on the downstream slope of the embankment. The comparison between 2016, 2017, 2018, 2020 and 2021 maximum piezometric levels for each of the piezometers is presented in **Table 2-1** below. Piezometer levels are presented in **Table 2-2** and show the piezometric levels varied from 0.10 to 3.45 ft, which is within the expected range.

**Table 2-1. Maximum change in water levels in Embankment piezometers for 2016, 2017, 2018, 2020 and 2021.**

	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9
Maximum Elev 2016 (ft amsl)	9869.94	9847.51	9867.51	9828.30	9829.78	9870.86	9870.33	9866.28	9865.79
Maximum Elev 2017 (ft amsl)	9869.93	9847.11	9866.82	9829.34	9830.53	9870.01	9870.73	9867.16	9866.04
Maximum Elev 2018 (ft amsl)	9860.36	9845.82	9864.32	9828.09	9828.70	9867.39	9866.65	9862.76	9864.24
Maximum Elev 2020 (ft amsl)	9868.60	9845.39	9866.84	9828.20	9828.77	9868.17	9869.53	9861.84	9865.12
Maximum Elev 2021 (ft amsl)	9861.28	9844.91	9864.06	9828.20	9829.75	9867.58	9866.91	9860.03	9864.58

<sup>3</sup> New Pitch weather station installed in 2019. All prior readings are from a rain gage located on site.

## 2.3. Facility Maintenance History

Piezometer P4 is close to the seepage area noted in 2000 and it is monitored closely. From 2005 to 2009 it was observed that the water level in P4 was not falling back as rapidly as the other piezometers. It was noted that when the probe was pulled out of the P4 and P5 it was covered with silt. The silt buildup had not allowed the pipes to drain sufficiently to accurately reflect the phreatic surface in the embankment. In July 2009, both piezometers P4 and P5 were flushed with high pressure water, approximately 250 gallons at 80 to 90 psi, to minimize the silt and other debris that had built up in the standpipes. The high-pressure flushing resulted in the water levels in both piezometers falling back to normal levels within a few days over the next few years, with the average water level in P4 dropping by more than 4.00 ft.

In 2015, the water level rise in P4 was small due to the water level in the pond being kept below the elevation of the 2001 repair. In 2016, the water in the pond increased to 9888 ft. amsl elevation for approximately two weeks in May due to snow melt with little rise in the water level in P4. A similar event occurred in 2017, with May being the month of pond increase to 9888 ft. amsl, elevating piezometer reading for approximately three weeks.

The flushing of P-7 and P-8 in late 2015, along with clearing of the drain line in 2009 has continued to keep water levels low in the downstream and toe section of the embankment. In 2016, with precipitation the lowest in the past three years, all piezometer levels were down relative to 2015 and 2014. In 2014, the water level in P4 increased by 6.31 feet but fell back rapidly. In 2016, the increase was only 0.36 ft. The high pressure flushing of P7 and P8 in late 2015 allowed water levels in both piezometers to rise and fall back quickly compared to their behavior in 2013 and 2014.

In 2014, maintenance included adding a debris trap above the outlet pipe and removal of pine seedlings on the downstream face of the embankment. The debris trap was cleaned in 2016 and pine seedlings were removed from the downstream face once again. No significant maintenance activities occurred in 2017.

## 3.0 2021 PHYSICAL INSPECTION

A physical inspection of the Sediment Control Embankment and related facilities was undertaken by the EOR on July 8, 2021. The upstream and downstream embankment toes were inspected, along with the crest.

No signs of physical distress or movement were noted. The emergency spillway is in good operating conditions, with no sign of being used during the past year. The primary outlet system which was reconstructed in 2020 is in good operating condition. No excessive vegetation or burrowing animals were noted.

#### 4.0 RECOMMENDATIONS

Strata Geo has the following recommendations after reviewing the 2021 data and pertaining documents focusing on the Sediment Control Embankment:

- A survey report should accompany the survey monument readings. This report should explain methods applied, equipment used, margin of error and field conditions.
- Flushing of piezometers and cleaning of debris be performed on an annual or biannual basis to improve readings
- Camera inspection of drains be performed every five years to mitigate clogs and help maintain efficiency.

#### 5.0 CONCLUSION

The 2021 survey results continue to indicate that the total vertical movement in the embankment is minimal, within historic levels, and lies within the range of survey error.

Water level trends measured in the piezometers for 2021 are consistent with historic readings.

Yours sincerely,  
**Strata-Geo LLC**



Mike Henderson, PE  
Engineer of Record

**APPENDIX D**

**Radioactive Materials License #150-01 Amendment 21**



Pursuant to the Colorado Radiation Control Act, Title 25, Article 11, Colorado Revised Statutes, and the State of Colorado Rules and Regulations Pertaining to Radiation Control (the Regulations) and in reliance on statements and representations heretofore made by the licensee designated below; a license is hereby issued authorizing such licensee to transfer, receive, possess and use the radioactive material(s) designated below; and to use such radioactive material(s) for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations, and orders now or hereafter in effect of the Colorado Department of Public Health and Environment and to any conditions specified below.

1. Licensee: Homestake Mining Company of California
2. Mailing address: P.O. Box 40, Sargents, CO 81248
3. License number: CO 150-01, Amendment Number 21
4. Expiration date: April 30, 2023
5. Authorized Storage/Use Location: approximately 10 miles east of Sargents, Colorado in portions of Sections 29, 30, 31, and 32, T48N, R6E, New Mexico Principal Meridian. 112 Marshall St., Sargents, CO 81248. Specifically, in the clay-lined and bermed low-grade ore stockpiles situated on the Indian Creek and Tie Camp waste rock-disposal sites and in a storage cell at the toe of the Indian Creek waste rock disposal site; the sediment collection pond and associated embankment; and the water treatment facilities and storage locations on site.
6. Designated Radiation Safety Officer: Randy Whicker
7. Radiation Safety Officer contact number: (970) 556-1174
8. Fee category: 3.Q, 2.C
9. Reference number: SUA-940 (Pinnacle Exploration Company)

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### Conditions

#### 10. Authorized radioactive material and uses:

- A. The licensee is authorized to possess any amount of naturally occurring uranium-series radionuclides, in particular radium-226 in any naturally-occurring form contained in soils, sediments, and water. The licensee is authorized to maintain the sediment collection capabilities and, as required by final project closure, properly dispose of sediment in the sediment collection pond or in an on-site disposal cell.

- B. The licensee is authorized to possess, handle, and store natural uranium and radium-226 bound to water treatment absorptive media collected through the Phosphate Injection System, Engineered Treatment Cell, Phosphate Residuals Management System, or Passive Water Treatment Pilot Systems as described in the license amendment request dated April 30, 2019; the correspondence dated May 20 and 26, 2019; and in the modification requests dated January 22, 2020, July 22, 2020, and June 7, 2021; not to exceed either:
- i. 1.0 Ci (37 GBq) total activity or 116,000 pCi (4.3 kBq) of natural uranium per gram of media; or
  - ii. 0.1 Ci (3.7 GBq) total activity or 6,300 pCi (0.23 KBq) of radium-226 per gram of media.

The total volume of such water treatment wastes stored at any one time on site shall not exceed 12,000 cubic feet. Final disposition of such wastes shall be conducted in accordance with Item 15.C.

#### 11. Authorized radioactive material users:

- A. Radioactive material shall be handled by the Radiation Safety Officer (RSO), or by individuals, including contract workers, who have successfully completed the training course as provided on May 20, 2019, and have been designated as authorized users by the RSO.
- B. The licensee shall maintain a list of all individuals currently authorized to use radioactive materials. This list and documentation of each authorized user's training shall be available for review by the department.
- C. The licensee shall maintain at least one authorized user, which shall include the RSO, until termination of the license.
- D. An authorized user shall be at the facility or immediately available at all times during licensed related activities.
- E. Prior to designating an individual as RSO, the licensee shall provide the department with documentation of the individual's training and experience.
- F. Refresher training in health physics is required at least every two years for the RSO. The licensee shall maintain documentation of the date and content of the refresher training for review by the department.

#### 12. General requirements:

- A. The licensee shall comply with the provisions of the Regulations: Part 1, "General Provisions"; Part 3, "Licensing of Radioactive Material"; Part 4, "Standards for Protection Against Radiation"; Part 10, "Notices, Instructions and Reports to Workers; Inspections"; and Part 17, "Transportation of Radioactive Material".

- B. Unless otherwise provided in this license, terms used herein are as defined in the Regulations.
- C. The licensee shall not transfer possession and/or control of radioactive materials or items contaminated with radioactive material except: by transfer of waste to an authorized recipient; by transfer to a specifically licensed recipient; or, as provided otherwise by specific condition of this license pursuant to the requirements of Part 3, Section 3.22 of the Regulations.
- D. Radioactive material authorized by Item 10 of this license shall be stored and used in a manner that will preclude possession or use by unauthorized personnel.
- E. The licensee shall ensure that information listed in this license is correct and accurate. The licensee shall notify the department in writing within 10 days whenever the information contained in Items 1 through 7 above is no longer current or determined to be incorrect.
- F. The licensee may transport radioactive material or deliver radioactive material to a carrier for transport in accordance with the provisions of Part 17 of the Regulations and the requirements of U.S. Department of Transportation (49 CFR), except for small quantities used to characterize site materials.
- G. Within the scope of applicable statutes and lawful regulations thereunder, the licensee shall operate in full compliance with the requirements of each other division of the department. Violation of such other requirements shall not by itself constitute violation of this license, unless the department makes an independent finding of violation of the Regulations, or a condition of this license.
- H. Where statements in referenced documents conflict, the most recent document shall prevail unless the department determines otherwise.
- I. The licensee shall not make any false statement, representation, or certification in any application, record, report, plan, or other document regarding radiation levels, tests performed or radiation safety conditions or practices.
- J. When required, department “approval”, “authorization”, or “concurrence” shall be obtained in writing from the department, unless otherwise specified.
- K. If any part of this license is held invalid, the remainder shall not be affected.

### **13. Occupational dose monitoring:**

- A. Dose monitoring and evaluation shall be consistent with Item 14.B.

## 14. Specific radiation safety requirements:

### A. Posting exemption

The licensee is hereby exempted from the requirements of Section 4.28 of the Regulations for areas within any exclusion area boundary, provided all entrances to the property are conspicuously posted with the sign:

**“Any Area or Container on this Property  
May Contain Radioactive Materials.”**

- B. All operations involving the handling or use of radioactive materials authorized in Item 10 or items contaminated with such radioactive material shall be conducted in accordance with the Radiation Protection Program Manual approved by the department; the license amendment request dated April 30, 2019; correspondence dated May 20 and 26, 2019; the modification requests dated January 22, 2020, July 22, 2020, and June 7, 2021; or a Radiation Work Permit approved by the RSO.

### C. Radiation Protection Program Manual

The licensee shall maintain a comprehensive written radiation safety program manual, approved by the department, governing licensed activities. The manual shall contain safety, monitoring, decontamination, and emergency procedures, including:

- i. Administrative and operating procedures relating to radiological health and safety;
- ii. Instructions and precautions to keep exposures and releases ALARA;
- iii. Specific information on analytical equipment, laboratories, and procedures for each aspect of the monitoring program;
- iv. All procedures manual revisions shall be submitted to the department for review and approval prior to implementation; and
- v. No reduction in monitoring provisions shall be made without department approval.

### D. Reports of accidents

- i. Immediately upon discovery of any failure, or imminent threat of failure, in any process, diversion, or retention system which results or may result in a release of radioactive material into unrestricted areas, or unexpected contaminants or concentrations exceeding the authorization in Item 10, the licensee shall notify the department by telephone at (303) 877-9757 (24-hour, 7-day emergency number).

- ii. The licensee shall document and maintain records for all incidents, accidents, spills, and emergencies. The documentation shall be available for review by the department.

E. Emergency response

The licensee shall use plans approved by the department to respond to emergencies such as radioactive material spills or treatment pond embankment failure. These plans shall include provisions for warning of personnel and for prompt retrieval of radioactive material released to uncontrolled areas.

- F. Periodic gamma exposure rate measurements, contamination surveys, and radon monitoring, with frequency determined by the RSO, shall be taken near the treatment facilities and waste storage areas during the period when the water treatment activities authorized in Item 10.B are conducted. Survey records shall be maintained and available for review by the department.
- G. Water treatment wastes authorized in Item 10.B shall be periodically characterized for natural uranium, radium-226, and radium-228, and in accordance with the correspondence provided by the licensee on May 20, 2019, or the updated characterization dated June 7, 2021. The Phosphate Residuals Management System waste collected shall also be characterized for natural uranium, radium-226, and radium-228 at least once at the end of the field season if the system was operated during that season.
- H. All personnel and equipment in contact with the licensed material authorized in Item 10.B shall be thoroughly surveyed for contamination before leaving the site. The licensee shall ensure that said personnel or equipment meet department approved unrestricted release criteria for levels of contamination prior being released. Surveys for the release of equipment shall be documented and maintained and available for review by the department.
- I. The licensee shall maintain sufficient models and numbers of radiation detection instruments on site during the period when the water treatment activities authorized in Item 10.B are conducted. The licensee shall calibrate all radiation detection instruments at least annually and after repair.

**15. Special license requirements:**

- A. The licensee shall not operate any on-site water treatment plant without department approval through a license amendment.
- B. The on-site building used for storage of treatment wastes resulting from the activities authorized in Item 10.B shall be locked at all time when authorized personnel are not present.
- C. All wastes or contaminated equipment resulting from the activities authorized in Item 10.B shall be disposed off-site at facilities authorized to accept such material, unless otherwise approved by the department.

D. Financial warranty:

The licensee shall maintain in effect a financial warranty acceptable to the department in accordance with the requirements of Section 3.9.5 of the Regulations:

- i. The licensee shall maintain in force a surety pursuant to Part 3 of the Regulations for decommissioning, decontamination, and reclamation of the site; past and present transport routes to the sediment pond; the on-site disposal areas; the radioactivity-laden fraction of pond sediments; and disposal of water treatment wastes and contaminated equipment.
- ii. The licensee shall maintain in effect a financial assurance warranty acceptable to the department, specific to the material authorized in Item 10.B, in the amount of \$720,000 in 2021 dollars in accordance with the requirements of Section 3.9.5 of the Regulations.
- iii. Item 16.F specifies provisions in effect, as provided by the financial warranty for Division of Reclamation, Mining, and Safety Permit M1977-004, totaling \$2,263,000.
- iv. Department incorporation into this license of the licensee's Financial Warranty for Permit M1977-004 relies on Section 3.9.5.4.5 of the Regulations and the Memorandum of Understanding between the department and the Division of Reclamation, Mining, and Safety of the Department of Natural Resources.
- v. Any surety agreement and surety instruments required by this license shall be subject to annual review for adequacy by the department, and such other agencies as the department designates, in accordance with Section 3.9.5.7 of the Regulations. Cost estimates may be adjusted upward or downward as current circumstances (including, but not limited to, inflation, regulations, technology, and work completed) require. The licensee shall provide in writing to the department, no later than June 30<sup>th</sup> of each calendar year, an annual report demonstrating proof of the value of existing financial warranties and any proposed changes to the financial assurance warranties, including updated Decommissioning Funding Plan.
- vi. The license and adequate surety shall remain in effect until final reclamation complies with applicable State and Federal regulations and final action on release is taken by the department as provided by the license and financial assurance agreements between the licensee and the State.

- vii. Prior to seeking release of surety pursuant to this license, the licensee shall notify the department of the request for release. The licensee shall also notify the department of any intent to request modification, reduction or release of this surety. Upon determination by the department that reclamation has been performed in compliance with this license, the Regulations, and the State law, the licensee shall be released from the surety requirements.

E. Recordkeeping requirements

- i. The results of sampling, analyses, surveys, instrument calibrations, inspections, audits, employee training, as well as any related reviews, investigations and corrective actions shall be documented and stored. The licensee shall maintain adequate safeguards against tampering and loss of records.
- ii. All such documentation shall be maintained until disposition is authorized by the department. Personnel exposure records shall be preserved indefinitely.

- F. The licensee shall, for the previous year ending December 31<sup>st</sup>, provide the department by May 31<sup>st</sup> of each year, a report that (i) states that no activity took place, or describing any activity that took place; (ii) evaluates the occupational and public exposures resulting from the licensed activities of the year; (iii) summarizes the survey or sampling activities; (iv) summarizes any incidents occurred; (v) provides a current storage inventory of the licensed material authorized in Item 10.B on site and the characterization results required in Item 14.G; and (vi) summarizes any water treatment wastes disposed off-site. A copy of the Reclamation Report to the Division of Reclamation, Mining, and Safety within the Colorado Department of Natural Resources shall be provided to the department annually.

G. Remedial action

- i. Prior to site closure, to assess radium-226 concentrations in all Radium Treatment Plant (RTP) drainage channels, the licensee shall conduct a soil and sediment sampling program approved by the department. The risk assessment used for the removal of soils at the RTP will form the basis for cleanup levels in the sediment pond.
- ii. Sediment pond solids shall be disposed of in place or within the on-site disposal cells in accordance with a design approved by the Division of Reclamation, Mining, and Safety as per Items 16.C and 16.D. If it is deemed viable to dispose of the solids within a disposal cell in the sediment pond area, an engineering design report will be prepared and submitted to the department for approval. Disposal of any soils and sediments containing radium-226 concentrations above applicable standards shall be by a program approved by the department. Any disposal on-site shall require a license amendment analogous to the action authorized by Amendment 08, which was effective August 15, 1994.

- iii. These decommissioned areas shall be returned to unrestricted use by decontamination to background radiation and toxic contaminant ranges acceptable to the department, based on statistically defensible tests of contamination with depth, in accordance with applicable State and Federal regulations and policies in effect at the time.

#### H. Radiation Work Permits (RWPs):

- i. The licensee shall have an RWP which establishes and specifies appropriate radiological and safety controls for any work, including maintenance, at any location of the licensed facility or site, which has radiation safety implications and for which no written procedure exists. The RSO shall be familiar with ongoing activities at the site, and make the determination if a RWP is required for a given task. All such RWPs shall be reviewed and approved in writing by the RSO prior to any activity that a RWP governs. All workers who will conduct the task a RWP governs shall be trained with the provisions in the RWP and the training shall be documented. A copy of all RWPs shall be retained for no less than 5 years for inspection by the department.
- ii. RWPs are not to be a substitute for written procedures. Should the activities governed under a RWP become routine or frequently performed activities, the licensee shall develop these work permits into written procedures and provide copies to the department for review, approval and incorporation into the license.

#### I. Change of ownership

- i. In furtherance of Section 3.15.2 of the Regulations, the licensee shall provide the department with ninety days advance notification of any proposed change in ownership or control of all properties used or to be used for activities authorized by this license.
- ii. The licensee may not transfer ownership or vacate any portion of the licensed site(s) without prior written authorization from the department.

#### J. Bankruptcy

The licensee shall notify the department, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapter of Title 11 (Bankruptcy) of the United States Code by or against:

- i. The licensee;
- ii. An entity [as that term is defined in 11 U.S.C. 101 (14)] controlling the licensee or listing the licensed facility or licensee as property of the estate; or

iii. An affiliate [as that term is defined in 11 U.S.C. 101 (2)] of the licensee.

This notification must indicate the bankruptcy court in which the petition for bankruptcy was filed and the date of the filing of the petition.

#### **16. Licensee commitments and reference documents:**

The State of Colorado Rules and Regulations Pertaining to Radiation Control shall govern unless the licensee's statements, representations, and procedures contained in the application and correspondence are more restrictive than the Regulations. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Item 10 of this license in accordance with the statements, representations, and procedures contained in:

- A. The license renewal application dated March 13, 2008, March 15, 2013, and March 2018, and the correspondences dated November 13, 2018, and December 14, 2018;
- B. The Division of Reclamation, Mining, and Safety permit, including Homestake's original 1977 application to this Division's predecessor the Mined Land Reclamation division (MLRD), as amended by the Homestake letters of January 16, August 31, and October 19, 1984 to MLRD, and as subsequently approved by the MLRD or Division of Reclamation, Mining, and Safety;
- C. The letter with attachment of May 3, 1989 from John Hardaway of Homestake to Edd Kray of the department containing revised reclamation and surety commitments;
- D. The request for amendment dated May 31, 1994;
- E. The letters with attachments dated June 2, 1994, and July 31, 1994, from Luke Russell of the Homestake Mining Company to Bruce Humphries and James Dillie of the Division of Minerals and Geology containing revised reclamation plans;
- F. The application for renewal submitted January 8, 1998;
- G. The Verification Sampling for Radium Treatment Plant Cleanup of the Pitch Reclamation Project report by Shepherd Miller dated April 2002;
- H. The request for amendment dated April 1, 2004;
- I. The request for RSO change dated March 28, 2017;
- J. The Radiation Protection Program Manual, Pitch Reclamation Project, Revision 5, dated May 6, 2021, or subsequently approved by the department;
- K. The license amendment request dated April 30, 2019, and the correspondence dated May 20, 2019, May 26, 2019, and June 11, 2019;
- L. The Decommissioning Funding Plan dated May 20, 2019;

- M. The modification request dated January 22, 2020; and
- N. The license amendment request dated July 22, 2020.
- O. The license amendment request dated June 7, 2021.

**For the Colorado Department of Public Health and Environment**

Date: 09/21/2021 By: \_\_\_\_\_

**APPENDIX E**

**DRMS Inspection Report**



**MINERALS PROGRAM INSPECTION REPORT**  
**PHONE: (303) 866-3567**

The Division of Reclamation, Mining and Safety has conducted an inspection of the mining operation noted below. This report documents observations concerning compliance with the terms of the permit and applicable rules and regulations of the Mined Land Reclamation Board.

<b>MINE NAME:</b> Pitch Project	<b>MINE/PROSPECTING ID#:</b> M-1977-004	<b>MINERAL:</b> Uranium and borrow construction	<b>COUNTY:</b> Saguache
<b>INSPECTION TYPE:</b> Monitoring	<b>INSPECTOR(S):</b> Dustin Czapla	<b>INSP. DATE:</b> October 13, 2021	<b>INSP. TIME:</b> 09:00
<b>OPERATOR:</b> Homestake Mining Company	<b>OPERATOR REPRESENTATIVE:</b> Dave Wykoff	<b>TYPE OF OPERATION:</b> 112d-3 - Designated Mining Operation	
<b>REASON FOR INSPECTION:</b> Normal I&E Program	<b>BOND CALCULATION TYPE:</b> None	<b>BOND AMOUNT:</b> \$24,451,940.00	
<b>DATE OF COMPLAINT:</b> NA	<b>POST INSP. CONTACTS:</b> None	<b>JOINT INSP. AGENCY:</b> None	
<b>WEATHER:</b> Clear	<b>INSPECTOR'S SIGNATURE:</b> 	<b>SIGNATURE DATE:</b> October 27, 2021	

**GENERAL INSPECTION TOPICS**

This list identifies the environmental and permit parameters inspected and gives a categorical evaluation of each. No problems or possible violations were noted during the inspection. The mine operation was found to be in full compliance with Mineral Rules and Regulations of the Colorado Mined Land Reclamation Board for the Extraction of Construction Materials and/or for Hard Rock, Metal and Designated Mining Operations. Any person engaged in any mining operation shall notify the office of any failure or imminent failure, as soon as reasonably practicable after such person has knowledge of such condition or of any impoundment, embankment, or slope that poses a reasonable potential for danger to any persons or property or to the environment; or any environmental protection facility designed to contain or control chemicals or waste which are acid or toxic-forming, as identified in the permit.

(AR) RECORDS----- <u>Y</u>	(FN) FINANCIAL WARRANTY----- <u>N</u>	(RD) ROADS----- <u>N</u>
(HB) HYDROLOGIC BALANCE----- <u>Y</u>	(BG) BACKFILL & GRADING----- <u>Y</u>	(EX) EXPLOSIVES----- <u>N</u>
(PW) PROCESSING WASTE/TAILING---- <u>N</u>	(SF) PROCESSING FACILITIES----- <u>N</u>	(TS) TOPSOIL----- <u>N</u>
(MP) GENL MINE PLAN COMPLIANCE- <u>N</u>	(FW) FISH & WILDLIFE----- <u>N</u>	(RV) REVEGETATION---- <u>N</u>
(SM) SIGNS AND MARKERS----- <u>N</u>	(SP) STORM WATER MGT PLAN---- <u>N</u>	(RS) RECL PLAN/COMP-- <u>Y</u>
(ES) OVERBURDEN/DEV. WASTE----- <u>N</u>	(SC) EROSION/SEDIMENTATION--- <u>Y</u>	(ST) STIPULATIONS----- <u>N</u>
(AT) ACID OR TOXIC MATERIALS----- <u>N</u>	(OD) OFF-SITE DAMAGE----- <u>N</u>	

Y = Inspected / N = Not inspected / NA = Not applicable to this operation / PB = Problem cited / PV = Possible violation cited

## **OBSERVATIONS**

This inspection was conducted as part of the Division of Reclamation, Mining and Safety's (Division) normal monitoring program. David Wykoff, representing the Operator, was present. Photographs are included with this report in order to illustrate some of the conditions observed.

The mine is located approximately six miles east of Sargents in Saguache County and accessed from Marshall Pass Road. The site is a 112d operation that includes a total of 3,003.4 permitted acres. The Division currently holds a financial warranty amount of \$24,451,940.00 for this site.

Adequate mine identification signage was noted at the entrance to the site.

Limestone Quarry: Reclamation grading at the limestone quarry has been completed. The area was reseeded in the fall. The work observed appears to be in accordance with the approved reclamation plan. No problems were noted.



South Pit: Reclamation grading at the South Pit Landslide Crest Mitigation Area has been completed. The area was reseeded in the fall. The work observed appears to be in accordance with the approved reclamation plan. No problems were noted.



The laydown area above the Tie Camp Rock dump has been regraded and reseeded. The reclamation work looks good. No problems were noted.



A significant amount of drainage work has been completed at the site. The channel above the north pit has been improved and constructed with rip-rap. A rip-rap drainage channel above the Tie-Camp rock dump has been constructed. 36" HDPE pipe has been installed along the road below the shop area and the channel has been improved down to the concrete structures above the sediment pond area.





The cericite stockpile has been removed and the area regraded and reseeded.

The sand filter plant has been removed and the area regraded and reseeded.



All the reclamation work observed during this inspection looks very good. No problems were noted.

Responses to this inspection report should be directed to Dustin Czapla at the Division of Reclamation, Mining and Safety, 1313 Sherman Street Room 215, Denver, Colorado, 80203, phone number (303) 866-3567, ext. 8188.

**Inspection Contact Address**

David Wykoff  
Homestake Mining Company  
P.O. Box 40  
Sargents, CO 81248

**APPENDIX F**  
**Letter of Surety**



**COLORADO**  
 Division of Reclamation,  
 Mining and Safety  
 Department of Natural Resources

1313 Sherman Street, Room 215  
 Denver, CO 80203

Effective January 9, 2020 this bond replaces Safeco Insurance Company Bond No. 6068126.

**FINANCIAL WARRANTY**  
**CORPORATE SURETY**

Operator: Homestake Mining Company  
 Operation: Pitch Mine  
 Permit No.: M-1977-004 Bond No.: 070206093

Warrantor: Liberty Mutual Insurance Company  
 Street: 175 Berkeley Street  
 City: Boston  
 State: MA Zip Code: 02116  
 Area Code: 617-357-9500 Telephone: 617-574-5955

*This form has been approved by the Mined Land Reclamation Board pursuant to sections 34-32-117, C.R.S., of the Mined Land Reclamation Act and 34-32.5-117, C.R.S., of the Colorado Land Reclamation Act for the Extraction of Construction Materials. Any alteration or modification of this form, without approval by the Board shall result in the financial warranty being invalid and result in the voiding of any permit issued in conjunction with such invalid financial warranty and subject the operator to cease and desist orders and civil penalties for operating without a permit pursuant to sections 34-32-123, C.R.S., of the Mined Land Reclamation Act and 34-32.5-123, C.R.S., of the Colorado Land Reclamation Act for the Extraction of Construction Materials.*

KNOW ALL MEN BY THESE PRESENTS, THAT:

WHEREAS, the Colorado Mined Land Reclamation Act, C.R.S. 1973, 34-32-101 *et seq.* (the "Act"), as amended, provides that no permit may be issued under the Act until the Mined Land Reclamation Board (the "Board") receives a Financial Warranty (or Warranties) as described in the Act.

WHEREAS, Homestake Mining Company (the "Operator"), a California corporation, has applied for a permit to conduct a mining operation known as Pitch Mine (the "Operation"), on certain lands in Saguache County, Colorado. These lands are described in the permit application, as amended and supplemented, and are referred to herein as the "Affected Lands".



WHEREAS, in the application for the permit, the Operator has agreed to be bound by all requirements of the Act and all applicable rules and regulations of the Board, as amended from time to time.

WHEREAS, in the application for the permit, the Operator has agreed with the Board to provide for reclamation of the Affected Lands that are now, or may become, subject to the permit, as required by law.

WHEREAS, the Operator and Liberty Mutual Insurance Company (the "Warrantor"), a corporation organized and existing under the laws of the State of Massachusetts and duly authorized to transact a bonding and surety business in the State of Colorado are hereby and firmly bound unto the State in the sum of Twenty Four Million Four Hundred Fifty One Thousand Nine Hundred Forty & No/100 Dollars (\$ 24,451,940.00 ) for the life of mine or until such time as replacement is received, for the payment of which sum, well and truly made, we hereby bind ourselves and our personal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Board has determined, in accordance with the Act, that the estimated costs of reclamation of the Affected Lands are those amounts for the stated periods of time as set forth herein. Said amount may be amended from time to time to reflect revised estimates of said costs of reclamation.

WHEREAS, the Operator and the Warrantor, in accordance with the Act, has promised and hereby promises the Board that it will be responsible for all the estimated costs of reclamation with regard to the Affected Lands.

WHEREAS, the Board has determined that this Financial Warranty by the Warrantor equals the estimated costs of reclamation, as approved by the Board, with regard to the Affected Lands.

NOW, THEREFORE, the Operator and the Warrantor are held hereby firmly unto the State of Colorado in the amount of those sums for those periods of time as set forth herein, until this Financial Warranty is amended or released in accordance with applicable law.

The Board may, for good cause shown, increase or decrease the amount and duration of this Financial Warranty. The Operator shall have sixty (60) days after the date of notice of any such adjustment to increase the surety amount, but no such increase shall bind the Warrantor unless and until it shall have consented thereto in writing by the issuance of an additional Financial Warranty or by an endorsement to this Financial Warranty.

The Operator and the Warrantor shall notify the Board immediately of any event which may impair this Financial Warranty. If the Board receives such notice, or otherwise has reason to believe that this Financial Warranty has been materially impaired, it may convene a hearing in accordance with the Act for the purpose of determining whether impairment has occurred.

The obligation of the Operator and the Warrantor shall continue until the Board has released this Financial Warranty or has ordered it forfeited in accordance with applicable provisions of the Act. It is understood that periods of years may necessarily be required before determination can be made that reclamation of the Affected Lands has been satisfactorily completed. It is also recognized that, as reclamation is accomplished, the amount of this Financial Warranty may be reduced with the approval of the Board so that it reflects the then current estimated cost of the remaining reclamation of the Affected Lands. No revision, extension, or renewal of the permit, or of the time allowed to complete reclamation, shall diminish the Operator's or Warrantor's obligation under this Financial Warranty. No misrepresentation by the Operator which may have induced the Warrantor to execute this Financial Warranty shall be any defense to demand by the State under this agreement.

In any single year during the life of the permit, the amount of the Financial Warranty shall not exceed the estimated cost of fully reclaiming all lands to be affected in said year, plus all lands affected in previous permit years and not yet fully reclaimed. Reclamation costs shall be computed with reference to current reclamation costs.

The amount of this Financial Warranty is based upon estimates as to the cost of reclamation, and does not operate to liquidate, limit, enlarge or restrict the Operator's obligations to complete reclamation and to comply in all respects with the permit and with applicable laws and regulations governing reclamation, even though the actual cost thereof may substantially exceed the amount of this Financial Warranty.

The Mined Land Reclamation Board or the Office of Mined Land Reclamation may recover the necessary costs, including attorney's fees or fees incurred in foreclosing on or realizing the collateral used in the event this Financial Warranty is forfeited. The face amount of this Financial Warranty shall be increased by five hundred dollars (\$500.00) to cover these costs.

The Warrantor shall not be liable under this Financial Warranty for an amount greater than the sum designated herein, unless increased by a later amendment to this Financial Warranty. This Financial Warranty shall be reviewed by the Board from time to time, and the Board may require an increase in the principal sum of this Financial Warranty (and a corresponding increase in the surety amount) to cover increases in the estimated costs of reclamation, but no such increase shall bind the Warrantor unless and until it shall have consented thereto in writing by the issuance of an additional Financial Warranty or by an endorsement to this Financial Warranty.

The Warrantor reserves the right to cancel this Financial Warranty, effective only upon an anniversary date, and only by giving written notice to that effect, mailed by Certified Mail, at least ninety (90) days prior to such anniversary date, addressed to both the Operator at its address herein stated, and to the Board at the address herein stated. In the event of such cancellation, this Financial Warranty shall nevertheless remain in full force and effect as respects the reclamation of all areas disturbed prior to the effective date of such cancellation, unless and until the Operator shall file a substitute Financial Warranty which: (1) assumes liability for all reclamation obligations which shall have arisen at any time while this Financial Warranty is in force; and (2) is accepted in writing by the Board.

In the event of such cancellation, if the Financial Warranty is not fully released, the amount of the continuing Financial Warranty available for the reclamation of areas disturbed and unreclaimed at the date of cancellation shall be fixed by the Board at the amount it determines necessary to complete such reclamation (which amount may not exceed the sum designated herein) and the Board shall concurrently identify such areas in writing, and notify the Warrantor and the Operator thereof. Thereafter, the obligation of the Warrantor shall be limited to reclamation of the areas so identified.

The consideration for the Warrantor's execution of this agreement is the promise of the Operator to pay the premiums, but failure by the Operator to pay such premiums shall not invalidate or diminish the Warrantor's obligation hereunder.

The Board may make demand upon the Warrantor for payment hereunder if the Board determines that reclamation which ought to have been performed by the Operator, or its successors or assigns, remains unperformed, and if Financial Warranty forfeiture procedures required by law have been initiated. No other condition precedent need be fulfilled to entitle the State to receive the amount so demanded. However, if, upon completion of reclamation by the State, the amounts expended for reclamation shall be less than the amount received from the Warrantor, the excess shall be promptly refunded to the Warrantor.

If demand is made upon the Warrantor for payment of an amount due to the Board hereunder, and if the Warrantor fails to make payment of such amount within ninety (90) days after the date of receipt of such demand, or if it should thereafter be determined, by agreement of the Warrantor or by final judgment of court, that the amount demanded was properly payable, the Warrantor agrees to pay to the Board, in addition to the amount demanded, interest at the

current published Wall Street Journal Prime Rate for the period commencing at the end of such ninety-day period and ending on the date of actual payment.

If the Board shall notify the Warrantor that the Operator is in default, and if the Board shall initiate any Financial Warranty forfeiture procedures required by law or regulation, the Warrantor may, in lieu of making payment to the Board of the amount due hereunder, cause the reclamation to be timely performed in accordance with all requirements of the Act and all applicable rules and regulations. In such event, when and if the reclamation has been timely performed to the satisfaction of the Board or Division, this Financial Warranty shall be released. If the reclamation shall not be so performed to the satisfaction of the Board or Division, this Financial Warranty shall remain in full force and effect.

This Financial Warranty shall be subject to forfeiture whenever the Board determines that any one or more of the following circumstances exist:

1. A Cease and Desist Order entered pursuant to Section 34-32-124 of the Act has been violated, and the corrective action proposed in such Order has not been completed, although ample time to have done so has elapsed; or
2. The Operator is in default under its Performance Warranty, and such default has not been cured, although written notice and ample time to cure such default has been given; or
3. The Operator and/or the Warrantor has failed to maintain its Financial Warranty in good standing as required by the Act; or
4. The Warrantor no longer has the financial ability to carry out its obligations in accordance with the Act.

The description of lands herein is for convenience of reference only, and no error in such description, nor any revision of the permitted mining area, nor the disturbance by the Operator of lands outside of the permitted mining area shall alter or diminish the obligations of the Operator and/or Warrantor hereunder, which shall extend to the reclamation of all such lands disturbed.

If this Financial Warranty applies to National Forest System lands, and if this Financial Warranty is accepted by the United States Forest Service ("U.S.F.S.") as the bond required under 36 C.F.R. 228.13, then the Operator, having requested that the Board and the U.S.F.S. accept this single Financial Warranty in lieu of the separate bonds which would otherwise be required by applicable law, hereby agrees that, notwithstanding any other provision hereof, or of law, this Financial Warranty shall remain in full force and effect until U.S.F.S. has advised the Board by written notice that the Operator's obligations to U.S.F.S., for which this Warranty is executed, have been satisfied, and until the financial warranty has been released by the Board.

If this Financial Warranty applies to lands under the jurisdiction of the State Board of Land Commissioners ("Land Board"), and if this Financial Warranty, in whole or in part, is accepted by the Land Board as the bond required under its applicable law and procedures, then the Operator, having requested that the State accept this Financial Warranty in lieu of the separate bonds which would otherwise be required by the Colorado Mined Land Reclamation Board or Division of Reclamation, Mining and Safety and by the Land Board, hereby agrees that, notwithstanding any other provision hereof, or of law, this Financial Warranty shall remain in full force and effect until the Board is notified in writing by the Land Board that the Operator's obligations to the Land Board, for which this Warranty is executed, have been satisfied, and until the financial warranty has been released by the Board.

If all or any part of the Affected Lands are under the jurisdiction of the Bureau of Land Management, United States Department of the Interior (the "BLM"), and if, at the request of the Operator on this Financial Warranty, the BLM has, pursuant to 43 C.F.R. 3809.1-9, accepted this Financial Warranty in lieu of requiring a separate reclamation bond

payable to the United States, then, notwithstanding any other provision of this Financial Warranty, or of law, the Operator and Warrantor hereby agree that this Financial Warranty shall not be released until the Board is advised in writing by the BLM that the Operator's obligations to the BLM, for which this Warranty is executed, have been satisfied, and until the financial warranty has been released by the Board.

This Financial Warranty may be executed in multiple copies, each of which shall be treated as an original, but together they constitute only one agreement, the validity and interpretation of which shall be governed by the laws of the State of Colorado.

The provisions hereof shall bind and inure to the benefit of the parties hereto and their successors and assigns.

SIGNED, SEALED AND DATED this 9th day of January, 2020.

Liberty Mutual Insurance Company (SEAL)  
Warrantor

By: *Sandra L. Ham*  
Sandra L. Ham, Attorney-In-Fact

Homestake Mining Company (SEAL)  
Operator

By: *[Signature]*

**NOTARIZATION OF WARRANTOR'S ACKNOWLEDGEMENT**

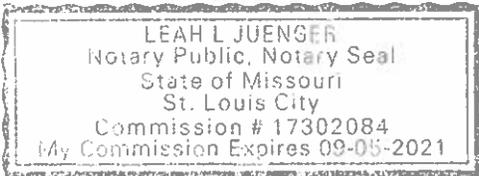
STATE OF Missouri )  
COUNTY OF St. Louis City ) ss.

The foregoing instrument was acknowledged before me this 9th day of January, 2020.

by Sandra L. Ham as Attorney-In-Fact of Liberty Mutual Insurance Company.

*[Signature]*  
NOTARY PUBLIC

My Commission expires: 09/05/2021

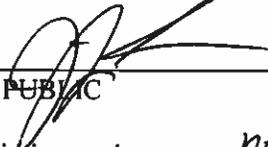


NOTARIZATION OF OPERATOR'S ACKNOWLEDGEMENT

PROVINCE  
STATE OF ONTARIO )  
CITY )  
COUNTY OF TORONTO ) ss.

The foregoing instrument was acknowledged before me this 14<sup>th</sup> day of January,  
2020

by Leo van Wyk as Treasurer of Homestake Mining Company.

  
\_\_\_\_\_  
NOTARY PUBLIC

My Commission expires: never

APPROVED:

State of Colorado  
Mined Land Reclamation Board  
Division of Reclamation, Mining and Safety

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Division Director



This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: 8201331

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Sandra L. Ham all of the city of St. Louis, state of Missouri each individually if there be more than one named, its true and lawful attorney-in-fact, with full power and authority hereby conferred to sign, execute and acknowledge the above-referenced surety bond.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 30th day of May, 2019.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company



By: [Signature of David M. Carey]

David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 30th day of May, 2019, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.



COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: [Signature of Teresa Pastella]

Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV - OFFICERS: Section 12. Power of Attorney.

Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII - Execution of Contracts: Section 5. Surety Bonds and Undertakings.

Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation - The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization - By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, of Liberty Mutual Insurance Company, The Ohio Casualty Insurance Company, and West American Insurance Company do hereby certify that this power of attorney executed by said Companies is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 9th day of January, 2020.



By: [Signature of Renee C. Llewellyn]

Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00am and 4:30pm EST on any business day.