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SENT VIA ELECTRONIC COMMUNICATIONS

February 22, 2024

Mr. Patrick Lennberg
Environmental Protection Specialist
Colorado Department of Natural Resources
Division of Reclamation, Mining and Safety
Office of Mined Land Reclamation
1313 Sherman Street, Room 215
Denver, Colorado 80203

RE: Additional Information Required No. 2, Grassy Valley Groundwater and Surface Water Monitoring Report September 2023; Permit No. M-1980-244

Dear Mr. Lennberg:

Cripple Creek and Victor Gold Mining Company (CC&V) received the Division of Reclamation, Mining, and Safety's (DRMS) *Additional Information Required No. 2, Grassy Valley Groundwater and Surface Water Monitoring Report September 2023*; *Permit No. M-1980-244.* CC&V has reviewed the additional information required in the letter dated January 23, 2024 from DRMS and has prepared the following responses for each comment. The DRMS comment (**in bold**) and CC&V's corresponding response (*in italics*) is presented below.

1. **From the responses provided, the Operator has collected analytical samples from locations, which are not part of a routine sampling program and reported to the Division, during investigations of the ECOSA Seep and impacts to the Grassy Valley hydrologic balance. The results of these samples have not been readily provided to the Division.**

   The Operator's response indicates that samples have been collected from OSABH-17 and GVMW- 7A/B. While other locations OSABH-18, GVMW-4 and GVMW-15 have been monitored to be dry. Provide the most recent and historic, dating as far back as 2021 if available, analytical data collected from OSABH-17 and GVMW-7A/B so the Division may evaluate the potential

impacts to groundwater from seepage at the ECOSA.

Attachment 1 indicates that analytical samples have been collected from GVMW-10. Provide a statement whether or not samples have been collected from this location during investigations of the ECOSA Seep and Grassy Valley beginning in 2021. As above, provide the relevant analytical data.

Analytical data for samples collected from OSABH-17, GVMW-7A, and GVMW-7B from 2021-present have been included in Attachment 1. During the period 2021-present, OSABH-17 has been sampled intermittently, and GVMW-7A and GVMW-7B were sampled only in 2023. Samples from GVMW-10 were not collected during this entire time period; the first sample was collected in December 2023. The analytical data for that sample was submitted in the Grassy Valley Groundwater and Surface Water Monitoring Report dated December 2023.

2. **In response to Item 2, the Operator states they met the commitment to develop and submit a long term plan for the ECOSA, which was later withdrawn at the request of the Division. Please note, TR-138 was considered to not be a long term plan per the TR-132 commitment and exceeded the scope of a technical revision. The Division was going to deny TR-138 as submitted, however the Operator chose to withdraw the application to preempt the denial. As no long term plan has been approved, the commitment has not been met by the Operator. Furthermore, TR- 138 lacked specific details and information which now appears to have been available following the initial data gap report from WSP Golder (Golder) in December 2021, including the geophysical survey of Grassy Valley performed by Golder in August 2022. To date the Operator has not provided the Division with the details of the investigation's findings.**

   Provide a copy of the initial WSP Golder report from December 2021, and any copies of additional follow-up reports from WSP Golder and others pertaining to the investigations of the ECOSA seepage and impacts to the hydrologic balance in Grassy Valley, including the July 2023 geophysical investigation.

   CC&V acknowledges the comments received on TR-138 and has continued to work *with the Division to address those comments and develop an adaptive management approach for ECOSA. Phase I of the proposed approach for installation of additional monitoring wells in Grassy Valley was submitted as TR-141 on December 20, 2023.*

Since the development of the WSP Golder work plan, CC&V has progressed the phases outlined in the report to address identified data gaps and allow for a better understanding of the colluvial groundwater regime in Grassy Valley. Work up to and including Phase 3 has been completed. This investigation led CC&V to pursue the installation of additional monitoring wells in Grassy Valley to provide more information on the hydrogeology and have the potential to be converted into interception wells as the most effective approach to monitor and manage ECOSA seepage (this planned work is generally equivalent to Phase 4/5). If the Division has further questions regarding the work plan, CC&V would be willing to organize a meeting to facilitate a more effective discussion regarding the contents of the work plan.

CC&V has attached the following final reports pertaining to the ECOSA investigations:

1. *The WSP Golder East Cresson Overburden Storage Area Acid Rock Drainage Sustainable Solutions Evaluations; Cripple Creek & Victor Mine; Shallow Groundwater Investigation Work Plan (WSP Golder), dated April 18, 2022 is included in Attachment 2.*

2. *The WSP Golder Report on East Cresson Overburden Storage Area Acid Rock Drainage Sustainable Solutions Evaluations; Cripple Creek & Victor Mine (WSP Golder), dated January 9, 2023 included in Attachment 3.*

Due to organizational changes to the ECOSA project structure, the Collier Geophysical Report was not finalized. CC&V is in the process of working with Collier to finalize the report and will provide the final report to the Division as soon as it is available.

3. **Provide the appropriate DWR well abandonment documents GVMW-4B and -15C. The Division reviewed the permit file and could not find documentation that approved the abandonment of these wells, provide the missing documentation. If no documentation exists provide a schedule to replace the abandoned monitoring wells.**

   Provide the well construction summaries for GVMW-4A and -15A and include with them the most recent water level measurements for each well.

   Attachment 4 contains the well abandonment documentation for GVMW-4B. Upon further investigation, GVMW-15C was only partially blocked at the surface and not completely abandoned. CC&V was able to clear the blockage and attempt to measure water level; however, no water was detected up to 500' which is the maximum length of CC&V's water level meters. CC&V is in the process of acquiring additional equipment to confirm the depth of water in the well, if any. The well construction summaries for GVMW-4A and GVMW-15A are included as Attachment 5 and Attachment 6 respectively. The most recent depth to water for GVMW-4A was 42 feet recorded on December 5, 2023. The most recent depth to water on GVMW-15A was 96 feet recorded on January 24, 2024.

4. **A replacement surface water sample location for GV-01, GV-01A, needs to be established between its former location and GV-02 2,200 feet downstream. Provide the coordinates for the new GV-01A sampling location. This location is to be monitored monthly along with the other Grassy Valley surface water locations.**

   CC&V will survey the area between the former GV-01 location and GV-02 to identify if an area exists where surface water flows are present and a sample can be collected. CC&V will plan to conduct the survey in the spring when the area is free of snow and ice and before the vegetation growth prevents observation of water.

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Should the Division required further information regarding the above responses, please do not hesitate to contact Antonio Matarrese at 719-851-4185 or Antonio.Matarrese@Newmont.com or me at 719-851-4048 or Katie.Blake@Newmont.com.

Sincerely,

DocuSigned by:
Katie Blake
5A3D013B629844B...

Katie Blake
Sustainability & External Relations Manager
Cripple Creek & Victor Mine

EC: M. Cunningham – DRMS
E. Russell - DRMS
K. Blake - CC&V
J. Gonzalez – CC&V
A. Matarrese – CC&V
J. Adams – CC&V

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Attachment 1

OSABH-17 Data (2021-2023)

	8/16/2021	12/6/2021	3/30/2022	4/13/2022	5/17/2022	6/15/2022	7/11/2022	8/15/2022	9/14/2022	11/21/2022	12/7/2022	1/16/2023	3/14/2023	4/12/2023	5/31/2023	6/14/2023	7/19/2023	8/30/2023	10/17/2023
Aluminum - Dissolved (mg/L)	157	799	935	907	607	219	299	264	840	1700	2250	2180	2270	1840	425	513	1250	2700	3300
Ammonia (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.060	<0.150	<0.030	<0.060	<0.030	<0.030	0.253
Antimony - Dissolved (mg/L)	<0.00300	<0.00300	<0.0100	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	<0.100	<0.00100	<0.0100	<0.0100	<0.100	<1.00	<0.00100	<0.00100	<0.00100	<0.0100	<0.100
Arsenic - Dissolved (mg/L)	0.013	0.0325	0.0694	0.0479	0.0219	0.023	0.0138	0.0141	0.216	0.00358	0.0828	0.0701	<1.00	<1.00	0.0789	0.058	0.131	0.474	0.392
Barium - Dissolved (mg/L)	0.0119	0.0108	0.0058	0.0067	0.0095	0.0092	0.0109	0.0112	0.0148	<0.100	0.0153	0.0102	<0.0200	0.0085	0.0053	0.0085	0.0051	<0.0020	<0.0100
Beryllium - Dissolved (mg/L)	0.118	0.277	0.277	0.267	0.205	0.101	0.125	0.119	0.255	0.393	0.449	0.48	0.465	0.436	0.132	0.15	0.293	0.439	0.59
Boron - Dissolved (mg/L)	<0.0400	<0.0400	<0.0400	<0.0400	0.0882	<0.0400	<0.0400	<0.0400	<0.0400	<2.00	<0.0400	<0.0400	<0.400	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	<0.200
Cadmium - Dissolved (mg/L)	0.872	2.66	2.97	2.87	2.11	1.03	1.32	1.22	2.44	4.81	5.22	6.06	6	5.57	1.42	1.59	3.22	4.73	6.04
Chloride - Total (mg/L)	17.1	34.3	32	29.2	29.6	24.9	25.6	21.6	20.6	24.9	25	28.3	26.2	30.6	13.1	13.3	22.5	22	21.5
Chromium - Dissolved (mg/L)	0.035	0.0697	0.214	0.217	0.0475	<0.0060	0.0384	0.0304	0.139	<0.300	0.443	0.289	0.593	0.311	0.0236	0.0204	0.119	0.421	0.794
Cobalt - Dissolved (mg/L)	0.725	3.81	4.92	4.56	3.26	0.944	1.4	1.24	3.52	7.66	10	9.85	11.2	8.85	2.15	2.36	5.93	10.3	13.3
Copper - Dissolved (mg/L)	0.725	2.77	3.83	3.48	2.44	0.931	1.15	1.06	2.82	5.84	9.24	9.86	9.88	9.15	1.84	2.02	4.85	9.38	12.1
Cyanide - Free (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0500	<0.0500
Cyanide - Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0083	0.0077	0.0051	<0.0050	<0.0050	<0.0050	0.0051	0.0147
Cyanide - WAD (mg/L)	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0500	<0.0500
Fluoride - Total F (mg/L)	35.2	135	70.1	83.5	91.8	51	52.4	58.1	117	321	286	329	80.3	307	61.3	92.6	259	379	246
Iron - Dissolved (mg/L)	0.902	0.639	16.2	10.8	4.92	0.986	1.2	0.669	9.7	37.8	53.5	79.6	86.1	41.6	3.58	3	10.6	74.4	279
Lead - Dissolved (mg/L)	0.0158	0.0879	0.0981	0.0917	0.058	0.0262	0.0331	0.0248	0.0676	<0.375	0.0595	0.138	0.101	0.0378	<0.0075	<0.0075	<0.0075	0.0251	0.0745
Lithium - Dissolved (mg/L)	<0.040	0.478	0.519	0.516	0.258	0.336	0.388	0.324	0.44	<2.00	0.547	0.799	0.796	0.841	<0.040	0.347	0.06	0.805	1.08
Manganese - Dissolved (mg/L)	103	309	348	334	227	127	148	143	278	555	705	702	733	688	190	206	410	736	870
Mercury - Dissolved (mg/L)	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Molybdenum - Dissolved (mg/L)	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.400	0.0439	<0.0080	<0.0800	<0.0080	0.0161	<0.0080	0.0367	<0.0800	<0.0400
Nickel - Dissolved (mg/L)	2.95	5.74	5.24	5.26	4.56	2.69	3.08	2.96	5.17	9.12	10.3	9.62	9.96	8.48	3.22	3.37	7.27	10.7	12.6
Nitrate as Nitrogen (mg/L)	2.7	3.8	8.61	7.75	8.34	5.51	5.38	2.27	3.36	5.35	7.26	8.9	4.23	8.05	1.88	3.41	4.85	6.05	5.86
Nitrite + Nitrate as Nitrogen (mg/L)	2.7	3.8	8.61	8.38	8.34	5.51	5.38	2.27	3.36	5.35	7.26	<10.0	4.23	<10.0	1.88	3.41	4.85	6.05	5.86
Nitrite as Nitrogen (mg/L)	<0.250	<12.5	<0.500	<1.25	<0.500	<0.500	<0.500	<0.250	<0.500	<0.500	<1.25	<5.00	<1.25	<5.00	<0.250	<0.250	<0.250	<1.25	<2.50
pH Field (pH unit)		3.82	3.32	3.38	3.5	3.2	3.36	5.2	3.4	3.29	3.2	3.56	3.4	3.01	3.11	3.13	3.16	2.94	2.77
Selenium - Dissolved (mg/L)	0.0892	0.202	0.473	0.34	0.152	0.0842	0.102	0.108	<0.100	<0.00100	0.638	0.394	<1.00	<1.00	0.0166	0.0976	0.033	0.0463	<0.100
Silver - Dissolved (mg/L)	<0.0050	<0.0050	0.0421	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.250	<0.0050	0.0183	<0.0500	0.0109	<0.0050	0.0083	<0.0050	<0.0050	<0.0250
Sodium - Dissolved (mg/L)	25	28.8	25.4	25.9	24.3	22.1	23.6	22.9	23.9	<25.0	24.1	24.9	20.6	25.3	14.3	16.7	20.4	23.9	20.6
Sulfate - Total (mg/L)	4780	7870	10200	9490	6690	4690	4250	4130	9290	16500	20000	19500	18100	17100	4860	5970	14700	23200	26900
Thallium - Dissolved (mg/L)	<0.00100	<0.00100	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.0200	<0.00100	<0.00200	<0.00200	<0.200	<0.200	<0.00200	<0.00100	<0.00100	<0.00200	<0.0200
Total Dissolved Solids (mg/L)	6600	12200	13200	12500	8950	6010	6200	6050	11800	20000	27000	25000	25900	23500	6850	8120	18000	28700	35400
Uranium - Dissolved (mg/L)	0.642	2.14	3.06	2.21	1.35	0.661	0.68	0.666	3.07	0.00158	8.15	7.47	9.29	6.42	1.16	1.53	4.05	11.2	12.8
Vanadium - Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0069	0.0117	<0.250	<0.0050	<0.0050	<0.0500	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0250
Zinc - Dissolved (mg/L)	19.7	76.3	86.6	85.3	60.2	30	34.9	32.3	61.5	145	191	189	193	191	48.2	44.3	111	173	192

GVMW-7A Data (2021-2023)

	3/14/2023	4/18/2023	5/31/2023	6/14/2023	7/19/2023	8/30/2023	9/26/2023	10/17/2023	11/13/2023	12/6/2023
Aluminium - Dissolved (mg/L)	<0.080	<0.080	<0.080	0.183	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
Ammonia (mg/L)	<0.030	<0.030	<0.030	<0.060	<0.030	<0.030	0.321	<0.030	<0.030	<0.030
Antimony - Dissolved (mg/L)	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00200
Arsenic - Dissolved (mg/L)	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00200
Barium - Dissolved (mg/L)	0.157	0.149	0.143	0.148	0.147	0.155	0.144	0.148	0.147	0.148
Beryllium - Dissolved (mg/L)	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Boron - Dissolved (mg/L)	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400
Cadmium - Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Chloride - Total (mg/L)	2.4	2.54	2.42	2.48	2.54	2.78	3.5	3.54	3.35	4.95
Chromium - Dissolved (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Cobalt - Dissolved (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Copper - Dissolved (mg/L)	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Cyanide - Free (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide - Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide - WAD (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride - Total F (mg/L)	0.937	0.929	0.777	0.944	0.976	0.968	0.994	0.997	0.926	0.926
Iron - Dissolved (mg/L)	0.862	0.778	0.798	0.817	0.823	0.788	0.813	0.356	<0.100	0.926
Lead - Dissolved (mg/L)	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
Lithium - Dissolved (mg/L)	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Manganese - Dissolved (mg/L)	0.175	0.168	0.17	0.247	0.16	0.172	0.17	0.28	0.259	0.178
Mercury - Dissolved (mg/L)	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Molybdenum - Dissolved (mg/L)	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080
Nickel - Dissolved (mg/L)	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Nitrate as Nitrogen (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Nitrite + Nitrate as Nitrogen (mg/L)	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Nitrite as Nitrogen (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
pH Field (pH unit)	7.69	7.49	7.35	7.55	7.52	7.45	7.41	7.37	7.49	7.32
Selenium - Dissolved (mg/L)	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.00200
Silver - Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium - Dissolved (mg/L)	8.56	8.41	7.78	8.41	8.23	8.35	8.2	8.81	9.02	8.36
Sulfate - Total (mg/L)	15.6	16.2	16.5	15.8	16.1	15.6	16.4	16.6	16.4	16.8
Thallium - Dissolved (mg/L)	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100	<0.000200	<0.00100	<0.000200	<0.000200	<0.000400
Total Dissolved Solids (mg/L)	158	169	215	179	158	170	188	171	148	188
Uranium - Dissolved (mg/L)	0.00353	0.0034	0.00385	0.00387	0.00312	0.0051	0.00358	0.00354	0.0035	0.00418
Vanadium - Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc - Dissolved (mg/L)	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100

GVMW-7B Data (2021-2023)

	3/14/2023	7/19/2023	8/30/2023	9/26/2023	10/17/2023	11/13/2023
Aluminium - Dissolved (mg/L)	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
Ammonia (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Antimony - Dissolved (mg/L)	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Arsenic - Dissolved (mg/L)	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Barium - Dissolved (mg/L)	0.132	0.0818	0.0484	0.0643	0.0762	0.0638
Beryllium - Dissolved (mg/L)	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Boron - Dissolved (mg/L)	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400
Cadmium - Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Chloride - Total (mg/L)	192	118	92.8	97.5	107	109
Chromium - Dissolved (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Cobalt - Dissolved (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Copper - Dissolved (mg/L)	<0.0100	<0.0100	<0.0100	0.018	0.023	<0.0100
Cyanide - Free (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide - Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide - WAD (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoride - Total F (mg/L)	0.341	0.209	0.205	0.24	0.2	0.294
Iron - Dissolved (mg/L)	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Lead - Dissolved (mg/L)	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
Lithium - Dissolved (mg/L)	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Manganese - Dissolved (mg/L)	<0.0080	<0.0080	<0.0080	0.0101	0.0092	<0.0080
Mercury - Dissolved (mg/L)	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200	<0.000200
Molybdenum - Dissolved (mg/L)	0.0102	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080
Nickel - Dissolved (mg/L)	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Nitrate as Nitrogen (mg/L)	0.21	0.512	0.639	0.621	0.517	0.389
Nitrite + Nitrate as Nitrogen (mg/L)	0.252	0.592	0.676	0.721	0.517	0.389
Nitrite as Nitrogen (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
pH Field (pH unit)	7.36	7.33	7.23	7.1	7.22	8.17
Selenium - Dissolved (mg/L)	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Silver - Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium - Dissolved (mg/L)	15.5	18.3	16.3	16.9	18.8	16.5
Sulfate - Total (mg/L)	144	357	258	281	344	289
Thallium - Dissolved (mg/L)	<0.00100	<0.00100	<0.000200	<0.00100	<0.000200	<0.000200
Total Dissolved Solids (mg/L)	586	679	527	582	695	601
Uranium - Dissolved (mg/L)	0.0343	0.0023	0.00168	0.0045	0.00589	0.0177
Vanadium - Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc - Dissolved (mg/L)	<0.0100	<0.0100	<0.0100	0.0105	<0.0100	<0.0100

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Attachment 2

REPORT

East Cresson Overburden Storage Area Acid Rock Drainage Sustainable Solutions Evaluations; Cripple Creek & Victor Mine

Shallow Groundwater Investigation Work Plan

Submitted to:

Cripple Creek & Victor Mining Company LLC

Submitted by:

Golder Associates USA Inc.
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21497838-002-R-1

April 18, 2022

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1.0 INTRODUCTION

Golder Associates USA Inc. (WSP Golder), a member of WSP USA, has prepared this Work Plan for Cripple Creek and Victor Gold Mining Company LLC to summarize the recommended path forward for additional characterization of the hydrogeologic setting and impacts to shallow groundwater from acid rock drainage (ARD) seepage from the East Cresson Overburden Storage Area (ECOSA) at the Cripple Creek and Victor (CC&V) Mine located in Teller County, Colorado.

This Work Plan is being submitted in conjunction with the Issued-for-Construction design for the seepage collection trench to be constructed along the toe of the ECOSA. In combination, the collection of toe seepage through the trench and the generation of additional data related to the hydrogeological setting of Grassy Valley is intended to provide a more sustainable and comprehensive approach to ARD seepage collection, management, and remediation throughout the remainder of the life of the ECOSA facility.

1.1 Site Background

The area known as Grassy Valley is located immediately to the east and south of the ECOSA facility. The CC&V Mine relies on the subsurface bedrock structure, known as the Cripple Creek Diatreme, to direct water infiltrating through the surface mine operations toward and through an igneous diatreme and ultimately discharge via the historic Carlton Tunnel. The Grassy Valley area is located beyond the eastern extent of the diatreme structure. Grassy Valley is underlain by colluvium and granitic bedrock with groundwater present in the bedrock and, at some locations, within the colluvium.

ARD impacts observed at monitoring well GVMW-25, which is screened within the Grassy Valley colluvium suggests that some quantity of infiltration through the ECOSA is not being captured, either by the volcanic diatreme or through shallow sumps constructed by Mine Operations in 2021 to collect and manage visible ARD seepage from the ECOSA toe. CC&V staff have indicated that monitoring well GVMW-25 is currently the only monitoring well completed within the colluvium in Grassy Valley. A preliminary review of available lithologic well logs or field groundwater sampling logs of existing monitoring wells in Grassy Valley (Table 1) have also identified GVMW-12B as screened within the Grassy Valley colluvium; however, the location of GCMW-12B is not known at this time.

Table 1: Summary of Grassy Valley Wells Logs

Well ID	X-Coordinate (NAD83 UTM)	Y-Coordinate (NAD83 UTM)	Total Depth (ft)	Screened Lithology	Thickness of Colluvium (ft)
GVMW-1A			200	Bedrock	25
GVMW-1B			50	Bedrock	25
GVMW-2A			200	Bedrock	21
GVMW-2B			30	Bedrock	20
GVMW-3A			200	Bedrock	47
GVMW-3B			50	Bedrock	25
GVMW-4A	489116	4288420	480	Bedrock	15
GVMW-4B	488354	4289090	50	Bedrock	15
GVMW-5A			250	Bedrock	40

Well ID	X-Coordinate (NAD83 UTM)	Y-Coordinate (NAD83 UTM)	Total Depth (ft)	Screened Lithology	Thickness of Colluvium (ft)
GVMW-6A	489992	4289310	200	Bedrock	5
GVMW-7A	489191	4288790	200	Bedrock	30
GVMW-7B	489187	4288790	50	Bedrock	20
GVMW-8A	490350	4288020	250	Bedrock	20
GVMW-8B	490347	4288020	50	Bedrock	20
GVMW-9A	489965	4288900	200	Bedrock	20
GVMW-10	488352	4289090	270	Bedrock	35
GVMW-11A			500	Bedrock	8
GVMW-11B			50	Bedrock	12
GVMW-12A			300	Bedrock	71
GVMW-12B			50	Colluvium	> 50
GVMW-13A			600	Bedrock	23
GVMW-13B			500	Bedrock	32
GVMW-13C			50	Bedrock	31
GVMW-14A			100	Bedrock	
GVMW-14B			100	Bedrock	50
GVMW-14C			600	Bedrock	50
GVMW-15A	488203	4288980	820	Bedrock	15
GVMW-15B	488213	4288980	102	Bedrock	15
GVMW-16A			820	Bedrock	15
GVMW-16B			102	Bedrock	25
GVMW-17A			820	Bedrock	10
GVMW-17B			105	Bedrock	15
GVMW-21A	488524	4289490	190	Bedrock	< 15
GVMW-22A	489551	4288080	90	Bedrock	
GVMW-22B	489557	4288080	30	Bedrock	
GVMW-25	489602	4287960	78	Colluvium	

WSP Golder is aware of the following additional wells groundwater monitoring wells in Grassy Valley; however, lithologic logs or well completion details have not been provided to date:

Table 2: Summary of Other Grassy Valley Wells

Well ID	X-Coordinate (NAD83 UTM)	Y-Coordinate (NAD83 UTM)	Total Depth (ft)
GVMW-15C	488191	4288990	1000
GVMW-23A	490322	4288440	65
GVMW-23B	490323	4288440	30
GVMW-24A	489681	4287690	250
GVMW-24B	489683	4287680	100
OSABH-12	489682	4287680	
OSABH-14	489543	4288080	
OSABH-16	489105	4288430	
OSABH-17	488467	4288860	
OSABH-18	488191	4288980	

These well data are tabulated herein to summarize the monitoring well documentation that has been provided to WSP Golder to date as well as highlight the data gaps in existing data; the highlighted wells are those wells believed to be screened within colluvium material in Grassy Valley.

It is evident by the number of existing monitoring wells in Grassy Valley that CC&V has previously invested in the targeted characterization and monitoring of bedrock groundwater units. However, in the absence of data associated with the completion and/or monitoring of the shallow colluvial monitoring wells, WSP Golder is unable to leverage this prior investment in the development of our conceptual site model. Task 1 of this Work Plan is provided to address and resolve these existing data gaps where possible to help inform future decision-making processes associated with remediating and mitigating shallow groundwater impacts in Grassy Valley.

1.2 Investigation Phases

WSP Golder proposes a phased approach to continuing to investigate shallow groundwater conditions in Grassy Valley and assessing the extent of ARD impacts in shallow groundwater, specifically the colluvial groundwater. This phased approach will allow for the progressive collection of data and recurring data analysis and refinement to help guide future data collection efforts, as necessary.

1.2.1 Phase 1: Existing Data Inventory

WSP Golder has completed a review of available records provided by CC&V, which included existing reports related to the site completed by others, monitoring well completion records (Table 1), and general site hydrogeologic information. The data that have been reviewed thus far indicate a bedrock groundwater flow regime that generally flows toward the diatreme, although the spatial distribution and temporal consistency of depth to groundwater measurements create uncertainty and do not include coverage in the southeastern portion of the Grassy Valley adjacent to the ECOSA. Groundwater flow within the colluvium cannot be determined because there is currently only one monitoring location, GVMW-25, that is known to be screened in the colluvium.

The primary data gaps identified through the records review that are relevant to assessing ARD impacts to groundwater are:

- Detailed lithologic descriptions of Grassy Valley colluvium
    - including grain size and sorting
- Detailed lithologic descriptions of Grassy Valley shallow and deep bedrock
    - including crystal size, mineralogy, and fractures
- Reliable depths to the colluvium-bedrock contact across the Grassy Valley
- Temporally consistent groundwater elevation records to demonstrate groundwater flow behavior over multiple years
    - differences between the shallow and deep groundwater regimes are not discernable, if present
    - not enough monitoring locations known to be screened in colluvium to ascertain the presence/extent of a shallow colluvial groundwater regime that behaves independent of the bedrock groundwater regime

The remainder of the phases outlined in this Work Plan were developed to specifically address these data gaps and allow for a better understanding of the colluvial groundwater regime, including any potential connectivity between the colluvial groundwater regime and the shallow bedrock groundwater regime. This data is intended to inform future evaluation and design of shallow groundwater remediation alternatives to prevent off-site migration and management of ARD-impacted groundwater.

1.2.2 Phase 2: Electromagnetic Induction Survey

WSP Golder recommends an Electromagnetic (EM) induction investigation to support evaluation of subsurface ground conditions related to observed seepage from the ECOSA and to provide a reconnaissance level map of bulk conductivity of the subsurface within Grassy Valley. EM will be used to evaluate the fluid flow conditions/moisture distribution of the materials in areas of interest, specifically the eastern toe of ECOSA extending approximately ¾-miles to the east through Grassy Valley. EM is a geophysical method that allows measurement and mapping of variations in the electrical properties of subsurface materials. Due to the contrasting electrical properties of the subsurface material, EM surveys are useful for identifying saturated zones and other hydrogeologic features, including the top of water, the top of bedrock surface, changes in lithology, and changes in pore fluid chemistry such as salinity or total dissolved solids. A change in any of these properties results in a variation of apparent conductivity.

It is anticipated that any areas of high Total Dissolved Solids and/or ARD seepage will appear as higher EM conductivity zones. EM surveys are completed by walking along the ground surface with an instrument and recording apparent conductivity measurements concurrently with GPS position. A series of transects of EM data will be collected to evaluate the spatial distribution of conditions in the subsurface and used to generate a map of conductivity which may correlate to areas with ARD-impacted earth materials.

EM induction instruments measure the apparent electrical conductivity of the near surface soils. A transmitter coil is used to induce an electrical (eddy) current into the ground. These induced currents produce secondary EM fields, and a receiver coil measures the strength of the secondary EM field generated by these currents. For this survey, quadrature-phase measurements will be collected to provide a profile of measured apparent conductivity (given in units of milli-Siemens per meter [mS/m]).

WSP Golder proposes to use both a Geonics Ltd. EM31-MKII (EM31) and an EM34-3 for this investigation. The EM31 and EM34 are both well suited to mapping terrain conductivity. The quadrature component for the EM instruments is sensitive to materials that have a low induction number, such as earth materials, and calibrated to give a measure of the bulk apparent conductivity of the subsurface. Apparent conductivity is a measure of electrical conductivity of the subsurface, which is primarily a function of interconnected porosity, clay content, moisture content and the dissolved ion concentration in the pore fluid. The EM-31 and EM-34 paired investigation is proposed to accomplish an appropriate survey depth. The EM-31 is capable of investigating to a depth of approximately 17 feet below ground surface (ft bgs). The EM-34 is capable of investigating to a depth of approximately 25 to 150 ft bgs, depending on the configuration of the receiver coils.

At the conclusion of the EM survey, a summary technical memorandum of the geophysical survey will be prepared including georeferenced color-contoured maps of apparent conductivity along the survey transects. Conclusions and recommendations regarding next steps will be presented in a teleconference between WSP Golder and CC&V following the submittal of the report.

1.2.3 Phase 3: Electrical Resistivity Imaging (ERI)

If the results of the EM survey do not clearly indicate shallow groundwater and/or seepage flow paths and/or do not clearly indicate the first occurrence of groundwater with enough confidence to inform subsequent phases of investigation, an Electrical Resistivity Imaging (ERI) survey may be recommended to better characterize the subsurface with depth along each proposed transect.

ERI is an electrical geophysical method used to determine the lateral and vertical changes in electrical resistivity of subsurface materials. These changes may result from variations in lithology and mineralogy, water content, pore-water chemistry, and the presence of altered or water-bearing fractured bedrock. The method involves transmitting an electric current into the ground between two current electrodes and measuring the voltage between two separate potential electrodes. The measured value at each point represents the apparent resistivity of the area beneath the electrodes. A combination of different electrode arrangements is used to collect a sufficient number of measurements to produce a high resolution geo-electric cross-section representing the distribution of varying apparent resistivity values along the transect.

WSP Golder generally utilizes IRIS instruments and Advanced Geosciences, Inc. (AGI) ERI systems. Systems consist of an engineering resistivity meter and 1 to 8 electrode cables each containing 8 to 12 connectors, and 24 to 120 stainless steel stakes. These systems are capable of recording ERI data with a spread length of up to 570 meters with a single setup.

The ERI output and display will be an interpreted profile showing the electrical resistivity values of the subsurface stratigraphy along the respective transect. These profiles will be used in combination with the EM survey mapping to identify areas where diffuse ARD seepage may be reporting to shallow groundwater within Grassy Valley and support the siting of additional monitoring or pumping wells for ARD impact monitoring and/or remediation.

1.2.4 Phases 4 and 5: Monitoring Well Installation

1.2.4.1 Phase 4

A Phase 4 monitoring well installation program may include the installation of up to four additional monitoring wells within Grassy Valley to provide permanent depth to groundwater and/or water quality sampling locations and supplement the existing monitoring well network. The monitoring well locations will be based on the conclusions of the EM and/or ERI surveys. WSP Golder preliminarily anticipates monitoring well locations as follows (at a minimum):

- one monitoring well to be located west of GVMW-25, between GVMW-25 and the eastern toe of the ECOSA and screened within the colluvium.
- one monitoring well to be installed east of GVMW-25 and screened in the colluvium to get a better understanding of the eastern extent of mine-impacted groundwater
- one monitoring well will be installed northwest of GVMW-25, downgradient of the ARD surface impoundment, and screened within the colluvium to serve as an additional colluvium monitoring location and to evaluate potential seepage from the retention pond.

The exact monitoring well locations will be determined following evaluation of geophysical survey results and discussion with CC&V.

WSP Golder recommends that one of the new colluvial monitoring wells be installed with a deeper completion pair installed to screen the bedrock at a depth equivalent to other bedrock monitoring wells existing in Grassy Valley (i.e., installed to monitor the bedrock groundwater at equivalent elevations). The purpose of a colluvium/ bedrock monitoring well nest will be to evaluate the vertical hydraulic gradient between the bedrock and colluvial groundwater. The additional bedrock monitoring well will also allow for delineation of potential deep groundwater ARD impacts

The three proposed and one known existing (GVMW-25) colluvial monitoring wells will allow for contouring of the colluvial groundwater elevation and determination of colluvial groundwater flow direction in the Grassy Valley area east of the ECOSA. Additional data may be generated from other existing monitoring wells screened in colluvium and identified under the Task 1 existing well inventory.

1.2.4.2 Phase 5

A Phase 5 monitoring well installation program will include the installation of up to four monitoring wells to be located immediately east of the ECOSA toe seepage collection trench (spaced approximately 1,500 feet along the trench alignment). The purpose of the Phase 5 monitoring wells will be to evaluate the quality of groundwater/ARD seepage that bypasses the collection trench; understanding the seepage bypass of the collection trench will be critical to understanding potential long-term ARD seepage impacts to shallow groundwater east of the ECOSA and in Grassy Valley.

The Phase 5 monitoring wells will be installed prior to construction of the seepage collection trench so that a groundwater sample(s) can be collected from each Phase 5 monitoring well before trench construction to allow for characterization of pre-trench (i.e., background) groundwater quality immediately east of the ECOSA toe. This will allow for an evaluation of pre- and post- trench construction groundwater quality and will help establish an understanding of how effective the trench is at intercepting seepage and mitigating would-be impacts to groundwater east of the ECOSA. It is noted that a single sample will not adequately characterize pre-trench seepage quality due to seasonal variability in groundwater conditions and seepage quality; however, considering the timeline for trench construction (summer 2022), WSP Golder understands that the collection of a full background data set is not feasible.

2.0 FIELD PROCEDURES

The following sections describe the field procedures for each proposed investigation phase.

2.1 Phase 1 – Existing Well Inventory

Well gauging can be performed using a standard electronic water level indicator.

Well surveying can be accomplished using survey-grade GPS rover or other surveying means. Existing ground and top of casing elevations shall be surveyed to a minimum accuracy of 0.01 feet.

2.2 Geophysical Investigation Methods

2.2.1 Phase 2 – EM Methods

With the EM method, an alternating current is passed through a wire coil (the transmitter) producing a time-varying magnetic field. This field in turn induces current to flow in any nearby conductor, the ground included. These induced currents produce a secondary time-varying magnetic field which is sensed together with the primary field at a receiver coil. EM induction instruments are used to measure the apparent electrical conductivity and metal content of the near surface.

The EM instrument's response is calibrated to give a measure of the bulk apparent conductivity (given in units of mS/m) of the subsurface centered at the measurement point. The investigative depth is roughly the depth at which 90 percent of the instrument response has occurred. Conductivity values represent weighted mean values of all the layer conductivities from the ground surface to the maximum depth that is sensed by the EM instrument. The contribution to the measured conductivity from a single layer depends on its conductivity, depth, and thickness. Deeper layers generally contribute less to the final values than do near-surface layers.

Geonics Ltd. EM31-MKII and EM34-3

The Geonics Ltd. EM31-MKII is a one-person operable EM induction device well suited to mapping apparent terrain conductivity with the transmitter and receiver coils mounted at either end of a 3.7 meter (12.1 foot) long boom. For this investigation, the field crew will use a digital "mark two" version of the EM31 (EM31-MKII) coupled with a Juniper Systems Allegro field computer acting as a data logger for both the EM data and GPS data. These data will be downloaded to a personal computer for later processing and analysis.

WSP Golder typically collects EM data with the instrument operated in continuous data collection mode with sub-meter accurate differential GPS positions recorded every second. EM data is collected two times per second as the operator walks with the instrument at a normal walking pace.

The Geonics Ltd. EM34-3 is a two-person operable instrument capable of measuring apparent conductivities to a depth of up to 150 feet depending on coil orientation and spacing. The coils can be oriented in either a vertical dipole or horizontal dipole configuration. For the vertical dipole case, the axes of the coils are oriented perpendicular to the ground surface, and for the horizontal dipole, the axes are parallel to the ground surface. For both cases, the coils are maintained in a coplanar state. The separation between the transmitter and receiver coils is the primary component that determines the depth of penetration. The EM34 coil configuration will be based on the results of the EM31 survey to best fill in vertical data gaps but is expected to be configured to accommodate a 50 foot investigation depth.

Both the EM31 and EM34 have a digital output that is streamed to a Windows-based data logger such as the Juniper Systems Allegro CX concurrently with positional information from a global navigational satellite system (GNSS) receiver. We propose to complete a series of transects along portions of Grassy Valley. A preliminary EM transect map is provided below in Figure 1 (see the green transect lines).

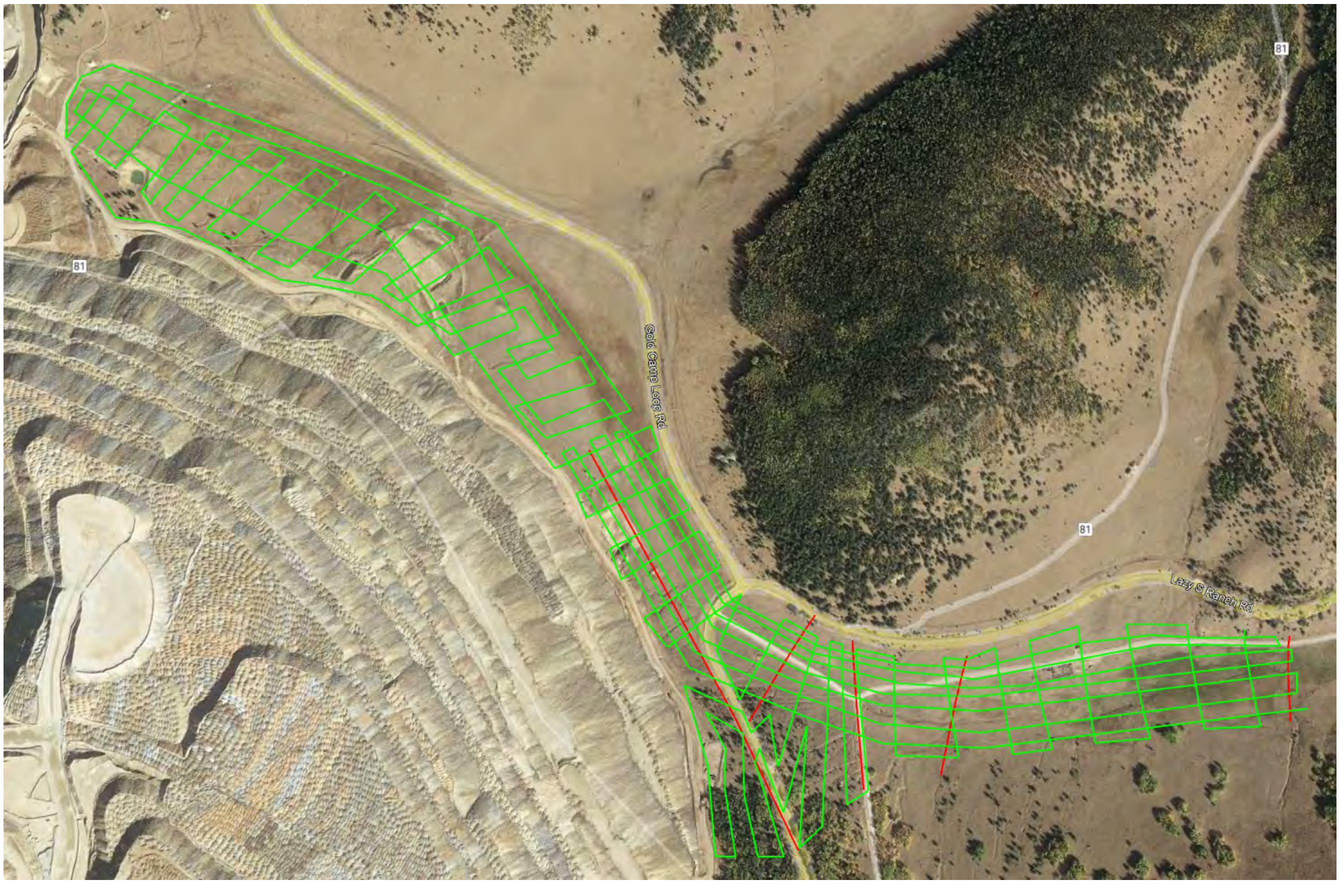

Figure 1: Preliminary Electromagnetic Transect Map

It is anticipated that the EM31 surveying will be completed over two survey days and that the EM34 data collection will be completed over two additional survey days, four days total for the combined EM31 and EM34 scope of work. The EM survey in the Grassy Valley area will be performed over an area of approximately 165 acres with total survey line length of approximately 100,320 feet (19 miles). The EM survey is expected to take four days to complete.

EM data processing and analysis will be performed using commercially available DAT31W and DAT34W software. The resulting dataset will be presented as a georeferenced color-contoured map of the apparent conductivity along the survey transects.

2.2.2 Phase 3 – Electrical Resistivity Imaging Methods

Apparent resistivity data can be collected using a variety of arrays (e.g., pole- dipole, dipole-dipole, Wenner, Schlumberger arrays), which may be sensitive to vertical or lateral variations in earth materials and provide either relatively deeper soundings or shallower sounding with greater resolution. Site conditions will dictate the use of the arrays that are less susceptible to noise from heterogeneous surface conditions and nearby linear utilities (e.g., power lines). The electrode spacing is typically 1 to 6 meters, with 24 to 120 electrodes in an array resulting in spread lengths of 24 to 595 meters (120 electrodes at 5 m spacing). After an initial spread of data is collected, the remaining spreads can be “roll-along” spreads, at half the length.

The cables and electrodes will be placed on the ground at the beginning of the survey day. Each electrode may be lightly immersed in salt water to reduce the contact resistance. A pre-programmed sequence of ERI measurements will be loaded into the digital acquisition system which will then automatically step through approximately 150 to 2,500 measurements. After completion of the first measurement cycle, a portion of the array can be picked up and moved forward for another measurement cycle (roll-along) which continues until the full length of transect has been investigated.

The ERI field crew will consist of a geophysicist and one technician. Approximately 5,900 feet of ERI survey line will be completed along five individual lines along the eastern toe of the ECOSA and within Grassy Valley (see preliminary transect lines shown in red in Figure 1). The ERI effort is expected to take three days to complete.

2.3 Phases 4 and 5 – Drilling and Monitoring Well Installation Methods

Drilling will be performed by a qualified environmental driller under contract to CC&V. It is assumed that drilling will be performed using a drill rig and method capable of retrieving a continuous core of subsurface material (soil and/or rock). The drill rig/method may be sonic, wireline coring, and/or hollow stem auger with continuous sampler. Continuous samples are recommended to retrieve high-quality geologic samples with a high degree of confidence in the depth samples were retrieved from. This is critical so that monitoring well screen intervals can be set at appropriate depths based on the purpose of each well. The borehole locations will be based on the location of utilities, topography, access constraints, ongoing operations, legal access, or other conditions encountered in the field, and informed by the results of the EM and/or ERI survey(s). Boreholes will be identified with naming convention “GVBH-2022-#”. Whatever drilling method(s) is employed, the initial drilling attempt will be made without the addition of drilling fluid. If necessary, water from an approved source may be used to help cool the drilling tooling and facilitate circulation of core and cuttings.

WSP Golder recommends surveying of each borehole location consistent with the surveying work under Phase 1. Preliminarily, WSP Golder can log field coordinates with a handheld GPS with approximately +/- 1 meter (m) lateral accuracy and +/- 2 m vertical accuracy. Geologic logs will be developed in general accordance with the Unified Soil Classification System (USCS) and applicable bedrock classification schemes.

2.3.1 Phase 4 – Grassy Valley Monitoring Well Installation

Up to four monitoring wells will be installed as part of Phase 4 and as previously described in Section 1.2.4.1 of this Work Plan. The colluvial monitoring wells will be installed with the base of the well screen no deeper than the colluvium/bedrock contact. The bedrock monitoring well will be installed at a depth of approximately 250 ft bgs. The colluvial monitoring wells will be completed with 2-inch, Schedule 40 PVC, flush-threaded well casing and screen. Each colluvial well screen will be 10 feet long with 0.010-inch milled slots. The bedrock well will be completed with 4-inch, Schedule 80 PVC, flush-threaded well casing and screen. The bedrock well screen will be 50 feet long with 0.010-inch milled slots. The bedrock well screen length is generally consistent with existing deep bedrock monitoring wells GVMW 8A-250 and GVMW 10-270, For all newly installed monitoring wells, the borehole annular space will be backfilled with silica sand to approximately two feet above the top of the well screen. A minimum two feet long bentonite chip or time release pellet seal, hydrated after placement, will be placed above the filter pack. The remainder of the annular space will be backfilled with hydrated bentonite chips or cement-bentonite grout to the ground surface. The shallow bedrock monitoring well will be completed in the same manner with the exception that the filter pack will not extend more than one foot above the top of the screen and the bentonite plug will cross the colluvium/bedrock interface with approximately one foot below the contact and one foot above the contact. The PVC casing will extend to approximately three feet above the ground surface, and a protective steel casing, concrete pad, and protective bollards will be installed at the request of the CC&V Mine.

2.3.2 Phase 5 – Collection Trench Monitoring Well Installation

Prior to the construction of the ARD seepage collection trench, the three Phase 5 monitoring wells will be installed immediately east of the trench to monitor for potential seepage/groundwater bypass of the collection trench. These wells will be installed per the same general specifications as outlined in Section 2.3.1 but with the top of each well screen set above the adjacent base of the collection trench and with the bottom of each well extending to the depth of bedrock. The locations of the Phase 5 monitoring wells will be based on a review of the colluvium thickness, colluvial water column length, results of the geophysical surveys, and locations where seepage has been identified in the past.

2.3.3 Monitoring Well Development

Newly installed monitoring wells will be developed by the drilling contractor using surge and purge techniques. The wells will be surged with a tight-fitting surge block and purged with a stainless steel or disposable bailer. Purged groundwater will be collected in an appropriate container for disposal. The entire well screen interval will be surged for a period of no less than 30 minutes prior to the start of purging. Water quality parameters including pH, electrical conductivity, and temperature will be measured throughout development until a minimum of five well casing volumes has been purged and the parameters are stable. A casing volume is considered the volume of water standing in the well casing, calculated from the measured total depth of the well minus the measured depth to static water level. Water quality stabilization is defined as less than 10% difference between three consecutive measurements for EC and temperature and less than 0.2 standard unit deviation between three consecutive measurements for pH. If water is used to facilitate drilling, then additional casing volumes may be purged to remove added water.

2.3.4 Phase 4 and Phase 5 Reporting

WSP Golder will prepare a brief technical memorandum describing the Phase 4 and Phase 5 field activities. The technical memorandum will include a discussion of drilling and well installation methods and well development methods, digital borehole logs and well installation diagrams, and relevant site figures.

2.3.5 Groundwater Sampling

WSP Golder recommends routine groundwater level measurement and groundwater sample collection from all newly installed monitoring wells and relevant pre-existing Grassy Valley monitoring wells.

- Routine groundwater level measurement: Depth to groundwater measurements should be collected no less frequently than quarterly but may be collected as frequently as weekly immediately following significant precipitation events. Depth to groundwater measurements should be taken from the fixed and surveyed top of casing location and all wells in the routine water level measurement program should be monitored on a single day, as practical.
- Routine groundwater sampling: Groundwater sampling should be performed no less frequently than quarterly but may be performed more frequently following significant precipitation events. Groundwater sample collection may be performed coincident with depth to groundwater measurements as described above. Groundwater sampling should follow industry-standard purging and sampling practices and samples will only be collected from wells with adequate volume of water to sample.

2.4 Field Documentation

Documentation of field activities will include health and safety forms, general field notes, photographs, boring logs, well construction logs, and well development forms.

2.5 Decontamination Procedures

At a minimum, decontamination will be performed on all non-dedicated, reusable drilling and well development equipment. Decontamination will include a wash with an environmental detergent solution (Alconox or similar) followed by a rinse with approved water. It is expected that decontamination will be required on downhole drilling equipment that is in direct contact with subsurface soil, and development and monitoring equipment in contact with groundwater (e.g., surge block/rod, bailer, water quality meter). Decontamination will be performed by a method that allows for containment and collection of decontamination fluids (e.g., temporary decontamination pad). Additional CC&V-specific decontamination procedures may apply.

2.6 Waste Management Procedures

Investigation derived waste (IDW) generated during drilling and sampling will be containerized in either CC&V Mine-provided containers (e.g., 55-gallon steel drums, 5-gallon buckets, or other rigid container with a lid) for appropriate characterization and disposal by the CC&V Mine. Expected IDW includes, but is not limited to, decontamination wash water, drill cuttings, soil/rock cores, core liners, and groundwater. Additional CC&V-specific IDW management procedures may apply.

3.0 CONCEPTUAL REMEDIAL SOLUTIONS

In anticipation of shallow groundwater remediation to prevent off-site migration of ARD-impacted groundwater, three conceptual remedial solutions, in addition to the ARD seepage collection trench described previously, are currently under presented herein for preliminary consideration:

- A hydraulic control system may include the installation of a series of dual-purpose groundwater pumping wells. The pumping wells would be designed to 1) intercept shallow (i.e., colluvial) ARD-impacted groundwater as it migrates east and potentially bypasses the seepage collection trench and 2) provide hydraulic control by imparting a change in the natural hydraulic gradient such that the groundwater flow direction is maintained towards the control wells to prevent off-site migration of ARD-impacted groundwater. The pumped water would be conveyed the ARD surface impoundment.
- A slurry or cut-off wall would involve excavating a narrow trench perpendicular to the axis of Grassy Valley, to at least the depth of bedrock, and backfilling the trench with a low-permeability slurry (e.g., soil-bentonite, cement-bentonite mix) to prevent down-valley migration of ARD-impacted groundwater. At this time, a slurry or cut-off wall would be the less-preferred conceptual remedial option presented herein because it would require capture and conveyance of groundwater on the upgradient (i.e. west) side of the wall. This would essentially require both the hydraulic control method described above, plus the slurry wall. The slurry wall could be considered secondary to the installation of hydraulic control system if that system was not effective at maintaining hydraulic control on its own.
- A permeable reactive barrier (PRB) would involve excavating a narrow trench perpendicular to the axis of Grassy Valley, to at least the depth of bedrock similar to a slurry or cut-off wall, but backfilling the trench with a permeable reactive media that effective treats low-flow or low-contaminant loading of ARD seepage bypassing the seepage collection trench. PRBs have been used to enhance bacterial sulfate

reduction and metal sulfide precipitation and have the potential to prevent ARD impacts to shallow groundwater and the associated release of dissolved metals.

Other remedial options may be identified and evaluated as additional data related to the occurrence of shallow groundwater, the shallow groundwater system in general, and impacts to shallow groundwater, are gathered and evaluated.

4.0 SCHEDULE

It is recommended that the Phase 1 – Existing Well Inventory commence immediately and Phases 2 and 3 – EM and ERI Geophysical Surveys commence in late spring after the chance of winter weather is reduced. A general phase schedule is provided below. It is noted that the need for subsequent phases will be evaluated progressively; therefore, this schedule is only intended for long-term conservative planning and budgeting.

- Phase 1 - 2+ weeks
- Phase 2 - 2 days on-site for EM31, 2 days on-site for EM34
- Phase 3 - 3 days on-site for the ERI survey; ERI survey could be completed immediately following the EM survey if CC&V was interested in moving forward with both geophysical surveys
- Phase 4 and Phase 5 - dependent on drilling subcontractor availability
  - Phase 4 - 6 days on-site
  - Phase 5 - 6 days on-site

5.0 ROUGH ORDER OF MAGNITUDE COST ESTIMATE AND STAFFING

The following rough order of magnitude (ROM) cost estimates are provided on a per-phase basis for CC&V's budgetary planning purposes. WSP Golder would appreciate the opportunity to provide CC&V with a more formal proposal for any individual phase(s) of the work upon request.

- Phase 1 – Existing Well Inventory: $2,500
  - Deliverable: Technical Memorandum expanding conceptual site model based on additional data
  - It is assumed that CC&V personnel will perform all remaining desktop review components associated with the well inventory.
  - Existing monitoring well inventory and well gauging can be performed by CC&V staff or one WSP Golder staff based in Denver, CO.
- Phase 2 – EM Survey: $20,000
  - Staffed by two WSP Golder staff, one based in Redmond, WA and one based in Denver, CO.
  - The Phase 2 budget includes post-processing of EM data and a brief technical memorandum
- Phase 3 – ERI Survey: $20,000
  - Approximately $3,000 can be saved if CC&V elects to perform the EM and ERI surveys concurrently. The savings is associated with mobilization/demobilization-related costs.

  - Deliverable: Summary Technical Memorandum and interpreted profiles
  - Staffed by two WSP Golder staff, one based in Redmond, WA and one based in Denver, CO.
  - The Phase 3 budget includes post-processing of ERI data and a brief technical memorandum
- Phase 4 – Grassy Valley Monitoring Well Installation and Development: $82,250
  - Deliverable: Well Installation Summary Memorandum and well installation data
  - $21,250 for WSP Golder field oversight. Staffed by one WSP Golder staff member based in Denver, CO.
  - $56,000 for drilling subcontractor, based on $500/hour estimate provided to WSP Golder by CC&V. WSP Golder is not aware of the basis for this estimate, if it includes mobilization fees or materials, or if it is applicable to the drilling methods recommended in Section 2.3. This estimate is assumed to include well development.
  - $5,000 for WSP Golder staff to prepare technical memorandum summarizing phase activities including digital borehole logs and well completion diagrams.
- Phase 5 – Collection Trench Monitoring Well Installation and Development: $63,500
  - Deliverable: Well Installation Summary Memorandum and well installation data
  - $16,500 for WSP Golder field oversight. Staffed by one WSP Golder staff member based in Denver, CO.
  - $42,000 for drilling subcontractor, based on $500/hour estimate provided to WSP Golder by CC&V. WSP Golder is not aware of the basis for this estimate, if it includes mobilization fees or materials, or if it is applicable to the drilling methods recommended in Section 2.3. This estimate is assumed to include well development.
  - $5,000 for WSP Golder staff to prepare technical memorandum summarizing phase activities including digital borehole logs and well completion diagrams.

A total per-phase cost summary is provided in Table 3 below:

Table 3: Rough Order of Magnitude Cost Summary

Phase	ROM Cost
Phase 1 – Existing Well Inventory	$2,500
Phase 2 – EM Survey	$27,000
Phase 3 – ERI Survey	$20,000
Phase 4 – Grassy Valley Monitoring Well Installation and Development	$82,250
Phase 5 – Collection Trench Monitoring Well Installation and Development	$63,500
ROM Total	$195,250

6.0 HEALTH AND SAFETY

All field work will be conducted under a project-specific health and safety program developed by WSP Golder. The health and safety program and requirements will be outlined in documentation including, at a minimum, field vehicle inspection forms, Work Method Statements (WMS), Job Safety and Environment Analysis (JSEA) forms completed prior to the start of each day's work, and Journey Management Plans (JMPs) for each person visiting the CC&V Mine and/or performing field work. Hard copies of the health and safety documentation will be readily available on-site during field work and will identify potential hazards, personal protective equipment (PPE), and communication protocols to ensure a safe work environment.

All field staff will be outfitted with the following PPE:

- hard hat
- hearing protection during drilling activities
- safety glasses with side shield
- safety toed boots
- gloves appropriate to the task being performed
- high-visibility safety vest

Golder field personnel will be current on a United States Food and Drug Administration (FDA) approved by emergency use authorization COVID-19 vaccine, per the manufacturers recommended vaccine series. The drilling subcontractor will submit a Colorado One-Call utility location request via the Utility Notification Center of Colorado (UNCC) before the start of work. No field work will be performed until utility location has been completed and confirmed. Golder will coordinate with the CC&V Mine to ensure private utilities and other known subsurface features, not marked as part of the One-Call request, are located and marked accordingly. If UNCC requires that the proposed borehole locations be marked prior to performing the utility locate, it is assumed that the marking will be performed by CC&V. If there are known subsurface utilities (e.g., water pipeline[s]) that are not located by UNCC and that CC&V is not able to provide certified as-built locations for, a private utility locator and/or daylighting services may be required. Additionally, Golder will coordinate with the CC&V Mine to ensure the site investigation activities are conducted within facility permit/property boundaries.

Signature Page

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https://golderassociates.sharepoint.com/sites/154109/project files/5 technical work/006 seep data evaluation/work plan/rev 1 - 18apr22/21497838-002-r-1-ecosa_gw_investigation_wp_18apr22.docx golder.com

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Attachment 3

January 9, 2023 Project No. 31405490.000

Craig Watkins, Senior Project Engineer
Cripple Creek & Victor Mining Company LLC
1632 Co Rd 82
Cripple Creek, CO 80813

REPORT ON EAST CRESSON OVERBURDEN STORAGE AREA ACID ROCK DRAINAGE SUSTAINABLE SOLUTIONS EVALUATIONS; CRIPPLE CREEK & VICTOR MINE

Dear Mr. Watkins,

WSP Golder is pleased to present this letter report to Cripple Creek & Victor Mining Company LLC documenting our geophysical investigation to evaluate shallow groundwater and acid rock drainage at East Cresson Overburden Storage Area (ECOSA) at the Cripple Creek & Victor Mine (CC&V), Colorado. This letter report presents a project background, summary of the methods used, data processing, results, interpretation, and concluding remarks.

EXECUTIVE SUMMARY

In August 2022 a geophysical investigation was conducted east of the CC&V ECOSA in Grassy Valley to determine if seepage flowpaths can be traced in the subsurface and to identify any other areas on, or adjacent to, the ECOSA that may be contributing impacts to groundwater. Two electromagnetic instruments, sensing the upper 15 and upper 50 feet, respectively, were utilized to generate a color-contoured map of the apparent conductivity and/or metal detected along the survey transects as shown in Figures 2 and 3 of this report. Additionally, Electrical Resistivity Imaging (ERI) data were collected along five transects to produce a high resolution geo-electric cross-section representing the distribution of varying apparent resistivity values at depth along each transect. The ERI profiles shown in Figures 4, 5, 6 and 7 of this report were generated to assess the vertical and spatial variability of the Grassy Valley subsurface and identify any potential seepage pathways.

The patterns observed in EM and ERI results from this investigation do not indicate an apparent preferred flowpath or zones of seepage between the ECOSA and GVMW-25 or other Grass Valley monitoring wells. It appears moderate EM conductivity areas detected downgradient of the ECOSA are representative of zones of increased surface moisture. ERI results show several anomalously low resistivity features that could either be the result of an unmapped utility (i.e., interference) or could represent preferential flow path(s) for high TDS groundwater.

Based on interpretation of the geophysical data presented, three potential locations for new monitoring wells are shown on Figure 8 and labeled PB23-# (potential boring 2023) but will likely be renamed. These locations are approximate and can be modified to accommodate field conditions considering accessibility, land ownership, utilities, and surface conditions. Each of these locations were selected where anomalously low resistivity features appear in the ERI data and loosely correlate with areas of moderate EM conductivity.

It is recommended that at each location, a shallow well be installed (estimated 25-35 feet deep) screened in colluvium, and a deeper well be installed in the fractured rock (estimate to be 30 to 50 feet bgs) to better characterize the subsurface conditions and possibly intercept degraded quality water.

1.0 BACKGROUND

The area known as Grassy Valley is located immediately to the north and east of the ECOSA facility. subsurface bedrock structure, known as the Cripple Creek Diatreme, to direct water infiltrating through the surface mine operations toward and through an igneous diatreme and ultimately discharge via the historic Carlton Tunnel. Most of the ECOSA and a large portion of Grassy Valley is located within the footprint of the diatreme (see Figure 2). The east-most portion of Grassy Valley area is located beyond the eastern extent of the diatreme structure. Grassy Valley is underlain by colluvium and granitic bedrock with groundwater present in the bedrock and, at some locations, within the colluvium.

Groundwater impacts (elevated metals concentrations) observed at monitoring well GVMW-25, which is screened within the Grassy Valley colluvium, suggest that some quantity of infiltration through the ECOSA is not being captured, either by the volcanic diatreme or through shallow sumps constructed by Mine Operations in 2021 to collect and manage visible seepage from the ECOSA toe. CC&V staff have indicated that monitoring well GVMW-25 is currently the only monitoring well completed within the colluvium in Grassy Valley. Existing wells in Grassy Valley within the geophysical investigation area are shown in Table 1. The objective of the geophysical investigation, conducted in August 2022, was to determine if seepage flowpaths can be traced in the subsurface and to identify any other areas on, or adjacent to, the ECOSA that may be contributing impacts to groundwater. The ultimate objective of the geophysical investigation was to inform seepage mitigation plan.

It is evident by the number of existing monitoring wells in Grassy Valley that CC&V has previously invested in the targeted characterization and monitoring of bedrock groundwater units. However, in the absence of data associated with the completion and/or monitoring of the shallow colluvial monitoring wells, an adequate characterization of the shallow colluvium is not complete. This geophysical investigation seeks to provide a spatial distribution of conditions in the subsurface that may correlate to areas where seepage from the ECOSA is present.

Table 1: Summary of Grassy Valley Wells Within Geophysical Investigation Area

Well ID	X-Coordinate (NAD83 UTM)	Y-Coordinate (NAD83 UTM)	Screen Depth (ft)	Screened Lithology	Thickness of Colluvium (ft)
GVMW-4A	488352	4289090	430 – 480	Bedrock	15
GVMW-4B	488354	4289090	30 – 50	Fractured rock	15
GVMW-7A	489191	4288790	155 – 195	Bedrock	30
GVMW-7B	489187	4288790	20 – 50	Fractured rock	20
GVMW-8A	490350	4288020	210 – 250	Bedrock	20
GVMW-8B	489557	4288080	20 – 50	Fractured rock	20
GVMW-9A	489965	4288900	160 – 200	Bedrock	20
GVMW-10	488352	4289090	210 – 270	Bedrock	35
GVMW-12B	?	?	? >50	Colluvium	>50
GVMW-15A	489965	4288900	700 – 800	Bedrock	15
GVMW-22A	490350	4288020	50 – 70	Bedrock	30
GVMW-22B	490347	4288020	5 – 30	Colluvium	15 or 35?
GVMW-23A	490322	4288440	40 – 90	Fractured rock	20?
GVMW-23B	490323	4288440	10 – 30	Fractured rock	10?
GVMW-24A	489681	4287690	210 – 250	Bedrock	?
GVMW-24B	489683	4287680	80 – 100?	Bedrock	?
GVMW-25	489602	4287960	68 – 78	Fractured rock	?
OSABH-12	489602	4287960	?	?	?
OSABH-14	489682	4287680	?	?	?
OSABH-16	489543	4288080	?	?	?
OSABH-17	489105	4288430	?	?	?
OSABH-18	488467	4288860	?	?	?

2.0 GEOPHYSICAL SURVEY METHODS

To determine if seepage flowpaths can be traced in the subsurface and to identify any other areas on, or adjacent to, the ECOSA that may be contributing impacts to groundwater, electromagnetic induction was used to evaluate subsurface ground conditions and to provide a reconnaissance level map of bulk conductivity of the subsurface within Grassy Valley. For this project, because seepage from the ECOSA has a higher TDS and specific conductance, it was anticipated that any seepage will appear as higher EM conductivity zones. Using elevated conductivity as a proxy for seepage, EM was used to evaluate the fluid flow conditions/moisture distribution of the materials in the areas of interest (AOI).

EM data were collected relatively rapidly by walking along the ground surface with an instrument and recording apparent conductivity measurements concurrently with GPS position. A series of transects of EM data were collected with two different EM instruments to evaluate the spatial distribution of conditions in the subsurface and used to generate a map of conductivity to correlate to areas with seepage impact.

2.1 Electromagnetic Induction (EM) Method Description and Data Collection

Electromagnetic (EM) induction instruments measure the apparent electrical conductivity of the near surface soils. A transmitter coil is used to induce an electrical (eddy) current into the ground. These induced currents produce secondary EM fields, and a receiver coil measures the strength of the secondary EM field generated by these currents. For this survey, quadrature-phase measurements were collected to provide a profile of measured apparent conductivity (given in units of milli-Siemens per meter [mS/m]).

Apparent conductivity is a measure of the bulk apparent conductivity of the subsurface, which is a function of mineralogy, interconnected porosity, moisture content, the dissolved ion concentration, temperature, phase state of the pore water, and the amount and composition of any suspended colloids in the pore fluid. A change in any of these properties results in a variation of apparent conductivity.

The EM phase of the investigation took place on August 24, 25, 26, 27, 28, and 29, 2022 and consisted of walking surveys on ECOSA roads in the mine, and outside of the mine in Grassy Valley using two EM instruments. Due to the large aerial extent, presence of fences and roads, and observed metallic surface features, some data gaps remain in the EM dataset.

WSP Golder used a Geonics LTD. EM31-MKII (EM31), a one-person operable instrument with a fixed coil spacing of approximately 12 feet for measuring apparent conductivity and detecting metal in the upper 16 feet of the subsurface during this investigation (Image 1). The EM31 quadrature component is calibrated to give a measure of the bulk apparent conductivity of the subsurface for a hemispherical volume of radius approximately 16 feet, centered at the measurement point. The in-phase EM31 response is sensitive to metal, given in parts per thousand (ppt), and used to delineate elevated conductivity readings from metallic materials.

Image 1 – EM31 in operation at CC&V Mine

To investigate deeper subsurface materials, a two-person Geonics EM34 was employed along similar transects. EM tracklines and monitoring locations are shown on Figure 1. The EM34 was used in horizontal dipole model with 20-meter (65.5 feet) separation providing a 50-foot investigation depth. Conductivity values represent weighted mean values of all the layer conductivities from the ground surface to the maximum depth that is sensed by the EM instrument. The contribution to the measured conductivity from a single layer depends on its conductivity, depth, and thickness. Deeper layers generally contribute less to the final values than do near-surface layers.

EM31 and EM34 data were collected at 1 Hertz (1 time per second) with each data reading recorded on a Windows-based data logger (Juniper Systems Allegro CX) concurrently with positional information from a global navigational satellite system (GNSS) receiver with sub-meter accuracy. The resultant EM31 dataset is composed of 31,909 individual data points and the EM34 dataset is 11,613 points. Each data point is georeferenced.

The EM34 was not used along the toe of the ECOSA and locations within 50 feet of surface metal were generally avoided as the instrument is laterally sensitive to metal within the same distance as the investigation depth.

EM31 data processing and analysis was performed using commercially available DAT31W software while EM34 data were processed much the same way using DAT34W software. The resulting datasets are presented as a color-contoured map of the apparent conductivity and/or metal detected along the survey transects in Figures 2 and 3.

2.2 Electrical Resistivity Imaging (ERI) Method Description and Data Collection

ERI is geophysical method that measures the resistivity (or conversely, conductivity) of the subsurface using injection of electrical current and measurement of voltage potentials along a series of surface electrodes to produce a high resolution geo-electric cross-section representing the distribution of varying apparent resistivity values at depth along the transect.

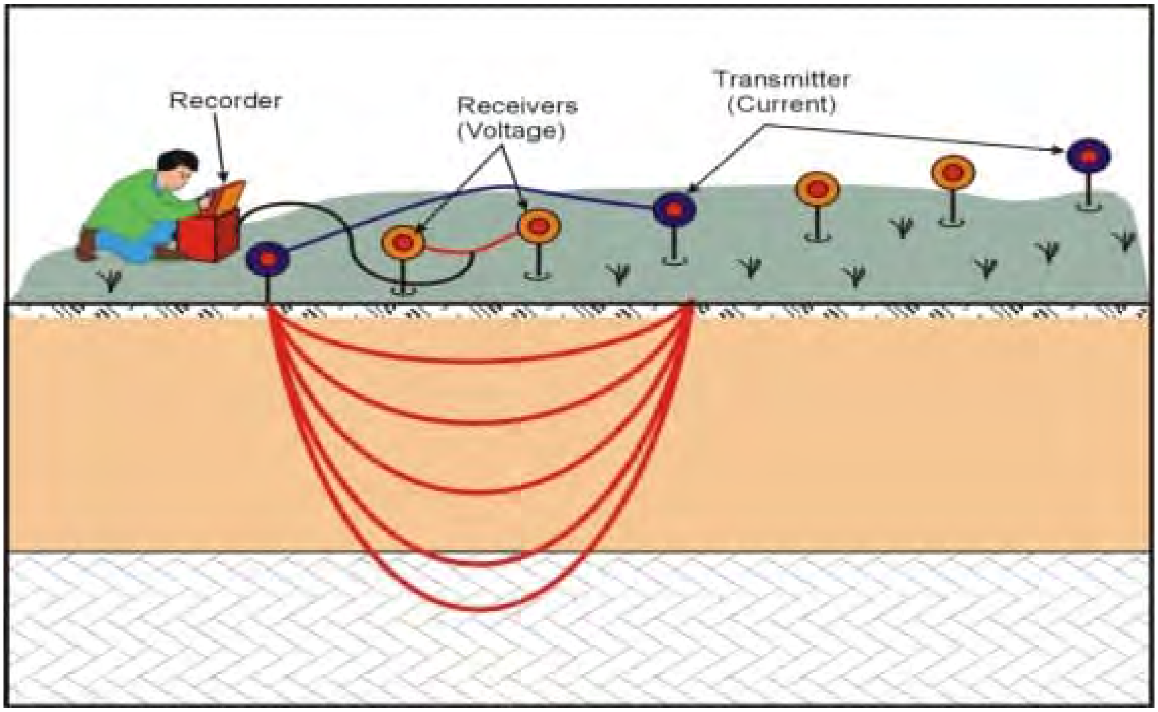
Electrical resistivity is a fundamental property of a material that describes how easily the material can transmit electrical current. High values of resistivity imply that the material is resistant to the flow of electricity; low values of resistivity imply that the material transmits electrical current easily. The primary properties that affect the resistivity of subsurface materials are porosity, water content, clay mineral and metal content, pore interconnectivity, and pore water conductivity. Since most soil and rock-forming minerals are essentially nonconductive, most current flow takes place through the material’s pore water and conductive interconnected features such as clay or brine-filled karst voids. Therefore, water-bearing fracture zones with a high porosity and water saturation or karst features filled with clay will appear as low resistivity zones in contrast to the surrounding more resistive, dry, unfractured bedrock (see Inset 1). Above the groundwater table, air-filled karst voids typically appear as high resistive areas since air does not conduct electrical current. Resistivity values of common rocks and soil materials are provided in Table 1.

Table 2: Resistivity Values of Common Rock and Soil Materials

Material	Resistivity (ohm-m)
Rocks	
Granite/Granodiorite	5000 - 10^6
Basalt	1000 - 10^6
Sandstone	100 – 4000

Material	Resistivity (ohm-m)
Shale	20 – 2000
Porous Limestone	100 – 1000
Dense Limestone	10^3 - 10^6
Evaporates, Salt	10^4 - 10^6
Soil and Water	
Clay	1 - 20
Sand (wet to moist)	20 – 200
Dry Loose Sand	500 - 10^5
Groundwater (fresh)	10 – 100
Sea Water	0.2

Electrical measurements are made using an automated meter and high voltage power source connected to a linear series of metal stakes (electrodes) as depicted in Graphic 1. The meter applies a potential difference to the ground surface in a fixed sequence of electrode pairs and measures the resulting current between them. A reverse model then calculates the apparent electrical resistivity at depth based on surficial measurements. The product of the modelling process is a two-dimensional (2D) profile showing resistivity (measured in Ohm-m) of the subsurface. ERI data may identify contrasts or anomalies associated with highly resistive bodies such as air-filled voids, bedrock, or low moisture zones, or low resistive bodies such as water-filled voids or fractures, saturated soil, and impacted soil or groundwater.



Graphic 1 - Electrical Resistivity Imaging Tomography Field Schematic

2.3 ERI Instrumentation and Software

For this project, WSP Golder used an Advanced Geosciences, Inc. (AGI) SuperSting R8 ERI system, consisting of an engineering resistivity meter, four multi-core electrode cables each containing 14 connectors, and 56 stainless steel stakes. The electrode spacing varied from 9 feet to 20 feet, resulting in spread lengths of 495 to 1100 feet in a single setup. Table 3 presents a summary of the ERI lines collected and the ERI lines are shown in red on Figure 1. A dipole-dipole array type was used.

Table 3: Summary of ERI Lines

Line ID	ELECTRODE SPACING (FT)	TOTAL LENGTH (FT)
GL22-1	20	1110
GL22-2	15	825
GL22-3	20	1110
GL22-4	9	495
GL22-5	10	550

Once the resistivity data was collected, it was downloaded to a laptop computer, processed, and interpreted. Apparent resistivity values collected in the field were processed using inversion and forward modeling techniques to generate cross sections of actual modeled resistivity values. This was completed using RES2DINV which uses a least-squares linear inversion techniques to generate a model of predicted two-dimensional resistivity values along the profile, which were then contoured to evaluate spatial trends in subsurface resistivity values.

3.0 RESULTS AND DISCUSSION

3.1 EM31 and EM34 Conductivity and Metal Detection Results

Figures 2 and 3 present the EM data as color-contoured maps of apparent resistivity. Areas of higher EM apparent conductivity appear as warmer/hot colors, such as yellow, orange and red; while lower conductivity areas are shown as purple and blue areas. Low conductivity areas (up approximately 25 mS/m) are interpreted to represent background conditions and/or dry subsurface. Low conductivity areas appear minimally disturbed with native soils at the surface and areas with no seepage impacts in the upper 16 feet of the subsurface.

Areas of moderate conductivity (25 to 35 mS/m) are interpreted to represent either locations with significant near surface groundwater (which may or may not be impacted by seepage) or areas immediately adjacent to nearby surface/near-surface metal features (e.g., fences and guardrails). Because of their impact on the EM data, known metallic surface features are added to Figures 2 and 3.

Areas of high conductivity (above 35 mS/m) are generally interpreted to be areas of where seepage may be present within the upper 16 feet, or where fences, guardrails and/or other near surface metal generate high apparent conductivity. The area of highest metallic object influence (conductivity values over 90 mS/m) are blanked out in Figures 2 and 3.

In the shallower EM31 dataset, elevated / moderate conductivity (21 to 45 mS/m) is generally present where surface conditions are wettest. There are also isolated pockets of moderate conductivity within the Grassy Valley drainage. These areas are likely localized areas of moist to saturated clayey soil, not sources of seepage. There do not appear to be continuous plume-like distributions of moderate or high conductivity.

Within a filled area at approximately 45200E, 61900N (see Figure 2) the EM31 data indicate highly variable conductivity and the metal detection component of EM31 response suggests several pieces of buried metal are present within the upper 16 feet of the subsurface. Northwest of this area, along the toe of the ECOSA, EM31 values are generally near background / low conductivity.

Along the mine access road east of the ECOSA only one area of elevated EM31 conductivity is seen in the dataset, but only a limited portion of the road was surveyed. Where EM31 data were collected at the toe of the ECOSA elevated EM31 conductivity does not correlate with observed seepage or staining at the surface. EM34 data were not collected along the road east of the ECOSA due to the presence of nearby metal and expectation that meaningful data would not be obtained.

In both EM31 and EM34 data, the highest conductivity areas not attributed to metallic feature influence appear to be in topographically low areas with no obvious surface expression of seeps, staining or other evidence of seepage from the ECOSA. An area of elevated EM conductivity is observed approximately 250 feet east of GVMW-25 which may warrant further investigation and is labeled AOI (area of interest) on Figures 2 and 3. There does not appear to be a significant change in either EM31 or EM34 conductivity where the diatreme contact is mapped.

3.2 Discussion of ERI Results

Electrical Resistivity Imaging results are presented in Figures 4, 5, 6 and 7 as two-dimensional (2D) profiles showing the modeled electrical resistivity values of the subsurface beneath each transect. Where a borehole location from previous investigations is close enough to project on a resistivity profile, it is shown. Since ERI measures the contrasting electrical properties of the subsurface material, these data are useful for identifying the top of bedrock surface, changes in lithology, weathering, fracturing, saturated zones, and changes in pore fluid chemistry such as salinity, pH or total dissolved solids. In the ERI dataset, low resistivity areas (blue zones with resistivity less than 50 ohm-meters) are interpreted to be areas of wet sediments in the shallow subsurface or seepage impacted areas. High resistivity areas (“warm” colors of orange, red, and brown with resistivity above 580 ohm-meters) are interpreted to represent intact rock with little pore water at depth or relatively well-draining soils and fill in the near surface.

Review of the ERI data presented in Figure 4 (ERI line GL22-1) indicates a low resistivity zone near the surface along most of the line which may be interpreted to be areas of moist to wet sediments. Below the low resistivity zone at an elevation of approximately 9900 feet, resistivity increases along most of the line, suggesting bedrock may be at this elevation, but this higher resistivity layer appears absent from the south-southwest start of the line to approximately 200 feet along the line. This may indicate either deeper bedrock, or the presence of low-resistivity impacted water.

Along ERI Line GL22-2 (Figure 5) relatively low resistivity appears from the southern start of the line to approximately 315 feet along the line. The low resistivity (high conductivity) zone appears at depth to the south of GVMW-25 but abruptly changes at approximately 325 feet along the line which may indicate a change in lithology or changes in pore fluid chemistry such as salinity, pH or total dissolved solids. The high resistivity at depth on the north end of the ERI line is interpreted as competent bedrock with minimal interconnected fractures to allow groundwater movement. The projected location of a shallow 8-inch steel pipe is shown on the resistivity model (Figure 5) and it does not appear the pipe significantly impacts the model response.

Low to moderate resistivity is present along most of the ERI Line GL22-3 (Figure 6) suggesting the presence of moist to saturated sediments and fractured rock. The most prominent feature in the geoelectric model is at approximately 690 feet along the line (between GVMW-25 and Lazy S Ranch Road) where the model resistivity is anomalously low. It is likely this is due to an unmapped utility, but that could not be confirmed. If this low resistivity/high conductivity feature is not related to an unmapped utility, it could represent a preferential flowpath for high TDS groundwater. The projected location of a shallow 8-inch steel pipe is shown on the resistivity model (Figure 6) and it does not appear the pipe significantly impacts the model response.

Along ERI Line GL22-4 (lower left panel of Figure 7) a similar pattern of a prominent low resistivity/high conductivity feature is observed in the resistivity model centered near 310 feet along the line (near a road crossing). To the south of this feature, subsurface resistivity generally follows a pattern of high resistivity near the surface and low to moderate resistivity at depth. To the north of this feature a band of low resistivity (blue colors) appears in the subsurface between 10 and 40 feet below ground surface. It is unclear whether the patterns in resistivity variations observed along GL22-4 represent lithologic changes, groundwater chemistry changes, or impacts of an unmapped utility. The projected location of a shallow 8-inch steel pipe is shown on the resistivity model and it does not appear the pipe significantly impacts the model response.

Along ERI Line GL22-5 (lower right panel of Figure 7) low resistivity/high conductivity is observed at depth throughout most of the resistivity model. This low resistivity is interpreted to be due to the presence of presence of moist to saturated sediments and fractured rock. Groundwater encountered along GL22-5 would be expected to be high TDS, which could be natural or the result of impacted groundwater. The projected location of a shallow

8-inch steel pipe is shown on the resistivity model and it does not appear the pipe significantly impacts the model response.

4.0 CONCLUSIONS

EM and ERI results from this investigation do not conclusively indicate a preferred flowpath of seepage between the ECOSA and GVMW-25 or other Grass Valley monitoring wells. While no apparent flowpath was detected, it may still be that the areas of high EM conductivity are zones of high-TDS water and/or sulfate material that act as the source of elevated sulfates detected in monitoring well GVMW-25 downgradient of the uncapped ECOSA but that subsurface heterogeneity limits the ability to identify a seepage pathway.

A data gap remains along portions of the toe of the ECOSA where EM and ERI data were not collected.

It appears moderate EM conductivity areas detected downgradient of the ECOSA are representative of zones of increased surface moisture. ERI results show several anomalously low resistivity features that could either be the result of an unmapped utility (i.e., interference) or could represent preferential flow path(s) for high TDS groundwater.

5.0 RECOMMENDATIONS

Due to continuing uncertainty in the hydrogeologic setting of alluvial and shallow bedrock in Grassy Valley, it is recommended that a two or three monitoring wells be installed in the colluvial materials in Grassy Valley to better characterize the subsurface conditions and possibly intercept degraded quality water.

Based on interpretation of the geophysical data presented, three potential locations for new monitoring wells are shown on Figure 8 and labeled PB23-# (potential boring 2023) but will likely be renamed. These locations are approximate and can be modified to accommodate field conditions considering accessibility, land ownership, utilities, and surface conditions. Each of these locations were selected where anomalously low resistivity features appear in the ERI data and loosely correlate with areas of moderate EM conductivity. In addition, these locations are spatially well-distributed within Grassy Valley.

Table 4: Potential New Monitoring Well Locations

Boring ID	MINE EASTING (FT)	MINE NORTHING (FT)	COMPLETION INTERVAL
PB23-01 A&B	47956	59126	Colluvium (A) & Shallow Fractured Rock (B)
PB23-02 A&B	48870	58946	C Colluvium (A) & Shallow Fractured Rock (B)
PB23-03 A&B	46489	60309.5	Colluvium (A) & Shallow Fractured Rock (B)

It is recommended that at each location, a shallow well be installed (estimated 25-35 feet deep) screened in colluvium, and a deeper well be installed in the fractured rock (estimate to be 30 to 50 feet bgs) to better characterize the subsurface conditions and possibly intercept degraded quality water. These wells may be completed as a nested pair, or drilled as a separate set of two adjacent boreholes.

At this time, limited additional geophysics may be considered to fill data gaps. A relatively low effort EM31 survey along the toe of the ECOSA, within 100-200 feet of the surface seeps along the toe, and a more dense set of transects between ECOSA and GWMW-25 would provide a more robust dataset to evaluate potential shallow (less than 16 feet bgs) seepage pathways. An ERI line collected parallel to the ECOSA toe, 100-200 feet east, and away from metal fences would allow identification of vertical and lateral changes in subsurface conditions close to the toe that may be the result of seepage.

6.0 LIMITATIONS OF GEOPHYSICAL METHODS

WSP Golder services were conducted in a manner consistent with that level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions, subject to the time limits, and financial and physical constraints applicable to the services. Electromagnetic induction is a remote sensing geophysical method that may not detect all subsurface features of concern as this method is based on detecting changes in subsurface material conductivity and background properties of subsurface bulk materials or groundwater may influence or distort survey results causing limitations to interpretation.

7.0 CLOSURE

WSP Golder is pleased to have the opportunity to support CC&V on this investigation and to have worked with you on this project. We trust that this document meets your expectations and needs. We look forward to the prospect of similar endeavors and collaborations in the future and thank you for your continued collaboration with us. Please contact the undersigned if you have any questions, comments, or if you require any additional information.

Golder Associates USA Inc.

for

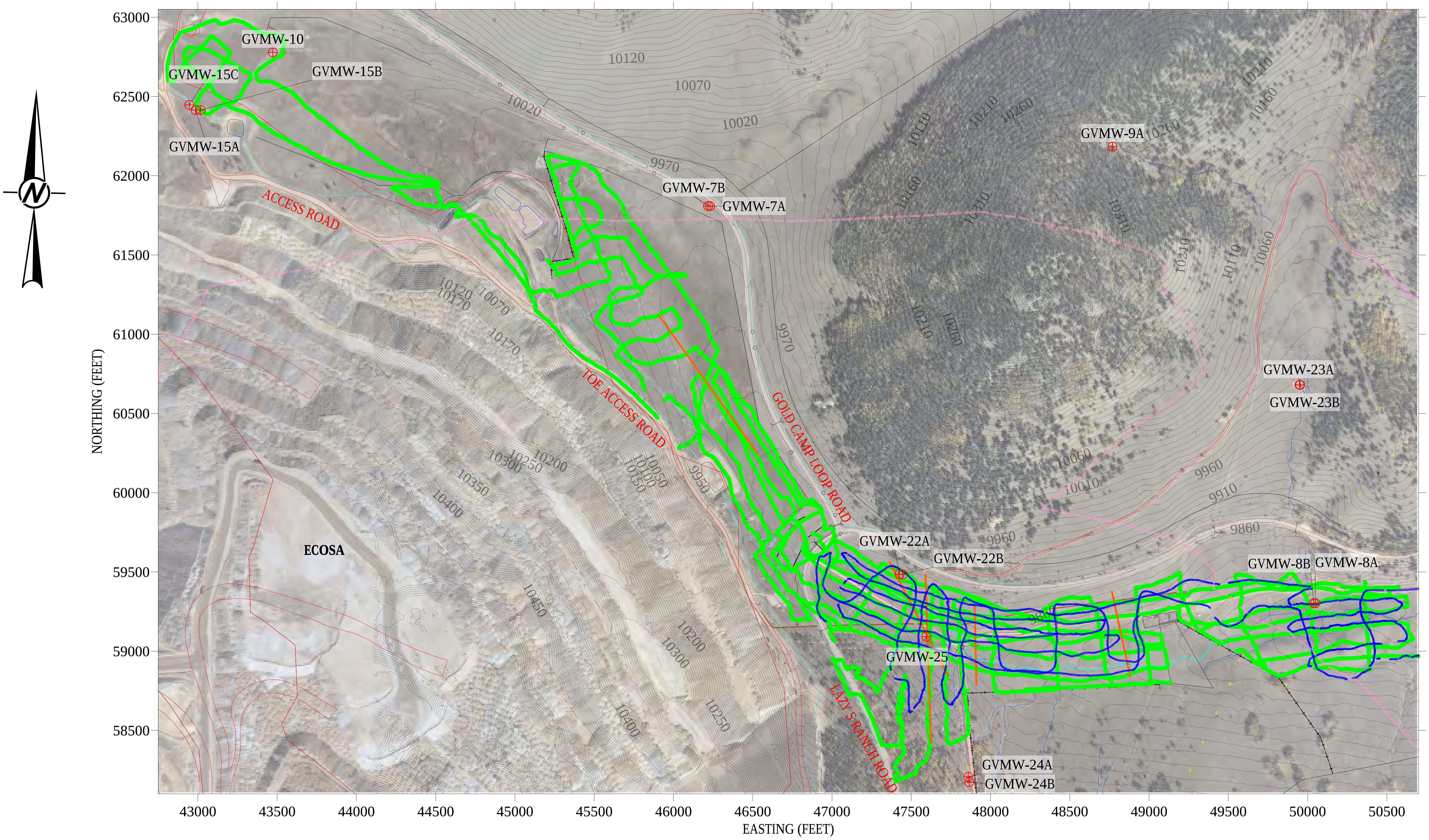
Peter Fahringer

David Moussa
Geophysicist

Peter Fahringer, PGp, LG, PG (CA, WA, PA)
Director, Senior Geophysicist

DM/PF/mb

https://wsponlinenam-my.sharepoint.com/personal/peter_fahringer_wsp_com/documents/!projects/202218714 cc&v grassy valley/letter report/31405490.000_09jan2023_technical memorandum.docx



NOTES

1) LOCATIONS COLLECTED WITH HANDHELD GNSS (1-3M ACCURACY)

2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY & COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.

3) MAP DATUM: CC&V MINE GRID, FEET.

LEGEND

⊕ MONITORING WELL
ELECTRICAL RESISTIVITY LINE
EM31 TRACKLINE
EM34 TRACKLINE
DIATREME BOUNDARY

CLIENT
CC&V /
NEWMONT

Newmont
CRIPPLE CREEK & VICTOR

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2023-01-11
PREPARED	PEF
DESIGN	PEF
REVIEW	DAM
APPROVED	JR

PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

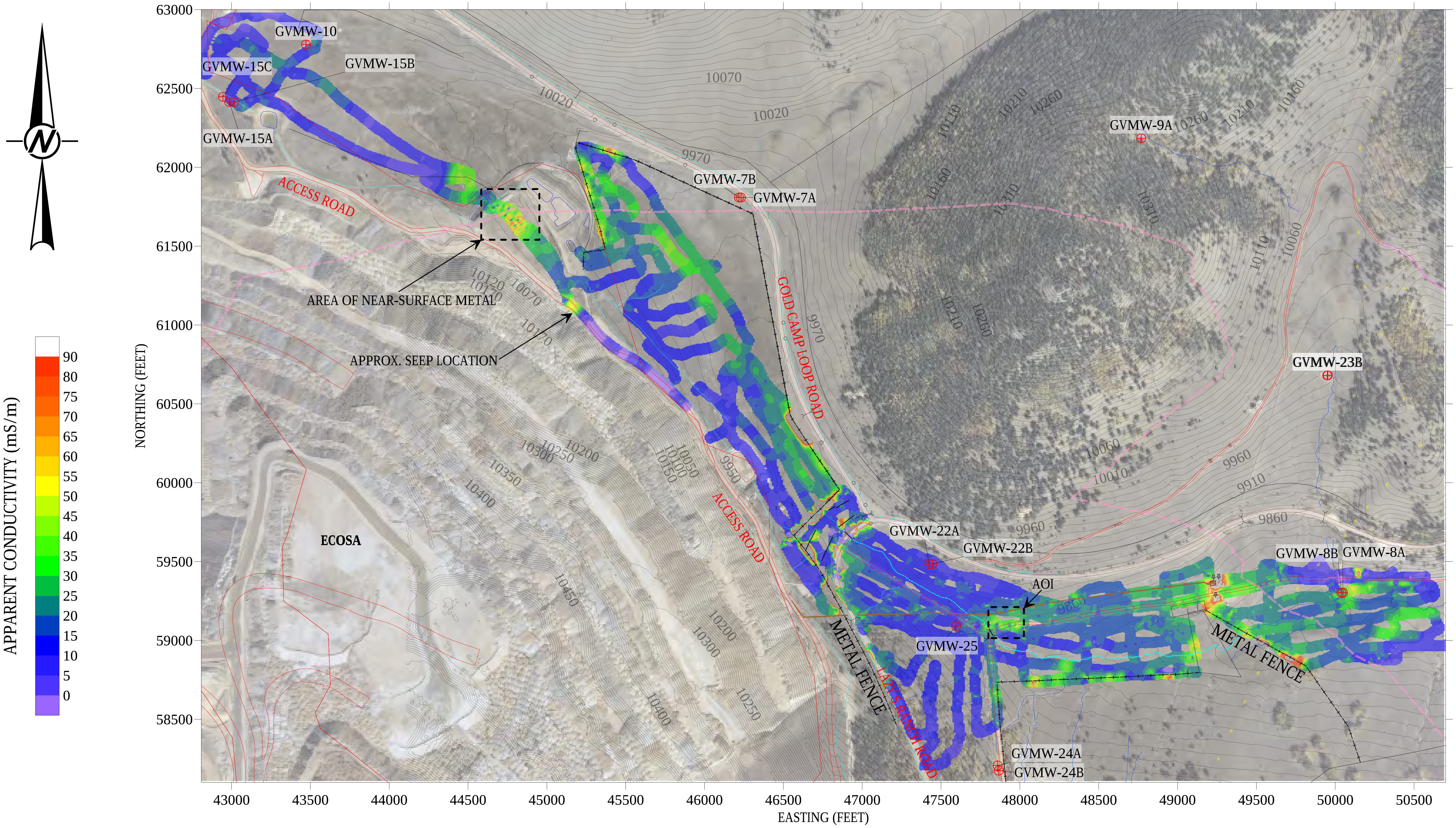
TITLE
INVESTIGATION AREA MAP

PROJECT No.	Rev.	Figure
31405490.000	1	1

31405490_FIGURE2.srf | revised: January 11, 2023

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0
1 inch



NOTES

1) LOCATION COLLECTED WITH HANDHELD GNSS (1-3M ACCURACY)
2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY & COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.
3) APPARENT CONDUCTIVITY DATA COLLECTED WITH GEONICS LTD. EM31
4) MAP DATUM: CC&V MINE GRID, FEET
5) BASE AERIAL PROVIDED BY CC&V, SEPT 2022
6) KNOWN UTILITIES FROM: *XREF-CC&V Utilities etc.DWG*

LEGEND

STEEL PIPE
ROAD EDGE
METAL FENCE
DRAINAGE
MONITORING WELL
DIATREME BOUNDARY

CLIENT
CC&V
NEWMONT

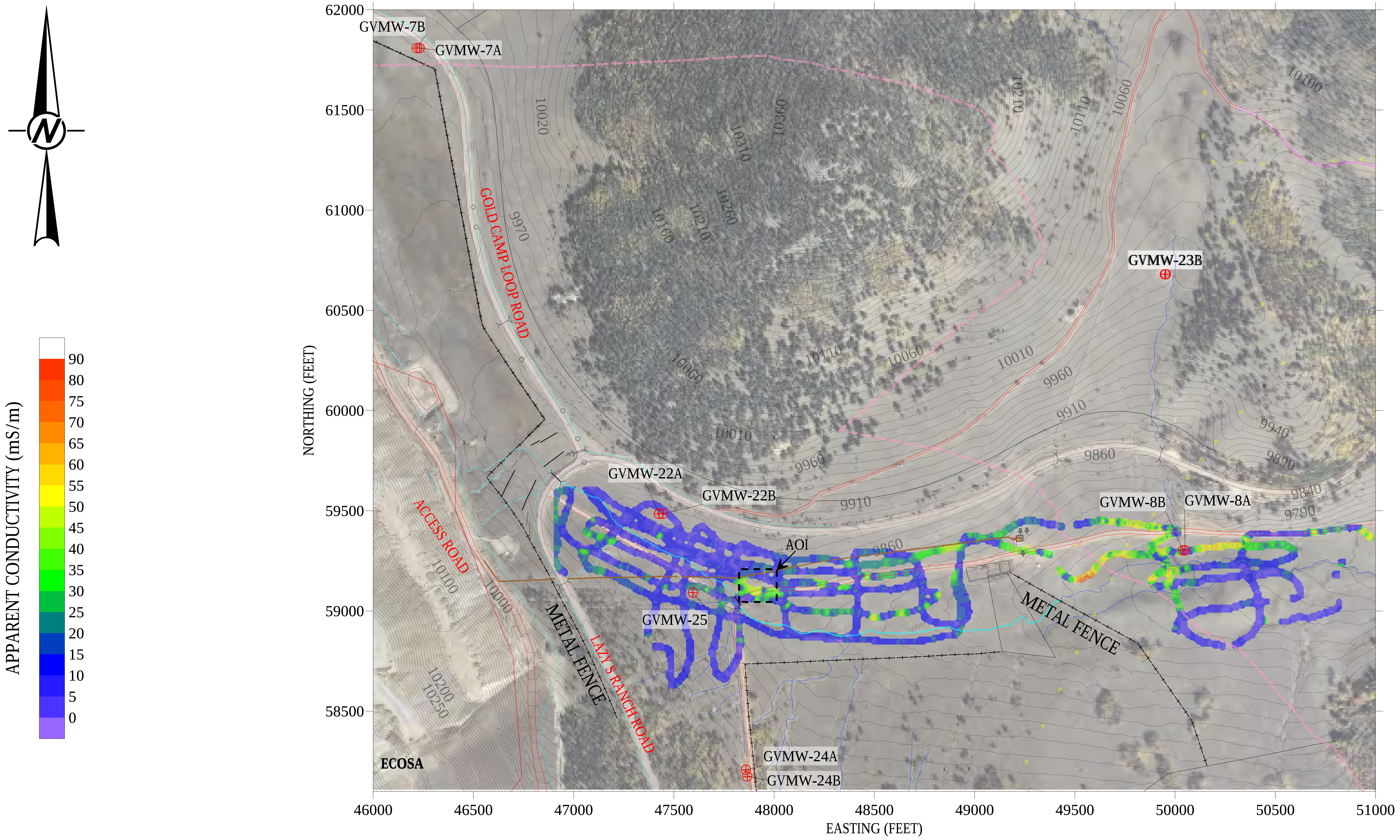
CONSULTANT

YYYY-MM-DD	2023-01-11
PREPARED	PEF
DESIGN	PEF
REVIEW	DAM
APPROVED	JR

PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

TITLE
GEONICS EM31 APPARENT CONDUCTIVITY
(TO ~16 FT DEPTH)

PROJECT No. 31405490.000
Rev. *1*
Figure 2



NOTES

1) LOCATION COLLECTED WITH HANDHELD GNSS (1-3M ACCURACY)
2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY
& COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.
3) APPARENT CONDUCTIVITY DATA COLLECTED WITH GEONICS LTD. EM34
4) MAP DATUM: CC&V MINE GRID, FEET
5) BASE AERIAL PROVIDED BY CC&V, SEPT 2022
6) KNOWN UTILITIES FROM: *XREF-CC&V Utilities etc.DWG*

LEGEND

- STEEL PIPE
- ROAD EDGE
- METAL FENCE
- DRAINAGE
- ⊕ WELL LOCATION
- DIATREME BOUNDARY

CLIENT
CC&V
NEWMONT

Newmont
CRIPPLE CREEK & VICTOR

PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

CONSULTANT

wsp GOLDER

YYYY-MM-DD	2023-01-11
PREPARED	PEF
DESIGN	PEF
REVIEW	DAM
APPROVED	JR

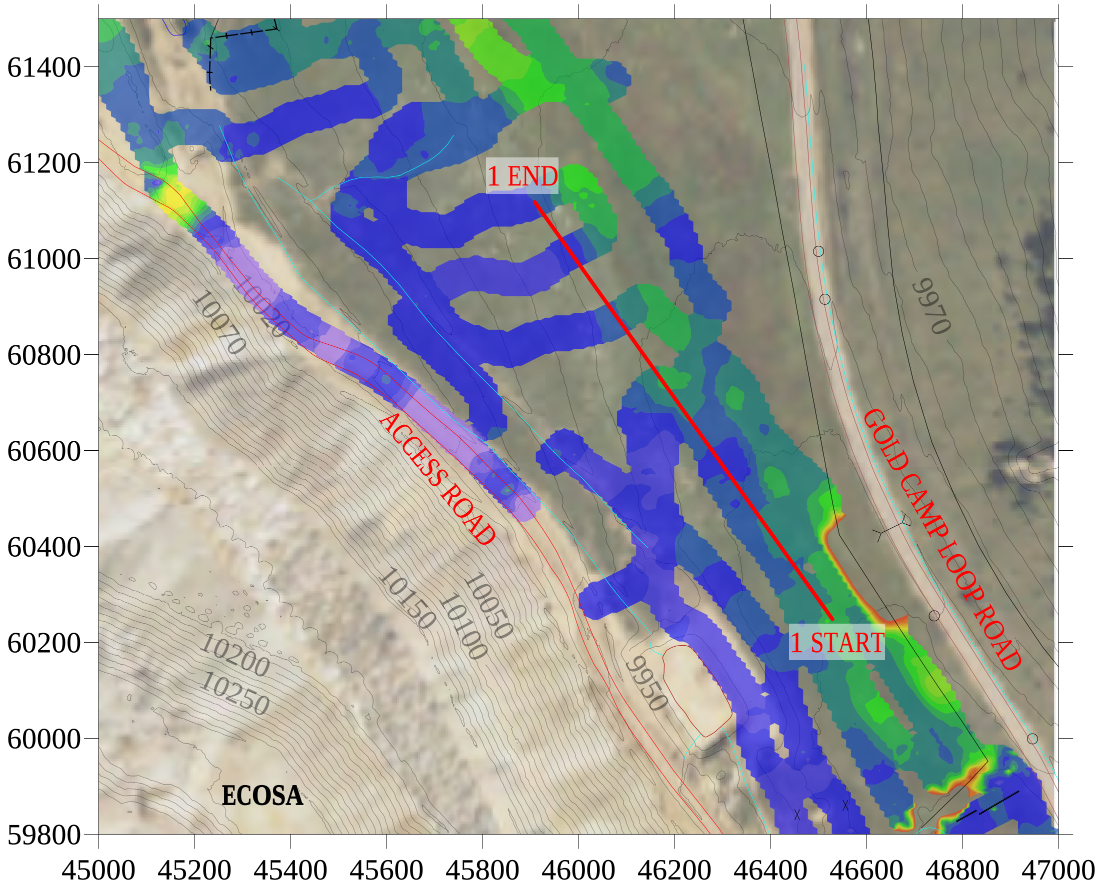
TITLE
GEONICS EM34 APPARENT CONDUCTIVITY
20M HORIZONTAL DIPOLE (~50 FT DEPTH)

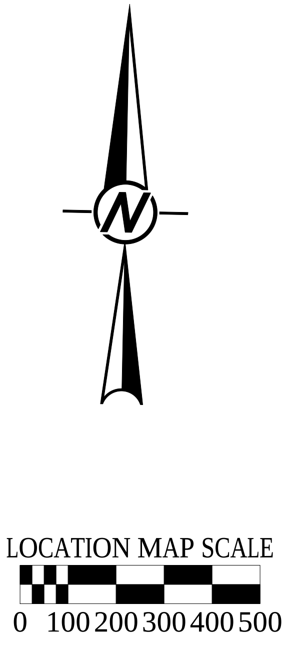
PROJECT No.	Rev.	Figure
31405490.000	1	3

31405490_FIGURE3.srf | revised: January 11, 2023

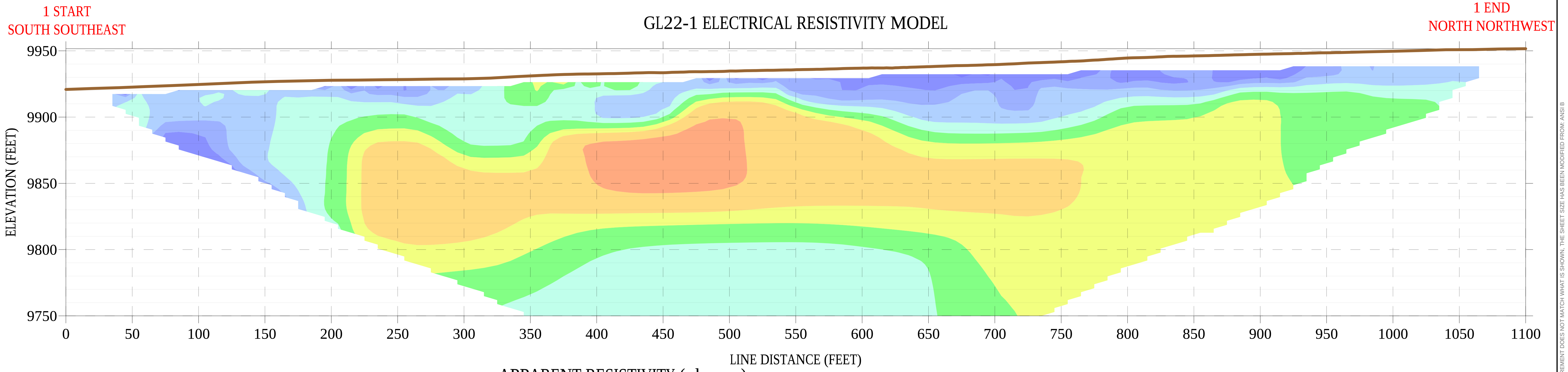
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 inch
0

LOCATION MAP

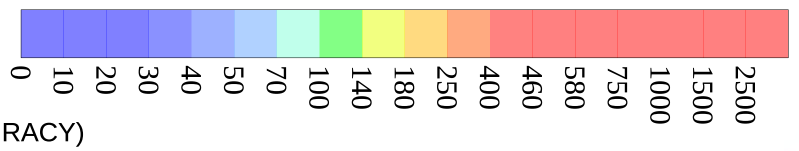




GL22-1 ELECTRICAL RESISTIVITY MODEL



APPARENT RESISTIVITY (ohm-m)



NOTES

1) LOCATIONS COLLECTED WITH HANDHELD GNSS (1-3M ACCURACY)
2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY
& COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.
3) ELECTRICAL RESISTIVITY DATA COLLECTED WITH 56-CHANNEL AGI SUPERSTING

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CC&V /
NEWMONT

Newmont
CRIPPLE CREEK & VICTOR

CONSULTANT

wsp GOLDER

YYYY-MM-DD	2023-01-11
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DESIGN	PEF
REVIEW	DAM
APPROVED	JR

PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

TITLE
ELECTRICAL RESISTIVITY LINE GL22-1 MODEL PROFILE

PROJECT No.
31405490.000

Rev.
1

Figure
4

31405490_FIGURE4.srf | revised: January 11, 2023

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 inch
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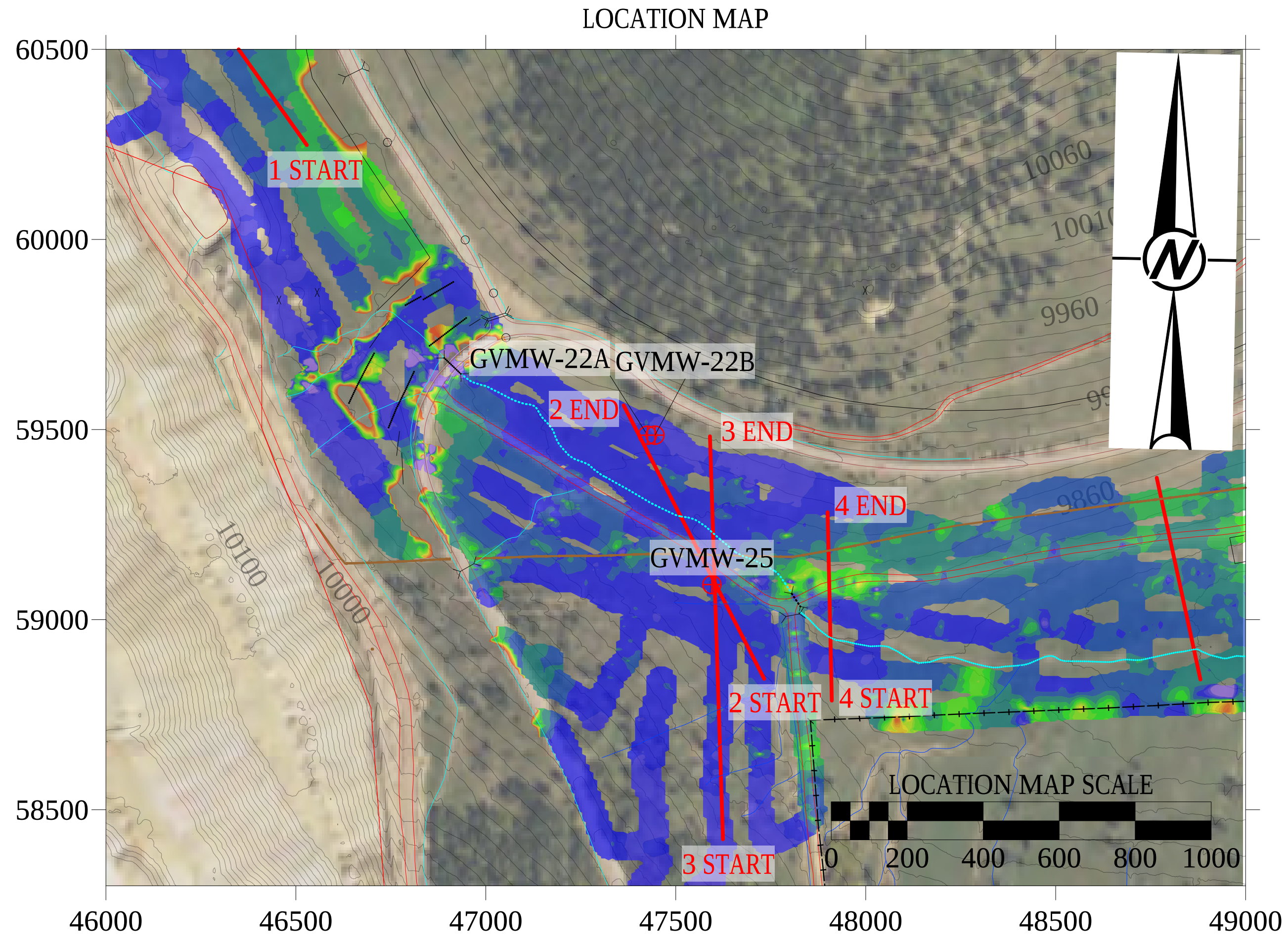

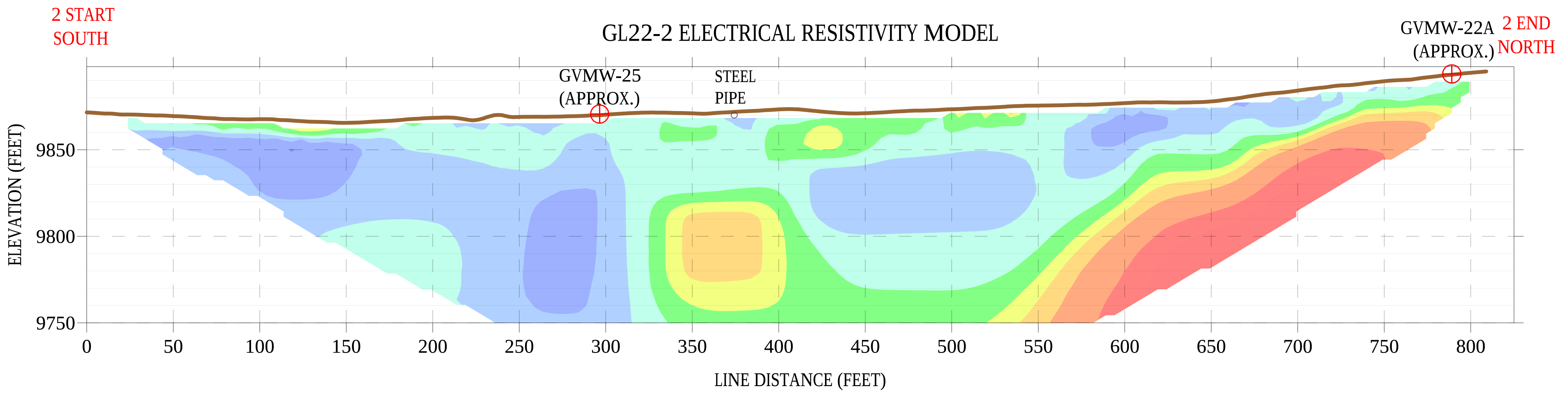

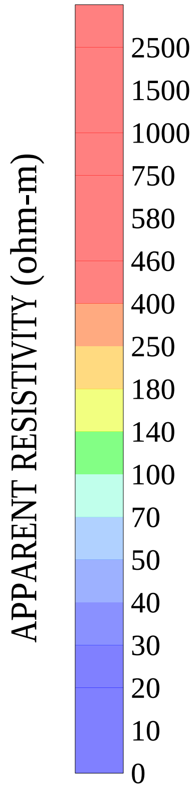

NOTES

1) LOCATION COLLECTED WITH HANDHELD GNSS (1-3M ACCURACY)
2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY
& COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.
3) ELECTRICAL RESISTIVITY DATA COLLECTED WITH 56-CHANNEL AGI SUPERSTING

31405490_FIGURE5.srf | revised: January 11, 2023

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CC&V /
NEWMONT

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CRIPPLE CREEK & VICTOR

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wsp GOLDER

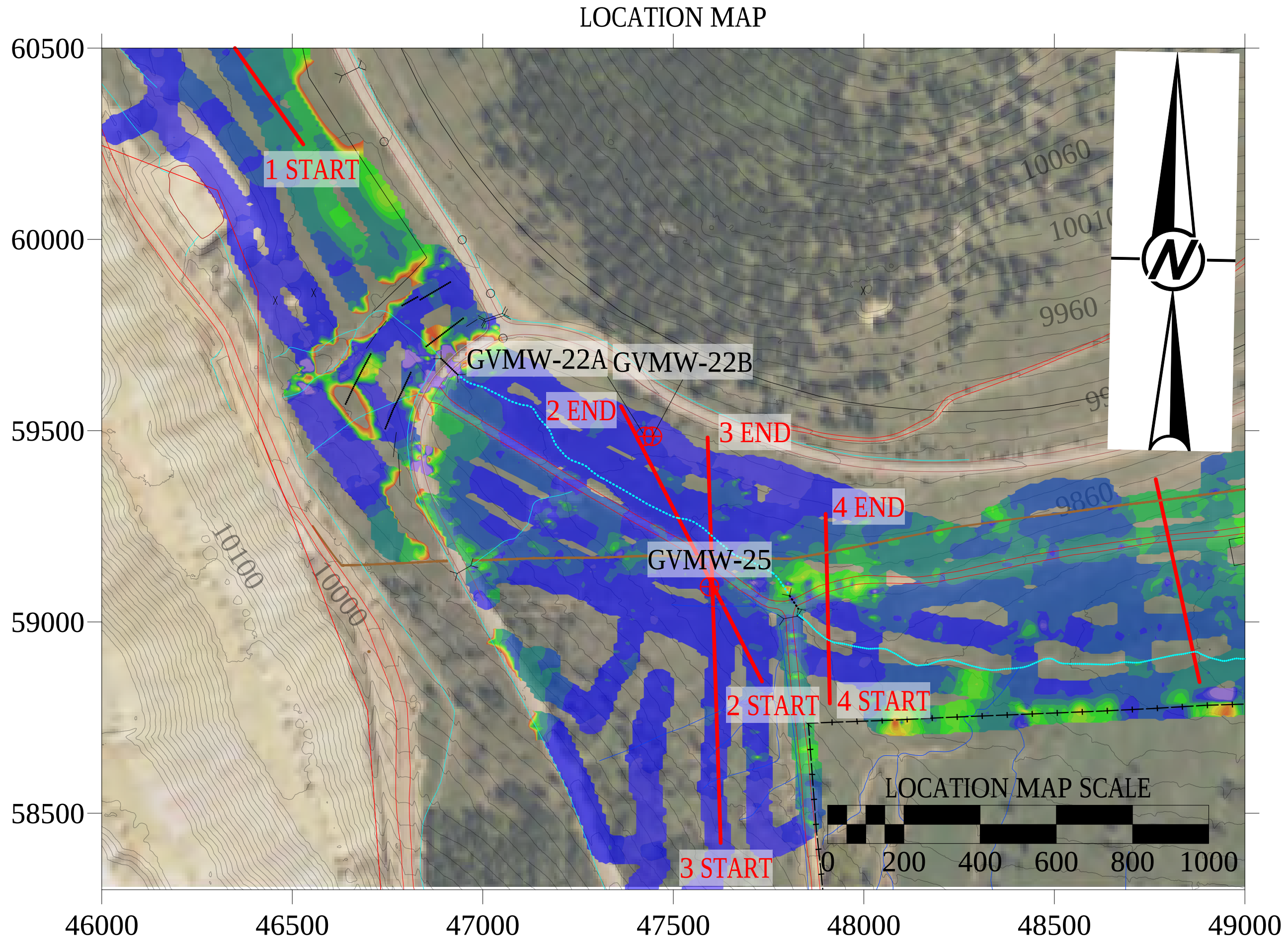
YYYY-MM-DD 2023-01-11
PREPARED PEF
DESIGN PEF
REVIEW DAM
APPROVED JR

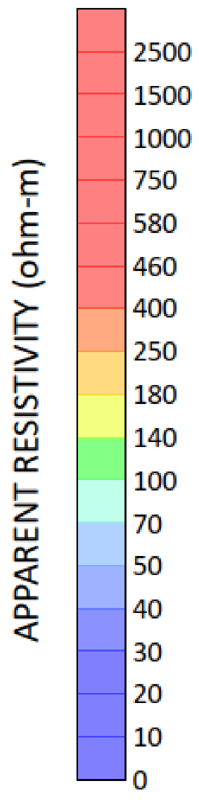
PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

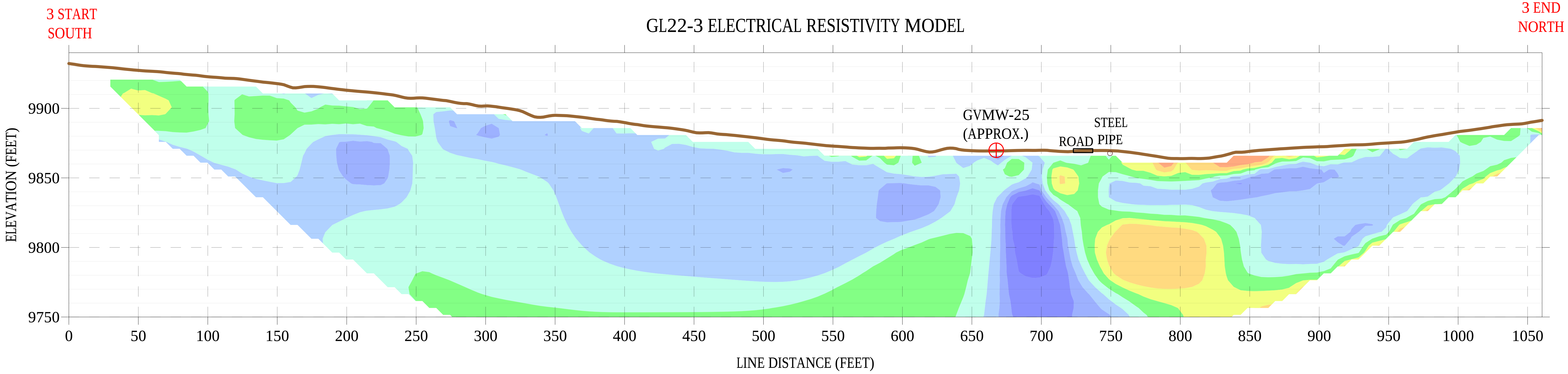
TITLE
ELECTRICAL RESISTIVITY LINE GL22-2 MODEL PROFILE

PROJECT No. 31405490.000
Rev. 1
Figure 5

0
1 inch
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B







NOTES

1) LOCATION COLLECTED WITH HANDHELD GNSS (1-3M ACCURACY)

2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY & COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.

3) ELECTRICAL RESISTIVITY DATA COLLECTED WITH 56-CHANNEL AGI SUPERSTING

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NEWMONT

Newmont
CRIPPLE CREEK & VICTOR

PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

CONSULTANT

WSP GOLDER

YYYY-MM-DD	2023-01-11
PREPARED	PEF
DESIGN	PEF
REVIEW	DAM
APPROVED	JR

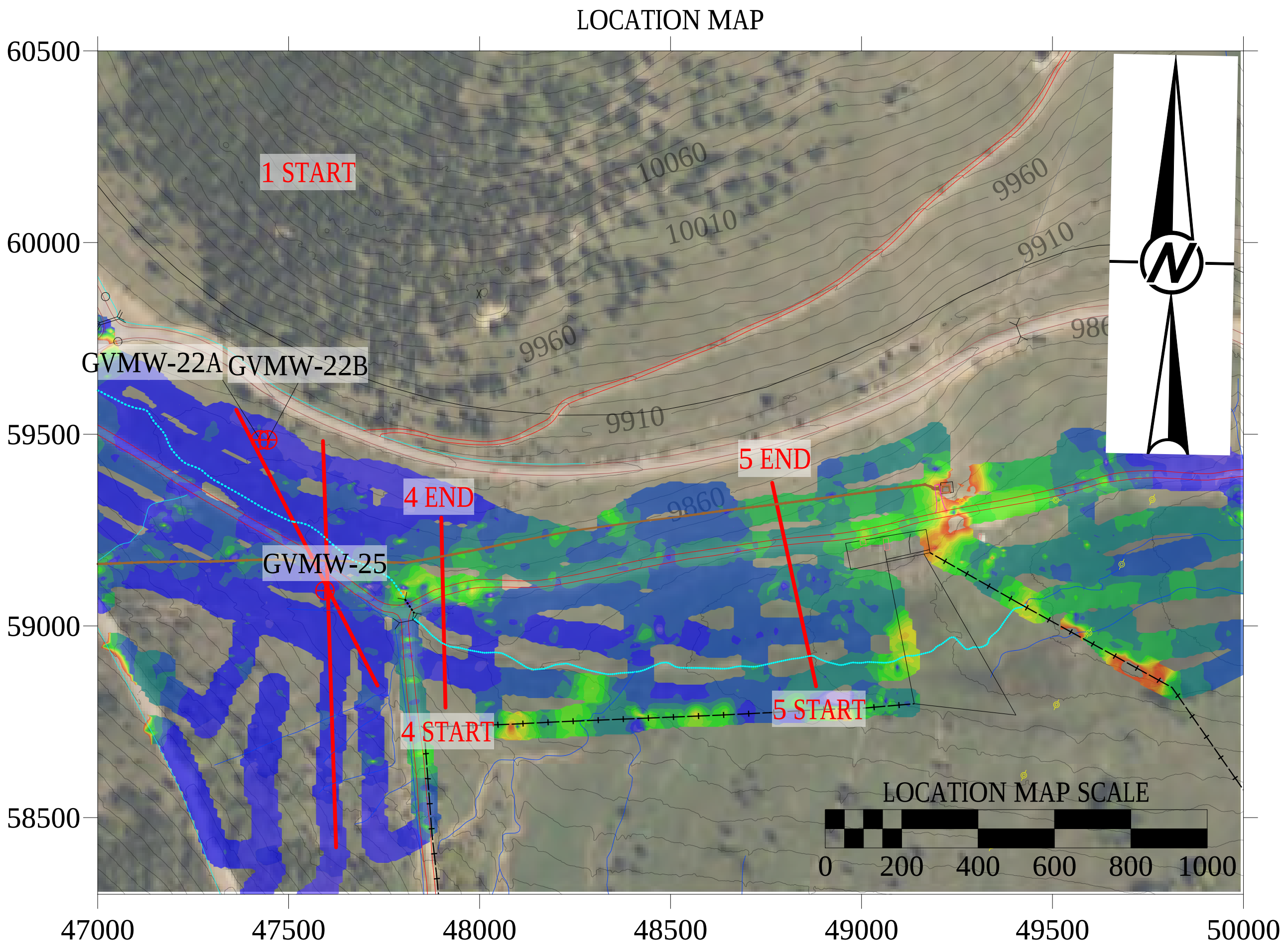
TITLE
ELECTRICAL RESISTIVITY LINE GL22-3 MODEL PROFILE

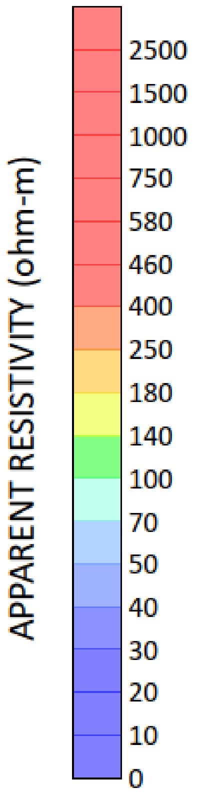
PROJECT No.	Rev.	Figure
31405490.000	1	6

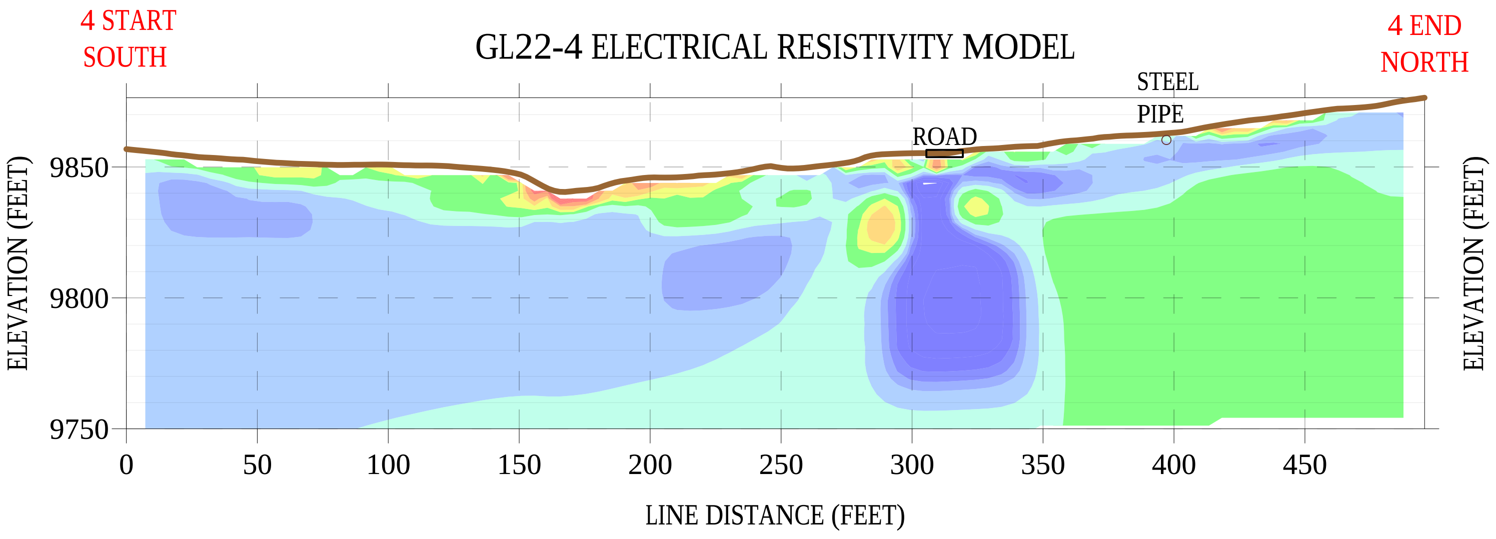
31405490_FIGURE6.srf | revised: January 11, 2023

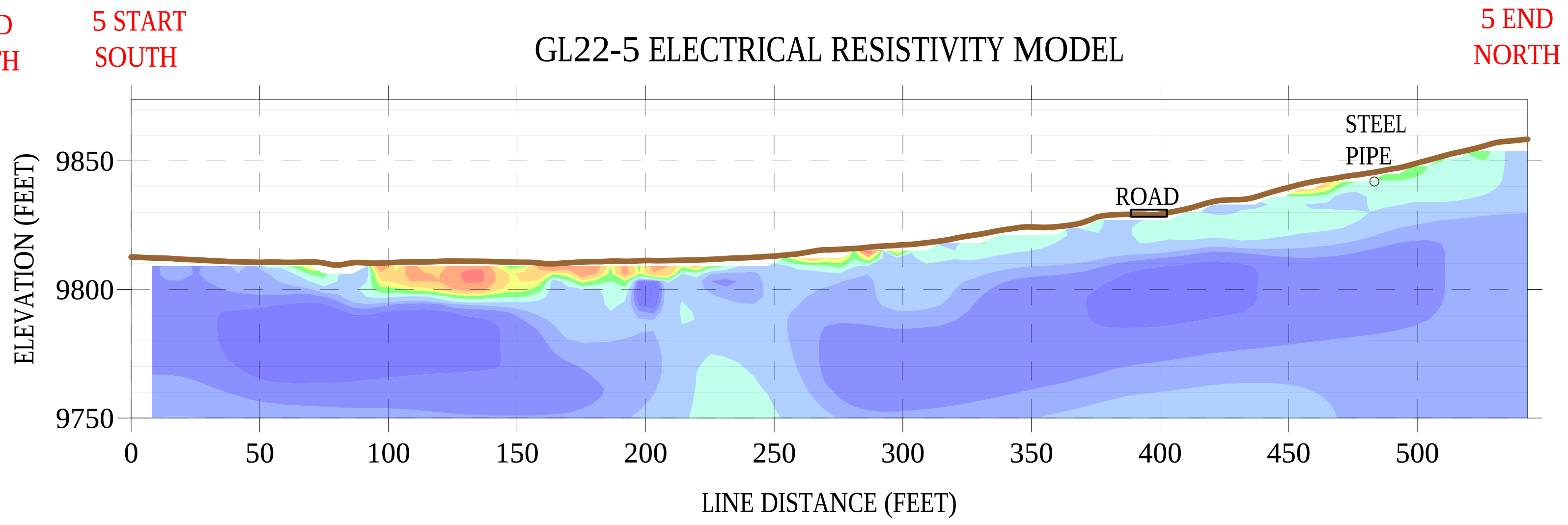
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0
1 inch









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NEWMONT

CONSULTANT

YYYY-MM-DD	2023-01-11
PREPARED	PEF
DESIGN	PEF
REVIEW	DAM
APPROVED	JR

PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

TITLE
ELECTRICAL RESISTIVITY LINES GL22-4 & -5 MODEL PROFILES

PROJECT No.
31405490.000

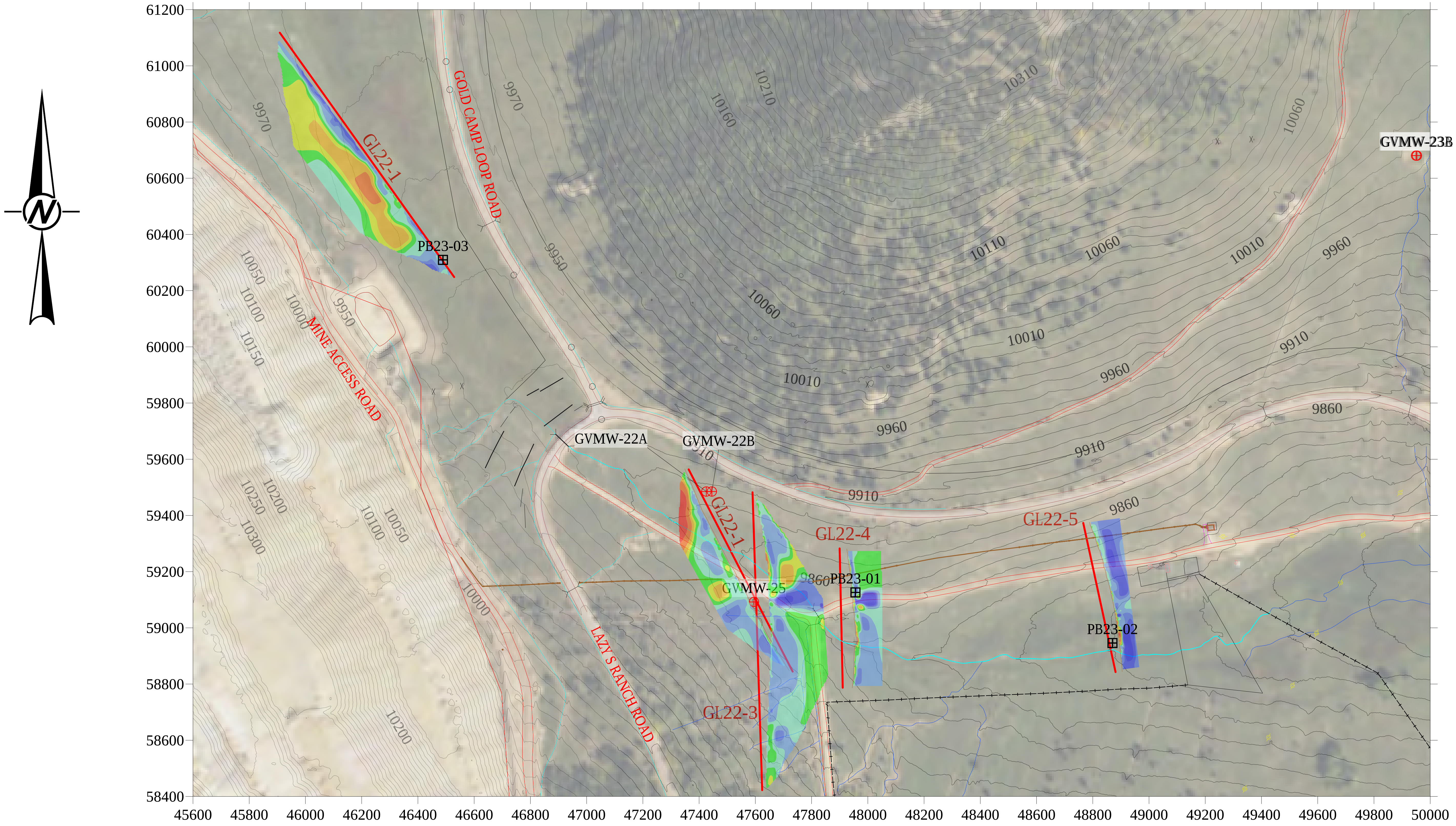
Rev.
1

Figure
7

NOTES

1) LOCATION COLLECTED WITH HANDHELD GNSS (1-3M ACCURACY)
2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY
& COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.
3) ELECTRICAL RESISTIVITY DATA COLLECTED WITH 56-CHANNEL AGI SUPERSTING

31405490_FIGURE7.srf | revised: January 11, 2023



NOTES
1) LOCATIONS APPROXIMATE
2) ELEVATION DATA (NAVD88) DERIVED FROM TELLER COUNTY
& COLORADO WATER CONSERVATION BOARD LIDAR DATA, 2016.

CLIENT
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NEWMONT

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CRIPPLE CREEK & VICTOR

CONSULTANT

wsp GOLDER

YYYY-MM-DD	2023-01-12
PREPARED	PEF
DESIGN	PEF
REVIEW	DAM
APPROVED	JR

PROJECT
ECOSA GRASSY VALLEY GEOPHYSICS
CRIPPLE CREEK & VICTOR (CC&V) MINE
TELLER COUNTY, CO

TITLE
ELECTRICAL RESISTIVITY PROFILES PROJECTED ON SCALED MAP VIEW

PROJECT No.	Rev.	Figure
31405490.000	1	8

31405490_FIGURE8.srf | revised: January 12, 2023

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1 inch

Newmont™
NORTH AMERICA

Cripple Creek & Victor
Gold Mining Company
P.O. Box 191
100 North 3rd Street
Victor, Colorado 80860

P 719.689.2977
F 719.689.3254
newmont.com

Attachment 4

Form No.
GWS-09
06/00

STATE OF COLORADO
OFFICE OF THE STATE ENGINEER
821 Centennial Bldg., 1313 Sherman St., Denver, CO 80203
(303) 866-3581 Fax (303) 866-3589

For Office Use Only

RECEIVED
OCT 09 2002
WATER
STATE ENGINEER
COLO.

004257/

WELL ABANDONMENT REPORT

Type or print in black ink. MH-42571 GVMW-4B

Well Permit Number of the well being plugged ______________.

Individual/Company responsible for plugging and sealing the well:

NAME(S) Cripple Creek & Victor Gold Mining Co.

Mailing Address PO Box 191

City, St. Zip Victor, CO 80860

Phone (719) 689-4056

ACTUAL WELL LOCATION: County ______________

Property Address ______________ (Address) (City) (State) (Zip)

SW 1/4 of the NE 1/4, Sec. 17, Twp. 15 ☐ N. or ☒ S., Range 69 ☐ E. or ☒ W., 6th P.M.

Distance from Section Lines ~2,000 Ft. From ☐ N. or ☑ S., ~1400 Ft. From ☐ E. or ☑ W. Line.

Subdivision Name n/a Lot n/a, Block n/a, Filing/Unit n/a

I (we) report that an existing well was plugged and sealed for the following reason(s):

☐ The well was plugged and sealed as required under Well Permit Number ______________.

☒ The well was not in use and was plugged and sealed.

☐ Other (please explain) ______________

The date the well was plugged according to the Water Well Construction Rules was ______________.

The well was plugged with the following materials placed at the indicated intervals:

Amount and Type of Material	**Method of Placement**	**Interval**
2 bags bentonite	bottom-up	from unknown feet to unknown feet
2 bags Sakerite Cement	bottom-up	from unknown feet to unknown feet
1 bags Portland Cement	bottom-up	from unknown feet to unknown feet
		from ______ feet to ______ feet

Intervals of casing removed/ripped in feet from 0 feet to 50 feet

I (we) have read the statements made herein, know the contents thereof, and that they are true to my (our) knowledge.

Please print the Signer's Name & Title	Signature(s)	Date
Phil Barnes Manager, Environmental Resources		9/26/02

It is the responsibility of the well owner to have the well properly plugged and sealed. The Well Construction Contractor is responsible for notifying the owner of this requirement.

FORM NO.
GWS-31
10/94

WELL CONSTRUCTION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Rm 818, Denver, CO 80203

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OCT 09 2002
WATER RESOURCES
STATE ENGINEER
COLO.

CRMW-~~3B~~ 4B

1. WELL PERMIT NUMBER MH-42571

2. OWNER NAME(S) Cripple Creek & Victor Gold Mining Co.
Mailing Address PO Box 191
City, St. Zip Victor, CO 80860
Phone (719) 689-4056

3. WELL LOCATION AS DRILLED: NE 1/4 NE 1/4, Sec. 30 Twp. 15 S, Range 69 W.
DISTANCES FROM SEC. LINES:
~350 ft. from North (north or south) Sec. line. and ~300 ft. from East (east or west) Sec. line. OR
SUBDIVISION: n/a LOT n/a BLOCK n/a FILING(UNIT) n/a.
STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION 9175 ft. DRILLING METHOD Reverse Circulation.
DATE COMPLETED August 1998. TOTAL DEPTH 220 ft. DEPTH COMPLETED 219 ft.

5. GEOLOGIC LOG:

Depth Description of Material (Type, Size, Color, Water Location)

See Attached

REMARKS:

6. HOLE DIAM. (in.)

HOLE DIAM. (in.)	From (ft)	To (ft)
11"	0	20
9"	0	220

7. PLAIN CASING

OD (in)	Kind	Wall Size	From(ft)	To(ft)
3"	PVC		+1.25-	178.75

PERF. CASING: Screen Slot Size:

OD (in)	Kind	Wall Size	From(ft)	To(ft)
3"	Slotted PVC		178.75	218.75

8. FILTER PACK:
Material Sand
Size
Interval 178.75 - 218.75

9. PACKER PLACEMENT:
Type
Depth

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement
Bentonite	5'		178.75 173.75	Bottom-up
Bentonite/Cement			4.15-173.75	Bottom-up
Cement			+0.85-4.15	Bottom-up

11. DISINFECTION: Type n/a Amt. Used n/a

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test.
TESTING METHOD
Static Level ft. Date/Time measured , Production Rate gpm.
Pumping level ft. Date/Time measured , Test length (hrs.).
Remarks

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Phone ( ) Lic. No.
Mailing Address

Name/Title (Please type or print)
Phil Barnes, Manager, Environmental Resources

Signature

Date
9/26/02

GWS-51
03/01

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black ink

RECEIVED
OCT 09 2002
WATER
STATE ENGINEER
COLO.

Well Owner's Name Cripple Creek & Victor Gold Mining Co

Landowner's Name Cripple Creek & Victor Gold Mining Co

Mailing Address: (Authorized Individual/or Driller)

Contact Timm Comer / Sr. Environmental Coordinator

Company Cripple Creek & Victor Gold Mining Co.

Address P.O Box 191

City, State, Zip Victor, CO 80860

Phone 719/689-4056 Fax No. 719/689-~~40~~3254

Driller Lic. No. (if applicable)

Site ID: GVMW-4B

Location: SW ¼, N[illegible] ¼, Section 17.

Township 15 N/[✓ S] Range 69 E/[✓ W] 6th PM

County Teller

Subdivision n/a.

Lot n/a, Blk n/a, Flg n/a

Hole(s) to be Constructed: Number 1

Estimated Depth 50 Ft. Aquifer

Purpose of Monitoring Hole(s) Water Quality Monitoring

Approximate Date of Construction 01/21/97*

* Well has already been constructed

Authorized Signature

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

MH- 42571

DIV. 2 WD 12 BAS ____ MD ____

PROCESSED BY A. Taff

DATE ACKNOWLEDGED 9-15-03

GROUND ELEV ____ USGS MAP # ____

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

Notice was provided to the State Engineer at least 3 days prior to construction of monitoring & observation hole(s).

Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer.

Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer.

Water diverted during testing shall not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.

All work must comply with the Water Well Construction Rules, 2 CCR 402-2. Minimum construction standards must be met or a variance obtained.

Well Construction and Test Reports (GWS-31) must be submitted to this office by the licensed contractor or authorized individual within 60 days of the completion of the work.

Unless a well permit is obtained, the hole(s) must be plugged and sealed within one (1) year after construction. An Abandonment Report (form GWS-9) must be submitted within 60 days of plugging & sealing.

The owner of the hole(s) should maintain records of water quality testing and submit this data to the State Engineer upon request.

The monitoring hole number, owner's structure name, and hole owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.

A monitoring hole cannot be converted to a production water well, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.

THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Additional Conditions

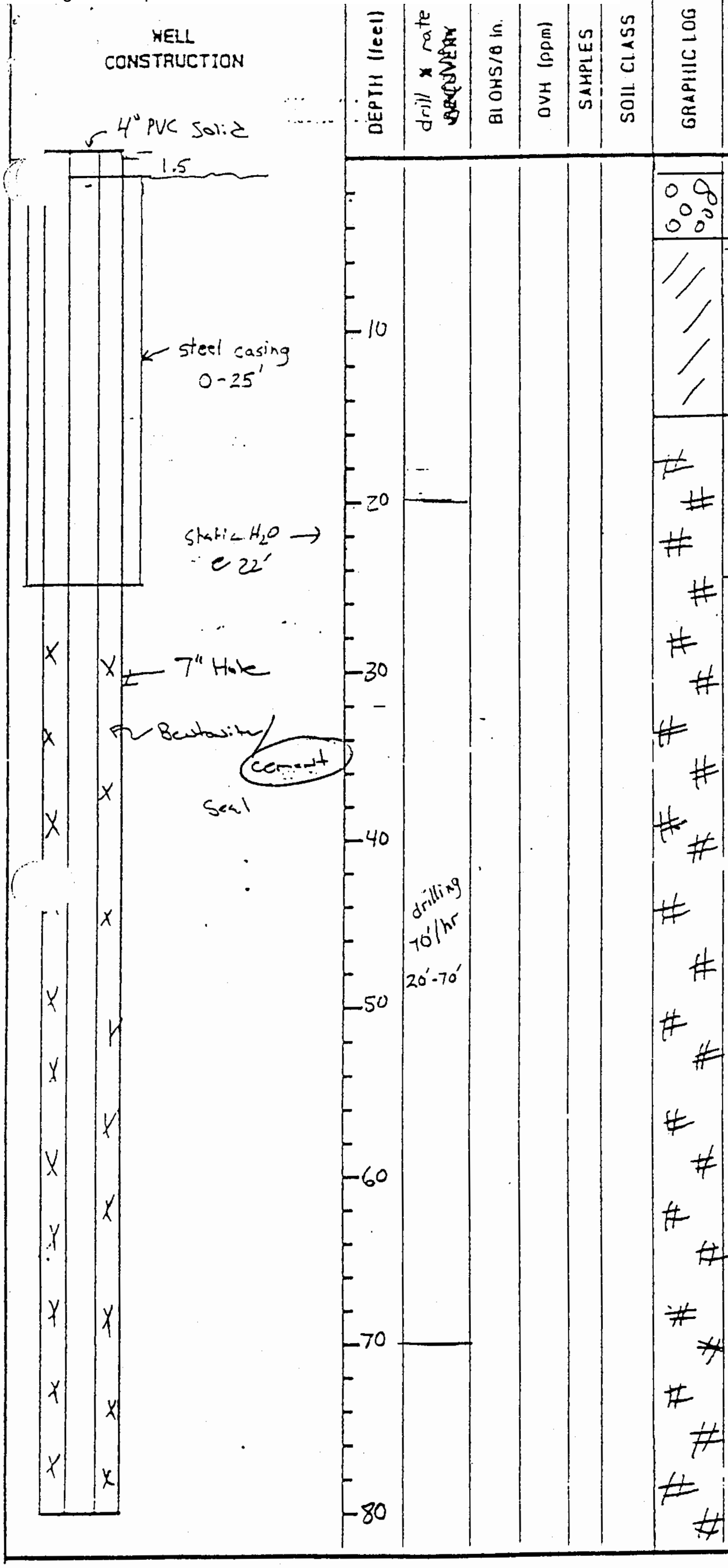
Newmont™
NORTH AMERICA

Cripple Creek & Victor
Gold Mining Company
P.O. Box 191
100 North 3rd Street
Victor, Colorado 80860

P 719.689.2977
F 719.689.3254
newmont.com

Attachment 5

GV-4A



MATERIALS DESCRIPTION

1.5'-5' sandy unconsolidated gravel/rail road bed

5'-15'
Dk black peat

H2O @ contact

15'-110' Xbs
PreCambrian Bt schist

drilled dry
25' ← H2O
drilled wet

15-70 mod Fx wkly oxidized
lm on Fx. surfaces.
local partings of gneiss

MONITOR WELL LOG

HOLE # GV -4A

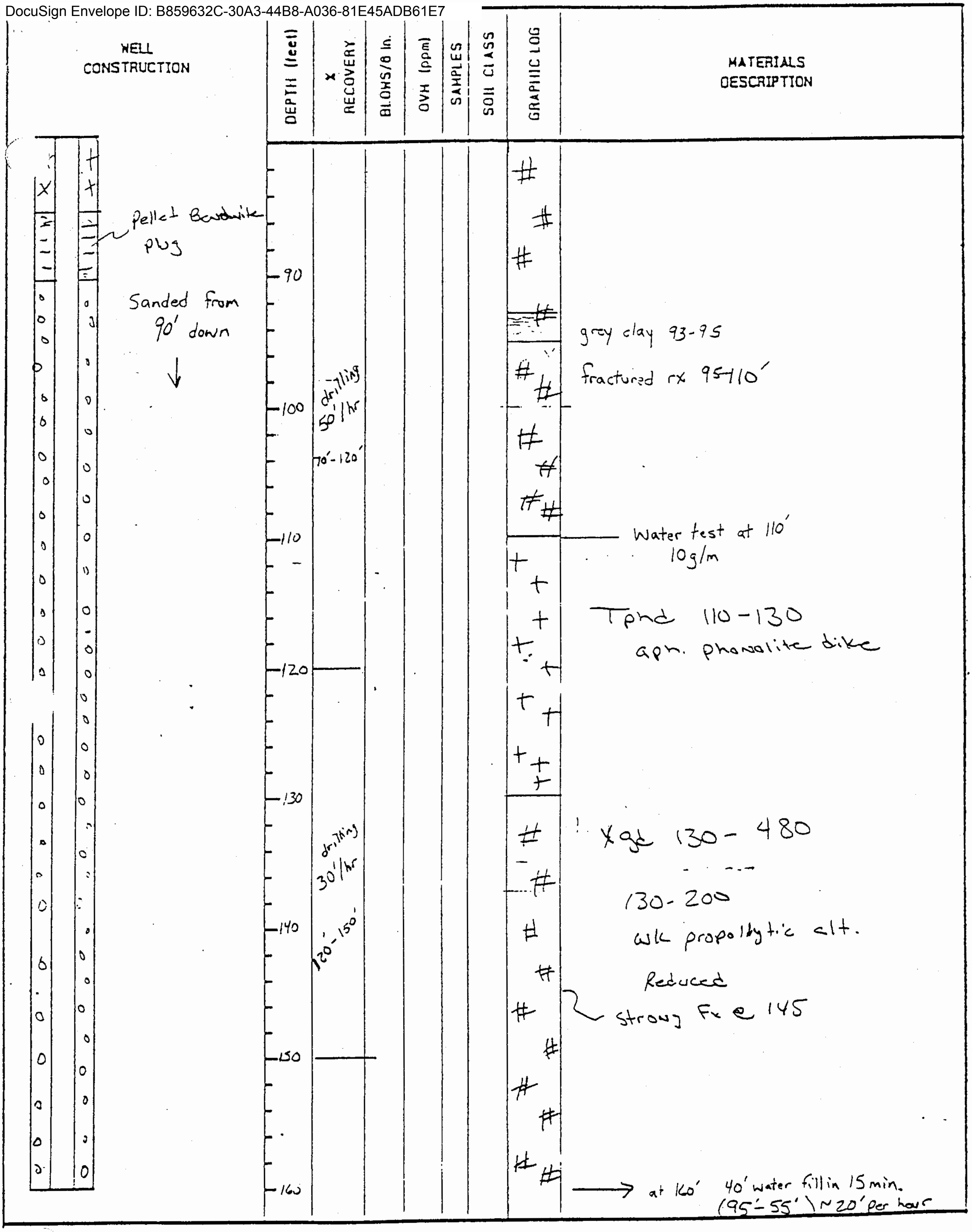
DATE Started 1-19-97 completed 1-22-97

GEOLOGIST Doug White / LL

DRILL METHOD RC

TOTAL DEPTH OF HOLE 430'

LOCATION Grassy Valley



Pellet Bentonite plug

Sanded from 90' down

drilling 50'/hr 70'-120'

drilling 30'/hr 120'-150'

grey clay 93-95

fractured rx 95-110'

Water test at 110' 10g/m

Tphd 110-130
aph. phonolite dike

Xgd 130-480

130-200
wk propollytic alt.

Reduced
strong Fx @ 145

at 160' 40' water fill in 15 min.
(95'-55') ~20' per hour

MONITOR WELL LOG

HOLE # GU-4A

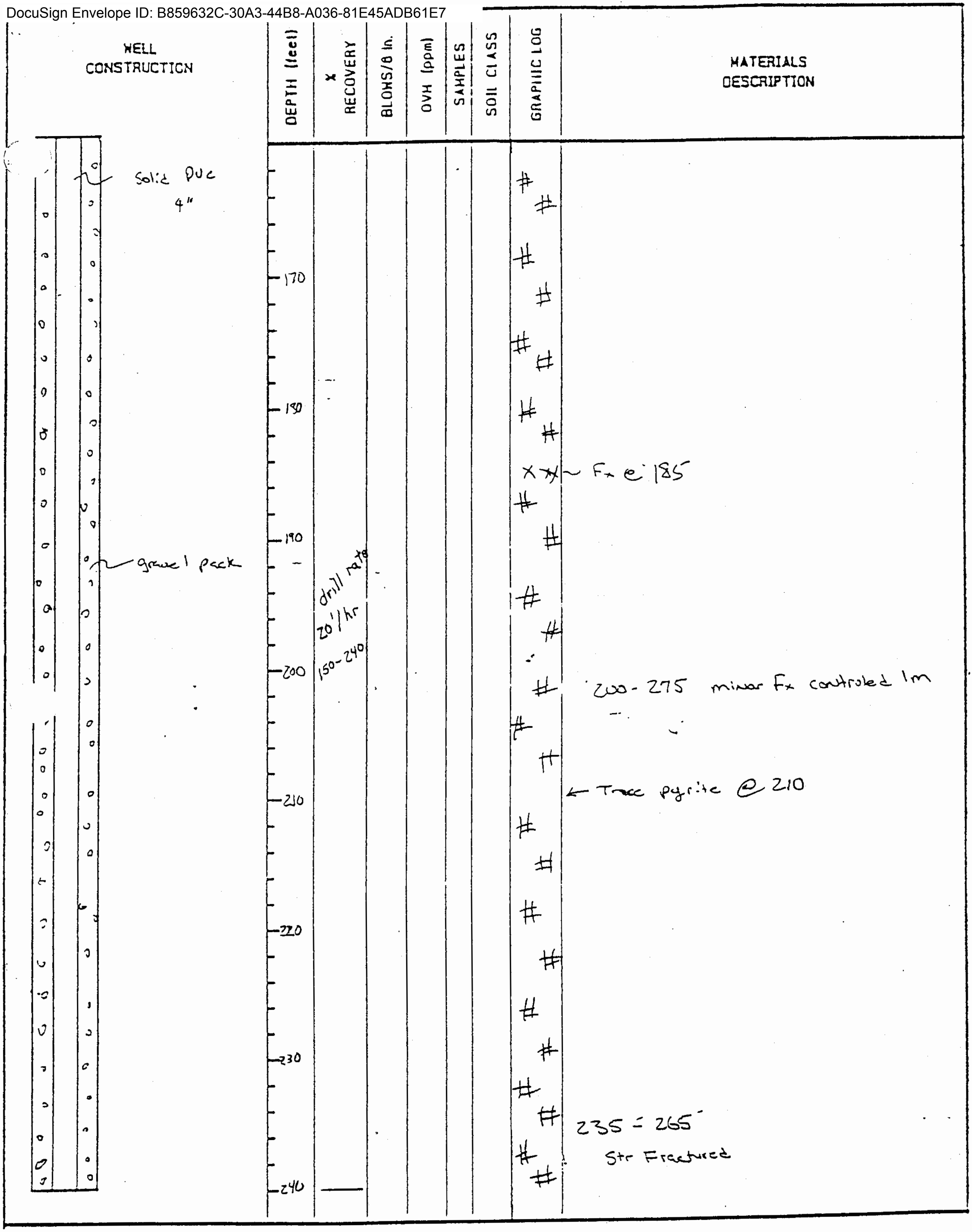
DATE 1-19-97

GEOLOGIST

TOTAL DEPTH OF HOLE 480'

DRILL METHOD RC

LOCATION Grassy Valley



Solid Pvc 4"

gravel pack

drill rate 20'/hr 150-240

Fx @ 185

200-275 minor Fx controled lm

Trace pyrite @ 210

235 = 265'
Str Fractured

MONITOR WELL LOG

HOLE # 6U-4A

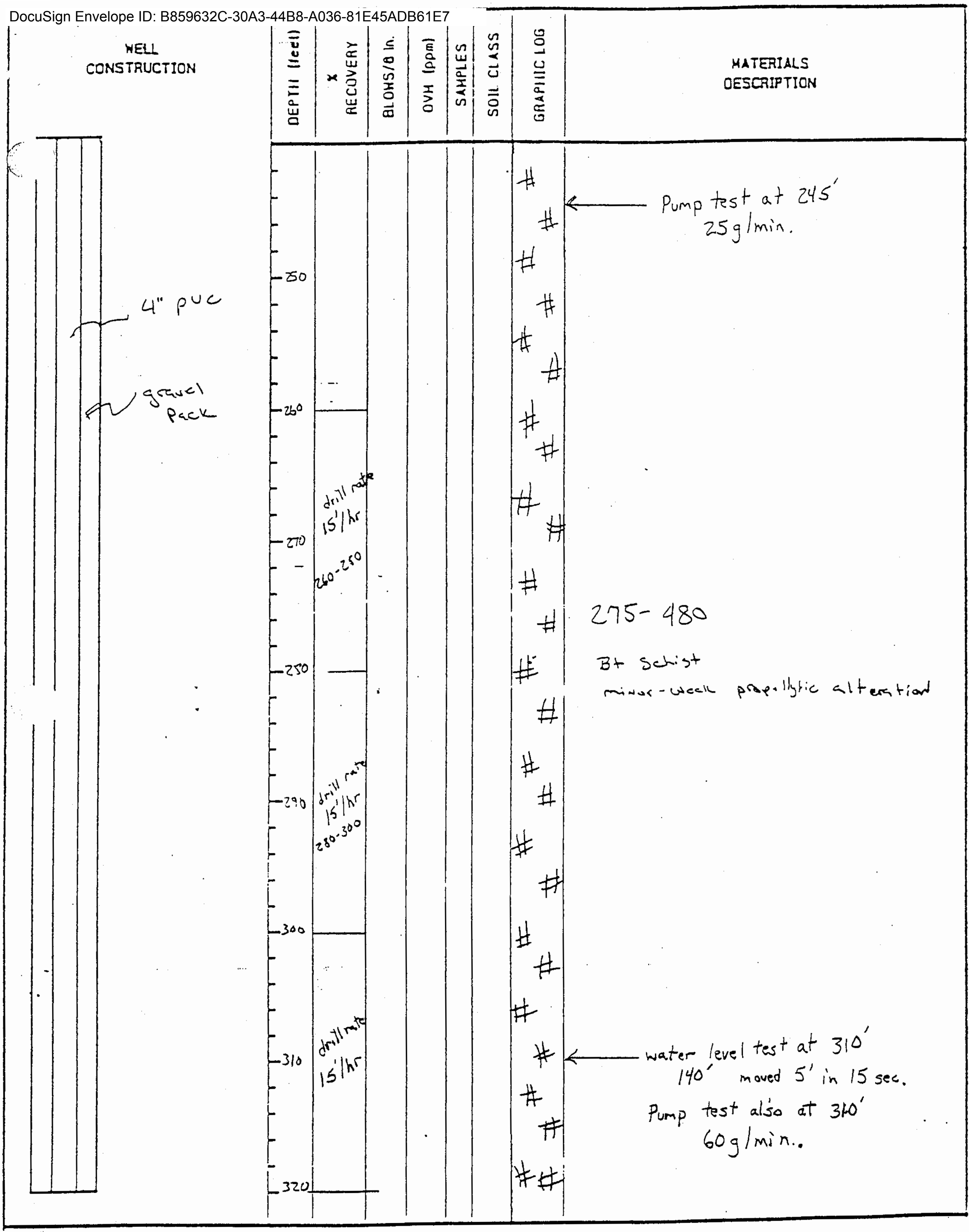
DATE

GEOLOGIST

TOTAL DEPTH OF HOLE

DRILL METHOD

LOCATION



Pump test at 245'
25g/min.

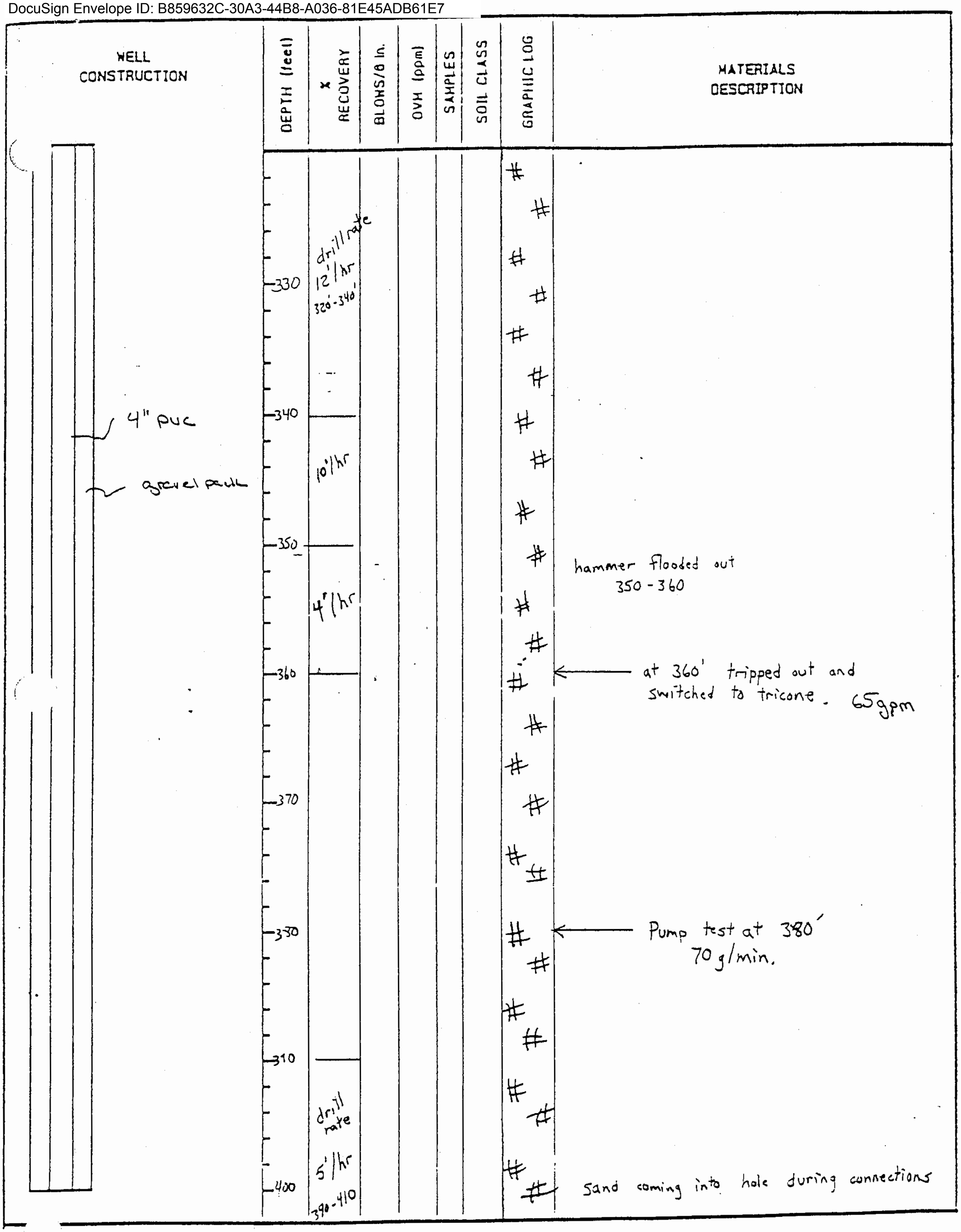
275- 480

Bt Schist
minor-weak propylitic alteration

water level test at 310'
140' moved 5' in 15 sec.
Pump test also at 310'
60g/min..

MONITOR WELL LOG

HOLE # 6U-4A
DATE
GEOLOGIST
TOTAL DEPTH OF HOLE
DRILL METHOD
LOCATION



hammer flooded out 350 - 360

at 360' tripped out and switched to tricone. 65gpm

Pump test at 380' 70 g/min.

Sand coming into hole during connections

MONITOR WELL LOG

HOLE # 6U-4A

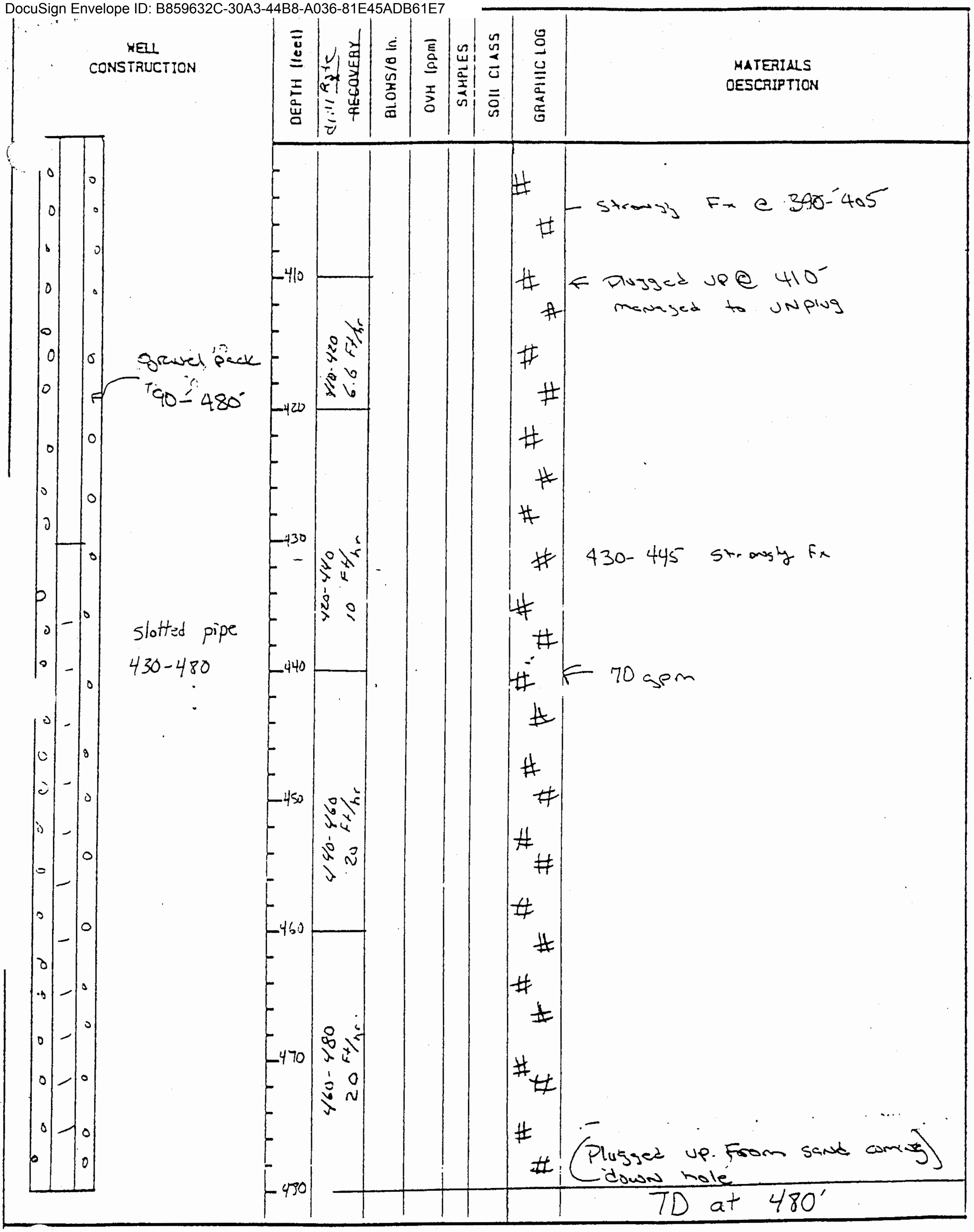
DATE

GEOLOGIST

TOTAL DEPTH OF HOLE

DRILL METHOD

LOCATION



— Strongly Fx @ 390'-405'

← Plugged up @ 410'
managed to unplug

430-445 Strongly Fx

← 70 gpm

(Plugged up. From sand coming down hole)

TD at 480'

MONITOR WELL LOG

HOLE # 60-4A

DATE ______

GEOLOGIST ______

TOTAL DEPTH OF HOLE ______

DRILL METHOD ______

LOCATION ______

Newmont™
NORTH AMERICA

Cripple Creek & Victor
Gold Mining Company
P.O. Box 191
100 North 3rd Street
Victor, Colorado 80860

P 719.689.2977
F 719.689.3254
newmont.com

Attachment 6

GVMW-15A

PAGE 1/6

WELL CONSTRUCTION

3.6 'Ft-STICK-UP 1/18/05
0'

+36-120'
8" STEEL
SURFACE
CASING

39 BAGS (50#)
3/8" CHIP
BENTONITE
HOLE PLUG
IN ANNULUS
0-100'

4"DIAM.
SOLID SCHED
40 PVC RISER
CASING +3.6-
700'

← Bottom STEEL
CASING

100-440':
21 BAGS (50#)
Bentonite powder
SLURRY
(150#/250 gal)

DEPTH (feet)	% RECOVERY	BLOWS/6 In.	OVH (ppm)	SAMPLES	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION
0–15		HIGHLY FRACTURED		DUPLICATE SAMPLES - 5 FT. BREAKS	OXID.		0-15' OVER-BURDEN: SAND+CLAY WITH PRECAMBRIAN SCHIST + GNEISS FRAGMENTS - SITE IS OLD R.R. SIDING
20		Schistose	← Bottom STRONG OXID. + mod - wk clay		ALL PYRITE		15-145: Precambrian Biotite GNEISS > SCHIST much of Biotite replaced WITH SERICITE - mostly 1-2 % specular HEMATITE Locally replaced by <1% PYRITE - LOCAL Aplitic ZONES < 5'
40	STATIC WATER 12/19	mod Fract.					
60					0-1% pyrite, Locally OXID. -Loc. 1-2%		
80	1st WATER < 1 gpm	SCHISTOSE plus mod. FRACTURED					
100							
120							
140							135-145: Precambrian GRANITE (Xgd)
145–160		mod Fract.			0.5-2% PYRITE		145-150: Hornblende Phonolite Flooded with K-feldspar. ½-2% py.
160							

①

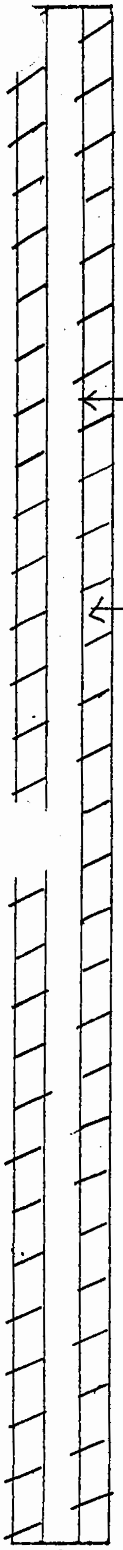
MONITOR WELL LOG

HOLE # GVMW-15A-800
DATE DRILLED DEC 3-5, 2004 - CONSTRUCTED 6-12 DEC.
GEOLOGIST F. R. Kurtz
DRILL METHOD CONVENTIONAL (NON-RC) Air Hammer
TOTAL DEPTH OF HOLE 820
LOCATION GRASSY VALLEY

GVMW-15A

PAGE 2/6

WELL CONSTRUCTION



+3.6-700' 4" DIAM. SCH. 40 SOLID PVC CASING

100-440': 21 BAGS (50#) BENTONITE POWDER SLURRY (150# 250 gal) INSERTED WITH 2" TREMIE LINE.

8" Hole

DEPTH (feet)	% RECOVERY	BLOWS/6 in.	OVM (ppm)	SAMPLES	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION
160-170	WATER FLOW – 2 GPM	SCHISTOSE TO MOD FRACTURED		DUPLICATE SAMPLES -5' BREAKS.			160-170: Precambrian Granite (Xgd)
180, 200					NIL to Loc. TRACE PYRITE		170-200- Biotite GNEISS > SCHIST with local granite mostly NO or Trace PYRITE 1-4% specular HEMATITE.
220		mostly WEAK Loc MOD-FRACT.			0.5-4% PYRITE		200-235: Porphyritic Phonolite K-feldspar FLOODED 20-30% Xgd. 0.5-4% pyrite
240, 260, 280		SCHISTOSE			0 pyrite - Locally few TENTH % PY.		235-285: Biotite Schist, Locally gneissic with 1-4% spec. Hem. 0-Trace PYRITE (<1%) Trace Chlorite
		MOD. FRACT.			0.5-4% PY.		285-295: MILKY QUARTZ VEIN plus pegmatite-Aplite
300, 320	24 gpm above				TRACE - Local 1-2% PY.		295-320: Biotite schist + GNEISS WEAK SERICITE-muscovite AFTER BIOTITE - Local TRACE Chlorite PYRITE usually <1% Local 1-3%

②

MONITOR WELL LOG

HOLE # GVMW-15A

DATE DEC 3-5, 2004

GEOLOGIST F.R. Kuntz

DRILL METHOD

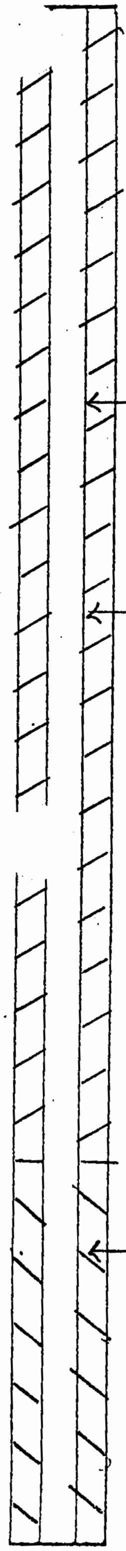
TOTAL DEPTH OF HOLE

LOCATION

GVMW-15A

WELL CONSTRUCTION	DEPTH (feet)	% RECOVERY	BLOWS/6 In.	OVH (ppm)	SAMPLES	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION

PAGE 3/6



+3.6-700'
4" DIAM. SOLID
PVC CASING
SCHED 40

100'-440'
21 BAGS (50#)
BENTONITE
POWDER
SLURRY
(150#/25 gal)
INSERTED
WITH 2"
TREMIE
PIPE

440-650'
51 BAGS
(50#) 3/8
CHIP BENTON.
-WASHED IN
BY TREMIE
PIPE

8" HOLE

Depth (feet): 340, 360, 380, 400, 420, 440, 460, 480

% Recovery: 4 gpm AIR LIFT TEST; TEST 4 gpm AIR LIFT (at 400)

Blows/6 In.: SCHISTOSE; SCHIST-OSE; FX ZONE

Samples: DUPLICATE SAMPLES - 5 FOOT BREAKS

Soil class: mostly 0-1% PYRITE - Locally 1-4% over 5'

295-520: BIOTITE SCHIST + GNEISS

Drillers say 465-470
WELL FRACTURED
470-520: WATER FLOW INCREASES
ERRATICALLY 4-8 gpm.

③

MONITOR WELL LOG

HOLE # GVMW-15A

DATE DEC 3-5, 2004

GEOLOGIST F.R. Koutz

DRILL METHOD

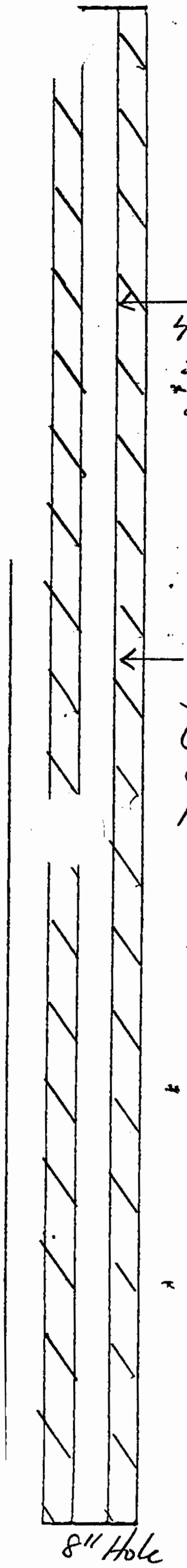
TOTAL DEPTH OF HOLE

LOCATION

GVMW-15A

PAGE 4/6

WELL CONSTRUCTION


+3.6-700'
4" DIAM. PVC SOLID CASING
*SCHED 40

100-650'
51 BAGS (50#) 3/8 CHIP BENTONITE HOLE PLUG WASHED INTO ANNULUS BY 2" TREMIE PIPE.

8" Hole

DEPTH (feet)	% RECOVERY	BLOWS/6 In	OVM (ppm)	SAMPLES	SOIL CLASS.	GRAPHIC LOG	MATERIALS DESCRIPTION
500		SCHISTOSE		DUPLICATE SAMPLES - 5 Ft. BREAK	TRACE (0-1%) PYRITE V. Local 2-4%		285-520 BIOTITE SCHIST + GNEISS 480-520': Drillers say WATER FLOW SOLID 8 gpm. BUT Local surges 12-15 gpm (higher values not very Accurate)
520 540		mod. Fract. + SCHISTOSE			1-2% to Local 2-4% PYRITE		520-550: Precambrian GRANITE plus GNEISS PYRITIC
560 580 600	TEST 8gpm	SCHISTOSE			0-1% PYRITE		550-615: PRECAMBRIAN BIOTITE GNEISS + SCHIST with Local Granite
620 640		HIGHLY FRACTURED + SCHISTOSE			0-1% PYRITE		615-640: Precambrian Aplite + PEGMATOID 2-4% SPECULAR. HEM.

MONITOR WELL LOG

HOLE # GVMW-15A
DATE DEC 3-5, 2004
GEOLOGIST FR Kuntz
TOTAL DEPTH OF HOLE
DRILL METHOD
LOCATION

GVMW-15A

WELL CONSTRUCTION	DEPTH (fee	x RECOVERY	BLOWS/6 i	OVA (ppm	SAMPLES	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION

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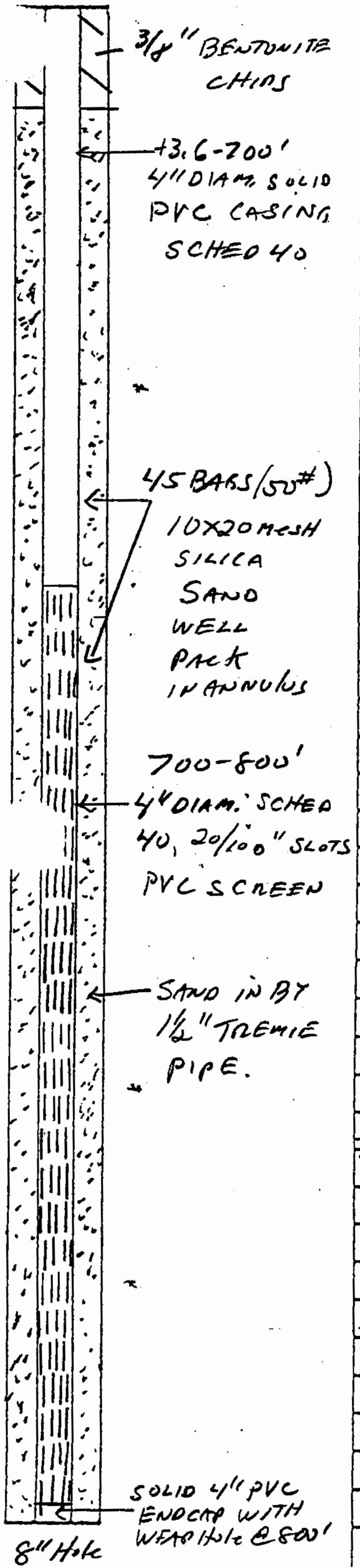

660
680
700
720
740
760
780
800

SCHISTOSE - LOCALLY MOD FRACTURED

DUPLICATE SAMPLES - 5' BREAK

TRACE PYRITE 0-1% VERY Locally 1-2%

640-820': Precambrian Biotite GNEISS + SCHIST
- mostly 2-4% Speculaite

Pump intake SET @ 660'

TRACE CHLORITE
WEAK SERICITE OVER mostly Interval.
- WEAK - TRACE CLAY ON Fractures

MONITOR WELL LOG

HOLE # GVMW-15A
DATE DEC 3-5, 2004
GEOLOGIST F.R.Koutz
TOTAL DEPTH OF HOLE
DRILL METHOD
LOCATION

GVMW-15A

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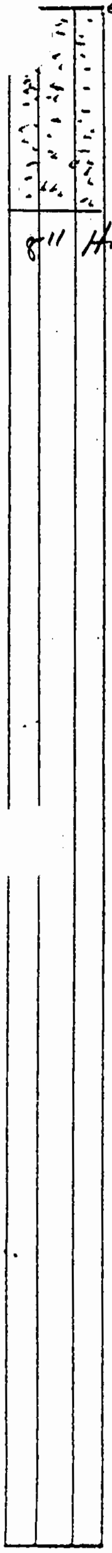

WELL CONSTRUCTION	DEPTH (fee	% RECOVERY	BLOWS/6 i	OVH (ppm	SAMPLES	SOIL CLAS	GRAPHIC LOG	MATERIALS DESCRIPTION
← END OF CASING 800-820' RATHOLE FOR CAVING	820	Air -8 gpm LIFT	SCHISTOSE		EVERY 5 FT.	0-1/2in		640-820 - Biot. SCHIST + GNEISS

8" Hole

TOTAL DEPTH = 820 FEET

DRILLED BY: AK DRILLING
185 S. PARKMONT
Butte, MT 59701
406-782-8506

TONY SLANE + JOSH CROSSMAN
LIC. WATER WELL DRILLERS

FOREMOST DR-24 RIG.

NO DOWNHOLE SURVEY
BY SDI.

Hole LOCATION
MINE GRID:
62429N
42975E
10047 ELEV.

"HYDRO-3A"
DRILL SITE

1½ HP - 5 gpm pump SET AT 660 FEET DEPT. 1" PVC pump column, + 1" BLACK PLASTIC AIRLINE TO PUMP INTAKE.

WEAP Hole - 1/8" in Column 37'4" From TOP. - 1/4" Holes Drilled IN FOLDED OVER SOUNDING PIPE For 1 Ft From END-KINK.

PUMP SETTING BY PEAK GROUNDWATER
BUTTE, MT. DEC 21, 2004

CHECK VALVE IN COLUMN
JUST ABOVE PUMP

FRK 1/19/05

⑥

MONITOR WELL LOG

HOLE # GVMW-15A-800
DATE DEC 3-5, 2004
GEOLOGIST F.R. KOUTZ
DRILL METHOD AIR HAMMER
TOTAL DEPTH OF HOLE 820'
LOCATION GRASSY VALLEY