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# GCC Pueblo TR-08 MW Installation Report

1 message

Amy Veek <aveek@gcc.com>

Tue, Apr 12, 2022 at 10:03 AM

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Good Morning Patrick,

Please see attached for the monitoring well installation report pursuant to TR-08 for GCC Rio Grande's Pueblo Plant (M-2002-004).

Let me know if you have any questions or concerns regarding this report.

Thanks,

Amy



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GCC RIO GRANDE PUEBLO PLANT TR-08 MONITORING WELLS INSTALLATION REPORT

Submitted to: GCC RIO GRANDE, INC.

Date: April 1, 2022

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# INTRODUCTION

This report documents installation of environmental monitoring wells at the GCC Pueblo plant and limestone quarry (GCC or Pueblo Plant) in 2021 under Technical Revision 8 (TR-08) to the Colorado Division of Reclamation, Mining and Safety (CDRMS) mine permit M-2002-004.

GCC commits to monitoring the new wells discussed in this report per the existing standards for compliance groundwater monitoring as established in TR-07, which is the current groundwater sampling and analysis plan (SAP). The SAP includes analysis of major ions, which was initiated for compliance groundwater samples beginning in 2021Q2. Furthermore, GCC commits to refining the proposed point-of-compliance (POC) monitoring wells, MW-13 (Fort Hayes limestone) and MW-14 (Codell sandstone), based on their presumed downgradient location with respect to the Pueblo Plant operations layout. This selection shall be officially proposed by GCC following a minimum of one year (four quarters) of routine monitoring and analysis. Because routine quarterly monitoring of all existing site monitoring wells, including the new wells discussed in this report, was ongoing in 2022Q1, this POC designation is expected to be proposed for CDRMS acceptance in the 2022 Annual Groundwater Report.

# PURPOSE

The purpose of the Pueblo Plant 2021 Monitoring Well Installation Program was to continue to install environmental monitoring wells to characterize groundwater quality and quantity in the mined horizon and underburden to support permitting efforts with CDRMS under mining permit M-2002-004. This work is now in the second phase of installation after delays in 2020 due to COVID-19. The first phase was completed in February 2020 as the single bedrock monitoring well installation of MW-8 to screen the Codell sandstone to fulfill Technical Revision TR-06, which has allowed groundwater data collection in the time since and has supported the evaluation of potential hydraulic communication between the Fort Hayes limestone member of the Niobrara Formation and the underlying Codell sandstone member of the Carlile Formation. This work was documented in a technical memorandum by Resource Hydrogeologic Services, Inc. (RHS) titled "GCC Rio Grande Pueblo Cement Plant Monitoring Well MW-8 Installation" dated March 27, 2020. Groundwater data collected from MW-8 compliments groundwater data from the two adjacent Fort Hayes monitoring wells, MW-6 and MW-7, installed in December 2017.

The second phase of installation is the subject of this report. The purpose was to install six permanent bedrock monitoring wells and potentially one permanent unconsolidated colluvium monitoring well, if warranted, at three additional locations at the Pueblo Plant to increase the spatial distribution of site water quality monitoring and allow for the determination of groundwater gradient and flow direction. This basic hydrogeologic characterization effort is expected to support future recommendations towards meeting operational and environmental monitoring goals.



The primary objective of each permanent monitoring well was to provide a dedicated access point for measuring groundwater levels and to collect groundwater samples that accurately represent groundwater conditions at discrete intervals in the target geologic unit. To successfully achieve this objective, it was necessary to fulfill the following criteria:

- 1. Construct each well with minimum disturbance to the geologic formation.
- 2. Construct each well of materials that are compatible with the anticipated geochemical and chemical environment.
- 3. Properly complete each well in the desired monitoring zone.
- 4. Adequately seal each well annulus with materials that will not interfere with the collection of representative water quality samples.
- 5. Sufficiently develop each well to remove any air or water introduced associated with drilling, allow well filter pack to properly re-sort, and generally ensure unobstructed flow through the well.

In addition to appropriate construction details, each monitoring well was designed in concert with the overall goals of the monitoring program. Key factors that were considered include the following, with specific considerations to the Pueblo Plant groundwater monitoring program italicized:

- 1. Intended purpose of each well documentation of groundwater presence, if present then documentation of water level and water quality through quarterly monitoring over time utilizing the approved and current compliance groundwater laboratory suite and methodologies for comparative purposes against existing Pueblo Plant monitoring wells as adopted in the Sampling and Analysis Plan (SAP), per Technical Revision TR-07. GCC will evaluate how to best monitor each proposed well for the long-term following construction and development and commits to submitting a subsequent TR for approval to revise the SAP appropriately. Additionally, GCC committed to continue (GCC started in 2021, quarter two) to have all compliance groundwater samples, as well as for those monitoring wells proposed here, analyzed for major ions to supplement the current TR-07 Table 1 GCC groundwater analytical parameters until the aforementioned subsequent TR to modify the SAP is approved by CDRMS.
- 2. Placement of each well to achieve accurate water levels and/or representative water quality samples proper design and installation methods to prevent groundwater from inadvertently migrating to strata above or below the target interval.
- 3. Adequate wellbore diameter to accommodate appropriate tools for well development, water quality sampling devices, and aquifer testing equipment *primarily a nominal 2-inch downhole surge block for development and nominal 2-inch environmental sampling bailer or pump as needed*.



4. Surface protection at each well to assure no alteration of the structure or impairment of the data collected from the well – *locking wellhead and bollard posts which are the same as the existing Pueblo Plant monitoring wells MW-5, MW-6, MW-7, and MW-8*.

# MONITORING WELL INSTALLATION DOCUMENTATION

Work was conducted by RHS to support the Pueblo Plant monitoring well installations. This included well design, materials specification, Colorado Division of Water Resources (CDWR) monitoring well permitting, drilling and completion service solicitation and coordination, coordination of underground utility locates/clearance services for drill sites, coordination of professional surveying services, as well as project coordination, as needed, with CDRMS and ongoing Pueblo Plant operations.

#### MONITORING WELL PERMITTING

RHS, as the authorized agent of GCC, submitted the appropriate CDWR monitoring well permit applications (GWS-46 forms) for each planned monitoring well and obtained the corresponding permits to construct in advance of mobilization for drilling and completion activities. Following the monitoring well installation program, the required CDWR Well Construction and Yield Estimate Reports (GWS-31 forms) were submitted by RHS to CDWR, per CDWR regulations. The CDWR permit documentation can be accessed at <a href="https://dwr.state.co.us/Tools/WellPermits">https://dwr.state.co.us/Tools/WellPermits</a> by using either the permit number or receipt number as the search criteria, found in **Table 1**.

### **MONITORING WELL LOCATIONS**

Phase II monitoring well locations were selected and completed for three areas, as shown in **Figure 1**. MW-9 and MW-10 are upgradient (presumed based on formation dip) of the existing and planned mine panels to allow baseline groundwater condition monitoring. MW-11 and MW-12 are immediately downgradient of mine panels 3 and 4, and MW-13 and MW-14 are downgradient of all mine panels and the plant, in the northeast portion of the mine permit area. The latter location is considered the current POC location, based on formation dip direction, until four quarters of static water levels are collected and interpreted for all site groundwater monitoring wells, which will allow for a more informed POC selection. The MW-15 location was not utilized for a monitoring well installation as the target unconsolidated soils were not found to be wet or even damp while drilling the adjacent MW-13 and MW-14 boreholes. This contingency was specified in the Work Plan approved as TR-08.

Each new monitoring location consists of two wells completed in the two target intervals, in a tightly spaced straight line "twinned" configuration with surface spacing distance of approximately 20 feet. The orientation of each twinned-well location is at a bearing of approximately 45° in line with formation dip direction with the shallowest well to the southwest (upgradient) and deepest well to the northwest (downgradient).



Locations were surveyed by the GCC-contracted professional surveyor, Clark Land Surveying, Inc. (Clark), in advance of mobilization of the drilling and completion effort. This process was part of the underground utility clearance, but also confirmed all planned monitoring well locations were inside of the CDRMS mine permit boundary and, in the case of the presumed upgradient monitoring well location (MW-9/MW-10), outside of the southwest extent of the mine panels 3 and 4. GCC committed to a 300-foot mining setback from this location to prevent future disturbance to monitoring in TR-08. A follow-up survey of the as-built monitoring wells was also conducted by Clark, with emphasis on high accuracy elevation in order to allow future reliable plotting of the potentiometric groundwater elevation data across the facility, thus allowing the determination of groundwater gradient and flow direction. Clark also surveyed the existing monitoring wells MW-5, MW-6, MW-7, and MW-8. The as-built survey data for all Pueblo Plant wells is given in **Table 1**.

### MONITORING WELL DESIGN

As-built monitoring well construction information for all existing Pueblo Plant monitoring wells, including the recently constructed wells documented in this report, is given in **Table 1**. These designs, as given in the TR-08 Work Plan, followed industry standard practice with the as-built construction determined by the professional judgement of the RHS field hydrogeologist and based on site-specific conditions. Well design was industry standard 2-inch PVC monitoring wells, installed for the purpose of monitoring groundwater level and water quality of the specified intervals identified during drilling and subsurface documentation at the planned monitoring well locations. **Figure 1** shows the as-built monitoring well locations.

### BOREHOLE DRILLING & MONITORING WELL INSTALLATION

The field hydrogeologist from RHS directed the GCC-contracted drill crew, HRL Compliance Solutions, Inc. (HRL), with respect to specific target formation depths and collected and documented geologic samples generated by rotary cuttings. Monitoring well installations were completed to the following specifications:

1. 12-inch hollow-stem augers drilled through the unconsolidated colluvium until bedrock refusal to effectively set temporary casing through this interval with the auger inner diameter allowing the bedrock borehole diameter to create a minimum 2-inch annulus between the borehole wall and the screen/casing per 2 CCR 402-2 State of Colorado Water Well Construction Rules, which for this project utilizing nominal 2-inch schedule 40 screen and casing was 6-3/8-inches. Air rotary hammer (with no water injection) drilled 6-3/8-inch hole (6-1/4-inch bit) from surface through the Fort Hayes limestone at the subject locations. From surface to total drilled depth, RHS collected and documented cuttings grab samples at 5-foot intervals or otherwise at significant lithology changes. The lithology encountered at each borehole is given in Figures 2 through 7. Planned air lift production testing through the blooey line to determine Fort Hayes groundwater production



rate via portable flume or bucket-and-stopwatch method was not viable as only one borehole, MW-14, was wet during drilling. And that groundwater was only produced as a mist. Therefore, RHS could not collect standard field water quality parameters (temperature, pH, specific conductance) for any of the boreholes during drilling or ahead of well installation. For the Fort Hayes monitoring wells, borehole drilling was then complete so well installation continued from step 3 below.

- 2. Air rotary hammer (with no water injection) advanced 6-3/8-inch borehole from the base of the Fort Hayes limestone into the Codell sandstone until either penetrating significant additional groundwater in the Codell or otherwise through the entire Codell sandstone member (thickness found to be 10 to 27 feet). As no boreholes produced water during drilling of the Codell, no flow rate or water quality information could be obtained at that time.
- 3. Installed 2-inch schedule 40 PVC environmental flush joint screen (FJT) (0.020-inch factory-machined slot) from total depth to near the top of either the Fort Hayes or the Codell, as appropriate for the location, hanging in tension from a casing clamp resting on the top of the hollow-stem auger extending above ground surface. Blank FJT 2-inch schedule 40 PVC was extended from the top of the screen section to 2-1/2 feet above ground surface. Stainless steel bow spring environmental centralizers were placed at the bottom and top of each screen section and then every 20 feet to surface. All tubulars and centralizers arrived to site new, bagged and boxed.
- 4. Installed 10-20 silica sand pack from total depth to 3 feet above the top of the screen section via surface pour, with continuous depth tagging to the level specified by the RHS hydrogeologist. Bentonite seal placement was accomplished by pouring two 5-gallon pails of 3/8-inch coated bentonite pellets via surface pour, hydrating with potable water as necessary since the boreholes were not holding water. The remaining annular seal up to ground surface was placed by pouring 3/8-inch chip bentonite from surface, hydrating with potable water as necessary. Continuous depth tagging was employed to ensure materials bridging did not occur or if they did it was caught soon enough to remedy.
- 5. Installed the appropriate 5-foot length by 4-inch square locking environmental monitoring well head protector set in 3-foot by 3-foot by 4-inch-thick cement pad with 4-inch diameter by 6-foot length steel pipe protective bollards cemented in-place offset at each pad corner. Each wellhead and bollard was painted high-visibility yellow and the wellhead were clearly labeled by the well name welded on the top cap prior to arriving onsite. The well names are MW-9, MW-10, MW-11, MW-12, MW-13, MW-14.

The as-built construction summary data, including location survey at ground surface and top of PVC casing for all wells is given in **Table 1**. The as-built monitoring well construction diagrams for each well are



presented in Figures 2 through 7. Photos of all twinned monitoring well locations are provided as Figures 8 through 10.

There were two notable exceptions to the installation specifications above; the drilling methodology at MW-10 and the screen installation at MW-13. Both exceptions were made in the field by RHS with consultation with GCC, to address site-specific field conditions, which are discussed below.

Monitoring location MW-10 is upgradient of current and future mining, per the TR-08 Work Plan. There was interest in collecting adequate rock sample at this location to potentially conduct whole rock chemical analysis and leachate testing, which would support the hydrogeochemical characterization of the mined Fort Haves limestone, interburden strata and the underburden Codell sandstone. Although this coring task was not a requirement, GCC had an expressed goal to collect core samples during the monitoring well installation program. To accomplish this, HQ (3.78") wireline core drilling was planned in lieu of air rotary drilling from top of bedrock to total depth (base of Codell sandstone). However, the GCC-contracted drilling company had tooling issues onsite with their wireline core drilling system and therefore the core hole was not drilled. MW-10 was thus drilled and completed per the methodology described above for all of the other monitoring wells, which was hollow stem auger drilling to bedrock, then switching to rotary air hammer to total borehole depth. It is interesting to note that the Fort Hayes limestone was neither encountered during rotary air hammer drilling at the MW-10 location, nor the adjacent MW-9 location, which is interpreted as the result of paleo-erosion in the arroyo. The uppermost bedrock encountered at this location was the Codell sandstone, which was completed as MW-9. MW-10 was completed in the member immediately below the Codell sandstone, which is the Blue Hills shale. The installation of MW-10 in the Blue Hills shale will allow for characterization of upgradient baseline conditions of the quarry floor rock to a greater extent with respect to potential vertical groundwater potentiometric and chemical gradients.

The second monitoring well that deviated from the original specifications due to site-specific conditions was MW-13. While completing the filter pack at the adjacent MW-14, significant time was consumed placing the material to the prescribed depth due to repeated annular sand bridges which required repeated potable water wash-downs or otherwise displacing the bridges with tremie pipe. Rather than attempt the same process with a much longer screen section (40 feet at MW-13 versus 15 feet at MW-14), schedule 40 PVC pre-pack screens were utilized with same 0.02-inch slot size and 10-20 grade silica sand. To hold the bentonite seal and annular seal in place above the screen section, a centralized 6-inch diameter foam bridge plug topped with 7-inch diameter rubber shale basket was installed immediately above the uppermost pre-packed screen section, as shown in **Figure 6**.

#### MONITORING WELL DEVELOPMENT

All new and existing wet Pueblo Plant monitoring wells were developed. The developments were batched into three groups to minimize mobilization/standby time. MW-9, MW-10, MW-11, MW-12, and MW-13



were developed in November 2021. MW-14 was developed in December 2021. The existing MW-6, MW-7, and MW-8 were developed in January 2022. MW-5 continued to be dry so was not developed. Well development was conducted by RHS no sooner than 24 hours following curing of annular bentonite seals and surface cement pad. Standard monitoring well development procedures were followed utilizing nominal 2-inch surge block with foot valve driven by a wellhead inertial pump (Waterra Hydrolift II) on new HDPE tubing to remove fines and properly distribute the annular filter pack. Water quality field parameters were monitored by the RHS field hydrogeologist during this process with emphasis in monitoring and reduction of turbidity over time as fine-grained materials generated during the drilling process are removed through the wellbore. The field parameters recorded during the developments are given in Table 2. As all Pueblo Plant monitoring wells can be considered low-yield, groundwater production by development exceeded the sustainable yield for each well. As a result, the wells required addition of potable water to help flush the fine-grained materials from the well bores at surface. Care was taken to not introduce too much potable water that would escape into the screened formations and potentially dilute near-term water quality. As such, the monitoring well development process was performed with sufficient time in advance (minimum 7 weeks) of initial compliance groundwater monitoring conducted in late March 2022.

One exception to the Waterra Hydrolift II development methodology, as described above, was at MW-14. Because this well is kinked in the blank casing section of the wellbore, reducing the wellbore inner diameter to approximately 1.1 inches at approximately 76.6 feet depth measured from the top of PVC casing, the nominal 2-inch surge block could not pass the kink to reach the total well depth of 207.85 feet measured from the top of PVC casing. The alternative development methodology utilized 1-inch outer diameter FJT pipe with a 5-foot length jetting assembly at bottom. The development pipe string was run into the wellbore and potable water was pumped through the string from surface allowing the highpressure jets to work the screen section up and down. The potable water returns to surface carried and flushed-out the fine-grained material from the wellbore, however this rendered measured field water quality parameters invalid with respect to their representation of the screened formation guality. As this 15-foot length screened interval was very low-yield, observations by RHS were that the volume introduced to the well was consistent with the volume that was flushed from the well so significant potable water dilution into the screened formation was not expected. Note that the kink in the MW-14 wellbore will not compromise the ability to obtain future compliance groundwater samples as a dedicated 1-inch diameter QED T1300 bladder pump has already been successfully installed to near the bottom of the well and it function tested properly.

Following development, all wells were documented to have significantly improved turbidity, with "hardtag" total depth measurements. This indicated no sediment remained in the wellbores, as the water level indicator allowed RHS to distinctly feel its steel probe knock against the PVC wellbore bottom cap.



TABLES



### Table 1. GCC Pueblo Plant existing monitoring well construction, all wells

Monitoring Well ID	Year Installed	CDWR Receipt Number	CDWR Permit Number	UTM NAD 83 Zone 13N Easting (meters)	UTM NAD 83 Zone 13N Northing (meters)	Elevation - Top of PVC Casing - Water Level Measuring Point (ft)	Surface at Wellhead	Well Diameter (in)	Well Casing Material	Total Well Completion Depth (ftbgs)	Screened Interval (ftbgs)	Screened Filter Pack Interval (ftbgs)	Screened Interval Formation
MW-5	2008	3632233	278490	533304.305	4217575.554	4966.65	4964.39	2	SCH 40 PVC	25.00	9.0-24.0	8.0-25.0	Colluvium/Unconsolidated
MW-6	2018	3690376A	312701	533308.582	4217579.756	5064.14	5061.62	2	SCH 40 PVC	56.40	30.9-56.4	28.0-56.7	Fort Hayes Limestone
MW-7	2018	3690376B	312702	534710.190	4219189.212	5063.75	5061.09	2	SCH 40 PVC	56.10	30.6-56.1	27.5-57.0	Fort Hayes Limestone
MW-8	2020	3696266	316170	534714.843	4219193.313	5062.90	5060.74	2	SCH 40 PVC	63.10	58.1-62.9	57.0-64.3	Codell Sandstone
MW-9	2021	10013525	323005	535148.659	4221153.094	5256.09	5253.97	2	SCH 40 PVC	40.30	30.0-40.0	20.9-42.0	Codell Sandstone
MW-10	2021	10013526	323006	535153.271	4221157.369	5255.82	5253.60	2	SCH 40 PVC	80.30	50.0-80.0	47.0-81.5	Blue Hills Shale
MW-11	2021	10013527	323007	534405.485	4219710.530	5084.30	5082.09	2	SCH 40 PVC	70.00	39.6-69.6	36.6-70.6	Fort Hayes Limestone
MW-12	2021	10013528	323008	534407.927	4219719.209	5083.94	5081.64	2	SCH 40 PVC	86.50	76.2-86.2	73.1-86.6	Codell Sandstone
MW-13	2021	10013529	323009	534401.520	4219714.939	4990.11	4987.93	2	SCH 40 PVC	175.33	135.0-175.0	135.0-175.0	Fort Hayes Limestone
MW-14	2021	10013530	323010	535242.397	4221415.851	4989.92	4987.81	2	SCH 40 PVC	205.33	190.0-205.0	187.0-206.0	Codell Sandstone



#### Table 2. GCC Pueblo Plant monitoring well development data, all wells

Monitoring Well ID	Year Installed	Date Developed	Development Methodology	Development Field Sample Temperature (C)	Development Field Sample pH (S.U.)	Development Field Sample Specific Conductance (µS/cm)	Development Field Sample Oxygen Reduction Potential (mV)	Development Field Sample Dissolved Oxygen (mg/L)	Development Field Sample Turbidity (NTU)	Total Well Completion Depth (ftbgs)	Screened Interval (ftbgs)	Screened Interval Formation
MW-5	2008	NA - dry	NA - dry	NA - dry	NA - dry	NA - dry	NA - dry	NA - dry	NA - dry	25.00	9.0-24.0	Colluvium/Unconsolidated
MW-6	2018	1/31/2022	Waterra Hydrolift II	12.9	7.13	8770	60.4	3.00	220	56.40	30.9-56.4	Fort Hayes Limestone
MW-7	2018	2/1/2022	Waterra Hydrolift II	12.1	7.30	8833	65.5	3.84	9	56.10	30.6-56.1	Fort Hayes Limestone
MW-8	2020	1/31/2022	Waterra Hydrolift II	14.6	7.32	9478	-98.0	2.60	290	63.10	58.1-62.9	Codell Sandstone
MW-9	2021	11/6/2021	Waterra Hydrolift II	22.5	7.33	6022	107.6	4.27	95	40.30	30.0-40.0	Codell Sandstone
MW-10	2021	11/6/21-11/7/21	Waterra Hydrolift II	16.4	7.96	2896	-5.3	4.87	90	80.30	50.0-80.0	Blue Hills Shale
MW-11	2021	11/7/2021	Waterra Hydrolift II	19.8	7.39	2822	-175.7	0.94	140	70.00	39.6-69.6	Fort Hayes Limestone
MW-12	2021	11/7/2021	Waterra Hydrolift II	22.4	7.67	2588	73.4	7.03	5	86.50	76.2-86.2	Codell Sandstone
MW-13	2021	11/8/21-11/9/21	Waterra Hydrolift II	14.2	8.70	3390	-231.0	3.00	170	175.33	135.0-175.0	Fort Hayes Limestone
MW-14	2021	12/16/2021	Hydro-jetting*	NA-diluted	NA-diluted	NA-diluted	NA-diluted	NA-diluted	NA-diluted	205.33	190.0-205.0	Codell Sandstone

\*Hydro-jetting development methodology immediately dilutes wellbore with potable water so field parameters not representative of the screened formation. All wells constructed of 2-inch schedule 40 PVC



FIGURES



#### Figure 1. GCC Pueblo monitoring well location map.





## Figure 2. GCC Pueblo MW-9 lithology and well completion diagram.

		PROJECT:	BORING						
		GCC RIO GRANDE PUEBLO PLANT	MW-9						
		LOCATION:	WELL ID	).					
		PUEBLO COUNTY, COLORADO	MW-9						
		DRILLING CONTRACTOR:		NG (UTM NAD 83):	EASTING (UTM NAD 83):				
		HRL COMPLIANCE SOLUTIONS	53514	. ,	4221153.0941				
		DRILLING EQUIPMENT:		D SURFACE ELEV.:	TOC PVC ELEVATION:				
	ESOURCE ROGEOLOGIC	DIEDRICH D-90		7 FT AMSL	5256.09 FT AMSL				
	SERVICES	DRILLING METHOD:		WELL DEPTH:	DEPTH TO WATER:				
		HOLLOW-STEM AUGER TO ROTARY AIR HAMMER		TBGS	23.84 FT BGS				
LOGGE	D BY:	SAMPLING METHOD:	DATE S	TARTED:	DATE COMPLETED:				
LJB		5' INTERVAL ROTARY CUTTINGS GRAB SAMPLES		GUST 2021	28 AUGUST 2021				
Depth (ft bgs)	Graphic	Description		Well Co	onstruction				
De De	Log	Decemption	Depth (ft bgs)						
_ <b>`</b>					Wellhead Protector 4" square				
					steel: locking				
- <u> </u>									
0			0		3' x 3' X 0.3' concrete well pad				
		SILT - grayish orange (10YR7/4), sandy, very fine,							
5		well-sorted, dry/loose, eolian.	5		Casing: 2" SCH 40 PVC; TFJ; -2.5'-30.0'				
- 10			<u> </u>		Centralizer: SS bow-spring type				
					Annular Seal: WYO-BEN Enviroplug 3/8" bentonite chips;				
		SILT w/GRAVEL - same as 0'-10' with coarse limestone			0'-15.0'				
- 15	$ \left[ \left[ \phi \right] \phi \left[ \phi \right] \phi \left[ \phi \right] \phi \right] $	gravel up to 3/4", angular to sub-rounded, weathered to hard, poorly sorted, coarsening upwards.	- 15						
	$\phi \phi \phi \phi \phi \phi$								
_			_		Bentonite Seal: PDS Pel-Plug 3/8" coated bentonite pellets;				
20	)	SILTSTONE - dark yellowish brown (10YR4/2), dry, soft,	20		15.0'-20.9'				
_		calcareous. SANDSTONE - medium dark gray (N3), dry, very hard to		3333 <u>3333</u>					
		medium hard, w/stringers of medium hard, medium dark gray							
25	5	(N4) shale.	25						
<u>ــــــــــــــــــــــــــــــــــــ</u>			_ <b>∠</b> 、		Filter Pack: Colorado silica sand 10-20; 20.9'-42.0'				
			_						
<u> </u>			<u> </u>						
L _			_		Screen: 2" SCH 40 PVC; TFJ;				
35	5	SHALE - medium dark gray (N3), dry, medium hard.	35		0.020" slot; 30.0'-40.0'				
<u> </u>									
E					End Cont 2" COLL 40 DV (C) TE I				
40			<u> </u>		End Cap: 2" SCH 40 PVC; TFJ; 40.0'-40.3'				
F									
					Plugback: WYO-BEN Enviroplug				
<b>4</b> 5			L 45		3/8" bentonite chips; 42.0'-45.5'				

45 			45	3/8" bentonite chips; 42.0'-45.5'
		method, well dry upon completio ra Hydrolift 2 inertial pump & surg		



### Figure 3. GCC Pueblo MW-10 lithology and well completion diagram.

			PROJECT:	BORIN			
			GCC RIO GRANDE PUEBLO PLANT	MW			
			LOCATION:	WELL	ID:		
			PUEBLO COUNTY, COLORADO	MW	-10		
			DRILLING CONTRACTOR:	NORT	HING	(UTM NAD 83):	EASTING (UTM NAD 83):
			HRL COMPLIANCE SOLUTIONS	5351	153.27	708	4221157.3692
			DRILLING EQUIPMENT:	GROL	JND S	URFACE ELEV.:	TOC PVC ELEVATION:
			DIEDRICH D-90	5253	3.60 F	TAMSL	5255.82 FT AMSL
			DRILLING METHOD:			L DEPTH:	DEPTH TO WATER:
			HOLLOW-STEM AUGER TO ROTARY AIR HAMMER				61.89 FT BGS
	GED	BY:	SAMPLING METHOD:	DATE			DATE COMPLETED:
LJ	LJB		5' INTERVAL ROTARY CUTTINGS GRAB SAMPLES	25 A	(UGU:	ST 2021	28 AUGUST 2021
	(s)	Craphia		- @			
Depth	gg	Graphic	Description	Depth (ft bgs)		Well Co	onstruction
۵ e	Ë	Log		ďť			
	-5			<u> </u>	.5		
—	-			F	-		Wellhead Protector 4" square steel: locking
	0			Ē	) 📖		-
	5	R <u>uuun</u> tin hittii hitti		⊨ `	- ****		3' x 3' X 0.3' concrete well pad
_	5		SILT - moderate yellowish brown (10YR5/4), dry/loose eolian deposit, very fine, well-sorted.	E,	5		
_	5	((((((((((((((((((((((((((((((((((((		<b>⊨</b> `	5		
	10	$\phi \phi \phi \phi \phi$		F.	10		Centralizer: SS bow-spring type
_	10		SILT w/GRAVEL - same as 0'-8' with coarse limestone gravel		10	$\searrow$	Centralizer. 33 bow-spring type
_			up to 2", sub-angular, weathered to hard, poorly sorted,	E	. –		
_	15	$\phi \left[ \phi \left[ \phi \right] \phi \right] \phi \left[ \phi \right]$	coarsening downwards.	'	15		
				E			Casing: 2" SCH 40 PVC; TFJ;
	20		SILTSTONE - medium gray (N5), dry, soft to medium hard		20		-2.5'-50.0'
			with highly weathered, fractured, competent to friable	E			
	25		limestone (possible boulder) from 19'-19.5'.	<u> </u> _ 2	25		
_			SHALE - medium dark gray (N4), dry, soft to medium hard.	F			
	30		SILTSTONE - medium light gray (N4), dry, very hard,	- €	30		
_			calcareous, with dry, hard, medium light gray (N4), dry, very hard,				
	35		limestone interbeds	┣ :	35		Annular Seal: WYO-BEN
				F			Enviroplug 3/8" bentonite chips; 0'-41.0'
_	40			<u> </u>	40		
				E			Bentonite Seal: Wyo-Ben
<u> </u>	45			<u> </u>	45		ENVIROPLUG 3/8" coated
			SHALE - medium dark gray (N4), dry, soft to medium hard.			22222	bentonite pellets; 41.0'-47.0'
	50			<u> </u>	50		
				È	-		
	55			<u> </u>	55		
F	00			⊨ `			Filter Pack: Colorado silica sand 10-20; 47.0'-81.5'
	60			E d	60		
	00			⊨ °			
	65			E,	65		
_	00			<b>F</b>	55		
	70		SHALE - black (N1), carbonaceous, dry, hard with thin medium dark gray (N4), dry, medium hard shale interbeds.	⊨ .	70		
	70		medium dark gray (194), dry, medium nard shale interbeds.		70		
				⊨ .			Screen: 2" SCH 40 PVC; TFJ;
_	75				75		0.020" slot; 50.0'-80.0'
				E			
	80			<b>⊢</b> •	30		End Cap: 2" SCH 40 PVC: TEJ:





### Figure 4. GCC Pueblo MW-11 lithology and well completion diagram.

			PROJECT:	BOR	ING	ID:					
			GCC RIO GRANDE PUEBLO PLANT	MV	V-11						
			LOCATION:	WEL	L ID:						
			PUEBLO COUNTY, COLORADO			MW-11					
			DRILLING CONTRACTOR:	NOR	THIN	IG (UTM NAD 83):	EASTING (UTM NAD 83):				
			HRL COMPLIANCE SOLUTIONS	534	4405.	.4851	4219710.5297				
	DE	SOURCE	DRILLING EQUIPMENT:	GRO	UND	SURFACE ELEV.:	TOC PVC ELEVATION:				
н		OGEOLOGIC	DIEDRICH D-90	508	32.09	FTAMSL	5084.30 FT AMSL				
		RVICES	DRILLING METHOD:	тот		/ELL DEPTH:	DEPTH TO WATER:				
			HOLLOW-STEM AUGER TO ROTARY AIR HAMMER			BGS	52.76 FT BGS				
	GED	BY.	SAMPLING METHOD:			ARTED:	DATE COMPLETED:				
LJ		51.	5' INTERVAL ROTARY CUTTINGS GRAB SAMPLES			UST 2021	26 AUGUST 2021				
	_										
ţ	(sg	Graphic	Description	Depth	(sb						
Depth	d ff	Log	Description			vveii Co	onstruction				
		<u> </u>									
	-5			_	-5		Wellhead Protector 4" square				
				_			steel: locking				
	0	<u>[]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]</u>			0		3' x 3' X 0.3' concrete well pad				
				_	6						
	5	RECORDECCE	SILT - moderate yellowish brown (10YR5/4), dry/loose eolian		5		Casing: 2" SCH 40 PVC; TFJ;				
_	5	Runnhann	deposit, sandy, very fine, well-sorted.		5		-2.5'-39.6'				
	10	$\phi \phi \phi \phi \phi$	SILT w/GRAVEL - same as 0'-9' with coarse limestone gravel		10		Centralizer: SS bow-spring type				
		$\phi \phi \phi \phi \phi$	up to 1", dry, sub-angular, weathered to hard, poorly sorted, coarsening upwards.								
	15			<u> </u>	15						
			GRAVEL - light gray (N7), dry, limestone up to 1-1/2"								
_	• •		diameter, subangular, well-sorted.	F	~~	$\langle \nabla \rangle$					
	20				20						
_				_							
	25				25		Annular Seal: 3/8" bentonite chips;				
							0'-30.0'				
	30				30						
	00				00		Bentonite Seal: Wyo-Ben				
_				_			ENVIROPLUG 3/8" coated bentonite pellets; 30.0'-36.6'				
	35		LIMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbeds.	_	35		bentonite penets, 50.0-50.0				
_											
	40			<u> </u>	40						
	45				45		Filter Pack: Colorado silica sand				
	45				4J		10-20; 36.6'-70.6'				
	50				50						
			SHALE - dark gray (N3), medium hard, dry.	F							
	55				55		Saraan: 2" SCH 40 BV/C: TE !				
_					-		Screen: 2" SCH 40 PVC; TFJ; 0.020" slot; 39.6'-69.6'				
_	~~			F	60						
	60		LIMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbeds.	$\vdash$	60						
			(1907, dry, calcareous shale interseus.								
	65				65						
						2222 2222					





## Figure 5. GCC Pueblo MW-12 lithology and well completion diagram.

GC RIO GRANDE PUEBLO PLANT LOCATION     WN 12 WELL D: WELL D: DECRET D: DECR				PROJECT:	POP		D:	
LOCATION     WELLID: MW-12       PUEBLO COUNTY, COLORADO DRILLING CONTRACTOR: HRL COMPLIANCE SOLUTIONS     54467.8271     EASTING (UTM NAD 83): 53467.8271       PRESOURCE BESOURCE     FOR CHEVATION: SERVICES     FOR CHEVATION: SOLUTIONS     FOR CHEVATION: 5014.4 FT AMSL     FOR CHEVATION: 503.8 FT AMSL       DRILLING CONTRACTOR: HYDROGEOLOGIC SERVICES     FOR CHEVATION: 503.8 FT AMSL     DESCRIPTION: 503.8 FT AMSL     DESCRIPTION: 503.8 FT AMSL       DIGGED BY: LB     SAMPLING METHOD: HOLDOW STEM AUGER TO ROTARY AIR HAMMER BS. ET BOS     DATE SOMPLETED: 2 AUGUST 2021     DATE COMPLETED: 2 AUGUST 2021     DATE COMPLETED: 2 AUGUST 2021       SMALE     BS. T. moderate yellowish brown (10/Y554), dryloose cellsen dopped: andy, vary fine, well-softd     5     O     St X X B 3 concrete well pa St X X X B 3 concrete Well pa St X X X B 3 concrete Well pa St X X B 3 concrete Well							D:	
PUEBLO COUNTY. COLORADO     MW-12       PUEBLO COUNTY. COLORADO     MW-12       PRECURCE     BRELLONG CONTRACTOR:       DRELLING COUNTY. COLORADO     SAMURE ACCESCULTONS       DERLING SOUPHANCE SOUPONE     GROUND SUPFACE ELEV:       DERLING SOUPHANCE SOUPONE     SOBALTANCE SOUPONE       DERLING SOUPHANCE     SOBALTANCE SOUPHANCE       SOBALTANCE SO								
PRESOURCE INDECEMPTICE     DRILLING CONTRACTOR: INDECEMPTIANCE SOLUTIONS     NORTHING (UTM NAD 83): 534407.8271     EASTING (UTM NAD 83): 534407.8271     EASTING (UTM NAD 83): 534407.8271       PRILLING CONTRACTOR: HILD COMPLIANCE SOLUTIONS     DRILLING CONTRACTOR: SERVICES     TOC PVC ELEVATION: 508.14 FT ANSL.     TOC PVC ELEVATION: 508.34 FT ANSL.     TOC PVC ELEVATION: 508.34 FT ANSL.       DORLLING CONTRACTOR: SERVICES     DRILLING CONTRACTOR: HILD COMPLETED: SERVICES     TOC PVC ELEVATION: 508.34 FT ANSL.     DORL TO VATER: 508.34 FT ANSL.       DORLLING CONTRACTOR: HILD CONTRACTOR: SERVICES     SAMPLING METHOD: LIB     DATE STARTED: 20 AUGUST 2021     DATE COMPLETED: 20 AUGUST 2021     DATE COMPLETED: 20 AUGUST 2021       SILT - moderatio yellowish brown (10/YE34), drylloose collan deposit, same, very fire, well-sorted.     10 10 10 10 10 10 10 10 10 10 10 10 10 1								
HRL COMPLIANCE SOLUTIONS 534407.3271 4319718.2022   OPILLING EQUIPMENT: DORCEOLOGIS SERVICES ORIGINA DETHOD: DORLING METHOD: DORLING METHOD: SERVICES ORIGINA DETHOD: TOTAL WELL DEPTH- LB TOTAL WELL DEPTH- S08.34 FT AMSL. DATE COMPLETED: 22.4 JOURT 2021 DATE COMPLETED: 24.4 JOURT 2021   LOGGED BY: LB SAMPLING METHOD: FINTERVAL ROTARY CUITINGS GRAB SAMPLES DATE STARTED: 22.4 JOURT 2021 DATE COMPLETED: 24.4 JOURT 2021 DATE COMPLETED: 24.4 JOURT 2021   Sit T - moderate velowish brown (10YRS4), dry/score cellan displication, with fine, well-wide, dry, with moder of the dry boots sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score cellan displication, with fine, well-wide, dry sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score cellan displication, with fine, well-wide, dry sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score cellan displication, with fine, well-wide, dry sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score cellan displication, with fine, well-wide, dry sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score cellan displication, with fine, well-wide, dry sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score cellan displication, with fine, well-wide, dry sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score displication, wellan displication, dry sated, coarsening upwards. Sit T - moderate velowish brown (10YRS4), dry/score displication, wellan displication, dry sated, coarsening upwards. Sit T - moderate velowish fine, dry sated, coarsening upwards.				PUEBLO COUNTY, COLORADO				
RESOURCE HYDROGEOLOGIC SERVICES   DRILLING EQUIPMENT: DIEDRICH 0:a0   GROUND SURFACE ELEV: SerVICES   TOC PVC ELEVATION: SerVICES     DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   SerVICES   SerVICES     DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0     DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0     DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0     DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0   DIEDRICH 0:a0				DRILLING CONTRACTOR:			G (UTM NAD 83):	EASTING (UTM NAD 83):
Resource Instruction     Solate FT AMSL     Solate FT AMSL       Delclink METHOD: HOLLOW STEM AUGER TO ROTARY AIR HAMMER     TOTAL WELL DEPTH: SAMPLING METHOD: HOLLOW STEM AUGER TO ROTARY AIR HAMMER     DATE STARTED: 22 AUGUST 2221     DATE COMPLETED: 24 AUGUST 2021       Lib     S'INTERVAL ROTARY CUTTINGS GRAB SAMPLES     DATE STARTED: 22 AUGUST 2021     DATE COMPLETED: 24 AUGUST 2021       SEE     Graphic Log     Description     SEE     Well Construction       SELT - moderate yellowish brown (10YR54), drybose eolan deposit, sandy, very fine, well-sorted     5     Well construction       SELT - moderate yellowish brown (10YR54), drybose eolan deposit, sandy, very fine, well-sorted     5     Well construction       SELT - moderate yellowish brown (10YR54), drybose eolan deposit, sandy, very fine, well-sorted     5     Centralizer: SS bow-spring by 220       SELT - moderate yellowish brown (10YR54), drybose eolan deposit, sandy, very fine, well-sorted     5     Centralizer: SS bow-spring by 23 Sit with coarse lineatone grave up to 1: "dryb, sub-angular, weathered to hard, poorly 33 Sit UNESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbod at 31''.     40     45       SHALE - dark gray (N3), dry, medium hard, drybe - dark gray (N3), dry, wery fine, medium hard, drybe - dark gray (N3), dry, wery fine, medium hard, drybe - dark gray (N3), dry, wery fine, medium hard, drybe - dark gray (N3), dry, medium hard, drybe - dark gray (N3), dry				HRL COMPLIANCE SOLUTIONS	534	4407.	9271	4219719.2092
HYDROGEOLOGIC SERVICES   DEERICH 0=0   9881.46 FT AMSL   983.46 FT AMSL   983.46 FT AMSL     DOBLING METHOD: HOLLOW STEM AUGER TO ROTARY AIR HAMMER   TOTAL WELL DEEPTH   DEFTH FOW NATER: 73.79 FT BGS   DATE COMPLETED: 24.00017 2021   DATE COMPLETED: 24.00017 2021   DATE COMPLETED: 24.00017 2021   DATE STARTED: DATE STARTED: LB   DATE STARTED: 24.00017 2021   DATE STARTED: 25.00017 2021   DATE S		DF	SOURCE	DRILLING EQUIPMENT:	GRC	UND	SURFACE ELEV.:	TOC PVC ELEVATION:
SERVICES DRILLING METHOD: HOLLOW-STEM AUGER TO ROTARY AIR HAMMER TOTAL WELL DEPTH: B6.5 FT BGS DEPTH TO WATER: T3:79 FT BGS   LOGGED BY: SAMPLING METHOD: FINTERVAL ROTARY CUTTINGS GRAB SAMPLES DATE STARTED: 22 AUGUST 2021 DATE STARTED: 24 AUGUST 2021 DATE STARTED: 26 AUGUST 2021   Image: Start S	нү			DIEDRICH D-90	50	81.64	FT AMSL	5083.94 FT AMSL
HOLLOW-STEM AUGER TO ROTARY AIR HAMMER 66.5 FT BGS 79.78 FT BGS   LOGGED BY: SAMPLING METHOD: DATE STARTED: DATE SCHARTED: DATE COMPLETED:   LB SAMPLING METHOD: DESCription E E Audust 2021   SAMPLING METHOD: DESCription E E Well Construction   Sampling Description E E Well Construction   Sampling Description E E Sampling by   Sampling Description E E Sampling by   Sampling Description E E E   Sampling Sampling by E E E   Sampling Sampling by E E E   Sampling Description E E E   Sampling Sampling by E E E   Sampling Description E <							ELL DEPTH:	DEPTH TO WATER:
LJB F INTERVAL ROTARY CUTTINGS GRAB SAMPLES 22 AUGUST 2021 26 AUGUST 2021   E Graphic Log Description E Well Construction   0 State State State State   10 State State State State   20 State State State State   20 State State State State   21 State State State State   20 State State State State   21 State State State State   22 State State State State State   23 State State State State State   24 State State State State State   25 State State State State State   25 State State State State <th></th> <th></th> <th></th> <th>HOLLOW-STEM AUGER TO ROTARY AIR HAMMER</th> <th>86.</th> <th>.5 FT</th> <th>BGS</th> <th>79.79 FT BGS</th>				HOLLOW-STEM AUGER TO ROTARY AIR HAMMER	86.	.5 FT	BGS	79.79 FT BGS
LLB F INTERVAL ROTARY CUTTINGS GRAB SAMPLES 22 AUGUST 2021 26 AUGUST 2021   g (b) g (b) g (c) g (c	I OG	GFD	BY <sup>.</sup>	SAMPLING METHOD:	DAT	E STA	ARTED:	DATE COMPLETED:
-5   -5   Wellhead Protector 4" square steel: locking     0   5   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   0     10   -5   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10     10   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     10   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     20   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     21   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     22   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, medium hard, poorty sorted.   20   -5     25   SILT - moderate yellowish brown (10YR5/4), dryllong medium hard, dry.   25   -5   -6     26   SHALE - dark gray (N3), dry, medium hard, dry.   55   -6   -6   -7     26   SHALE - dark gray (N3), dry, medium hard, dry.   55   -7   -7   -7     27   SHALE - dark gray (N3), dry, very fin								
-5   -5   Wellhead Protector 4" square steel: locking     0   5   SILT - moderate yellowish brown (10YR5(4), dry/locee cellan deposit, sandy, very fine, well-sorted.   0     10   5   SILT work   SILT work   SILT work     10   5   SILT work   SILT work   SILT work     10   SILT work   SILT work   SILT work   SILT work     20   SILT work   SILT work   SILT work   SILT work     21   SILT work   SILT work   SILT work   SILT work     20   SILT work   SILT work   SILT work   SILT work     21   SILT work   SILT work   SILT work   SiLT work     22   SILT work   SILT work   SiLT work   SiLT work     23   SILT work   SiLT work   SiLT work   SiLT work     24   SILT work   SiLT work   SiLT work   SiLT work   SiLT work     24   SiLT work   SiLT work   SiLT work   SiLT work   SiLT work   SiLT work     25   SiLT work   SiLT work   SiLT work   SiLT work   SiLT work   SiLT wo	- 1	6	Craphia			s)		
-5   -5   Wellhead Protector 4" square steel: locking     0   5   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   0     10   -5   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10     10   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     10   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     20   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     21   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, well-sorted.   10   -5     22   SILT - moderate yellowish brown (10YR5/4), drylloose eolian deposit, sandy, very fine, medium hard, poorty sorted.   20   -5     25   SILT - moderate yellowish brown (10YR5/4), dryllong medium hard, dry.   25   -5   -6     26   SHALE - dark gray (N3), dry, medium hard, dry.   55   -6   -6   -7     26   SHALE - dark gray (N3), dry, medium hard, dry.   55   -7   -7   -7     27   SHALE - dark gray (N3), dry, very fin	epth	n n	-	Description	epth	t bg	Well Co	Instruction
0   0	Ōŧ	=	LOG	•	D S	£		
0   0		-5				-5		Wellboad Protector 4" square
5   SILT - moderate yellowish brown (10YR5/4), dry/loose eolian   5     10   SILT - moderate yellowish brown (10YR5/4), dry/loose eolian   5     10   SILT - moderate yellowish brown (10YR5/4), dry/loose eolian   5     10   SILT - wiGRAVEL - same as 0°-15' with coarse limestone gravel up to 1', dry, sub-angular, weathered to hard, poorly sorted, coarsening upwards.   15   Centralizer: SS bow-spring ty context, coarsening upwards.     25   SILT - Gark gray (N7), dry, hard, with thin dark gray (N7), dry, hard, with thin dark gray (N3), dry, celoareous shale interbed at 31'.   40     40   HMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, celoareous shale interbed at 31'.   40     45   SitALE - dark gray (N3), medium hard.   50     56   SHALE - dark gray (N3), dry, medium hard.   65     57   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   75     66   SANDSTONE - dark gray (N3), dry, very fine, medium hard.   75     76   SANDSTONE - dark gray (N3), dry, very fine, medium hard.   75     80   SANDSTONE - dark gray (N3), dry, wery fine, medium hard.   80     77   SANDSTONE - dark gray (N3), dry, wery fine, medium hard.   80     80   Sand Gareous   Screen: 2' SCH 40 PVC; TF.	_							
5   SILT - moderate yellowish brown (10YR5/4), dry/loose eolian   5     10   deposit, sandy, very fine, well-sorted.   10     11   b d b d b d b   SILT w/GRAVEL - same as 0°-15' with coarse limestone gravel up to 1°, dry, sub-angular, weathered to hard, poorly 20   20     20   b d b d b d b   SILT w/GRAVEL - same as 0°-15' with coarse limestone gravel up to 1°, dry, sub-angular, weathered to hard, poorly 20   20     25   25   25   30     35   LIMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbed at 31'.   40     40   45   50     55   SHALE - dark gray (N3), dry, medium hard, dry.   55     66   SHALE - dark gray (N3), dry, medium hard, dry.   55     66   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   70     56   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   75     80   SANDSTONE - dark gray (N3), dry, wery fine, medium hard, non-calcareous   75     80   Screen: 2' SCH 40 PVC; TF, 020' sit; 762'-82.''   76     81   Strate - dark gray (N3), dry, wery fine, medium hard, non-calcareous   80     82   Strate - dark gray (N3), dry, wery fine, medium hard, non-c		0				0 🛛		3' x 3' X 0 3' concrete well had
SILT	_				E	<u>.</u>		o x o x o.o conorece well pau
10   deposit, sandy, very fine, well-sorted.   10   Casing: 2" SCH 40 PVC; TFJ-25-76.2"     15   SILT W(CRAVEL - same as 0-15' with coarse limestone   15   Centralizer: S3 bow-spring by     20   Image: Sint of the sorted coarse in grave up to 1' if (the sub-angular, weathered to hard, poorly sorted, coarsening upwards.   20   25     30   Image: Sint of the sorted coarsening upwards.   20   20     35   LiMESTONE - light gray (N7), dry, hard, with thin dark gray   35   30     40   Sint of the sorted coarsening upwards.   40   45     50   Sint of the sorted coarsening upwards.   50     51   LiMESTONE - light gray (N3), medium hard, dry.   55     66   LiMESTONE - same as 21'-51'.   60     66   SHALE - dark gray (N3), dry, medium hard.   70     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin non-calcareous   70     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard.   80     80   Sorter: 2' SCH 40 PVC; TF.   0.020' Si - 76'. 86'. 50'; 76'. 86'. Dry drilling method, well dry upon completion with water coming in after approximately 1 week. A     81   SHALE - dark gray (N3), dry, medium hard.   80     82   <		5	- Maaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa			5		
10   10   10   10   Casing: 2* SCH 40 PVC; TFJ     15   15   SILT w/CRAVEL - same as 0*15* with coarse limestone gravel up to 1* dry, sub-angular, weathered to hard, poorly sorted, coarsening upwards.   15   Centralizer: SS bow-spring ty     20   0   0   0   0   0   0   0     25   30   15   20   25   30   20   25     30   14   14   20   25   30   35   14   14   20   25   30     35   14   14   14   14   20   25   30   35   26   26   30   35   20   25   30   35   26   30   35   26   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35   30   35	_				E			
15   SILT w/GRAVEL - same as 0°-15' with coarse limestone gravel up to 'T, dry, sub-angular, weathered to hard, poorly sorted, coarsening upwards.   15   Centralizer: SS bow-spring ty sorted, coarsening upwards.     20   25   30   20   25     30   25   25   30     35   LIMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbed at 31'.   40     46   45   40     46   45   50     56   SHALE - dark gray (N3), medium hard, dry.   55     66   SHALE - dark gray (N3), dry, medium hard.   65     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   70     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard.   70     86   SANDSTONE - dark gray (N3), dry, very fine, medium hard.   80     87   SHALE - dark gray (N3), dry, medium hard.   80     86   SHALE - dark gray (N3), dry, medium hard.   80     86   SHALE - dark gray (N3), dry, medium hard.   80     87   SHALE - dark gray (N3), dry, medium hard.   80     88   SHALE - dark gray (N3), dry, medium hard.   80     90 <td< td=""><td></td><td>10</td><td></td><td>acposit, survey, very fille, weil-solled.</td><td></td><td>10</td><td></td><td>Casing: 2" SCH 40 PVC; TFJ;</td></td<>		10		acposit, survey, very fille, weil-solled.		10		Casing: 2" SCH 40 PVC; TFJ;
20   0	_							-2.5'-76.2'
20   0		15			<u> </u>	15		
20   \$   \$   \$   \$   \$   \$   \$   \$   \$   \$	_							Centralizer: SS bow-spring type
25   30     35   LIMESTONE - light gray (N7), dry, hard, with thin dark gray     40   45     40   45     50   SHALE - dark gray (N3), medium hard, dry.     55   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard, dry.     65   SHALE - dark gray (N3), dry, medium hard.     65   SHALE - dark gray (N3), dry, medium hard.     66   SHALE - black (N1), carbonaceous, dry, calcareous with thin     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin     76   SHALE - dark gray (N3), dry, wery fine, medium hard.     77   SANDSTONE - dark gray (N3), dry, very fine, medium hard.     75   SHALE - dark gray (N3), dry, wery fine, medium hard.     80   Sandbronk - calcareous     81   String and the gray (N3), dry, wery fine, medium hard.     82   String and the gray (N3), dry, wery fine, medium hard.     90   90		20	$\phi \phi \phi \phi \phi$	sorted, coarsening upwards.		20		
30   30     35   UMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbed at 31'.     40   45     40   45     50   SHALE - dark gray (N3), medium hard, dry.     55   UMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   SHALE - dark gray (N3), dry, medium hard.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, wery fine, medium hard, non-calcareous     80   Screen: 2" SCH 40 PVC; TF, 0.020" slot; 76'; 28: 2" SCH 4	_	20			-	20		
30   30     35   UMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbed at 31:.     40   45     40   45     50   SHALE - dark gray (N3), medium hard, dry.     41   45     55   UMESTONE - same as 21:51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   UMESTONE - same as 21:51'.     60   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, wery fine, medium hard, non-calcareous     80   Screen: 2" SCH 40 PVC; TF, 0.020" slot; 76: 28:0; 2" SCH 40 PVC; TF, 0.020" slot;		25				25		
35   IMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbed at 31'.   35     40   45     40   45     40   45     40   45     50   SHALE - dark gray (N3), medium hard, dry.     55   IMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     80   Screen: 2" SCH 40 PVC; TF, 0.20" slot; 76 2'-86 2'     90   SHALE - dark gray (N3), dry, medium hard.     90   90	_	20			E	20		
35   IMESTONE - light gray (N7), dry, hard, with thin dark gray (N3), dry, calcareous shale interbed at 31'.   35     40   45     40   45     40   45     40   45     50   SHALE - dark gray (N3), medium hard, dry.     55   IMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     80   Screen: 2" SCH 40 PVC; TF, 0.20" slot; 76 2'-86 2'     90   SHALE - dark gray (N3), dry, medium hard.     90   90		30				30		
40   40     45   40     45   40     45   45     50   SHALE - dark gray (N3), medium hard, dry.     55   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51'.     60   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard.     76   SANDSTONE - dark gray (N3), dry, very fine, medium hard.     80   Shale - dark gray (N3), dry, wery fine, medium hard.     75   SHALE - dark gray (N3), dry, wery fine, medium hard.     80   Screen: 2" SCH 40 PVC; TF.     90   90	_	00			<u> </u>	00		
40   40     45   40     45   40     45   45     50   51     51   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard, dry.     65   LIMESTONE - same as 21'-51' with pyrite.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard.     80   Screen: 2" SCH 40 PVC; TF. 0.020" slot; 76 2:86.2"     90   90	_	35		I IMESTONE - light gray (NZ) dry bard with this dark gray		35		
45   45     50   SHALE - dark gray (N3), medium hard, dry.     55   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51' with pyrite.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard.     80   Screen: 2" SCH 40 PVC; TF.     0.020" slot; 76.2" 86.2"     81   Screen: 2" SCH 40 PVC; TF.     0.020" slot; 76.2" 86.2"     80   Screen: 2" SCH 40 PVC; TF.     0.020" slot; 76.2" 86.2"     81   Screen: 2" SCH 40 PVC; TF.     90   90	_	00				00		
45   45     50   SHALE - dark gray (N3), medium hard, dry.     55   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51' with pyrite.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard.     80   Screen: 2" SCH 40 PVC; TF.     0.020" slot; 76.2" 86.2"     81   Screen: 2" SCH 40 PVC; TF.     0.020" slot; 76.2" 86.2"     80   Screen: 2" SCH 40 PVC; TF.     0.020" slot; 76.2" 86.2"     81   Screen: 2" SCH 40 PVC; TF.     90   90	_	4∩				40		
50   50     55   55     60   55     61   11MESTONE - same as 21'-51'.     60   65     65   11MESTONE - same as 21'-51' with pyrite.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     80   Screen: 2" SCH 40 PVC; TF, 0.20" slot; 76.2'-86.2'     81   Sthale - dark gray (N3), dry, medium hard.   80     85   90	_	40				40		
50   50     55   55     60   55     61   11MESTONE - same as 21'-51'.     60   65     65   11MESTONE - same as 21'-51' with pyrite.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     80   Screen: 2" SCH 40 PVC; TF, 0.20" slot; 76.2'-86.2'     81   Sthale - dark gray (N3), dry, medium hard.   80     85   90	_	15				15		
55   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51' with pyrite.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     80   SANDSTONE - dark gray (N3), dry, medium hard.     81   SHALE - dark gray (N3), dry, medium hard.     90   Streen: 2" SCH 40 PVC; TF. 0.020" slot; 76.2"-86.2"     End Cap: 2" SCH 40 PVC; TF. 0.020" slot; 76.2"-86.2"     82   SHALE - dark gray (N3), dry, medium hard.     90   90	_	40				43		
55   LIMESTONE - same as 21'-51'.     60   SHALE - dark gray (N3), dry, medium hard.     61   SHALE - dark gray (N3), dry, medium hard.     65   LIMESTONE - same as 21'-51' with pyrite.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     80   SANDSTONE - dark gray (N3), dry, wery fine, medium hard, non-calcareous     81   SHALE - dark gray (N3), dry, medium hard.     90   90		50				50		
55   IMESTONE - same as 21'-51'.   55     60   SHALE - dark gray (N3), dry, medium hard.   65     61   IMESTONE - same as 21'-51' with pyrite.   65     62   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   70     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   75     80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80     85   SHALE - dark gray (N3), dry, medium hard.   80     90   90   90	_	50		SHALE - dark gray (N3), medium hard, dry.	Ē	50		
60   SHALE - dark gray (N3), dry, medium hard.     65   SHALE - dark gray (N3), dry, medium hard.     65   IMESTONE - same as 21'-51' with pyrite.     65   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous     85   SHALE - dark gray (N3), dry, medium hard.     90   90	_	55			E	55		
65   SHALE - dark gray (N3), dry, medium hard.   65     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   65     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   70     80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80     85   SHALE - dark gray (N3), dry, medium hard.   80     90   90   90		55		LIMESTONE - same as 21'-51'.	Ē	55		
65   SHALE - dark gray (N3), dry, medium hard.   65     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   65     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   70     80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80     85   SHALE - dark gray (N3), dry, medium hard.   80     90   90   90		60				60		
65   LIMESTONE - same as 21'-51' with pyrite.   65     70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   70     75   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   75     80   SHALE - dark gray (N3), dry, medium hard.   80     90   90   90	_	50		SHALE - dark gray (N3), dry, medium hard.		00		Annular Seal: 3/8" bentonite chips
70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   70   Filter Pack: Colorado silica satistica satistatistica satistica satistica satistita satistica satistica satist		65				65		0-07.1
70   SHALE - black (N1), carbonaceous, dry, calcareous with thin interbeds of limestone.   70   ENVIROPLUG 3/8" coated bentonite pellets; 67.1'-73.1'     75   75   75   75   75   75     80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80   80   85     85   SHALE - dark gray (N3), dry, medium hard.   85   85   Screen: 2" SCH 40 PVC; TF. 0.020" slot; 76.2'-86.2'     90   90   90   90   90   90	_	00				00		Dententia Oriela Maria D
70   SHALE - black (RT), carbonaceous, dry, carcareous with thin interbeds of limestone.   70   bentonite pellets; 67.1'-73.1'     75   75   75   75   80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80   80   Screen: 2" SCH 40 PVC; TF, 0.20" slot; 76.2'-86.2'     85   SHALE - dark gray (N3), dry, medium hard.   85   85   Screen: 2" SCH 40 PVC; TF, 0.20" slot; 76.2'-86.2'     90   90   90   90   90   90	_	70				70		Bentonite Seal: Wyo-Ben ENVIROPLUG 3/8" coated
75   75   75   Filter Pack: Colorado silica sa 10-20; 73.1'-86.6'     80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80   80     85   SHALE - dark gray (N3), dry, medium hard.   85   Screen: 2" SCH 40 PVC; TF, 0.020" slot; 76.2'-86.2'     90   90   90   90	_	10		י סחאנב - סומכא (ז'א), carbonaceous, dry, calcareous with thin interbeds of limestone.		10		
80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80   80   Screen: 2" SCH 40 PVC; TF. 0.020" slot; 76.2'-86.2'     85   SHALE - dark gray (N3), dry, medium hard.   85   90   90	_	75			F	75		
80   SANDSTONE - dark gray (N3), dry, very fine, medium hard, non-calcareous   80   Screen: 2" SCH 40 PVC; TFL 0.020" slot; 76.2'-86.2'     85   SHALE - dark gray (N3), dry, medium hard.   85   85   Screen: 2" SCH 40 PVC; TFL 0.020" slot; 76.2'-86.2'     90   90   90   90   90   90	_	13				13		Filter Pack: Colorado silica sand
80   non-calcareous   80   Screen: 2" SCH 40 PVC; TF. 0.020" slot; 76.2'-86.2'     85   SHALE - dark gray (N3), dry, medium hard.   85   End Cap: 2" SCH 40 PVC; TF. 0.020" slot; 76.2'-86.2'     90   90   90   90   90	_	00		SANDSTONE - dark gray (N3), dry, very fine, medium hard.	F	00		10-20, 73.1-86.6
85   0.020" slot; 76.2'-86.2'     90   90     NOTES: Centralizers placed at 6',16', 36', 56', 76', 86'. Dry drilling method, well dry upon completion with water coming in after approximately 1 week. A	_	00				00		Screen: 2" SCH 40 PVC; TFJ;
90 NOTES: Centralizers placed at 6',16', 36', 56', 76', 86'. Dry drilling method, well dry upon completion with water coming in after approximately 1 week. A	_	<u>و</u> د			E	<u>و</u> د		
90 NOTES: Centralizers placed at 6',16', 36', 56', 76', 86'. Dry drilling method, well dry upon completion with water coming in after approximately 1 week. A	_	00		SHALE - dark gray (N3), dry, medium hard.	E	00		End Cap: 2" SCH 40 PVC; TFJ;
NOTES: Centralizers placed at 6',16', 36', 56', 76', 86'. Dry drilling method, well dry upon completion with water coming in after approximately 1 week. A	_	00			F	00		86.2'-86.5'
		90				90		
			0				·····	n
sentorine hydrated with potable water, wen developed with waterra πydrollit 2 mertial pump α surge block on new poly tubing on 11/7/2021.								
	Jenno	Jinte	myurateu with pola	ione water, wen developed with water a mydrollit z mertial pump	o su	ige n	ook on new poly lubi	ng un Th/1/2021.



### Figure 6. GCC Pueblo MW-13 lithology and well completion diagram.

		1		<b>B C</b> = 10	<b>a</b> /=		
			PROJECT:	BORIN			
			GCC RIO GRANDE PUEBLO PLANT	MW-1			
			LOCATION:	WELL I			
			PUEBLO COUNTY, COLORADO	MW-1			
			DRILLING CONTRACTOR:	NORTH	ING (UT	FM NAD 83):	EASTING (UTM NAD 83):
			HRL COMPLIANCE SOLUTIONS	53440	01.5203		4219714.9385
	PF	SOURCE	DRILLING EQUIPMENT:	GROUN	ND SURI	FACE ELEV.:	TOC PVC ELEVATION:
ну		OGEOLOGIC	DIEDRICH D-90	4987.	93 FT A	MSL	4990.11 FT AMSL
	SE	RVICES	DRILLING METHOD:	TOTAL	WELL D	EPTH:	DEPTH TO WATER:
			HOLLOW-STEM AUGER TO ROTARY AIR HAMMER	175.3	FT BGS	6	59.90 FT BGS
LOG	GED	BY:	SAMPLING METHOD:	DATE S	STARTE	D:	DATE COMPLETED:
	LJB		5' INTERVAL ROTARY CUTTINGS GRAB SAMPLES		VEMBE		6 NOVEMBER 2021
j th	(sb	Graphic	Description	Depth (ft bgs)			
Depth	ш с (щ с	Log	Description			vvell C	onstruction
		-					
				E			Wellhead Protector 4" square steel: locking
	0		SILT - moderate yellowish brown (10YR5/4), dry/loose eolian	— O			C C
			deposit, calcareous.	E			
	10	$\phi \phi \phi \phi \phi$	SILT w/GRAVEL - same as 0'-7' with limestone gravel up to 1" diameter	<u> </u>	0		Casing: 2" SCH 40 PVC; TFJ; -2.5'-135.0'
				E	C		Centralizer: SS bow-spring type
	20			- 20	0		
			SHALE - very pale orange (10YR6/2), dry, silty, weathered,	E			Annular Seal: 3/8" bentonite chips; 0'-27.5'
	30		soft to medium hard.	- 30	0		
				E	C		
	40			- 40	0		
				E			
	50			- 50	0		
				E	<		
	60			6	0		
				E			
	70			- 70	0		
				E	C	$\rightarrow$	
	80			- 80	0		
			SHALE - grayish black (N2), dry, hard.	E			
	90			- 90	0		
				E	C		
	100			<u> </u>	00		Bentonite Seal: Wyo-Ben
							ENVIROPLUG 3/8" coated
	110			<b>–</b> 1 <sup>.</sup>	10		bentonite pellets; 27.5'-133.5'
				Ē	C		
	120	0		<b>–</b> 1:	20		
				E .			
	130			<b>–</b> 1:	30		Foom Dridge Diver 9 Ob-1-
E				É .			Foam Bridge Plug & Shale Basket: 6.25", 133.5'
	140			<u> </u>	40 <		,
				E '			
	150			E 1	50		Screen: 2" SCH 40 PVC; TFJ; 0.020" slot w/pre-pack Colorado
_			LIMESTONE - white (N9), dry to 166', then wet fracture zone	⊨ '`			silica sand 10-20; 135.0'-175.0'
	160		166'-176', hard, carbonaceous shale interbed at 174'.	E 16	60		<b>_</b>
_	100			⊢ ''			Open Annulus: 6.25" borehole





## Figure 7. GCC Pueblo MW-14 lithology and well completion diagram.

		PROJECT:		RING ID						
		GCC RIO GRANDE PUEBLO PLANT			MW-14					
		LOCATION:	WELL ID:							
		PUEBLO COUNTY, COLORADO	м	W-14						
		DRILLING CONTRACTOR:	NO	RTHING	6 (UTM NAD 83):	EASTING (UTM NAD 83):				
		HRL COMPLIANCE SOLUTIONS	53	35242.3	970	4221415.8508				
_	•	DRILLING EQUIPMENT:	GR	OUND S	URFACE ELEV.:	TOC PVC ELEVATION:				
		DIEDRICH D-90			TAMSL	4989.92 FT AMSL				
	ERVICES	DRILLING METHOD:			LL DEPTH:	DEPTH TO WATER:				
		HOLLOW-STEM AUGER TO ROTARY AIR HAMMER		)5.3 FT		78.00 FT BGS				
OGGE		SAMPLING METHOD:		TE STAI		DATE COMPLETED:				
	זם <i>כ</i> .	5' INTERVAL ROTARY CUTTINGS GRAB SAMPLES			ST 2021	6 NOVEMBER 2021				
Depth (ft bgs)	Graphic Log	Description	Depth	(ft bgs)	Well Co	nstruction				
-10	C		=	-10		Wellhead Protector 4" square				
0	<u>\</u>		<b>—</b>	0 🚥		steel: locking 3' x 3' X 0.3' concrete well pad				
-	$\phi \phi \phi \phi \phi \phi$	SILT - moderate yellowish brown (10YR5/4), dry/loose eolian deposit, calcareous.		•						
_ 10		SILT w/GRAVEL - same as 0'-3' with limestone gravel up to	Ē	10		Casing: 2" SCH 40 PVC; TFJ; -2.5'-190.0'				
20		\1" diameter SHALE - very pale orange (10YR6/2), dry, silty, weathered, coff to medium hard	E-	20		Annular Seal: 3/8" bentonite chip 0'-27.5'				
- 00		SILTSTONE - moderate yellowish brown (10YR5/4), dry,	Ē	20						
30		\sandy, very fine. SHALE - very pale orange (10YR6/2), dry, silty, weathered,	E	30						
40		soft to medium hard.	<b>—</b>	40						
			E			Centralizer: SS bow-spring type				
- 50			_	50		g-,p				
60				60						
_ 00			E	00						
- 70			_	70						
-			E							
80		SHALE - grayish black (N2), dry, hard, with very thin		80						
90		limestone interbeds 39'-43'.	<u> </u>	90						
			E							
10	0		_	100						
- 11	•		E	110	$ \rightarrow $					
_ 11	0		=	110						
12	0		Ē-	120						
-			E		$\frown$					
_ 13	0		E	130						
14	0		E_	140						
	~		E	1-10						
15	0		<u> </u>	150						
16		LIMESTONE - white (N9), dry, hard.		160						
-						Pontonito Sool: Mus Dor				
17	0		<u> </u>	170		Bentonite Seal: Wyo-Ben ENVIROPLUG 3/8" coated				
18		SHALE black (N1) corbonaccous dry coff	E	180		bentonite pellets; 169.3'-181.0'				
10		SHALE - black (N1), carbonaceous, dry, soft. SANDSTONE - dark gray (N3) to medium dark gray (N5), dry,	E	100						
19	0	very fine, well-sorted, medium hard, traces of pyrite,	Ē-	190		Filter Pack: Colorado silica sand 10-20; 187.0'-206.0'				
-		laminations up to 3 mm.	E			Screen: 2" SCH 40 PVC; TFJ;				
_ 20	0	SANDSTONE - medium dark gray (N5), dry, very fine, soft, calcareous.	E	200		0.020" slot; 190.0'-205.0'				
21	0	SANDSTONE - same as 179'-198'.	E	210		End Cap: 2" SCH 40 PVC; TFJ; 205.0'-205.3'				
	•	SANDSTONE - medium dark gray (N5), dry, very fine,	Ê	210		200.0-200.0				
22	0	\medium hard, non-calcareous.	E_	220						
		at 5', 25', 45', 65', 85', 105', 125', 145', 165', 185', 195', 205'. D	ny dr	illing me	thad barehale inte	rsected 1st water from fracture a				



Figure 8. GCC Pueblo MW-9 & MW-10 surface completions looking northeast. MW-9 nearest, MW-10 furthest.





Figure 9. GCC Pueblo MW-11 & MW-12 surface completions looking northeast. MW-11 nearest, MW-12 furthest.





Figure 10. GCC Pueblo MW-13 & MW-14 surface completions looking north. MW-13 nearest/left, MW-14 furthest/right.

