

All unconsolidated surficial deposits in the immediate RDA toe region will be stripped to bedrock to provide a firm foundation base.

#### 2.04.7 Hydrology Description

##### (1) Groundwater Information

A detailed investigation of the groundwater hydrology for the permit area was conducted by Water, Waste, and Land in 1980. The investigation was updated by a report prepared by Basin Resources in 1994. These reports are provided in Exhibit 8-Hydrology and Geology Information. Both investigations indicate that groundwater resources in the Raton Formation near the New Elk Mine are limited. Additional hydrologic testing for the project area was performed in 2010 to support the permit renewal for mining in the Blue, Allen, and Apache coal seams. The 2010 testing program focused on evaluating the permeability of the coal beds and adjacent rocks. Three monitoring wells were also installed to evaluate bedrock groundwater levels. The results of the 2010 hydrologic investigation are summarized in the following sections. Complete documentation for the program is presented in Exhibit 8.

##### 2010 Groundwater Investigation

Hydrogeologic studies during 2010 included the installation of three bedrock monitoring wells and packer permeability testing in exploration boreholes. The monitoring wells NE-1-10, NE-6-10(a), and NE-6-10 (b) were installed in the Allen, Apache, and Blue coal seams, respectively. Packer permeability tests focused on evaluating the hydraulic conductivity of the Raton Formation between the Allen and Blue coal seams. Results from the packer testing program are summarized in Table 8. Well completion details and water level elevations measured in 2010 and 2021 are summarized in Table 9.

**Table 7. Joint Orientation of the Refuse Disposal Area (RDA)**

STATION	STRIKE	DIP
1	N78E	86N
2	E-W	87N
3	N88W	86N
5	N75E	86S
	N82E	88N-86S
8	N79E	84S

**Table 8. Results of 2010 Packer Testing Program**

Unit		Number of Tests	Hydraulic Conductivity (ft/day)	
			Range	Average
Allen	Roof	2	1.10 to 1.46	1.28
	Coal	3	0.35 to 0.64	0.51
	Floor	2	0.001 to 0.004	0.003
Apache	Roof	1	0.002	0.002
	Coal	3	0.15 to 0.80	0.48
	Floor	2	1.10 to 1.46	1.28
Maxwell	Roof	4	0.001 to 0.04	0.02
	Coal	5	0.02 to 0.29	0.013
	Floor	2	0.04 to 0.10	0.07
Blue	Roof	2	0.02 to 1.06	0.54
	Coal	3	0.12 to 0.47	0.43
	Floor	3	0.03 to 0.27	0.11
Other units	Coal	8	0.02 to 2.45	0.43
	Sandstone	3	0.01 to 0.84	0.31
	Siltstone, Mudstone and Shale	11	0.001 to 0.11	0.02

**Table 9. Completion Summary for Monitoring Wells**

Well ID	Monitored Unit	Northing (ft)	Easting (ft)	Top of Casing (ft elev.)	Screened Interval (ft bgs)	Completion Date	Depth to Water – 2010 – 2021 (ft btoc)
NE-1-10	Allen	1,179,572	3,161,180	7,334.3	418.5 to 428.5	9/13/10	288.8 - 304.9
NE-6-10 (a)	Apache	1,183,658	3,167,370	7,370.9	715.2 to 735.2	11/15/10	597.8 - 663.8
NE-6-10 (b)	Blue	1,183,658	3,167,370	7,370.6	426.2 to 436.2	11/16/10	337.4 - 370.4

Packer permeability tests indicate that the average hydraulic conductivities of the Allen, Apache, Red, Upper Bingham Canyon, Blue, Green, and Yellow coal seams are similar and range from 0.43 to 0.51 ft/day. The permeability of the Maxwell seam is lower with an average value of .013 ft/day. Clastic rocks including sandstone, siltstone, mudstone, and shale usually have lower permeability than the associated coals. Exceptions to this generalization include the interval between the Allen and Apache beds, which has an average hydraulic conductivity of 1.28 ft/day, and the roof of the Blue coal seam, which has an average hydraulic conductivity of 0.54 ft/day.

Water level measurements during packer testing indicate that heads in the coal seams are lower than in the surrounding rocks. In many cases, the observed vertical gradients are exceptionally high and exceed unity. The high vertical gradients are related to groundwater pumping from the coal beds for coalbed methane (CBM) production. One hundred twenty-seven CBM wells are located within a one-mile radius of the permit area as of December 2021. The presence of high vertical gradients indicates that permeability is low, perpendicular to bedding, and limits the flow of groundwater from the surrounding elastic rocks to the coal beds.

Three bedrock monitoring wells were installed during the 2010 hydrologic investigation. Monitoring well NE-1-10 is located near the northeast corner of the permit boundary and is completed in the Allen seam. Monitoring wells NE-6-10(a) and NE-6-10(b) are located north of the proposed PR-6 permit boundary and are completed in the

Apache and Blue Seams, respectively. The completion groundwater elevation in the Allen seam at NE-1-10 was 7,045.5 feet on September 13, 2010. The completion groundwater elevation in the Apache seam at NE-6-10(a) was 6,773.1 feet on November 15, 2010. The completion groundwater elevation in the Blue seam at NE-6-10(b) was 7,033.2 feet on November 16, 2010.

#### Groundwater Usage

Domestic wells for area residents are supplied by alluvial sediments and bedrock in the Raton Formation. A few higher-yield production wells are also located near the mine and are used for irrigation. The irrigation wells are completed in the Purgatoire River Alluvium. CBM development activities in the northern portion of the Raton Basin are currently producing groundwater from coal beds in the Raton and Vermejo Formations. Groundwater withdrawal related to CBM production has partially dewatered coal seams in the permit area but has not impacted water availability in alluvial wells. Similarly, dewatering of the Blue, Allen, and Apache Seams for mining is not expected to lower water levels in alluvial wells that are used for domestic supply and irrigation (**Exhibit 8**). The Blue Seam has a current inflow range of 5 to 40 gpm in short periods. It may, however, impact deeper bedrock wells that are completed in permeable strata near the Blue, Allen, and Apache Seams. A summary of developed groundwater sources for domestic use and irrigation is presented in Table 10. Wells that are located within one mile of the permit boundary (excluding CBM wells) are shown on Map 8. Locations for CBM development wells are shown on Map 20.

**Table 10. Ground Water User Inventory**

Owner	Year Installed	Use/comments	Well Depth (ft)	Well Yield (gpm)	Static Water Level (ft)	Screened Formation	Screened Interval Lithology	Easting <sup>(2)</sup> (ft)	
Colorado Fuel & Iron Corp.	1958	Industrial	12	5	7	Alluvium	---	3144598	
Picketwire Processing Co. LLC	1958	Industrial	24	12	9	Alluvium	---	3156469	
Armstrong, Allen	1994	Monitoringwell	75	15	29	Bedrock	sandstone/shale	3159166	
Storz O.T., CF & I Lessee	1970	Domestic	220	10	80	Bedrock	sandstone/shale	3149889	
Storz O.T.	1970	Domestic	75	10	35	Bedrock	sandstone/shale	3145924	
Chavez, George	1945	Domestic	12	25	---	Alluvium	---	3143294	
Orge, Ramon M.	1978	Household useonly	30	8	20	Bedrock	sandstone/shale	3165214	
Dickerhoof, Robert	1990	Household useonly	53	15	8	Alluvium	---	3140136	
Diller, Roger K.	2000	Domestic	160	1	20	Bedrock	shale	3159515	
Armstrong, Monrose Allen	2000	Domestic	169	3	87	Bedrock	sandstone/shale	3158768	
Armstrong, Monrose Allen	2001	Domestic	102	8	16	Bedrock	sandstone/shale	3168220	
Stiles, Richard W.	2000	Domestic	140	0.5	80	Bedrock	sandstone/shale	3167883	
York, Lisa c.	2002	Domestic	513	7	186	Bedrock	sandstone/shale	3144802	
Chenoweth, Bob & Barbara	2004	Household useonly	43	14	3	Alluvium	---	3140340	
Leef, Ronald E.	2003	Domestic	140	2	40	Bedrock	shale/coal	3157653	
Clounch, Roger D.	2004	Household useonly	40	14	7	Alluvium	---	3140133	
Doran, John & Sophia	2004	Household useonly	39	14	5	Alluvium	---	3140546	
Festi, Charles & Patricia	2005	Household useonly	40	14	6	Alluvium	---	3140240	
Pachorek, Joseph C. Jr.	2005	Household use only	40	14	8	Alluvium	---	3140697	
Edwards, Elizabeth J.	2005	Household useonly	30	14	3	Alluvium	---	3140511	
Baired, Robert G.	2005	Household useonly	30	14	3	Alluvium	---	3140565	
Neas, Charles M.	2005	Household useonly	48	14	8	Alluvium/Bedrock	sandstone/shale	3140319	
Patrick, R.C.	2006	Household useonly	30	14	3	Alluvium	---	3140440	
Haslam, Mary Claire Worrell	2006	Household useonly	30	14	3	Alluvium	---	3140197	

**Table 10. Ground Water User Inventory (continued)**

Well Permit Number	Owner	Year Installed	Use/comments	Well Depth (ft)	Well Yield (gpm)	Static Water Level (ft)	Screened Formation	Screened Interval Lithology	Easting <sup>(2)</sup> (ft)	Northing <sup>(2)</sup> (ft)
264440	Armstrong, Helen M.	2005	Household use only	200	---	54	Bedrock	sandstone/shale /coal	3163297	1180686
264559	Franklin, Darrel K.	2006	Household use only	30	14	3	Alluvium	---	3140280	1175743
264674	Spurgeon, Dan M.	2005	Domestic, Stock	260	7.5	44	Bedrock	sandstone/shale /coal	3167326	1182788
264789	Timmons, David & Robin	2005	Household use only	48	14	5	Alluvium/Bedrock	boulders/sandstone /shale	3140226	1175755
265698	Handley, Stephen D.	2005	Household use only	48	14	9	Alluvium/Bedrock	boulders/sandstone /shale	3140092	1175827
265771	Sturgeon, Mary	2006	Household use only	30	14	3	Alluvium	---	3140290	1175887
269004	Smith, J. Dallas Jr.	1960	Commercial	60	15	---	---	---	3140169	1175710
269720	Erickson, Chris E.	2006	Domestic	60	10	5	Bedrock	sandstone/coal /shale	3160730	1182667
269852	Kosslyn, Robert M.	2006	Domestic	60	13.5	8	Bedrock	boulders/sandstone /shale	3156407	1188158
276011	Toupal, James A.	2008	Domestic	66	12	15	Alluvium/Bedrock	---	3139367	1176282
277155	Montoya, Marino & Pat	1953	Domestic	30	12	---	Alluvium	---	3163939	1179744
284213	New Elk Coal Company, LLC	2010	Monitoring well	442	---	289	Bedrock	mudstone/siltstone /coal	3160432	1179585
49429-MH <sup>(4)</sup>	New Elk Coal Company, LLC	2010	Monitoring well	451	---	337	Bedrock	Apache Coal	3167370	1183568
49430-MH <sup>(4)</sup>	New Elk Coal Company, LLC	2010	Monitoring well	750	---	598	Bedrock	Blue Coal	3167370	1183658
4 <sup>(1)</sup>	Chavez, D.G.	-- -	Domestic, stock	12	25	---	Alluvium <sup>(3)</sup>	---	3143864	1177532
5 <sup>(1)</sup>	Wyoming Fuel Co.	---	Domestic, industrial	12	5	---	Alluvium <sup>(3)</sup>	---	3145684	1178152
8 <sup>(1)</sup>	Wyoming Fuel Co.	---	Industrial	390	112	---	Bedrock	---	3156053	1178735
9 <sup>(1)</sup>	Wyoming Fuel Co.	---	Domestic, industrial	24	12.5	---	Alluvium <sup>(3)</sup>	---	3155302	1179209
10 <sup>(1)</sup>	Wyoming Fuel Co.	---	Domestic, industrial	100	12.5	---	Alluvium <sup>(3)</sup>	---	3155696	1179449
11 <sup>(1)</sup>	Mozingo	---	Domestic	65	---	---	Alluvium <sup>(3)</sup>	---	3140305	1176999
12 <sup>(1)</sup>	Vialpando	---	Cistern/ Domestic	10-15	---	---	Alluvium <sup>(3)</sup>	---	3159146	1180498
13 <sup>(1)</sup>	Vialpando	---	Cistern/ Domestic	10-15	---	---	Alluvium <sup>(3)</sup>	---	3158890	1180158
14 <sup>(1)</sup>	Vialpando	---	Cistern/ Domestic	10-15	---	---	Alluvium <sup>(3)</sup>	---	3159375	1180154
15 <sup>(1)</sup>	Chavez, J.	---	Cistern	10	---	---	Alluvium <sup>(3)</sup>	---	3167886	1178094

**Table 10. Ground Water User Inventory (concluded)**

Well Permit Number	Owner	Year Installed	Use/comments	Well Depth (ft)	Well Yield (gpm)	Static Water Level (ft)	Screened Formation	Screened Interval Lithology	Easting <sup>(2)</sup> (ft)	Northing <sup>(2)</sup> (ft)
16 <sup>(1)</sup>	No Residence	---	---	60	---	---	---	---	3168178	1177904
17 <sup>(1)</sup>	Chavez, J.	---	No longer used	---	---	---	---	---	3168696	1177886
24 <sup>(1)</sup>	---	---	---	---	---	---	---	---	3165844	1183540
43 <sup>(1)</sup>	---	---	---	---	---	---	---	---	3157773	1186088
44 <sup>(1)</sup>	---	---	---	---	---	---	---	---	3143474	1177394
46 <sup>(1)</sup>	---	---	---	---	---	---	---	---	3156229	1179197
47 <sup>(1)</sup>	---	---	---	---	---	---	---	---	3155365	1178827
48 <sup>(1)</sup>	---	---	---	---	---	---	---	---	3155777	1179051
50 <sup>(1)</sup>	---	---	---	---	---	---	---	---	3140594	1174186
PAW-1	New Elk Coal Company, LLC	---	MonitoringWell	18	---	8	Alluvium	---	3153325	1178756
PAW-2	New Elk Coal Company, LLC	---	MonitoringWell	17	---	13	Alluvium	---	3154818	1179030
PAW-3	New Elk Coal Company, LLC	1985	MonitoringWell	18	---	32	Alluvium	---	3156451	1179517
PAW-4	New Elk Coal Company, LLC	1985	MonitoringWell	17	---	---	Alluvium	---	3157032	1179434
PAW-8	New Elk Coal Company, LLC	---	MonitoringWell	40	---	33.5	Alluvium	---	3157347	1179626
PAW-9	New Elk Coal Company, LLC	---	MonitoringWell	27	---	15	Alluvium	---	3160235	1179606
ACAW-1	New Elk Coal Company, LLC	1984	MonitoringWell	---	---	12.8	Alluvium	---	3168469	1175617

**Notes:**

- <sup>(1)</sup> Colorado Department of Water Resources well permit ID missing; ID shown correlates to original well ID from Map 8, Regional Hydrology.
- <sup>(2)</sup> Coordinate System is CO State Plane NAD 83, Zone 0503.
- <sup>(3)</sup> Alluvium is based on information from residents of the area. No specific geologic logs were interpreted.
- <sup>(4)</sup> Monitoring well notice of intent number; undergoing state review before permit number is issued.

In the spring of 1984, WFC completed a water user survey for the permit and surrounding area. The survey included wells, windmills, and stock ponds within a one-mile radius of the permit boundaries for the New Elk and Golden Eagle mines and supplemented the inventory that had been previously compiled by CF&I (Exhibit 11). Information from the WFC and CF&I surveys has been updated for the current permit revision with water well data from the Colorado Department of Water Resources. The updated inventory reflects all permitted wells within a one-mile radius of the permit area (including the PR-6 area) as of December 2021 as well as the stock ponds and windmills identified in the previous surveys. The updated groundwater user inventory is presented in Table 10. Resource locations are presented on the updated Map 8-Regional Hydrology.

According to the 1984 survey, the water supply for the city of Trinidad is the primary source of water for domestic use east of the North Fork of the Purgatoire River. The city water originates from North Lake and Monument Lake and is piped via an aqueduct in a southeasterly direction along the North Fork and then east along the north side of Highway 12. With the exception of two residents (Wells 15 and 16), everyone contacted in 1984 used city water for domestic supply. City water was not available west of the North Fork and those users relied on well water.

Since 1984, a number of wells have been installed within one mile of the permit boundary. The wells include 14 bedrock wells that produce from the Raton Formation and 17 wells that are completed in alluvium (Table 10 and Map 8). Current totals for wells and other sources that access groundwater are presented in Table 11.

**Table 11. Summary of Groundwater Users/Access Points within One Mile of the Permit Boundary**

<b>Groundwater Source</b>	<b>Number</b>
Alluvial water supplies	29
Bedrock water supplies	15
Unknown water supplies	9
Alluvial monitoring wells	7
Bedrock monitoring wells	4

The well inventory and user survey indicates that there are two primary groundwater sources in the study area. The first source consists of alluvial aquifers and springs associated with the Purgatoire River and its tributaries. The second source is bedrock groundwater from the Raton Formation. Alluvial wells are typically less than 100 ft deep and access groundwater that is hydraulically connected to surface water. Bedrock wells range from about 30 to 513 ft in depth and produce groundwater from poorly interconnected zones of limited areal extent. The USGS describes the groundwater system in Raton Formation Aquifer as being heterogeneous and anisotropic with individual beds having limited lateral continuity (Watts, 2006)<sup>1</sup>. Alluvial

<sup>1</sup> Watts, K., R., (2006), "Hydrostratigraphic Framework of the Raton, Vermejo, and Trinidad Aquifers in the Raton Basin, Las Animas County, Colorado," United States Geological Survey Scientific Investigations Report 2006-5129.

water sources have low potential to be affected by mining in the Blue, Allen, and Apache Seams because of the low vertical hydraulic conductivity of the rocks and limited lateral continuity of water-bearing zones (Exhibit 8).

Two bedrock water supply wells are located in the permit area. Well 39685 is a 220-ft-deep domestic supply well. The owner of record is Storz O.T.-CF&I Lessee. Well 8 is a 390-ft-deep industrial supply well owned by New Elk Coal Company. Both wells could be impacted by mining in the Blue, Allen, and Apache coal seams. Impacts to the wells could include changes in water levels and water quality.

Users located near Stonewall primarily rely on shallow wells in the alluvium adjacent to the Middle Fork of the Purgatoire River for domestic water supply. One well (269004) may be completed in bedrock, but it is only 60 feet deep, and it is not likely to be affected by mining.

A number of residents are located north and northeast of the permit area and use bedrock wells for domestic water supply. Wells 269720 and 264440 are located closest to the permit boundary and have the greatest potential to be impacted by mining. Well 269720 is 60 ft deep, and given its shallow completion, it is unlikely that mining will affect the water level or water quality in the well. Well 264440 is 200 ft deep and is completed in an unidentified coal seam. Well 264440 has a greater potential to be adversely impacted by mining in the Blue, Allen, and Apache coal seams than Well 269720.

Wells 12, 13, and 14 are actually cisterns. These cisterns have been in use for over 65 years. No problems were reported with water quality or quantity during previous mining. The water levels in the cisterns vary slightly with the season. These variations suggest that the cisterns are fed by runoff and infiltration from the Purgatoire River.

Wells 15, 16, and 17 were the only wells identified east of the North Fork of the Purgatoire River during previous studies. Well 15 is a cistern that is believed to be spring fed from a northeasterly direction because of the presence of springs to the north in Santistevan Canyon. The water quality is reported to be excellent with no problems in quantity. Well 16 is approximately 60 ft deep. The well produces poor quality water. Chavez (1984) describes the well water as having a terrible odor. It is believed that the well is completed in an upper coal seam and that hydrogen sulfide gas is the source of the bad smell. Well 17 is no longer in use because of the availability of city water.

Well 11 is apparently completed in the Purgatory River alluvial aquifer. No problems were reported with the quantity or quality of water from the well during previous mining activities. The well is the water supply source for the Picketwire Lodge.

The highland wells (windmills) south of the Purgatoire River are all listed as being owned by the Division of Wildlife. The respective water levels for Wells 4, 5, 6, 7, and 9 are reported to be 25, 15.5, 46.5, and 7.5 ft but no information is available for when these were measured. The water quality is reported to be similar that of coal seepage and different from surface water quality in streams and stock ponds, suggesting that the windmill water is coming from an upper coal seam. Geologic logs for the highland area show a series of coal seams approximately 100 to 150 ft.



below ground surface. Experience from previous mining operations suggests that the water source for the windmills will not be affected by mining in the Blue, Apache, and Allen Seams.

The existing workings for the New Elk Mine extend under the Purgatoire River beneath Wells 8, 9, 10, 12, 13, and 14. Well owners did not report adverse effects on either water quality or quantity during previous mining.

## (2) Surface Water Information

Surface water quality and quantity information was developed historically through a study by Water, Waste and Land, Ltd. The report of the quality and quantity of water associated with the permit and areas adjacent to the New Elk Mine is found in Exhibit 8, Hydrology and Geology Information. In addition, historical water quality analyses are provided in Exhibit 10, Water Quality Analysis. All surface waters in the New Elk permit area and adjacent areas are shown on Map 8, Regional Hydrology. Discharges of surface water at the New Elk Mine are shown on Map 8. Discharges from the mine and from the coalbed methane (CBM) gas-production operations in Apache Canyon are permitted under the National Pollutant Discharge Elimination System (NPDES), which requires quarterly monitoring and reporting of the quality and quantity of discharges to surface water. The results of recent NPDES monitoring at the mine are presented in Table 10A. As indicated, no discharges have been measured at any of the monitoring points during 2021. Average flow rates for the Purgatoire River at Madrid, Colorado, since 2002 are presented by month in Table 10B.

**Table 10A. New Elk Mine NPDES Monitoring Data 2021**

Discharge Point	Flow Rate (Mgd)	Specific Conductance (dS/m)	pH	Total Iron (µg/L)	Total Manganese (µg/L)	Total Sodium (µg/L)
001 Mine Water to Purgatoire River	No discharge*					
004 Runoff Pond 4 to Purgatoire River	No discharge*					
007 Runoff Pond 7 to Purgatoire River	No discharge*					
008 Refuse Area Pond to Purgatoire River	No discharge*					
010 SAE near Pond 7 to Purgatoire River Mine	No discharge*					
011 SAE to Purgatoire River	No discharge*					
012 SAE to Purgatoire River	No discharge*					

\*No discharge occurred during any monitoring period from January 2021 through December 2021

**Table 10B. Average Monthly Flow Rates for the Purgatoire River at Madrid, Colorado (USGS Data)**

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2002	12.4	14.2	13.3	11.0	14.4	9.51	12.5	8.12	17.9	16.4	12.7	10.3
2003	12.0	11.3	15.7	24.1	59.9	119.9	46.3	51.0	119.3	35.5	23.8	18.4
2004	17.0	18.6	22.9	172.1	306.6	146.6	164.7	263.7	46.0	35.7	31.0	28.5
2005	30.2	35.1	38.4	141.1	332.7	326.4	115.9	104.1	44.4	39.5	29.4	22.6
2006	21.8	21.7	17.3	20.8	46.9	38.8	80.8	136.9	74.2	73.1	47.2	37.5
2007	40.0	51.9	75.3	103.2	233.5	236.5	115.5	145.5	65.7	44.5	30.0	26.4
2008	26.5	30.0	40.1	72.6	151.6	203.0	114.3	148.4	68.6	44.3	35.8	34.0
2009	32.3	29.1	29.8	50.8	178.2	180.5	14.9	35.2	41.5			
Average	24.0	26.5	31.6	74.5	165.5	157.7	83.1	111.6	59.7	41.3	30.0	25.4
Maximum	40.0	51.9	75.3	172.1	332.7	326.4	164.7	263.7	119.3	73.1	47.2	37.5
Minimum	12.0	11.3	13.3	11.0	14.4	9.5	12.5	8.1	17.9	16.4	12.7	10.3

The existing surface water rights in the permit area and adjacent areas were compiled from records of the Colorado Division of Water Resources and are summarized in Table I0C. The primary sources of diversion are the Purgatoire River, South Fork Purgatoire River, North Fork Purgatoire River, and various seepage locations. Irrigation is the primary use of surface water diversions in the areas adjacent to the permit area. Other uses include domestic, industrial, stock, municipal, and fisheries.

WFC has conducted further surface water baseline and operational monitoring. Baseline studies include establishing flumes in Apache and Santistevan Canyons. Quality and flow measurements were taken during 1984 and 1985 in these canyons as well as the Middle Fork or the Purgatoire River. Monthly flow and water quality data has been collected in Wet, Lopez, and Cherry Canyons and the Purgatoire River. WFC also evaluated springs and seeps in and adjacent to the permit area. Exhibit 10, Annual Hydrologic Monitoring Report, contains all surface water data taken since NECC acquired the New Elk Mine.

#### Spring and Seeps

As part of previous New Elk and Golden Eagle permitting, preliminary spring/seep surveys were conducted as early as 1984 using aerial photographs. Previously identified by the USGS were first examined for characteristic features which were then applied to the area of interest. Primary selection criteria included anomalous green vegetation and the presence of deciduous trees along drainage bottoms. There are a total of twelve potential springs and seeps sites identified within a one-mile buffer of the PR-6 permit boundary. Locations of these springs and seeps are shown on Map 8 and are summarized in Table 11a, Preliminary Spring/Seep Locations. Stock pond and windmill locations are also plotted on Map 8, Regional Hydrology.

As part of the hydrology sampling the springs and seeps will be monitored as well as their locations confirmed. Parameters measured will included pH, flow, conductivity, and temperature. The results of this inventory will be presented in Table 12, Results of Field Spring and Seep Inventory.

For the purposes of this discussion no distinction is made between springs or seeps. It appears however, most of the water encountered was a result of seepage. All of the water, with the exception of No. 23 in Apache Canyon and springs in Santistevan Canyon, come from seepage from coal or the interfaces between coal and shale or sandstone. No. 14 in Apache Canyon is a developed spring, while Santistevan Canyon springs

**Table 10C**  
**Existing Water Rights in the Permit and Adjacent Areas**

<b>Administration No.</b>	<b>Name of Structure</b>	<b>Structure Type</b>	<b>Appropriation Date</b>	<b>Use Type<sup>1</sup></b>	<b>Location of Point of Diversion</b>	<b>Water Source</b>	<b>Decreed Amount of Water</b>
5935.00000	Dom Ditch	Ditch 1	4/1/1866	I	T34S R67W Sec. 2	South Fork Purgatoire River	2.4000 cfs
42091.00000	CF&I No. 21	Well	3/29/65	S	T34S R67W Sec. 4	Seepage, Arkansas River	0.0110 cfs
7394.00000	Maes-Duran Ditch	Ditch 2	3/30/1870	I	T34S R67W Sec. 10	South Fork Purgatoire River	5.0000 cfs
6666.00000	J L Bialpando Vialpando Ditch	Ditch 3	4/1/1868	I	T33S R68W Sec. 11	North Fork Purgatoire River	1.6000 cfs
6666.00000	James Lash Ditch	Ditch 4	4/1/1868	I	T33S R68W Sec., 13	North Fork Purgatoire River	1.8000 cfs
7045.00000	Peter Caplett NS Ditch	Ditch 5	4/15/1869	I	T33S R68W Sec. 13	North Fork Purgatoire River	2.2000 cfs
7337.00000	Peter Caplett Ditch	Ditch 6	2/1/1870	I	T33S R68W Sec. 13	North Fork Purgatoire River	1.0000 cfs
26304.08918	Crooked Creek No. 13 Ditch	Ditch 7	6/1/1874	I	T33S R68W Sec. 17	Crooked Creek	4.0000 cfs
19579.08918	Crooked Creek No. 2 Ditch	Ditch 7	6/1/1874	I	T33S R68W Sec. 17	Crooked Creek	4.0000 cfs
19579.08918	Crooked Creek No. 3 Ditch	Ditch 7	6/1/1874	I	T33S R68W Sec. 17	Crooked Creek	4.0000 cfs
41603.00000	CF&I Well No. 13	Well	11/27/1963	S	T34S R67W Sec. 32	Seepage, Arkansas River	0.00200 cfs
41609.00000	CF&I Well No. 16	Well	12/3/1963	S	T34S R67W Sec. 34	Seepage, Arkansas River	0.00200 cfs
41843.00000	CF&I Well No. 18	Well	7/24/1964	S	T34S R67W Sec. 28	Seepage, Arkansas River	0.0066 cfs
42087.00000	CF&I Well No. 22	Well	3/25/1965	S	T34S R67W Sec. 28	Seepage, Arkansas River	0.0150 cfs
42096.00000	CF&I Well No. 20	Well	4/3/1965	S	T34S R67W Sec. 1	Seepage, Arkansas River	0.0089 cfs
6391.00000	Storz Ditch	Ditch 8	7/1/1867	I	T33S R68W Sec. 20	Mid-Fork Purgatoire River	2.2000 cfs
6391.00000	Russel Reservoir	Reservoir	7/1/1867	I	T33S R68W Sec. 20	Mid-Fork Purgatoire River	312.0000 acre-foot
48940.00000	Russel Res 83CW131	Reservoir	12/29/1983	I, M <sup>2</sup>	T33S R68W Sec. 20	Whiskey Creek	77.0000 acre-foot
6391.00000	Storz	Ditch 9	7/1/1867	I, M <sup>2</sup>	T33S R68W Sec. 20	North Fork Purgatoire River	0.7100 cfs
37070.00000	CF&I Well No. 1	Well	6/30/1951	N, D	T33S R68W Sec. 21, SENW	Seepage, Purgatoire River	0.0110 cfs
4323.00000	New Elk Mine West Diversion	Mine, Other 10	11/1/1861	I, M <sup>2</sup>	T33S R68W Sec. 21, NESE	Seepage, Mid-Fork Purgatoire River	0.3300 cfs
6149.00000	New Elk Mine West Diversion	Mine, Other 11	11/1/1866	I, M	T33S R68W Sec. 21, NESE	Seepage, Mid-Fork Purgatoire River	1.0000 cfs
8126.00000	Chavez Ditch	Ditch 12	3/31/1872	I	T33S R68W Sec. 22, SWNW	Mid-Fork Purgatoire River	1.4000 cfs
43788.00000	CF&I Well No. 30	Well	11/20/1969	D	T33S R68W Sec. 22, SESW	Seepage	0.0220 cfs
6149.00000	New Elk Mine Discharge	Mine, Other 13	11/1/1866	I, M <sup>2</sup>	T35S R68W Sec. 23, SWNE	Seepage, Mid-Fork Purgatoire River	1.0000 cfs
4323.00000	New Elk Mine East Diversion	Mine, Other	11/1/1861	I, M <sup>2</sup>	T33S R68W Sec. 23, SWNE	Seepage, Mid-Fork Purgatoire River	121.25000 acre-feet
4323.00000	New Elk Mine Discharge	Mine, Other 14	11/1/1861	I, M <sup>2</sup>	T33S R68W Sec. 23, SWNE	Seepage, Mid-Fork Purgatoire River	121.25000 acre-feet
6149.00000	New Elk Mine East Diversion	Mine, Other	11/1/1866	I, M <sup>2</sup>	T33S R68W Sec. 23, SWNE	Seepage, Mid-Fork Purgatoire River	1.0000 cfs
39171.00000	CF&I Well No. 3	Well	3/31/1957	N, D	T33S R68W Sec. 23, SENW	Seepage, Purgatoire River	0.0280 cfs

**Table 10C**  
**Existing Water Rights in the Permit and Adjacent Areas**

<b>Administration No.</b>	<b>Name of Structure</b>	<b>Structure Type</b>	<b>Appropriation Date</b>	<b>Use Type<sup>1</sup></b>	<b>Location of Point of Diversion</b>	<b>Water Source</b>	<b>Decreed Amount of Water</b>
40786.00000	CF&I Well No.4	Well	9/1/1967	N	T33S R68W Sec. 23, SENW	Seepage, Purgatoire River	0.0670 cfs
37375.00000	CF&I Well No.2	Well	4/30/1952	N	T33S R68W Sec. 23, NWSE	Seepage	0.2500 cfs
4780.00000	Dolores Duran Ditch	Ditch 15	2/1/1863	I	T33S R68W Sec. 2	Seepage, Mid-Fork Purgatoire River	1.0000 cfs
6329.00000	Ignacio & Chacon Ditch	Ditch 16	4/30/1867	I	T33S R68W Sec. 24	North Fork Las Purgatoire River	1.2000 cfs
6329.00000	Dolores Duran Ditch	Ditch 17	4/30/1867	I	T33S R68W Sec. 24	Mid-Fork Purgatoire River	2.0000 cfs
12539.00000	Rafael Griego Ditch	Ditch 18	4/30/1884	I	T33S R68W Sec. 24	Purgatoire River	0.8000 cfs
6329.0000	Ignacio Chacon	Ditch 19	4/30/1867	I, M <sup>2</sup>	T33S R68W Sec. 24	North Fork Purgatoire River	0.4000 cfs
6391.00000	Maxwell Irr. No. 11 Ditch	Ditch 20	7/1/1867	I	T33S R68W Sec. 29	Mid-Fork Purgatoire River	4.0000 cfs
10228.0000	Maxwell Irr. No. 10 Ditch	Ditch21	1/1/1878	I, M, N	T33S R68W Sec. 29	Mid-Fork Purgatoire River	1.3000 cfs
19579.00000	Russell Lake Ditch	Ditch 22	1/1/1878	I	T33S R68W Sec. 29	Mid-Fork Purgatoire River	0.7000 cfs
48940.00000	Stonewall Res. No. 2	Reservoir 3	12/29/1983	I, M <sup>2</sup>	T33S R68W Sec. 29	South Fork Purgatoire River	2100.000 acre-foot
48940.00000	Stonewall Res. No. 1	Reservoir 4	12/29/1983	I, M <sup>2</sup>	T33S R68W Sec. 29	South Fork Purgatoire River	5000.000 acre-foot
4323.00000	Golden Eagle Mine Diversion	Mine	11/1/1861	I, M <sup>2</sup>	T33S R68W Sec. 29, SWNE	Seepage, Mid-Fork Purgatoire River	6.6000 cfs
6149.00000	Golden Eagle Mine Diversion	Mine, Other 23	11/1/1866	I, M <sup>2</sup>	T33S R68W Sec. 29 SWNE	Seepage, Mid-Fork Purgatoire River	1.0000 cfs
5904.00000	Segundo Ditch Golden Eagle Discharge	Ditch Well	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire River	0.3300 cfs
5904.00000	Golden Eagle Diversion	Mine	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire River	0.3300 cfs
5904.00000	Hill Ranch Aug Plan	Augmentation	3/1/1866	I, M, N	T33S R68W Sec. 30	Ricon Creek	0.72 cfs
5904.00000	Maxwell Ditch No. 9	Ditch	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire	0.3300 cfs
5904.00000	Maxwell Ditch No. 10	Ditch	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire	20.0000 cfs
5904.00000	New Elk East Diversion	Mine	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire	121.25000 acre-feet
5904.00000	New Elk Mine Discharge	Mine	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire	121.25000 acre-feet
5904.00000	New West Diversion	Mine	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire	121.25000 acre-feet
5904.00000	Russell Reservoir	Reservoir	3/1/1866	I, M, N	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire	5.0000 cfs
9983.00000	Maxwell Irr. No. 13 Ditch	Ditch	5/1/1877	I, M, N	T33S R68W Sec. 30	Mid-Fork Purgatoire River	0.9000 cfs
4323.0000	Antonio Lopez Ditch	Ditch	11/1/1861	I	T33S R68W Sec. 30	Seepage, Mid-Fork Purgatoire River	0.7500 cfs

**Table 10C**  
**Existing Water Rights in the Permit and Adjacent Areas**

<b>Administration No.</b>	<b>Name of Structure</b>	<b>Structure Type</b>	<b>Appropriation Date</b>	<b>Use Type<sup>1</sup></b>	<b>Location of Point of Diversion</b>	<b>Water Source</b>	<b>Decreed Amount of Water</b>
9251.00000	Randolph & Howlett Irr. Ditch	Ditch	4/30/1875	I	T33S R68W Sec. 30	Mid-Fork Purgatoire River	0.5000 cfs
8126.00000	Maxwell Irr. No. 9 Ditch	Ditch	3/31/1872	I	T33S R68W Sec. 30	Mid-Fork Purgatoire River	3.0000 cfs
10044.00000	A Storz No. 2 Ditch	Ditch	7/1/1877	I, M, N	T33S R68W Sec. 30	Mid-Fork Purgatoire River	0.7000 cfs
48940.00000	South Lake Res 83CW131	Reservoir	12/29/1983	I, M <sup>2</sup>	T33S R68W Sec. 30	Mid-Fork Purgatoire River	300.0000 acre-foot
42611.00000	Barron No. 1	Well	8/31/1966	I, D	T33S R68W Sec. 30, NWNE	Seepage, Arkansas River	0.0670 cfs
36284.0000	Jamieson Well No. 1	Well	5/5/1949	D	T33S R68W Sec. 30, NWNE	Seepage, Arkansas River	0.0440 cfs
35364.00000	Beardon Well No. 1	Well	10/28/1946	D	T33S R68W Sec. 30, NWNE	Seepage, Arkansas River	0.0220 cfs
35861.00000	Gross No. 1 Well	Well	3/8/1948	D	T33S R68W Sec. 30, NWNE	Seepage, Arkansas River	0.0440 cfs
35226.00000	John Bearden Well No.1	Well	6/12/1946	D	T33S R68W Sec. 30, NWNE	Seepage, Arkansas River	0.0130 cfs
46386.00000	Smokey's Fish Flow	Pipeline	12/31/1973	P	T33S R68W Sec. 30, SWNE	Mid-Fork Purgatoire River	1.0000 cfs
42458.00000	Stonewall Well	Well	3/31/1966	D	T33S R68W Sec. 30, NENW	Seepage, Arkansas River	0.0330 cfs
17533.00000	Maxwell Irr. No. 3 Ditch	Ditch	1/1/1898	I	T33S R68W Sec. 31	Abbott Creek	1.0200 cfs
38888.00000	CF&I Well No. 1	Well	6/21/1956	I, D, S	T33S R68W Sec. 31, NWNW	Purgatoire River	0.1330 cfs
6149.00000	Ramon Torres Ditch	Ditch 24	11/1/1866	I, M, M	T34S R68W	South Fork Purgatoire River	7.0000 cfs
7791.00000	Garcia-Trujillo	Ditch 25	5/1/1871	I	T34S R68W Sec. 10	South Fork Purgatoire River	0.8000 cfs
7397.00000	Santistevan Ditch	Ditch 26	4/2/1870	I	T33S R67W Sec. 19	Purgatoire River	3.2000 cfs
9231.00000	Cosme Deaguero Ditch	Ditch 27	4/10/1875	I	T33S R67W Sec. 27	Purgatoire River	1.2000cfs
11111.00000	Juan Felipe Lopez Ditch	Ditch 28	6/2/1880	I	T33S R67W Sec. 27	Purgatoire River	0.2000 cfs
7315.00000	Samora Ditch	Ditch 29	1/10/1870	I	T33S R67W Sec. 29	Purgatoire River	2.4000 cfs
36159.00000	Whiskey Well No. 1	Well	12/31/1948			Purgatoire River	0.2222 cfs
8350.00000	Turner Ditch	Ditch 30	11/10/1872	I	T33S R67W Sec. 29	Purgatoire River	1.8000 cfs
6149.00000	Golden Eagle Mine Discharge	Mine, Other	11/1/1866	I, M <sup>2</sup>	T33S R67W Sec. 29, NESW	Seepage, Mid-Fork Purgatoire River	2.6800 cfs
4323.00000	Golden Eagle Mine Discharge	Mine, Other	11/1/1861	I, M <sup>2</sup>	T33S R67W Sec. 29, NESW	Seepage, Mid-Fork Purgatoire River	0.7500 cfs
7426.00000	Ramos Ditch	Ditch 31	5/1/1870	I	T33S R67W Sec. 34	Purgatoire River	1.8000 cfs
26304.12245	Julianita Vigil Ditch	Ditch 32	7/11/1883	I	T33S R67W Sec. 35	South Fork Purgatoire River	0.5000 cfs
19377.19173	East Weston Pipeline	Pipeline	6/30/1902	N, D	T33S R67W Sec. 35	South Fork Purgatoire River	0.25000 cfs
8521.00000	Weston Ditch	Ditch 33	4/30/1873	I	T33S R67W Sec. 35	South Fork Purgatoire River	5.0000 cfs
42001.00000	CF&I Well No. 19	Well	12/29/1964	D	T33S R67W Sec. 35	Seepage, Arkansas River	0.0310 cfs
8825.0000	Alejandro Torres Vigil D	Ditch 34	2/28/1874	I	T34S R67W Sec. 1	South Fork Purgatoire River	0.089 cfs
4780.00000	Dolores Duran Ditch	Ditch	2/1/1863	I	T33S R68W Sec. 24 SWNE	Middle Fork Purgatoire River	2.6000 cfs
6329.00000	Dolores Duran Ditch	Ditch	4/30/1867	I	T33S R68W Sec. 24 SWNE	Middle Fork Purgatoire River	2.6000 cfs
7397.00000	Santistevan Ditch	Ditch	4/2/1870	I	T33S R67W Sec. 19 NWSE	Purgatoire River	3.2000 cfs
19579.19173	Segundo Pump and Pipeline	Pipeline	6/30/1902	N	T34S R66W Sec. 1 SWSE	Purgatoire River	0.75000 cfs

**Table 10C**  
**Existing Water Rights in the Permit and Adjacent Areas**

<b>Administration No.</b>	<b>Name of Structure</b>	<b>Structure Type</b>	<b>Appropriation Date</b>	<b>Use Type<sup>1</sup></b>	<b>Location of Point of Diversion</b>	<b>Water Source</b>	<b>Decreed Amount of Water</b>
59900.00000	Solitario Pond	Reservoir	12/31/2013	I, P	T33S R67W Sec. 19 NESW	Purgatoire River	7.0000 acre-feet

Source: Colorado Division of Water Resources, 1993 and 2022.

1 Use Types: I= Irrigation, M= Municipal, N= Industrial, S= Stock, P= Fishery

2 More than three uses are decreed.

Notes:

cfs = cubic feet per second