



Water Quality Assessment
an unnamed tributary to South Fork of the Arkansas River
Powder Monarch LLC, Monarch Ski Area WWTF
and
Monarch Mountain Lodge, Monarch Mountain Lodge WWTF

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I. Water Quality Assessment Summary

Table A-1 includes summary information related to this WQA. This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and Monitoring and Evaluation listings; low flow and facility flow summaries; and a list of parameters evaluated.



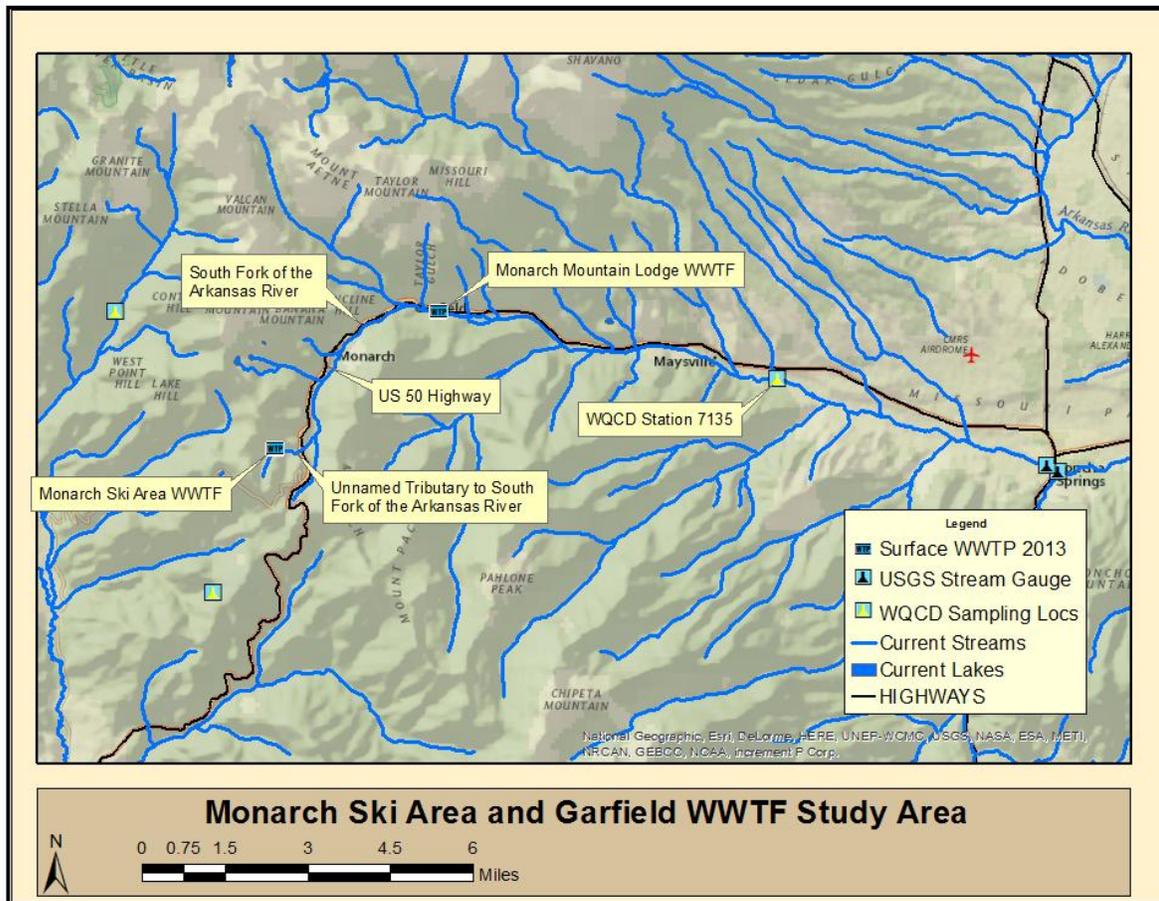
<b>Table A-1 WQA Summary</b>					
<b>Facility Information</b>					
<b>Facility Name</b>		<b>Permit Number</b>	<b>Design Flow (max 30-day ave, MGD)</b>	<b>Design Flow (max 30-day ave, CFS)</b>	
F1. Monarch Ski Area WWTF		CO0031399	0.023	0.036	
F2. Monarch Mountain Lodge WWTF		CO0028444	0.041	0.063	
<b>Receiving Stream Information</b>					
<b>Receiving Stream Name</b>	<b>Segment ID</b>	<b>Designation</b>	<b>Classification(s)</b>		
S1. unnamed tributary to South Fork of the Arkansas River	COARUA12b	Undesignated	Aquatic Life Cold 1 Recreation Class E Agriculture Water Supply		
S2. South Fork of the Arkansas River	COARUA12b	Undesignated	Aquatic Life Cold 1 Recreation Class E Agriculture Water Supply		
<b>Low Flows (cfs)</b>					
<b>Receiving Stream Name</b>	<b>1E3 (1-day)</b>	<b>7E3 (7-day)</b>	<b>30E3 (30-day)</b>	<b>Ratio of 30E3 to the Design Flow (cfs)</b>	
S1. unnamed tributary to South Fork of the Arkansas River	0	0	0	0:1	
S2. South Fork of the Arkansas River	2.0	2.2	2.3	37:1	
<b>Regulatory Information</b>					
<b>T&amp;E Species</b>	<b>303(d) (Reg 93)</b>	<b>Monitor and Eval (Reg 93)</b>	<b>Existing TMDL</b>	<b>Temporary Modification(s)</b>	<b>Control Regulation</b>
None	None	None	None	As(ch)=hybrid Expiration 12/31/2021	Regulation 85
<b>Pollutants Evaluated</b>					
Ammonia, E. Coli, TRC, Nitrate, Nitrite, Temp					



## II. Introduction

The water quality assessment (WQA) of an unnamed tributary to South Fork of the Arkansas River near the Monarch Ski Area wastewater treatment facility (WWTF), located in Chaffee County, is intended to determine the assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other requirements as discussed in the permit rationale. Figure A-1 contains a map of the study area evaluated as part of this WQA.

FIGURE A-1



The Monarch Ski Area WWTF discharges to an unnamed tributary to South Fork of the Arkansas River, which is stream segment COARUA12b. The Monarch Mountain Lodge WWTF discharges to the mainstem of the South Fork of the Arkansas River, which is also stream segment COARUA12b. The discharge from the Monarch Ski Area WWTF eventually enters the mainstem of the South Fork of the Arkansas River in approximately 0.5 miles. This means the Arkansas River Basin, Upper Arkansas Sub-basin, Stream Segment 12b. This segment is composed of the “Mainstem of



Cottonwood Creek (Chaffee County), from the source to the confluence with the Arkansas River; South Fork of the Arkansas, including all tributaries and wetlands, from the National Forest boundary to the confluence with the Arkansas River.”. Stream segment COARUA12b is classified for Aquatic Life Cold 1, Recreation Class E, Water Supply, and Agriculture.

Information used in this assessment includes data gathered from the Monarch Ski Area WWTF, the Monarch Mountain Lodge WWTF, the Division, the U.S. Geological Survey (USGS), and communications with the local water commissioner. The data used in the assessment consist of the best information available at the time of preparation of this WQA analysis.

### **III. Water Quality Standards**

#### **Narrative Standards**

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

(i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or (v) produce a predominance of undesirable aquatic life; or (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

(i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in CDPS discharge permits.

#### **Standards for Organic Parameters and Radionuclides**

**Radionuclides:** Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.



In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

Table A-2 Radionuclide Standards	
Parameter	Picocuries per Liter
Americium 241*	0.15
Cesium 134	80
Plutonium 239, and 240*	0.15
Radium 226 and 228*	5
Strontium 90*	8
Thorium 230 and 232*	60
Tritium	20,000

\*Radionuclide samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values.

**Organics:** The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as “interim standards” and will remain in effect until alternative permanent standards are adopted by the Commission. These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards for organics apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where the Water Quality Control Commission has made such determination.

Because the an unnamed tributary to South Fork of the Arkansas River is classified for Aquatic Life Cold 1, with a water supply designation, the water supply, water + fish, and aquatic life standards apply to this discharge.



## **Salinity and Nutrients**

The Division's policy, Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, may be applied to discharges where an agricultural water intake exists downstream of a discharge point. Limitations for electrical conductivity and sodium absorption ratio may be applied in accordance with this policy.

## **Nutrients**

**Phosphorus and Nitrogen:** Regulation 85, the *Nutrients Management Control Regulation* has been adopted by the Water Quality Control Commission and became effective September 30, 2012. This regulation contains requirements for total phosphorus and Total Inorganic Nitrogen (TIN) concentrations for some point source dischargers. Limitations for phosphorus and TIN may be applied in accordance with this regulation.

## **Temperature**

Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

## **Segment Specific Numeric Standards**

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Water Quality Control Commission. The standards in Table A-3 have been assigned to stream segment COARUA12b in accordance with the *Classifications and Numeric Standards for Arkansas River Basin*.



<b>Table A-3</b>
<b>In-stream Standards for Stream Segment COARUA12b</b>
<i>Physical and Biological</i>
Dissolved Oxygen (DO) = 6 mg/l, minimum (7 mg/l, minimum during spawning)
pH = 6.5 - 9 su
E. coli chronic = 126 colonies/100 ml
Temperature June-Sept = 17° C MWAT and 21.7° C DM
Temperature Oct-May = 9° C MWAT and 13° C DM
Chlorophyll <i>a</i> = 150 mg/m <sup>2</sup>
<i>Inorganic</i>
Total Ammonia acute and chronic = TVS
Chlorine acute = 0.019 mg/l
Chlorine chronic = 0.011 mg/l
Free Cyanide acute = 0.005 mg/l
Sulfide chronic = 0.002 mg/l
Boron chronic = 0.75 mg/l
Nitrite acute = 0.05 mg/l
Nitrate acute = 10 mg/l
Chloride chronic = 250 mg/l
Sulfate chronic = For WS, the greater of ambient water quality as of January 1, 2000 or 250 mg/l
Total Phosphorus = 110 µg/l
<i>Metals</i>
Dissolved Arsenic acute = 340 µg/l
Total Recoverable Arsenic chronic = 0.02 µg/l
Dissolved Cadmium acute for trout and Dissolved Cadmium chronic = TVS
Total Recoverable Trivalent Chromium acute = 50 µg/l
Dissolved Trivalent Chromium chronic = TVS
Dissolved Hexavalent Chromium acute and chronic = TVS
Dissolved Copper acute and chronic = TVS
Dissolved Iron chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 300 µg/l
Total Recoverable Iron chronic = 1000 µg/l
Dissolved Lead acute and chronic = TVS
Dissolved Manganese chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 50 µg/l
Dissolved Manganese acute and chronic = TVS
Total Recoverable Molybdenum chronic = 160 µg/l
Total Mercury chronic = 0.01 µg/l
Dissolved Nickel acute and chronic = TVS
Dissolved Selenium acute and chronic = TVS
Dissolved Silver acute and Dissolved Silver chronic for trout = TVS
Dissolved Zinc acute and chronic = TVS



**Table Value Standards and Hardness Calculations**

As metals with standards specified as TVS are not included as parameters of concern for this facility, the hardness value of the receiving water and the subsequent calculation of the TVS equations is inconsequential and is therefore omitted from this WQA.

**IV. Receiving Stream Information**

**Low Flow Analysis**

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

The Division determined in the previous permit that the receiving stream is intermittent based on information provided by the USGS National Hydrography dataset (NHD). The Division has again concluded that the small steep tributary stream has zero 1E3 and 30E3 monthly flows since groundwater depth in the area is about 35 feet. Communications with the local water commissioner have confirmed that the assumption of zero low flow is consistent with the actual conditions of the low flows for the unnamed tributary to South Fork of the Arkansas River at the Monarch Ski Area WWTF (Table A-4a).

<b>Table A-4a</b>													
<b>Low Flows for an unnamed tributary to South Fork of the Arkansas River at the Monarch Ski Area WWTF</b>													
<i>Low Flow (cfs)</i>	<i>Annual</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
1E3 Acute	0	0	0	0	0	0	0	0	0	0	0	0	0
7E3 Chronic	0	0	0	0	0	0	0	0	0	0	0	0	0
30E3 Chronic	0	0	0	0	0	0	0	0	0	0	0	0	0

The ratio of the low flow of an unnamed tributary to South Fork of the Arkansas River to the Monarch Ski Area WWTF design flow is 0:1

Note that since the low flow has been determined to be zero, the ambient water quality discussion is unnecessary for the Monarch Ski Area WWTF. This is explained in more detail under the Technical Information discussion in Section VI.



Monarch Mountain Lodge WWTF is located about 4.5 miles downstream from the Monarch Ski WWTF and discharges to the South Fork of the Arkansas River. There is no gage station with current flow data representative of the South Fork of the Arkansas River available. Therefore, to determine the low flows in the South Fork of the Arkansas River at the Monarch Mountain Lodge WWTF, a comparable watershed with an active gage station has been used. The comparable station was USGS station 07083000 (Halfmoon Creek near Malta, CO), located about 45 miles north of the South Fork of the Arkansas River. This station provides comparable flow measurements because it was the closest watershed measuring flow in a natural drainage that has similar orientation, climate, size, and elevation. Closer stations on Chalk, Cottonwood, South Arkansas, and Poncha Creeks all had periods of record between 1911 and 1916 or that ended in 1985, and therefore were not deemed representative. Data from October 2003 to September 2013 from the Halfmoon Creek gage were used to calculate the low flows available to Monarch Mountain Lodge WWTF.

The comparable Halfmoon Creek gage watershed has a USGS recorded area of 23.5 square miles, while the South Fork of the Arkansas River above the Monarch Mountain Lodge WWTF discharge point has a GIS-calculated area of 18.8 square miles, resulting in a ratio of 18.8/23.5 (0.8). The low flow calculated at the gage station was multiplied by the ratio of watershed areas to determine the low flows in the South Fork of the Arkansas River at Monarch Mountain Lodge WWTF and are presented in table A-4b.

<i>Low Flow (cfs)</i>	<i>Annual</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
1E3 Acute	2.0	2.0	2.3	2.3	2.5	2.7	14.0	11.0	8.8	6.6	4.7	2.6	2.0
7E3 Chronic	2.2	2.2	2.3	2.3	2.4	2.7	14.0	11.0	8.8	6.6	4.7	2.6	2.2
30E3 Chronic	2.3	2.3	2.5	2.5	2.5	2.7	14.0	14.0	8.8	6.6	4.7	2.6	2.3

During the months of May, June, August, September, October, and November; the acute low flow calculated by DFLOW exceeded the 30E3 chronic low flow. In accordance with Division standard procedures, the acute low flows were thus set equal to the 30E3 chronic low flows for these months.

During the months of May, June, August, September, October, and November; the 7E3 chronic low flow calculated by DFLOW exceeded the 30E3 chronic low flow. In accordance with Division standard procedures, the 7E3 chronic low flows were thus set equal to the 30E3 chronic low flows for these months.

For ammonia modeling, a prorated flow increase from the Monarch Ski Area WWTF point of discharge to the Monarch Mountain Lodge WWTF point of discharge was used to account for the difference of dilution flows above the two facilities. This was calculated on a monthly basis by dividing the difference in flows between the two facilities by their distance apart.



### **Mixing Zones**

The amount of the available assimilative capacity (dilution) that may be used by the permittee for the purposes of calculating the WQBELs may be limited in a permitting action based upon a mixing zone analysis or other factor. These other factors that may reduce the amount of assimilative capacity available in a permit are: presence of other dischargers in the vicinity; the presence of a water diversion downstream of the discharge (in the mixing zone); the need to provide a zone of passage for aquatic life; the likelihood of bioaccumulation of toxins in fish or wildlife; habitat considerations such as fish spawning or nursery areas; the presence of threatened and endangered species; potential for human exposure through drinking water or recreation; the possibility that aquatic life will be attracted to the effluent plume; the potential for adverse effects on groundwater; and the toxicity or persistence of the substance discharged.

Unless a facility has performed a mixing zone study during the course of the previous permit, and a decision has been made regarding the amount of the assimilative capacity that can be used by the facility, the Division assumes that the full assimilative capacity can be allocated. Note that the review of mixing study considerations, exemptions and perhaps performing a new mixing study (due to changes in low flow, change in facility design flow, channel geomorphology or other reason) is evaluated in every permit and permit renewal.

If a mixing zone study has been performed and a decision regarding the amount of available assimilative capacity has been made, the Division may calculate the water quality based effluent limitations (WQBELs) based on this available capacity. In addition, the amount of assimilative capacity may be reduced by T&E implications.

Since the receiving stream for the Monarch Ski Area WWTF has a zero low flow as calculated above, the WQBELs would be equal to the WQS, and therefore consideration of full or reduced assimilative capacity is inconsequential.

For the Monarch Mountain Lodge WWTF, 100% of the available assimilative capacity may be used because the 30E3 chronic low flow is greater than 20:1, is a minor domestic facility, and the discharge is not to a T&E stream segment, and is not expected to have an influence on any of the other factors listed above.

### **Ambient Water Quality**

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19).

The ambient water quality was not assessed for an unnamed tributary to South Fork of the Arkansas River because the background in-stream low flow condition is zero, and because no ambient water



quality data are available for an unnamed tributary to South Fork of the Arkansas River upstream of the Powder Monarch LLC WWTF discharge.

The ambient water quality for the South Fork of the Arkansas River is evaluated in this WQA analysis for use in determining assimilative capacities and in completing antidegradation reviews for pollutants of concern, where applicable. To conduct an assessment of the ambient water quality upstream of the Monarch Mountain Lodge WWTF, data were gathered from Division Station 7135 (S Arkansas R at 220 RD near Maysville) located approximately 6.5 miles downstream from the Monarch Mountain Lodge WWTF. Data were available for a period of record from January 2000 through April 2011. These data are summarized in Table A-5.

<b>Table A-5</b>								
<b>Ambient Water Quality for the South Fork of the Arkansas River</b>								
<i>Parameter</i>	<i>Number of Samples</i>	<i>15th Percentile</i>	<i>50th Percentile</i>	<i>85th Percentile</i>	<i>Mean</i>	<i>Maximum</i>	<i>Chronic Stream Standard</i>	<i>Notes</i>
DO (mg/l)	18	8.1	9.3	10	9.3	11	7	
pH (su)	17	7.4	7.9	8.2	7.9	9.5	6.5-9	
<i>E. coli</i> (#/100 ml)	5	1	6	28	6	38	126	1, 2
NH <sub>3</sub> as N, Tot (mg/l)	4	0	0.0075	0.029	0.014	0.04	TVS	2
Sulfate (mg/l)	3	10	11	17	13	19	250	
<small>Note 1: The calculated mean is the geometric mean. Note that for summarization purposes, the value of one was used where there was no detectable amount because the geometric mean cannot be calculated using a value equal to zero.</small>								
<small>Note 2: When sample results were below detection levels, the value of zero (one for <i>E. coli</i>) was used in accordance with the Division's standard approach for summarization and averaging purposes.</small>								

## V. Facility Information and Pollutants Evaluated

### Facility Information

The Monarch Ski Area WWTF is located in the NW 1/4 of the NW 1/4 of S17, T49N, R6E; 23715 US Hwy. 50 Monarch, CO; at 38.513611° latitude North and 106.337222° longitude West in Chaffee County. The current design capacity of the facility is 0.023 MGD (0.036 cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity.

The Monarch Mountain Lodge WWF is located in the NE 1/4 of the NE 1/4 of S34, T50N, R6E, NM P.M.; 22700 West Highway 50 Monarch, CO 80201; at 38.5503° latitude North and 106.2867° longitude West in Chaffee County. The current design capacity of the facility is 0.041 MGD (0.063 cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity.

An assessment of Division records indicate that there are 3 facilities discharging to the same stream segment or other stream segments immediately upstream or downstream from this facility. Several



of these facilities are covered by general permits and have limitations set at the water quality standards. These facilities were not modeled in this WQA as they have a minimal impact on the ambient water quality. Some facilities, although on the same stream segment, actually discharge to a different receiving stream and therefore were not considered in this WQA. Other facilities were located more than ten miles from the Monarch Mountain Lodge WWTF and thus were not considered. The nearest dischargers were:

- The Spring Canyon Christian Camp Facility, which discharges to Little Cochetopa Creek, which eventually discharges to the South Fork of the Arkansas River more than 10 miles downstream of the Monarch Mountain Lodge WWTF.

The Monarch Ski Area WWTF is the sole known point source contributor to an unnamed tributary to South Fork of the Arkansas River. No other point sources were identified as dischargers to an unnamed tributary to South Fork of the Arkansas River upstream or downstream of the confluence with the South Fork of the Arkansas River. Note that due to the intermittent nature of stormwater discharges, and that these types of discharges do not typically occur at low flow conditions, they are not considered in this WQA. Due to the in-stream low flow of zero, the assimilative capacities during times of low flow are not affected by nearby contributions. Therefore, modeling nearby facilities in conjunction with this facility was not necessary, except for ammonia which will be modeled together with Monarch Mountain Lodge.

### **Pollutants of Concern**

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit rationale.

There are no site-specific in-stream water quality standards for BOD<sub>5</sub> or CBOD<sub>5</sub>, TSS, percent removal, and oil and grease for this receiving stream. Thus, assimilative capacities were not determined for these parameters. The applicable limitations for these pollutants can be found in Regulation No. 62 and will be applied in the permit for the WWTF.

The following parameters were identified by the Division as pollutants to be evaluated for this facility:

- Total Residual Chlorine
- *E. coli*
- Nitrate
- Ammonia
- Temperature



Based upon the size of the discharge, the lack of industrial contributors, dilution provided by the receiving stream and the fact that no unusually high metals concentrations are expected to be found in the wastewater effluent, metals are not evaluated further in this water quality assessment.

According to the *Rationale for Classifications, Standards and Designations of the Arkansas River*, stream segment COARUA12b is designated a water supply because the Town of Salida withdraws surface water from the South Fork of the Arkansas downstream from the discharge. In addition, there are several drinking water wells just downstream of the Monarch Ski Area WWTF. Thus, the nitrate and other drinking water standards are further evaluated as part of this WQA.

During assessment of the facility, nearby facilities, and receiving stream water quality, no additional parameters were identified as pollutants of concern.

## VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

### Technical Information

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (federal effluent limitations guidelines, state effluent limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections II and III are used to determine the assimilative capacity of an unnamed tributary to South Fork of the Arkansas River near the Monarch Ski Area WWTF for pollutants of concern, and to calculate the WQBELs. For all parameters except ammonia, it is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis. For ammonia, it is the standard procedure of the Division to determine monthly WQBELs using the monthly low flows, as the regulations allow the use of seasonal flows.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants and modeling for pollutants such as ammonia. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard.

The mass-balance equation is expressed as:

$$M_2 = \frac{M_3Q_3 - M_1Q_1}{Q_2}$$

Where,

$$Q_1 = \text{Upstream low flow (1E3 or 30E3)}$$

$$Q_2 = \text{Average daily effluent flow (design capacity)}$$



$Q_3$  = Downstream flow ( $Q_1 + Q_2$ )

$M_1$  = In-stream background pollutant concentrations at the existing quality

$M_2$  = Calculated WQBEL

$M_3$  = Water Quality Standard, or other maximum allowable pollutant concentration

When  $Q_1$  equals zero,  $Q_2$  equals  $Q_3$ , and the following results:

$$M_2 = M_3$$

Because the low flow ( $Q_1$ ) for an unnamed tributary to South Fork of the Arkansas River is zero, the WQBELs for an unnamed tributary to South Fork of the Arkansas River for the pollutants of concern are equal to the in-stream water quality standards. These conditions apply for the Monarch Ski Area facility.

For the Monarch Mountain Lodge WWTF, the upstream background pollutant concentrations used in the mass-balance equation will vary based on the regulatory definition of existing ambient water quality. For most pollutants, existing quality is determined to be the 85<sup>th</sup> percentile. For metals in the total or total recoverable form, existing quality is determined to be the 50<sup>th</sup> percentile. For pathogens such as fecal coliform and *E. coli*, existing quality is determined to be the geometric mean.

For temperature, the highest 7-day mean (for the chronic standard) of daily average stream temperature, over a seven consecutive day period will be used in calculations of the chronic temperature assimilative capacity, where the daily average temperature should be calculated from a minimum of three measurements spaced equally through the day. The highest 2-hour mean (for the acute standard) of stream temperature will be used in calculations of the acute temperature assimilative capacity. The highest 2-hour mean should be calculated from a minimum of 12 measurements spaced equally through the day.

A more detailed discussion of the technical analysis is provided in the pages that follow.

### Calculation of WQBELs

Using the mass-balance equation provided in the beginning of Section VI, the acute and chronic low flows set out in Section IV, ambient water quality as discussed in Section IV, and the in-stream standards shown in Section III, the WQBELs for were calculated. The data used and the resulting WQBELs,  $M_2$ , are set forth in Table A-6a for the chronic WQBELs and A-7a for the acute WQBELs for the Monarch Ski Area WWTF. The resulting WQBELs for the Monarch Mountain Lodge WWTF are set forth in Table A-6b for the chronic WQBELs and A-7b for the acute WQBELs.

Where a WQBEL is calculated to be a negative number and interpreted to be zero, or when the ambient water quality exceeds the in-stream standard, the Division standard procedure is to allocate the water quality standard to prevent further degradation of the receiving waters.

**Chlorine:** There are no point sources discharging total residual chlorine within one mile of the Monarch Ski Area WWTF or the Monarch Mountain Lodge WWTF. Because chlorine is rapidly oxidized, in-stream levels of residual chlorine are detected only for a short distance below a source. Ambient chlorine was therefore assumed to be zero.



**E. coli:** There are no point sources discharging E. coli within one mile of the Monarch Ski Area WWTF or the Monarch Mountain Lodge WWTF. Thus, WQBELs were evaluated separately. For E. coli, the Division establishes the 7-day geometric mean limit as two times the 30-day geometric mean WQBEL and also includes maximum limits of 2,000 colonies per 100 ml (30-day geometric mean) and 4,000 colonies per 100 ml (7-day geometric mean). This 2000 colony limitation also applies to discharges to ditches.

**Temperature:**

For the Monarch Ski Area WWTF, the 7E3 low flow is 0, so the discharge is to an effluent dependent (ephemeral stream without the presence of wastewater) water, therefore in accordance with Regulation 31.14(14), no temperature limitations are required.

For the Monarch Mountain Lodge WWTF, The 7E3 low flow is 2.2 cfs, resulting in a dilution ratio (7E3 low flow to effluent) of 35:1. As the discharge is from a Domestic WWTF where the available dilution ratio is > 10:1, in accordance with the Division’s Temperature Policy, no temperature limitations are required.

**Nitrate / Total Inorganic Nitrogen (T.I.N.):** An acute nitrate standard of 10 mg/l is assigned to this segment. Because nitrite and ammonia can also form nitrate, compliance with the nitrate standard is achieved through imposition of a Total Inorganic Nitrogen (T.I.N.) limit. T.I.N. effectively measures nitrate and its precursors including nitrite and ammonia.

<b>Table A-6a</b>						
<b>Chronic WQBELs at the Monarch Ski Area WWTF</b>						
<i>Parameter</i>	<i>Q<sub>1</sub> (cfs)</i>	<i>Q<sub>2</sub> (cfs)</i>	<i>Q<sub>3</sub> (cfs)</i>	<i>M<sub>1</sub></i>	<i>M<sub>3</sub></i>	<i>M<sub>2</sub></i>
E. coli (#/100 ml)	0	0.036	0.036	0	126	<b>126</b>
TRC (mg/l)	0	0.036	0.036	0	0.011	<b>0.011</b>
Chloride (mg/l)	0	0.036	0.036	0	250	<b>250</b>
Sulfate (mg/l)	0	0.036	0.036	0	250	<b>250</b>
Sulfide as H <sub>2</sub> S (mg/l)	0	0.036	0.036	0	0.002	<b>0.002</b>

<b>Table A-6b</b>						
<b>Chronic WQBELs at the Monarch Mountain Lodge WWTF</b>						
<i>Parameter</i>	<i>Q<sub>1</sub> (cfs)</i>	<i>Q<sub>2</sub> (cfs)</i>	<i>Q<sub>3</sub> (cfs)</i>	<i>M<sub>1</sub></i>	<i>M<sub>3</sub></i>	<i>M<sub>2</sub></i>
E. coli (#/100 ml)*	2.3	0.063	2.363	6	126	<b>4525</b>
TRC (mg/l)	2.3	0.063	2.363	0	0.011	<b>0.41</b>
Chloride (mg/l)	2.3	0.063	2.363	0	250	<b>9377</b>
Sulfate (mg/l)	2.3	0.063	2.363	17	250	<b>8756</b>

\*Will be capped at 2,000.

<b>Table A-7a</b>
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<b>Acute QBELs at the Monarch Ski Area WWTF</b>						
<i>Parameter</i>	<i>Q<sub>1</sub> (cfs)</i>	<i>Q<sub>2</sub> (cfs)</i>	<i>Q<sub>3</sub> (cfs)</i>	<i>M<sub>1</sub></i>	<i>M<sub>3</sub></i>	<i>M<sub>2</sub></i>
E. coli (#/100 ml)*						<b>252</b>
TRC (mg/l)	0	0.036	0.036	0	0.019	<b>0.019</b>
Nitrate as N (mg/l)	0	0.036	0.036	0	10	<b>10</b>
Nitrite as N (mg/l)	0	0.036	0.036	0	0.05	<b>0.05</b>

\*The acute QBEL is calculated as double the chronic QBEL

<b>Table A-7b Acute QBELs at the Monarch Mountain Lodge WWTF</b>						
<i>Parameter</i>	<i>Q<sub>1</sub> (cfs)</i>	<i>Q<sub>2</sub> (cfs)</i>	<i>Q<sub>3</sub> (cfs)</i>	<i>M<sub>1</sub></i>	<i>M<sub>3</sub></i>	<i>M<sub>2</sub></i>
E. coli (#/100 ml)*						<b>9050</b>
TRC (mg/l)	2	0.063	2.063	0	0.019	<b>0.62</b>
Nitrate as N (mg/l)	2	0.063	2.063	0	10	<b>327</b>

\*The acute QBEL is calculated as double the chronic QBEL and will be capped at 4,000.

**Ammonia:** The Ammonia Toxicity Model (AMMTOX) is a software program designed to project the downstream effects of ammonia and the ammonia assimilative capacities available to each discharger based on upstream water quality and effluent discharges. To develop data for the AMMTOX model, an in-stream water quality study should be conducted of the upstream receiving water conditions, particularly the pH and corresponding temperature, over a period of at least one year.

Temperature and corresponding pH data sets reflecting upstream ambient receiving water conditions were not available for an unnamed tributary to South Fork of the Arkansas River; therefore, the Division standard procedure is to rely on statistically-based, regionalized data for pH and temperature compiled for similar headwaters as inputs for the AMMTOX model.

Monarch Ski Area WWTF pH data were extracted from the DMR data from April 2011 to June 2014 for the months in which there was discharge. However, pH data were missing for the month of August; thus, pH data from the previous ammonia modeling were used for that month. Temperature data for the Monarch Ski Area WWTF were not available and were therefore extracted from statistically-based, regionalized data for temperature compiled for similar facilities.

Monarch Mountain Lodge WWTF pH data were extracted from the DMR data from May 2007 to May 2013 for the months in which there was discharge. Temperature data for the Monarch Mountain Lodge WWTF were not available and were therefore extracted from statistically-based, regionalized data for temperature compiled for similar facilities.

As mentioned above, prorated flow increases were used to account for the difference in flows between the two facilities. In the AMMTOX model, this was done by inputting accrual rates for each month, which were calculated as the difference in the flows available to the two facilities divided by their distance.



The AMMTOX may be calibrated for a number of variables in addition to the data discussed above. The values used for the other variables in the model are listed below:

- Stream velocity =  $0.3Q^{0.4d}$
- Default ammonia loss rate = 6/day
- pH amplitude was assumed to be medium
- Default times for pH maximum, temperature maximum, and time of day of occurrence
- pH rebound was set at the default value of 0.2 su per mile
- Temperature rebound was set at the default value of 0.7 degrees C per mile.

The results of the ammonia analyses for the Monarch Ski Area WWTF are presented in Table A-8a. The results of the ammonia analyses for the Monarch Mountain Lodge WWTF are presented in Table A-8b.

<b>Table A-8a</b>		
<b>AMMTOX Results for an unnamed tributary to South Fork of the Arkansas River at the Monarch Ski Area WWTF</b>		
<i>Month</i>	<i>Total Ammonia Chronic (mg/l)</i>	<i>Total Ammonia Acute (mg/l)</i>
<b>January</b>	5.4	20.1
<b>February</b>	5.4	20.4
<b>March</b>	5.3	19.7
<b>April</b>	4.9	16.9
<b>May</b>	3.5	9.7
<b>June</b>	3.0	7.5
<b>July</b>	2.7	8.7
<b>August</b>	3.9	15.7
<b>September</b>	3.3	10.5
<b>October</b>	3.9	11.3
<b>November</b>	4.5	14.3
<b>December</b>	4.8	15.7



<b>Table A-8b</b>		
<b>AMMTOX Results for an unnamed tributary to South Fork of the Arkansas River at the Monarch Mountain Lodge WWTF</b>		
<i>Month</i>	<i>Total Ammonia Chronic (mg/l)</i>	<i>Total Ammonia Acute (mg/l)</i>
<b>January</b>	85	175
<b>February</b>	90	195
<b>March</b>	85	180
<b>April</b>	70	150
<b>May</b>	40	90
<b>June</b>	130	300
<b>July</b>	130	275
<b>August</b>	150	450
<b>September</b>	80	200
<b>October</b>	75	175
<b>November</b>	60	130
<b>December</b>	65	125

## VII. Antidegradation Evaluation

As set out in *The Basic Standards and Methodologies for Surface Water*, Section 31.8(2)(b), an antidegradation analysis is required except in cases where the receiving water is designated as “Use Protected.” Note that “Use Protected” waters are waters “that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process” as set out in Section 31.8(2)(b). The antidegradation section of the regulation became effective in December 2000, and therefore antidegradation considerations are applicable to this WQA analysis.

According to the *Classifications and Numeric Standards for Arkansas River Basin*, stream segment COARUA12b is Undesignated. Thus, an antidegradation review is required for this segment if new or increased impacts are found to occur.

### Introduction to the Antidegradation Process

The antidegradation process conducted as part of this water quality assessment is designed to determine if an antidegradation review is necessary and if necessary, to complete the required calculations to determine the limits that can be selected as the antidegradation-based effluent limit (ADBEL), absent further analyses that must be conducted by the facility.

As outlined in the *Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance* (AD Guidance), the first consideration of an antidegradation evaluation is to determine if new or increased impacts are expected to occur. This is determined by a comparison of the newly calculated WQBELs verses the existing permit limitations in place as of



September 30, 2000, and is described in more detail in the analysis. Note that the AD Guidance refers to the permit limitations as of September 30, 2000 as the existing limits.

If a new or increased impact is found to occur, then the next step of the antidegradation process is to go through the significance determination tests. These tests include: 1) bioaccumulative toxic pollutant test; 2) temporary impacts test; 3) dilution test (100:1 dilution at low flow) and; 4) a concentration test.

As the determination of new or increased impacts, and the bioaccumulative and concentration significance determination tests require more extensive calculations, the Division will begin the antidegradation evaluation with the dilution and temporary impact significance determination tests. These two significance tests may exempt a facility from further AD review without the additional calculations.

Note that the antidegradation requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard should be used. The appropriate standards are used in the following antidegradation analysis.

### **Significance Tests for Temporary Impacts and Dilution**

The ratio of the chronic (30E3) low flow to the design flow for the Monarch Ski Area WWTF is 0:1, and is less than the 100:1 significance criteria. Therefore the Monarch Ski Area WWTF is not exempt from an AD evaluation based on the dilution significance determination test, and the AD evaluation must continue.

The ratio of the chronic (30E3) low flow to the design flow for the Monarch Mountain Lodge WWTF is 37:1, and is less than the 100:1 significance criteria. Therefore the Monarch Mountain Lodge WWTF is not exempt from an AD evaluation based on the dilution significance determination test, and the AD evaluation must continue.

For the determination of a new or increased impact and for the remaining significance determination tests, additional calculations are necessary. Therefore, at this point in the antidegradation evaluation, the Division will go back to the new or increased impacts test. If there is a new or increased impact, the last two significance tests will be evaluated.

### **New or Increased Impact and Non Impact Limitations (NILs)**

To determine if there is a new or increased impact to the receiving water, a comparison of the new WQBEL concentrations and loadings versus the concentrations and loadings as of September 30, 2000, needs to occur. If either the new concentration or loading is greater than the September 2000 concentration or loading, then a new or increased impact is determined. If this is a new facility (commencement of discharge after September 30, 2000) it is automatically considered a new or increased impact.



Note that the AD Guidance document includes a step in the New or Increased Impact Test that calculates the Non-Impact Limit (NIL). The permittee may choose to retain a NIL if certain conditions are met, and therefore the AD evaluation for that parameter would be complete. As the NIL is typically greater than the ADBAC, and is therefore the chosen limit, the Division will typically conclude the AD evaluation after determining the NIL. Where the NILs are very stringent, or upon request of a permittee, the Division will calculate both the NIL and the AD limitation so that the limitations can be compared and the permittee can determine which of the two limits they would prefer, one which does not allow any increased impact (NIL), or the other which allows an insignificant impact (AD limit).

The non impact limit (NIL) is defined as the limit which results in no increased water quality impact (no increase in load or limit over the September 2000 load or limit). The NIL is calculated as the September 2000 loading, divided by the new design flow, and divided by a conversion factor of 8.34. If there is no change in design flow, then the NIL is equal to the September 2000 permit limitation.

If the facility was in place, but did not have a limitation for a particular parameter in the September 2000 permit, the Division may substitute an implicit limitation. Consistent with the First Update to the AD Guidance of April 2002, an implicit limit is determined based on the approach that specifies that the implicit limit is the maximum concentration of the effluent from October 1998 to September 2000, if such data is available. If this data is unavailable, the Division may substitute more recent representative data, if appropriate, on a case by case basis. Note that if there is a change in design flow, the implicit limit/loading is subject to recalculation based on the new design flow. For parameters that are undisclosed by the permittee, and unknown to the Division to be present, an implicit limitation may not be recognized.

The Monarch Ski Area WWTF was in place as a discharger prior to September 30, 2000, and therefore the new or increased impacts test must be conducted. As the design flow for this facility is the same as it was in September 2000, the NILs are equal to the permit limitations as of September 2000. For total residual chlorine, and total ammonia, the limitations as of September 2000 were used in the evaluation of new or increased impacts. For *E. coli*, data from this timeframe were used to determine an implicit limitation. In accordance with the Division's practice regarding *E. coli*, an implicit limit for *E. coli* is determined as 0.32 times the permit limit for fecal coliform. For chloride, sulfate, and sulfide; data prior to 2000 were not available. Therefore, data from 2011 to 2014 were determined to be adequate and were used to determine the implicit limitations. Similarly, nitrate and nitrite data prior to 2000 were not available. Therefore, data from November 2008 to March 2009 were determined to be adequate and were used to determine implicit limitations.

The Monarch Mountain Lodge WWTF was also in place as a discharger prior to September 30, 2000, and therefore the new or increased impacts test must be conducted. As the design flow for this facility is the same as it was in September 2000, the NILs are equal to the permit limitations as of September 2000. For total residual chlorine and total ammonia, the limitations as of September 2000 were used in the evaluation of new or increased impacts. For *E. coli*, data from this timeframe were used to determine an implicit limitation. In accordance with the Division's practice regarding *E. coli*, an implicit limit for *E. coli* is determined as 0.32 times the permit limit for fecal coliform. For nitrate, nitrite, sulfate, chloride, and sulfide; there are no effluent data available and therefore, the



Division will include monitoring requirements in the permit so that data can be collected in order to make such a determination of an implicit limit.

**Calculation of Loadings for New or Increased Impact Test**

The equations for the loading calculations are given below. Note that the AD requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the AD review; however, where there is only an acute standard, the acute standard should be used. Thus, the chronic low flows will be used later in this AD evaluation for all parameters with a chronic standard, and the acute low flows will be used for those parameters with only an acute standard.

$$\begin{aligned}
 \text{Previous permit load} &= M_{\text{permitted}} \text{ (mg/l)} \times Q_{\text{permitted}} \text{ (mgd)} \times 8.34 \\
 \text{New WQBELs load} &= M_2 \text{ (mg/l)} \times Q_2 \text{ (mgd)} \times 8.34
 \end{aligned}$$

Where,

- $M_{\text{permitted}}$  = September 2000 permit limit (or implicit limit) **(mg/l)**
- $Q_{\text{permitted}}$  = design flow as of September 2000 **(mgd)**
- $Q_2$  = current design flow (same as used in the WQBEL calculations)
- $M_2$  = new WQBEL concentration **(mg/l)**
- 8.34 = unit conversion factor

Table A-9a shows the results of these calculations and the determination of a new or increased impact for the Monarch Ski Area WWTF. Table A-9b shows the results of these calculations and the determination of a new or increased impact for the Monarch Mountain Lodge WWTF.



<b>Table A-9a</b>						
<b>Determination of New or Increased Impacts for the Monarch Ski Area WWTF</b>						
<i>Pollutant</i>	<i>Sept 2000 Permit Limit</i>	<i>Sept 2000 Permit Load (lbs/day)</i>	<i>NIL</i>	<i>New WQBEL</i>	<i>New WQBEL Load (lbs/day)</i>	<i>New or Increased Impact</i>
<i>E. coli</i> (#/100 ml)	1504	288	1504	126	24	No
TRC (mg/l)	0.12	0.023	0.12	0.011	0.0021	No
Nitrate as N (mg/l)	NA	NA	13	10	1.9	No
Nitrite as N (mg/l)	NA	NA	0.37	0.05	0.0096	No
NH <sub>3</sub> , Tot (mg/l) Jan	12.4	2.4	12.4	5.4	0.79	No
NH <sub>3</sub> , Tot (mg/l) Feb	13.4	2.6	13.4	5.4	0.86	No
NH <sub>3</sub> , Tot (mg/l) Mar	4.6	0.88	4.6	5.3	0.82	Yes
NH <sub>3</sub> , Tot (mg/l) Apr	2.8	0.54	2.8	4.9	0.61	Yes
NH <sub>3</sub> , Tot (mg/l) May	3	0.58	3	3.5	0.35	Yes
NH <sub>3</sub> , Tot (mg/l) Jun	11.8	2.3	11.8	3.0	0.27	No
NH <sub>3</sub> , Tot (mg/l) Jul	9.3	1.8	9.3	2.7	0.27	No
NH <sub>3</sub> , Tot (mg/l) Aug	6.1	1.2	6.1	3.9	0.44	No
NH <sub>3</sub> , Tot (mg/l) Sep	5.6	1.1	5.6	3.3	0.4	No
NH <sub>3</sub> , Tot (mg/l) Oct	4.7	0.9	4.7	3.9	0.54	No
NH <sub>3</sub> , Tot (mg/l) Nov	2.4	0.46	2.4	4.5	0.48	Yes
NH <sub>3</sub> , Tot (mg/l) Dec	3.4	0.65	3.4	4.8	0.61	Yes
Chloride (mg/l)	NA	NA	100	250	48	Yes
Sulfate (mg/l)	NA	NA	100	250	48	Yes
Sulfide as H <sub>2</sub> S (mg/l)	NA	NA	55	0.002	0.00038	No

As shown in Table A-9a, there are no new or increased impacts to the receiving stream for the Monarch Ski Area WWTF based on the new WQBELS for *E. coli*, TRC, Nitrate, Ammonia (except in March, April, May, November, and December), and Sulfide; and for these parameters, the AD evaluation is complete and the WQBELS are the final result of this WQA.

For Ammonia (March, April, May, November, and December), Chloride, and Sulfate for the Monarch Ski Area WWTF; there are new or increased impacts and in accordance with regulation, the permittee has the option of choosing either the NIL's or ADBAC's. Because the ADBAC's are generally more stringent than NIL's, the Division assumes that the permittee will choose NIL's rather than ADBAC's, and therefore the Division will stop the AD evaluation at this point and assign the NILs to the permit. For those parameters where there is not a NIL (either implicit or explicit) the AD Guidance allows for the collection of data to determine an implicit limitation. Therefore, the permittee will be required to conduct "monitoring only" for those parameters. The permittee may request ADBAC limits. If the permittee does request ADBAC limits, the Division will proceed with the completion of this Antidegradation Analysis.



**Table A-9b  
Determination of New or Increased Impacts for the Monarch Mountain Lodge  
WWTF**

<i>Pollutant</i>	<i>Sept 2000 Permit Limit</i>	<i>Sept 2000 Permit Load (lbs/day)</i>	<i>NIL</i>	<i>New WQBEL</i>	<i>New WQBEL Load (lbs/day)</i>	<i>New or Increased Impact</i>
<i>E. coli</i> (#/100 ml)	876.8	300	876.8	4525	1547	Yes
TRC (mg/l)	0.041	0.014	0.041	0.41	0.14	Yes
Nitrate as N (mg/l)	NA	NA	NA	327	112	Yes
NH <sub>3</sub> , Tot (mg/l) Jan	9.6	3.3	9.6	85	15	Yes
NH <sub>3</sub> , Tot (mg/l) Feb	8.2	2.8	8.2	90	15	Yes
NH <sub>3</sub> , Tot (mg/l) Mar	5.5	1.9	5.5	85	17	Yes
NH <sub>3</sub> , Tot (mg/l) Apr	6.1	2.1	6.1	70	19	Yes
NH <sub>3</sub> , Tot (mg/l) May	7	2.4	7.0	40	24	Yes
NH <sub>3</sub> , Tot (mg/l) Jun	16.1	5.5	16.1	130	94	Yes
NH <sub>3</sub> , Tot (mg/l) Jul	11	3.8	11	130	85	Yes
NH <sub>3</sub> , Tot (mg/l) Aug	6.2	2.1	6.2	150	53	Yes
NH <sub>3</sub> , Tot (mg/l) Sep	5.3	1.8	5.3	80	38	Yes
NH <sub>3</sub> , Tot (mg/l) Oct	3.7	1.3	3.7	75	34	Yes
NH <sub>3</sub> , Tot (mg/l) Nov	5.1	1.7	5.1	60	19	Yes
NH <sub>3</sub> , Tot (mg/l) Dec	7.6	2.6	7.6	65	15	Yes
Chloride (mg/l)	NA	NA	NA	9377	3206	Yes
Sulfate (mg/l)	NA	NA	NA	8756	2994	Yes

For Ammonia and *E.coli* for the Monarch Mountain Lodge WWTF; there are new or increased impacts and in accordance with regulation, the permittee has the option of choosing either the NIL's or ADBAC's. Because the ADBAC's are generally more stringent than NIL's, the Division assumes that the permittee will choose NIL's rather than ADBAC's, and therefore the Division will stop the AD evaluation at this point and assign the NILs to the permit. For those parameters where there is not a NIL (either implicit or explicit) the AD Guidance allows for the collection of data to determine an implicit limitation. Therefore, the permittee will be required to conduct "monitoring only" for those parameters. The permittee may request ADBAC limits. If the permittee does request ADBAC limits, the Division will proceed with the completion of this Antidegradation Analysis.

At this time since the TRC for the Monarch Mountain Lodge, NIL is too stringent, the Division will calculate the ADBAC limits in following section of this fact sheet to determine the final effluent limits for the Monarch Mountain Lodge.



<b>Table A-10 Final Selection of WQBELs, NILs, and ADBACs for the Monarch Ski Area WWTF</b>			
<i>Pollutant</i>	<i>NIL</i>	<i>New WQBEL</i>	<i>Chosen Limit</i>
<i>E. coli</i> (#/100 ml)	1504	126	WQBEL
TRC (mg/l)	0.12	0.011	WQBEL
Nitrate as N (mg/l)	13	10	WQBEL
NH3 as N, Tot (mg/l) Jan	12.4	5.4	WQBEL
NH3 as N, Tot (mg/l) Feb	13.4	5.4	WQBEL
NH3 as N, Tot (mg/l) Mar	4.6	5.3	NIL
NH3 as N, Tot (mg/l) Apr	2.8	4.9	NIL
NH3 as N, Tot (mg/l) May	3.0	3.5	NIL
NH3 as N, Tot (mg/l) Jun	11.8	3.0	WQBEL
NH3 as N, Tot (mg/l) Jul	9.3	2.7	WQBEL
NH3 as N, Tot (mg/l) Aug	6.1	3.9	WQBEL
NH3 as N, Tot (mg/l) Sep	5.6	3.3	WQBEL
NH3 as N, Tot (mg/l) Oct	4.7	3.9	WQBEL
NH3 as N, Tot (mg/l) Nov	2.4	4.5	NIL
NH3 as N, Tot (mg/l) Dec	3.4	4.8	NIL
Chloride (mg/l)	100	250	NIL
Sulfate (mg/l)	100	250	NIL
Sulfide as H2S (mg/l)	55	0.002	WQBEL

Table A-10 shows the selected limits for the Monarch Ski Area WWTF permit.

For Ammonia (March, April, May, November, and December), Chloride, and Sulfate; the NILs have been established for the Monarch Ski Area WWTF. The NILs were selected as they are less stringent than the WQBELs and the ADBACs. However, the facility has the final choice between the NILs and ADBACs, and if the ADBAC is preferred, the permit writer should be contacted.

**Determination of Baseline Water Quality (BWQ)**

The BWQ is the ambient condition of the water quality as of September 30, 2000. The BWQ defines the baseline low flow pollutant concentration, and for bioaccumulative toxic pollutants, the baseline load. The BWQ is to take into account the influence of the discharger if the discharge was in place prior to September 30, 2000. In such a case, data from a downstream location should be used to determine the BWQ. If only upstream data is available, then a mass balance equation may be applied, using the facilities effluent data to determine the BWQ. If the discharge was not present prior to September 30, 2000, then the influence of that discharge would not be taken into account in determining the BWQ. If the BWQ has already been determined in a previous WQA AD evaluation,



it may not need to be recalculated as the BWQ is the water quality as of September 30, 2000, and therefore should not change unless additional data is obtained or the calculations were in error. The BWQ concentration for TRC was set to zero for this receiving water since no other TRC source is available. This is shown in Table A-11.

<b>Table A-11</b>						
<b>BWQ Concentrations Based on Previous Determinations</b>						
<i>Pollutant</i>	<i>M<sub>eff</sub></i>	<i>Q<sub>eff</sub> (cfs)</i>	<i>M<sub>u/s</sub></i>	<i>Q<sub>u/s</sub> (cfs)</i>	<i>BWQ</i>	<i>WQS</i>
TRC (mg/l)					0	0.011

**Significant Concentration Threshold**

The SCT is defined as the BWQ plus 15% of the baseline available increment (BAI), and is calculated by the following equation:

$$SCT = (0.15 \times BAI) + BWQ$$

The BAI is the concentration increment between the baseline water quality and the water quality standard, expressed by the term (WQS – BWQ). Substituting this into the SCT equation results in:

$$SCT = 0.15 \times (WQS - BWQ) + BWQ$$

Where,

- WQS = Chronic standard or, in the absence of a chronic standard, the acute standard
- BWQ = Value from Table A-11

**Determination of the Antidegradation Based Average Concentrations**

Antidegradation based average concentrations (ADBACs) are determined for all parameters except ammonia, by using the mass-balance equation, and substituting the SCT in place of the water quality standard, as shown in the following equation:

$$ADBAC = \frac{SCT \times Q_3 - M_1 \times Q_1}{Q_2}$$

Where,

- Q<sub>1</sub>* = Upstream low flow (1E3 or 30E3 based on either the chronic or acute standard)
- Q<sub>2</sub>* = Current design capacity of the facility
- Q<sub>3</sub>* = Downstream flow (*Q<sub>1</sub>* + *Q<sub>2</sub>*)
- M<sub>1</sub>* = Current ambient water quality concentration (From Section III)
- SCT* = Significant concentration threshold

The ADBACs were calculated using the SCTs, and are set forth in Table A-12.



<b>Table A-12</b>						
<b>SCTs and ADBACs</b>						
<i>Pollutant</i>	<i>Q<sub>1</sub>(cfs)</i>	<i>Q<sub>2</sub>(cfs)</i>	<i>Q<sub>3</sub>(cfs)</i>	<i>M<sub>1</sub></i>	<i>SCT</i>	<i>ADBAC</i>
TRC (mg/l)	2.3	0.063	2.363	0	0.0017	0.064

**Concentration Significance Tests**

The concentration significance determination test considers the cumulative impact of the discharges over the baseline condition. In order to be insignificant, the new or increased discharge may not increase the actual instream concentration by more than 15% of the available increment over the baseline condition. The insignificant level is the ADBAC calculated in Tables A-12 above. If the new WQBEL concentration (or potentially the TL Conc for bioaccumulatives) is greater than the ADBAC, an AD limit would be applied. This comparison is shown in Tables A-13.

<b>Table A-13</b>			
<b>Concentration Significance Test</b>			
<i>Pollutant</i>	<i>New WQBEL</i>	<i>ADBAC</i>	<i>Concentration Test Result</i>
TRC (mg/l)	0.41	0.064	Significant

**Antidegradation Based Effluent Limitations (ADBELs)**

The ADBEL is defined as the potential limitation resulting from the AD evaluation, and may be either the ADBAC, the NIL, or may be based on the concentration associated with the threshold load concentration (for the bioaccumulative toxic pollutants). ADBACs, NILs and TLs have already been determined in the AD evaluation, and therefore to complete the evaluation, a final comparison of limitations needs to be completed.

Note that ADBACs and NILs are not applicable when the new WQBEL concentration (and loading as evaluated in the New and Increased Impacts Test) is less than the NIL concentration (and loading), or when the new WQBEL is less than the ADBAC.

Where an ADBAC or NIL applies, the permittee has the final choice between the two limitations. A NIL is applied as a 30-day average (and the acute WQBEL would also apply where applicable) while the ADBAC would be applied as a 2 year rolling average concentration. For the purposes of this WQA, the Division has made an attempt to determine whether the NIL or ADBAC will apply. The end results of this AD evaluation are in Table A-14, including any parameter that was previously exempted from further AD evaluation, with the final potential limitation identified (NIL, WQBEL or ADBAC).



<b>Table A-14</b>				
<b>Final Selection of QBELs, NILs, and ADBACs</b>				
<i>Pollutant</i>	<i>NIL</i>	<i>New QBEL</i>	<i>ADBAC</i>	<i>Chosen Limit</i>
E. coli (#/100 ml)	876.8	4525	NA	NIL
TRC (mg/l)	0.041	0.41	0.064	ADBAC
Nitrate as N (mg/l)	NA	327	NA	QBEL
NH3 as N, Tot (mg/l) Jan	9.6	85	NA	NIL
NH3 as N, Tot (mg/l) Feb	8.2	90	NA	NIL
NH3 as N, Tot (mg/l) Mar	5.5	85	NA	NIL
NH3 as N, Tot (mg/l) Apr	6.1	70	NA	NIL
NH3 as N, Tot (mg/l) May	7	40	NA	NIL
NH3 as N, Tot (mg/l) Jun	16.1	130	NA	NIL
NH3 as N, Tot (mg/l) Jul	11	130	NA	NIL
NH3 as N, Tot (mg/l) Aug	6.2	150	NA	NIL
NH3 as N, Tot (mg/l) Sep	5.3	80	NA	NIL
NH3 as N, Tot (mg/l) Oct	3.7	75	NA	NIL
NH3 as N, Tot (mg/l) Nov	5.1	60	NA	NIL
NH3 as N, Tot (mg/l) Dec	7.6	65	NA	NIL
Chloride (mg/l)	NA	9377	NA	QBEL
Sulfate (mg/l)	NA	8756	NA	QBEL
Sulfide as H2S (mg/l)	NA	0.075	NA	QBEL

### **Alternatives Analysis**

If the permittee does not want to accept an effluent limitation that results in no increased impact (NIL) or in insignificant degradation (ADBAC), the applicant may conduct an alternatives analysis (AA). The AA examines alternatives that may result in no degradation or less degradation, and are economically, environmentally, and technologically reasonable. If the proposed activity is determined to be important economic or social development, a determination shall be made whether the degradation that would result from such regulated activity is necessary to accommodate that development. The result of an AA may be an alternate limitation between the ADBEL and the QBEL, and therefore the ADBEL would not be applied. This option can be further explored with the Division. See Regulation 31.8 (3)(d), and the Antidegradation Guidance for more information regarding an alternatives analysis.

## **VIII. Technology Based and Control Based Limitations**

### **Federal Effluent Limitation Guidelines**

The Federal Effluent Limitation Guidelines for domestic wastewater treatment facilities are the secondary treatment standards. These standards have been adopted into, and are applied out of, Regulation 62, the Regulations for Effluent Limitations.



**Regulations for Effluent Limitations**

Regulation No. 62, the Regulations for Effluent Limitations, includes effluent limitations that apply to all discharges of wastewater to State waters, with the exception of storm water and agricultural return flows. These regulations are applicable to the discharge from the proposed discharge.

**Nutrient Effluent Limitation Considerations**

WQCC Regulation No. 85, the new *Nutrients Management Control Regulation*, includes technology based effluent limitations for total inorganic nitrogen and total phosphorus that currently, or will in the future, apply to many domestic wastewater discharges to State surface waters. These effluent limits for dischargers are to start being implemented in permitting actions as of July 1, 2013, and are shown in the two tables below:

**Effluent Limitations Table at 85.5(1)(a)(iii)**

*For all Domestic Wastewater Treatment Works not identified in subsections (a)(i) or (ii) above (in Reg. 85) and discharging prior to May 31, 2012 or for which a complete request for preliminary effluent limits has been submitted to the Division prior to May 31, 2012, the following numeric limits shall apply:*

Parameter	Parameter Limitations	
	Annual Median <sup>1</sup>	95 <sup>th</sup> Percentile <sup>2</sup>
Total Phosphorus	1.0 mg/l	2.5 mg/l
Total Inorganic Nitrogen <sup>3</sup>	15 mg/l	20 mg/l

*1 Running Annual Median: The median of all samples taken in the most recent 12 calendar months.*

*2 The 95<sup>th</sup> percentile of all samples taken in the most recent 12 calendar months.*

*3 Determined as the sum of nitrate as N, nitrite as N, and ammonia as N.*

**Effluent Limitations Table at 85.5(1)(b)**

*For New Domestic Wastewater Treatment Works which submit a complete request for preliminary effluent limits to the Division on or after May 31, 2012, the following numeric limits shall apply:*

Parameter	Parameter Limitations	
	Annual Median <sup>1</sup>	95 <sup>th</sup> Percentile <sup>2</sup>
Total Phosphorus	0.7 mg/l	1.75 mg/l
Total Inorganic Nitrogen <sup>3</sup>	7 mg/l	14 mg/l

*1 Running Annual Median: The median of all samples taken in the most recent 12 calendar months.*

*2 The 95<sup>th</sup> percentile of all samples taken in the most recent 12 calendar months.*

*3 Determined as the sum of nitrate as N, nitrite as N, and ammonia as N.*

Requirements in Reg. 85 also apply to non-domestic wastewater for industries in the Standard Industrial Class ‘Major Group 20,’ and any other non-domestic wastewater where the facility is expected, without treatment, to discharge total inorganic nitrogen or total phosphorus concentrations in excess of the numeric limits listed in 85.5 (1)(a)(iii). The facility must investigate, with the Division’s approval, whether different considerations should apply.

All permit actions based on this WQA will occur after the July 1, 2013 permit implementation date of Reg. 85. Therefore, total inorganic nitrogen and total phosphorus effluent limitations potentially imposed because of Reg. 85 must be considered. However, also based on Reg. 85, there are direct exemptions from these limitations for smaller domestic facilities that discharge less than 1 million



gallons per day (MGD), or are a domestic facility owned by a disadvantaged community.

Delayed implementation (until 5/31/2022) is also specified in Reg. 85 to occur for domestic WWTFs that discharge 1 MGD or more, and less than 2.0 MGD, or have an existing watershed control regulations (such as WQCC Reg.'s 71-74), or where the discharge is to waters in a low-priority 8-digit HUC.

For all other larger domestic WWTFs, the nutrient effluent limitations from the two tables above will apply, unless other considerations allowed by Reg. 85 at 85.5(3) are utilized to show compliance with exceptions or variances to these limitations.

The Division will consider these WWTF to be existing WWTFs, as the previous facilities were discharging and permitted prior to May 31, 2012. Also, since the design capacities of the Monarch Ski Area WWTF and Monarch Mountain Lodge WWTF are 0.023 MGD and 0.041 MGD, respectively, these facilities are not currently required to address the new technology based effluent limits as of 7/1/2013.

However, the Division does not intend these results to discourage this WWTF from working on nutrient control with the other dischargers within the Arkansas River watershed. These dischargers upstream and downstream of the Monarch Ski Area WWTF and the Monarch Mountain Lodge WWTF have the potential to create future nutrient issues in the South Fork of the Arkansas River and Arkansas River watersheds. The Division encourages these entities to all work together to create the most efficient and cost effective solutions for nutrient control in the Arkansas River watershed.

### **Supplemental Reg. 85 Nutrient Monitoring**

Reg. 85 also requires that some monitoring for nutrients in wastewater effluent and streams take place, independent of what nutrient effluent limits or monitoring requirements may be established in a discharge permit. The requirements for the type and frequency of this monitoring are set forth in Reg. 85 at 85.6. This nutrient monitoring is not currently required by a permitting action, but is still required to be done by the Reg. 85 nutrient control regulation. Nutrient monitoring for the Reg. 85 control regulation is currently required to be reported to the WQCD Environmental Data Unit.

## **IX. References**

### **Regulations:**

*The Basic Standards and Methodologies for Surface Water, Regulation 31*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective January 31, 2013.

*Classifications and Numeric Standards for Arkansas River Basin, Regulation No. 32*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective April 30, 2014

*Regulations for Effluent Limitations, Regulation 62*, CDPHE, WQCC, July 30, 2012.



*Nutrients Management Control Regulation, Regulation 85*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective September 30, 2012.

*Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation 93*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 30, 2012.

**Policy and Guidance Documents:**

*Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance*, Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

*Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0*, Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

*Rationale for Classifications, Standards and Designations of Segments of the Arkansas River*, Colorado Department Public Health and Environment, Water Quality Control Division, effective October 29, 2002.

*Policy Concerning Escherichia coli versus Fecal Coliform*, CDPHE, WQCD, July 20, 2005.

*Colorado Mixing Zone Implementation Guidance*, Colorado Department Public Health and Environment, Water Quality Control Division, effective April 2002.

*Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits*, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.

*Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops*, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-24, effective March 10, 2008.

*Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits*, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.