WQCC APPROVED

TOTAL MAXIMUM DAILY LOAD (TMDL)
FOR THE
RIO RUIDOSO

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Prepared by

New Mexico Environment Department, Surface Water Quality Bureau, Monitoring, Assessment, and Standards Section

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For additional information please visit:

www.nmenv.state.nm.us/swqb

~or~

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COVER PHOTO: Rio Ruidoso above Highway 70, September 2012. NMED/SWQB.

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4Q3	4-Day, 3-year low-flow frequency
AU	Assessment Unit
BL-A	Background Load Allocation
BLM	Bureau of Land Management
BMP	Best management practices
BST	Bacterial Source Tracking
CAFO	Concentration Animal Feeding Operation
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cfu	Coliform forming units
CGP	Construction general storm water permit
CWA	Clean Water Act
°C	Degrees Celsius
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
EQIP	Environmental Quality Incentive Program
°F	Degrees Fahrenheit
FG-WLA	Future Growth Wasteload Allocation
HUC	Hydrologic unit code
$j/m^2/s$	Joules per square meter per second
km^2	Square kilometers
LA	Load allocation
lbs/day	Pounds per day
MASS	Monitoring, Assessment and Standards Section
mgd	Million gallons per day
mg/L	Milligrams per Liter
mi^2	Square miles
mL	Milliliters
MOS	Margin of safety
MOU	Memorandum of Understanding
MS4	Municipal separate storm sewer system
MSGP	Multi-sector general storm water permit
NM	New Mexico
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NRCS	Natural Resource Conservation Service
NTU	Nephelometric Turbidity Units
QAPP	Quality Assurance Project Plan
RFP	Request for proposal
SEE	Standard Error of the Estimate
SEV	Severity of Ill Effect

SWPPP	Storm water pollution prevention plan
SWQB	Surface Water Quality Bureau
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids
UL	Upstream Loading
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WLA	Waste load allocation
WBP	Watershed-based plan
WQCC	Water Quality Control Commission
WQS	Water quality standards
WQX	Water quality exchange
WWTP	Wastewater treatment plant

EXECUTIVE SUMMARY

Section 303(d) of the Federal Water Pollution Control Act, a.k.a. Clean Water Act (CWA), 33 U.S.C. §1313[1], requires states to develop Total Maximum Daily Load (TMDL) management plans for water bodies determined to be impaired. A TMDL defines the amount of a pollutant that a waterbody can assimilate without exceeding the state's water quality standard for that waterbody and allocates loads to known point sources and nonpoint sources. It further identifies potential methods, actions, or limitations that could be implemented to achieve water quality standards. "Total Maximum Daily Load" is defined as the sum of the individual Waste Load Allocations (WLA) for point sources and Load Allocations (LA) for nonpoint source and background conditions (see 40 C.F.R. §130.2(i))[2]. TMDLs also include a Margin of Safety (MOS), a required component that acknowledges and counteracts uncertainty.

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) conducted water quality surveys of the Sacramento Mountains in 2012. Water quality monitoring stations were located within the watersheds to evaluate ambient water quality conditions and the impact of tributary streams. As a result of assessing data generated during these monitoring efforts, the following impairments of water quality standards were found:

- Plant nutrients for Rio Ruidoso (Eagle Creek to US Hwy 70 bridge) and Rio Ruidoso (US Hwy 70 bridge to Carrizo Creek).
- Total phosphorus for Rio Ruidoso (Carrizo Creek to Mescalero Apache boundary)

This TMDL addresses the above impairments as summarized in Table ES1. The 2012 field studies identified other potential water quality impairments which are not addressed in this document due to additional data needs, assessment protocol revisions or re-application, impending use attainability analyses, or they have been addressed in other TMDL documents. Additional information can be reviewed in the 2016-2018 Clean Water Act §303(d)/ §305(b) Integrated Report and List. If additional impairments are verified or found, subsequent TMDLs will be developed for those impairments. The SWQB prepared TMDLs in 2006 for portions of these watersheds including: TMDLs for bacteria on Carrizo Creek, Rio Bonito, and Rio Hondo; as well as TMDLs for plant nutrients, temperature, and turbidity on the Rio Ruidoso. The SWQB prepared TMDLs in 2015 for portions of these watersheds including: TMDLs for *E.coli* on Carrizo Creek, Rio Bonito, Nogal Creek, and Rio Ruidoso; as well as TMDLs for turbidity for Agua Chiquita, Rio Peñasco, and Rio Ruidoso.

The SWQB's Monitoring, Assessment and Standards Section (MASS) will next collect water quality data in the Sacramento Mountains in 2021-2022. TMDLs will be re-examined and potentially revised at that time as this document is considered to be an evolving management plan. In the event that the new data indicate that the targets used in the analyses are not appropriate and/or if new standards are adopted, the TMDLs will be adjusted accordingly. When attainment of applicable water quality standards has been achieved, the impairment will be removed from New Mexico's CWA §303(d) List of Impaired Waters.

[1] http://www.epw.senate.gov/water.pdf

[2] http://www.gpo.gov/fdsys/pkg/CFR-2002-title40-vol18/pdf/CFR-2002-title40-vol18-part130.pdf

The SWQB's Watershed Protection Section will continue to work with watershed groups to develop Watershed-Based Plans (WBPs) to implement strategies that attempt to correct the water quality impairments detailed in this document. Implementation of items detailed in the WBP will be done with participation of all interested and affected parties. Further information on WBPs is in Section 5.

ES1. TOTAL MAXIMUM DAILY LOAD FOR RIO RUIDOSO UPSTREAM OF EAGLE CREEK

New Mexico Standards Segment	20.6.4.209 and 20.6.4.208					
Waterbody Identifier	NM-2209.A_20 NM-2209.A_21 NM-2208_20					
Combined Segment Length	20.5 miles					
Parameters of Concern	Total phosphorus Total nitrogen					
Uses Affected	High Quality Coldwater Aquatic Life and Coldwater Aquatic Life					
Geographic Location	Rio Hondo USGS Hydrologic Unit Code 13060008					
Land Type	Arizona/New Mexico Mountains (Ecoregion 23f) Arizona/New Mexico Mountains (Ecoregion 23b)					
Combined Probable Sources	Bridge/culverts/railroad crossings, CAFO, channelization, drought-related impacts, dumping/garbage/litter/trash, flow alterations, gravel/dirt roads, highway/road/bridge runoff, inappropriate waste disposal, livestock grazing, mass wasting, on-site treatment systems, pavement/impervious surfaces, rangeland grazing, residences/buildings, stream channel incision, surface films/odors, urban runoff/storm sewers, waste from pets, waterfowl, watershed runoff following forest fire.					
IR Category	5/5A					
Priority Ranking	High					
	WLA	**FG-WLA**	**LA**	**B-LA**	**MOS**	**TMDL**
Total Phosphorus	1.64	0.72	0.44	0.25	0.34	3.39 lbs/day
Total Nitrogen	37.1	16.2	14.0	9.06	8.48	84.8 lbs/day

NOTE: "FG-WLA" = Future Growth Wasteload Allocation
"B-LA" = Background Load Allocation (upstream contributions)

1.0 INTRODUCTION

Under Section 303 of the Federal Water Pollution Control Act, a.k.a. the Clean Water Act (CWA), 33 U.S.C. §1313, individual states establish water quality standards, which are submitted and subject to the approval of the U.S. Environmental Protection Agency (USEPA). Under Section 303(d)(1) of the CWA (33 U.S.C. §1313(d)), states are required to develop a list of waters within a state that are impaired and establish a total maximum daily load ("TMDL") for each pollutant. A TMDL is defined as "*a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standard including consideration of existing pollutant loads and reasonably foreseeable increases in pollutant loads*" (USEPA 1999). A TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state's water quality standards. It also allocates that load capacity to known point sources and nonpoint sources at a given flow. TMDLs are defined in 40 Code of Federal Regulations (CFR) Part 130 (40 C.F.R. §130) as the sum of the individual Waste Load Allocations (WLAs) for point sources and Load Allocations (LAs) for nonpoint sources and natural background conditions." TMDLs also include a margin of safety (MOS).

This document provides TMDLs for stream segments within the Sacramento Mountains that have been determined to be impaired based on a comparison of measured concentrations and conditions with numeric water quality criteria or with numeric translators for narrative standards. This document is divided into several sections. Section 2.0 provides background information on the location and history of the Sacramento Mountains, specifies applicable water quality standards for the assessment units addressed in this document, and briefly discusses the water quality survey that was conducted in the Sacramento Mountains in 2012. Section 3.0 provides total nitrogen and total phosphorus TMDLs. Pursuant to CWA Section 106(e)(1), Section 4.0 provides a monitoring plan in which methods, systems, and procedures for data collection and analysis are discussed. Section 5.0 discusses implementation of TMDLs (phase two) and the relationship between TMDLs and Watershed-Based Plans (WBPs). Section 6.0 discusses applicable regulations and stakeholder assurances, Section 7.0 public participation in the TMDL process, and Section 8.0 provides references.

2.0 SACRAMENTO MOUNTAIN CHARACTERISTICS

The watersheds in the Sacramento Mountains were monitored by the Surface Water Quality Bureau (SWQB) from April to October 2012 with additional monitoring in 2014. Surface water quality monitoring stations were selected to characterize water quality of perennial stream reaches of the Sacramento Mountains. Information regarding previous sampling efforts by SWQB in the Sacramento Mountains is detailed in the Sacramento Mountains Water Quality Sampling Summary (NMED/SWQB 2015b) available on the SWQB website.

2.1 Location Description

The watersheds within the Sacramento Mountains (US Geological Survey [USGS] Hydrologic Unit Code [HUC] 13060003, 13060008, and 13060010) are located in south central New Mexico. The Rio Hondo, Rio Peñasco, and Tularosa watersheds encompass approximately 9,329 square miles and extend over portions of Lincoln, Chaves, and Otero counties. The watersheds in the Sacramento Mountains are located in Omernik Level III Ecoregions 23, 24, and 26 (Arizona/New Mexico Mountains, Chihuahuan Deserts, and Southwestern Tablelands) (Omernik 2006). This document covers impaired waters within the Rio Hondo watershed in the Arizona/New Mexico Mountains.

As presented in **Figure 2.1**, the Rio Hondo HUC (13060008) land use is 19% rangeland, 70% forest, 7% agriculture, and 3% built-up. **Figure 2.2** shows ownership as 58% private, 17% USFS, 11% Tribal, 10% BLM, and 4% State. Federally listed threatened and endangered species include the Pecos Bluntnose Shiner, Chihuahua Chub, Pecos Gambusia, Mexican Spotted Owl, Pecos Sunflower, Kuenzler's Hedgehog Cactus, Pecos Assiminea, Koster's Springsnail, and the Roswell Springsnail. (See http://nhnm.unm.edu/)

According to the Smokey Bear Ranger District in the Lincoln National Forest, the White Fire burned 10,361 acres from Trash and Lookout Canyons to Lone Pine Canyon in the Sacramento Mountains adjacent to the Village of Ruidoso and Highway 70 in April 2011 (Smokey Bear Ranger District 2011). The Little Bear Fire burned approximately 44,330 acres in the White Mountain Wilderness and the mountains adjacent to the communities of Ruidoso, Alto and Angus in June 2012 (Smokey Bear Ranger District 2012).

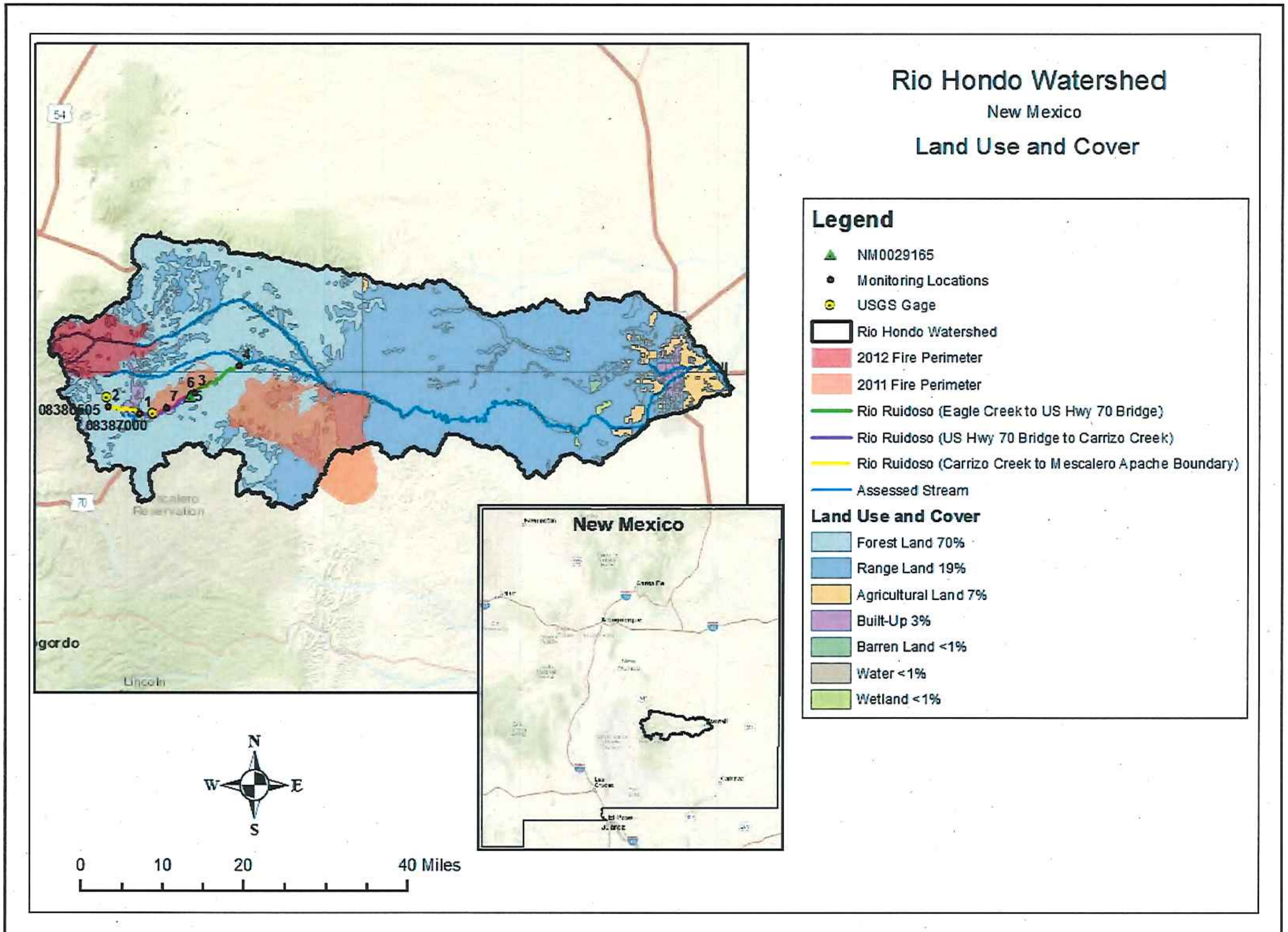

Figure 2.1 Land Use and 2012 Sampling Stations in the Sacramento Mountains. See Table 2.1 for station information.

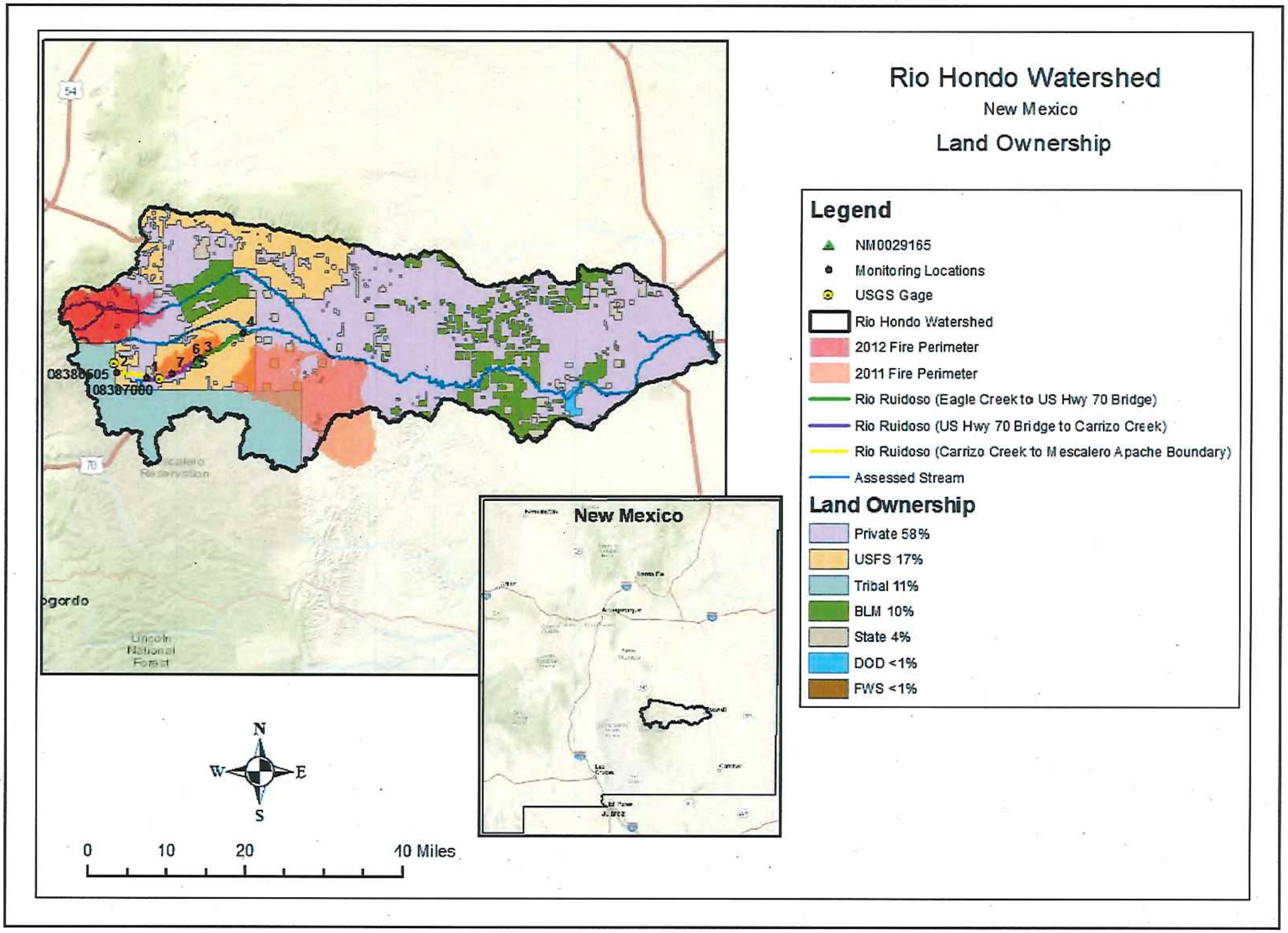

Figure 2.2 Land Management and 2012 Sampling Stations in the Sacramento Mountains

2.2 Geology and History

The geology of the Rio Hondo watershed consists of a complex distribution of Cretaceous intrusive rocks, Permian sedimentary rocks, and Cretaceous sedimentary rocks (Figure 2.3). The high dome of Sierra Blanca Peak is an intrusion of Tertiary igneous rocks associated with many nearby faults and dikes (Chronic 1987). Sierra Blanca is separated from the smaller Tertiary intrusions of the Carrizo and Capitan Mountains by the valley of soft, Cretaceous shale around its north end (*Ibid*). The Cenozoic igneous rocks of Sierra Blanca and the northwestern part of the Mescalero Apache Reservation include intrusive plugs, stocks, and dikes of the Sierra Blaca volcanic pile (Ahlen and Hanson 1986). Breccias and purplish-green porphyrys are commonly exposed towards the Ski Area on Sierra Blanca Peak (*Ibid*). Cenozoic rocks are also exposed on Sierra Blanca that include igneous intrusive, volcanic, and sedimentary rocks (*Ibid*). There are also glacial deposits in the cirque on the northeast slopes of the Peak at the head of the North Fork of the Rio Ruidoso (*Ibid*). San Andres Limestone forms the surface between Tularosa and Ruidoso; the stream valleys in this watershed cut down into the red and yellow soil zone of the Yeso Formation (Chronic 1987). Cub Mountain Formation consists of white sandstone, multicolored siltstone, and light-colored igneous rocks (Ash and Davis 1964). The Yeso formation consists of beds of siltstone, sandstone, shale, limestone, anhydrite, gypsum, and salt and does not readily transmit water (Mourant 1963). The Yeso Formation was formed by the precipitation of gypsum and salt from an evaporating inland sea (Chronic 1987). The San Andres Limestone forms the aquifer for Roswell's water (*Ibid*). The upper part of the San Andres Limestone consists of dolomite and chert-limestone, as well as siltstone, sandstone, gypsum, anhydrite, and shale. The Artesia Formation consists of similar sedimentary rocks (Mourant 1963). The Cretaceous Dakota Sandstone consists of quartzose sandstone interbedded with grey shale and conglomerate (*Ibid*). Mancos Shale is black shale, limestone and sandstone while the Mesaverde Formation is grey, yellow, and buff quartzose sandstone, grey shale, and coal (*Ibid*).

Mining activity in Lincoln County has produced a number of minerals and metals including: gold, coal, iron, lead, copper, zinc, fluorite, gypsum, tungsten, and bastnaesite (Griswold 1959). Spaniards likely performed the earliest mining in Lincoln County, but no evidence of their activity exists (*Ibid*). However, the first mining in Lincoln County by Americans appears to be a gold vein at the Helen Rae and American mines in 1868 (*Ibid*).

Three Rivers Petroglyphs (west of Sierra Blanca) is a mile-long display of pictures carved into the volcanic rock mostly made by prehistoric Native Americans and may be contemporary with the nearby Mimbres site dating from 900-1,000 A.D. (Ash and Davis 1964). Hale Springs (south of Ruidoso Downs) once fed a Native American irrigation ditch and the caliche formed in this ditch is used to line the driveways in the area (Ash and Davis 1964). One of the first battles of the Lincoln County War occurred at Blazer's Mill (southwest of Ruidoso) on April 5, 1878 when Billy the Kid and the McSween faction attempted to make an arrest (Ash and Davis 1964). The 116-mile Bonito pipeline built in 1908 supplied water for railroad and domestic use from Nogal Lake (Ash and Davis 1964). Bonito Lake was built in the 1930's to store the water from Nogal Lake when the first lake started leaking (Barker *et al.* 1991). As a cub, Smokey Bear was rescued from a forest fire in Capitan Gap in 1950, nursed back to health, and flown to Washington, D.C. to become the mascot for the U.S. Forest Service's (USFS) fire prevention program (Ash and Davis 1964). Hispanic farmers from the Rio Grande valley established the Village of Tularosa in

1862 and the village was named after the Spanish description for the rose-colored reeds that grow along the Rio Tularosa (Village of Tularosa 2014).

2.3 Water Quality Standards and Designated Uses

Water quality standards (WQS) for all assessment units in this document are set forth in Sections 206.4.208 and 20.6.4.209 of the *Standards for Interstate and Intrastate Surface Waters,* 20.6.4 New Mexico Administrative Code (NMAC), as amended through June 5, 2013 (NMAC 2013). These standards have been approved by the USEPA for CWA purposes. The following are the relevant NMAC code sections:

20.6.4.208 PECOS RIVER BASIN - Perennial reaches of the Rio Peñasco and its tributaries above state highway 24 near Dunken, perennial reaches of the Rio Bonito downstream from state highway 48 (near Angus), the Rio Ruidoso downstream of the U.S. highway 70 bridge near Seeping Springs lakes, perennial reaches of the Rio Hondo upstream from Bonney canyon and perennial reaches of Agua Chiquita.

A. Designated Uses: fish culture, irrigation, livestock watering, wildlife habitat, coldwater aquatic life and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: temperature 30°C (86°F) or less, and phosphorus (unfiltered sample) less than 0.1 mg/L.

20.6.4.209 PECOS RIVER BASIN - Perennial reaches of Eagle creek upstream of Alto dam to the Mescalero Apache boundary, perennial reaches of the Rio Bonito and its tributaries upstream of state highway 48 (near Angus) excluding Bonito lake, and perennial reaches of the Rio Ruidoso and its tributaries upstream of the U.S. highway 70 bridge near Seeping Springs lakes, above and below the Mescalero Apache boundary.

A. Designated Uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 600 μS/cm or less in Eagle creek, 1,100 μS/cm or less in Bonito creek and 1,500 μS/cm or less in the Rio Ruidoso; phosphorus (unfiltered sample) less than 0.1 mg/L; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

The numeric criteria identified in these sections are used for assessing waters for use attainability. The referenced Section 20.6.4.900 NMAC provides a list of water chemistry analytes for which SWQB tests and identifies numeric criteria for specific designated uses. In addition, waters are assessed against the narrative criteria identified in Section 20.6.4.13 NMAC, including bottom sediments and suspended or settleable solids, plant nutrients, and turbidity. The individual water quality criteria or narrative standards are detailed for each parameter in the chapters that follow.

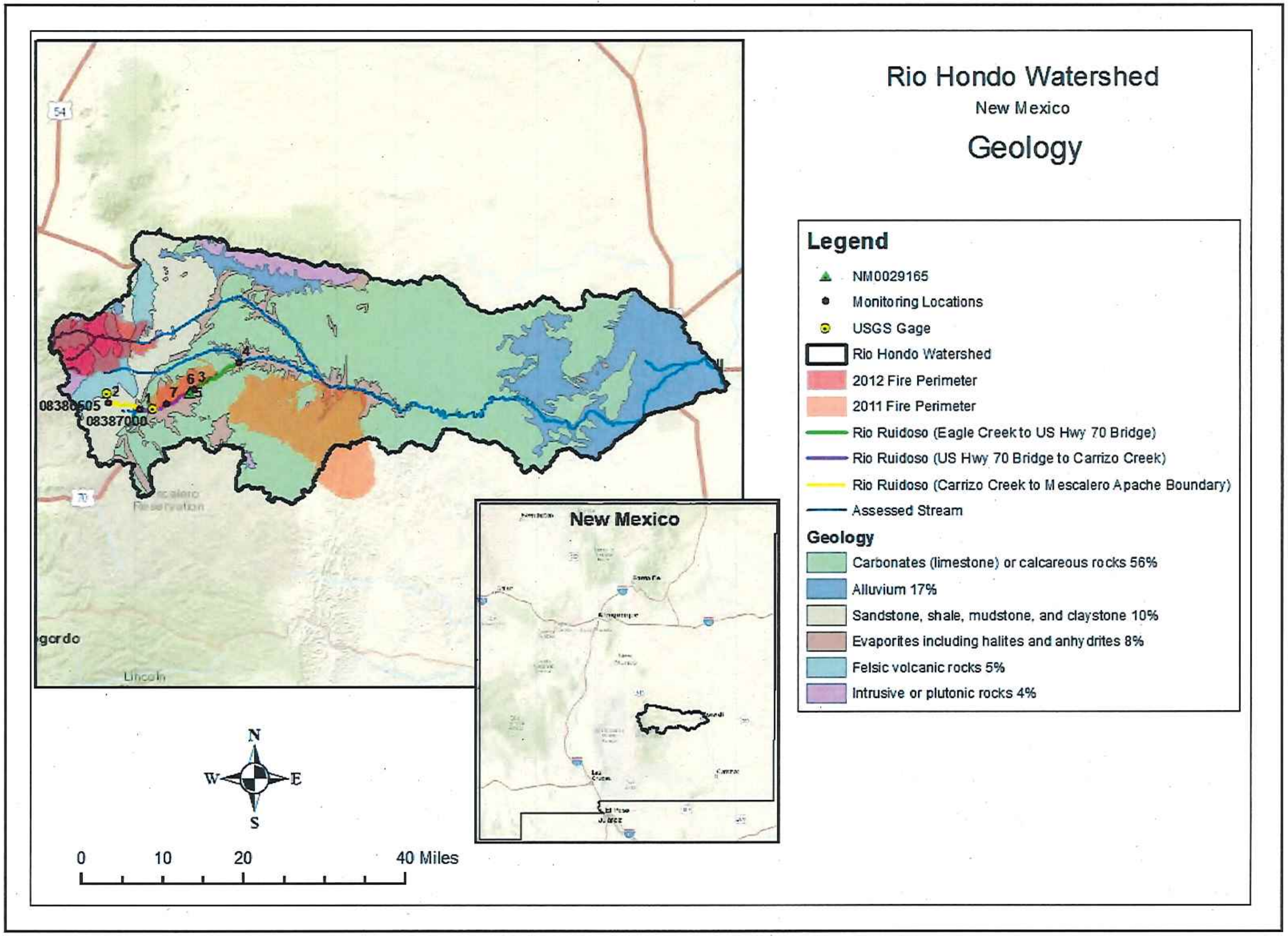

Figure 2.3 Geologic Map of the Sacramento Mountains and 2012 Sampling Stations

Current impairment listings for the Sacramento Mountain watersheds are included in the WQCC-approved 2016-2018 State of New Mexico Clean Water Act §303(d)/§305(b) Integrated List (NMED/SWQB 2016a). The Integrated List is a catalog of assessment units (AUs) throughout the state with a summary of their current status as assessed/not assessed or impaired/not impaired. Once a stream AU is identified as impaired, a TMDL guidance document is developed for that segment with guidelines for stream restoration. Target values for TMDLs are determined based on: 1) applicable numeric criteria or appropriate numeric translator to a narrative standard; 2) the degree of experience in applying various management practices to reduce a specific pollutant's loading; and 3) the ability to easily monitor and produce quantifiable and reproducible results. AU names and WQS have changed over the years and the history of these individual changes is tracked in the Record of Decision document associated with the 2016-2018 Integrated List available at https://www.env.nm.gov/swqb/303d-305b/2016-2018/index.html.

New Mexico's *Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC) establish surface water quality standards that consist of designated uses of surface waters of the State, the water quality criteria necessary to protect the uses, and an antidegradation policy. New Mexico's antidegradation policy, which is based on the requirements of 40 CFR 131.12, describes how waters are to be protected from degradation (Subsection A of 20.6.4.8 NMAC) while the *Antidegradation Policy Implementation Procedures* establish the process for implementing the antidegradation policy (NMED/SWQB 2011). At a minimum, the policy mandates that "the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state." In addition, whether or not a segment is impaired, the State's antidegradation policy requirements, as detailed in the *Antidegradation Policy Implementation Procedure* (NMED/SWQB 2011), must be met. TMDLs are consistent with this policy because implementation of a TMDL restores water quality so that existing uses are protected and water quality criteria are achieved. The *Antidegradation Policy Implementation Procedure* can be found in Appendix A of the *Statewide Water Quality Management Plan and Continuing Planning Process* document.

2.4 Water Quality Sampling

The Sacramento Mountain watersheds were monitored by the SWQB in 2012 and 2014. A brief summary of the survey and the hydrologic conditions during the sample period is provided in the following subsections. A more detailed description can be found in the Sacramento Mountains Water Quality Sampling Summary (NMED/SWQB 2015b).

2.4.1 Survey Design

The Monitoring, Assessment, and Standards Section (MASS) of the SWQB conducted a water quality survey of the Sacramento Mountains in 2012 between March and November and again in 2014 between May and October. Most sites were sampled eight times, while some secondary sites were sampled one to four times. Monitoring these sites enabled an assessment of the cumulative influence of the physical habitat, water sources, and land management activities upstream from the sites. Data results from grab sampling are housed in the SWQB water quality database and uploaded to USEPA's Water Quality Exchange (WQX) database. Sampling sites in **Figure 2.1** and listed in **Table 2.1** represent only those sites that are discussed in this document.

All temperature and chemical/physical sampling and assessment techniques are detailed in the *Quality Assurance Project Plan* (NMED/SWQB 2012) and the SWQB assessment protocols (NMED/SWQB 2015a). As a result of the 2012 and 2014 monitoring efforts and subsequent assessment, several surface water impairments were determined. Accordingly, these impairments were added to New Mexico's Integrated CWA §303(d)/305(b) List in 2014 (NMED/SWQB 2016a).
In addition to the 2012 and 2014 water quality sampling, fish sampling was conducted by SWQB staff in the Rio Ruidoso on September 16-17, 2015 at four locations. All sampling was performed using a backpack electrofisher (Smith-Root, Model 12-B). Stream lengths sampled varied from 60 to 100 meters. All available habitat types (pool, run, riffle) were sampled. The first location sampled was immediately below the Mescalero Apache boundary. SWQB captured 39 brown trout (*Salmo trutta*) ranging from 92 mm to 280 mm total length (TL) and 27 longnose dace (*Rhinichthys cataractae*) up to 132 mm TL. The second location was immediately upstream of the confluence with Carrizo Creek at Two Rivers Park. A single rainbow trout (*Oncorhynchus mykiss*), 280 mm TL was captured, which appeared to be a hatchery stocked fish. Additionally, 30 brown trout (88-275 mm TL) and 67 longnose dace (adults and juveniles) were captured. The third location was just downstream of the Ruidoso Downs racetrack. Three stocked rainbow trout (260, 290, 320 mm TL), 20 brown trout (100-280 mm TL), 24 longnose dace (adults and juveniles), and 3 Rio Grande chub (*Gila pandora*) (180, 210, 213 mm TL) were captured. The fourth and final location was downstream of the US 70 bridge just below the wastewater treatment plant. Only two species were captured: 45 longnose dace and 123 Rio Grande chub, both species exhibiting various size classes. All trout are classified as cold water species; longnose dace and Rio Grande chub are cool water species.

Table 2.1 SWQB Sacramento Mountains Sampling Stations

Station #	Station Description	STORET/ WQX ID
1	Rio Ruidoso at Carrizo Creek	57RRuido045.3
2	Rio Ruidoso at Mescalero boundary at USGS Gage 08386505	57RRuido052.4
3	Rio Ruidoso @ CR E002	57RRuido030.5
4	Rio Ruidoso at Glencoe FR 443	57RRuido019.8
5	Ruidoso new WWTP outfall pipe	NM0029165
6	Rio Ruidoso abv Hwy 70 bridge	57RRuido031.5
7	Rio Ruidoso blw Ruidoso Downs Racetrack @ Joe Welch Dr	57RRuido039.4

2.4.2 Hydrologic Conditions

There are two active USGS gaging stations in the portion of the Sacramento Mountains with impaired AUs included in this document (**Table 2.2**). As described in the following sections, USGS gage 08387000 and 08386505 were used, as appropriate, in flow calculations in the TMDLs. **Figure 2.4 and Figure 2.5** display the daily and historic mean discharge for each USGS gage.

Table 2.2 USGS gages in the Sacramento Mountains

Agency	Site Number	Site Name	Period of Record
USGS	08387000	Rio Ruidoso at Hollywood (near intersection of Hwy 48 and Hwy 70)	1953-present
USGS	08386505	Rio Ruidoso at Ruidoso (at Mescalero boundary)	1998-present

As stated in the Assessment Protocol (NMED/SWQB 2015a), data collected during all flow conditions, including low flow conditions (e.g., flows below 4-day, 3-year flows), will be used to determine designated use attainment status during the assessment process. For the purpose of assessing designated use attainment in ambient surface waters, WQS apply at all times under all flow conditions. Flow data used in the calculation of the TMDLs is discussed in Section 3.2.

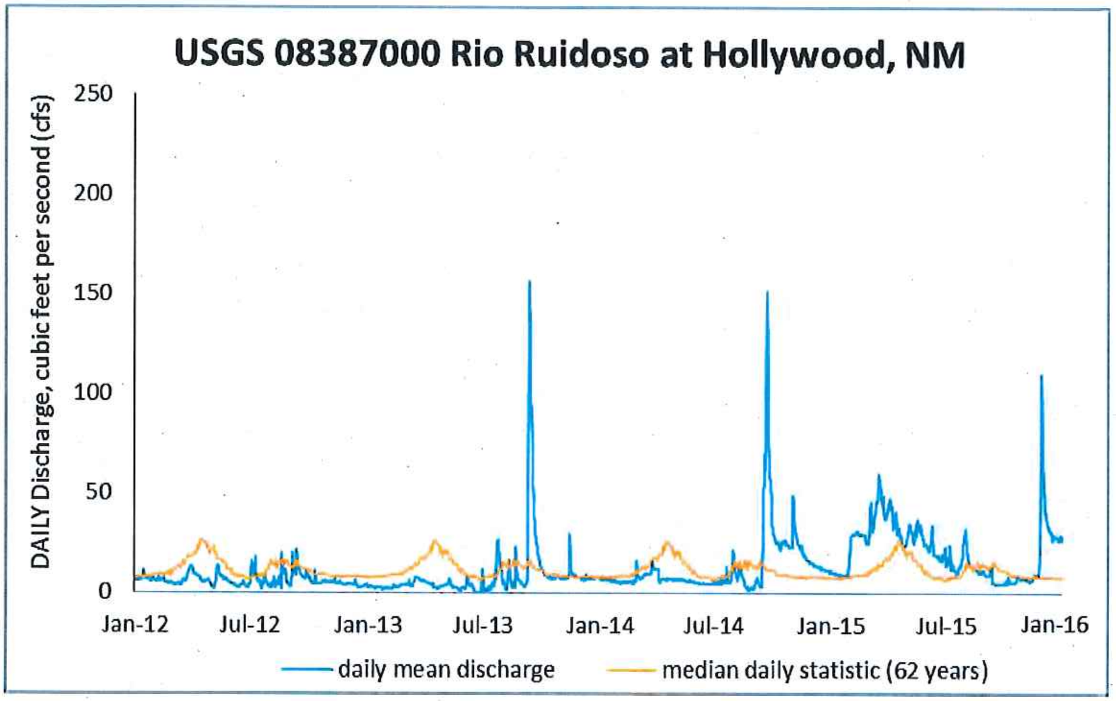

Figure 2.4 Daily and historic mean discharge for the Rio Ruidoso near Hollywood, NM (2012-2016)

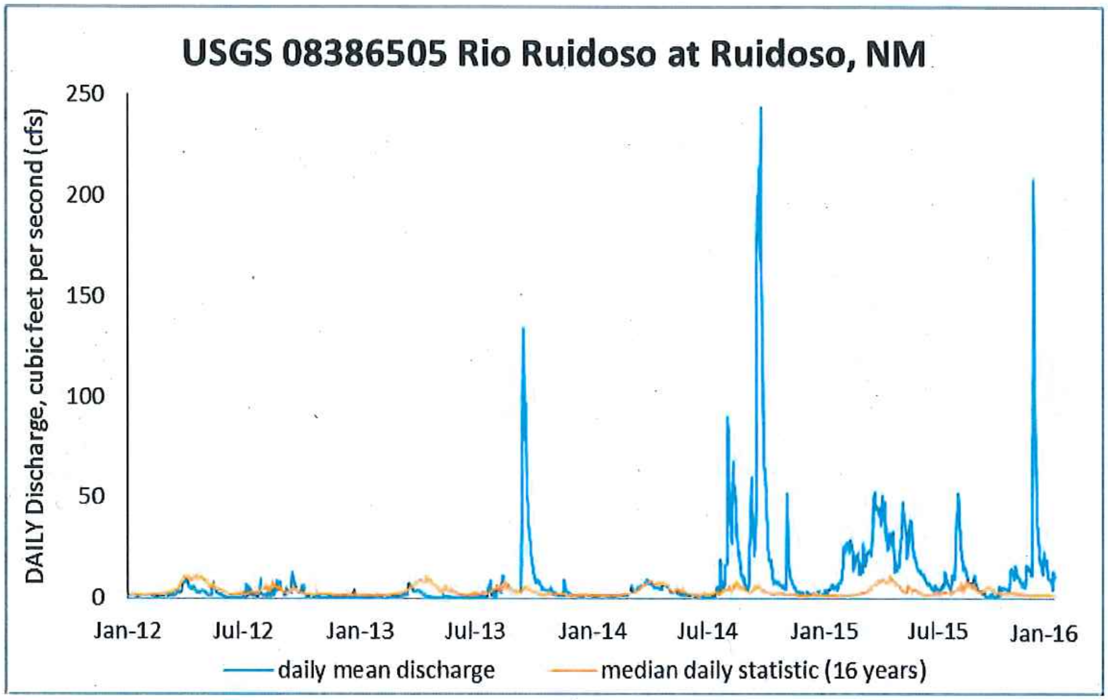

Figure 2.5 Daily and historic mean discharge for the Rio Ruidoso at Ruidoso, NM (2012-2016)

3.0 PLANT NUTRIENTS AND TOTAL PHOSPHORUS

Level I and Level II nutrient assessments were conducted on waterbodies in the Sacramento Mountains in 2012. Detailed assessment of various water quality parameters indicated plant nutrient impairment in two portions of the Rio Ruidoso: US Hwy 70 to Carrizo Creek and Eagle Creek to US Hwy 70. Assessment of water quality data indicated total phosphorus impairment for the Rio Ruidoso (Carrizo Creek to Mescalero Boundary) assessment unit. A TMDL for plant nutrients was developed in 2006 for the Rio Ruidoso (Rio Bonito to US Hwy 70) assessment unit; the plant nutrients TMDL for Rio Ruidoso (Eagle Creek to US Hwy 70) in this document serves as a revision to the 2006 TMDL.

SWQB is revising the 2006 TN and TP TMDLs for the Rio Ruidoso based on additional data collection, new nutrient and critical flow analyses, and to re-evaluate the wasteload allocation for the NPDES permit for the City of Ruidoso Downs and Village of Ruidoso Wastewater Treatment Plant (NM0029165). This revised TMDL is based on the same in-stream targets used in the previous 2006 TMDL (0.1 mg/L TP and 1.0 mg/L TN); however the critical flows in the revised TMDL are estimated using more recent streamflow data (2004-2015). Furthermore, the critical flow for nutrients was re-evaluated and determined to be the average annual median flow because of the long term growth cycle of algae in response to excess nutrients, in contrast to protecting for acute toxicity using the 4Q3 (see Section 3.2 for more information). Therefore, comparison of the 2006 TMDL with this revised TMDL should be done with caution as several parameters have changed the calculations and subsequent allocations. SWQB staff will conduct routine monitoring in the Rio Ruidoso watershed in 2021-2022, assess the new data in 2023, and revise the TMDL if necessary at that time.

To address concerns about reasonable assurance and questions that were raised during the first public review period in 2014 as well as USEPA reviews, SWQB is also taking a watershed approach to this revised TMDL to account for upstream contributing areas. This type of approach allows for calculation of a watershed-wide TMDL and better accounting of the incoming nutrient loads and allowable loading in the impaired sub-watersheds. By using this approach, point and nonpoint sources throughout the watershed are accounted for and can be appropriately targeted through the implementation process. Additional information about reasonable assurance is included in Section 5.0.

3.1 Target Loading Capacity

There are two potential causes of nutrient enrichment in a given stream: excessive phosphorus and/or nitrogen. Phosphorous is found in water primarily as orthophosphate. In contrast nitrogen may be found as several dissolved species, all of which must be considered in nutrient loading. Total nitrogen is defined as the sum of nitrate+nitrite (N+N), and Total Kjeldahl Nitrogen (TKN). At the present time, there is no USEPA-approved method to test for total nitrogen, however adding the results of USEPA methods 351.2 (TKN) and 353.2 (N+N) is appropriate for estimating total nitrogen (APHA 1989).

The intent of nutrient criteria, whether numeric or narrative, is to limit nutrient inputs in order to control the excessive growth of attached algae and higher aquatic plants. Controlling algae and plant growth preserves aesthetic and ecologic characteristics along the waterway. While conceptually there may be a number of possible combinations of total nitrogen (TN) and total phosphorus (TP) concentrations that are protective of water quality, the application of simple chemical limitation concepts to a complex biologic system to determine these combinations is challenging. One of the primary reasons for this is that different species of algae and higher aquatic plants will have different nutritional needs. Some species will thrive in nitrogen limited environments while others will thrive in phosphorous limited environments. Because of the diversity of nutritional needs amongst organisms, numeric thresholds for both TN and TP are required to preserve the aesthetic and ecologic characteristics along a waterway. Focusing on one nutrient or trading a decrease in one for an increase in the other may simply favor a particular species without achieving water quality standards (USEPA 2012).

New Mexico has a narrative criterion for plant nutrients set forth in Subsection E of 20.6.4.13 NMAC:

> ***Plant Nutrients:*** *Plant nutrients from other than natural causes shall not be present in concentrations which will produce undesirable aquatic life or result in the dominance of nuisance species in surface waters of the state.*

This narrative criterion can be challenging to assess because the relationships between nutrient levels and impairment of designated uses are not defined, and distinguishing nutrients from "other than natural causes" is difficult. Numeric thresholds are necessary to establish targets for TMDLs, to develop water quality-based permit limits and source control plans, and to support designated uses within the watershed. Therefore, SWQB, with the assistance from EPA and the USGS, developed nutrient-related thresholds, or *narrative translators*, to address both cause (TN and TP) and response variables (dissolved oxygen [DO], pH, and periphyton chlorophyll *a*). Water quality assessments for nutrients are based on quantitative measurements of these causal and response indicators. If these measurements exceed the numeric nutrient threshold values, indicate excessive primary production, and/or demonstrate an unhealthy biological community, the reach is considered impaired (NMED/SWQB 2015a). The applicable threshold values for cause and response variables in the Rio Ruidoso watershed are shown in **Table 3.1**. These threshold values were used for water quality assessments and as a starting point for TMDL development.

Table 3.1 Applicable nutrient-related thresholds for the Rio Ruidoso watershed

Ecoregion	23-Arizona/New Mexico Mountains
WQS segment	20.6.4.208, 20.6.4.209
Aquatic Life Use	Coldwater, High Quality Coldwater
Total Phosphorus	< 0.1 mg/L[(a)]
Total Nitrogen	≤ 0.25 mg/L[(b)]
Dissolved Oxygen	≥ 6.0 mg/L[(c)]
pH	6.6 – 8.8[(c)]
Chlorophyll *a*	5.8 – 11.0 μg/cm^2 [(b)]

Notes: *(a)* Segment-specific TP criterion in 20.6.4.208 and 20.6.4.209 NMAC.
(b) Threshold value for Ecoregion 23.
(c) Criteria for coldwater and high quality coldwater aquatic life uses.

For this TMDL the target value for TP is the segment-specific TP criterion of 0.1 mg/L (20.6.4.208 and 20.6.4.209 NMAC); however, in recommending a TN target for this TMDL, a 10:1 ratio of TN:TP was determined to be appropriate. With a segment-specific TP standard of 0.1 mg/L, the corresponding TN TMDL target is 1.0 mg/L. Documentation in support of the 10:1 ratio include regional studies from the Rocky Mountain West (see discussion below) as well as site-specific data from the Rio Ruidoso.

A nutrient ratio of 10:1 is consistent with other recently adopted nutrient limits in the Rocky Mountain West and NMED's ecoregion-based nutrient thresholds for the state of New Mexico. Colorado and Montana are two Mountain West states that have recently adopted numeric TN and TP standards. Colorado adopted interim nutrient limits which have a TN:TP ratio of 11.4 and 11.8 for warm and cold water streams and rivers, respectively (Colorado Department of Public Health and Environment 2013). Montana's nutrient standards have TN:TP ratios that range from 2.4 to 13.3, with an average ratio of 7.6 (Montana Department of Environmental Quality 2014). Finally, New Mexico specific TN:TP ratios calculated from the nutrient thresholds developed using regional data range from 5.5 to 13 with an average of 10.2 (NMED/SWQB 2015a). Of particular note, the Rio Ruidoso is located within the Arizona/New Mexico Mountain Ecoregion. The ratios of nutrient thresholds for this ecoregion are 12.5 for coldwater systems and 5.8 for warmwater systems. The Rio Ruidoso is located in a transitional zone between these systems, with segment 20.6.4.209 designated high-quality cold water and segment 20.6.4.208 designated coldwater with a segment specific criterion of 30°C. The ratios of TN and TP thresholds in the *Refinement of Stream Nutrient Impairment Thresholds in New Mexico* report (NMED/SWQB 2016b) are 10 for steep sites and 8.4 for flat-moderate sites.

A nutrient ratio of 10:1 is also supported by site specific data collected on the Rio Ruidoso. The water quality data collected by SWQB during the 2012 survey indicate that the stream is impaired, but marginally. A review of 26 stream samples (**Table 3.2**) collected above and below the Highway 70 bridge during the summer period (July through September) when biological productivity is greatest, found that concentrations averaged above the TMDL targets of 1.0 and 0.1 mg/L for TN and TP, respectively, whereas the median values are just below these targets. Both average and median values produce ratios near 10:1. This is a strong indication that these targets based on the 10:1 ratio are protective of water quality in the Rio Ruidoso.

Table 3.2 2012-2014 Rio Ruidoso water quality data statistical summary

	TN (mg/L)	TP (mg/L)	TN:TP Ratio
Average	2.09	0.54	14.2
Median	0.69	0.09	10.4
Maximum	10.12	3.11	60
Minimum	0.30	0.005	3.25
Sample size (n)	26	26	22

These results are consistent with an algal growth assay study conducted in 2002 by UNM (under contract from NMED). This study examined the effect of phosphorus and nitrogen additions on algal mass for river waters from three sites (**Table 3.3**) on the Rio Ruidoso (**Appendix D**).

Table 3.3 2002 Algal Bioassay sites

Site number	Site Name
I	Rio Ruidoso @ Mescalero Boundary west of Ruidoso – Upper Canyon Road
II	Rio Ruidoso @ NM mile marker 267.5 (HWY 70), below WWTP
III	Rio Ruidoso abv. site on Susan Lattimer's property

In all three water samples, algal growth was increased by the addition of nitrogen indicating that nitrogen is the primary limiting nutrient in the Rio Ruidoso and is driving the productivity of algae and macrophytes in the stream. Two examples of the responses are shown in **Figures 3.1 and 3.2**. Phosphorus addition alone did not increase algal growth but did increase growth when added along with nitrogen. Therefore, the algal growth assay suggests that to ensure that the narrative WQS are met, land use and/or point source management activities should avoid any increased inputs of nitrogen as well as nitrogen and phosphorus combinations.

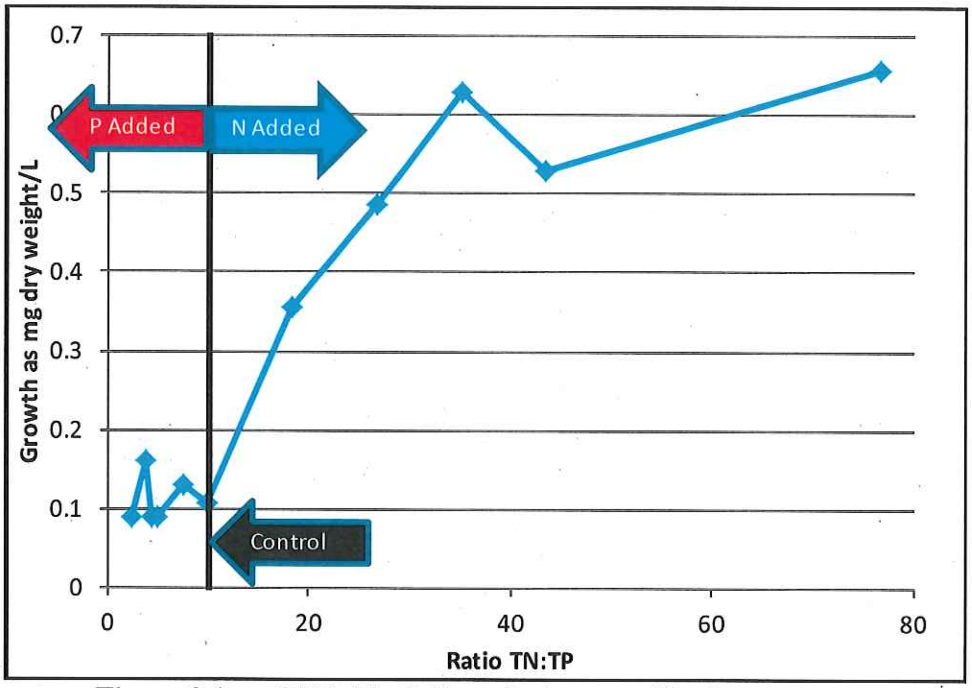

Figure 3.1 2002 Algal Growth Assay at Site I

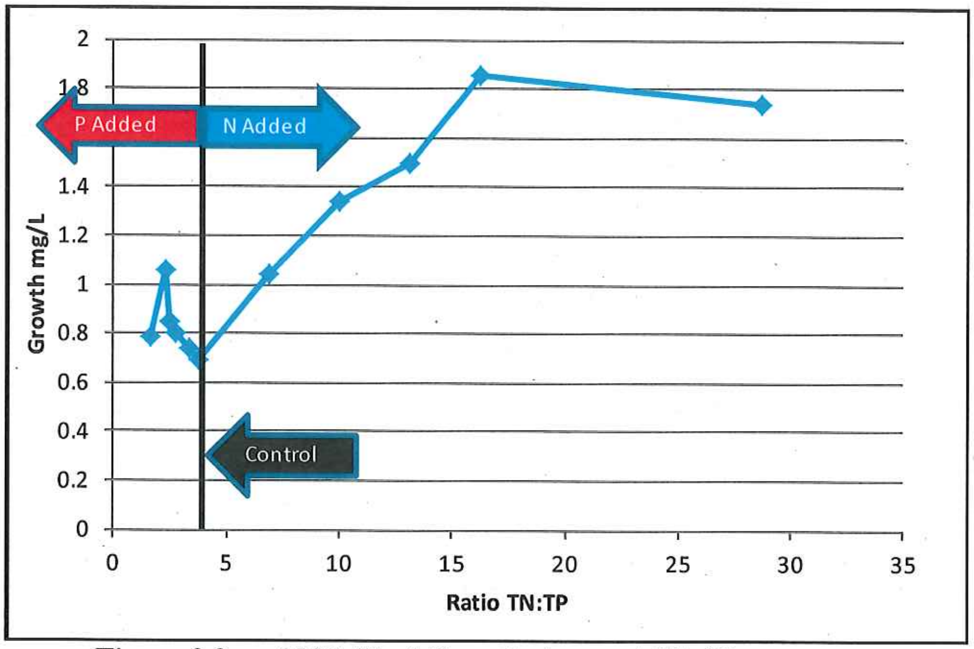

Figure 3.2 2002 Algal Growth Assay at Site II

3.2 Flow

40 CFR 130.7(c)(1) requires states to calculate a TMDL using the critical conditions for stream flow. The presence of plant nutrients in a stream can vary as a function of flow, however, higher nutrient concentrations typically occur during low-flow conditions because there is reduced stream capacity to assimilate nutrients. In other words, as flow decreases, the stream cannot dilute its constituents causing the concentration of plant nutrients to increase.

The critical low flow definition in 20.6.4.11 NMAC indicates that for numeric criteria (e.g., TP), the critical low flow is the 4Q3, which is defined as the minimum average four consecutive day flow that occurs with a frequency of at least once every 3 years. The 4Q3 was calculated using the 11-year period from 2004-2015. This period was selected because it represents the most recent hydrologic conditions but also is representative of long term precipitation based on tree ring data from A.D. 1000 – 2000 (Gutzler 2007). SWQB tested this idea by calculating flows for different time periods. It was discovered, presumably because of drying trends in the region, that using the full period of record may over-predict flows currently being observed in the Rio Ruidoso.

For the narrative TN translator, the WQS regulations do not require a specific low flow condition, and after careful consideration of a number of critical flow conditions NMED is proposing to use the average annual median flow. The use of the median flow, rather than a 4Q3 flow, is appropriate because of the long term growth cycle of algae in response to excess nutrients, in contrast to protecting for acute toxicity. The summer months are the critical time period for nutrient growth as this is when stream temperature, and thus stream metabolism, is greatest. However, based on SWQB review, there is no significant difference between the summer and annual median flow values, so the average annual median flow for 2004-2015 was used for the TN TMDL calculations. For the same reasons as discussed above for the 4Q3 flow, median flow for the last decade (2004-2015) was used. Other states have also used median flow for TMDL calculations, such as in the phosphorus TMDL for the Little Bear River in Utah (UDEQ 2006) and Rock River in Wisconsin (WIDNR 2011).

When available, USGS gages are used to estimate flow. There are two gages on the Rio Ruidoso (see Section 2.4.2) but one active gage in the Rio Ruidoso watershed that is appropriate to estimate flow for the impaired reaches (**Table 3.4**). The 4Q3 flow was estimated using gage data from the Rio Ruidoso and DFLOW software, Version 3.1b (USEPA 2006). DFLOW 3.1b is a Windows-based tool developed to estimate user selected design stream flows for low flow analysis by utilizing algorithms based on Log Pearson Type III distribution.

A climatic year starting April 1 of the prior year and ending March 31 is often used when examining critical low flow conditions in the United States. This choice reduces the likelihood of splitting low flow periods - typically found in the summer or fall - across different years and thereby affecting the results of Log Pearson Type III analysis of series of annual low flows. A different climatic year or shorter season may be used if low flow periods occur at other times of the year or overlap the boundaries of the climatic year.

Table 3.4 USGS gage in the Rio Ruidoso used for TMDL flow estimations

USGS Gage	Site Name	Period of Record	4Q3*	Annual median*
08387000	Rio Ruidoso at Hollywood	1953-present	1.67 cfs 1.08 mgd	9.13 cfs 5.90 mgd

*Time period used for calculation was 01-01-2004 to 12-31-2015

The 4Q3 and average annual median flows for the Rio Ruidoso at Hollywood gage are displayed in **Table 3.4**. Because the bottom of the assessment unit at Eagle Creek is below the 08387000 gage, the gage flows were area weighted according to Thomas et al. (1997).

Critical flow ungaged = $Q(u) = Q(g) \times (Au/Ag)^{0.5}$
Where:

$Q(g)$ = Critical flow at the gaged site (cfs)
Au = drainage area at the ungaged site (mi^2)
Ag = drainage area at the gaged site (mi^2)
$Q(u)$ = area weighted critical flow at the ungaged site (cfs)

Finally, in order to calculate the critical flow for the total Rio Ruidoso watershed, the design capacity (2.70 mgd) of the Village of Ruidoso/City of Ruidoso Downs Wastewater Treatment Plant (WWTP) was added to the area weighted 4Q3 and average annual median flow because the WWTP is located downstream of the gage. The calculation of the total critical flow for the Rio Ruidoso watershed is outlined in **Table 3.5**.

Table 3.5 Flow summaries for Rio Ruidoso watershed

Watershed	Parameter	Area-weighted Stream Critical Flow (mgd)	WWTP Design Flow (mgd)	Total Critical Flow (mgd)*
Rio Ruidoso watershed upstream of Eagle Creek	Total Phosphorus	1.37	2.7	4.07
	Total Nitrogen	7.46	2.7	10.2

*Total critical flow = stream critical flow + WWTP design flow

It is important to remember that in this case, the TMDL itself is a value calculated at a defined critical flow condition, and is calculated as part of the planning process designed to achieve water quality standards. Since flows vary throughout the year in these systems, the actual load at any given time will also vary.

3.3 TMDL Calculation

This subsection describes the relationship between the numeric nutrient targets and the allowable pollutant-level by determining the total assimilative capacity of the waterbody, or loading capacity, for the pollutant. The loading capacity is the maximum amount of pollutant loading that a waterbody can receive while meeting its water quality objectives.

As a river flows downstream it has a specific carrying capacity for nutrients. This carrying capacity, or TMDL, is defined as the mass of pollutant that can be carried under critical flow conditions without violating the target concentration for that constituent. These TMDLs were developed based on simple dilution calculations using critical flows, the numeric target, and a conversion factor. The specific carrying capacity of a receiving water for a given pollutant, was estimated using Equation 3-1. The calculated daily target loads (i.e. TMDLs) for TP and TN are summarized in **Table 3.6.**

Critical flow (4Q3) x WQS x Conversion Factor = Target Loading Capacity (TMDL) **(Eq. 3-1)**

Table 3.6 Daily target loads for TP & TN

TMDL Watershed	Parameter	Critical Flow (mgd)[(a)]	In-Stream Target (mg/L)	Conversion Factor	TMDL (lbs/day)
Rio Ruidoso watershed upstream of Eagle Creek	Total Phosphorus	4.07	0.1	8.34	3.39
	Total Nitrogen	10.2	1.0	8.34	84.8

Notes: *(a)* See Section 3.2 for details about critical flow calculations.

This total TMDL for the Rio Ruidoso watershed upstream of Eagle Creek is then allocated as follows: first the MOS is subtracted as described in Section 3.4, then the Load Allocation is subtracted as described in Section 3.5.1, and the remainder is the Waste Load Allocation as described in Section 3.5.2.

3.4 Margin of Safety

TMDLs should reflect a MOS based on the uncertainty or variability in the data, the point and nonpoint source load estimates, and the modeling analysis. The MOS can be expressed either implicitly or explicitly. An implicit MOS is incorporated by making conservative assumptions in the TMDL analysis, such as allocating a conservative load to background sources. An explicit MOS is applied by reserving a portion of the TMDL and not allocating it to any other sources.

For these nutrient TMDLs, the margin of safety was developed using a combination of conservative assumptions and explicit recognition of potential errors. Therefore, this margin of safety is the sum of the following two elements:

- *Conservative Assumptions*
  - Treating phosphorus and nitrogen as pollutants that do not readily degrade in the environment.

- *Explicit Recognition of Potential Errors*
  - Uncertainty exists in sampling nonpoint sources of pollution. A conservative MOS for this element is therefore **5 %.**
  - There is inherent error in all flow measurements; a conservative MOS for this element in gaged streams is **5 %.**

3.5 Load Allocations and Waste Load Allocations

3.5.1 Load Allocation

The total LA for the Rio Ruidoso watershed upstream of Eagle Creek was calculated using the total area-weighted critical stream flow from the 08387000 gage (see **Table 3.5**) and the targets proposed in the *"Refinement of Stream Nutrient Impairment Thresholds in New Mexico"* summary report (NMED/SWQB 2016b) of 0.061 mg/L TP and 0.37 mg/L TN. The Total Watershed LA is listed in **Table 3.7.**

Table 3.7 Watershed Load Allocation

TMDL Watershed	Parameter	Unimpaired concentration (mg/L) [a]	Critical flow (mgd) [b]	Conversion Factor	Total LA (lbs/day)
Rio Ruidoso watershed upstream of Eagle Creek	Total Phosphorus	0.061	1.37	8.34	0.69
	Total Nitrogen	0.37	7.46	8.34	23.0

[a] Unimpaired concentration from "*Refinement of Stream Nutrient Impairment Thresholds in New Mexico*" summary report
[b] Critical flow is area-weighted as described in Section 3.2. The critical flow for the LA does not include the 2.70 mgd WWTP design capacity

The total LA (**Table 3.7**) was subdivided into a load allocation and a background load allocation based on a percent watershed approach. The background LA is comprised of loading contributed to the impaired watershed from tributaries or upstream watersheds. For example, Carrizo Creek is 26% of the total watershed area of the Rio Ruidoso upstream of Eagle Creek, the Rio Ruidoso watershed upstream of Carrizo Creek is 13% of the total watershed area, and the watershed upstream of the Mescalero Apache boundary is 10% of the watershed area; the background LA is the sum of the individual tributary loads. Therefore, the Background LA for the watershed was calculated as follows:

TP Background LA = 0.25 lbs/day
Carrizo Creek Background LA = percent watershed x total LA
= 26% x 0.69 lbs/day
= 0.18 lbs/day
Rio Ruidoso above Mescalero bnd = percent watershed x total LA
= 10% x 0.69 lbs/day
= 0.07 lbs/day
Therefore, 0.18 lbs/day + 0.07 lbs/day = 0.25 lbs/day

TN Background LA = 9.06 mg/L
Carrizo Creek Background LA = percent watershed x total LA
= 26% x 23 lbs/day
= 5.97 lbs/day
Rio Ruidoso Watershed (above Carrizo Creek) = percent watershed x total LA
= 13% x 23 lbs/day
= 3.09 lbs/day
Therefore, 5.97 lbs/day + 3.09 lbs/day = 9.06 lbs/day

3.5.2 Waste Load Allocation

There are no National Pollutant Discharge Elimination System (NPDES) individual permits that discharge to the Rio Ruidoso (US Hwy 70 to Carrizo Creek) or Rio Ruidoso (Carrizo Creek to Mescalero Apache bnd) assessment units. However, the Village of Ruidoso/City of Ruidoso Downs WWTP (NM0029165) directly discharges into the Rio Ruidoso (Eagle Creek to US Hwy 70 bridge) assessment unit, the most downstream AU in the previously-defined watershed. The WWTP was upgraded and became operational in 2011. The total WLA was calculated as the remainder of the TMDL after subtracting the MOS and LA for the Rio Ruidoso watershed upstream of Eagle Creek (**Table 3.8**). The total WLA was further divided (based on flow proportion) into a Current WLA and a Future Growth WLA as follows, where 1.88 mgd is the maximum WWTP discharge for the 2012-2016 period and 2.70 mgd is the design flow of the plant:

Total TP WLA = 2.36 lbs/day TP
Current TP WLA = 2.36 x (1.88 mgd/2.70 mgd) = 1.64 lbs/day
Future Growth TP WLA = 2.36 – 1.64 = 0.72 lbs/day

Total TN WLA = 53.3 lbs/day
Current TN WLA= 53.3 x (1.88 mgd/2.70 mgd) = 37.1 lbs/day
Future Growth WLA = 53.3 – 37.1 = 16.2 lbs/day

Discharge Monitoring Reports (DMRs) from the Village of Ruidoso/City of Ruidoso Downs WWTP for the 2012-2016 period are included in **Appendix C**.

Nutrient removal is a pressing challenge facing wastewater treatment facilities. Nutrients can be removed from wastewater via biological, chemical, or combined biological and chemical processes. There are limits of removal that can be achieved with different removal mechanisms. The limit of technology, based on annual averages, is generally considered to be 0.1 mg/L for TP and 3 mg/L for TN (Jeyanayagam 2005). More recent studies by USEPA show that the limit of technology for TP is less than 0.01 mg/L. According to USEPA (2007), chemical addition to wastewater with aluminum, or iron-based coagulants followed by tertiary filtration, can reduce TP concentrations in the final effluent to very low levels. Land application of tertiary effluent through soil has been shown to meet a TP effluent concentration of 0.01 mg/L at all times (USEPA 2008). In addition, the cost of applying tertiary treatment for phosphorus removal is affordable, with monthly residential sewer rates charged to maintain and operate the entire treatment facility ranging from as low as $18 to as high as $46 (USEPA 2007).

TP concentrations in treated effluent typically range from 0.1 to 1.0 mg/L, whereas TN concentrations typically range from 3.0 to 10.0 mg/L, depending on the removal process and site-specific conditions. Some facilities may be able to achieve lower concentrations by using a combination of biological and chemical treatments, however biological treatment is highly temperature dependent therefore seasonal limits may need to be considered in some cases. The choice of technology to be used as well as the option and use of seasonal limits depend on the site-specific conditions, such as temperature, dissolved oxygen levels, and pH in combination with the economic feasibility.

The Ruidoso Downs Racetrack is located within the Rio Ruidoso (Hwy 70 bridge to Carrizo Creek) assessment unit. The racetrack does not currently have a NPDES individual permit; however, the racetrack submitted a Notice of Intent (NOI) to obtain coverage under the Concentrated Animal Feeding Operation (CAFO) general permit but the NOI was not approved. The current general CAFO permit states that "*there shall be no discharge of manure, litter, or process wastewater pollutants into waters of the United States from the production area*" except in extreme precipitation events described in the permit. The new general CAFO permit is expected to be issued in 2016. As no discharge is expected from this CAFO unless it exceeds the 25 year – 24 hour event, no WLA is assigned to the facility at this time.

There are no Municipal Separate Storm Sewer System (MS4) permits in these AUs. However, excess nutrient loading may be a component of some storm water discharges covered under general NPDES permits. There may be storm water discharges from construction activities covered under the NPDES Construction General Permit (CGP). Permitted sites require preparation of a SWPPP that includes identification and control of all pollutants associated with the construction activities to minimize impacts to water quality. The current CGP also includes state-specific requirements to implement site-specific interim and permanent stabilization, managerial, and structural solids, erosion, and sediment control Best Management Practices (BMPs) and/or other controls. BMPs are designed to prevent to the maximum extent practicable an increase in sediment load to the water body or an increase in a sediment-related parameter, such as total suspended solids, turbidity, siltation, stream bottom deposits, etc. BMPs also include measures to reduce flow velocity during and after construction compared to pre-construction conditions to assure that WLAs or applicable water quality standards, including the antidegradation policy, are met. Compliance with a SWPPP that meets the requirements of the CGP is generally assumed to be consistent with this TMDL.

Storm water discharges from active industrial facilities are generally covered under the current NPDES Multi-Sector General Permit (MSGP). This permit also requires preparation of an SWPPP, which includes specific requirements to limit (or eliminate) pollutant loading associated with the industrial activities in order to minimize impacts to water quality. Compliance with a SWPPP that meets the requirements of the MSGP is generally assumed to be consistent with this TMDL.

It is not possible to calculate individual WLAs for facilities covered by these General Permits at this time using available tools. Loads that are in compliance with the General Permits are therefore currently included as part of the LA. The City's sewer line extension project and the sewer interceptor replacement project are discussed in Section 5.0.

In summary, a watershed TMDL was calculated as described in Section 3.3 and a watershed LA (Section 3.5.1) and WLA (Section 3.5.2) were calculated. A summary of the allocations is included in **Table 3.8.**

Table 3.8 Allocation of TMDLs for TP and TN

TMDL Watershed	Parameter	WLA[a] (lbs/day)		LA (lbs/day)		MOS (10%)	TMDL (lbs/day)
		C	FG	LA	BLA		
Rio Ruidoso watershed upstream of Eagle Creek	Total Phosphorus	1.64	0.72	0.44	0.25	0.34	3.39
		C	FG	LA	BLA		
	Total Nitrogen	37.1	16.2	14.0	9.06	8.48	84.8

Notes: *(a)* WLA is for NM0029165. CAFO permit is pending; WLA for CAFO will remain zero. C= Current WLA and FG= Future Growth WLA. LA = Load Allocation and BLA = Background Load Allocation.

3.5.3 Load Reductions

The measured loads for TP and TN can be calculated using Equation 3-1; the measured load for the Rio Ruidoso (Eagle Creek to US Hwy 70) AU, as a representation of the entire Rio Ruidoso watershed upstream of Eagle Creek, is presented in **Table 3.9** The load reductions necessary to meet the target loads were calculated as the difference between the calculated daily target load (**Table 3.6**) and the measured load, and are shown in **Table 3.9**.

Table 3.9 Calculation of load reduction for TP and TN

TMDL Watershed	Parameter	Target Load[a] (lbs/day)	Measured Load[b] (lbs/day)	Load Reduction (lbs/day)	Percent Reduction[c]
Rio Ruidoso watershed upstream of Eagle Creek	Total Phosphorus	3.05	7.96	4.91	62%
	Total Nitrogen	76.3	132	55.7	42%

Notes: *(a)* Target Load = TMDL – MOS. The MOS is not included in the load reduction calculations because it is a set aside value, which accounts for any uncertainty or variability in TMDL calculations and therefore should not be subtracted from the measured load.

(b) The measured load is the magnitude of point and nonpoint sources. It is calculated using mean measured values for the Rio Ruidoso (Eagle Creek to US Hwy 70 bridge) AU (see Appendix C) and the total critical flow (Table 3.5).

(c) Percent reduction is the percent the existing measured load must be reduced to achieve the target load, and is calculated as follows: (Measured Load – Target Load) / Measured Load x 100.

3.6 Identification and Description of Pollutant Sources

SWQB fieldwork includes an assessment of the probable sources of impairment (**Appendix A**). The approach for identifying "Probable Sources of Impairment" was modified by SWQB to include additional input from a variety of stakeholders including landowners, watershed groups, and local, state, tribal and federal agencies. Probable Source Sheets are filled out by SWQB staff during watershed surveys and watershed restoration activities. The draft probable source list (**Table 3.10**) will be reviewed and modified, as necessary, with watershed group/ stakeholder input during the TMDL public meeting and comment period.

Table 3.10 Pollutant source summary for plant nutrients and total phosphorus

TMDL Watershed	NPDES permits[(a)]	Probable Sources
Rio Ruidoso watershed upstream of Eagle Creek	NM0029165	Bridge/culverts/railroad crossings, CAFO, channelization, drought-related impacts, dumping/garbage/litter/trash, flow alterations, gravel/dirt roads, highway/road/bridge runoff, inappropriate waste disposal, livestock grazing, mass wasting, on-site treatment systems, pavement/impervious surfaces, rangeland grazing, residences/buildings, stream channel incision, surface films/odors, urban runoff/storm sewers, waste from pets, waterfowl, watershed runoff following forest fire.

Notes: *(a)* Racetrack CAFO permit pending NMG010000.

The Probable Source Identification Sheets in **Appendix A** provide an approach for a visual analysis of a pollutant source along an impaired reach. Although this procedure is qualitative, SWQB feels that it provides the best available information for the identification of probable sources of impairment in a watershed. The list of "Probable Sources" is not intended to single out any particular land owner or single land management activity and has therefore been labeled "Probable" and generally includes several sources for each impairment. Probable sources of impairment along each reach as determined by field reconnaissance and assessment are listed in **Table 3.10**. Probable sources of nutrients will be evaluated, refined, and changed as necessary through the Watershed-Based Plan (WBP).

3.7 Linkage between Water Quality and Pollutant Sources

The source assessment phase of TMDL development identifies sources of nutrients that may contribute to both elevated nutrient concentrations and the stimulation of algal growth in a waterbody. Where data gaps exist or the level of uncertainty in the characterization of sources is large, the recommended approach to TMDL assignments requires the development of allocations based on estimates utilizing the best available information.

Photo 1: Algae at Rio Ruidoso at County Road E002. Credit: NMED/SWQB, 2012.

Phosphorus and nitrogen generally drive the productivity of algae and macrophytes in aquatic ecosystems, therefore they are regarded as the primary limiting nutrients in freshwaters. The main reservoirs of natural phosphorus are rocks and natural phosphate deposits. Weathering, leaching, and erosion are all processes that breakdown rock and mineral deposits allowing phosphorus to be transported to aquatic systems via water or wind. The breakdown of mineral phosphorus produces inorganic phosphate ions ($H_2PO_4^-$, HPO_4^{2-}, and PO_4^{3-}) that can be absorbed by plants from soil or water (USEPA 1999). Phosphorus primarily moves through the food web as organic phosphorus (after it has been incorporated into plant or algal tissue) where it may be released as phosphate in urine or other waste by heterotrophic consumers and reabsorbed by plants or algae to start another cycle (Nebel and Wright 2000).

The largest reservoir of nitrogen is the atmosphere. About 80% of the atmosphere by volume consists of nitrogen gas (N_2). Although nitrogen is plentiful in the environment, it is not readily available for biological uptake. Nitrogen gas must be converted to other forms, such as ammonia (NH_3 and NH_4^+), nitrate (NO_3^-), or nitrite (NO_2^-) before plants and animals can use it. Conversion of gaseous nitrogen into usable mineral forms occurs through three biologically mediated processes of the nitrogen cycle: nitrogen fixation, nitrification, and ammonification (USEPA 1999). Mineral forms of nitrogen can be taken up by plants and algae and incorporated into their tissue. Nitrogen follows the same pattern of food web incorporation as phosphorus and is released in waste primarily as ammonium compounds. The ammonium compounds are usually converted to nitrates by nitrifying bacteria, making it available again for uptake, starting the cycle anew (Nebel and Wright 2000).

Rain, overland runoff, groundwater, drainage networks, and industrial and residential waste effluents transport nutrients to receiving waterbodies. Once nutrients have been transported into a waterbody they can be taken up by algae, macrophytes, and microorganisms either in the water column or in the benthos; they can sorb to organic or inorganic particles in the water column and/or sediment; they can accumulate or be recycled in the sediment; or they can be transformed and released as a gas from the waterbody (**Figure 3.3**).

As noted above, phosphorus and nitrogen are essential for proper functioning of ecosystems. However, excess nutrients cause conditions unfavorable for the proper functioning of aquatic ecosystems. Nuisance levels of algae and other aquatic vegetation (macrophytes) can develop rapidly in response to nutrient enrichment when other factors (e.g., light, temperature, substrate) are not limiting (**Figure 3.3**). The relationship between nuisance algal growth and nutrient enrichment in stream systems has been well documented in the literature (Welch 1992; Van Nieuwenhuyse and Jones 1996; Dodds *et al.* 1997; Chetelat *et al.* 1999). Unfortunately, the magnitude of nutrient concentration that constitutes an "excess" is difficult to determine and varies by ecoregion. The recommended level of total phosphorus to avoid algal blooms in nitrogen-limited ecosystems is 0.01 to 0.1 mg/L and 0.1 mg/L to 1 mg/L of total nitrogen. The upper end of these ranges also support less biological diversity (NOAA/USEPA 1988).

An algal bioassay study conducted in the Rio Ruidoso prior to the development of the 2006 TMDL indicates that the Rio Ruidoso nitrogen limited, but that the addition of both phosphorous and nitrogen also caused algal growth. Recent data collections by SWQB show that nutrient ratios vary seasonally, but during the summer the existing ratio of TN:TP is approximately 10:1. The biogeochemical cycling of N and P are closely linked to each other, and thus measures focusing on one of the nutrients can influence the other (Ekholm 2008). Davidson and Howarth (2007) summarize the combined effect of TN and TP in aquatic ecosystems with the following:

> *"Analysis demonstrates a surprisingly consistent pattern of a synergistic effect of N and P addition on net primary productivity across all ecosystem types. Adding N and P together seems to give photosynthesis by algae and higher plants more of a boost than adding either one separately... the stoichiometry of N and P supply and demand must generally be in close balance in most ecosystems. According to this interpretation, P is rarely available in great excess relative to N, so a modest addition of N quickly provokes a limitation on P. When N and P are added together, N and P limitation may alternate in numerous small incremental steps, ultimately producing a synergistic effect."*

Seasonal changes in nutrient limitation and co-limitation are often observed in freshwater stream systems (USEPA 2012).

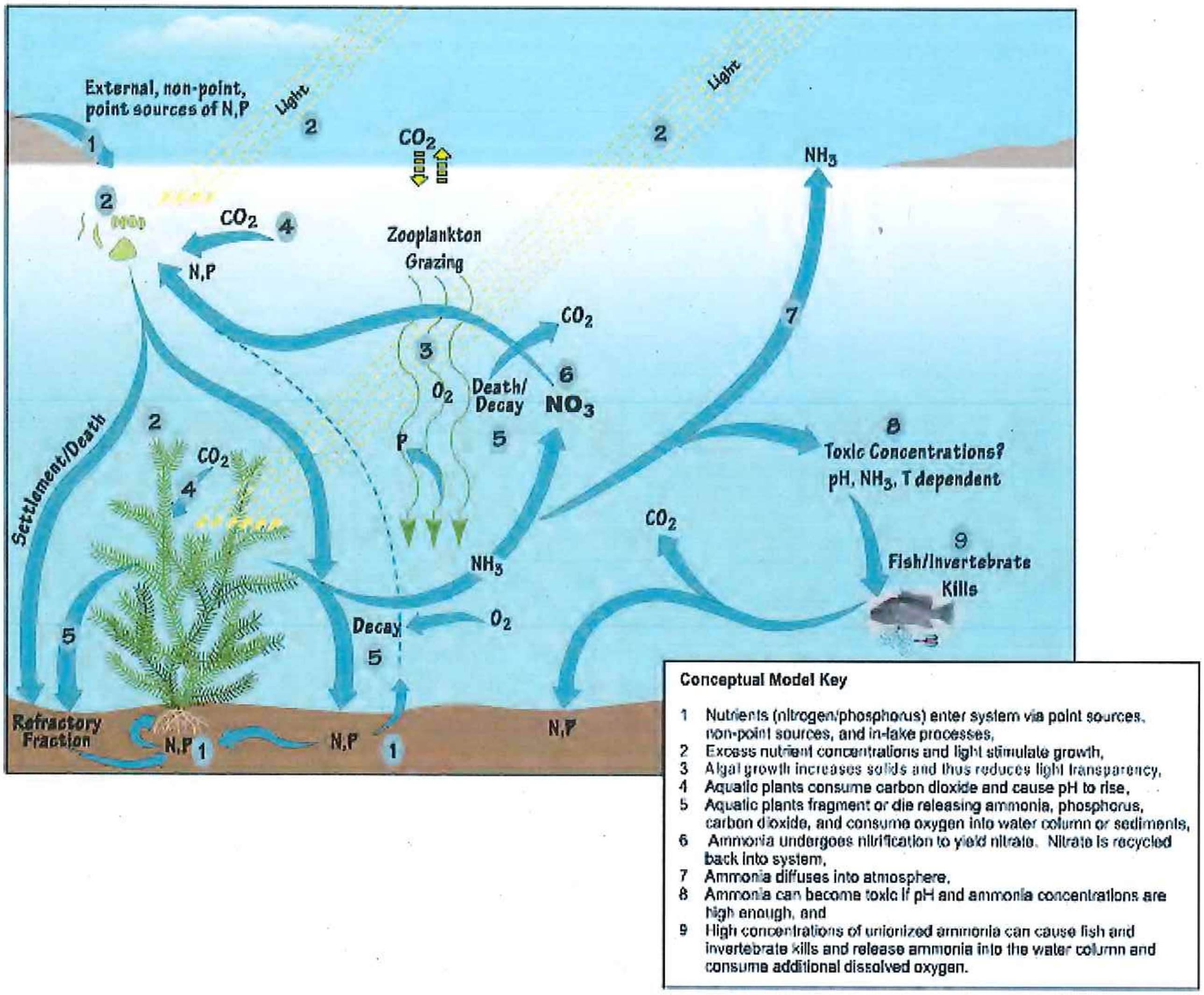

Figure 3.3 Nutrient conceptual model (USEPA 1999)

As described in Section 3.2, the presence of plant nutrients in a stream can vary as a function of flow. As flow decreases through water diversions and/or drought-related stressors, the stream cannot effectively dilute its constituents, which causes the concentration of plant nutrients to increase. Nutrients generally reach a waterbody from land uses that are in close proximity to the stream because the hydrological pathways are shorter and have fewer obstacles than land uses located away from the riparian corridor. During the growing season (i.e. in agricultural return flow) and in storm water runoff, distant land uses can become hydrologically connected to the stream, thus transporting nutrients from the hillslopes to the stream during these time periods.

In addition to agriculture, there are several other human-related activities that influence nutrient concentrations in rivers and streams. Residential areas contribute nutrients from septic tanks, landscape maintenance, as well as backyard livestock (e.g., cattle, horses) and pet wastes. Urban development contributes nutrients by disturbing the land and consequently increasing soil erosion, by increasing the impervious area within the watershed, and by directly applying nutrients to the landscape. Recreational activities such as hiking and biking can also contribute nutrients to the stream by reducing plant cover and increasing soil erosion (e.g., trail network, streambank destabilization), direct application of human waste, campfires and/or wildfires, and dumping trash near the riparian corridor.

Undeveloped, or natural, landscapes also can deliver nutrients to a waterbody through decaying plant material, soil erosion, and wild animal waste. Another geographically occurring nutrient source is atmospheric deposition, which adds nutrients directly to the waterbody through dryfall and rainfall. Atmospheric phosphorus and nitrogen can be found in both organic and inorganic particles, such as pollen and dust as well as anthropogenic sources such as combustion and agriculture. The contributions from these natural sources are generally considered to represent background levels.

Photo 2: Cattle at Rio Ruidoso upstream of Highway 70 bridge. Credit: NMED/SWQB, 2003.

Water pollution caused by on-site septic systems is a widespread problem in New Mexico (McQuillan 2004). Septic system effluents have contaminated more water supply wells, and more acre-feet of ground water, than all other sources in the state combined. Groundwater contaminated by septic system effluent can discharge into streams gaining from groundwater inflow. Nutrients such as phosphorous and nitrogen released into gaining streams from aquifers contaminated by septic systems can contribute to eutrophic conditions.

3.8 Consideration of Seasonal Variability

Section 303(d)(1) of the CWA requires TMDLs to be "established at a level necessary to implement the applicable WQS with seasonal variation." Data used in the calculation of this TMDL were collected during the spring, summer, and fall to ensure coverage of any potential seasonal variation in the system. Exceedences were observed during all seasons, which captured flow alterations related to snowmelt, the growing season, and summer monsoonal rains. The critical condition used for calculating the TMDL is considered to be conservative and protective of the water quality standard under all flow conditions. Based on SWQB review, there is no significant difference between the summer and annual median flow values, so the average annual median flow was chosen for the TN TMDL calculations (see Section 3.2). Calculations made at the critical flow, in addition to using other conservative assumptions as described in the previous section on MOS, should be protective of the water quality standards designed to preserve aquatic life in the stream. It was assumed that if critical conditions were met during this time, coverage of any potential seasonal variation would also be met. Flow considerations are discussed in Section 3.2.

3.9 Future Growth

Growth estimates by county are available from the New Mexico Bureau of Business and Economic Research. These estimates project growth to the year 2040. The Lincoln County population is projected to grow by an estimated 1.3% over the 2010-2040 time period. Similarly, the Chaves County population is projected to grow by an estimated 4.71% and the Otero County population is project to grow by an estimated 0.79% over the same time period. The 2010 Census population for Lincoln County is 20,497, Chaves County is 65,783, and Otero County is 64,275 (NMBBER 2012).

Estimates of future growth in Lincoln, Chaves, and Otero counties are not anticipated to lead to a significant increase in nutrients that cannot be controlled with BMPs. However, it is imperative that BMPs continue to be utilized to improve road conditions and grazing allotments and adhere to SWPPP requirements related to construction and industrial activities covered under the general permit. Any future growth would be considered part of the existing load allocation, assuming persistence of the hydrologic conditions used to develop these TMDLs. The Total WLA for the NM0029165 permit was divided into a Current WLA and a Future Growth WLA in order to facilitate the allocation of additional WLA to the facility if it begins to discharge at its design flow.

4.0 MONITORING PLAN

Pursuant to CWA Section 106(e)(1), 33 U.S.C. Section 1251, the SWQB has established appropriate monitoring methods, systems and procedures in order to compile and analyze data on the quality of the surface waters of New Mexico. In accordance with the New Mexico Water Quality Act, NMSA 1978, Sections 74-6-1 to -17, the SWQB has developed and implemented a comprehensive water quality monitoring strategy for the surface waters of the State.

The monitoring strategy establishes the methods of identifying and prioritizing water quality data needs, specifies procedures for acquiring and managing water quality data, and describes how these data are used to progress toward three basic monitoring objectives: to develop water quality-based controls, to evaluate the effectiveness of such controls, and to conduct water quality assessments. SWQB revised its 10-year monitoring and assessment strategy (NMED/SWQB 2010b) and submitted it to USEPA Region 6 for review on March 23, 2010. The strategy details both the extent of monitoring that can be accomplished with existing resources plus expanded monitoring strategies that could be implemented given additional resources. The SWQB utilizes a rotating basin approach to water quality monitoring. In this approach, a select number of watersheds are intensively monitored each year with an established return frequency of approximately every eight years. The next scheduled monitoring date for the Sacramento Mountains is 2021-2022. The SWQB maintains current quality assurance and quality control plans to cover all monitoring activities. This document, called the QAPP, is updated and certified annually by USEPA Region 6. In addition, the SWQB identifies the data quality objectives required to provide information of sufficient quality to meet the established goals of the program. Current priorities for monitoring in the SWQB are driven by the CWA Section 303(d) list of streams requiring TMDLs. Short-term efforts were directed toward those waters that are on the USEPA TMDL consent decree list (U.S. District Court for the District of New Mexico 1997), however NMED/SWQB completed the final remaining TMDL on the consent decree in December 2006 and USEPA approved this TMDL in August 2007. The U.S. District Court dismissed the Consent Decree on April 21, 2009.

Once assessment monitoring is completed, those reaches showing impacts and requiring a TMDL will be targeted for more intensive monitoring. The methods of data acquisition include fixed-station monitoring, intensive surveys of priority assessment units (including biological assessments), and compliance monitoring of industrial, federal, and municipal dischargers, as specified in the SWQB Standard Operating Procedures (NMED/SWQB 2010a).

Long-term monitoring for assessments will be accomplished through the establishment of sampling sites that are representative of the waterbody and which can be revisited approximately every eight years. This information will provide time relevant information for use in CWA Section 303(d) listing and 305(b) report assessments and to support the need for developing TMDLs. The approach provides:

- a systematic, detailed review of water quality data which allows for a more efficient use of valuable monitoring resources;
- information at a scale where implementation of corrective activities is feasible;

- an established order of rotation and predictable sampling in each basin which allows for enhanced coordinated efforts with other programs; and
- program efficiency and improvements in the basis for management decisions.

It should be noted that a watershed would not be ignored during the years in between water quality surveys. The rotating basin program will be supplemented with other data collection efforts such as on-going studies being performed by the USGS and USEPA. Data will be analyzed and field studies will be conducted to further characterize acknowledged problems and TMDLs will be developed and implemented accordingly. Both long-term and intensive field studies can contribute to the State's Integrated 303(d)/§305(b) listing process for waters requiring TMDLs.

5.0 IMPLEMENTATION OF TMDLS

When approving TMDL documents, EPA takes action on the TMDL, LA, WLA, and other components of the TMDL as needed (e.g. MOS and future growth). EPA does not take action on the implementation section of the TMDL, and EPA is not bound to implement any recommendations found in this section, in particular if they are found to be inconsistent with Clean Water Act and NPDES regulations, guidance, or policy.

5.1 Point Sources – NPDES permitting

City of Ruidoso Downs and Village of Ruidoso WWTP (NPDES permit NM0029165)

In 1987, Congress passed amendments to the Clean Water Act (CWA). In those amendments, Congress added two "anti-backsliding" provisions, Sections 303(d)(4), that restrict the circumstances under which NPDES permit limits may be relaxed upon permit renewal, reissuance, or modification. Section 303(d)(4), which identifies further grounds for backsliding for water quality-based permits. Under Section 303(d)(4),

> "*For waters... where the applicable water quality standard has not yet been attained, any effluent limitation based on a total maximum daily load or other waste load allocation established under this section may be revised only if the cumulative effect of all such revised effluent limitations based on such total maximum daily load or waste load allocation will assure the attainment of such water quality standard...*"

As explained by USEPA, for non-attainment waters, 303(d)(4) allows backsliding only where the existing permit limit sought to be revised is based on a TMDL or other WLA, and the revised permit limit assures attainment of the water quality standard at issue.

This revised nutrient TMDL allocates a larger waste load allocation and assigns less stringent permit limits for plant nutrients than the original 2006 TMDL (NMED/SWQB 2006). However, the revised TMDL is calculated using the same protective, in-stream targets from the original TMDL and the revised wasteload allocations assigned to the Ruidoso/Ruidoso Downs WWTP (NM0029165) are consistent with the TMDL. Therefore, if the conditions in the TMDL are met, attainment of the water quality standard is assured.

There are WLAs for TN and TP assigned to the Ruidoso/Ruidoso Downs WWTP. Due to the chronic rather than acute nature of nutrient impairments (as discussed in Section 3) the TN and TP effluent limits should be implemented as a 30-day average, or longer averaging period, rather than a daily maximum limit[3] in the future permit. Based on DMRs submitted by the permittee from January 2012-April 2016 (see Appendix C), the average monthly (i.e., 30-day) effluent loading was 30.1 lbs/day TN and 0.7 lbs/day TP. As the WWTP daily discharge changes,

[3] See Section 4.3.1.4 of the June 2014 National Association of Clean Water Agencies' review of EPA's Methods for Setting Water Quality-Based Effluent Limits for Nutrients.
http://www.ppacg.org/files/ENVIRON/AF%20CURE/effluent_limits_june2014.pdf

nutrient concentrations in the effluent would have to change accordingly to maintain the assigned WLA. For example, as discharge volume increases, the effluent concentrations would need to decrease in order to meet the WLA. The concentrations associated with the Total WLA as well as the Current WLA and Future Growth WLA are 0.11 mg/L TP and 2.41 mg/L TN. However, as detailed below, SWQB encourages EPA Region 6 to include only loading (and not concentrations) in future permits. SWQB suggests that the next permit include the Current-WLA with a provision that addresses the permittee's ability to apply for portions of the FG-WLA during the next permit renewal or through a permit revision.

SWQB offers the following considerations in order to address TMDL implementation through the next NPDES permit process. It is possible that a combination of portions of the following options could result in the most effective implementation of the TMDL and WLA through the permit process.

- The next permit could be issued utilizing interim temperature-dependent TN 30-day average permit limits, similar to the previous permit, and include a compliance schedule to allow the facility time to meet the new WLA.
- The next permit could only include loading limits that would be based on a 30-day average (or longer averaging period) rather than a daily maximum. The permit could include a compliance schedule to allow the facility time to meet the new WLA.
- The next permit could include additional nutrient monitoring beyond the minimum of twice monthly.
- A Temporary Standard (TS) provision was approved by the NMWQCC in September 2016 as part of the Triennial Review. As approved, a TS proposal could be submitted that is waterbody-pollutant specific. The TS would apply for a set amount of time and would include milestones to be achieved. The original water quality standard would apply upon expiration of the TS. SWQB is currently working with USEPA to implement a work plan that details a nutrient implementation strategy for point source dischargers.

There are no other individual NPDES permits that discharge to assessment units addressed in this document. The MSGP and CGP NPDES permits, as well as the pending CAFO permit for the Ruidoso Downs Racetrack, are discussed in Section 3.5.2.

5.2 Nonpoint Sources – WBP and BMP Coordination

The 2007 Settlement Agreement between NMED and the City of Ruidoso Downs and the Village of Ruidoso outlined plans to address non-point sources in the Rio Ruidoso watershed. The City of Ruidoso Downs and the Village of Ruidoso submitted the final report in fulfillment of the Settlement Agreement in March 2013. The City of Ruidoso Downs and the Village of Ruidoso continue to pursue projects to address non-point source sources of nutrients in the Rio Ruidoso watershed. As a result of the June 2008 flood, the Village of Ruidoso entered into an agreement on January 9, 2016 with the Federal Emergency Management Agency (FEMA) and the New Mexico Department of Homeland Security and Emergency Management to include hazard mitigation of disaster-damaged elements of the Ruidoso Sewer Line Relocation Project. The facility sustained damage as a result of flooding (FEMA-1783-DR-NM) and will be funded under the Public Assistance Grant Program authorized for the major disaster declaration FEMA-11783-DR-NM declared on August 14, 2008. The Project will include design, project management costs and repair and replacement costs to mitigate the flood damage to the Ruidoso Sewer System in the Upper, Middle and Lower Canyon of Ruidoso and Ruidoso Downs, which probably contains leaks, located under the Rio Ruidoso. The main sewer line will be relocated away from the river bed. FEMA has approved 30% of the design of the Project, and the Village has completed this first portion of design. Design is planned to resume in August 2016, and construction is planned to begin in 2017.

Public awareness and involvement will be crucial to the successful implementation of these plans and improved water quality. A Watershed-Based Plan ("WBP") is a written plan intended to provide a long-range vision for various activities and management of resources in a watershed. It includes opportunities for private landowners and public agencies in reducing and preventing nonpoint source impacts to water quality. This long-range strategy will become instrumental in coordinating efforts to achieve water quality standards in the watershed. The WBP is essentially the Implementation Plan, or Phase Two of the TMDL process. The completion of the TMDLs and WBP leads directly to the development of on-the-ground projects to address surface water impairments in the watershed. BMPs to be considered as part of on-the ground-projects to address nutrients include: bioretention areas (rain gardens), vegetated water quality swales, infiltration trenches and basins, riparian buffer or vegetation filter strips, constructed wetlands, stormwater detention or wetland retrofits, cisterns, and permeable pavement. Additional information about the reduction of non-point source pollution can be found online at: https://www.epa.gov/polluted-runoff-nonpoint-source-pollution.

SWQB staff will continue to provide technical assistance such as selection and application of BMPs needed to meet WBP goals. Stakeholder public outreach and involvement in the implementation of this TMDL will be ongoing.

5.3 Clean Water Act §319(h) Funding

The Watershed Protection Section of the SWQB can potentially provide USEPA Section 319(h) funding to assist in implementation of BMPs to address water quality problems on reaches listed as category 4 or 5 waters on the Integrated 303(d)/ §305(b) list. These monies are available to all private, for-profit, and nonprofit organizations that are authenticated legal entities, or governmental jurisdictions including: cities, counties, tribal entities, federal agencies, or agencies of the state. Proposals are submitted by applicants through a Request for Proposal (RFP) process. Selected projects require a non-federal match of 40% of the total project cost consisting of funds and/or in-kind services. Funding is potentially available, generally annually, for both watershed-based planning and on-the-ground projects to improve surface water quality and associated habitat. Further information on funding from the CWA Section 319(h) can be found at the SWQB website: http://www.nmenv.state.nm.us/swqb/.

Historically, the Ruidoso River Association was involved in watershed restoration and planning. The following four projects were previously funded with 319(h) funds in the Rio Ruidoso watershed-

- Rio Ruidoso Watershed Restoration Project Phase I (FY98-D).

- Upper Hondo Restoration Project Phase I (FY01-L).
- Rio Ruidoso Watershed Restoration Project Phase II (FY03-D).
- Upper Hondo Restoration Project Phase II (FY06-B).

SWQB staff will continue to conduct outreach related to the CWA 319(h) funding program which could lead to the formation of additional watershed groups in the area.

5.4 Other Funding Opportunities and Restoration Efforts in the Rio Ruidoso Watershed

Several other sources of funding exist to address impairments discussed in this TMDL document. NMED's Construction Programs Bureau assists communities in need of funding for WWTP upgrades and improvements to septic tank configurations. They can also provide matching funds for appropriate CWA §319(h) projects using state revolving fund monies. The USDA Natural Resources Conservation Service (NRCS) Environmental Quality Incentive Program (EQIP) program can provide assistance to private land owners in the basin. The USDA Forest Service aligns their mission to protect lands they manage with the TMDL process, and are another source of assistance. The Bureau of Land Management (BLM) has several programs in place to provide assistance to improve unpaved roads and grazing allotments.

SWQB annually makes available Section 604(b) funds through a Request for Quotes (RFQ) process. SWQB requests quotes from regional public comprehensive planning organizations to conduct water quality management planning as defined under Sections 205(j) and 303(e) and the CWA. SWQB seeks proposals to conduct water quality management planning with a focus on projects that clearly address the State's water quality goals to preserve, protect and improve the water quality in New Mexico. SWQB encourages proposals focused on TMDLs and UAAs or other water quality management planning activities that will directly address identified water quality impairments. The SWQB 604(b) RFQ is released annually in September.

The New Mexico Legislature appropriated $2.3 million in state funds for the River Stewardship Program during the 2014 Legislative Session, $1 million during the 2015 Special Session, and $1.5 million during the 2016 Legislative Session. The River Stewardship Program has the overall goal of addressing the root causes of poor water quality and stream habitat. Objectives of the River Stewardship Program include: "restoring or maintaining hydrology of streams and rivers to better handle overbank flows and thus reduce flooding downstream; enhancing economic benefits of healthy river systems such as improved opportunities to hunt, fish, float or view wildlife; and providing state matching funds required for federal CWA grants." A competitive request for proposals was conducted for 2014 funding and twelve projects located throughout the state were selected. Responsibility for the program is assigned to NMED, and SWQB staff administers the projects. SWQB issued a competitive request for proposals for the 2015-2016 funding in early 2016. Submitted project proposals have been reviewed, funding has been approved, and contracts are currently in development.

Information on additional watershed restoration funding resources is available on the SWQB website at-
https://www.env.nm.gov/swqb/Watershed_Protection/FundingSourcesforWatershedProtection.pdf.

6.0 APPLICABLE REGULATIONS and STAKEHOLDER ASSURANCES

New Mexico's Water Quality Act ("Act") authorizes the WQCC to "promulgate and publish regulations to prevent or abate water pollution in the state" (NMSA 1978, § 74-6-4.E[4]) and to require permits. The Act authorizes a constituent agency to take enforcement action against any person who violates a water quality standard. Several statutory provisions on nuisance law could also be applied to NPS water pollution. The Water Quality Act also provides that:

> *"[t]he Water Quality Act does not grant to the commission or to any other entity the power to take away or modify the property rights in water, nor is it the intention of the Water Quality Act to take away or modify such rights."*

NMSA 1978, §74-6-12.A[5]. In addition, the State of New Mexico Surface Water Quality Standards, Subsection C of 20.6.4.4 NMAC also provides:

> *"C. Pursuant to Subsection A of Section 74-6-12 NMSA 1978, this part does not grant to the water quality control commission or to any other entity the power to take away or modify property rights in water."*

20.6.4.4.C NMAC[6]. New Mexico policies are in general accord with the federal Clean Water Act Section 101(g), 33 U.S.C. §1251(g), goals:

> *"It is the policy of Congress that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this chapter. It is the further policy of Congress that nothing in this chapter shall be construed to supersede or abrogate rights to quantities of water which have been established by any State. Federal agencies shall co-operate with State and local agencies to develop comprehensive solutions to prevent, reduce and eliminate pollution in concert with programs for managing water resources."*

33 U.S.C. §1251(g)[7]. New Mexico's CWA Section 319 program has been developed in a coordinated manner with the State's Section 303(d) process. All Section 319 watersheds that are targeted in the annual RFP process coincides with the State's preparation of the biennial impaired waters listing as approved by the USEPA. The State has given a high priority for funding, assessment, and restoration activities to these impaired/listed watersheds.

As a constituent agency, NMED has the authority pursuant to NMSA 1978, Section 74-6-10, to issue a compliance order or commence civil action in district court for appropriate relief if NMED determines that actions of a "person" (as defined in the Act) have resulted in a violation of a water quality standard including a violation caused by a NPS. The NMED NPS water quality management program has historically strived for and will continue to promote voluntary compliance to NPS water pollution concerns by utilizing a voluntary, cooperative approach. The

[4] http://www.nmlegis.gov/sessions/03%20Regular/FinalVersions/HB0114.html
[5] http://www.nmlegis.gov/sessions/03%20Regular/FinalVersions/HB0114.html
[6] http://www.nmcpr.state.nm.us/nmac/parts/title20/20.006.0004.htm
[7] http://www.epw.senate.gov/water.pdf

State provides technical support and grant monies for implementation of BMPs and other NPS prevention mechanisms through Section 319 of the Clean Water Act (33 U.S.C. §1329). Since portions of this TMDL will be implemented through NPS control mechanisms, the New Mexico Watershed Protection Program will target efforts to this and other watersheds with TMDLs.

In order to obtain reasonable assurances for implementation in watersheds with multiple landowners, including federal, state, and private entities, NMED has established Memoranda of Understanding ("MOU") with various federal agencies, in particular the USFS and the BLM. A MOU has also been developed with other state agencies, such as the New Mexico Department of Transportation. These MOUs provide for coordination and consistency in dealing with NPS issues.

The time required to attain standards for all reaches is estimated to be approximately ten to twenty years. This estimate is based on a five-year time frame implementing several watershed projects that may not be starting immediately or may be in response to earlier projects. Stakeholders in this process will include the SWQB, and other parties identified in the WBP. The cooperation of watershed stakeholders will be pivotal in the implementation of these TMDLs as well.

7.0 PUBLIC PARTICIPATION

Public participation was solicited in development of the first draft of this TMDL document (*E.coli*, turbidity, total phosphorus, and plant nutrient TMDLs). The first draft TMDL was made available for a 30-day comment period beginning on July 7, 2014. The draft document notice of availability was extensively advertised via newsletters, email distribution lists, webpage postings (http://www.nmenv.state.nm.us), and press releases to area newspapers. A public meeting was held on July 16, 2014 in Ruidoso. A meeting with all parties who submitted public comments was held on October 24, 2014 to discuss the draft TMDL and the draft Response to Comments. A meeting was held with all parties on December 5, 2014 to discuss the 2015 sampling to be performed by Parametrix and the Village of Ruidoso/City of Ruidoso Downs. SWQB staff provided comments on the draft field sampling plan to Parametrix on January 2, 2015. Comments on the revised TMDL and the draft Response to Comments were received from EPA Region 6, Steve Sugarman (representing Rio Hondo Land & Cattle Co, LP and WildEarth Guardians), and Village of Ruidoso/City of Ruidoso Downs on January 5, 2015. The plant nutrient and total phosphorus TMDLs were removed from the document and the remaining *E.coli* and turbidity TMDLs were presented to the WQCC for approval on August 11, 2015 and received USEPA Region 6 approval on September 21, 2015. On February 22, 2016, SWQB received from the Village of Ruidoso/City of Ruidoso Downs Joint Use Board, a Notice of Intent to conduct a Use Attainability Analysis (UAA) on the Rio Ruidoso downstream of the Highway 70 bridge.

The revised plant nutrient and total phosphorus TMDL document was made available for a 30-day comment period beginning on August 22, 2016.The draft document notice of availability was extensively advertised via newsletters, email distribution lists, webpage postings (http://www.nmenv.state.nm.us), and press releases to area newspapers. A public meeting will be held on September 14, 2016 in Ruidoso. In addition, a separate meeting will be held with affected stakeholders on September 7, 2016 in Ruidoso.

Once the TMDL is approved by the WQCC, the next step for public participation will be activities as described in Section 6.0 and participation in watershed protection projects including those that may be funded by Clean Water Act Section 319(h) grants.

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APPENDIX A

CONVERSION FACTOR DERIVATIONS