UPDATE

USEPA-APPROVED

TOTAL MAXIMUM DAILY LOAD (TMDL)

FOR THE

MORA RIVER (USGS GAGE EAST OF SHOEMAKER TO HWY 434)

July 22, 2015

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~or~

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COVER PHOTO: Mora River near La Cueva gage, Jeff Scarano 2014

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LIST OF ABBREVIATIONS

4Q3	4-Day, 3-year low-flow frequency
AU	Assessment Unit
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
^{o}C	Degrees Celsius
DO	Dissolved Oxygen
EQIP	Environmental Quality Incentive Program
^{o}F	Degrees Fahrenheit
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
OSE	Office of the State Engineer
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
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WLA	Waste load allocation
WBP	Watershed-based plan
WPS	Watershed Protection Section
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, 33 U.S.C. §§1251 to 1388[1], requires states to develop Total Maximum Daily Load ("TMDL") management plans for water bodies determined to be impaired.33 U.S.C. § 1313[2] 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 ("WLAs") for point sources and Load Allocations ("LAs") for nonpoint source ("NPS") and background conditions (see 40 C.F.R. §130.2(i))[3]. TMDLs also include a Margin of Safety ("MOS"), a required component to address uncertainty in load estimates, modeling analyses, and/or variability in the data.

The New Mexico Environment Department ("NMED") Surface Water Quality Bureau ("SWQB") conducted an initial water quality survey of the Canadian watershed in 2002. Water quality monitoring stations were located within the watersheds to evaluate ambient water quality conditions and the impact of tributary streams. Additional data were collected in 2003 and 2006. SWQB prepared TMDLs in 2007 for various portions of this watershed including one for plant nutrients on the Mora River (USGS gage east of Shoemaker to Hwy 434). This TMDL update addresses the impairments summarized in **Table ES1**.

SWQB's Monitoring, Assessment, and Standards Section ("MASS") will next collect water quality data in the Canadian watershed in 2015. 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.

SWQB's Point Source Regulation Section ("PSRS") will continue to work with the United States Environmental Protection Agency ("USEPA") and local entities to implement strategies through the National Pollutant Discharge Elimination System ("NPDES") program that reduce or eliminate point source pollutants in surface waters of New Mexico. In addition, SWQB's Watershed Protection Section ("WPS") will continue to work with watershed groups to develop Watershed-Based Plans ("WBPs") to implement best management practices ("BMPs") that reduce nonpoint source pollutants. Implementation of items detailed in the NPDES permit(s) and/or WBP will be done with participation of all interested and affected parties and will attempt to correct the water quality impairments detailed in this document.

[1] http://www.epw.senate.gov/water.pdf
[2] http://www.epw.senate.gov/water.pdf
[3] http://www.gpo.gov/fdsys/pkg/CFR-2002-title40-vol18/pdf/CFR-2002-title40-vol18-part130.pdf

Table ES1. Total Maximum Daily Loads for Mora River (USGS Gage East of Shoemaker to Hwy 434)

New Mexico Standards Segment	Mora River Basin 20.6.4.307			
Waterbody Identifier	NM-2305.3.A_00			
Segment Length	53.44 miles			
Parameters of Concern	Plant nutrients			
Uses Affected	Marginal Coldwater and Warmwater Aquatic Life			
Geographic Location	Mora USGS Hydrologic Unit Code 11080004			
Scope/size of Watershed	144.5 mi^2			
Land Type	Southern Rockies Ecoregion (21) Southwestern Tablelands Ecoregion (26)			
Land Use/Cover	58% Grassland; 30% Forest; 12% Shrubland; <1% Agriculture			
Probable Sources	Agriculture; Flow Alterations from Water Diversions; Drought related; Habitat modifications; Municipal Point Source Discharges; Natural Sources; On-site Treatment Systems (Septic); Rangeland Grazing; Recreational use; and Silviculture Harvesting; Wildlife other than waterfowl.			
Land Management	84% Private; 13% Forest Service; 3% State			
IR Category	4A			
Priority Ranking	High			
TMDL for:	**WLA (lbs/day)+LA (lbs/day)+MOS (lbs/day = TMDL (lbs/day)**			
Summer:				
Total phosphorous	1.16	1.31	0.27	2.75
Total nitrogen	9.41	21.9	3.48	34.80
Winter:				
Total phosphorous	0.38	0.34	0.08	0.79
Total nitrogen	3.18	5.84	1.00	10.03

1.0 PLANT NUTRIENTS

The potential for excessive nutrients in the Mora River was first noted through visual observation. To address this concern, data collected during 2002 and 2006 from seven stations in the assessment unit were collated and applied to SWQB's nutrient assessment protocol (NMED/SWQB 2013). Total nitrogen ("TN") values were above the threshold value in 48% of the samples, total phosphorus ("TP") values were above the threshold value in 28% of the samples, and the percent dissolved oxygen ("DO") saturation was greater than 120% in 51% of the samples. Chlorophyll *a* and ash free dry mass also exceeded impairment thresholds. As a result of this assessment, the Mora River (USGS gage east of Shoemaker to Hwy 434) was determined to be impaired due to Nutrient/Eutrophication Biological Indicators and was first listed on the State of New Mexico Clean Water Act 2004-2006 §303(d) List of Impaired Surface Waters (NMED/SWQB 2004)[4].

1.1 Target Loading Capacity

Target values for nutrient loads are determined based on 1) the presence of numeric or narrative criteria, 2) the degree of experience in applying the indicator, and 3) the ability to easily monitor and produce quantifiable and reproducible results. For this Total Maximum Daily Load ("TMDL") document the target value for plant nutrients is based on both narrative and numeric translators.

The New Mexico Water Quality Control Commission ("WQCC") has adopted a narrative water quality standards criterion for plant nutrients to sustain and protect existing or attainable uses of the surface waters of the state. This general criterion applies to surface waters of the state at all times unless a specific criterion is provided elsewhere. The narrative criterion for plant nutrients leading to an assessment of use impairment is as follows Subsection E of 20.6.4.13 New Mexico Administrative Code ("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. Therefore, the Surface Water Quality Bureau ("SWQB"), with the assistance from the USEPA and the United States Geologic Service ("USGS"), developed a *Nutrient Assessment Protocol* (NMED/SWQB 2013) to assist in meeting these challenges. The protocol was initially developed for wadeable streams because they represent the majority of assessed surface waters in the state. It addresses both cause (TN and TP) and response variables DO, pH, and periphyton chlorophyll *a*) and uses a weight-of-evidence approach to determine impairment. Threshold values for each of the cause and response variables are used to translate the narrative nutrient criterion into quantifiable endpoints (**Table 1.1**). A protocol for large, non-wadeable rivers is currently under development.

[4] Available at http://www.nmenv.state.nm.us/swqb/305b/2002/index.html

Water quality assessments for nutrients are based on quantitative measurements of causal and response indicators. If these measurements exceed the numeric nutrient threshold values, indicate excessive primary production (e.g., large DO and pH fluctuation and/or high chlorophyll *a* concentration), and/or demonstrate an unhealthy biological community, the reach is considered to be impaired.

There are two potential causes of nutrient enrichment in a given stream: excessive nitrogen and excessive phosphorus. Nutrient criteria, whether numeric or narrative, control the excessive growth of attached algae and higher aquatic plants, which preserves the aesthetic and ecologic characteristics along the waterway. 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.

Phosphorous is found in water primarily as ortho-phosphate. 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 a combination of USEPA methods 351.2 (TKN) and 353.2 (Nitrate+Nitrite) is appropriate for estimating Total Nitrogen (APHA 1989). The applicable threshold values for cause (phosphorus and nitrogen) and response (DO, pH, and chlorophyll *a*) variables in the Mora River watershed are shown in **Table 1.1**. These threshold values were used for water quality assessments and for TMDL development.

The Mora River (USGS gage east of Shoemaker to Hwy 434) is located in both Ecoregion 21 (Southern Rockies) and Ecoregion 26 (Southwestern Tablelands) and has designated aquatic life uses of both marginal coldwater and warmwater (20.6.4.307 NMAC). The upstream Assessment Unit ("AU") (Mora River (Hwy 434 to Luna Creek)), which entirely within Ecoregion 21, is not impaired for plant nutrients, however maximum instream values in this AU for both TN and TP are at or above the Ecoregion 26 thresholds (Appendix A). Based on this, it is reasonable to conclude that the Ecoregion 26 threshold should be sufficiently protective of water quality for the downstream AU - Mora River (USGS gage east of Shoemaker to Hwy 434). For this reason this TMDL sets the numeric targets for TN and TP at the Ecoregion 26 thresholds of 0.38 mg/L and 0.03 mg/L, respectively.

Table 1.1. Applicable thresholds for the Mora River (USGS gage east of Shoemaker to Hwy 434)

Mora River	
Ecoregion	21-Southern Rockies, and 26-Southwestern Tablelands
WQS segment	20.6.4.307
Aquatic Life Use	Marginal Coldwater and Warmwater
Total Phosphorus[(a)]	0.02mg/L and 0.03 mg/L
Total Nitrogen[(a)(c)]	0.25 mg/L and 0.38 mg/L
Dissolved Oxygen[(b)]	6.0 mg/L and 5.0 mg/L
pH	6.6 – 9.0
Chlorophyll *a* [(a)]	3.9-5.5 µg/cm^2 and 8.2-14.0 µg/cm^2

(a) Ecoregion 21 and 26 thresholds, respectively.
(b) Water Quality Standard ("WQS") segment 20.6.4.307 includes both the Marginal Coldwater and Warmwater aquatic life uses.
(c) Total Nitrogen is defined as the sum of Nitrate+Nitrite (N+N), and TKN. At the present time, there is no USEPA-approved method to test for Total Nitrogen, however a combination of USEPA methods 351.2 (TKN) and 353.2 (N+N) is appropriate for estimating Total Nitrogen (APHA 1989).

1.2 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. Thus, a TMDL is calculated for each assessment unit at the critical low flow ("4Q3").

Historically, the SWQB has used the 4Q3 to calculate nutrient TMDLs, which is defined as the minimum average four consecutive day flow that occurs with a frequency of at least once every three years. 20.6.4.11(B)(2) NMAC. However, the Water Quality Standards ("WQS") regulations (20.6.4.11 NMAC) only require the use of a 4Q3 low flow for numeric water quality criteria. Further, the 4Q3 is not an appropriate low flow for nutrient impairments, which typically occur in response to long term exposure to elevated nutrients. After consideration of a number of low flow stream conditions used by other Western states, including the 7Q10, average annual, monthly average, and median flows, SWQB is proposing to use a seasonal median flow. This is appropriate because the median flow represents the "typical" base flow in a water body, which is more likely to occur for longer periods of time. The use of the median flow also eliminates the influence of flashy monsoon events that would bias the average flow value high, relative to the typical stream condition. The most critical season for algae growth is typically the summer

months, when stream temperatures are highest, but if there is significant seasonality in the flow pattern, then multiple seasonal medians may be appropriate to protect against nuisance algae throughout the year.

When available, USGS gages are used to estimate flow. There are two active gages on the Mora River that may be used to estimate flow for the impaired reach (**Table 1.2**). The gage at La Cueva was chosen for this TMDL because it is downstream of the wastewater treatment plant ("WWTP") and it is also one of SWQB's water quality stations.

Table 1.2 Active USGS gages in the Mora River

Agency	Site Number	Site Name	Period of Record
USGS	07215500	Mora River at La Cueva, NM	1998-present
USGS	07216500	Mora River near Golondrinas, NM	1998-present

The flows in the Mora River at the La Cueva gage (07215500) vary significantly over the course of a year, with almost an order of magnitude difference between winter and summer median flows. Thus two separate TMDLs were calculated; one for summer flows and one for winter flows. These are discussed in greater detail below. There are also several known diversion points between the Mora Mutual Domestic Water and Sewerage Works Association WWTP and the La Cueva gage that may be artificially reducing the gaged flows and should be included in the TMDL calculations (OSE 2014). In an effort to estimate these diversions, SWQB staff met with Office of the State Engineer ("OSE") staff and conducted field flow measurements in August and September 2014 at the Cañoncito and La Cueva diversions near Mora, NM. The following information was obtained:

- The diversion at Cañoncito is not gaged and the La Cueva diversion is only gaged at the point where it enters a lake used for irrigation water storage.
- Based on paper recorder strips of the La Cueva diversion near the lake, winter diversions generally vary from 0 to 8.5 cubic feet per second ("cfs") and are only active between November 1 and March 31. This diversion averaged 2 cfs between November and March from 2008 to 2013.
- Summer diversions from the La Cueva and Cañoncito diversions are not gaged, but according to OSE should be on the order of 1.5 acre-feet per irrigated acre. There are approximately 240 irrigated acres below the Cañoncito diversion and 810 acres below the La Cueva diversion, which equates to approximately 1.0 cfs and 3.0 cfs, respectively, of irrigation flow.
- On August 6, 2014 the Cañoncito diversion was measured by SWQB staff to be 1.7 cfs and the La Cueva diversion was measured by SWQB staff to be 3.4 cfs. The USGS gage at La Cueva at the time of measurement was 17 cfs.
- On September 5, 2014, the Cañoncito diversion was measured by SWQB staff to be 0.0 cfs and the La Cueva diversion was measured by SWQB staff to be 8.8 cfs. The USGS gage at La Cueva at the time of measurement was 16 cfs.

Based on the information summarized above, it is apparent that diversions are not consistent, completely gaged, and cannot be directly correlated back to flows in the Mora River. Therefore, it was decided to use conservative, average estimates of diversion flows in this TMDL document to be protective of water quality. Thus the diversions in the Mora River were estimated to be 4.0 cfs from April through October and 2.0 cfs from November through March. These flows were added to the USGS gage at La Cueva to determine critical low flow condition downstream of the WWTP. The typical irrigation (i.e., growing) season in the Mora River watershed (Ecoregion 26) is generally considered to be May 15 through November 15 (OSE 2014), thus the critical period for algae growth would be the warmest months during this growing season. However, because river flows in May and June are also very high and flows in October drop off significantly from the growing season median (**Table 1.3**), the period of May through September was used to calculate the summer median flow used in the TMDL calculations and the reminder of the year (October through April) was used to calculate the winter median flows.

Table 1.3 Median Flows in the Mora River at the La Cueva Gage, 2004 to 2014

Month	Median Flow, cfs
May	12
June	25
July	19
August	14
September	11.5
October	5.1

The summer and winter median flows were calculated using gage data from 2004-2014. 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 AD 1000 – 2000 (Gutzler 2007). In addition, the median gaged flow from the period of record (considered to be 1998 to present because the Mora Fish Hatchery came online in 1998) was calculated to be 5.3 cfs and the last decade median flow value was 4.9 cfs. Thus, using the full period of record may over-predict current flow conditions in the Mora River. Summer (May to September) and winter (October to April) median flows, based on daily flows from the USGS gage at La Cueva and corrected for diversions, are listed in **Table 1.4**.

Table 1.4 Summer and winter median flows for the Mora River, corrected for diversions

Period	Dates	Median Flow (cfs/mgd[(a)])
Summer	May – September	17 / 10.98
Winter	October - April	4.9 / 3.17

(a) million gallons per day

It is important to remember that the TMDL itself is a value calculated at a defined critical low flow condition, and is calculated as part of 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.

1.3 Calculations

This section 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 low-flow conditions without exceeding 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 1-1**. The calculated daily target loads (i.e., TMDLs) for TP and TN are summarized in **Table 1.5**.

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

The measured loads for TP and TN were similarly calculated. In order to achieve comparability between the target and measured loads, the same flow value was used for both calculations. The arithmetic mean of the collected data was substituted for the WQS in **Equation 1-1.** The same conversion factor of 8.34 was used. The results are presented in **Table 1.6**.

Table 1.5 Daily summer and winter target loads for TP & TN

Assessment Unit	Parameter	Critical Flow (mgd)[(a)]	In-Stream Target (mg/L)	Conversion Factor	TMDL (lbs/day)
	Summer (May to September)				
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	10.98	0.03	8.34	2.75
	Total Nitrogen	10.98	0.38	8.34	34.80
	Winter (October to April)				
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	3.17	0.03	8.34	0.79
	Total Nitrogen	3.17	0.38	8.34	10.03

(a) See Section 1.2 for details about critical flow calculations

Table 1.6 Measured loads for TP and TN

Assessment Unit	Parameter	Critical Flow (mgd)[a]	Arithmetic Mean Conc.[b] (mg/L)	Conversion Factor	Measured Load (lbs/day)
Summer (May to September)					
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	10.98	0.05	8.34	4.58
	Total Nitrogen	10.98	0.40	8.34	37.63
Winter (October to April)					
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	3.17	0.05	8.34	1.32
	Total Nitrogen	3.17	0.40	8.34	10.58

(a) See Section 1.2 for details about critical flow calculations

(b) Arithmetic mean of TP and TN concentrations from SWQB water quality surveys conducted between 2002 and 2006, see Appendix A.

1.4 Waste Load Allocations and Load Allocations

1.4.1 Waste Load Allocation

There are two existing point sources with individual NPDES permits in the Mora River assessment unit. These permitted facilities include the WWTP owned and operated by the Mora Mutual Domestic Water and Sewerage Works Association ("MMDWSWA") (NM0024996) and the Mora National Fish Hatchery and Technology Center (NM0030031). The WWTP discharges directly into the Mora River between the gage east of Shoemaker and Hwy 434. The fish hatchery discharges into an ephemeral unnamed ditch, then into Tambley Ditch, and then into the Mora River between the gage east of Shoemaker and Hwy 434.

There are no Municipal Separate Storm Sewer System ("MS4") storm water permits in these AUs. However, excess nutrient loading may be a component of some storm water discharges covered under general National Pollutant Discharge Elimination System ("NPDES") permits. Storm water discharges from construction activities are transient because they occur mainly during the construction itself, and then only during storm events. Coverage under the NPDES Construction General Permit ("CGP") for construction sites greater than one acre requires preparation of a Storm Water Pollution Prevention Plan ("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 waste load allocations ("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 load allocation ("LA").

Nutrient removal is one of the most pressing challenges 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, has generally been considered to be 0.1 mg/L for TP and 3.0 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 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.

Nutrient WLAs for the Mora WWTP and the Mora National Fish Hatchery and Technology Center are shown in **Table 1.7.** The summer WLAs were calculated based on recent DMR data from the hatchery, which show that TN and TP effluent concentrations are typically below 1.0 mg/L and 0.1 mg/L, respectively, and an instream target of 0.25 mg/L of TN and 0.015 mg/L of TP for NPS LA (discussed in Section 1.4.2 below in more detail). The winter WLAs were calculated based on NPS instream targets of 0.26 mg/L for TN and 0.015 mg/L for TP, and then proportionally reducing the WLAs for the WWTP and hatchery until the TMDL was achieved.

Table 1.7 Nutrient Wasteload Allocations for the Mora WWTP and the Mora National Fish Hatchery and Technology Center

	Facility	Parameter	Permitted Design Capacity (mgd)	Conversion Factor	Wasteload Allocation (lbs/day)
Summer (May-Sept)	Mora WWTP (NM0024996)[(a)]	Total Phosphorus	0.052	8.34	0.81
		Total Nitrogen			5.91
	Mora National Fish Hatchery and Technology Center (NM0030031)[(b)]	Total Phosphorus	0.420		0.35
		Total Nitrogen			3.50
Winter (Oct-April)	Mora WWTP (NM0024996)[(a)]	Total Phosphorus	0.052	8.34	0.26
		Total Nitrogen			2.0
	Mora National Fish Hatchery and Technology Center (NM0030031)[(b)]	Total Phosphorus	0.420		0.11
		Total Nitrogen			1.19

(a) Current NPDES Permit expired October 31, 2013, but has been administratively extended by USEPA

(b) Current NPDES Permit expires July 31, 2018

1.4.2 Load Allocation and Margin of Safety

Ideally, the instream targets for the LA would be based on a reference site that is not impacted by any point or non-point sources of pollution. Several stations upstream of and/or near to the impaired AU on the Mora River were evaluated as reference sites, and although all of them showed evidence of potential non-point sources of pollution (e.g., agricultural land, livestock watering ponds, structures, etc.). A station on the Rio de la Casa (07RiolaC006.2) was the least impacted with median annual TN and TP values of 0.129 mg/L and 0.015 mg/L, respective. While these values represent the ideal in terms of nonpoint source loading for a watershed in this region, such values may be difficult to achieve.

The assessment unit immediately upstream of the nutrient-impaired Mora River AU presents an alternative as the land use characteristic and hydrology are comparable to the TMDL watershed. Critically, this AU has no NPDES discharges and is not impaired for nutrients, thus nonpoint source loading in this watershed should be similar to that in the impaired AU, with median annual TN and TP concentrations of 0.25 mg/L and 0.015 mg/L, respectively. Thus it is reasonable to assume that the measured values at the Mora River at Chacon (07MoraRi170.9) site in the unimpaired AU are achievable for the Mora River (USGS gage east of Shoemaker to Hwy 434) AU, and would achieve water quality standards. Therefore, rather than using the reference site or ecoregion thresholds, the seasonal median values from the Mora River at Chacon (07MoraRi170.9) site were used. Based on data collected in 2002 at this station (Appendix A), summer instream target for TN and TP were 0.25 mg/L and 0.015 mg/L, respectively. Winter instream targets of TN and TP were 0.26 mg/L and 0.015 mg/L, respectively. To calculate the LA for TP and TN, the following equations were used for summer flows:

$$\text{TP LA} = 0.015\text{mg/L} \times \text{critical flow (mgd)} \times 8.34 \quad \text{(Eq. 1-2)}$$

$$\text{TN LA} = 0.25\text{mg/L} \times \text{critical flow (mgd)} \times 8.34 \quad \text{(Eq. 1-3)}$$

The Margin of Safety ("MOS") was developed using a combination of conservative assumptions and explicit recognition of potential errors (discussed in more detail in Section 1.7 below). Results using an explicit MOS of 10% are presented in **Table 1.8**.

Table 1.8 Calculation of TMDLs for TP and TN

Assessment Unit	Parameter	WLA (lbs/day)	LA (lbs/day)	MOS (10%)	TMDL (lbs/day)
	Summer (May to September)				
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	1.16	1.31	0.27	2.75
	Total Nitrogen	9.41	21.9	3.48	34.80
	Winter (October to April)				
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	0.38	0.34	0.08	0.79
	Total Nitrogen	3.18	5.84	1.00	10.03

The load reductions necessary to meet the target loads were calculated as the difference between the calculated daily target load (i.e., TMDL) (**Table 1.8**) and the measured load (**Table 1.6**), and are shown in **Table 1.9**.

Table 1.9 Calculation of load reduction for TP and TN[(a)]

Assessment Unit	Parameter	Target Load (lbs/day)	Measured Load (lbs/day)[(b)]	Load Reduction (lbs/day)	Percent Reduction[(c)]
	Summer (May to September)				
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	2.47	4.58	2.10	46
	Total Nitrogen	31.32	37.63	6.31	17
	Winter (October to April)				
Mora River (USGS gage east of Shoemaker to Hwy 434)	Total Phosphorus	0.71	1.32	0.61	46
	Total Nitrogen	9.03	10.58	1.55	15

(a) 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 the target load is calculated as WLA + LA.

(b) The measured load is the magnitude of point and nonpoint sources.

(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.

1.5 Identification and Description of Pollutant Sources

SWQB fieldwork includes an assessment of the probable sources of impairment, which are listed in **Table 1.10** for the Mora River TMDL. 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, and 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. The draft probable source list will be reviewed and modified, as necessary, with watershed group/ stakeholder input during the TMDL public meeting and comment period as well as during the development of future Watershed-Based Plans ("WBPs") that include this assessment unit.

Table 1.10 Pollutant source summary for plant nutrients

Assessment Unit	NPDES permit	Probable Sources
Mora River (USGS gage east of Shoemaker to Hwy 434)	NM0024996 NM0030031	Agriculture; Flow Alterations from Water Diversions; Drought related; Habitat modifications; Municipal Point Source Discharges; Natural Sources; On-site Treatment Systems (Septic); Rangeland Grazing; Recreational use; and Silviculture Harvesting; Wildlife other than waterfowl.

1.6 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.

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 break down 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 plant or algal 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 1.1**).

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. 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 support less biological diversity (NOAA/EPA 1988).

An algal bioassay study conducted in the Rio Ruidoso prior to the development of the 2006 TMDL indicate that the Rio Ruidoso is co-limiting for TN and TP and recent data collections by SWQB show that the limiting nutrient varies seasonally. The biogeochemical cycling of N and P are closely linked to each other, and thus the measures focusing on one of the nutrients can affect the other (Ekholm 2008). Davidson and Howarth (2008) summarize TN and TP limiting studies: "*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."* Streams have demonstrated seasonal changes in nutrient limitation and co-limitation is often observed in freshwater systems (USEPA 2012).

As described in Section 1.2, 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.

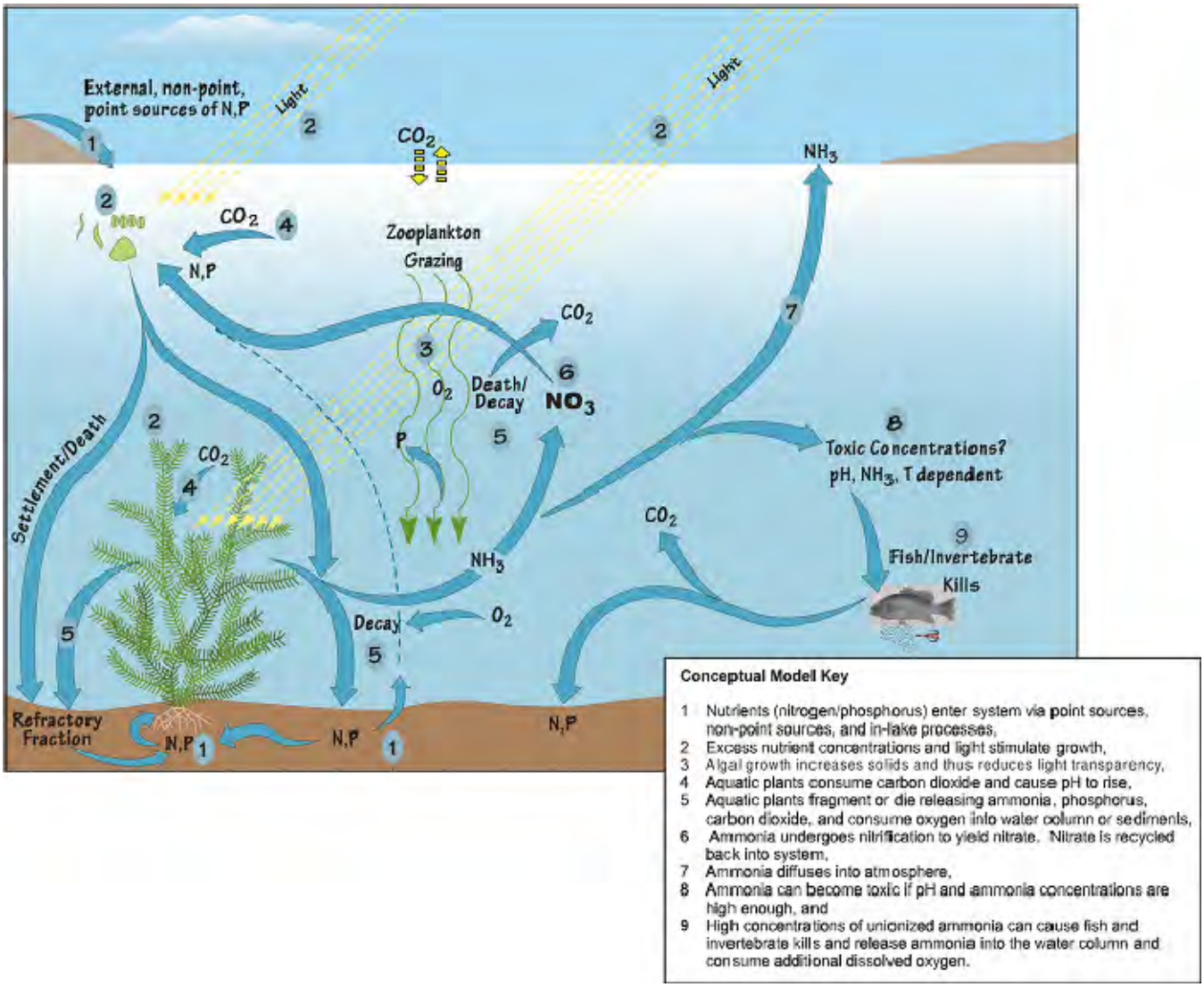

Figure 1.1. Nutrient conceptual model (USEPA 1999)

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. The contributions from these natural sources are generally considered to represent background levels.

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.

1.7 Margin of Safety (MOS)

Section 303(d)(1) of the CWA requires TMDLs to be "*established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality."* 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.
    - Using the 24-month maximum monthly discharge from the National Fish Hatchery for calculating the point source loading when, under most conditions, the hatchery is not operating at this maximum discharge.
    - Basing LA calculation on actual nonpoint source loading rather than ideal conditions from minimally impacted watershed.

- *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 %**.

1.8 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 variability related to snowmelt, the growing season, and summer monsoonal rains. The critical condition used for calculating the TMDL was low-flow. Calculations made at the critical median 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 further in Section 1.2.

1.9 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 2030. Growth estimates for Mora County project a 40% growth rate through 2030. Since future projections indicate that nonpoint sources of nutrients will more than likely increase as the region continues to grow and develop, it is imperative that BMPs continue to be utilized and improved upon in this watershed while continuing to improve road conditions and grazing allotments and adhering to SWPPP requirements related to construction and industrial activities covered under the general permit.

2.0 Public Participation

Public participation was solicited in development of this TMDL. The draft TMDL was first made available for a 30-day comment period beginning September 19, 2014 and ending on October 20, 2014. The draft document notice of availability was extensively advertised via email distribution lists, webpage postings, and press releases to area newspapers. The public notice about the public meeting was published in the Albuquerque Journal, Santa Fe New Mexican, and the Las Vegas Optic and was also sent to our email list of 973 recipients. The public meeting flyer was sent to staff at the Office of the State Engineer District VII office in Cimarron, the Mora National Fish Hatchery, the Mora Mutual Domestic Water and Sewerage WWTP, Luna Community College, and the Hermit's Peak Watershed Alliance. A public meeting was held on October 7 at the Luna Community College in Mora from 6-8pm. SWQB staff contacted staff at the Mora Mutual Domestic Water and Sewerage Works Association and the Mora National Fish Hatchery and Technology Center prior to the public comment period and the associated public meeting. SWQB staff offered to meet with both permitees to discuss the revised TMDL; SWQB staff met with Mora National Fish Hatchery staff on October 7.

Once the TMDL is approved by the Water Quality Control Commission and USEPA Region 6, the next step for public participation is development of a WBP and participation in watershed protection projects including those that may be funded by Clean Water Act §319(h) grants. The WBP development process is open to any member of the public who wants to participate. For example, the Hermit's Peak Watershed Alliance is currently receiving CWA §319(h) funds for a watershed based plan to address the nutrient and sedimentation impairments in the Mora River (USGS gage east of Shoemaker to Hwy 434). The tasks in the plan include stakeholder

engagement, data review, and assessment of current field conditions as well as an interim report and a final watershed based plan.

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APPENDIX A

WATER QUALITY DATA

Table A.1 Plant nutrient data

STORET ID	Site name	Date	TN (mg/L)	TP (mg/L)
07RiolaC006.2	Rio de la Casa 4 miles above Mora River	4/1/2002	0.1	0.015
07RiolaC006.3	Rio de la Casa 4 miles above Mora River	5/1/2002	0.1	0.015
07RiolaC006.4	Rio de la Casa 4 miles above Mora River	6/3/2002	0.158	0.015
07RiolaC006.5	Rio de la Casa 4 miles above Mora River	7/1/2002	0.1	0.015
07RiolaC006.6	Rio de la Casa 4 miles above Mora River	7/30/2002	0.167	0.015
07RiolaC006.7	Rio de la Casa 4 miles above Mora River	8/27/2002	0.1	0.015
07RiolaC006.8	Rio de la Casa 4 miles above Mora River	9/17/2002	0.195	0.015
07RiolaC006.9	Rio de la Casa 4 miles above Mora River	10/15/2002	0.1	0.015
07MoraRi154.8	Mora River at Cleveland by bridge on Church Road	4/1/2002	0.31	0.015
07MoraRi154.9	Mora River at Cleveland by bridge on Church Road	5/1/2002	0.32	0.015
07MoraRi154.10	Mora River at Cleveland by bridge on Church Road	6/3/2002	0.362	0.015
07MoraRi154.11	Mora River at Cleveland by bridge on Church Road	7/1/2002	0.26	0.015
07MoraRi154.12	Mora River at Cleveland by bridge on Church Road	7/30/2002	0.24	0.045
07MoraRi154.13	Mora River at Cleveland by bridge on Church Road	8/27/2002	0.17	0.015
07MoraRi154.14	Mora River at Cleveland by bridge on Church Road	9/17/2002	0.25	0.015
07MoraRi154.15	Mora River at Cleveland by bridge on Church Road	10/15/2002	0.1	0.015
07MoraRi154.16	Mora River at Cleveland by bridge on Church Road	5/16/2006	0.33	0.032
07MoraRi154.17	Mora River at Cleveland by bridge on Church Road	8/3/2006	0.17	0.015
07MoraRi154.18	Mora River at Cleveland by bridge on Church Road	9/27/2006	0.2	0.015
07MoraRi147.2	Mora River above Hatchery	6/3/2002	0.221	0.015
07MoraRi147.2	Mora River above Hatchery	8/27/2002	0.1	0.015
07MoraRi147.2	Mora River above Hatchery	10/15/2002	0.241	0.015
07MoraRi147.2	Mora River above Hatchery	8/3/2006	0.19	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	4/1/2002	0.1	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	5/1/2002	0.1	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	6/3/2002	0.274	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	6/27/2002	0.438	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	7/30/2002	0.223	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	8/27/2002	0.167	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	9/17/2002	0.237	0.514
07MoraRi147.1	Mora River above Mora WWTP lagoons	5/16/2006	0.6	0.042
07MoraRi147.1	Mora River above Mora WWTP lagoons	8/3/2006	0.1	0.015
07MoraRi147.1	Mora River above Mora WWTP lagoons	9/27/2006	0.28	0.015
NM0024996	MORA WASTEWATER PLANT	5/16/2006	2.86	0.256
NM0024996	MORA WASTEWATER PLANT	8/3/2006	2.04	0.169

NM0024996	MORA WASTEWATER PLANT	9/27/2006	0.96	0.143
07MoraRi146.6	Mora River below Mora WWTP lagoons	4/2/2002	0.301	0.015
07MoraRi146.6	Mora River below Mora WWTP lagoons	5/1/2002	0.242	0.015
07MoraRi146.6	Mora River below Mora WWTP lagoons	6/3/2002	0.275	0.015
07MoraRi146.6	Mora River below Mora WWTP lagoons	6/27/2002	0.243	0.015
07MoraRi146.6	Mora River below Mora WWTP lagoons	7/30/2002	0.397	0.04
07MoraRi146.6	Mora River below Mora WWTP lagoons	8/27/2002	0.376	0.057
07MoraRi146.6	Mora River below Mora WWTP lagoons	9/17/2002	0.567	0.073
07MoraRi146.6	Mora River below Mora WWTP lagoons	10/15/2002	0.41	0.033
07MoraRi146.6	Mora River below Mora WWTP lagoons	5/16/2006	0.89	0.058
07MoraRi146.6	Mora River below Mora WWTP lagoons	8/3/2006	0.39	0.015
07MoraRi146.6	Mora River below Mora WWTP lagoons	9/27/2006	0.24	0.015
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	4/1/2002	0.196	0.015
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	5/1/2002	0.586	0.044
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	6/3/2002	0.506	0.03
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	7/1/2002	0.323	0.015
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	7/30/2002	0.347	0.063
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	8/27/2002	0.231	0.035
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	9/17/2002	0.277	0.04
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	10/15/2002	0.189	0.015
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	5/16/2006	0.65	0.054
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	8/2/2006	0.31	0.198
07MoraRi139.9	MORA RIVER AT LA CUEVA USGS GAGE	9/27/2006	0.22	0.015
07MoraRi094.0	Mora River @ Watrous	4/2/2002	0.1	0.015
07MoraRi094.0	Mora River @ Watrous	4/24/2002	0.1	0.015
07MoraRi094.0	Mora River @ Watrous	5/15/2002	0.183	0.015
07MoraRi094.0	Mora River @ Watrous	6/5/2002	0.261	0.015
07MoraRi094.0	Mora River @ Watrous	7/2/2002	0.1	0.015
07MoraRi094.0	Mora River @ Watrous	7/31/2002	0.204	0.015
07MoraRi094.0	Mora River @ Watrous	8/27/2002	0.415	0.015
07MoraRi094.0	Mora River @ Watrous	9/17/2002	0.269	0.015
07MoraRi094.0	Mora River @ Watrous	10/16/2002	0.231	0.015

APPENDIX B

PUBLIC COMMENTS

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SWQB hosted a public meeting in Mora, NM on October 7, 2014 to discuss the Public Comment Draft Mora River TMDL. Notes from the public meeting are available in the SWQB TMDL files in Santa Fe.

SWQB received the following public comments on the revised Mora River TMDL:

A. Richard Wooster, EPA Region 6
B. Nathan Wiese, Mora National Fish Hatchery
C. Marianna Lands, stakeholder

Changes made to the TMDL based on public comment include:

- Updated information added to Section 1.7 and 2.0
- Updates to Section 1.4.2 and Table 1.8 in response to EPA Region 6 comments
- Incorporation of stakeholder input regarding Probable Sources in Table 1.10 and the Executive Summary.

***PLEASE NOTE**:*

When feasible, original typed letters that were not received electronically were scanned and converted to MSWord. Likewise, when feasible, letters received electronically were also converted to MSWord. All text was converted to Times New Roman 12 font with standard page margins for ease of collation. Contact information such as phone number, street addresses, and e-mail addresses from private citizens were removed for privacy reasons. All original letters of comment are on file at the SWQB office in Santa Fe, NM.

Comment Set A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

OCT 16 2014

Mr. Jeff Scarano,
Program Manager, Monitoring, Assessment, and Standards
Surface Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, N2050
P.O. Box 5469
Santa Fe, New Mexico 87502-5469

Dear Mr. Scarano:

I would like to thank you and your staff for taking the time to speak with us on October 1, 2014. During our conversation, we expressed our concern regarding the revisions that were made to the document titled, *Total Maximum Daily Load for the Mora River (USGS Gage East to Shoemaker to Hwy 434) Public Comment Draft*, which were made subsequent to agency discussions and Environmental Protection Agency (EPA) review. We agreed that our agencies would embrace a "no surprises" philosophy for our future interactions. The comments submitted with this letter are a result of our discussion.

During the conference call, we discussed the New Mexico Environment Department's (NMED) approach of using nitrogen and phosphorus data from a reference location rather than using the upstream site-specific surface water data representing an assessment unit that is identified as not impaired for either nitrogen or phosphorus. It is our position that when actual background loading data exists, such data should be used in the calculation of downstream total maximum daily loads (TMDLs). This is the most scientifically defensible method for representing the overall status of water quality in the watershed, and it provides a more accurate depiction of the waterbody of interest than using reference location data. During discussions, NMED explained that by using reference location data, the load allocation is calculated to represent water with minimal anthropogenic impact. An assessment of the upstream segment determined that its uses are not impaired due to nitrogen or phosphorus based on Ecoregion 21 threshold concentrations of 0.25 mg/L nitrogen and 0.02 mg/L phosphorus. However, the nitrogen and phosphorus loads measured in the upstream segment do exceed the loads calculated using the reference stream data of 0.137 mg/L nitrogen and 0.015 mg/L phosphorus. As a result, it appears that the NMED's use of reference stream water quality data, rather than actual upstream water quality data, results in underestimated background loadings for the pollutants of concern.

Notwithstanding our position that actual upstream water quality data must be used, when available, for calculating TMDLs, EPA is willing to review NMED's rationale for the use of the reference location data, including an explanation of why this approach is applicable and appropriate for this TMDL and this set of circumstances. EPA requests that any rationale provided fully explain the methodology used, as well as assurances that the load will be reduced to meet the load allocation calculated using reference location data such that water quality targets will be met. Additionally, we request further explanation of how the load will be reduced along segments assessed as 'not impaired' at or slightly above the ecoregion values such that downstream load allocations based on the reference location data can be met.

We are available to discuss this further and look forward to receiving and reviewing the NMED's rationale. Please feel free to contact me at 214-665-6473 or Miranda Hodgkiss 214-665-7538, should you have questions or require additional clarification regarding the comments above.

Sincerely yours,

Richard A. Wooster
Chief, TMDL Section

cc: Heidi Henderson, New Mexico Environment Department- Surface Water Quality Bureau

<u>SWQB response</u>: The public comment draft of the Mora River TMDL used water quality data from a reference site (07RiolaC006.2) to calculate the Load Allocation. Your comment indicates that EPA would prefer that data from the upstream, unimpaired assessment unit be used instead of the reference site data. Our understanding is that EPA's reasons for this are two fold – first it is reflective of actual conditions in the watershed and second, while using targets based on a minimally impacted watershed may be justified, EPA's review guidelines for approval of this TMDL would require documentation of reasonable assurance that the load allocation target would be met (http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/final52002.cfm). Notwithstanding SWQB's position that setting a LA target based on a minimally impacted site is an appropriate and justified target, we recognize that setting a LA based on actual nonpoint source load in the watershed creates greater reasonable assurance that the LA in the TMDL will be achieved.

*SWQB has updated the TMDL calculations to reflect this request and provide the necessary reasonable assurance that the load allocation targets in the TMDL will be achieved. Instead of using values based on nearby minimally impacted watersheds (0.137 mg/L TN and 0.015mg/L TP for summer and 0.1 mg/L TN and 0.015 mg/L TP for winter) the Load Allocation calculations now use the median values from water quality data collected from the Mora River at Chacon site (07MoraR170.9). The site is located in the assessment unit immediately upstream of the nutrient-impaired Mora River AU so provides an accurate representation of the current nonpoint source loading in the watershed. This data was collect*ed *in 2002 and provides target concentrations of 0.25 mg/L TN in the summer and 0.26 mg/L TN in the winter and 0.015 mg/L TP in both the summer and the winter. Language in Section 1.4.2 and data in Table 1.8 have been updated.*

Comment Set B

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mora National Fish Hatchery
Hwy 434 Mile Marker 2
Mora, New Mexico
Phone: 575-387-6022

October 16, 2014
NMED-SWQB
1190 St. Francis Drive
P.O. Box 5469
Santa Fe, NM 87502
Heidi.henderson@state.nm.us

Ms. Henderson,

This correspondence provides comments on the revised Mora River TMDL. The Hatchery appreciates the opportunity to comment on the updated TMDL document for the Mora River as it relates to Permit No. NM0030031 for the Mora National Fish Hatchery (Hatchery).

The Hatchery staff began additional monitoring of incoming well-water in July of 2012. This data has shown influent water samples for Total Phosphorus ranging from below method detection to 3.79 mg/l. Influent water samples of Total nitrogen have ranged from below method detection to 0.498 mg/l (see attached datset).

Because the Hatchery wells are relatively shallow, they are influenced by surface water and vice versa. Thus, influent Total Phosphorus and Total Nitrogen are accounted for by Load Allocations (LA) for nonpoint sources and background conditions. In this case, the Hatchery TMDL discharges may be double accounted as part of the both the LA's and the Waste Load Allocations (WLA's). To correct this double accounting, the Hatchery suggests using a net discharge from the facility (Effluent – Influent concentrations) to develop total daily load discharges.

Additionally, the Hatchery operates a technologically advanced water recirculation facility. The facility was designed to rear up to 100,000 pounds of fish annually. However, current fish production is less than 10,000 pounds annually because of the unique rearing parameters required to effectively propagate Threatened Gila Trout. The current TMDL Measured Load is based on water quality data collected during the period of rearing relatively low levels of fish onsite. The Hatchery requests the TMDL consider the original design criteria of the facility when setting Target Loads.

Sincerely,

Nathan Wiese
Project Leader
Mora National Fish Hatchery

Total Phosphorus and Total Nitrogen (mg/l) influent and effluent from Mora National Fish Hatchery, 2012-2014

	Date	Ttl P Influent	Ttl P Effluent	Ttl N Influent	Ttl N Effluent	Ave. Flow (gpd)	Max Flow (gpd)	Feed (lbs)
2012	7/16/2012	0	0	0	0	194,652	244,500	209.4
	7/31/2012	ND	0	ND	0	194,652	244,500	
	8/14/2012	3.79	0.338	0.498	0.496	191,665	253,800	240.5
	8/30/2012	1.37	1.15	0	0	191,665	253,800	
	9/13/2012	0.387	0.173	0	0	177,237	242,800	244.2
	9/27/2012	0	0	0	0	177,237	242,800	
	10/17/2012	0	0	0	0	179,990	357,600	657.3
	10/30/2012	0.014	0	0	0	179,990	357,600	
	11/15/2012	0.01	0.01	0	0	171,393	231,100	657.3
	11/29/2012	0.09	0.01	0	0	171,393	231,100	
	12/17/2012	0.022	0.023	0	0.58	168,568	182,200	657.3
	12/31/2012	0.067	0	0	0	168,568	182,200	
2013	1/15/2013	0	0	0	0	181,313	343,000	322.7
	1/31/2013	0.01	0.044	0	0	181,313	343,000	
	2/13/2013	0.026	0.031	0	0	176,107	368,600	173.3
	2/28/2013	0.01	0	0	0	176,107	368,600	
	3/16/2013	0	0.035	0	0	184,494	313,800	316.1
	3/31/2013	0	0	0	0	184,494	313,800	
	4/16/2013	0.17	0.16	0	0.3	197,393	395,200	293.7
	5/2/2013	0	0.033	0	0	197,393	395,200	
	5/16/2013	0	0	0	0.28	181,252	226,300	291.4
	5/30/2013	0	0	0	0	181,252	226,300	
	6/12/2013	0	0	0	0	173,550	202,400	435
	6/27/2013	0	0	0	0	173,550	202,400	
	7/16/2013	0	0	0	0	187,116	233,200	650
	7/31/2013	0	0	0	0	187,116	233,200	
	8/16/2013	0	0	0	0	201,206	220,800	773.7
	8/29/2013	0	0	0	0	201,206	220,800	
	9/16/2013	0	0	0	0	215,620	411,000	785
	9/30/2013	0	0	0	0	215,620	411,000	
	10/17/2013	0	0	0	0	222,661	280,800	739.1
	10/31/2013	0	0.01	0	0	222,661	280,800	
	11/14/2013	0	0	0	0	225,317	285,500	344.5
	11/29/2013	0.01	0.01	0	0	225,317	285,500	
	12/16/2013	0	0	0	0	239,997	288,700	347.5
	12/31/2013	0	0	0	0	239,997	288,700	

2014	1/17/2014	0	0	0	0	225,355	274,500	425.3
	1/31/2014	0	0	0	0	225,355	274,500	
	2/14/2014	0.01	0	0	0	211,325	300,300	422.8
	2/28/2014	0	0.022	0	0	211,325	300,300	
	3/18/2014	0	0	0	0	202,245	252,200	83.3
	3/31/2014	0.01	0.033	0	4.6	202,245	252,200	
	4/16/2014	0	0	0	0	183,977	338,700	488.6
	4/30/2014	0.01	0.012	0	0	183,977	338,700	
	5/15/2014	0.01	0.11	0	0	185,529	276,600	290.9
	5/31/2014	0	0	0	0	185,529	276,600	
	6/15/2014	0	0	0	0	173,063	225,000	425.1
	6/30/2014	0.01	0.01	0	0	173,063	225,000	
	7/15/2014	0	0.01	0	0	209,535	256,600	561.1
	7/31/2014	0	0.068	0	0	209,535	256,600	
	8/14/2014	0	0	0	0	218,468	400,600	570.1
	8/28/2014	0	0.081	0	0	218,468	400,600	
	9/15/2014	0.1	0.027	0	0	n/a	n/a	618.7
	9/30/2014	n/a	n/a	n/a	n/a	n/a	n/a	

<u>SWQB response</u>: Thank you for attending the public meeting on October 7 and for arranging a tour of the Mora National Fish Hatchery prior to the public meeting. SWQB appreciates your proactive approach to sampling the water quality of the influent used by the hatchery.

To address your comment about "double accounting," SWQB recognizes that there is often a connection between groundwater and surface water, but the calculations in the TMDL cannot assume a connection, nor would a connection affect our TMDL calculations, as these are strictly set to achieve water quality standards instream. Thus the TMDL includes allocations that will achieve water quality standards. You may request of EPA Region 6 (the NPDES permitting authority in New Mexico) that the "net discharge concentration" from the hatchery be the method by which compliance with the permit is calculated.

As indicated by your submitted data, the hatchery's current flow is well below the permitted capacity, thus the hatchery has significant capacity to increase their fish production. However for this TMDL the waste load allocation calculations used your current discharge (0.42 mgd) which is the same flow as was used in the hatchery NPDES permit as required by 40 CFR 40 CFR Part 122.21(g). SWQB believes this is the appropriate discharge flow to utilize in the TMDL to provide reasonable assurance that the TMDL will achieve water quality standards and also is consistent with how the TMDL will be implemented within the NPDES permit.

SWQB recognizes that the discharge volume and hence the nutrient loading may change over the course of hatchery operations. Should the fish hatchery change from the current 10,000 pounds of fish per year to the design of the hatchery at 100,000 pounds per year this would obviously represent a significant change in the hatchery process and the discharge volume. While this TMDL is based on current conditions, the State of New Mexico Statewide Water Quality Management Plan and Continuing Planning Process Section IV(B)(1) allows for WLA increases due to increase discharge volumes in these types of situations without the need to revise this TMDL document. Through this process as the hatchery discharge volume increases the hatchery WLA would also increase. This additional WLA to be added to the existing WLA would be calculated based on the following equation:

(new hatchery discharge volume (mgd) – current hatchery discharge volume(mgd)) x TMDL target concentration (mg/L) x conversion factor = new WLA (lbs/day)

Finally, discussions of the measured load in the TMDL are based on current conditions and included only for discussion purposes. These calculations do not affect the target load or the waste load allocation assigned to the hatchery.

Comment Set C

Monday, October 20, 2014
To: New Mexico Environment Department, Surface Water Quality Bureau
Att: Heidi Henderson
Re: Public comment – Revised Mora River TMDL
From: Marianna Lands

I would like to thank the staff from the NM Environmental Department's Surface Water Quality Bureau for coming to Mora, NM on October 7th to inform the public on conditions and continued monitoring of the Mora River and receive public input to the revised proposal.

I am adding this public comment as an individual, although I am currently involved in developing the Mora Watershed Alliance (MWA)

Even with good advertising, most people in Mora did not know about the meeting. I do not know if the institutions or organizations (Soil & Water/NRCS/Forestry, etc.) sent out a list serve to their networks, but that might help to get the word out. Many people do not use computers in this rural area, so could not read the proposal before the meeting. Perhaps leaving some out at the Post Offices in Mora County would allow people more time to review the document and propose pertinent questions during the meeting.

It would be helpful if the presentation had been prepared with clearer explanations for the non-informed citizens. The two-hour meeting was taken up by explaining terms, among other things. For many of us, it was a first meeting of the Dept. staff and not enough time to ask more questions or understand the draft proposal.

It is important that the NM. Environmental. Dept. work with local communities to fulfill their mission and find solutions for our impaired rivers. Because Mora is mostly owned privately, communications to land owners and comprehensive understanding of the elements involved in polluting and then remediating the waterbodies is essential. The Mora Watershed Alliance was formed recently to enable citizens to participate in watershed stewardship and to be kept informed of current affairs affecting the watershed and water quality.

The Mora Watershed Alliance is emerging as a stakeholder in these affairs and would appreciate:

- Technical Assistance: Support in developing the MWA as an efficient organization (it is currently incorporated in NM); specifically, board development, funding, communications and public relations.
- To be kept informed of current affairs that relate to Mora County and the watershed region.
- To work with the NM Evir. Dept. to develop funding for projects, provide educational materials to the public of Mora, organize meetings for strategic planning and partnership building.
- To work with other Watershed Alliances and Institutions, such as Highlands University, The Hermits Peak Watershed Alliance, Luna Community College, Mora Independent School District, Soil and Water, NRCS, The Acequia Associations, water/sewage districts, etc.).

Thank you for this opportunity to work together on stewarding our environment.
Sincerely,

Marianna Lands

SWQB response: Thank you for attending the public meeting on October 7 to discuss the Mora River TMDL. The audience was not shy about asking questions during the presentation and hopefully the additional questions and our responses helped to clarify the Clean Water Act requirements and the work conducted by the Surface Water Quality Bureau. It was requested during the meeting that we include more detail in the presentation and we will certainly update our presentation to address this concern.

The SWQB agrees that it is critical to work with local communities to find solutions for water quality impairments and we take the public participatios process for efforts such as this TMDL revision seriously. The public notice about the public meeting was published in the Albuquerque Journal, Santa Fe New Mexican, and the Las Vegas Optic and was also sent to our email list of 973 recipients. The public meeting flyer was sent to staff at the Office of the State Engineer District VII office in Cimarron, the Mora National Fish Hatchery, the Mora Mutual Domestic Water and Sewerage WWTP, Luna Community College, and the Hermit's Peak Watershed Alliance. SWQB staff contacted staff at the Mora Mutual Domestic Water and Sewerage Works Association and the Mora National Fish Hatchery and Technology Center prior to the public comment period and the associated public meeting. SWQB staff offered to meet with both permitees to discuss the revised TMDL; SWQB staff met with Mora National Fish Hatchery staff on October 7. For those with internet access, we encourage stakeholders to sign up for our email list via this link: http://nmenv-it.nmenv.state.nm.us/Listserv/RPD/?p=subscribe&id=4%20 The SWQB strives to reach as many stakeholders as possible, but recognizes that not every stakeholder has a computer or internet access. We will make every attempt to post meeting notices at local post offices or other community gathering places.

The SWQB looks forward to coordinating with the Mora Watershed Alliance (MWA) and will add your email address to our email list. At the public meeting, we discussed funding opportunities, the role of staff in our Watershed Protection Section, and introduced the staff person that already works closely with other community groups in the area. The SWQB is currently conducting water quality monitoring in the Canadian River watershed and hosted public meetings in Raton on March 5 and Tucumcari on March 10 to discuss our sampling plan. If you have further questions that were not answered during the TMDL public meeting we would be happy to meet with MWA individually to further discuss water quality sampling, funding opportunities, and the development of a Watershed Based Plan.