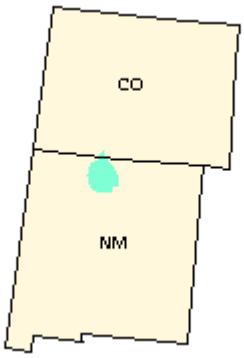
TOTAL MAXIMUM DAILY LOAD FOR THE RIO CHAMITA FROM THE CONFLUENCE OF THE RIO CHAMA TO THE NEW MEXICO – COLORADO BORDER



Summary Table

New Mexico Standards Segment	Rio Grande, 2116
Waterbody Identifier	Rio Chamita URG2-30500
Parameters of Concern	Total phosphorous, Total ammonia Fecal coliform
Uses Affected	High Quality Cold Water Fishery
State Priority	2
Threatened or Endangered Species	None
Geographic Location	Rio Chama River Basin
Scope/size of watershed	38 mi^2
Land type	Southern Rockies Ecoregion
Land use/cover	Rangeland 42%, Forest 43%, Colorado 15%, Water <1%
Identified Sources	Village of Chama WWTP, NM0027731
Watershed Ownership	68% State Land, 32% Private
Total Maximum Daily Load Allocation Total phosphorous Total ammonia Fecal coliform	LA + WLA + MOS = TMDL 1.1 lbs/day + 1.35 lbs/day + 0 = 2.45lbs/day 0.0 lbs/day + 12.7 lbs/day + 0= 12.7 lbs/day 1.0034×10^{10} fcu/day + $1.136\ 10^{9}$ fcu/day + 0 = 1.117×10^{10} fcu/day

Table of Contents

LIST OF ABBREVIATIONS ..... **III**

EXECUTIVE SUMMARY ..... **IV**

BACKGROUND INFORMATION **1**

AMMONIA AND TOTAL PHOSPHOROUS TMDL **3**

TARGET LOADING CAPACITY 3
IDENTIFICATION AND DESCRIPTION OF EXISTING POLLUTANT SOURCES 3
WASTE LOAD ALLOCATIONS AND LOAD ALLOCATIONS 5
SCENARIO ONE- TMDL BASED ON CURRENT AMMONIA STANDARD 5
Load Allocation 5
Waste Load Allocation 5
Consideration of seasonal variation 6
SCENARIO TWO- BASED ON REVISED TOTAL AMMONIA STANDARD 7
Load allocation 7
Waste Load Allocation 7
Consideration of seasonal variation 8
LINKAGE OF WATER QUALITY AND POLLUTANT SOURCES 8
MARGIN OF SAFETY 8
ALLOWANCE FOR FUTURE GROWTH 9
IMPLEMENTATION PLAN 9
TIME LINE 9
Assurances 10
Milestones 12

FECAL COLIFORM TMDL **13**

IDENTIFICATION OF SOURCES 13
CALCULATIONS OF STREAM LOADING CAPACITY 14
MARGIN OF SAFETY 15
WASTE LOAD ALLOCATION 15
LOAD ALLOCATION 15
SEASONAL VARIABILITY 16
TMDL SPECIFIC MONITORING 16
IMPLEMENTATION PLAN 16
Management measures 16
Assurances 17
Milestones 18

MONITORING PLAN **19**

PUBLIC PARTICIPATION **20**

REFERENCES CITED **24**

APPENDICES **27**

List of Abbreviations

4Q3	Minimum average four consecutive day flow which occurs with a frequency of once in three years
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CBOD	Carbonaceous Biochemical Oxygen Demand
CFS	Cubic Feet per Second
CFU	Colony Forming Unit
CWA	Clean Water Act
CWAP	Clean Water Action Plan
CWF	Cold Water Fishery
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
HQCWF	High Quality Cold Water Fishery
LA	Load Allocation
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
MOS	Margin of Safety
MULTI-SMP	Multiple Discharge Version of the Simplified Method Program
MQL	Minimum Quantification Level
NMED	New Mexico Environment Department
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint Sources
NTU	Nephelometric Turbidity Units
SWQB	Surface Water Quality Bureau
TA	Total Ammonia
TMDL	Total Maximum Daily Load
TP	Total Phosphorous
TRC	Total Residual Chlorine
TSS	Total Suspended Solids
UWA	Unified Watershed Assessment
WLA	Waste Load Allocation
WQLS	Water Quality Limited Segment
WQCC	New Mexico Water Quality Control Commission
WQS	Water Quality Standards
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to develop TMDL management plans for water bodies determined to be water quality limited. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state's water quality standards. It also allocates that load capacity to known point sources and nonpoint sources. TMDLs are defined in 40 CFR Part 130 as the sum of the individual Waste Load Allocations (WLA) for point sources and Load Allocations (LA) for nonpoint sources, including a margin of safety and natural background conditions.

The Rio Chamita flows from headwaters in Colorado to its confluence with the Rio Chama below the Village of Chama. The New Mexico 1998 §303(d) report, *"State of New Mexico §303(d) List for Assessed Stream and River Reaches,"* lists this segment as being water quality limited for the following pollutants: total phosphorous, total ammonia, fecal coliform, temperature, stream bottom deposits, chlorine, and turbidity. Subsequent sampling conducted in three seasons in 1998 resulted in a re-evaluation of these listings. Based on this sampling, the listings were modified to include only total ammonia, total phosphorous, and fecal coliform. This Total Maximum Daily Load (TMDL) document addresses these three constituents.

New Mexico *Standards for Interstate and Intrastate Streams* (WQCC, 1995) (Standards) identify and designate the Rio Chamita as a high quality coldwater fishery. With other designated uses of domestic water supply, fish culture, irrigation, livestock watering, wildlife habitat, and secondary contact. The Standards specify specific constituent criteria levels to be maintained so that the water body can support these designated uses. TMDL targets specified in this document are based on these water quality standards criteria. TMDL numeric targets are calculated so as to provide protection of designated uses. Load capacities are estimated as a function of these water quality targets and the assimilative capacity of the Rio Chamita. Load allocations presented in this TMDL are based on the load capacities developed using these targets. Targets, loading analyses, and load allocations are presented for total ammonia, total phosphorous, and fecal coliform. These load analyses show that the estimated load capacities are currently exceeded, and therefore require reductions. Proposed reductions as well as the allocations for point and nonpoint sources vary by pollutant.

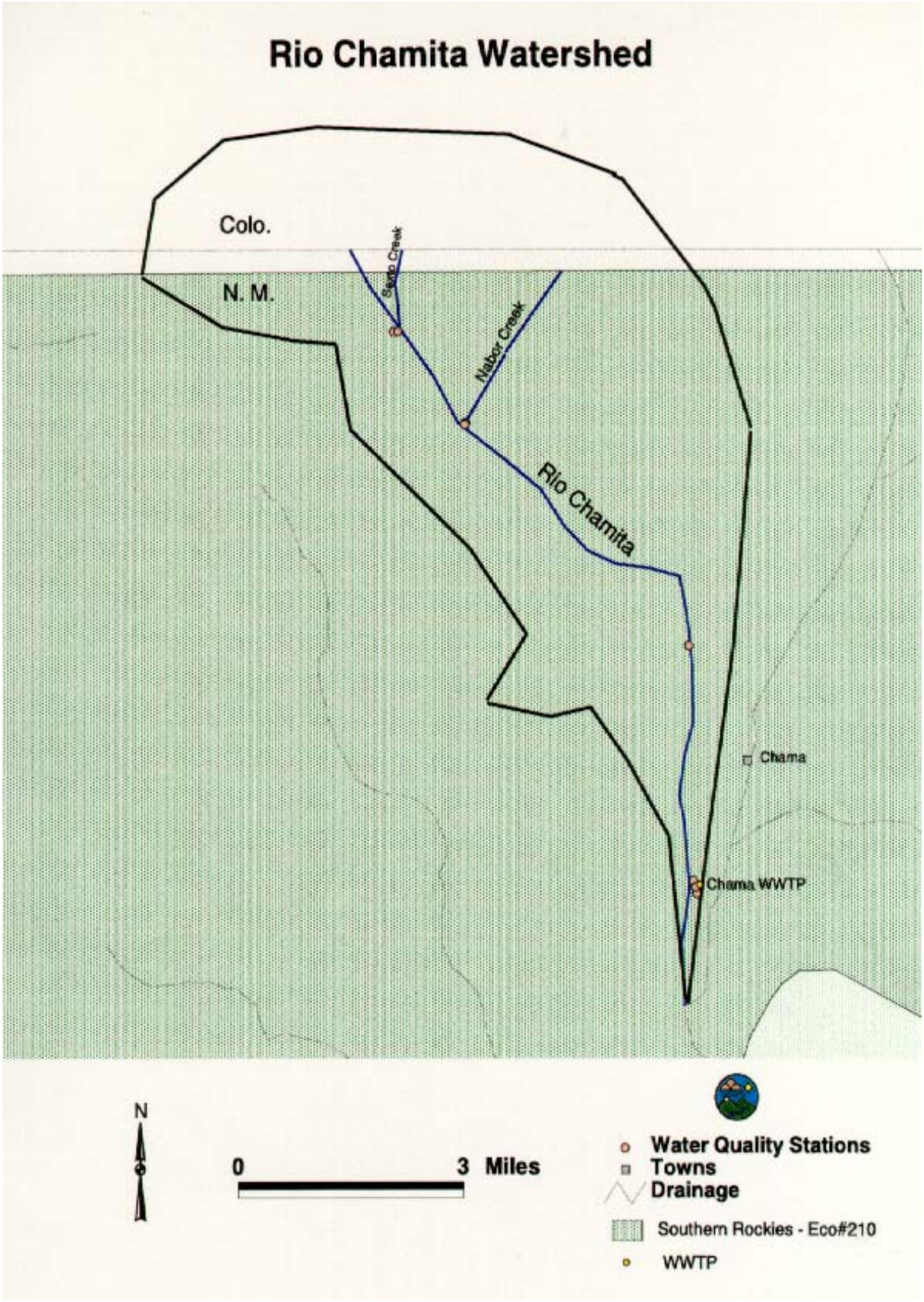
A general implementation plan for activities to be established in the watershed is included in this document. The Surface Water Quality Bureau's Point Source Regulation and Nonpoint Source Pollution Sections will further develop the details of this plan. Implementation of recommendations in this document will be done with full participation of all interested and affected parties. During implementation, additional water quality data will be generated. As a result targets will be re-examined and potentially revised; this document is considered to be an evolving management plan. In the event that new data indicate that the targets used in this analysis are not appropriate or if new standards are adopted, the load capacity will be adjusted accordingly.

Background Information

The Rio Chamita flows for approximately 12.6 miles through Rio Arriba County, New Mexico (Figure 1). The headwaters of the Rio Chamita arise in Colorado and pass into New Mexico within the approximately 32 square mile Edward Sargent Fish and Wildlife Area. The Rio Chamita then flows along the western side of the Village of Chama to the confluence with the Rio Chama approximately 1.5 miles below the village. Several significant tributaries to the Rio Chamita originate on the Edward Sargent Fish and Wildlife Area. Sexto Creek combines with the Rio Chamita approximately 0.5 miles below the Colorado-New Mexico State boundary. Nabor Creek enters the Rio Chamita 1.5 miles below Sexto Creek. There appear to be significant groundwater inputs to the river, as evidenced in flow monitoring data collected during 1998 sampling, although a thorough study of groundwater flows has not been done. There is no other significant surface water input to the system. The Rio Chamita segment originating in Colorado was found to have no measurable flow above Sexto Creek during both summer and fall sampling events. Flow was observed but not measured during the spring run.

The Village of Chama wastewater treatment plant has a design capacity of 0.3 MGD average discharge and serves a population of approximately 400 persons. The plant is a lagoon system with chlorination and dechlorination that is monitored through an NPDES permit. Because of the plant size, effluent limits for total ammonia and total phosphorous have not been required. The current NPDES permit was issued in 1989 and expired on March 2, 1994. The requirements of effluent limits and monitoring frequencies for BOD, TSS, fecal coliform, and TRC remain in effect pending permit renewal.

Six ambient water quality monitoring stations were sampled in 1998. Results of this effort are listed in Appendix A. These data were used to characterize water quality of the stream reach (Figure 1). Station locations were selected to evaluate impacts of tributary streams, establish background concentrations, and evaluate impacts of the wastewater discharge to the system. This monitoring effort documented several exceedances of New Mexico water quality standards for ammonia and total phosphorous. All exceedances for total ammonia and total phosphorous were observed below the Village of Chama wastewater discharge, with the exception of several exceedances attributed to a lack of flow at the uppermost Rio Chamita station.


Rio Chamita Watershed
Colo.
N. M.
Sangre Creek
Nabor Creek
Rio Chamita
Chama
Chama WWTP
N
0
3 Miles
Water Quality Stations
Towns
Drainage
Southern Rockies - Eco#210
WWTP

Ammonia and Total Phosphorous TMDL

Target loading capacity

Target values for total phosphorous and total ammonia will be determined based on 1) the presence of numeric criteria, 2) the degree of experience in applying the indicator and 3) the ability to easily monitor and produce quantifiable and reproducible results. The standards leading to an assessment of use impairment on the Rio Chamita are the High Quality Coldwater Fishery (HQCWF) numeric criteria for total ammonia and total phosphorous. The numeric criterion for total phosphorous is 0.1 mg/L. The numeric criterion for total ammonia varies as a function of instream temperature and pH levels. Established SWQB protocols state that the ammonia criterion shall be calculated based on the 75th percentile of sample pH measurements and the maximum temperature allowed by the designated use. The 75th percentile for pH is 8.13 Standard Units (S.U.). The maximum temperature for the HQCWF designation is 20°C. Using Table N of the Standards, and applying the above values, a target criterion of 0.52 mg/L total ammonia was calculated.

The specific carrying capacity of a receiving water for a given pollutant, defined by a numeric standard, may be estimated as:

Combined flow (in MGD) x numeric standard (in mg/L) x 8.34 (Equation 1.)

The combined flow is calculated by adding the critical low flow (See Appendix B for derivation of 4Q3) and the average design flow contribution from any point sources. Multiplying by the numeric standard and 8.34 (a unit-less factor used to convert mg/L units to lbs/day), this yields an estimate that the Rio Chamita can transport approximately 2.46 lbs/day of total phosphorous during critical low-flow conditions without exceeding water quality standards. Similarly, applying Equation 1 for ammonia results in a calculated specific carrying capacity for total ammonia of 12.8 lbs/day.

Table 1. Estimates of target loading.

Parameter	Flow (MGD)	Standard (mg/L)	Estimate of Target Loading (lbs/day)
Total phosphorous	2.95	0.1	2.46
Total ammonia	2.95	0.52	12.8

Identification and description of existing pollutant sources

Point Sources

Effluent loads from the Village of Chama WWTP were calculated using a plant average design flow of 0.30 MGD and the geometric mean (US EPA, 1994) of pollutant concentrations (3.19 mg/L) as measured during 1998 sampling. Applying Equation 1 the average daily calculated

load is 8.25 lbs/day of total phosphorous (Table 2). The calculated average daily load for total ammonia from the WWTP is calculated as 20.87 lbs/day (Table 3).

Nonpoint Sources

Current loads from nonpoint sources in the watershed include contributions from natural background and rangeland use. The load attributed to nonpoint sources of total phosphorous was calculated to be 1.1 lbs/day. This result was obtained by using the mean concentration upstream of the treatment unit using data collected within 10 years (0.05 mg/L, n= 8) and applying Equation 1.

Nonpoint source loads in this watershed are considered to be minimal. Approximately 32 mi^2 of the upper watershed area within New Mexico are included within the Edward Sargent Fish and Wildlife Area that was established in 1978. This wildlife area is managed by the New Mexico Department of Game and Fish under the wild life management plan *"Edward Sargent Fish and Wildlife Area Management Plan"* (NMGF, 1983). Although listed as rangeland, domestic grazing is excluded from this area. Impacts are limited to elk herds that reside in the area. Public access to this area is restricted to foot and horseback traffic.

Table 2. Calculation of current loading for total phosphorous.

Pollutant Sources Total Phosphorous	**Flow (MGD)**	**Concentration mg/L**	**Current Loading lbs/day**	**Location**
Point:	0.30	3.19	8.25	Village of Chama WWTP
Nonpoint:	2.65	.055	1.1	Background Rangeland

All measures for total ammonia above the wastewater treatment plant were reported as less than detection at an MQL of 0.1 mg/L. In accordance with implementation guidelines developed for New Mexico (US EPA, 1994) concentration values for nonpoint sources of total ammonia are set to zero.

Table 3. Calculation of current loading for total ammonia.

Pollutant Sources Total Ammonia	**Flow (MGD)**	**Concentration mg/L**	**Current Loading lbs/day**	**Location**
Point:	0.30	7.2	18.0	Village of Chama WWTP
Nonpoint:	2.65	0.00	0.0	NA

Waste load allocations and load allocations

The SWQB will propose to the WQCC, during calendar 1999, that the criterion for total ammonia standards be revised in light of the recently released EPA document *"1998 Update of Ambient Water Quality Criteria for Ammonia*" (USEPA, 1998). It is expected that action will be taken on this recommendation after issuance of this TMDL. For this reason, the SWQB has elected to include load allocations for both criterion levels in this TMDL. A TMDL must be written to the appropriate current standard. Therefore, Scenario One is based on the current numerical criterion for total ammonia and will be in effect until such time that changes to the standard are adopted.

SCENARIO ONE- TMDL based on current total ammonia standard.

Load allocation

The load allocation for total phosphorous will remain as 1.1 lbs/day. No reductions in nonpoint sources will be required, since most of this area is currently managed as a natural area and most sample results were reported as less than detect (MQL=0.05 mg/L. There was no attempt to allocate this loading to specific sources.

Nonpoint source loads for total ammonia are similar. Reported concentrations from the 1998 ambient water quality survey above the plant are all less than detection (MQL = <0.1 mg/L). Following the Region 6 implementation guidelines (US EPA, 1994), if all values are reported as less than the detection level, values will be assumed to be zero. Therefore, for the purposes of this calculation, there is no upstream total ammonia load allocation for nonpoint sources.

Waste load allocation

Current average total phosphorous loads from the treatment facility are approximately 8.25 lbs/day. The MULTI-SMP model (US EPA, 1992) was used to calculate effluent concentrations of total phosphorous which will allow attainment of stream water quality criterion. A printout of a run of this model is included in Appendix C 1-2 of this document. Total phosphorous was treated as a conservative pollutant with all model decay rates set to zero. All model assumptions are specified in the model printout. The model calculates a total phosphorous effluent concentration of 0.54 mg/L (1.35 lbs/day) which provides for attainment of the instream criterion (Table 4).

Current total ammonia waste loads of 18.0 lbs/day exceed the target loading capacity of 11.5 lbs/day and therefore require load reductions. The entire load for total ammonia is allocated to the point source discharge. To accurately estimate the effluent concentration required that provides for attainment of the instream criterion, the MULTI-SMP model was run (Appendix C 3-4). This model yields an allowable effluent concentration of 5.1 mg/L (12.7 lbs/day) total ammonia (Table 4).

Table 4. Total Maximum Daily Load Allocations for total phosphorous and total ammonia at critical low flow.

Parameter	Load Allocation (lbs/day)	Waste Load Allocation (lbs/day)	Margin of Safety (lbs/day)	Total Maximum Daily Load Allocation (lbs/day)[a]
Total phosphorous	1.1	1.35	Implicit	2.45
Total ammonia	0.0	12.7	Implicit	12.7

[a] Differences between these values and values from Table 1 are due to rounding.

Consideration of seasonal variation

TMDL calculations necessarily must be protective of standards at critical flows and will therefore be protective of standards at all flows. Sampling for this stream was conducted during three seasons representative of different expected hydrological conditions. All exceedances of standards were observed during summer and fall under lower flow conditions. Calculations made at the critical low flow (4Q3), and using other conservative assumptions as described in the section on Margin of Safety, are protective from July through February and therefore at all times. Seasonally high receiving water flows associated with snowmelt conditions occur in the months March through June. These higher flows could accommodate a higher effluent discharge concentration without exceeding water quality standards. A seasonal 4Q3 (March through June) for the Rio Chamita was calculated to determine maximum loads that could be utilized for permit limitations if seasonal limits are requested.

A seasonal 4Q3 cannot be directly calculated for the Rio Chamita due to lack of a flow monitoring station on the reach. An evaluation of flows at the nearest flow gage was done to arrive at estimates that could be used in this calculation. The March to June seasonal 4Q3 was determined by calculating the 4Q3 for the downstream gage (Rio Chama at La Puente, 08284100) for March through June (28.6 MGD). This was compared to the 4Q3 calculated for critical low flow conditions at the same gage (11.3 MGD). The ratio of the two 4Q3 (28.6/11.3 = 2.5) was used as a multiplier to estimate the spring 4Q3 for the Rio Chamita. Critical low 4Q3 for the Rio Chamita (2.65 MGD) times 2.5 gives an estimated March to June 4Q3 for the Rio Chamita of 6.6 MGD.

Again, all total ammonia values measured at the upstream station were less than detection and were according to the implementation guidance set to zero. Applying the MULTI-SMP model (Appendix C 5-6), and using zero for upstream contributions during high flow months, an effluent concentration of 12.0 mg/L total ammonia was determined to be protective for March through June, and converts to 30.0 lbs/day (Table 5). This value was used as the final load allocation. In addition to the implicit margin of safety, an additional explicit margin of safety of 10% has been included in this calculation to address the greater uncertainty in flow estimates. This reduction has been applied to the point source load and yields a final concentration of 10.8 mg/L and a WLA of 27.0 lbs/day (Table 5).

A review of seasonal concentrations for total phosphorous using data from 1991 shows that there is no meaningful difference between upstream concentrations reported for a March-June data

period (mean = 0.05, n=2) and other seasonal data (mean=0.05, n=6). Load allocations were recalculated to 2.75 lbs/day using Equation 1. The WLA was calculated using the MULTI-SMP model (Appendix C 7-8) which gives an effluent discharge concentration of 1.2 mg/L (3.0 lbs/day) to achieve the instream criterion under high ambient flow conditions. Again to allow for uncertainty in the flow calculations a 10% reduction in the WLA was applied to the WLA. This yields an effluent concentration for total phosphorous of 1.08 mg/L and the recalculated load is 2.7 lbs/day.

Table 5. Total Maximum Daily Load values for high flow months of March – June.

Parameter	Load Allocation (lbs/day)	Waste Load Allocation (lbs/day)	Margin of Safety (lbs/day)	Total Maximum Daily Load Allocation (lbs/day)
Total phosphorous	2.75	2.7	.6	6.05
Total ammonia	0.0	27.0	3.0	30.0

Scenario Two- Based on revised total ammonia standard.

The SWQB will recommend to the WQCC that the Standards be changed to reflect significant changes made in the calculation of ambient water quality criterion for total ammonia (US EPA, 1998). If adopted by the WQCC, the ambient water quality criterion for total ammonia for this segment would be 1.04 mg/l (Appendix D). This new criterion would still be exceeded in several samples from the fall sampling. A TMDL would still be required for this segment, although allowable loads would be greater. This Scenario will be implemented only if the WQCC adopts these changes into the Standards. This would not affect the TMDL for total phosphorous since the standard for total phosphorous would remain the same.

Load allocation

The load allocation from nonpoint sources will remain the same as previously calculated.

Waste load allocation

Using the MULTI-SMP model (Appendix C 9-10), an effluent concentration of 10 mg/L was calculated as being protective of the in stream loading capacity. This concentration yields an effluent load of 25 lbs/day (Table 6).

Table 6. Total Maximum Daily Load for total ammonia if revised criteria are adopted.

Parameter	Load Allocation (lbs/day)	Waste Load Allocation (lbs/day)	Margin of Safety (lbs/day)	Total Maximum Daily Load Allocation (lbs/day)
Total ammonia	0.0	25.0	Implicit	25.0

Consideration of seasonal variation

The loading values listed above will be protective during all seasons. Because there is a significant difference between critical low flows and seasonal low flows calculated for March through June, the application of a seasonal limit is appropriate. A MULTI-SMP model run (Appendix C 11-12) was used to determine the appropriate effluent limit under these conditions. A concentration limit of 20 mg/L was determined to be sufficient to meet loading limits. Table 7 shows the application of this calculation. Again, an explicit margin of safety was allowed as a consideration for uncertainty in flow calculations.

Table 7. Total Maximum Daily Load values for high flow months of March – June.

Parameter	Load Allocation (lbs/day)	Waste Load Allocation (lbs/day)	Margin of Safety (lbs/day)	Total Maximum Daily Load Allocation (lbs/day)
Total ammonia	0.0	50.1	7.1	57.2

Linkage of water quality and pollutant sources

Discharge and upstream/downstream sampling for total phosphorus and total ammonia in the Rio Chamita provide sufficient evidence to link water quality criterion exceedances to the Village of Chama WWTP discharge. The average instream concentration for total phosphorous at the station immediately above the treatment plant discharge pipe is 0.05 mg/L, with a range of 0.025 mg/L to 0.09 mg/L (n= 7). Sampling at the site downstream from the treatment plant discharge yields an average instream concentration of 0.23 mg/L, with a range of 0.12 to 0.29 mg/L (n=4). These increased instream levels of total phosphorous, combined with monitoring data from the discharge showing an average concentration of 3.2 mg/L, provide a direct link between the WWTP discharge and instream exceedances of total phosphorous.

Total ammonia concentrations above the plant are consistently reported as <0.1 mg/L. Average total ammonia concentration below the plant is 0.54 mg/L, with a range of 0.05 mg/L to 1.35 mg/L (n= 7). This, coupled with an average total ammonia discharge of 7.17 mg/L from the WWTP, provides a direct link between the effluent discharge and instream exceedances.

Margin of safety

Regulations require that TMDLs reflect a margin of safety based on uncertainty or variability of data, point and nonpoint source load estimates, and/or modeling analysis. For this TMDL, the

margin of safety is implicit in assumptions used in calculating the point source loads. These assumptions include:

- Use of treatment plant design capacity for calculation of point source loading,
- Use of 4Q3 critical flows to calculate the allowable load,
- Conservative estimates in determination of the instream criterion by use of maximum allowable temperature (20°C) and 75th percentile pH values,
- An explicit margin of safety ≥10 % has been added for uncertainty for seasonally adjusted loads.

Allowance for 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 2020. Growth estimates for Rio Arriba County project a 19% growth rate through 2020. Current flow at the wastewater treatment plant averages 0.17 MGD. For all calculations in development of this TMDL, a plant design flow of 0.30 MGD was used. There remains sufficient treatment capacity to accommodate projected growth through 2020. Therefore, no specific allowances for future growth will be made.

Implementation plan

Time line

Implementation Action	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Public Outreach and Involvement	X	X	X	X	X
Establish Milestones	X				
Secure Funding	X				
Complete construction				X	
Achieve final limits					X

Assurances

Permits (NPDES) issued under Section 402 of the CWA contain specific and legally enforceable effluent limitations and self-monitoring requirements. It is expected that modifications to the WWTP will be required to meet the limits specified in this TMDL. The customary timeframe for achieving compliance with new NPDES permit limits is three years with compliance being reached in the fourth year.

Milestones

Milestones will be used to determine if control actions are being implemented and standards attained. For this TMDL, initial milestones to be established are listed below.
Milestones will be reevaluated periodically, depending on specific BMP implementation. Further implementation of this TMDL will be revised based on this reevaluation.

- Monitor pollutant loading.
- Track implementation and effectiveness of controls.
- Assess water quality trends in the water body.
- Reevaluate TMDL for attainment of water quality standards.

Fecal Coliform TMDL

The Rio Chamita is classified in the Standards as a HQCWF. Segment specific standards for fecal coliform are found under standards segment 2116. This reach includes all perennial reaches to the Rio Chama above Abiquiu Dam, except the Rio Gallina and Rio Puerco de Chama. For this segment, "The monthly geometric mean of fecal coliform bacteria shall not exceed 100 (fcu)/100 ml; no single sample shall exceed 200 (fcu)/100 ml" (WQCC, 1995).

The Rio Chamita is listed on the 1998 303(d) list with fecal coliform as a pollutant of concern. Presence of fecal coliform bacteria is an indicator of the possible presence of other bacteria that may limit beneficial uses and present human health concerns. There are two significant sources of fecal coliform bacteria in the Rio Chamita watershed. The Village of Chama WWTP has been documented through DMR reports as a known source of fecal coliform bacteria. There are uncharacterized non-point sources of fecal coliform bacteria that cause upstream fecal coliform levels to be above current stream criterion.

Identification of sources

Fecal coliform sampling in this watershed is limited to sampling conducted in 1990, 1991, and 1998 by the Point Source Regulation Section (PSRS), limited samples collected by the Surveillance and Standards Section in 1998, and Discharge Monitoring Reports (DMR) of wastewater discharge from the Village of Chama WWTP. Samples collected by the PSRS are from the Rio Chamita above the WWTP discharge, from the discharge itself, and from below the WWTP. Table 8 summarizes this information.

Table 8. Results of fecal coliform sampling in the Rio Chamita watershed.

Σαμπλε Δατε	Αβοϖε ΩΩΤΠ	ΩΩΤΠ Ουτφα λλ	Βελοω ΩΩΤΠ
Οχτοβερ, 1998[1]	14	––	12
Αυγυστ, 1998[1]	590	1600	400
Αυγυστ, 1998	460	––	450
ϑυλψ, 1991	210	5950[2]	580
Αυγυστ, 1991	––	11750[2]	––
Οχτοβερ, 1990	<10	177[2]	20

[1] Σαμπλε φρομ Συρϖειλλανχε ανδ Στανδαρδσ Σεχτιον συρϖεψ.
[2] ςαλυε ισ χαλχυλατεδ φρομ τωο ορ μορε δυπλιχατε σαμπλεσ.

The current Village of Chama NPDES permit specifies a 7-day geometric mean fecal coliform limit of 500 fcu/100 and a 30-day geometric mean of 500/100 ml. Effluent data collected by the SWQB presented in Table 8 show that these limits are not being consistently met. Village of Chama DMR data shown in Table 9 support this assertion. The permit requires two samples per month for fecal coliform and the DMR includes the monthly maximum value and the 30-day geometric mean of the two samples.

Table 9. 1998 Discharge Monitoring Report for fecal coliform data reported by the Village of Chama WWTP.

Μοντη	Μαξιμυμ ςαλυε	30−δαψ Γεομετριχ Μεαν
ϑανυαρψ	7	2.7
Φεβρυαρψ	1680∗	1680∗
Μαρχη	838∗	278
Απριλ	1620∗	127
Μαψ	6120∗	1074∗
ϑυνε	218	53
ϑυλψ	640∗	57
Αυγυστ	1140∗	687∗
Σεπτεμβερ	2840∗	2344∗
Οχτοβερ	80	37
Νοϖεμβερ	740∗	377
Δεχεμβερ	1306∗	36
Αννυαλ Αϖερα γε	1435	563

∗ Περμιτ εξχεεδανχε.

Although WWTP discharge levels of fecal coliform are high, Table 8 also shows that in all but one sample the upstream fecal coliform levels are greater than stream standards allow. Additional fecal coliform sampling will be conducted to more fully characterize sources of fecal coliform bacteria in the Rio Chamita watershed. However, sufficient data exists to support development of a fecal coliform TMDL to address the stream standards violations.

Calculations of stream loading capacity

Given that fecal coliform standards are expressed as colonies per unit volume, using 30-day geometric mean criterion of 100 fcu/100 ml stream load can be calculated. This is accomplished through application of the following conversion calculations.

C as fcu/100 ml * 1000ml/1 L * 1 L/ 0.264 gallons * Q in gallons / day = fcu/day

Where C = State water quality standard criterion,
Q = stream flow in gallons

Applying this conversion using the 100 fcu/100 ml criterion and using the previously determined combined stream flow of 2.95 MGD, the load may be expressed as:

100 fcu/100 ml * 1000ml/1 L * 1 L/ 0.264 gallons * 2950000 flow in gallons / day

This yields an assimilative loading limit in the stream of 1.117×10^{10} fcu/day at the 4Q3 low flow.

Margin of safety

Significant conservative assumptions have been used in developing these loading limits. These include:

- use of the 4Q3 flow for loading assumptions,
- treating fecal coliform as a conservative pollutant, that is a pollutant that does not readily degrade in the environment,
- use of the design flow for calculation of WWTP contributions,

No additional explicit margin of safety will be applied in calculation of this TMDL.

Waste load allocation

Under the conditions of the TMDL the permittee will be required to meet segment specific fecal coliform standards after final treatment. The limits will be 100 fcu/100 ml as a 30-day geometric mean and a single sample maximum of 200 fcu/100 ml. Applying these values to the formula above the waste load allocation may be determined as:

100 fcu/100 ml * 1000ml/1 L * 1 L/ 0.264 gallons * 300000 flow in gallons / day

Thus yielding a 30-day geometric mean waste load allocation of 1.136×10^{9} fcu/day .

Load allocation

The nonpoint source load allocation is calculated by subtracting the waste load allocation from the final allowable capacity.

$$LA = 1.117 \times 10^{10} - 1.136 \times 10^{9}$$
$$LA = 1.0034 \times 10^{10}$$

This allocation can be converted to a target concentration limit using the conversion formula:

1.0034×10^{10} fcu/ day * 1 day / 2650000 gal * 0.264 gal / 1 L * .1 L / 100 ml

This yields a target 30-day geometric mean of 100 fcu/100ml. With current levels reaching an average of about 450 fcu/100 ml in the most recent evaluations, a reduction of almost 75% in nonpoint source contributions must be achieved.

It is important to note that these load allocations are estimates based on a low flow condition. It is conceivable, due to differing hydrologic conditions that greater loads may not exceed water quality standards. Likewise, it is possible that lower load conditions could exceed the water

quality standards under certain hydrologic conditions. For this reason the load allocations given here are less meaningful than are the relative percent reductions. Compliance with this TMDL will be determined based on achieving the nonpoint source 30-day geometric mean of 100 fcu/100 ml.

Seasonal variability

There is no single critical condition for fecal coliform. It is possible that the criterion may be exceeded under a low flow condition when there is insufficient dilution of the point source. This has been addressed by setting the end of pipe discharge equal to the instream standard. It is also conceivable that the criterion may be exceeded during wet weather events as a result of nonpoint source contributions. As demonstrated by data presented in Table 9, fecal coliform discharges from the Village of Chama WWTP do not have a seasonal component. Evaluation of seasonal variability for potential nonpoint sources is difficult due to limited available data. However, some observations may be made from the available data. All samples collected during the warm-weather period yielded high background fecal coliform levels. Samples collected in October 1990 and 1998, which are beyond the warm-weather season, yielded low upstream fecal counts. This allows inference that seasonal inputs may account, in part, for the elevated fecal counts upstream of the WWTP. Additional information will be needed to support or refute this observation. Due to the uncertainty involved, there will be no seasonal allocations for fecal coliform in this TMDL.

TMDL specific monitoring

Although there are sufficient data available to prepare a TMDL, a database sufficient to characterize the diffuse sources of fecal coliform bacteria does not exist. Additional sampling needs to be conducted to characterize upstream sources of fecal coliform bacteria. This sampling program will incorporate a sampling scheme that will allow evaluations of seasonal loading as well as identification of specific sources. A monitoring plan will be developed to address each of these components.

Implementation plan

Management measures

Management measures are “economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives” (USEPA, 1993). A combination of best management practices (BMPs) will be used to implement this TMDL. Public outreach and stakeholder involvement in implementation of this TMDL will be ongoing. Stakeholder participation will range from choosing to install BMPs, to the potential for volunteer monitoring.

Time line

Implementation Action	Year 1	Year 2	Year 3	Year 4	Year 5
Public Outreach and Involvement	X	X	X	X	X
Establish Milestones	X				
Secure Funding	X				
Implement Management Measures (BMPs)		X	X		
Monitor BMPs		X	X	X	X
Determine BMP Effectiveness				X	X
Re-evaluate Milestones				X	X
Achieve compliance with standards					X

Assurances

This section provides the basis for reasonable assurances that TMDLs will be achieved and maintained. New Mexico has programs in place that will be utilized for both point source and nonpoint source reductions.

NMED, acting under authority delegated by the WQCC, implements water quality standards, including the antidegredation policy, by establishing and maintaining controls on discharges of pollutants to surface waters of the State. NMED is responsible for administering State responsibilities associated with the NPDES program. A federal NPDES permit must cover wastewater discharges, including some storm water discharges into watercourses. NMED certifies proposed NPDES permits to assure that US EPA-issued permits protect State water quality standards and are compatible with state law. Each NPDES permit issued must contain requirements necessary to achieve water quality standards (40 CFR 122.4(d)). Where a WLA has been assigned through the TMDL process, the WLA will be incorporated in the permit. Where a WLA has not been developed, NMED, along with US EPA, will review effluent discharge data to ensure that NPDES permit limits are protective of water quality. In reviewing such data, NMED will use recognized assessment protocols and other documentation to establish effluent limits when certifying NPDES permits. NMED staff inspects permitted facilities to monitor compliance with permit requirements and Water Quality Control Commission regulations.

New Mexico's Clean Water Action Plan has been developed in a coordinated manner with the State's 303(d) process. All Category I watersheds identified in New Mexico's Unified Watershed Assessment process are totally coincident with the impaired waters lists for 1996

and 1998 as approved by EPA. The State has given a high priority for funding, assessment, and restoration activities to these watersheds.

The description of legal authorities for regulatory controls/management measures in New Mexico's Water Quality Act does not contain enforceable prohibitions directly applicable to nonpoint sources of pollution. The Act does authorize the Water Quality Control Commission to "promulgate and publish regulations to prevent or abate water pollution in the state" and to require permits. Several statutory provisions on nuisance law could also be applied to nonpoint source water pollution.

NMED nonpoint source water quality management utilizes a voluntary approach. The state provides technical support and grant monies for implementation of BMPs and other NPS prevention mechanisms through §319 of the Clean Water Act. Since portions of this TMDL will be implemented through NPS control mechanisms, the New Mexico Nonpoint Source Program will target efforts to this and other watersheds with TMDLs. The Nonpoint Source Program coordinates with the Nonpoint Source Taskforce. The Nonpoint Source Taskforce is the New Mexico statewide focus group representing federal and state agencies, local governments, tribes and pueblos, soil and water conservation districts, environmental organizations, industry, and the public. This group meets on a quarterly basis to provide input on the § 319 program process, to disseminate information to other stakeholders and the public regarding nonpoint source issues, to identify complementary programs and sources of funding, and to help review and rank § 319 proposals.

In order to obtain reasonable assurances for implementation in watersheds with multiple landowners, including Federal, State and private land, NMED has established Memoranda of Understanding (MOUs) with various Federal agencies, in particular the Forest Service and the Bureau of Land Management. MOUs have also been developed with other State agencies, such as the New Mexico State Highway and Transportation Department. These MOUs provide for coordination and consistency in dealing with nonpoint source issues.

The time required to attain standards in this case is estimated to be five years.

Milestones

Milestones will be used for determining if control actions are being implemented and standards attained. For this TMDL several milestones will be established including the following*:*

- Conducting in-depth fecal coliform sampling to identify specific sources of fecal coliform bacteria to the river**.**
- Develop BMPs to reduce fecal coliform loading
- Implementation of BMPs

Milestones will be reevaluated periodically, depending on what BMPs were implemented. Further implementation of this TMDL will be revised based on this reevaluation.

Monitoring Plan

Pursuant to Section 106(e)(1) of the Federal Clean Water Act (33U.S.C. § 1251 et seq.), the SWQB has established appropriate monitoring methods, systems, and procedures in order to compile and analyze data on quality of surface waters of New Mexico. In accordance with the New Mexico Water Quality Act (NMSA, 1978, § 74-6-1 et seq.), the SWQB has developed and implemented a comprehensive water quality monitoring strategy for surface waters of the State. The monitoring strategy establishes 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. These objectives are: development of water quality-based controls, to evaluate the effectiveness of such controls, and to conduct water quality assessments.

The SWQB utilizes a rotating basin system approach to water quality monitoring. In this system, a select number of watersheds are intensively monitored each year with an established return frequency of five years.

The SWQB maintains current EPA approved quality assurance and quality control plans to cover all monitoring activities. This document, the "Quality Assurance Project Plan for Water Quality Management Programs" (QAPP), is updated annually. The QAPP identifies data quality objectives required to provide information of sufficient quality to meet established goals of the program. Additional site specific QAPP documents are prepared for each stream survey to assure these objectives are being met.

Current priorities for monitoring surface waters are driven by the CWA 303(d) list of streams requiring TMDLs. Short-term efforts will be directed toward those waters that are on the TMDL consent decree list (Forest Guardians, 1997) and that are due within the first two years of the monitoring schedule. Once assessment monitoring is completed, those reaches still showing impacts and requiring a TMDL will be targeted for more intensive monitoring. Methods of data acquisition include; fixed-station monitoring, intensive surveys of priority water bodies including biological assessments, and compliance monitoring of industrial, federal, and municipal dischargers, and are specified in the SWQB assessment protocol.

Long term monitoring for assessments will be accomplished through establishment of sampling sites that are representative of the water body and which can be revisited every five years. This gives an unbiased assessment of the water body and establishes a long term monitoring record for simple trend analyses. This information will provide time relevant information for use in CWA §305(b) assessments and to support the need for developing TMDLs.

This approach provides:

- a systematic, detailed review of water quality data and 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 that allows coordinated efforts with other programs,

- for enhanced efficiency and improves the basis for management decisions.

It should be noted that a basin is not ignored during its 4 year sampling hiatus. The rotating basin program will be supplemented with other data collection efforts that will be classified as field studies. This time will be used to analyze data collected, to conduct field studies to further characterize identified problems, to develop TMDLs, and implement corrective actions. Both types of monitoring, long term and field studies, can contribute to the CWA §305 and §303 listing processes, but they should be stored in the primary database with distinguishing codes that will allow for separate data retrievals.

The following schedule is a draft of the sampling seasons through 2002 and will be done in a consistent manner to support the New Mexico Unified Watershed Assessment (UWA) and the Nonpoint Source Management Program. This sampling regime will reflect seasonal variation by sampling in spring, summer, and fall for each of the watersheds.

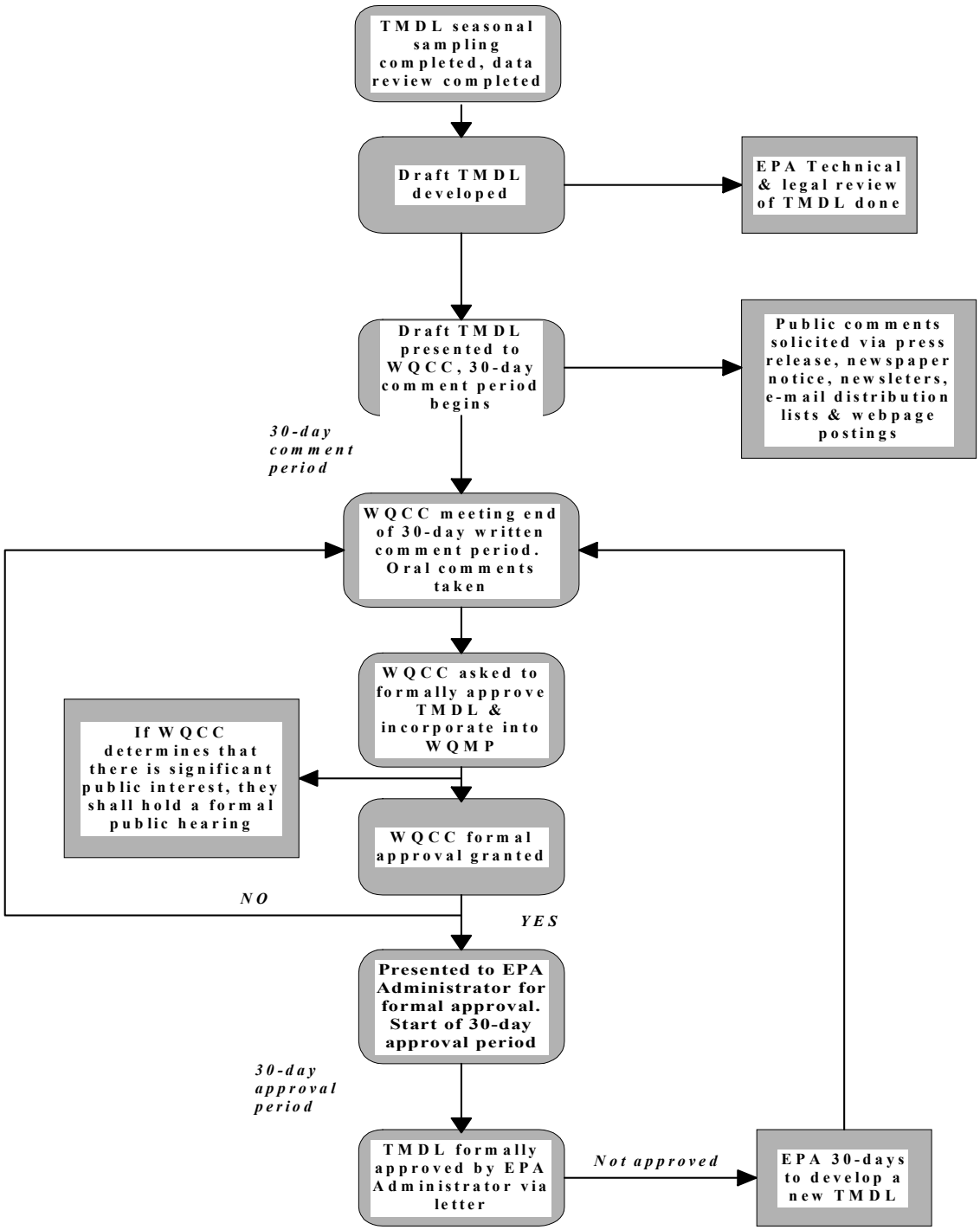
1998 - Jemez, Chama (above El Vado), Cimarron (above Springer), Santa Fe River, San Francisco
1999 - Chama (below El Vado), middle Rio Grande, Gila, Red River
2000 - San Juan, Upper Pecos (headwaters to Ft. Sumner)
2001 - Upper Rio Grande, lower Pecos (Roswell south)
2002 - Upper Rio Grande, Mimbres and other closed basins

In addition to the regularly scheduled instream monitoring, NPDES compliance monitoring will be conducted. NPDES discharge monitoring will include regular monitoring requirements for each of the TMDL parameters to assure continued compliance. Regularly scheduled inspections, conducted by the PSRS will also be conducted to assure compliance with permit requirements. As used in this strategy, "compliance monitoring" is a generic term that includes all activities conducted by the SWQB to verify compliance or non-compliance with effluent limitations and other conditions of NPDES permits. The SWQB routinely conducts two types of compliance monitoring activities: compliance evaluation inspections (CEI) and compliance sampling inspections (CSI). As part of the terms of the reissued NPDES permit the permittee will be required to conduct regular compliance monitoring and report this information to the SWQB and EPA through quarterly Discharge Monitoring Reports.

Public Participation

Public participation in development of this TMDL has been extensive. A flow chart of this process is shown in Figure 2. Response to comments is attached as Appendix E. All meetings and the draft document notice of availability were extensively advertised via newsletters, email distribution lists, webpage postings, and press releases to area newspapers

Figure 2. Public participation flow chart.



References Cited

Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, U.S. Environmental Protection Agency, Civil Action No 96-0826 LH/LFG, April, 1997.

NMED, 1999. Special Water quality Survey of the Upper Chama Watershed, Rio Arriba County, New Mexico, June 1 – October 22, 1998.

NMGF, 1983. Edward Sargent Fish and Wildlife Area Management Plan. New Mexico Department of Game and Fish. June, 1983.

US EPA, 1992. MULTI-SMP: Simplified Method Program for Multiple Discharges, Version 2.0. US EPA, Monitoring and Support Division, Washington, D.C. December 1992.

US EPA, 1993. Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. EPA-840-B-92-002. Washington, D.C.

US EPA, 1994. Implementation Guidance for Water Quality Standards for Interstate and Intrastate Streams in New Mexico, EPA Region 6, Water Management Division, Permits Branch. September 21, 1994.

US EPA, 1998, 1998 Update of Ambient Water Quality Criteria for Ammonia. EPA 822-R-98-008. August 1998. Washington, D.C.

WQCC, 1995. Title 20, Chapter 6, Part 1- Standards for Interstate and Intrastate streams. 20NMAC 6.1

Appendices

Appendix A. Results of 1998 water quality survey.

Appendix B. Calculation of the site-specific 4Q3 for the Rio Chamita.

Appendix C. MULTI-SMP model printouts.

Appendix D. Calculation of Chronic Criterion Concentration for the Rio Chamita

Appendix E. Response to public comments.