WATER QUALITY SURVEY SUMMARY

FOR THE

UPPER RIO GRANDE WATERSHED, PART II

(BETWEEN NORTH OF EMBUDO CREEK AND ANGOSTURA DIVERSION)

2001

Prepared by

Surface Water Quality Bureau
New Mexico Environment Department

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1.0 EXECUTIVE SUMMARY

Water quality surveys and assessments are completed in fulfillment of Section 106 of the Clean Water Act (CWA), *Work Program for Water Quality Management.* The purpose of the water quality survey is to collect water quality data to identify and prioritize water quality problems within a watershed and to evaluate the effectiveness of water quality based controls. The data collected as part of the survey are compared to current United State Environmental Protection Agency (USEPA) approved water quality standards to determine if waterbodies throughout the watershed are supporting their designated uses, such as the fishable and swimmable goals set forth in the CWA §102(a).

Water Quality Survey Summary Reports focus on information and data collected by the New Mexico Environment Department's (NMED) Surface Water Quality Bureau (SWQB) pertaining to stream reaches that were identified as NOT meeting water quality standards. All data collected as part of a survey are available upon request to the SWQB and can be downloaded from USEPA's computerized environmental data system known as STORET (http://www.epa.gov/storet/). The data collected as part of this study are later combined with all other readily available or submitted data that meet state quality assurance/quality control requirements to form the basis of designated use attainment determinations summarized in the *Integrated CWA §303(d)/305(b) Water Quality Monitoring and Assessment Report.*

The most common water quality exceedences and/or impairments identified as part of this study of the upper Rio Grande watershed between Embudo Creek and the Angostura Diversion were for turbidity. Aluminum was exceeded in the portions of the mainstem of the Rio Grande sampled as part of this study; however, the exceedences were not significant enough to classify the waterbody as impaired due to aluminum. The Rio Grande is impaired due to turbidity from Cochiti Reservoir to Embudo Station and biologically impaired from Santa Clara to Embudo Creek. Galisteo Creek, in the southern portion of the study area is impaired due to temperature and conductivity; however, the creek may be misclassified as a high quality coldwater fishery due to the fact that some portions of the creek go dry at times. Turbidity and mercury exceedences were also observed in these tributaries; however, they were not significant enough to be considered impaired due to these parameters.

In the Los Alamos area, Pueblo Canyon, Mortandad Canyon, and Pajarito Canyon were all considered impaired due to gross alpha and selenium, and Pajarito Canyon was also impaired due to mercury. The selenium levels may be elevated due to the effects of the Cerro Grande fire. The Rito de los Frijoles was the most impaired waterbody in this portion of the study area and is impaired due to temperature, dichlorodiphenyltrichloroethane (DDT), fecal coliform and turbidity. Finally, Capulin Creek is biologically impaired and impaired due to stream bottom deposits.

As you move up the watershed, the Pojoaque River is impaired due to stream bottom deposits and also had minor exceedences of aluminum, dissolved oxygen, temperature, and turbidity. In the Tesuque tributaries, water quality impairments exist for aluminum, conductivity, and turbidity. In the Chimayo area the only water quality impairment identified was for turbidity on

the Rio Quemado, although there were also minor exceedences of aluminum, conductivity, and turbidity in some of these tributaries.

In the upper portion of the study area water quality is biologically impaired and impaired due to turbidity on portions of the Rio Pueblo, Rio Santa Barbara, and Embudo Creek. Embudo Creek is also impaired due to stream bottom deposits. Minor exceedences were also observed in these tributaries for aluminum, conductivity, and turbidity.

2.0 INTRODUCTION

From May to October 2001, the Surface Water Quality Bureau (SWQB) of the New Mexico Environment Department (NMED) conducted a series of multiple-day intensive water quality surveys of the upper Rio Grande watershed. The survey included the geographic area draining into a portion of the Rio Grande located from just north of Embudo Creek (approximately 87 river miles upstream of Albuquerque) to near the Angostura Diversion (approximately 19 river miles above Albuquerque) and will be referred to as Part II of the upper Rio Grande watershed study. The Rio Chama sub-watershed and portions of the Santa Fe sub-watershed were excluded from this survey, as they were surveyed in separate studies. The study area extends more than 85 miles from north to south and more than 55 miles east-to-west. Land uses in this 2900 sq. mi. drainage consist of dry land and irrigated agriculture (including orchards), grazing, recreation (including designated wilderness), and urban development. The Los Alamos National Laboratory, cities including Santa Fe and Espanola, Native American lands, and extensive public lands (including Bandelier National Monument) are located within this watershed.

3.0 NM WATER QUALITY STANDARDS

General standards and standards applicable to attainable or designated uses for portions of the upper Rio Grande watershed that were surveyed in this study are set forth in sections 20.6.4.12 and 20.6.4.900, of *Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC, October 11, 2002). Segment specific standards for the upper Rio Grande watershed are set forth in Sections 20.6.4.110, 20.6.4.114, 20.6.4.121, and 20.6.4.123 and read as follows:

20.6.4.110 RIO GRANDE BASIN - The main stem of the Rio Grande from Angostura diversion works upstream to Cochiti dam.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact, coldwater fishery, and warmwater fishery.

B. Standards:

(1) In any single sample: pH shall be within the range of 6.6 to 9.0, and temperature shall not exceed 25°C (77°F). The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 200/100 mL; no single sample shall exceed 400/100 mL (see Subsection B of 20.6.4.13 NMAC).
[20.6.4.110 NMAC – Rp 20 NMAC 6.1.2108, 10-12-00]

20.6.4.114 RIO GRANDE BASIN - The main stem of the Rio Grande from the headwaters of Cochiti reservoir upstream to Taos Junction bridge, Embudo creek from its mouth on the Rio Grande upstream to the junction of the Rio Pueblo and the Rio Santa Barbara, the Santa Cruz river below Santa Cruz dam, the Rio Tesuque below the Santa Fe national forest and the Pojoaque river below Nambe dam.

A. Designated Uses: irrigation, livestock watering, wildlife habitat, marginal coldwater fishery, primary contact, and warmwater fishery.

B. Standards:

(1) In any single sample: pH shall be within the range of 6.6 to 9.0, temperature shall not exceed 22°C (71.6°F), and turbidity shall not exceed 50 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 200/100 mL; no single sample shall exceed 400/100 mL (see Subsection B of 20.6.4.13 NMAC).

(3) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS shall not exceed 500 mg/L, sulfate shall not exceed 150 mg/L, and chloride shall not exceed 25 mg/L.

[20.6.4.114 NMAC – Rp 20 NMAC 6.1.2111, 10-12-00]

20.6.4.121 RIO GRANDE BASIN - Perennial tributaries to the Rio Grande in Bandelier national monument and their headwaters in Sandoval county, all perennial reaches of tributaries to the Rio Grande in Santa Fe county unless included in other segments.

A. Designated Uses: domestic water supply, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, municipal and industrial water supply, secondary contact, and primary contact.

B. Standards:

(1) In any single sample: conductivity shall not exceed 300 µmhos, pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20°C (68°F), and turbidity shall not exceed l0 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Subsection B of 20.6.4.13 NMAC).

[20.6.4.121 NMAC – Rp 20 NMAC 6.1.2118, 10-12-00]

20.6.4.123 RIO GRANDE BASIN - The Red river upstream of the mouth of Placer creek, all tributaries to the Red river, and all other perennial reaches of tributaries to the Rio Grande in Taos and Rio Arriba counties unless included in other segments.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, and secondary contact.

B. Standards:

(1) In any single sample: conductivity shall not exceed 400 µmhos (500 µmhos for the Rio Fernando de Taos), pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20°C (68°F), and turbidity shall not exceed 25 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Subsection B of 20.6.4.13 NMAC).

[20.6.4.123 NMAC – Rp 20 NMAC 6.1.2120, 10-12-00]

4.0 METHODS

Water quality sampling methods were in accordance with the approved *Quality Assurance Project Plan for Water Pollution Control Programs* (QAPP) (NMED, 2001). Benthic macroinvertebrate and fish sampling methods conformed to protocols in United States Environmental Protection Agency's (EPA)

Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (Barbour *et al*., 1999) and the SWQB QAPP (NMED, 2001). Fluvial geomorphologic measurements were in accordance with protocols for the SWQB QAPP (NMED, 2001).

Water chemistry samples were collected on a seasonal basis, with most site visits on the third week of May, second week of August, and the first week of October.

5.0 SAMPLING SUMMARY

The station numbers (in this instance station numbers were assigned to station locations in alphabetical order), STORET identification codes (where available), and location descriptions of sampling stations selected for this survey are provided in Table 1.

Table 1. Sampling Stations

Station	STORET Code	Location Description
1		Alamo Canyon above Ponderosa Trail Crossing
2		Capulin Creek
3		Chamisal Creek below Village of Chamisal
4	URG111.021505	Embudo Creek at Hwy 68 bridge near Dixon at USGS Gage
5	URG111.021590	Embudo Creek below Santa Barbara/Pueblo confluence
6		Galisteo Creek at Cathy Richardson property above Cerillos
7		Galisteo Creek at Hwy 14 near Cerillos
8		Galisteo Creek at Jim Cumming's residence in Canoncito
9		Galisteo Creek in Galisteo
10	URG118.003407	Little Tesuque Creek at first crossing of Hyde Park Road (Hwy 475)
11	URG118.003420	Little Tesuque Creek at Hyde Park Road above Hyde Park
12		Mortandad below White Rock WWTP outfall
13	URG118.003440	N Fork of Tesuque Creek above Hyde Park Road (Hwy 475)
14	URG40	Pajarito above Rio Grande
15		Pojoaque River at State Road 84D
16	URG111.003115	Pueblo Canyon below Bayo WWTP outfall
17		Rio Chiquito near mouth
18	LOWE	Rio Chupadero above summer homes
19		Rio Chupadero at Borrego Canyon
20		Rio del Pueblo 0.8 miles above Hwy 518/75 at USGS Gage 08277470
21	URG118.003635	Rio en Medio at USFS boundary
22		Rio Frijoles above Rio Medio
23		Rio Grande above Embudo Creek
24	URG111.004407	Rio Grande above Espanola at Valdez Bridge
25	URG111.021035	Rio Grande at Embudo Station
26	URG111.021025	Rio Grande at Hwy 74 near San Juan Pueblo
27	URG108.000415	Rio Grande at San Felipe Pueblo (pueblo land, no AU)
28		Rio Grande at USGS gage below Cochiti Reservoir outlet
29		Rio Grande at USGS gage in White Rock Canyon (near Water Canyon)
30		Rio Grande below Rio Chama
31		Rio Grande below Rio Pueblo de Taos at USGS gage
32		Rio Medio above Santa Cruz River
33	HRG83	Rio Nambe above Nambe Reservoir
34		Rio Pueblo above Rio Santa Barbara

Station	STORET Code	Location Description
35	URG120.022510	Rio Pueblo at Hwy 75 above Rio Santa Barbara
36	URG120.022550	Rio Pueblo below Flechado campground, above Sipapu Ski Area
37		Rio Quemado near Chimayo
38	URG120.022023	Rio Santa Barbara at Hodges Campground
39	URG120.022001	Rio Santa Barbara at mouth
40	URG111.503010	Rito Canon de los Frijoles below cave
41		Rito de los Frijoles above Upper Falls
42		Rito de los Frijoles at Bandelier Visitor Center
43	URG111.503015	Rito de los Frijoles at Bridge ¾ miles above ceremonial cave
44		San Cristobal Creek at Hwy 41 south of Galisteo
45	HRG82	Santa Cruz River at gage below Rio Medio and Rio Frijoles
46	8291000	Santa Cruz River near Cundiyo
47	URG118.003430	Tesuque Creek (south fork) above Hyde Park Road (Hwy 475)
48		Tesuque Creek across from Tesuque Post Office
49	8302500	Tesuque Creek at USGS Gage 08302500 near Santa Fe
50		Tesuque Creek near Bishops Lodge
51		Trampas Creek above Hwy 76

6.0 WATER QUALITY ASSESSMENT (RESULTS AND DISCUSSION)

6.1 Assessment Units (Stream Reach)

The following water quality assessment summary is divided into Assessment Units (also known as waterbody or stream reaches). Assessment Units and their associated sampling stations are given in Table 2.

Table 2. Assessment Units and Associated Sampling Stations

Assessment Unit	Sampling Stations
Alamo Canyon (Rio Grande to headwaters)	1
Capulin Creek (Rio Grande to headwaters)	2
Chamisal Creek (above Embudo Creek, except Picuris Pueblo)	3
Embudo Creek (Canada de Ojo Sarco to Picuris Pueblo boundary)	4
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	5
Galisteo Creek (Perennial reaches above Santo Domingo Pueblo boundary)	6, 7, 8, 9
Little Tesuque Creek (Rio Tesuque to headwaters)	10, 11
Mortandad Canyon (San Ildefonso boundary to headwaters)	12
Pajarito Canyon (Rio Grande to headwaters)	14
Pojoaque River (San Ildefonso boundary to Pojoaque boundary)	15
Pueblo Canyon (Los Alamos Canyon to headwaters)	16
Rio Chiquito (Picuris Pueblo boundary to headwaters)	17
Rio Chupadero (USFS boundary to headwaters)	18, 19
Rio en Medio (non-pueblo lands Pojoaque River to Aspen Ranch)	21
Rio Medio (Rio Frijoles to headwaters)	32

Assessment Unit	Sampling Stations
Rio Frijoles (Rio Medio to Pecos Wilderness)	22
Rio Grande (non-pueblo land Angostura Diversion to Cochiti Reservoir)	28
Rio Grande (Cochiti Reservoir to San Ildefonso boundary)	29
Rio Grande (non pueblo lands Santa Clara to Embudo Creek)	24, 25, 26, 30
Rio Grande (Embudo Creek to Rio Pueblo de Taos)	23, 31
Rio Nambe (Nambe Pueblo boundary to headwaters)	33
Rio Pueblo (Picuris Pueblo boundary to headwaters)	20, 34, 35, 36
Rio Quemado (Santa Cruz River to headwaters)	37
Rio Santa Barbara (Picuris Pueblo boundary to USFS boundary)	39
Rio Santa Barbara (USFS boundary to confluence of E and W forks)	38
Rito de los Frijoles (Rio Grande to headwaters)	40,41, 42, 43
San Cristobal Creek (Galisteo Creek to headwaters)	44
Santa Cruz River (Santa Cruz Reservoir to Rio Medio)	45, 46
Tesuque Creek (Little Tesuque Creek to confluence of forks)	48, 49, 50
Tesuque Creek (North Fork)	13
Tesuque Creek (South Fork)	47
Trampas Creek (Rio Embudo to headwaters)	51

6.2 Discussion of Exceedences of Water Quality Standards

For many water quality parameters, the State of New Mexico maintains numeric water quality standards. However, for several parameters (e.g., plant nutrients, stream bottom deposits), only narrative standards exist. Data are assessed for designated use attainment status for both numeric and narrative water quality standards by application of the *Assessment Protocol* and associated appendices (NMED/SWQB, 2004a).

Table 3 includes information pertaining to all exceedences of water quality standards found during the intensive watershed survey. The purpose of this section of the report is to provide the reader with information on where current water quality standards are being exceeded within the watershed. These exceedences are used to determine designated use impairment status. Final assessment determinations as to whether or not a stream reach is considered to be meeting its designated uses depend on the overall amount and type of data available during the assessment process (Refer to NMED/SWQB's *Assessment Protocol* for additional information on the assessment process, NMED/SWQB 2004a). When available, outside sources of data that meet quality assurance requirements are combined with data collected by SWQB during intensive watershed survey to determine final impairment status. Final designated use impairment status is housed in the Assessment Database (ADB) and is reported in *Appendix B* of the *Integrated Clean Water Act §303(d)/ §305(b) Report* (NMED/SWQB, 2004b).

Table 3. Water Quality Exceedences

Alamo Canyon (Rio Grande to headwaters)

Applicable standard 20.6.4.121: municipal, irrigation, secondary contact, livestock watering, high quality coldwater fishery, wildlife habitat, domestic water supply, primary contact

No evidence that it fails to meet all designated uses. However, this remote location was sampled only for field parameters.

Capulin Creek (Rio Grande to headwaters)

Applicable standard 20.6.4.121: primary contact, domestic water supply, high quality coldwater fishery, wildlife habitat, irrigation, municipal, secondary contact, livestock watering

No evidence that it fails to meet all designated uses. However, this remote location was sampled only for field parameters and benthic macroinvertebrates.

Chamisal Creek (above Embudo Creek except Picuris Pueblo)

Applicable standard 20.6.4.123: domestic water supply, wildlife habitat, irrigation, high quality coldwater fishery, secondary contact, fish culture, livestock watering

Fails to meet segment-specific criteria for specific conductance and turbidity. This stream was sampled only three times.

segment specific criteria

Conductivity

Chamisal Creek below Village of Chamisal

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Specific conductance	No	540	400	umhos	10/02/2001

1 exceedance in 3 samples.

Turbidity

Chamisal Creek below Village of Chamisal

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	41	25	ntu	05/22/2001

1 exceedance in 3 samples.

Embudo Creek (Canada de Ojo Sarco to Picuris Pueblo boundary)

Applicable standard 20.6.4.114: warmwater, irrigation, primary contact, livestock watering, wildlife habitat, marginal coldwater fishery

fishery (chronic)

Dissolved aluminum

Embudo Creek below Santa Barbara/Pueblo confluence

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.09	0.087	mg/L	05/22/2001

This concentration is less than the screening level, and the arithmetic mean of all results is less than the action level.

Embudo Creek (Rio Grande to headwaters)

Applicable standard 20.6.4.114: warmwater, irrigation, primary contact, livestock watering, wildlife habitat, marginal coldwater fishery

Fails to meet segment-specific criteria for turbidity.

segment specific criteria

Turbidity

Embudo Creek at Hwy 68 bridge near Dixon at USGS gage

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	72	50	ntu	08/14/2001
Yes	Turbidity	No	240	50	ntu	08/15/2001

2 exceedances in 8 samples.

Galisteo Creek (Perennial reaches above Santo Domingo Pueblo boundary)

Applicable standard 20.6.4.121: domestic water supply, municipal, primary contact, high quality coldwater fishery, livestock watering, irrigation, warmwater, wildlife habitat, secondary contact

Fails to meet segment-specific criteria for specific conductance, temperature, and turbidity. A mercury detection indicates possible failure to meet chronic fishery criteria. Some stations on this stream were sampled only three times. Significant reaches of Galisteo Creek are ephemeral.

fishery (chronic)

Dissolved aluminum

Galisteo Creek at Hwy 14 near Cerrillos

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.12	0.087	mg/L	08/14/2001

This concentration is less than the screening level, and the arithmetic mean of all results is less than the action level.

Total mercury

Galisteo Creek at Hwy 14 near Cerrillos

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	mercury	No	0.0003	0.000012	mg/L	08/14/2001

1 exceedance in 3 samples. This result is near the instrument detection limits, but it also reported in a duplicate sample incidentally collected. This result was audited and confirmed by the laboratory.

segment specific criteria

Conductivity

Galisteo Creek at Cathy Richardson property above Cerrillos

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Specific conductance	No	1563	300	umhos	05/24/2001

Galisteo Creek at Hwy 14 near Cerrillos

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Specific conductance	No	1639	300	umhos	05/22/2001
Yes	Specific conductance	No	1562	300	umhos	05/23/2001
Yes	Specific conductance	No	1103	300	umhos	05/24/2001
Yes	Specific conductance	No	385	300	umhos	08/14/2001
Yes	Specific conductance	No	1576	300	umhos	09/25/2001

Galisteo Creek in Galisteo

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Specific conductance	No	505	300	umhos	05/22/2001
Yes	Specific conductance	No	432	300	umhos	05/23/2001
Yes	Specific conductance	No	591	300	umhos	05/24/2001
Yes	Specific conductance	No	312	300	umhos	08/14/2001
Yes	Specific conductance	No	615	300	umhos	08/15/2001
Yes	Specific conductance	No	619	300	umhos	09/25/2001
Yes	Specific conductance	No	588	300	umhos	09/26/2001
Yes	Specific conductance	No	564	300	umhos	09/27/2001

14 exceedances in 16 samples.

Temperature

Galisteo Creek at Hwy 14 near Cerrillos

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Temperature	No	21.87	20	C	05/23/2001

Galisteo Creek in Galisteo

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Temperature	No	21.74	20	C	05/22/2001
Yes	Temperature	No	22.6	20	C	05/24/2001
Yes	Temperature	No	24.68	20	C	08/14/2001
Yes	Temperature	No	23.4	20	C	08/15/2001

5 exceedances in 14 samples.

Turbidity

Galisteo Creek at Hwy 14 near Cerrillos

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	999	10	ntu	08/14/2001

Galisteo Creek in Galisteo

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	999	10	ntu	08/14/2001

2 exceedances in 9 samples. ("999" signifies a reading beyond the instrument's capability).

Little Tesuque Creek (Rio Tesuque to headwaters)

Applicable standard 20.6.4.121: irrigation, livestock watering, municipal, high quality coldwater fishery, domestic water supply, primary contact, wildlife habitat, secondary contact

fishery (chronic)

Dissolved aluminum

Little Tesuque Creek at Hyde Park Road above Hyde Park

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.11	0.087	mg/L	05/22/2001
Yes	aluminum	No	0.12	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.13	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.19	0.087	mg/L	05/24/2001

Except for the 5/24 result, these concentrations are less than the screening level. The arithmetic mean of all results is less than the action level.

Fails to meet chronic fishery criteria for aluminum. Chloride concentrations may exceed the segment-specific criteria, however the stream was not sampled during the required high flow.

fishery (chronic)

Dissolved aluminum

Little Tesuque Creek at first crossing of Hyde Park Road (Hwy 475)

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.4	0.087	mg/L	05/22/2001
Yes	aluminum	No	0.5	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.6	0.087	mg/L	05/24/2001

These concentrations exceed the screening level, and the arithmetic mean of all results (0.196 mg/L) exceeds the action level.

segment specific criteria

Chloride, Q > 100 cfs

Little Tesuque Creek at first crossing of Hyde Park Road (Hwy 475)

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Chloride	No	25.7	25	mg/L	08/21/2001
Yes	Chloride	No	31	25	mg/L	10/02/2001

The discharge for these samples was 0.5 and 0.25 cfs, respectively.

Mortandad Canyon (San Ildefonso boundary to headwaters)

Applicable standard unclassified: livestock watering, wildlife habitat

No evidence that it fails to meet all designated uses. This sample station was dry during some sampling visits.

Pajarito Canyon (Rio Grande to headwaters)

Applicable standard unclassified: wildlife habitat, livestock watering

No evidence that it fails to meet all designated uses. This sample station was dry during some sampling visits.

Pojoaque River (San Ildefonso boundary to Pojoaque boundary)

Applicable standard 20.6.4.114: wildlife habitat, warmwater, marginal coldwater fishery, primary contact, livestock watering, irrigation

Fails to meet the marginal coldwater fishery and warmwater fishery criteria for dissolved oxygen and the segment-specific criteria for temperature and turbidity. One aluminum concentration exceeded the "screening level" chronic fishery criterion. This sample station was dry during some sampling visits (this stream is explicitly protected in 20.6.4.114, without perennial qualification).

fishery (chronic)

Dissolved aluminum

Pojoaque River at State Road 84D

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.2	0.087	mg/L	05/22/2001
Yes	aluminum	No	0.12	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.09	0.087	mg/L	05/24/2001

The 5/22 result exceeds the screening level, but the arithmetic mean of all results is less than the action level.

marginal coldwater fishery

Dissolved oxygen

Pojoaque River at State Road 84D

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Dissolved oxygen	No	4.2	6	mg/L	08/21/2001
Yes	Dissolved oxygen	No	3.19	6	mg/L	08/22/2001

2 exceedances in 5 samples. During three sampling visits the stream was dry.

segment specific criteria

Temperature

Pojoaque River at State Road 84D

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Temperature	No	23.9	22	C	05/22/2001
Yes	Temperature	No	23.3	22	C	05/23/2001
Yes	Temperature	No	23.2	22	C	05/24/2001

3 exceedances in 5 samples. During three sampling visits the stream was dry.

Turbidity

Pojoaque River at State Road 84D

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	435	50	ntu	05/22/2001
Yes	Turbidity	No	382	50	ntu	05/23/2001
Yes	Turbidity	No	152	50	ntu	05/24/2001

3 exceedances in 5 samples. During three sampling visits the stream was dry.

warmwater fishery

Dissolved oxygen

Pojoaque River at State Road 84D

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Dissolved oxygen	No	4.2	5	mg/L	08/21/2001
Yes	Dissolved oxygen	No	3.19	5	mg/L	08/22/2001

2 exceedances in 5 samples. During three sampling visits the stream was dry.

Pueblo Canyon (Los Alamos Canyon to headwaters)

Applicable standard unclassified: wildlife habitat, livestock watering

No evidence that it fails to meet all designated uses. This sample station was dry during some sampling visits.

Rio Chiquito (Rio Santa Barbara to headwaters)

Applicable standard 20.6.4.123: fish culture, secondary contact, wildlife habitat, livestock watering, irrigation, high quality coldwater fishery, domestic water supply

Fails to meet segment-specific criteria for turbidity. This stream was sampled only three times. The sampling station was immediately upstream of a road crossing (passing through the channel), and one sampling event was during rain with obvious turbid discharge from the road (however, the inflowing stream water was obviously turbid, too).

segment specific criteria

Turbidity

Rio Chiquito near mouth

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	62	25	ntu	05/22/2001
Yes	Turbidity	No	43.4	25	ntu	08/14/2001

2 exceedances in 3 samples. The 8/14 sample was collected during rainfall, and turbid water was observed draining from the road into the stream. However, the inflowing stream water was also turbid.

Rio Chupadero (USFS boundary to headwaters)

Applicable standard 20.6.4.121: wildlife habitat, livestock watering, high quality coldwater fishery, domestic water supply, irrigation, primary contact, secondary contact, municipal

Fails to meet the segment-specific criteria for turbidity. Also fails to meet chronic fishery criteria for aluminum at the downstream site. The upstream site reported exceedances of the "screening level", but the arithmetic average meets the "action level". A lead detection indicates possible failure to meet chronic fishery criteria.

fishery (chronic)

Dissolved aluminum

Rio Chupadero above summer homes

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.3	0.087	mg/L	05/22/2001
Yes	aluminum	No	0.18	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.17	0.087	mg/L	05/24/2001
Yes	aluminum	No	0.18	0.087	mg/L	05/24/2001

These concentrations exceed the screening level, and the arithmetic mean of all results (0.1009 mg/L) exceeds the action level.

Rio Chupadero at Borrego Canyon

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.13	0.087	mg/L	05/22/2001
Yes	aluminum	No	0.15	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.14	0.087	mg/L	05/24/2001

These concentrations are less than the screening level, and the arithmetic mean of all results is less than the action level.

Dissolved lead

Rio Chupadero above summer homes

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	lead	No	0.001	5.482843E-04	mg/L	05/23/2001

1 exceedance in 9 samples. This result is near the instrument detection limit. Lead was not detected at this sampling location on 5/22 nor 5/24 (sampled and analyzed in duplicate). This result was audited and confirmed by the laboratory.

segment specific criteria

Turbidity

Rio Chupadero above summer homes

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	25.9	10	ntu	05/22/2001
Yes	Turbidity	No	18	10	ntu	05/23/2001
Yes	Turbidity	No	17.9	10	ntu	05/24/2001
Yes	Turbidity	No	18.3	10	ntu	10/02/2001

Rio Chupadero at Borrego Canyon

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	10.3	10	ntu	05/22/2001

These represents 5 exceedances in 16 samples.

Rio en Medio (non-pueblo lands Pojoaque River to Aspen Ranch)

Applicable standard 20.6.4.121: primary contact, livestock watering, municipal, wildlife habitat, irrigation, secondary contact, domestic water supply, high quality coldwater fishery

Fails to meet the segment-specific criteria for turbidity. This sampling did not include metals.

segment specific criteria

Turbidity

Rio en Medio at USFS boundary

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	11.1	10	ntu	05/22/2001
Yes	Turbidity	No	10.3	10	ntu	05/24/2001

2 exceedances in 8 samples. This sampling did not include metals.

Rio Medio (Rio Frijoles to headwaters)

Applicable standard 20.6.4.121: domestic water supply, municipal, high quality coldwater fishery, livestock watering, primary contact, secondary contact, irrigation, wildlife habitat

Fails to meet the segment-specific criteria for turbidity. This stream was sampled only three times. Thermograph data indicate that this stream supports applicable temperature criteria.

segment specific criteria

Turbidity

Rio Medio above Santa Cruz River

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	13.5	10	ntu	10/03/2001

1 exceedance in 3 samples.

Rio Frijoles (Rio Medio to Pecos Wilderness)

Applicable standard 20.6.4.121: secondary contact, primary contact, domestic water supply, irrigation, high quality coldwater fishery, livestock watering, municipal, wildlife habitat

Fails to meet the segment-specific criteria for turbidity. This stream was sampled only three times. Thermograph data indicate that this stream supports applicable temperature criteria.

segment specific criteria

Turbidity

Rio Frijoles above Rio Medio

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	13.6	10	ntu	10/03/2001

1 exceedance in 3 samples.

Rio Grande (non-pueblo land Angostura Diversion to Cochiti Reservoir)

Applicable standard 20.6.4.110: livestock watering, coldwater fishery, warmwater, wildlife habitat, irrigation, secondary contact

Fails to meet the chronic fishery criteria for aluminum. One aluminum detection also indicates possible failure to meet acute fishery criteria.

fishery (acute)

Dissolved aluminum

Rio Grande at USGS gage below Cochiti Reservoir outlet

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	1	0.75	mg/L	09/27/2001

1 exceedance in 9 samples. This result was audited and confirmed by the laboratory.

fishery (chronic)

Dissolved aluminum

Rio Grande at USGS gage below Cochiti Reservoir outlet

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.1	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.14	0.087	mg/L	05/24/2001
Yes	aluminum	No	0.7	0.087	mg/L	09/24/2001
Yes	aluminum	No	1	0.087	mg/L	09/27/2001

The 9/27 concentration exceed the screening level, and this result was audited and confirmed by the laboratory. The arithmetic mean of all results (0.236 mg/L) exceeds the action level.

Rio Grande (Cochiti Reservoir to San Ildefonso boundary)

Applicable standard 20.6.4.114: secondary contact, irrigation, wildlife habitat, livestock watering, marginal coldwater fishery, warmwater

Fails to meet the segment-specific criteria for turbidity and the chronic fishery criteria for aluminum.

fishery (chronic)

Dissolved aluminum

Rio Grande at USGS gage in White Rock Canyon (near Water Canyon)

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.2	0.087	mg/L	05/22/2001
Yes	aluminum	No	0.14	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.14	0.087	mg/L	05/24/2001

These concentrations are less than the screening level, but the arithmetic mean of all results (0.102 mg/L) exceeds the action level.

segment specific criteria

Turbidity

Rio Grande at USGS gage in White Rock Canyon (near Water Canyon)

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	110.9	50	ntu	05/22/2001
Yes	Turbidity	No	166	50	ntu	08/21/2001
Yes	Turbidity	No	225	50	ntu	08/22/2001

3 exceedances in 6 samples.

Rio Grande (non pueblo land Santa Clara to Embudo)

Applicable standard 20.6.4.114: livestock watering, warmwater, primary contact, marginal coldwater fishery, irrigation, wildlife habitat

Fails to meet the segment-specific criteria for turbidity. One dissolved oxygen result indicates possible failure to meet marginal coldwater fishery criteria. One temperature result indicates possible failure to meet segment-specific criteria.

fishery (chronic)

Dissolved aluminum

Rio Grande at Embudo Station

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.12	0.087	mg/L	05/22/2001
Yes	aluminum	No	0.11	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.12	0.087	mg/L	05/23/2001
Yes	aluminum	No	0.12	0.087	mg/L	05/24/2001

These concentrations are less than the screening level, and the arithmetic mean of all results is less than the action level.

segment specific criteria

Turbidity

Rio Grande above Espanola at Valdez Bridge

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	54.6	50	ntu	05/22/2001
Yes	Turbidity	No	51.1	50	ntu	05/24/2001
Yes	Turbidity	No	119.8	50	ntu	08/21/2001
Yes	Turbidity	No	133.4	50	ntu	08/22/2001
Yes	Turbidity	No	146.2	50	ntu	09/25/2001
Yes	Turbidity	No	138.9	50	ntu	09/26/2001
Yes	Turbidity	No	133.5	50	ntu	09/27/2001

Rio Grande at Embudo Station

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	73.2	50	ntu	05/22/2001
Yes	Turbidity	No	72	50	ntu	05/23/2001
Yes	Turbidity	No	77	50	ntu	05/24/2001
Yes	Turbidity	No	72	50	ntu	08/14/2001
Yes	Turbidity	No	295	50	ntu	08/15/2001

Rio Grande at San Juan Pueblo

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	86.8	50	ntu	05/22/2001
Yes	Turbidity	No	75.7	50	ntu	05/23/2001
Yes	Turbidity	No	78	50	ntu	05/24/2001
Yes	Turbidity	No	94	50	ntu	08/14/2001
Yes	Turbidity	No	999	50	ntu	08/15/2001

Rio Grande below Rio Chama

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	999	50	ntu	08/14/2001

These represent 18 exceedances in 25 samples. ("999" signifies a reading beyond the instrument's capability).

Rio Grande (Embudo Creek to Rio Pueblo de Taos)

Applicable standard 20.6.4.114: livestock watering, warmwater, primary contact, marginal coldwater fishery, irrigation, wildlife habitat

No evidence that it fails to meet all designated uses.

Rio Nambe (Nambe Pueblo boundary to headwaters)

Applicable standard 20.6.4.121: irrigation, domestic water supply, livestock watering, municipal, secondary contact, primary contact, high quality coldwater fishery, wildlife habitat

No evidence that it fails to meet all designated uses. This stream was sampled only three times for general chemistry and five times for nutrients (spring and fall only).

Rio Pueblo (Picuris Pueblo boundary to headwaters)

Applicable standard 20.6.4.123: fish culture, wildlife habitat, livestock watering, high quality coldwater fishery, irrigation, domestic water supply, secondary contact

One turbidity result indicates possible failure to meet segment-specific criteria. This sampling did not include metals.

segment specific criteria

Turbidity

Rio Pueblo at Hwy 75 below Penasco

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	28	25	ntu	08/15/2001

1 exceedance in 1 sample. This sampling did not include metals.

Rio Quemado (Santa Cruz River to headwaters)

Applicable standard 20.6.4.121: wildlife habitat, irrigation, livestock watering, high quality coldwater fishery, municipal, domestic water supply, secondary contact, primary contact

Fails to meet the segment-specific criteria for specific conductance and turbidity. This stream was sampled only three times.

segment specific criteria

Conductivity

Rio Quemado near Chimayo

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Specific conductance	No	334	300	umhos	10/03/2001

1 exceedance in 3 samples.

Turbidity

Rio Quemado near Chimayo

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	20.3	10	ntu	05/22/2001
Yes	Turbidity	No	104	10	ntu	08/14/2001

2 exceedances in 3 samples.

Rio Santa Barbara (Picuris Pueblo boundary to USFS boundary)

Applicable standard 20.6.4.123: livestock watering, secondary contact, irrigation, wildlife habitat, fish culture, high quality coldwater fishery, domestic water supply

Fails to meet the segment-specific criteria for turbidity. This sampling did not include metals.

segment specific criteria

Turbidity

Rio Santa Barbara at mouth

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	36	25	ntu	08/14/2001
Yes	Turbidity	No	37	25	ntu	08/15/2001

2 exceedances in 8 samples. This sampling did not include metals.

Rio Santa Barbara (USFS boundary to confluence of East and West forks)

Applicable standard 20.6.4.123: livestock watering, high quality coldwater fishery, wildlife habitat, domestic water supply, secondary contact, fish culture, irrigation

No evidence that it fails to meet all designated uses. This sampling did not include metals.

Rito de los Frijoles (Rio Grande to headwaters)

Applicable standard 20.6.4.121: wildlife habitat, high quality coldwater fishery, irrigation, domestic water supply, municipal, primary contact, livestock watering, secondary contact

Fails to meet the segment-specific criteria for fecal coliforms (single sample), turbidity, and temperature (the temperature exceedance is based on thermograph data). This sampling did not include metals. The bacteria

were sampled only three times.

segment specific criteria

Fecal coliforms, single sample

Rito de los Frijoles above Upper Falls

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	fecals	No	360	200	/100 mL	09/18/2001
Yes	fecals	No	300	200	/100 mL	10/17/2001

2 exceedances in 3 samples.

Turbidity

RITO CANON DE LOS FRIJOLES BELOW CAVE

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	11.1	10	ntu	05/23/2001
Yes	Turbidity	No	12.7	10	ntu	05/24/2001
Yes	Turbidity	No	10.7	10	ntu	09/25/2001

Rito de los Frijoles above Upper Falls

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	10.8	10	ntu	05/23/2001
Yes	Turbidity	No	13.5	10	ntu	08/21/2001

These represent 5 exceedances in 16 samples.

San Cristobal Creek (Galisteo Creek to headwaters)

Applicable standard unclassified: wildlife habitat, livestock watering

No evidence that it fails to meet all designated uses. This sample station was dry during some sampling visits.

Santa Cruz River (Santa Cruz Reservoir to Rio Medio)

Applicable standard 20.6.4.114: warmwater, livestock watering, marginal coldwater fishery, irrigation, primary contact, wildlife habitat

Fails to meet the chronic fishery criteria for aluminum. This stream was sampled only three times.

fishery (chronic)

Dissolved aluminum

Santa Cruz River in Chimayo

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	aluminum	No	0.2	0.087	mg/L	05/22/2001

This concentration exceeds the screening level, and the arithmetic mean of all 3 results (0.087 mg/L) meets the action level.

Tesuque Creek (Little Tesuque Creek to confluence of forks)

Applicable standard 20.6.4.121: irrigation, secondary contact, municipal, wildlife habitat, primary contact, domestic water supply, high quality coldwater fishery, livestock watering

Fails to meet the segment-specific criteria for specific conductance and turbidity. This sampling did not include metals.

segment specific criteria

Conductivity

Tesuque Creek Across From Tesuque Post office

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Specific conductance	No	394	300	umhos	08/21/2001
Yes	Specific conductance	No	323	300	umhos	08/22/2001
Yes	Specific conductance	No	397	300	umhos	10/02/2001
Yes	Specific conductance	No	407	300	umhos	10/03/2001
Yes	Specific conductance	No	418	300	umhos	10/04/2001

5 exceedances in 8 samples.

Turbidity

Tesuque Creek Across From Tesuque Post office

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	20.3	10	ntu	05/22/2001
Yes	Turbidity	No	16.4	10	ntu	05/23/2001
Yes	Turbidity	No	12.5	10	ntu	05/24/2001

3 exceedances in 8 samples.

Tesuque Creek near Bishops Lodge

Exceeds:	Analyte:	LessThan:	Result:	Standard:	Units:	Sampling date:
Yes	Turbidity	No	15.4	10	ntu	05/22/2001
Yes	Turbidity	No	16.1	10	ntu	05/23/2001

2 exceedances in 8 samples.

Tesuque Creek (North Fork)
Applicable standard 20.6.4.121: secondary contact, wildlife habitat, primary contact, irrigation, domestic water supply, livestock watering, high quality coldwater fishery, municipal

No evidence that it fails to meet all designated uses. This sampling did not include metals.

Tesuque Creek (South Fork)
Applicable standard 20.6.4.121: domestic water supply, secondary contact, primary contact, wildlife habitat, high quality coldwater fishery, livestock watering, irrigation, municipal

No evidence that it fails to meet all designated uses. This sampling did not include metals.

Trampas Creek (Rio Embudo to headwaters)
Applicable standard 20.6.4.123: secondary contact, livestock watering, domestic water supply, fish culture, high quality coldwater fishery, irrigation, wildlife habitat

No evidence that it fails to meet all designated uses. This stream was sampled only three times.

7.0 CONCLUSIONS

The most common water quality exceedences and/or impairments identified as part of this study of the upper Rio Grande watershed between Embudo Creek and the Angostura Diversion were for turbidity. Aluminum was exceeded in the portions of the mainstem of the Rio Grande sampled as part of this study; however, the exceedences were not significant enough to classify the waterbody as impaired due to aluminum. The Rio Grande is impaired due to turbidity from Cochiti Reservoir to Embudo Station and biologically impaired from Santa Clara to Embudo Creek. Galisteo Creek, in the southern portion of the study area is impaired due to temperature and conductivity; however, the creek may be misclassified as a high quality coldwater fishery due to the fact that some portions of the creek go dry at times. Turbidity and mercury exceedences were also observed in these tributaries; however, they were not significant enough to be considered impaired due to these parameters.

In the Los Alamos area, Pueblo Canyon, Mortandad Canyon, and Pajarito Canyon were all considered impaired due to gross alpha and selenium, and Pajarito Canyon was also impaired due to mercury. The selenium levels may be elevated due to the effects of the Cerro Grande fire. The Rito de los Frijoles was the most impaired waterbody in this portion of the study area and is impaired due to temperature, dichlorodiphenyltrichloroethane (DDT), fecal coliform and turbidity. Finally, Capulin Creek is biologically impaired and impaired due to stream bottom deposits.

As you move up the watershed, the Pojoaque River is impaired due to stream bottom deposits and also had minor exceedences of aluminum, dissolved oxygen, temperature, and turbidity. In the Tesuque tributaries, water quality impairments exist for aluminum, conductivity, and turbidity. In the Chimayo area the only water quality impairment identified was for turbidity on the Rio Quemado, although there were also minor exceedences of aluminum, conductivity, and turbidity in some of these tributaries.

In the upper portion of the study area water quality is biologically impaired and impaired due to turbidity on portions of the Rio Pueblo, Rio Santa Barbara, and Embudo Creek. Embudo Creek is also impaired due to stream bottom deposits. Minor exceedences were also observed in these tributaries for aluminum, conductivity, and turbidity.

8.0 REFERENCES

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