2015 Taos Water Quality Sampling Report – Rio Hondo, Rio Fernando and Rio Pueblo de Taos

Lead: Sentinels-Rios de Taos
Support: Amigos Bravos

Summary:
Surface water quality sampling was conducted in the Taos NM area in May, July, and August, 2015. Samples were collected from 6 sites in the Rio Hondo, 5 sites in the Rio Pueblo de Taos, 4 sites in the Rio Fernando de Taos, 4 sites in the Red River, and 2 sites in the Rio Grande. All sample sites were monitored for dissolved oxygen, temperature, electrical conductivity, pH, and *E. coli*. Several sites near the Taos Wastewater Treatment Facility were also monitored for nutrients. Sites on the Red River were monitored for hardness and total Aluminum. Water quality standards were exceeded at least once in the Rio Pueblo de Taos, Rio Fernando de Taos, the Rio Hondo, and the Red River.

In July and August the Rio Fernando did not meet standards for dissolved oxygen and electrical conductivity and *E. coli*. Following grazing in the Riparian Pasture in the Flechado allotment, *E. coli* levels in the upper Rio Fernando, greatly exceeded standards. High *E. coli* levels at Fred Baca Park also continue to be a problem in the summer months.

In 2015 we continued to monitor the impact of the Taos wastewater treatment plant on the Rio Pueblo and on a small perennial unnamed stream that flows from the wastewater treatment plant. The results from the perennial unnamed wastewater stream had high conductivity readings (though there is still not an electrical conductivity standard for the unnamed perennial stream, so a standard was not exceeded). There is also no phosphate standard for the lower Rio Pueblo sites. If the standard that applies to all other river systems in the area (including the upper Rio Pueblo) were to apply, there would have been extreme phosphate exceedences in the unnamed perennial stream.

Sampling from two sites on the Rio Grande were added this year. All water quality standards were met.

Although less than recorded in 2014, aluminum levels continue to be high in the Red River. The only true exceedance was in July at site RR3. Aluminum standards are dependent on hardness and are set. However please see the Red River section for more information on aluminum levels.

Sampling results in 2015 again confirm the New Mexico Environment Department's previous listing of the lower segment of the Rio Fernando de Taos *E. coli* in the upper two segments, and for *E. coli*, Nutrient/Eutrophication Biological Indicators, Sedimentation/Siltation, Specific Conductance, and Temperature in the lower segment. High *E. coli* levels also continue to plague the upper and lower Rio Fernando sites.

A very high sample result for *E. coli* in Rio Hondo near the conflucene with the Rio Grande replicates some previous high levels recorded at this site in previous years. While the level recorded (> 8,000 colonies per 100/ml) is extremely high, well over the

standard of 410 colonies per 100/ml, this does not trigger a non supporting designation for the primary contact use because the assessment protocols require more than one sample to exceed the criteria to be non supporting.

Introduction:

This sampling project was initiated by Sentinels – Rios de Taos due to a concern that inadequate data were available to accurately assess the health of the Rio Hondo, Rio Fernando, and Rio Pueblo de Taos watersheds. Sentinels – Rios de Taos contacted Amigos Bravos in 2005 with concerns about water quality in local watersheds. Specifically, there was some concern about nutrient loading in the upper Rio Hondo. With Amigos Bravos' assistance Sentinels-Rios de Taos identified sampling locations and developed a monitoring plan. National representatives from Sierra Club's Water Sentinels program traveled to Taos and gave several trainings to the Sentinels – Rios de Taos' volunteers. Sentinels – Rios de Taos initiated sampling first in February of 2007 with assistance from Amigos Bravos. In 2012 four sites in the Red River were also monitored. This year (2015), two sites in the upper Rio were added to our monitoring sites. Eight previous sampling reports have been prepared for sampling that occurred in 2007 - 2014. This report covers the sampling that occurred in 2015.

Methods:

Surface water quality sampling was conducted in the Taos NM area in May, July, and August, 2015. Samples were collected from 6 sites in the Rio Hondo, 5 sites in the Rio Pueblo de Taos, 4 sites in the Rio Fernando de Taos, 4 sites in the Red River, and 2 sites in the Rio Grande (Appendix A and Appendix C). All samples were kept on ice until they were processed by Sangre de Cristo labs in Alamosa Colorado. Laboratory samples were collected for *E. coli*. For some samples nitrates, ammonia, hardness, or aluminum were also analyzed. All laboratory samples were collected and processed within an 8hr holding time. EPA approved methods and holding times were used to analyze the samples (Appendix B). Field measurements for pH, temperature, dissolved oxygen and conductivity were conducted. Field measurements of hardness were collected for all samples for which laboratory samples for aluminum were collected (Appendix B).

The concentration of aluminum in natural waters can vary significantly depending on various physicochemical and mineralogical factors. Dissolved aluminum concentrations in waters with near-neutral pH values usually range from 1 - 50 μg/L but rise to 500–1000 μg/L in more acidic waters or water rich in organic matter. At the extreme acidity of waters affected by acid mine drainage, dissolved aluminum concentrations of up to 90,000 µg/L have been measured. The current New Mexico Water Quality Standards provide a table for maximum aluminum values, which are now dependent on hardness following the 2010 updates. They provide values for both acute and chronic criteria (see (3) Table of Selected Values, pg. 40-41 of the NM Standards for Interstate and Intrastate Surface Waters).

Acute criteria is for toxicity involving a stimulus severe enough to induce a response in 96 hours of exposure or less. Compliance with acute water quality criteria is determined from the analytical results of a single grab sample and cannot be exceeded. Chronic

criteria effects include, but are not limited to, lethality, growth impairment, behavioral modifications, disease, and reduced reproduction. Compliance with chronic water quality criteria is determined from the arithmetic mean of the analytical results of samples collected using the appropriate protocols. Chronic criteria cannot be exceeded more than once every three years.

Acute Ammonia standards are dependent on pH and the presence or absence of salmonids (species of fish that spawn in fresh water including trout and salmon; See table K of NM water quality standards). Chronic ammonia standards are dependent on pH, temperature, and the presence or absence of salmonids (See table L of NM water quality standards).

Results:

A list of the full sampling results for 2015 can be found in Appendix C.

Rio Hondo:

May 28, 2015: Laboratory samples were collected from 5 sites in the Rio Hondo. These samples were analyzed in the lab for *E. coli,* nitrate, ammonia, and phosphorus. Field readings for temperature, pH, conductivity, and dissolved oxygen were also taken at these 5 locations. No exceedences were found in these samples (Appendix C).

July 16, 2015: Laboratory samples were collected from 5 sites in the Rio Hondo. These samples were analyzed for *E. coli*. Nitrate, ammonia, and phosphate levels were measured for sites H2B2, H2C and H2E. Field readings for temperature, pH, conductivity, and dissolved oxygen were also taken at all 5 locations. Site H2C exceeded phosphate standards, and site H6 had *E. coli* levels Too Numerous To Count (TNTC-over 8,000 colonies/100ml).

August 27, 2015: Laboratory samples were collected from 6 sites in the Rio Hondo. These samples were analyzed for only *E. coli* in the lab on this date. Field readings for temperature, pH, conductivity, and dissolved oxygen were also taken at these 6 locations. No water quality standard exceedences were recorded for the tested parameters during this period (Appendix C).

Rio Pueblo:

May 28, 2015: Laboratory samples were collected from 5 sites in Rio Pueblo de Taos and analyzed for *E. coli,* nitrates, ammonia, and phosphrous. Field readings for temperature, pH, DO, and conductivity were taken. At P1A, (culvert that goes under Upper Ranchitos Rd), electrical conductivity was measured at 618 microsiemens/cm, which is above the standard (<=400 microsiemens/cm). In addition, conductivity at PS2 (unnamed perennial stream below wastewater plant) had an electrical conductivity of 695 (higher than the normal standard) and phosphate levels at PS2 were 4.87mg/L – about 25 times higher than levels at other sites. Though it is important to note that there is no standard for phosphate/phosphorous or electrical conductivity at PS2 and PS3. The phosphate levels

of 5.14mg/L in 2013 and 5.0mg/L in 2014 found at PS2 are also well above the standard that applies to the other river segments in the sampling project). No other tested parameters, either in the laboratory samples or field samples, were above water quality standards (Appendix C).

July 16, 2015: Laboratory samples were collected at 4 sites in the Rio Pueblo de Taos and analyzed for *E. coli*. Phosphate and ammonia levels were taken from PS2 and PS3. Field readings for temperature, pH, DO, and conductivity were taken at all 4 sites. Electrical conductivity were even higher at PS2 (786 microsiemens/cm) and was also exceeded at P1A (447 microsiemens/cm) during this sample. Site P1A (culvert that goes under Upper Ranchitos Rd) also exceeded *E. coli* standards, with a reading of 428 colonies/100ml). There is no standard for phosphate or electrical conductivity at PS2 and PS3. The phosphate level of 7.96 at PS2 is about 79.6 times higher than the standard of 0.1 mg/L that applies to the other river segments in the sampling project. No other tested parameters, either in the laboratory samples or field samples, were above water quality standards (Appendix C).

August 27, 2015: Laboratory samples were collected at 4 sites in the Rio Pueblo de Taos and analyzed for *E. coli*. Phosphate levels were analyzed at PS2 and PS3. Field readings for temperature, pH, DO, and conductivity were taken at all 4 sites. E. coli levels were above the standard again at P1A, with 256 colonies/100ml (Appendix C). The phosphate level of 2.67 mg/L in 2015 found at PS2 (unnamed perennial stream below the wastewater plant) is 26.7 times higher than the standard of 0.1mg/L that applies to the other river segments in the sampling project. Electrical conductivity at PS2 measured at 726 microsiemens/cm, and was 920 microsiemens/cm in 2014, both of which are above the standard that applies to the other river segments (400-500 microsiemens/cm) that we sample in this project. PS3 also showed high electrical conductivity at 437 this year and was consistently high in previous years (553 in September of 2014).

Rio Fernando de Taos:

May 28, 2015: Laboratory samples were collected at 4 sites in the Rio Fernando and analyzed for *E. coli,* ammonia, and phosphorous. Field readings for temperature, pH, DO, and conductivity were also taken. No tested parameters, either in the laboratory samples or field samples, were above water quality standards (Appendix C). Parameters that we often see above standards on the Rio Fernando are Electrical Conductivity, and *E. coli*. Electrical conductivity levels were between 200-376 microsiemens/cm and *E. coli* levels were only 1-5 colonies/100ml.

July 16, 2015: Laboratory samples were collected at the same 4 sites in the Rio Fernando and analyzed for *E. coli*. Field readings for temperature, pH, DO, and conductivity were also taken. Dissolved oxygen, electrical conductivity, and *E. coli* at FRE (the Riparian Exclosure) exceeded standards. F1 and F4 (Divisidero and Fred Baca Park) both exceeded Electrical conductivity standards. No other tested parameters, either in the laboratory samples or field samples, were above water quality standards (Appendix C).

August 27, 2015: Laboratory samples were collected at the same 4 sites in the Rio Fernando (F1, F1A, F1B and F4) and analyzed for *E. coli*. Field readings for temperature, pH, DO, and conductivity were also taken. Water quality standards for dissolved oxygen, conductivity, and *E. coli* were not met at F4 (Fred Baca Park). Electrical conductivity levels were also above standards at F1, and E. coli was exceeded at FRE (the Riparian Exclosure). E. coli levels at Divisidero and Fred Baca Park were both Too Numerous To County (TNTC), meaning levels were over 8,000 colonies/100ml. Those levels are over 34 times the surface water quality standard for the Rio Fernando.

Red River:
On May 28, July 16 and August 27 2015, samples were collected from 4 sites (RR1, RR2, RR3 and RR4) on the Red River. Some of these sites were tested for *E. coli* and all of the sites were tested for hardness, aluminum, dissolved oxygen, electrical conductivity, pH and temperature.

May 28, 2015: Site RR1 (Junebug Campground) exceeded the standard of 6.6-8.8 for pH with a testing of 8.95. This standard was also exceeded in 2014 with a PH of 9. No other tested parameters, either in the laboratory samples or field samples, were above water quality standards (Appendix C).

July 16, 2015: Site RR1 did not exceed the standard for pH, but measured equal to the highest value under the standard – 8.8 pH units. For aluminum however, the samples on July 16 showed high levels of aluminum at RR3. This is very similar to the middle sampling period in 2013 and 2014, which showed much higher levels of aluminum than the earlier and later sampling dates as well. July 16, 2015 Aluminum levels were: >2,400µg/L at RR3 (Hardness of 140) and under 1,100 µg/L at the other sites. This is over the chronic limit for a hardness of 100 (1,370mg/L). In 2014, RR2, RR3 and RR4 were all in exceedences of acute criteria standards for aluminum, and all 4 Red River sites exceeded levels for chronic criteria aluminum standards. The levels found on August 14, 2013 fell in the range of 1,781-2,306µg/L, exceeding chronic criteria standards as well. Since chronic criteria cannot be exceeded more than once every 3 years, RR3 has officially exceeded chronic criteria standards for Aluminum.

The current (2010) Water Quality Standards table provided for Aluminum gives Acute and Chronic results for Hardness of 100mg/L and 200mg/L but not values in between. For a hardness of 100mg/L, the Acute criteria standard is 3,241µg/L and for chronic criteria it is 1,370µg/L. Using those values and the fact that the aluminum standards get higher as hardness gets higher, the aluminum standards were not exceeded during this sampling event.

August 27th, 2015: None of the Red River sites exceeded pH standards during this sampling event. Aluminum levels ranged from 1,000-1280 µg/L. This is not exceeding the chronic or acute levels for a hardness of 100. Our calucalted hardness levels ranged from 100-150.

Rio Grande:

Samples were taken at two locations on the Rio Grande during all three sampling days. During each sampling event, both sites were analyzed for *E. coli,* temperature, pH, DO, and conductivity. NO exceedences of water quality were found at these two sites in 2015.

Discussion:

Rio Hondo
In 2015 The Rio Hondo continued to have good water quality, with one exception. In 2014, there was one exceedence of pH at site H6 (near confluence with Rio Grande), and in 2015, that site had a pH within the limits, but showed E. coli levels of over 8,000 colonies/100ml (the water quality standard for *E. coli* is 235 cfu/100ml). No water quality standard exceedences were observed during 2013. Amigos Bravos will investigate this site again in 2016, and follow up as needed. In 2007 and 2008 we did observe some high levels of *E. coli* in the lower sections of the Rio Hondo but these high *E. coli* levels had not been observed since 2008.

Rio Fernando
Amigos Bravos and Sentinels Rios de Taos have been collaborating to collect water quality samples and prepare the attached reports for rivers in the Taos area, including the Rio Fernando de Taos, for the past 9 years. Our sampling results show numerous *E. coli* water criteria exceedences in the Rio Fernando.

The New Mexico Environment Department and the USFS both conducted a special study of *E. coli* levels in the upper Rio Fernando that also demonstrated high and in some cases extremely high levels of *E. coli* in the upper Rio Fernando. [1] In 2010 NMED/USFS sampling showed *E. coli* concentrations at 461 cfu/100ml (about twice the allowable level) in the La Jara Pasture, 921 cfu/100ml (about 4 times the allowable level) in the Riparian exclosure, and >2,419 cfu/100ml (more than 10 times the allowable level) in the Gathering Pasture in the Upper Rio Fernando.[2] Sampling in 2007 and 2009 also found levels of *E. coli* above water quality standards in all three pastures.[3]

In 2015, we continued to see exceedences in the upper Rio Fernando following the beginning of cattle grazing. While all standards were met in May, when flow was high,

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[1]Carson National Forest E. coli Sampling Summaries for Apache Canyon and Rio Fernando de Taos, USFS 2007, 2009, and 2010.

[2]Ibid (2010 Report)

[3]Sampling in the La Jara Exclosure in 2007 showed levels of E. coli at 1986 cfu/100ml (about 8.5 times the allowable level) and 1732 cfu/100ml (7.4 times the allowable level) in 2009. Sampling in 2007 showed levels of E. coli in the riparian exclosure to be as high as 1732 cfu/100ml (7.4 times the allowable level) and >802 cfu/100ml (more than 3.4 times the allowable level) in 2009. No sampling was conducted in these pastures in 2008, 2011, 2012 or 2013.

dissolved oxygen, electrical conductivity, and E. coli levels exceeded standards at the lower three sites in July and August.

Samples taken in June and July, 2014[4] on the Rio Fernando at the mouth of La Jara Canyon (sites FLJ, FRE, FAP1) conclusively show the impact of cattle to the stream. Samples taken on June 13, 2014 prior to the seasonal release of cattle into La Jara Canyon showed *E. coli* at 0 CFU (Colony Forming Units) per 100 ml. However, samples taken on July 21, 2 days after the cows were removed after grazing for 26 days in La Jara Canyon, showed elevated levels of *E. coli* at 365 CFUs per 100 mls, or over 1.5 times higher than the allowable water quality standard of 235 CFUs per 100 mls.

The contamination in the Rio Fernando is a threat to the public health and safety of the Taos Community and is unacceptable. The US Forest Service, the New Mexico Environment Department and our local decision makers must take action to restore the water quality of the Rio Fernando watershed and stop on-going pollution. Amigos Bravos will begin the Watershed Based Planning 319 process in 2016.

Rio Pueblo de Taos
While there is no standard electrical conductivity standard for the lower Rio Pueblo de Taos and therefore no exceedences of standards, the electrical conductivity readings in the lower Rio Pueblo continue to be some of the highest recorded in the four river systems sampled. The levels were well above the standards that apply to similar river systems such as the Rio Hondo and Red River where the electrical conductivity standard is <=400 microsiemens/cm. P1A and PS2 exhibited high levels of electrical conductivity in the first two sampling events. And PS2 and PS3 exceeded electrical conductivity standards in the August sampling event.

There is also no phosphate standard in the lower Rio Pueblo sites, yet the phosphate levels recorded are well above the standard of 0.1mg/L that applies to all the other river segments in the sampling project. Site P1A (culvert that goes under Upper Ranchitos Rd about 200 feet from intersection with Ranchitos Rd) greatly exceeded phosphate/phosphorous levels during all three sampling events (4.87, 7.96, 2.67mg/L). these levels are 26.7-79.6 times above the usual standard).

Red River
Aluminum results from immediately below the Chevron mine were well above standards during the July 16, 2015 sample at RR3. This is similar to past years results, where the middle sample (mid July to early August) showed levels above standards. In addition to the mine there is also a lot of natural scaring in the drainages that feed into the Red River in this section of the river. The high aluminum levels could be coming from either or both of these sources.

In July 16, 2015 Aluminum levels were: >2,400µg/L at RR3 (Hardness of 140). This is over the chronic limit for a hardness of 100 (1,370mg/L). In 2014, RR2, RR3 and RR4 were all in exceedence of acute criteria standards for aluminum, and all 4 Red River sites exceeded levels for chronic criteria aluminum standards. Since chronic criteria cannot be

exceeded more than once every 3 years, RR3 has officially exceeded chronic criteria standards for Aluminum.

Rio Grande
All measured values at sites RG1 and RG2 were within the standards for the Rio Grande during 2015. We will continue to keep the Rio Grande on our sampling plan for the next few years.

Conclusion/Recommendations:

- Sampling done in the Rio Hondo for the past seven years has not shown water quality exceedences. This year, there was one alarming *E. coli* finding in July near the confluence with the Rio Grande. Amigos Bravos will keep monitoring this location.
- Fred Baca Park continues to have serious water quality problems with *E. coli*, dissolved oxygen and electrical conductivity. Efforts should be made to further identify sources and restore water quality at the Fred Baca site and in the headwaters.
- The upper Rio Fernando continues to be impacted by elevated levels of *E. coli* following the use of the La Jara canyon grazing pasture. Cattle grazing and wildlife use on Forest Service land has been suggested as a source of contamination. The Rio Fernando Watershed Based Planning Process will allow us to determine the sources of *E. coli* contamination in 2016.
- Electrical conductivity readings in the lower Rio Pueblo de Taos continue to be high in 2015, as they have been for the past several years. Though standards are not exceeded since there is no standard applied to this section of the Rio Pueblo, similar river systems such as the Rio Hondo and Red River have an electrical conductivity standard of <=400 microsiemens/cm. An electrical conductivity standard should be considered for the lower stretch of the Rio Pueblo de Taos during the next Triennial Review process.
- Phosphate levels in the lower Rio Pueblo de Taos were also high in the past several years, though standards are not exceeded since there is no standard applied to this section of the Rio Pueblo. Similar river systems such as the Rio Hondo and Red River have a phosphate standard of 0.1mg/L. A phosphate standard should be considered for the lower stretch of the Rio Pueblo de Taos during the next Triennial Review process as well.
- While some aspects of water quality have improved since 2011 in the perennial arroyo to the Rio Pueblo, which receives flow from the wastewater treatment plant, electrical conductivity and phosphate continue to greatly exceed the standards given to neighboring waterways.
- The huge difference between the Aluminum standard that applied to the Red River prior to 2010 and the current standard continues to be of concern. Especially since many samples in 2013-2015 were above the 2010 standard and below the 2013 standard. More investigation should be done to determine if the current 2013 standard is actually protective of designated uses in the Red River. Amigos Bravos fought for more protective standards during the 2015 New

Mexico Triennial Review of Water Quality Standards. Results of this hearing are expected in the fall of 2016.

APPENDIX A

SENTINELS-RIOS de TAOS WATER SAMPLING SITES
-2015 sites are in BOLD

ON THE RIO FERNANDO

FLJ	**La Jara Canyon, about 200 meters upstream from HWY 64.** **N 36 25.160** **W 105 20.592**
FRE	**Rio Fernando Riparian Exclosure, Taos Canyon Riparian Exclosure** **N 36 24.231** **W 105 20.706**
F1A	Above Shadybrook Development, about 5 miles east of Taos, by bridge on road to Valle Escondido N 36 22' 19.76" W 105 23' 07.75" (GE)
F1B	About 200 meters downstream from Shadybrook, by NF La Sombra campground. N 36 22' 10.45" W 105 28' 08.51" (GE)
F 1	**About 10 yards downstream from the west bridge by the USFS parking lot at the Divisidero/South Boundary trailhead. On the north bank.** **N 36 22' 32.56"** **W 105 32' 49.92"**
F2	About 10 yards upstream from Paseo del Pueblo Sur, across street from ABC Lock. On the north bank. We'll usually use this site only when a storm is in progress. N 36 23' 54.99" W 105 34' 38.76" (GE)
F3	About 25 yards downstream from Paseo del Pueblo Sur, by ABC Lock. On the south bank, by a concrete bar. N 36 23' 55.02" W 105 34' 39.25" (GE)
F4	**Fred Baca Park, about 50 yards downstream from the footbridge at the bend. On northwest side. of stream.** **N36 23' 56.8"** **W105 35' 23.2"**
FAP1	Small stream . Sample upstream of Apache Canyon Road about 15 feet below fence line. N 36 23' 08.09" W 105 19' 33.43"

ON THE RIO PUEBLO

P 1	**About 27 yards downstream from the stop sign on Upper Ranchitos Road at Paseo del Pueblo Norte. On north side of stream by the car wash.** **N36 25' 13"** **W105 34' 23"**
P1A	**Perennial spring about 100 feet from where it feeds into Rio Pueblo de Taos. Right where spring comes out of culvert that goes under Upper Ranchitos Rd about 200 feet from intersection with Ranchitos Rd.** **N 36 24' 16.01"** **W 105 35' 53.35**
P1B	**Ranchitos Rd. Near bridge by Callegon Rd and SR 240 (near Hacienda de los Martinez). Mile Marker 4.** **N 36 24' 1.30"** **W 105 36' 25.71"**
P1C	Ranchitos Rd near mile marker 13 go down dirt road to the left by road to Blackstone Ranch. N36 23' 34.6" W 105 37' 26.4"
P 2	About 15 yards downstream from bridge (right near turn to Los Cordovos Rd) at Ranchitos Road and Culebra Road. On north side of stream by survey sign. N 36 23' 23.74 W105 37' 50.46"
P2A	Brad Hockmeyer and Janet Gauthier's property on the Rio Pueble de Taos. Take Los Cordovas Rd. south towards the wastewater treatment facility. Take a right at number 118C. Take this drive all the way to the end making a sharp right at the Webber's property to continue onto the geodesic domes. Park at the domes and walk down to the river from here. N 36 23'11.78" W 105 39'03.37"
PS1	mainstem of Rio Pueblo de Taos about 200 yards upstream from the town of Taos wastewater effluent discharge arroyo. Valerie Graves is the property owner. Sample on rocky point bar in the middle of her property. N 36 22' 50.47" W105 39' 44.30"
PS2	**Perennial effluent dependent arroyo (town of Taos wastewater discharge). Turn right onto Thomas Romero Rd and then an immediate right onto Paintbrush Rd. Sample immediately after the gate (which is usually left open) in the arroyo.** **N 36 22' 32.05"** **W 105 39' 25.36"**

PS3	**Rio Pueblo de Taos about a quarter mile downstream from the confluence of the town of Taos wastewater arroyo and the Rio Pueblo. Drive on Thomas Romero Rd, past the open gravel pit on right until you reach the small subdivision. The road is usually gated past this point. Take a right at the subdivision and then your first right (on small dirt road) at the large map sign then take your first right again onto a small two track that crosses a couple of rough patches and then winds down to the river. Park on grassy open area upstream from the gazebo.** **N 36 22' 41.26"** **W 105 40' 05.63"**
P 3	About 10 yards upstream from the road barrier from the parking lot on the northeast corner of Taos Junction Bridge area. On east bank of stream. N 36 20' 19.63" W 105 43' 47.36" (GE)

ON THE RIO HONDO

H 1	Above Phoenix Restaurant, which is upstream from the Bavarian Inn N 36 34' 30.67" W 105 26' 20.47" (GE)
H 2A	Rio Hondo just upstream from where the branch coming from Bavarian Inn (after going through the culvert under the trail) empties into the Rio Hondo. N 36 34' 41.38" W 105 26' 25.62 (GE)
H2B	Branch coming from Bavarian Inn just before it empties into the main Rio Hondo. N 36 34' 41.90" W 105 26' 25.88" (GE)
H 2C	**About 10 yards upstream from the bridge near the day care center in the Ski Village. On the north bank.** **N 36 35' 47.23** **W 105 27' 15.19" (GE)**
H2B2	**Across from Phoenix switch back @ culvert between two dirt roads.** **N 36 34' 33.14'** **W 105 26' 21.31" (GE)**
H2C2	Directly above Taos Ski Valley Effluent Pipe N 36 35' 46.85" W 105 27' 41.76" (GE)
H2D	Just above the Riverside property, about 175 yards downstream from the stop sign at the intersection of the Village of TSV maintenance road and Route 150. North bank. N 36 35' 41.78" W 105 28 16.37" (GE)

H2E	Rio Hondo directly downstream of effluent pipe N36 35' 47" W105 27' 43"
H2F	Taos Ski Valley effluent pipe N 36 35' 46.77" W 105 27' 42.29" (GE)
H 3	Cuchilla Campground, just downstream from entrance road. North bank. N 36 32' 32.08 W 105 33' 22.90 (GE)
H 4	**Kaufman Property. About 20 yards downstream from footbridge. South bank.** **N 36 32' 14.8"** **W 105 38' 43.4"**
H4A	Just downstream from Route 522 Bridge, north bank. N 36 32' 07.1" W 105 40' 02.7"
H 5	**About 20 yards upstream from bridge in Lower Arroyo Hondo, just before the road crosses the Rio Hondo and goes uphill towards New Buffalo. North ban** **N 36 31' 58.62"** **W 105 40' 55.43"**
H 6	**About 10 yards upstream from confluence with Rio Grande.** **N 26 32' 02.12** **W 105 42'27.26" (GE)**
HVB	N 36 31' 58.5" W 105 35' 04.0"
HVG	5 M downstream from bridge on lane to Jackie Garcia property N 36 32' 07.6" W 105 34' 12.2".

ON THE RED RIVER

RR1	**Junebug Campground, approximately 10 miles east of Questa on HWY 38.** **N 36 42' 28.25"** **W105 26' 04.92**
RR2	**Goat Hill Campground, approximately 3 miles east of Questa on Hwy 38.** **N 36 41' 20.65"**

W105 32’ 27.73

RR3 **By the bridge at Hwy 522 in Questa.**
N 36 41’ 33.69
W105 36’ 44.50

RR4 **Below Red River Fish Hatchery, approximately 0.5 miles down the foot trail.**
N 36 40’ 57.14”
W 105 39’ 19.11”

ON THE RIO GRANDE DEL RANCHO

RGDR1 Right above bridge on Partrick Larkin’s property.

ON THE RIO LUCERO

RL1 Rio Lucero, private land.

ON THE RIO GRANDE

RG2 Just below the confluence of the Rio Grande and the Rio Pueblo de Taos.

APPENDIX B

SENTINELS--RIOS de TAOS

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Project Description

The goal of the Sentinels--Rios de Taos water monitoring project is to provide additional water quality data to local, state, and federal decision makers, as well as the public at large. This project was initiated due to a concern that inadequate data was available to accurately assess the health of the Rio Hondo, Rio Fernando, and Rio Pueblo de Taos watersheds. The cumulative impact of point and nonpoint sources of pollution will be characterized by collecting data on those parameters that are basic indicators of water quality and watershed health. Surface water samples collected by volunteer monitors will be analyzed for some or all of the following constituents:

- Nitrates
- Phosphorous
- Total Dissolved Solids
- E. Coli
- pH
- Conductivity
- Dissolved Oxygen
- Temperature
- Biological Oxygen Demand (BOD)
- Aluminum
- Hardness
- Residual Chlorine
- Ammonia

Sampling Locations

Sampling sites may change in attempt to identify sources of pollution. Some identified sampling sites include:

SENTINELS-RIOS de TAOS WATER SAMPLING SITES

ON THE RIO FERNANDO

F1A	Above Shadybrook Development, about 5 miles east of Taos, by bridge on road to Valle Escondido N 36 22' 19.76" W 105 23' 07.75" (GE)
F1B	About 200 meters downstream from Shadybrook, by NF La Sombra campground. N 36 22' 10.45" W 105 28' 08.51" (GE)
F 1	About 10 yards downstream from the west bridge by the USFS parking lot at the Divisidero/South Boundary trailhead. On the north bank. N 36 22' 32.56" W 105 32' 49.92"
F2	About 10 yards upstream from Paseo del Pueblo Sur, across street from ABC Lock. On the north bank. We'll usually use this site only when a storm is in progress. N 36 23' 54.99" W 105 34' 38.76" (GE)
F3	About 25 yards downstream from Paseo del Pueblo Sur, by ABC Lock. On the south bank, by a concrete bar. N 36 23' 55.02" W 105 34' 39.25" (GE)
F4	Fred Baca Park, about 50 yards downstream from the footbridge at the bend. On northwest side. of stream. N36 23' 56.8" W105 35' 23.2"
F4G	

ON THE RIO PUEBLO

P 1	About 27 yards downstream from the stop sign on Upper Ranchitos Road at Paseo del Pueblo Norte. On north side of stream by the car wash. N36 25' 13" W105 34' 23"
P1A	Perennial spring about 100 feet from where it feeds into Rio Pueblo de Taos. Right where spring comes out of culvert that goes under Upper Ranchitos Rd about 200 feet from intersection with Ranchitos Rd. N 36 24' 16.01" W 105 35' 53.35
P1B	Ranchitos Rd. Near bridge by Callegon Rd and SR 240 (near Hacienda de los Martinez). Mile Marker 4. N 36 24' 1.30" W 105 36' 25.71"

P1C	Ranchitos Rd near mile marker 13 go down dirt road to the left by road to Blackstone Ranch. N36 23' 34.6" W 105 37' 26.4"
P 2	About 15 yards downstream from bridge (right near turn to Los Cordovos Rd) at Ranchitos Road and Culebra Road. On north side of stream by survey sign. N 36 23' 23.74 W105 37' 50.46"
P2A	Brad Hockmeyer and Janet Gauthier's property on the Rio Pueble de Taos. Take Los Cordovas Rd. south towards the wastewater treatment facility. Take a right at number 118C. Take this drive all the way to the end making a sharp right at the Webber's property to continue onto the geodesic domes. Park at the domes and walk down to the river from here. N 36 23'11.78" W 105 39'03.37"
PS1	mainstem of Rio Pueblo de Taos about 200 yards upstream from the town of Taos wastewater effluent discharge arroyo. Valerie Graves is the property owner. Sample on rocky point bar in the middle of her property. N 36 22' 50.47" W105 39' 44.30"
PS2	**Perennial effluent dependent arroyo (town of Taos wastewater discharge). Turn right onto Thomas Romero Rd and then an immediate right onto Paintbrush Rd. Sample immediately after the gate (which is usually left open) in the arroyo.** **N 36 22' 32.05"** **W 105 39' 25.36"**
PS3	**Rio Pueblo de Taos about a quarter mile downstream from the confluence of the town of Taos wastewater arroyo and the Rio Pueblo. Drive on Thomas Romero Rd, past the open gravel pit on right until you reach the small subdivision. The road is usually gated past this point. Take a right at the subdivision and then your first right (on small dirt road) at the large map sign then take your first right again onto a small two track that crosses a couple of rough patches and then winds down to the river. Park on grassy open area upstream from the gazebo.** **N 36 22' 41.26"** **W 105 40' 05.63"**
P 3	About 10 yards upstream from the road barrier from the parking lot on the northeast corner of Taos Junction Bridge area. On east bank of stream. N 36 20' 19.63" W 105 43' 47.36" (GE)

ON THE RIO HONDO

H 1	Above Phoenix Restaurant, which is upstream from the Bavarian Inn N 36 34' 30.67" W 105 26' 20.47" (GE)
H 2A	Rio Hondo just upstream from where the branch coming from Bavarian Inn (after going through the culvert under the trail) empties into the Rio Hondo. N 36 34' 41.38" W 105 26' 25.62 (GE)
H2B	Branch coming from Bavarian Inn just before it empties into the main Rio Hondo. N 36 34' 41.90" W 105 26' 25.88" (GE)
H 2C	**About 10 yards upstream from the bridge near the day care center in the Ski Village. On the north bank.** **N 36 35' 47.23** **W 105 27' 15.19" (GE)**
H2B2	**Across from Phoenix switch back @ culvert between two dirt roads.** **N 36 34' 33.14'** **W 105 26' 21.31" (GE)**
H2C2	Directly above Taos Ski Valley Effluent Pipe N 36 35' 46.85" W 105 27' 41.76" (GE)
H2D	Just above the Riverside property, about 175 yards downstream from the stop sign at the intersection of the Village of TSV maintenance road and Route 150. North bank. N 36 35' 41.78" W 105 28 16.37" (GE)
H2E	**Rio Hondo directly downstream of effluent pipe** **N36 35' 47"** **W105 27' 43"**
H2F	Taos Ski Valley effluent pipe N 36 35' 46.77" W 105 27' 42.29" (GE)
H 3	Cuchilla Campground, just downstream from entrance road. North bank. N 36 32' 32.08 W 105 33' 22.90 (GE)
H 4	Kaufman Property. About 20 yards downstream from footbridge. South bank. N 36 32' 14.8" W 105 38' 43.4"
H4A	Just downstream from Route 522 Bridge, north bank. N 36 32' 07.1"

W 105 40’ 02.7”

H 5 **About 20 yards upstream from bridge in Lower Arroyo Hondo, just before the road crosses the Rio Hondo and goes uphill towards New Buffalo. North ban**
N 36 31’ 58.62”
W 105 40’ 55.43”

H 6 **About 10 yards upstream from confluence with Rio Grande.**
N 26 32’ 02.12
W 105 42’27.26” (GE)

HVB N 36 31’ 58.5”
W 105 35’ 04.0”

HVG 5 M downstream from bridge on lane to Jackie Garcia property
N 36 32’ 07.6”
W 105 34’ 12.2”.

ON THE RED RIVER

RR1 **Junebug Campground, approximately 10 miles east of Questa on HWY 38.**
N 36 42’ 28.25”
W105 26’ 04.92

RR2 **Goat Hill Campground, approximately 3 miles east of Questa on Hwy 38.**
N 36 41’ 20.65”
W105 32’ 27.73

RR3 **By the bridge at Hwy 522 in Questa.**
N 36 41’ 33.69
W105 36’ 44.50

RR4 **Below Red River Fish Hatchery, approximately 0.5 miles down the foot trail.**
N 36 40’ 57.14”
W 105 39’ 19.11”

ON THE RIO GRANDE DEL RANCHO

RGDR1 Right above bridge on Partrick Larkin’s property.

ON THE RIO LUCERO

RL1 Rio Lucero, private land.

ON THE RIO GRANDE

RG2: Near the confluence of the Rio Hondo and the Rio Grande.

RG3: In Pilar, NM near the Rio Pueblo and Rio Grande confluence.

Testing results will be sent to Region 6 of the Environmental Protection Agency (EPA), the State of New Mexico Environmental Department's Surface Water Quality Bureau, Amigos Bravos, and local newspapers and publications. Sampling results will be stored in the Sierra Club Sentinels--Rios de Taos database.

Project Organization

Project Coordinator Contact information:

Eric E. Patterson
Box 334
Valdez, NM 87580
575-776-2833
eepatt@gmail.com

The project coordinator ensures all components of the project identified by this QAPP are completed in an efficient and timely manner. This includes oversight on sample collection, delivery, analysis, and reporting.

Sample Collector Contact Information

Eric E. Patterson, contact person (see above)

Mary Pickett	Nora Patterson	Rachel Conn
Gary Grief	Dorothy Wells	Betsy Wolf
Annouk Ellis	Jeanne Green	Moira O'Hanlon
Roberta Salazar	Flowers Espinosa	Shannon Romeling

Sample collectors will conduct sample collection activities according to the methods identified by this QAPP. Responsibilities include:

- Calibration, maintenance and utilization of field equipment for analysis of dissolved oxygen (DO), temperature, pH, and conductivity.
- Obtaining needed sample containers and preservatives for sampling events.

- Following quality assurance procedures for sample collection identified by this QAPP.
- Filling out chain of custody (COC) forms.

Sample Transport Contact Information

Eric E. Patterson (see above)

Sample Transport will ensure that water samples are delivered to Sangre de Cristo Laboratory, Inc., Alamosa, CO, or another EPA certified laboratory, in a secure and timely manner. Responsibilities include:

- Keeping samples secure between sampling site and the laboratory.
- Maintaining COC document according to procedures identified.
- Delivering samples within specified holding times.

Sample Analysis/Laboratory Contact Information:

Sangre de Cristo Laboratory, Inc., an EPA certified laboratory
Tierra del Sol Industrial Park
2329 Lava Lane
Alamosa, CO 81101

Sample Analysis Staff will ensure that samples are analyzed in a manner that provides the most accurate data possible. Responsibilities include:

- Analyzing samples according the methods identified in Standard Operating Procedures (SOPs).
- Analyzing samples within established holding times.
- Reporting results to Project Coordinator

Data Reporting Contact Information

Rachel Conn, Amigos Bravos Projects Director
Box 238
Taos, NM 87571
575-758-3874
rconn@amigosbravos.org

Data reporting will ensure the data collected by the project is stored appropriately and disseminated to interested parties. Responsibilities include:

- Organization of final report on data collected by the project.
- Dissemination of report to specified local, state and federal agencies.
- Dissemination of report to newspapers and other local news media and presentation of
- project information to the public upon request.
- Entering data into Sierra Club's Water Sentinel database.

Quality Assurance of Field Analysis

Measurements will be made using the following equipment:

- CHEMets Dissolved Oxygen Kit, Model K-7512 – tested dissolved oxygen
- Euteck Instruments PCTestr 35 from Oakton – tested pH, temperature, and electrical conductivity
- Hach Model 5-EP MG/L #1454-01 test kit – tests hardness (calcium carbonate)

PARAMETER	DETECTION LIMIT	ACCURACY
Dissolved Oxygen	1 to 12 mg/L	+/- 1 ppm
Temperature	0^o to 50^o C	+/- 0.5^o C
Conductivity	0 to 1999 µS/cm	+/-10 µS/cm
pH	0.00 to 14.00 ph units	+/-.001 pH units
Hardness	0 to 400 mg/L calcium carbonate	+/- 20 mg/L

Field instruments will be calibrated according to manufacturers' instructions <24 hours prior to each sampling event. Chemicals used for dissolved oxygen will be replaced according to expiration dates provided by the manufacturer. Samples will be collected using the containers, preservatives, volumes and holding times identified in Appendix A.

Field Sample Collection Procedures

Samples will be collected:

- Midstream just below the water's surface.
- Facing upstream to avoid disturbances caused by the sample collector.
- Upstream of minor temporal or spatial impacts, such as bridges and campsites.
- Free of floating debris.
- Using appropriate sample containers and preservatives specified in Appendix A.

Samples will be tagged appropriately with identifying number/information and delivered to appropriate laboratory personnel accompanied by appropriately completed and signed Chain of Custody (COC) forms.

Quality Assurance of Laboratory Analysis

Quality assurance of laboratory methods is the sole responsibility of the sample analysis/laboratory coordinator previously identified. Samples with high turbidity (>30 NTU) are filtered through a 10um filter before being analyzed for Aluminum. Samples will be analyzed using methods contained in the laboratory's Standard Operating Procedures. These are located at Sangre de Cristo Laboratory, Inc. and can be obtained from the sample analysis coordinator upon request.

METHODS FOR LABORATORY ANALYSIS

MATRIX	PARAMETER	METHOD
Nonpotable water	Total Dissolved Solids	EPA 160.1
Nonpotable water	Nitrates	EPA 300.0
Nonpotable water	Total Phosphorus	EPA 365.2
Nonpotable water	E. Coli	EPA 10030
Nonpotable water	BOD	SM 5210B
Nonpotable water	Ammonia	4500NH3D
Nonpotable water	Residual Chlorine	300.5

Nonpotable water	Phosphate	420.1
Nonpotabe water	Aluminum	200.9

Containers, Volumes, Preservatives, and Holding Times

Parameter	Optimum Volume	Container Type	Preservation Method	Holding Time
Total Nitrogen (Calculation: TKN + (NO2 + NO3 as N)	250 mL	Plastic, Glass	Cool	**48 Hours**
Total Phosphorus	250 mL	Plastic, Glass	Cool	**24 Hours**
Total Suspended Solids (also called Non Filterable Residue)	500 mL	Plastic, Glass	Cool	**24 Hours**
E. coli or Fecal Coliform	150 mL	Sterile Bottle	Cool	**8 Hours**
Dissolved Oxygen	Determined On-Site			**None**
Temperature	Determined On-Site			**None**
Conductivity	Determined On-Site			**None**