

Sampling Summary
RIO CHAMA WATERSHEDS
Water Quality Survey

Survey Conducted
March-November, 2012

Data Gaps Survey Conducted
May-October, 2014

Summary Prepared
March, 2015

Monitoring, Assessment and Standards Section
Surface Water Quality Bureau
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Abbreviations

| | |
|--------|----------------------------------------------------------------------|
| AP | Assessment Protocol |
| AU | Assessment Unit |
| BMP | Best Management Practice |
| BNSF | Burlington Northern – Santa Fe |
| CWA | Clean Water Act |
| FR | Forest Road |
| FSP | Field Sampling Plan |
| HP | Hydrology Protocol |
| IR | State of New Mexico Clean Water Act §303(d)/305(b) Integrated Report |
| km | kilometer |
| m | meter |
| MASS | Monitoring, Assessment and Standards Section |
| NMED | New Mexico Environment Department |
| NMEDAS | New Mexico Environmental Data Analysis System |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | Nonpoint Source |
| PSRS | Point Source Regulation Section |
| QA/QC | Quality Assurance/Quality Control |
| QAPP | Quality Assurance Project Plan |
| SLD | Scientific Laboratory Division |
| SOP | Standard Operating Procedures |
| SVOC | Semi-Volatile Organic Compounds |
| SWQB | Surface Water Quality Bureau |
| TDS | Total Dissolved Solids |
| TKN | Total Kjeldahl Nitrogen |
| THM | Total Heavy Metals |
| TMDL | Total Maximum Daily Load |
| TSS | Total Suspended Solids |
| UAA | Use Attainability Analysis |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compounds |
| WQCC | Water Quality Control Commission |
| WPS | Watershed Protection Section |
| WQS | Water Quality Standard |
| WWTP | Wastewater Treatment Plant |

Introduction

The New Mexico Environment Department (NMED), Surface Water Quality Bureau (SWQB) conducted a water quality survey of the Chama watershed between March and October of 2012. Additional data were collected between May and October of 2014. This watershed is located primarily in the Colorado Plateau physiographic province and is characterized by relatively flat-lying sedimentary rocks that have been sculpted into mesas, buttes, and badlands over the eons by the erosive effects of wind and water. The eastern edge of the watershed extends into the Southern Rockies physiographic province.

In the Chama basin, average annual precipitation varies between 203 millimeters (9 inches) per year near the confluence with the Rio Grande to more than 635 millimeters (25 inches) per year in the higher elevations. Mean maximum July temperatures range from 31°C (near Abiquiu) to 27°C (near Brazos Cliffs) while the average January minimum temperatures range from -8°C (near Abiquiu) to -14.5°C (at El Vado) (WRCC 2012). The Chama watershed upstream of Abiquiu Reservoir and the higher elevations downstream of the reservoir are located in Omernick Level III Ecoregion 20 (Southern Rockies). The area around Abiquiu and the Chama River valley downstream of the reservoir are in Ecoregion 22 (Arizona/New Mexico Plateau) (Omernick, 2008). The Chama River watershed reaches its highest elevation of approximately 3,446 meters (11,303 feet) at Brazos Peak. The lowest elevation of approximately 1,716 meters (5,630 feet) occurs at the confluence with the Rio Grande.

The Chama River watershed contains approximately 8,143 square kilometers (3,144 square miles) at the furthest downstream U.S. Geological Survey (USGS) gage (USGS 08290000 RIO CHAMA NEAR CHAMITA, NM) approximately 2.5 miles above the confluence with the Rio Grande. Flows in the mainstem of the Chama River are heavily regulated by the operation of three reservoirs: Heron, El Vado and Abiquiu. Heron Reservoir receives an average of 110,000 acre-feet per year from the San Juan River watershed. This interbasin water transfer is part of the U.S. Bureau of Reclamation's San Juan-Chama Project. The project consists of a series of tunnels and diversions that take water from the drainage basin of the San Juan River to supplement water resources in the Rio Grande watershed.

Several species within the Chama watershed are listed as either threatened or endangered by state and/or federal agencies. Federal or state threatened and endangered species that are reliant on aquatic and riparian habitat include Rio Grande Cutthroat Trout, Jemez Mountains Salamander, Boreal Toad, Arizona Montane Vole, and Southwestern Willow Flycatcher.

Land management in the Chama watershed is approximately 8% Bureau of Land Management, 10% Department of Energy, 40% Forest Service, 16% Tribal Land, 14% National Park Service, 9% Private, and 3% State. The Chama River enters Ohkay Owingeh tribal lands approximately 3.25 miles upstream of the confluence with the Rio Grande.

Personnel Roles and Responsibilities

The SWQB Monitoring, Assessment and Standards Section (MASS) primarily conducted this survey, with assistance from other SWQB sections for planning, execution, and use of the data. Individual roles and responsibilities are described in Table 1.

Table 1. Personnel Roles and Responsibilities

| Name | Position/Role | Responsibilities |
|--------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Seva Joseph 505-827-0573 Charles Dentino 505-827-2470 | Monitoring Staff | <ul style="list-style-type: none"> • Planned survey • Collected and documented chemical, physical, and biological data • Provided results for watershed assessment • Prepared survey report |
| Delbert Trujillo 505-827-2867 | Watershed Protection Section (WPS) Liaison | <ul style="list-style-type: none"> • Provided information and data needs pertaining to nonpoint sources of pollution and best management practices (BMPs) located within the study area |
| Erin Trujillo 505-827-0418 | Point Source Regulation Section (PSRS) Liaison | <ul style="list-style-type: none"> • Provided information and data needs pertaining to point source discharges located within the study area • Assisted with development of final survey report |
| Heidi Henderson 505-827-2901 | Total Maximum Daily Load (TMDL) Liaison | <ul style="list-style-type: none"> • Provided information and data needs pertaining to TMDL development to be conducted in the study area • Assisted with development of final survey report; will develop TMDLs as needed |

Objectives

Because the data generated must serve the needs of all sections within the SWQB, this survey had several objectives, as outlined in Table 2.

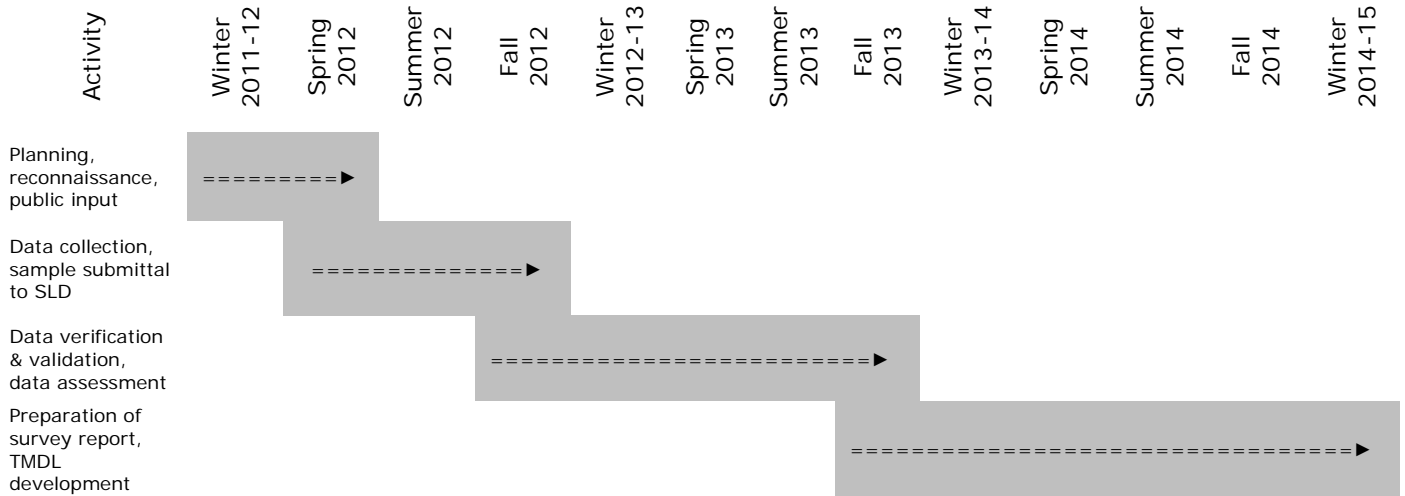
Table 2. Survey Objectives

| | Intended use of data | Question to be answered | Products/ Outcomes | Decision Criteria |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Primary Objective | Assess designated use attainment for the New Mexico Clean Water Act §303(d)/305(b) <i>Integrated Report</i> and provide information to the public on the condition of surface waters | Are sampled waterbodies meeting water quality standards (WQS) criteria? | Integrated Report and Survey Report | WQS as interpreted by the SWQB Assessment Protocols (APs) |
| Secondary Objectives | Develop load and waste load allocations for TMDLs | What is the maximum pollutant load a waterbody can receive and still meet the requirements of the WQS? | TMDL loading calculations and National Pollutant Discharge Elimination System (NPDES) permit limits | WQS as interpreted by the APs |
| | Evaluate restoration and mitigation measures implemented to control Nonpoint Source (NPS) pollution | Have watershed restoration activities and mitigation measures improved water quality? | Project Summary Reports, NPS Annual Report, Integrated Report (<i>De-Listing</i>) | WQS as interpreted by the APs |
| | Develop or refine surface WQS | Are the existing uses appropriate for the waterbody? | Use Attainability Analyses (UAA), Amendments to WQS | Are data sufficient to support a petition to the Water Quality Control Commission (WQCC) to revise WQS? |

Schedule

This survey was made up of many components, beginning with planning and ending with the generation of the State of New Mexico Clean Water Act (CWA) Section 303(d)/305(b) Integrated Report (IR). Total Maximum Daily Loads (TMDLs), if necessary, are planned for 2015. A tentative schedule (Table 3) shows that completion of the entire project took four years. As part of the survey planning process a public meeting was held to answer questions and solicit input for the survey. This meeting took place March 1, 2012 near Abiquiu, NM.

Table 3. Project Schedule



Sampling plan

The survey included collection of chemical water quality samples, which were collected monthly between March and October 2012, biological sampling, conducted within the index period (August 15 - November 15, 2012), and physical measurements that were taken during periods of base flow. Data were collected according to SWQB standard operating procedures (SOPs; NMED/SWQB 2007-2011) and the field sampling plan (FSP) developed for this survey.

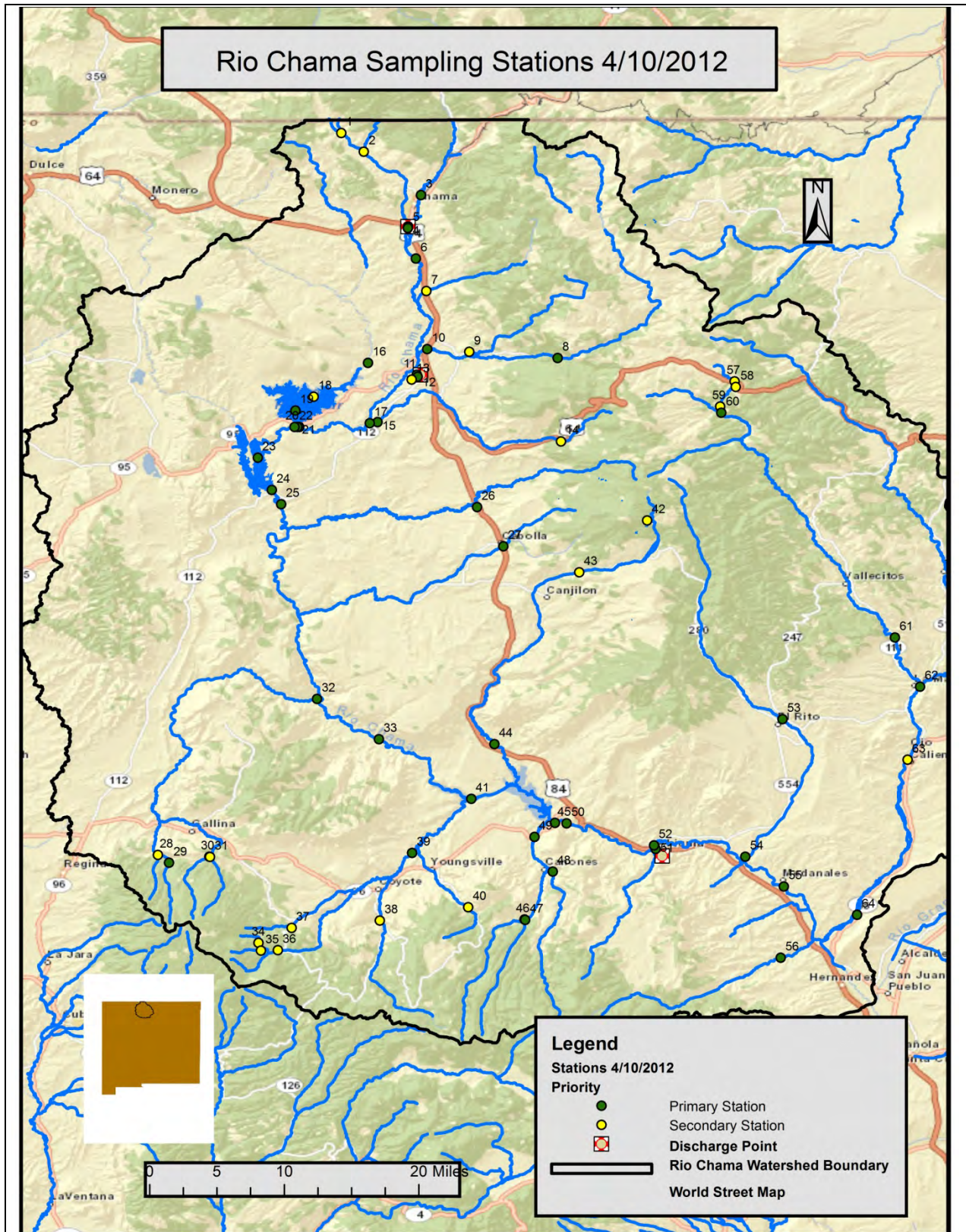


Figure 1. Location of the Chama watershed and sample locations in New Mexico. Station numbers relate to Table 4.

Table 4. SWQB Water Quality Stations in the Rio Chama

| Map ID | Storet ID | Station | Station Rationale |
|--------|----------------|-----------------------------------------------------------------|----------------------|
| 1 | 29SextoC000.1 | Sexto Creek above Rio Chamita | Impaired |
| 2 | 29NaborC000.1 | Nabor Creek upstream of Rio Chamita | Lowest Station in AU |
| 3 | 29RChama183.4 | Rio Chama at NM 17 | Impaired |
| 4 | NM0027731 | Chama WWTF effluent discharge | Impaired |
| 5 | 29RChami002.7 | Rio Chamita below Chama WWTP outfall | Impaired |
| 6 | 29RChama174.0 | Rio Chama below Chama Town | Impaired |
| 7 | 29Cannon002.4 | Cañones Creek above US Hwy 84 (near Chama) | Lowest Station in AU |
| 8 | 29RBrazo010.1 | Rio Brazos 1 mile above Corkins Lodge | Lowest Station in AU |
| 9 | 29Chavez000.1 | Chavez Creek at Hwy 512 above Rio Brazos | Impaired |
| 10 | 29RBrazo001.6 | Rio Brazos above US Hwy 84 bridge | Impaired |
| 11 | NM0030139 | Los Ojos Fish Hatchery Outfall #1 | Point Source |
| 12 | NM0030139 | Los Ojos Fish Hatchery Outfall #2 | Point Source |
| 13 | 29BurnsLakeDp | Burn's Lake (Laguna del Campo) | Never Assessed |
| 14 | 29RTierr026.1 | Rito de Tierra Amarilla at Hwy 64 bridge | Lowest Station in AU |
| 15 | 29RTierr000.7 | Rito de Tierra Amarilla at Hwy 112 bridge | Impaired |
| 16 | 29Willow000.1 | Willow Creek above Heron Lake | Monitor lake input |
| 17 | 29RChama147.0 | Rio Chama below Rito de Tierra Amarilla and above gage 08284100 | Impaired |
| 18 | 29HeronLakeSH | Heron Lake – shallow station | Monitor lake input |
| 19 | 29HeronLDpDam | Heron Lake – deep station | Deep Station |
| 20 | 29RChama137.5 | Rio Chama above Heron Lake outfall | Lowest Station in AU |
| 21 | 29HeronOutfall | Heron Lake outfall | Monitor lake output |
| 22 | 29RChama137.0 | Rio Chama above El Vado | Monitor lake input |

| Map ID | Storet ID | Station | Station Rationale |
|---------------|------------------|---------------------------------------------------|------------------------------|
| 23 | 29EIVadoResSH | El Vado Reservoir – shallow station | Monitor lake input |
| 24 | 29EIVadoResDP | El Vado – deep station | Deep Station |
| 25 | 29RChama120.6 | Rio Chama at USGS gage 08285500 below El Vado Dam | Monitor lake output |
| 26 | 29RNutri005.4 | Rio Nutrias above Rio Chama | Lowest Station in AU |
| 27 | 29RCebol027.0 | Rio Cebolla at US 84 | Lowest Station in AU |
| 28 | 29ClearC000.1 | Clear Creek at FR 76 | Lowest Station in AU |
| 29 | 29RGalli045.1 | Rio Gallina at FR 76 | Lowest Station in AU |
| 30 | 29RCapul010.3 | Rio Capulin above Cecilia Canyon Creek | Impaired |
| 31 | 29Cecili000.1 | Cecilia Canyon Creek at FR 171 | Lowest Station in AU |
| 32 | 29RGalli000.5 | Rio Gallina at confluence with Rio Chama | Lowest Station in AU |
| 33 | 29RChama079.5 | Rio Chama above Abiquiu Reservoir at USGS gage | Lowest Station in AU |
| 34 | 29RResum001.9 | Rito Resumidero below Resumidero Spring | Impaired |
| 35 | 29RRedon000.2 | Rito Redondo at FR 93 | Lowest Station in AU |
| 36 | 29RPuerc037.5 | Rio Puerco de Chama at FR 103 | Lowest Station in AU |
| 37 | 29PoleoC009.5 | Poleo Creek at FR 103 | Impaired |
| 38 | 29Coyote005.6 | Coyote Creek at FR 316 at Coyote Creek Campground | Lowest Station in AU |
| 39 | 29RPuerc011.0 | Rio Puerco de Chama at CR 211 | Impaired |
| 40 | 29REncin009.7 | Rito Encino at FR 100Z | Lowest Station in AU |
| 41 | 29AbiqReInlet | Abiquiu Reservoir – shallow (Rio Chama inlet) | Impaired, Monitor Lake Input |
| 42 | 29Canjilon(a) | Canjilon Lake | Impaired |
| 43 | 29Canjil039.5 | Canjilon Creek above Canjilon Lake | Impaired |
| 44 | 29Canjil006.2 | Canjilon Creek above Abiquiu Reservoir at US 84 | Lowest Station in AU |
| 45 | 29AbiquiuRDam | Abiquiu Reservoir – deep station | Impaired |

| Map ID | Storet ID | Station | Station Rationale |
|--------|---------------|------------------------------------------------------------|----------------------------------------------|
| 46 | 29Canone007.1 | Cañones Creek above Chihuahueños Creek | Impaired |
| 47 | 29Chihua005.8 | Chihuahueños Creek at FR 449 | Lowest Station for Access |
| 48 | 29Polvad008.8 | Polvadera Creek at FR 27 (CR 95) | Impaired |
| 49 | 29Canone004.6 | Cañones Creek at FR 167 below Cañones | Impaired |
| 50 | 29RChama050.4 | Rio Chama below Abiquiu Dam at USGS 08287000 gage | Monitor Lake Output |
| 51 | 29Abique001.8 | Abiquiu Creek at US Hwy 84 bridge | Impaired |
| 52 | NM0024830 | Abiquiu WWTP effluent discharge | Point Source |
| 53 | 29EIRito021.0 | El Rito at bridge in El Rito 400 feet from Hwy 554 | Lowest Station in AU |
| 54 | 29EIRito000.7 | El Rito Creek 0.5 mile above Rio Chama | Lowest Station in AU |
| 55 | 29RChama019.3 | Rio Chama at NM Hwy 233 three miles below El Rito Creek | Lowest Station in AU |
| 56 | 29RioOso004.7 | Rio del Oso above Rio Chama | Impaired |
| 57 | 29Placer005.1 | Placer Creek at NM 64 | Lowest Station in AU |
| 58 | 29HopewellLk | Hopewell Lake | Deep Station |
| 59 | 29Placer001.0 | Placer Creek above box | Monitor lake output |
| 60 | 29Placer000.1 | Placer Creek above Rio Vallecitos | Lowest Station in AU |
| 61 | 29RValle007.9 | Rio Vallecitos 3.9 miles above La Madera at bridge | Impaired |
| 62 | 29RTusas000.1 | Rio Tusas above Rio Vallecitos | Impaired |
| 63 | 29ROjoCa026.1 | Rio Ojo Caliente at Hwy 414 (Hot Springs) bridge | Secondary Station – Other Station May Go Dry |
| 64 | 29ROjoCa005.1 | Rio Ojo Caliente 3.4 miles above confluence with Rio Chama | Lowest Station in AU |

Chemical Sampling

The locations of sampling stations are shown in Figure 2. Chemical sampling sites were generally allocated one per assessment unit (AU) and were usually positioned near the lower end of the AU, access permitting. Additional stations were located to document the condition of AUs below potential pollution sources and where AU and designated aquatic life use revisions are recommended. Stations from previous surveys were used whenever possible to evaluate trends. Water samples for chemical analyses were submitted to the New Mexico Scientific Laboratory Division (SLD). *E. coli* samples were processed in the SWQB laboratory or with mobile equipment. Water quality analytes and their sampling frequencies for 2012 are outlined in Table 5. The additional sampling conducted in 2014 is shown in Table 7. In addition to the analytes listed, field measurements (temperature, specific conductance, dissolved oxygen (DO) concentration, DO percent saturation, pH, and turbidity) were taken during each sampling visit. Long term datasets were collected during deployments of 3-21 days with a multi-parameter sonde or DO logger at select sites and multiple month deployments of thermographs.

During or following the 2012 survey, it was recognized that some of the sites were poorly located due to drying of the site (2, 7, 15, 26, 27, 28, 32, 39, 54, 56 and 64) dominance of groundwater inputs (34, 53 and 62), or difficulty in accessing an adequate length of stream (55, 60, & 61). Where possible, these sites were relocated for monitoring during the 2012 survey and/or 2014 follow up. These "New" sites are shown in Table 6. In some cases perennial reaches could not be identified in the AU or access could not be obtained (2, 27, 28, 32, 39, 46 and 56).

Table 5. Summary of Completed/Planned Chemical Samples for 2012

| Map ID | Station | Assessment Unit | TSS/TDS | Nutrients ¹ | Dissolved Metals ² | Total Metals | E. coli | Chlorine | Volatile Organic Compounds ³ | Semi-Volatile Organics ³ | Radionuclides ⁴ |
|--------|--------------------------------------------|---------------------------------------------------------|---------|------------------------|-------------------------------|--------------|---------|----------|-----------------------------------------|-------------------------------------|----------------------------|
| 1 | Sexto Creek above Rio Chamita | Sexto Creek (Rio Chamita to CO border) | 4/4 | 4/4 | 0 | 0 | 4/4 | 0 | 0 | 0 | 0 |
| 2 | Nabor Creek upstream of Rio Chamita | Nabor Creek (Rio Chamita to CO border) | 1/4 | 1/4 | 0 | 0 | 1/4 | 0 | 0 | 0 | 0 |
| 3 | Rio Chama at NM 17 | Rio Chama (Little Willow Creek to CO border) | 8/8 | 8/8 | 4/4 | 4/4 | 8/8 | 0 | 0/2 | 0/2 | 0/2 |
| 4 | Chama WWTF effluent discharge | NPDES permit # NM0027731 | 8/8 | 8/8 | 3/4 | 3/4 | 8/8 | 3/8 | 0 | 0 | 0 |
| 5 | Rio Chamita below Chama WWTP outfall | Rio Chamita (Rio Chama to CO border) | 8/8 | 8/8 | 3/4 | 3/4 | 8/8 | 0 | 0/2 | 0/2 | 0/2 |
| 6 | Rio Chama below Chama Town | Rio Chama (Rio Brazos to Little Willow Creek) | 8/8 | 8/8 | 4/4 | 4/4 | 8/8 | 0 | 1/2 | 1/2 | 2/2 |
| 7 | Cañones Creek above US Hwy 84 (near Chama) | Cañones Creek (Rio Chama to Jicarilla Apache reservoir) | 4/4 | 4/4 | 3/4 | 3/4 | 4/4 | 0 | 0 | 0 | 0 |
| 8 | Rio Brazos 1 mile above Corkins Lodge | Rio Brazos (Chavez Creek to Jicarilla Apache reservoir) | 8/8 | 8/8 | 3/4 | 3/4 | 8/8 | 0 | 0 | 0 | 0 |

| Map ID | Station | Assessment Unit | TSS/TDS | Nutrients ¹ | Dissolved Metals ² | Total Metals | E. coli | Chlorine | Volatile Organic Compounds ³ | Semi-Volatile Organics ³ | Radionuclides ⁴ |
|--------|-----------------------------------------------------------------|---------------------------------------------------------|---------|------------------------|-------------------------------|--------------|---------|----------|-----------------------------------------|-------------------------------------|----------------------------|
| 9 | Chavez Creek at Hwy 512 above Rio Brazos | Chavez Creek (Rio Brazos to headwaters) | 3/4 | 3/4 | 2/4 | 2/4 | 3/4 | 0 | 0 | 0 | 0 |
| 10 | Rio Brazos above US Hwy 84 bridge | Rio Brazos (Rio Chama to Chavez Creek) | 8/8 | 8/8 | 3/4 | 3/4 | 8/8 | 0 | 1/2 | 1/2 | 1/2 |
| 11 | Los Ojos Fish Hatchery Outfall #1 | NPDES permit # NM0030139 | 8/8 | 8/8 | 3/4 | 3/4 | 8/8 | 0 | 0 | 0 | 0 |
| 12 | Los Ojos Fish Hatchery Outfall #2 | NPDES permit # NM0030139 | 8/8 | 8/8 | 3/4 | 3/4 | 8/8 | 0 | 0 | 0 | 0 |
| 13 | Burn's Lake (Laguna del Campo) | Burn's Lake (Laguna del Campo) | 2/3 | 2/3 | 2/3 | 2/3 | 2/3 | 0 | 0 | 0 | 0 |
| 14 | Rito de Tierra Amarilla at Hwy 64 bridge | Rito de Tierra Amarilla (HWY 64 to headwaters) | 3/4 | 3/4 | 3/4 | 3/4 | 1/4 | 0 | 0 | 0 | 0 |
| 15 | Rito de Tierra Amarilla at Hwy 112 bridge | Rito de Tierra Amarilla (Rio Chama to HWY 64) | 5/8 | 5/8 | 2/4 | 2/4 | 4/8 | 0 | 0/2 | 0/2 | 0/2 |
| 16 | Willow Creek above Heron Lake | Willow Creek (Heron Lake to Jicarilla Apache Reservoir) | 2/4 | 2/4 | 0 | 0 | 2/4 | 0 | 0 | 0 | 0 |
| 17 | Rio Chama below Rito de Tierra Amarilla and above gage 08284100 | Rio Chama (El Vado Reservoir to Rio Brazos) | 5/4 | 5/4 | 2/0 | 2/0 | 4/4 | 0 | 2/2 | 2/2 | 2/2 |
| 18 | Heron Lake – shallow station | Heron Reservoir | 2/4 | 2/4 | 0 | 0 | 2/4 | 0 | 0 | 0 | 0 |
| 19 | Heron Lake – deep station | Heron Reservoir | 3/4 | 4/4 | 3/4 | 3/4 | 4/4 | 0 | 2/2 | 2/2 | 2/2 |
| 20 | Rio Chama above Heron Lake outfall | Rio Chama (El Vado Reservoir to Rio Brazos) | 2/4 | 2/4 | 2/4 | 2/4 | 2/4 | 0 | 1/0 | 1/0 | 1/0 |
| 21 | Heron Lake outfall | Rio Chama (El Vado Reservoir to Rio Brazos) | 2/4 | 3/4 | 0 | 0 | 3/4 | 0 | 0 | 0 | 0 |
| 22 | Rio Chama above El Vado | Rio Chama (El Vado Reservoir to Rio Brazos) | 3/4 | 3/4 | 0 | 0 | 3/4 | 0 | 0 | 0 | 0 |
| 23 | El Vado Reservoir – shallow station | El Vado Reservoir | 1/4 | 1/4 | 0 | 0 | 1/4 | 0 | 0 | 0 | 0 |
| 24 | El Vado Reservoir – deep station | El Vado Reservoir | 4/4 | 4/4 | 3/4 | 3/4 | 4/4 | 0 | 2/2 | 2/2 | 2/2 |
| 25 | Rio Chama at USGS gage 08285500 below El Vado Dam | Rio Chama (Abiquiu Reservoir to El Vado Reservoir) | 3/4 | 3/4 | 0 | 0 | 3/4 | 0 | 0 | 0 | 0 |
| 26 | Rio Nutrias above Rio Chama | Rio Nutrias (Rio Chama to headwaters) | 5/8 | 5/8 | 2/4 | 2/4 | 5/8 | 0 | 0/2 | 0/2 | 1/2 |
| 27 | Rio Cebolla at US 84 | Rio Cebolla (Rio Chama to headwaters) | 0/8 | 0/8 | 0/4 | 0/4 | 0/8 | 0/0 | 0/2 | 0/2 | 0/2 |
| 28 | Clear Creek at FR 76 | Clear Creek (Rio Gallina to headwaters) | 2/4 | 2/4 | 0 | 0 | 2/4 | 0 | 0 | 0 | 0 |
| 29 | Rio Gallina at FR 76 | Rio Gallina (HWY 96 to headwaters) | 7/8 | 7/8 | 0 | 0 | 7/8 | 0 | 0 | 0 | 0 |
| 30 | Rio Capulin above Cecilia Canyon Creek | Rio Capulin (Rio Gallina to headwaters) | 7/8 | 7/8 | 0 | 0 | 7/8 | 0 | 0 | 0 | 0 |

| Map ID | Station | Assessment Unit | TSS/TDS | Nutrients ¹ | Dissolved Metals ² | Total Metals | E. coli | Chlorine | Volatile Organic Compounds ³ | Semi-Volatile Organics ³ | Radionuclides ⁴ |
|--------|---------------------------------------------------|---------------------------------------------------------------------|---------|------------------------|-------------------------------|--------------|---------|----------|-----------------------------------------|-------------------------------------|----------------------------|
| 31 | Cecilia Canyon Creek at FR 171 | Cecilia Canyon Creek (Rio Capulin to USFS reservoir) | 3/4 | 3/4 | 0 | 0 | 3/4 | 0 | 0 | 0 | 0 |
| 32 | Rio Gallina at confluence with Rio Chama | Rio Gallina (Rio Chama to HWY 96) | 4/8 | 4/8 | 2/4 | 2/4 | 4/8 | 0 | 0/2 | 0/2 | 1/2 |
| 33 | Rio Chama above Abiquiu Reservoir at USGS gage | Rio Chama (Abiquiu Reservoir to El Vado Reservoir) | 7/8 | 7/8 | 3/4 | 3/4 | 7/8 | 0 | 2/2 | 2/2 | 2/2 |
| 34 | Rito Resumidero below Resumidero Spring | Rito Resumidero (Rio Puerco de Chama to headwaters) | 4/4 | 4/4 | 0 | 0 | 4/4 | 0 | 0 | 0 | 0 |
| 35 | Rito Redondo at FR 93 | Rito Redondo (Rito Resumidero to headwaters) | 3/4 | 3/4 | 0 | 0 | 3/4 | 0 | 0 | 0 | 0 |
| 36 | Rio Puerco de Chama at FR 103 | Rio Puerco de Chama (HWY 96 to headwaters) | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 0 | 0 | 0 | 0 |
| 37 | Poleo Creek at FR 103 | Poleo Creek (Rio Puerco de Chama to headwaters) | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 0 | 0 | 0 | 0 |
| 38 | Coyote Creek at FR 316 at Coyote Creek Campground | Coyote Creek (Rio Puerco de Chama to headwaters) | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 0 | 0 | 0 | 0 |
| 39 | Rio Puerco de Chama at CR 211 | Rio Puerco de Chama (Abiquiu Reservoir to HWY 96) | 5/8 | 5/8 | 2/4 | 2/4 | 4/8 | 0 | 1/2 | 1/2 | 1/2 |
| 40 | Rito Encino at FR 100Z | Rito Encino (Rio Puerco de Chama to headwaters) | 4/4 | 4/4 | 2/4 | 2/4 | 4/4 | 0 | 0 | 0 | 0 |
| 41 | Abiquiu Reservoir – shallow (Rio Chama inlet) | Abiquiu Reservoir | 2/4 | 2/4 | 0 | 0 | 2/4 | 0 | 0 | 0 | 0 |
| 42 | Canjilon Lake | Canjilon Lake | 2/3 | 2/3 | 2/3 | 2/3 | 2/3 | 0 | 0 | 0 | 0 |
| 43 | Canjilon Creek above Canjilon Lake | Canjilon Creek (Perennial portions Abiquiu Reservoir to headwaters) | 5/0 | 5/0 | 3/0 | 3/0 | 5/0 | 0 | 1/0 | 1/0 | 1/0 |
| 44 | Canjilon Creek above Abiquiu Reservoir at US 84 | Canjilon Creek (Perennial portions Abiquiu Reservoir to headwaters) | 2/8 | 2/8 | 1/4 | 1/4 | 2/8 | 0 | 0/3 | 0/3 | 0/3 |
| 45 | Abiquiu Reservoir – deep station | Rio Chama (Ohkay Owingeh to Abiquiu Dam) | 4/4 | 4/4 | 4/4 | 4/4 | 5/4 | 0 | 1/2 | 0/2 | 2/2 |
| 46 | Cañones Creek above Chihuahueros Creek | Cañones Creek (Abiquiu Reservoir to headwaters) | 0/4 | 0/4 | 0/4 | 0/4 | 0/4 | 0 | 0 | 0 | 0 |
| 47 | Chihuahueros Creek at FR 449 | Chihuahueros Creek (Cañones Creek to headwaters) | 2/8 | 3/8 | 3/4 | 3/4 | 3/8 | 0 | 0 | 0 | 0 |

| Map ID | Station | Assessment Unit | TSS/TDS | Nutrients ¹ | Dissolved Metals ² | Total Metals | E. coli | Chlorine | Volatile Organic Compounds ³ | Semi-Volatile Organics ³ | Radionuclides ⁴ |
|-------------------------|------------------------------------------------------------|-------------------------------------------------|---------|------------------------|-------------------------------|--------------|---------|----------|-----------------------------------------|-------------------------------------|----------------------------|
| 48 | Polvadera Creek at FR 27 (CR 95) | Polvadera Creek (Cañones Creek to headwaters) | 5/8 | 6/8 | 3/4 | 3/4 | 5/8 | 0 | 0 | 0 | 0 |
| 49 | Cañones Creek at FR 167 below Cañones | Cañones Creek (Abiquiu Reservoir to headwaters) | 5/8 | 5/8 | 4/4 | 4/4 | 5/8 | 0 | 1/2 | 1/2 | 0/2 |
| 50 | Rio Chama below Abiquiu Dam at USGS 08287000 gage | Rio Chama (Ohkay Owingeh to Abiquiu Dam) | 1/4 | 3/4 | 0/1 | 0 | 3/4 | 0 | 0 | 0 | 0 |
| 51 | Abiquiu Creek at US Hwy 84 bridge | Abiquiu Creek (Rio Chama to headwaters) | 7/8 | 7/8 | 3/4 | 3/4 | 7/8 | 0 | 0/2 | 0/2 | 0/2 |
| 52 | Abiquiu WWTP effluent discharge | NM0024830 | 4/8 | 6/8 | 0 | 0 | 6/8 | 3/8 | 0 | 0 | 0 |
| 53 | El Rito at bridge in El Rito 400 feet from Hwy 554 | El Rito Creek (HWY 554 to headwaters) | 5/8 | 5/8 | 2/4 | 2/4 | 5/8 | 0 | 0/2 | 0/2 | 0/2 |
| 54 | El Rito Creek 0.5 mile above Rio Chama | El Rito Creek (Perennial reaches below HWY 554) | 7/8 | 7/8 | 3/4 | 3/4 | 7/8 | 0 | 2/2 | 2/2 | 2/2 |
| 55 | Rio Chama at NM Hwy 233 three miles below El Rito Creek | Rio Chama (Ohkay Owingeh to Abiquiu Dam) | 7/8 | 7/8 | 3/4 | 3/4 | 8/8 | 0 | 3/2 | 3/2 | 2/2 |
| 56 | Rio del Oso above Rio Chama | Rio del Oso (Rio Chama to headwaters) | 1/8 | 1/8 | 0/4 | 0/4 | 1/8 | 0 | 0 | 0 | 0 |
| 57 | Placer Creek at NM 64 | Placer Creek (Hopewell Lake to headwaters) | 3/4 | 3/4 | 3/4 | 3/4 | 2/4 | 0 | 0 | 0 | 0 |
| 58 | Hopewell Lake | Hopewell Lake | 1/3 | 2/3 | 2/3 | 2/3 | 1/3 | 0 | 0 | 0 | 0 |
| 59 | Placer Creek above box | Placer Creek (Rio Vallecitos to Hopewell Lake) | 4/3 | 4/3 | 3/2 | 3/2 | 3/3 | 0 | 1/0 | 1/0 | 1/0 |
| 60 | Placer Creek above Rio Vallecitos | Placer Creek (Rio Vallecitos to Hopewell Lake) | 0/8 | 0/8 | 0/4 | 0/4 | 0/8 | 0 | 0/2 | 0/2 | 0/2 |
| 61 | Rio Vallecitos 3.9 miles above La Madera at bridge | Rio Vallecitos (Rio Tusas to headwaters) | 6/8 | 6/8 | 3/4 | 3/4 | 6/8 | 0 | 0 | 0 | 0 |
| 62 | Rio Tusas above Rio Vallecitos | Rio Tusas (Rio Vallecitos to headwaters) | 5/8 | 5/8 | 2/4 | 2/4 | 3/8 | 0 | 0 | 0 | 0 |
| 63 | Rio Ojo Caliente at Hwy 414 (Hot Springs) bridge | Rio Ojo Caliente (Rio Chama to Rio Vallecitos) | 7/4 | 7/4 | 3/4 | 3/4 | 6/4 | 0 | 2/0 | 2/0 | 2/0 |
| 64 | Rio Ojo Caliente 3.4 miles above confluence with Rio Chama | Rio Ojo Caliente (Rio Chama to Rio Vallecitos) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| QC | | | 0 | 23 | 18 | 0 | 23 | 0 | 7 | 0 | 0 |
| Total Number of Samples | | | 245 | 391 | 194 | 175 | 391 | 16 | 51 | 44 | 44 |
| WTU | | | 117,520 | | | | | | | | |

¹ Suite includes total Kjeldahl nitrogen, nitrate+nitrite, ammonia, and total phosphorus.

²Suite includes aluminum, antimony, arsenic, barium, boron, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, molybdenum, nickel, silicon, silver, tin, vanadium, and zinc.

³Refer to SLD for a complete list of analytes.

⁴A radionuclide sample will include gross alpha and gross beta and, depending on detections, may include Uranium mass and Radium 226 + 228.

Long-term Dataset, Biological and Physical Habitat Sampling

Biological indicators and physical measurements give an overall indication of the integrity of the AU. Stations were selected for biological and physical monitoring based on their current IR status and results of level 1 nutrient and stream bottom deposit assessments. Resources and access issues did not allow for the collection of biological and physical data in all AUs.

The SWQB collected periphyton and physical habitat data at select sites to obtain data to support water quality standards development and to assess waterbodies for potential impairment from sediment deposition and nutrient enrichment. A summary of 2012 biological and physical monitoring appears below (Table 6).

Table 6. Summary of Completed/Planned Biological and Physical Sampling for 2012

| Map ID | Station | Assessment Unit | Macroinvertebrates | Nutrient Level 1 | Chlorophyll a ¹ | Physical Habitat ^{2,3} | Sonde | Thermograph | Fish ⁴ | Phytoplankton | Periphyton - diatoms |
|--------|---------------------------------------------|--------------------------------------------------------|--------------------|------------------|----------------------------|---------------------------------|-------|-------------|-------------------|---------------|----------------------|
| 1 | Sexto Creek above Rio Chamita | Sexto Creek (Rio Chamita to CO border) | - | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 2 | Nabor Creek 5 yards upstream of Rio Chamita | Nabor Creek (Rio Chamita to CO border) | - | 0/1 | - | 0/1 | - | 1/1 | - | - | - |
| 3 | Rio Chama at NM 17 | Rio Chama (Little Willow Creek to CO border) | - | 1/1 | - | 1/1 | - | 1/1 | 0/1 | - | - |
| 4 | Chama WWTP effluent discharge | NPDES permit # NM0027731 | - | - | - | - | - | - | - | - | - |
| 5 | Rio Chamita below Chama WWTP outfall | Rio Chamita (Rio Chama to CO border) | 0/1 | 1/1 | 1/1 | 0/1 | 1/1 | 1/1 | 0/1 | - | - |
| 6 | Rio Chama Below Chama Town | Rio Chama (Rio Brazos to Little Willow Creek) | - | 1/1 | 1/1 | 1/1 | 1/1 | 1/1 | 0/1 | - | - |
| 7 | Cañones Creek above HWY 84 (near Chama) | Cañones Creek (Rio Chama to Jicarilla Apache boundary) | - | 1/1 | - | 0/1 | 0/1 | 1/1 | - | - | - |
| 8 | Rio Brazos 1 mile above Corkin Lodge | Rio Brazos (Chavez Creek to Jicarilla Apache boundary) | 0/1 | 1/1 | - | 1/1 | - | 1/1 | - | - | - |

| Map ID | Station | Assessment Unit | Macroinvertebrates | Nutrient Level 1 | Chlorophyll a ¹ | Physical Habitat ^{2,3} | Sonde | Thermograph | Fish ⁴ | Phytoplankton | Periphyton - diatoms |
|--------|-------------------------------------------------------------|--------------------------------------------------------|--------------------|------------------|----------------------------|---------------------------------|-------|-------------|-------------------|---------------|----------------------|
| 9 | Chavez Creek at hwy 512 above Rio Brazos | Chavez Creek (Rio Brazos to headwaters) | - | 1/1 | - | 1/1 | - | 1/1 | 0/1 | - | - |
| 10 | Rio Brazos above hwy 84 bridge | Rio Brazos (Rio Chama to Chavez Creek) | - | 1/1 | - | 1/1 | - | 1/1 | 0/1 | - | - |
| 11 | Los Ojos Fish Hatchery outfall #1 | NPDES permit # NM0030139 | - | - | - | - | - | - | - | - | - |
| 12 | Los Ojos Fish Hatchery outfall #2 | NPDES permit # NM0030139 | - | - | - | - | - | - | - | - | - |
| 13 | Burn's Lake (Laguna del Campo) | Burn's Lake (Laguna del Campo) | - | - | 2/3 | - | - | - | - | 2/3 | - |
| 14 | Rito de Tierra Amarilla at Hwy 64 | Rito de Tierra Amarilla (HWY 64 to headwaters) | - | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 15 | Rito de Tierra Amarilla at hwy 112 | Rito de Tierra Amarilla (Rio Chama to HWY 64) | 0/1 | 1/1 | - | 0/1 | 0/1 | 0/1 | 0/1 | - | - |
| 16 | Willow Creek above Heron | Willow Creek (Heron Lake to Jicarilla Apache Boundary) | - | - | - | - | - | - | - | - | - |
| 17 | Rio Chama below Rito de Tierra Amarilla above gage 08284100 | Rio Chama (El Vado Reservoir to Rio Brazos) | 0/1 | 1/1 | 1/1 | 1/1 | 1/1 | 1/1 | 0/1 | - | - |
| 18 | Heron Lake - shallow station | Heron Reservoir | - | - | 2/4 | - | - | - | - | - | - |
| 19 | Heron Lake - deep station | Heron Reservoir | - | - | 4/4 | - | - | - | - | 4/4 | - |
| 20 | Rio Chama above Heron | Rio Chama (El Vado Reservoir to Rio Brazos) | - | - | - | - | - | - | - | - | - |
| 21 | Heron Lake outfall | Rio Chama (El Vado Reservoir to Rio Brazos) | - | - | - | - | - | - | - | - | - |

| Map ID | Station | Assessment Unit | Macroinvertebrates | Nutrient Level 1 | Chlorophyll a ¹ | Physical Habitat ^{2,3} | Sonde | Thermograph | Fish ⁴ | Phytoplankton | Periphyton - diatoms |
|--------|---------------------------------------------------|-----------------------------------------------------|--------------------|------------------|----------------------------|---------------------------------|-------|-------------|-------------------|---------------|----------------------|
| 22 | Rio Chama above El Vado | Rio Chama (El Vado Reservoir to Rio Brazos) | - | - | - | - | - | - | - | - | - |
| 23 | El Vado - shallow station | El Vado Reservoir | - | - | 1/4 | - | - | - | - | - | - |
| 24 | El Vado - deep station | El Vado Reservoir | - | - | 4/4 | - | - | - | - | 4/4 | - |
| 25 | Rio Chama at USGS gage 08285500 below El Vado Dam | Rio Chama (Abiquiu Reservoir to El Vado Reservoir) | - | - | - | - | - | - | - | - | - |
| 26 | Rio Nutrias above Rio Chama | Rio Nutrias (Rio Chama to headwaters) | 0/1 | 1/1 | - | 1/1 | 1/1 | 1/1 | - | - | - |
| 27 | Rio Cebolla at US 84 | Rio Cebolla (Rio Chama to headwaters) | - | 0/1 | - | 0/1 | - | 0/1 | - | - | - |
| 28 | Clear Creek at FR 76 | Clear Creek (Rio Gallina to headwaters) | - | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 29 | Rio Gallina at FR 76 | Rio Gallina (HWY 96 to headwaters) | 0/1 | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 30 | Rio Capulin above Cecilia Canyon Creek | Rio Capulin (Rio Gallina to headwaters) | - | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 31 | Cecilia Canyon Creek at FR 171 | Cecilia Canyon Creek (Rio Capulin to USFS boundary) | - | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 32 | Rio Gallina at confluence with Rio Chama | Rio Gallina (Rio Chama to HWY 96) | - | 0/1 | - | 0/1 | - | 0/1 | 0/1 | - | - |
| 33 | Rio Chama above Abiquiu Reservoir at USGS gage | Rio Chama (Abiquiu Reservoir to El Vado Reservoir) | 1/1 | 1/1 | 1/1 | 1/1 | - | 0/1 | - | - | 0/1 |
| 34 | Rito Resumidero below Resumidero Spring | Rito Resumidero (Rio Puerco de Chama to headwaters) | 1/1 | 1/1 | - | 1/1 | - | 1/1 | - | - | - |

| Map ID | Station | Assessment Unit | Macroinvertebrates | Nutrient Level 1 | Chlorophyll a ¹ | Physical Habitat ^{2,3} | Sonde | Thermograph | Fish ⁴ | Phytoplankton | Periphyton - diatoms |
|--------|---------------------------------------------------|---------------------------------------------------------------------|--------------------|------------------|----------------------------|---------------------------------|-------|-------------|-------------------|---------------|----------------------|
| 35 | Rito Redondo at FR 93 | Rito Redondo (Rito Resumidero to headwaters) | - | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 36 | Rio Puerco de Chama at FR 103 | Rio Puerco de Chama (HWY 96 to headwaters) | - | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 37 | Poleo Creek at FR 103 | Poleo Creek (Rio Puerco de Chama to headwaters) | 0/1 | 1/1 | - | 1/1 | 1/1 | 1/1 | - | - | - |
| 38 | Coyote Creek at FR 316 at Coyote Creek Campground | Coyote Creek (Rio Puerco de Chama to headwaters) | - | 1/1 | - | 1/1 | - | 0/1 | - | - | - |
| 39 | Rio Puerco de Chama at CR 211 | Rio Puerco de Chama (Abiquiu Reservoir to HWY 96) | - | 1/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | - | - |
| 40 | Rito Encino at FR 100Z | Rito Encino (Rio Puerco de Chama to headwaters) | - | 1/1 | - | 1/1 | 1/1 | 1/1 | - | - | - |
| 41 | Abiquiu Reservoir - shallow (Rio Chama inlet) | Abiquiu Reservoir | - | - | 1/4 | - | - | - | - | - | - |
| 42 | Canjilon Lake | Canjilon Lake | - | - | 2/3 | - | - | - | - | 2/3 | - |
| 43 | Canjilon Creek near Echo | Canjilon Creek (Perennial portions Abiquiu Reservoir to headwaters) | 0/1 | 1/1 | 0/1 | - | 1/1 | 1/1 | 0/1 | - | - |
| 44 | Canjilon Creek above Abiquiu Reservoir at US 84 | Canjilon Creek (Perennial portions Abiquiu Reservoir to headwaters) | 0/1 | - | - | 1/1 | - | 0/1 | - | - | - |
| 45 | Abiquiu Reservoir - deep station | Rio Chama (Ohkay Owingeh to Abiquiu Dam) | - | - | 4/4 | - | - | - | - | 4/4 | - |
| 46 | Cañones Creek above Chihuahueños Creek | Cañones Creek (Abiquiu Reservoir to headwaters) | - | - | - | - | - | - | - | - | - |
| 47 | Chihuahueños Creek at FR 449 | Chihuahueños Creek (Cañones Creek to headwaters) | 1/0 | 1/1 | - | 1/1 | - | 1/1 | - | - | - |

| Map ID | Station | Assessment Unit | Macroinvertebrates | Nutrient Level 1 | Chlorophyll a ¹ | Physical Habitat ^{2,3} | Sonde | Thermograph | Fish ⁴ | Phytoplankton | Periphyton - diatoms |
|--------|---------------------------------------------------------------------------------------|-------------------------------------------------|--------------------|------------------|----------------------------|---------------------------------|-------|-------------|-------------------|---------------|----------------------|
| 48 | Polvadera Creek at FR 27 (CR 95) | Polvadera Creek (Cañones Creek to headwaters) | 0/1 | 1/1 | - | 2/1 | - | 1/1 | - | - | - |
| 49 | Cañones Creek at hwy 96 | Cañones Creek (Abiquiu Reservoir to headwaters) | 0/1 | 1/1 | - | 1/1 | 1/1 | 1/1 | - | - | - |
| 50 | Rio Chama below Abiquiu Dam at USGS 08287000 gage | Rio Chama (Ohkay Owingeh to Abiquiu Dam) | - | - | 0/1 | - | - | - | - | - | 0/1 |
| 51 | Abiquiu Creek at US 84 bridge | Abiquiu Creek (Rio Chama to headwaters) | - | 1/1 | - | 0/1 | 0/1 | 0/1 | - | - | - |
| 52 | Abiquiu WWTP | NM0024830 | - | - | - | - | - | - | - | - | - |
| 53 | El Rito at bridge in El Rito 400 Ft. from Hwy 554 | El Rito Creek (HWY 554 to headwaters) | - | 1/1 | - | 1/1 | - | 1/1 | 0/1 | - | - |
| 54 | El Rito Creek 0.5 mile above Chama River (replaced by El on FS 7 miles below El Rito) | El Rito Creek (Perennial reaches below HWY 554) | - | 1/1 | - | 1/1 | - | 1/1 | 0/1 | - | - |
| 55 | Chama River at NM HWY 233(replaced by Chama River at NM Hwy 554) | Rio Chama (Ohkay Owingeh to Abiquiu Dam) | 1/0 | 1/1 | - | 1/1 | - | 0/1 | - | - | 0/1 |
| 56 | Rio del Oso above Rio Chama | Rio del Oso (Rio Chama to headwaters) | 0/1 | 0/1 | - | 0/1 | - | 0/1 | - | - | - |
| 57 | Placer Creek at NM 64 | Placer Creek (Hopewell Lake to headwaters) | 0/1 | 1/1 | - | 1/1 | - | 1/1 | - | - | - |
| 58 | Hopewell Lake - deep station | Hopewell Lake | - | - | 2/3 | - | - | - | - | 2/3 | - |
| 59 | Placer Creek above Box | Placer Creek (Rio Vallecitos to Hopewell Lake) | - | 1/0 | - | 1/0 | - | 0/0 | - | - | - |
| 60 | Placer Creek above Rio Vallecitos | Placer Creek (Rio Vallecitos to Hopewell Lake) | 0/1 | 0/1 | - | 0/1 | - | 0/1 | - | - | - |

| Map ID | Station | Assessment Unit | Macroinvertebrates | Nutrient Level 1 | Chlorophyll a ¹ | Physical Habitat ^{2,3} | Sonde | Thermograph | Fish ⁴ | Phytoplankton | Periphyton - diatoms |
|---------------|-----------------------------------------------------------------------------------------|------------------------------------------------|--------------------|------------------|----------------------------|---------------------------------|-------------|--------------|-------------------|---------------|----------------------|
| 61 | Rio Vallecitos 3.9 miles above La Madera at bridge (replaced by above Rio Ojo Caliente) | Rio Vallecitos (Rio Tusas to headwaters) | 0/1 | 1/1 | - | 1/1 | 1/1 | 1/1 | 0/1 | - | - |
| 62 | Rio Tusas above Rio Vallecitos | Rio Tusas (Rio Vallecitos to headwaters) | - | 1/1 | 1/1 | 1/1 | 1/1 | 1/1 | 0/1 | - | - |
| 63 | Rio Ojo Caliente at Hwy 414 at Hot Springs bridge | Rio Ojo Caliente (Rio Chama to Rio Vallecitos) | - | 1/0 | 1/0 | 1/0 | - | - | 0/1 | - | - |
| 64 | Rio Ojo Caliente 3.4 miles above confluence with Rio Chama | Rio Ojo Caliente (Rio Chama to Rio Vallecitos) | 0/1 | 0/1 | - | 0/1 | - | 0/1 | - | - | - |
| Totals | | | 4/17 | 38/40 | 28/41 | 33/41 | 8/14 | 22/42 | 0/15 | 16/21 | 0/3 |

¹Refers to cross-section, flow, canopy cover, and slope data required to use SSTEMP temperature modeling software for streams with temperature impairments.

²Additional stations may be added as indicated by preliminary data.

³Level 2 Nutrient Assessments are scheduled at these sites because they are currently listed as impaired for nutrients. Additional stations will be added as indicated by preliminary data. Nutrient screening is a two-step process where a preliminary assessment nutrient variable is used to determine if level 2 sampling, consisting of chlorophyll determinations and a sonde deployment to record diurnal variations in pH and dissolved oxygen concentrations, is warranted.

⁴Data collected in 2007.

⁵Thermographs currently in place as part of ongoing 319 project.
Highlighted cells represent incomplete planned sampling activities

Chama Date Gaps Survey 2014

During the 2012 water quality survey, some of the scheduled monitoring was not completed. This was primarily due to the drying of sites later in the sampling season where there were no other established access points to perennial reaches. The high releases from El Vado and Abiquiu Reservoirs throughout the summer months also prevented the deployment of thermographs in the Chama River during the hottest part of the year. Other thermographs were redeployed as the data indicated that they were poorly placed in the stream, either being out of the water at times or placed in pools dominated by groundwater inputs that were not representative of the assessment unit. Chlorophyll samples analyzed during the 2012 survey were rejected due to equipment failure and collections were repeated along with the associated nutrient parameters. Also, it was recognized that additional data were needed in the upper portions of some AUs (Rio Nutrias and Rio Vallecitos) to explore the applicability of the current water quality standards. Table 7 presents monitoring that was conducted in 2014 in order to fill these data gaps.

Not all of the monitoring that was planned for 2014 could be completed. High flow events caused channel scouring late in the season, preventing sufficient recovery time to collect these data according to SWQB standard operating procedures. When chlorophyll samples were not collected due to scouring events, the concurrent nutrient samples were also not collected. In a few cases, monitoring that was not scheduled for the season was conducted as data needs were defined.

Table 7. Stream Water Quality Monitoring Completed/Planned in 2014

| Map ID | Station | Assessment Unit | thermo-graphs | Nuts/ TSS | Metals | chlorophyll | Sonde/DO Logger | Habitat | Fish | Benthic Macroinvertebrate |
|--------|----------------------------------------------------------|--------------------------------------------------------|---------------|-----------|--------|-------------|-----------------|---------|------|---------------------------|
| 7 | Cañones Creek above Hwy 84 (near Chama) | Cañones Creek (Rio Chama to Jicarilla Apache boundary) | 1/1 | | | | 0/1 | 0/1 | | |
| 9 | Chavez Creek at Hwy 512 above Rio Brazos | Chavez Creek (Rio Brazos to headwaters) | 1/1 | 2/2 | | 1/1 | 1/1 | | | |
| 50 | Rio Chama above Abiquiu Reservoir at USGS Gage | Rio Chama (Abiquiu Reservoir to El Vado Reservoir) | 1/1 | 4/4 | | 0/1 | | | | |
| New | Chama River at NM Hwy 554 – 29RChama038.3 | Rio Chama (Ohkay Owingeh to Abiquiu Dam) | 1/1 | | | | | | | |
| New | Rio Tusas at forest service boundary - 29RTusas001.9 | Rio Tusas (Rio Vallecitos to headwaters) | 1/1 | 2/2 | | 1/1 | 1/1 | 0/1 | | |
| New | Rio Nutrias at NF Boundary - 29RNutri040.5 | Rio Nutrias (Rio Chama to headwaters) | 1/1 | 4/4 | 1/0 | | | | | |
| New | Rito Tierra Amarilla 1 mile below Hwy 84 - 29RTierr007.5 | Rito de Tierra Amarilla (Rio Chama to HWY 64) | 1/1 | 4/4 | 4/4 | 1/1 | 1/1 | 1/1 | 1/1 | 1/1 |
| New | El Rito above El Rito – 29EIRito025.4 | El Rito Creek (HWY 554 to headwaters) | 1/1 | 3/4 | 1/2 | 1/1 | 1/1 | | | |

| Map ID | Station | Assessment Unit | thermo-graphs | Nuts/ TSS | Metals | chlorophyll | Sonde/DO Logger | Habitat | Fish | Benthic Macroinvertebrate |
|--------|-----------------------------------------------------------------|-------------------------------------------------|---------------|-----------|--------|-------------|-----------------|---------|------|---------------------------|
| New | New - Rio Vallecitos 8.4 miles above Vallecitos - 29RValle030.5 | Rio Vallecitos (Rio Tusas to headwaters) | 1/1 | 4/4 | 2/0 | | | | | |
| 46 | Cañones above Chihuahueños | Cañones Creek (Abiquiu Reservoir to headwaters) | 1/1 | | | | | | 1/1 | |
| 49 | Cañones Creek at hwy 96 - 29Canone001.7 | Cañones Creek (Abiquiu Reservoir to headwaters) | 0/1* | 0/1 | | 0/1 | 0/1 | | 1/1 | |
| New | El Rito Creek on FS 7 miles below El Rito - 29ElRito008.6 | El Rito Creek (Perennial reaches below HWY 554) | | 0/1 | | 0/1 | 0/1 | | | |
| 37 | Poleo Creek at FR 103 - 29PoleoC009.5 | Poleo Creek (Rio Puerco de Chama to headwaters) | | 0/1 | | 0/1 | 0/1 | | | |
| 10 | Rio Brazos above Hwy 84 - 29RBrazo001.6 | Rio Brazos (Rio Chama to Chavez Creek) | | 2/1 | | 1/1 | 1/1 | | | |
| 17 | Rio Chama below Rito de TA above gage 08284100 - 29RChama147.0 | Rio Chama (El Vado Reservoir to Rio Brazos) | | 2/1 | | 1/1 | 1/1 | | | |
| 3 | Rio Chama at NM 17 - 29RChama183.4 | Rio Chama (Little Willow Creek to CO border) | | 2/1 | | 1/1 | 1/1 | | | |
| 6 | Rio Chama Below Chama Town - 29RChama174.0 | Rio Chama (Rio Brazos to Little Willow Creek) | | 2/1 | | 1/1 | 1/1 | | | |
| 5 | Rio Chamita below Chama WWTP outfall - 29RChami002.7 | Rio Chamita (Rio Chama to CO border) | | 2/1 | | 1/1 | 1/1 | | | |
| 26 | Rio Nutrias above Rio Chama - 29RNutri005.4 | Rio Nutrias (Rio Chama to headwaters) | | 2/1 | | 1/1 | 1/1 | | 1/1 | |
| 63 | Rio Ojo Caliente at Hwy 414 at Hot Springs - 29ROjoCa026.1 | Rio Ojo Caliente (Rio Chama to Rio Vallecitos) | | 2/1 | | 1/1 | 1/1 | | | 1/1 |
| New | Rio Vallecitos above Rio Ojo Caliente - 29RValle000.1 | Rio Vallecitos (Rio Tusas to headwaters) | | 2/1 | | 1/1 | 1/1 | | | 1/1 |

* Thermograph lost due to scouring

Because chlorophyll samples collected in 2012 were rejected, numerous lakes in the survey also required resampling in 2014.

Table 8. Lake Water Quality Monitoring Completed/Planned in 2014

| Map ID | Station | Assessment Unit | Nutrients | Chlorophyll | Phytoplankton |
|----------------------------------------|---------------------------------------------------|--------------------------------------------------------|--------------|--------------|---------------|
| 16 | Willow Creek above Heron | Willow Creek (Heron Lake to Jicarilla Apache Boundary) | 3/4 | | |
| 19 | Heron Lake | Heron Reservoir | 3/4 | 3/4 | 3/4 |
| 21 | Heron Lake outfall | Rio Chama (El Vado Reservoir to Rio Brazos) | 3/4 | | |
| 22 | Chama River above Vado | Rio Chama (El Vado Reservoir to Rio Brazos) | 3/4 | | |
| 24 | El Vado Lake | El Vado Reservoir | 4/4 | 4/4 | 4/4 |
| 25 | Rio Chama at USGS gage 08285500 below El Vado Dam | Rio Chama (Abiquiu Reservoir to El Vado Reservoir) | 4/4 | | |
| 11 | Burns Lake inlet | Los Ojos Fish Hatchery outfall | 5/4 | | |
| 13 | Burn's Lake | Burn's Lake (Laguna del Campo) | 3/4 | 3/4 | 3/4 |
| NA | Burns Lake outfall | NA | 2/4 | | |
| 57 | Placer Creek above Hopewell | Placer Creek (Hopewell Lake to headwaters) | 3/4 | | |
| 58 | Hopewell Lake | Hopewell Lake | 3/4 | 3/4 | 3/4 |
| 59 | Placer Creek below Hopewell | Placer Creek (Rio Vallecitos to Hopewell Lake) | 3/4 | | |
| 42 | Canjilon Lake | Canjilon Lake (a) | 2/4 | 2/4 | 2/4 |
| 45 | Abiquiu Lake | Abiquiu Reservoir | 4/4 | 4/4 | 4/4 |
| Total Completed / Total Planned | | | 57/56 | 19/24 | 19/24 |

Summary

A detailed FSP was prepared prior to beginning the survey in 2012; however, a large number of deviations occurred over the course of the survey. These deviations from the FSP were primarily due to the following:

1. Decrease in the budget allocated to this survey prevented analysis of the full number of samples planned (most sites);
2. the drying of sites later in the season where there was no established access to perennial reaches (2, 15, 27, 28, 32, 39, 54, and 56);
3. The high releases from El Vado and Abiquiu Reservoirs throughout the summer months also prevented the deployment of thermographs in the Chama River during the hottest part of the year (32 and 55); and
4. Rainstorms in 2014 caused scouring flows that prevented the collection of some habitat and biological data.

For most sites, one or more of the late summer sample events were not fully conducted due to the lack of budget. Specifically, metals which are rarely found to be above standards were not sampled. Also, the less common parameters (Volatile Organic Compounds, Semi-Volatile Organics, and Radionuclides) were not monitored at lower priority sites.

If other perennial reaches are not identified in the AU, the Hydroprotocol should be conducted at sites that went dry during this survey to determine if the appropriate WQS are in place and to aid in future survey design.

The data from the 2012 survey have been validated and verified according to SWQB standard operating procedures (SOPs; NMED/SWQB 2011). The data collected in 2014 will be validated and verified in 2014. All of the data will be uploaded to USEPA's STORET Data Warehouse via The Water Quality Exchange (WOX) where they are available to the public. All of the data collected during these surveys are also available by request to the Monitoring Staff associated with this survey.

The data have been assessed to determine the impairment status of the sampled waters. The assessments were conducted in accordance with the Procedures for Assessing Water Quality Standards Attainment for the State of New Mexico Integrated Clean Water Act §303(d)/§305(b) Integrated Report which are available on the SWQB website. The assessment conclusions were incorporated into the 2014-2016 Integrated Report, which was completed in 2014 and is also on the SWQB website. In cases where impairments to water and habitat quality were found, data from this survey will be used to draft TMDLs.

REFERENCES

NMED/SWQB. 2007-2011. *Standard Operating Procedures for Sample Collection and Handling*. New Mexico Environment Department, Surface Water Quality Bureau.

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APPENDIX A. Analytes included in Volatile (VOC) and Semi-volatile (SVOC) organic compound suites.

| Semi-Volatile Organic Compounds | Volatile Organic Compounds |
|----------------------------------------|------------------------------------|
| 1,2,4-Trichlorobenzene | 1,1,1,2-Tetrachloroethane |
| 1,2-Dichlorobenzene | 1,1,1-Trichloroethane |
| 1,2-Dinitrobenzene | 1,1,2,2-Tetrachloroethane |
| 1,3-Dichlorobenzene | 1,1,2-Trichloroethane |
| 1,3-Dinitrobenzene | 1,1-Dichloroethane |
| 1,4-Dichlorobenzene | 1,1-Dichloroethene |
| 1,4-Dinitrobenzene | 1,1-Dichloropropene |
| 1-Methylnaphthalene | 1,2,3-Trichlorobenzene |
| 2,3,4,6-Tetrachlorophenol | 1,2,3-Trichloropropane |
| 2,3,5,6-Tetrachlorophenol | 1,2,4-Trichlorobenzene |
| 2,4,5-Trichlorophenol | 1,2,4-Trimethylbenzene |
| 2,4,6-Trichlorophenol | 1,2-Dibromo-3-chloropropane (DBCP) |
| 2,4-Dichlorophenol | 1,2-Dibromoethane (EDB) |
| 2,4-Dimethylphenol | 1,2-Dichlorobenzene |
| 2,4-Dinitrophenol | 1,2-Dichloroethane |
| 2,4-Dinitrotoluene | 1,2-Dichloropropane |
| 2,6-Dinitrotoluene | 1,3,5-Trimethylbenzene |
| 2-Chloronaphthalene | 1,3-Dichlorobenzene |
| 2-Chlorophenol | 1,3-Dichloropropane |
| 2-Methylnaphthalene | 1,4-Dichlorobenzene |
| 2-Methylphenol | 1,4-Dioxane |
| 2-Nitroaniline | 2,2-Dichloropropane |
| 2-Nitrophenol | 2-Butanone (MEK) |
| 3,3'-Dichlorobenzidine | 2-Chloroethyl vinyl ether |
| 3-Methylphenol & 4-Methylphenol | 2-Chlorotoluene |
| 3-Nitroaniline | 2-Hexanone |
| 4,4'-DDD | 4-Chlorotoluene |
| 4,4'-DDE | 4-Isopropyltoluene |
| 4,4'-DDT | 4-Methyl-2-pentanone |
| 4,6-Dinitro-2-methylphenol | Acetone |
| 4-Bromophenyl Phenyl Ether | Acetonitrile |
| 4-Chloro-3-methylphenol | Acrolein |
| 4-Chloroaniline | Acrylonitrile |
| 4-Chlorophenyl Phenyl Ether | Allyl chloride |
| 4-Nitroaniline | Benzene |
| 4-Nitrophenol | Bromobenzene |
| Acenaphthene | Bromochloromethane |
| Acenaphthylene | Bromodichloromethane |
| Alachlor | Bromoform |
| Aldrin | Bromomethane |
| alpha-BHC | Carbon disulfide |
| Aniline | Carbon tetrachloride |
| Anthracene | Chlorobenzene |
| Atrazine | Chloroethane |
| Azobenzene | Chloroform |

| Semi-Volatile Organic Compounds | Volatile Organic Compounds |
|----------------------------------------|-----------------------------------------|
| Benzidine | Chloromethane |
| Benzo(a)anthracene | Chloroprene |
| Benzo(a)pyrene | cis-1,2-Dichloroethene |
| Benzo(b)fluoranthene | cis-1,3-Dichloropropene |
| Benzo(g,h,i)perylene | cis-1,4-Dichloro-2-butene |
| Benzo(k)fluoranthene | Dibromochloromethane |
| Benzyl alcohol | Dibromomethane |
| beta-BHC | Dichlorodifluoromethane |
| bis(2-Chloroethoxy)methane | Ethyl methacrylate |
| bis(2-Chloroethyl)ether | Ethylbenzene |
| bis(2-Chloroisopropyl)ether | Hexachlorobutadiene |
| bis(2-Ethylhexyl)adipate | Iodomethane |
| bis(2-Ethylhexyl)phthalate | Isobutyl alcohol |
| Butyl Benzyl Phthalate | Isopropylbenzene |
| Carbazole | m- & p-Xylenes |
| Chrysene | Methyl methacrylate |
| cis-Chlordane | Methylacrylonitrile |
| Cyanazine | Methylene chloride (Dichloromethane) |
| delta-BHC | Naphthalene |
| Dibenz(a,h)anthracene | n-Butylbenzene |
| Dibenzofuran | Nitrobenzene |
| Dieldrin | o-Xylene |
| Diethylphthalate | Pentachloroethane |
| Dimethylphthalate | Propionitrile |
| Di-n-butyl Phthalate | Propylbenzene |
| Di-n-octyl phthalate | sec-Butylbenzene |
| Endosulfan I | Styrene |
| Endosulfan II | tert-Butyl methyl ether (MTBE) |
| Endosulfan sulfate | tert-Butylbenzene |
| Endrin | Tetrachloroethene |
| Endrin aldehyde | Tetrahydrofuran (THF) |
| Endrin ketone | Toluene |
| Fluoranthene | Total trihalomethanes |
| Fluorene | Total xylenes |
| gamma-BHC (lindane) | trans-1,2-Dichloroethene |
| Heptachlor | trans-1,3-Dichloropropene |
| Heptachlor epoxide | trans-1,4-Dichloro-2-butene |
| Hexachlorobenzene | Trichloroethene |
| Hexachlorobutadiene | Trichlorofluoromethane |
| Hexachlorocyclopentadiene | Vinyl acetate |
| Hexachloroethane | Vinyl chloride |
| Indeno(1,2,3-cd)pyrene | |
| Isophorone | |
| Methoxychlor | |
| Metolachlor | |
| Metribuzin | |
| Naphthalene | |

| Semi-Volatile Organic Compounds | Volatile Organic Compounds |
|----------------------------------------|-----------------------------------|
| Nitrobenzene | |
| N-nitrosodimethylamine | |
| N-nitroso-di-n-propylamine | |
| N-nitrosodiphenylamine | |
| Pentachlorophenol | |
| Phenanthrene | |
| Phenol | |
| Prometryne | |
| Pyrene | |
| Pyridine | |
| Simazine | |
| trans-Chlordane | |