Retained Sediment Characterization Report

Galisteo Reservoir
Santa Fe County, New Mexico

Prepared for:

U. S Army Corps of Engineers
Albuquerque District
Albuquerque, New Mexico
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ACRONYMS AND ABBREVIATIONS

This document utilizes the following acronyms & abbreviations, which may be found in this report.

AALI	Assaigai Analytical Laboratories, Inc.
ADR	Automated Data Review
AVM	AVM Environmental Services, Inc.
AHA	Applied Hydrology Associates, Inc.
COC	Chain of Custody
COE	Corps of Engineers
DGPS	Differential Global Positioning System
EPA	U. S. Environmental Protection Agency
EWI	Earth Work Institute
HASP	Health and Safety Plan
IQR	Inter-Quartile Range
mg/Kg	Milligram per kilogram (equivalent to ug/g or PPM)
mg/L	Milligram per liter (mg/L = ug/L/1000)
ug/g	Microgram per gram (equivalent to mg/Kg or PPM)
ug/L	Microgram per liter (ug/L = 1000 x mg/L)
µm	Micron (micrometer, 1E+06 x meter)
ml	Milliliter (1000 x liter)
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
PPE	Personnel Protective Equipment
PPM	Parts per million
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
SAP	Sampling and Analysis Plan
SOW	Scope of Work
SPLP	Synthetic Precipitation Leaching Procedure
SQG	Sediment Quality Guideline
USACE	U.S. Army Corps of Engineers
USEPA	U. S. Environmental Protection Agency
USGS	U. S. Geological Survey

EXECUTIVE SUMMARY

The Galisteo Reservoir is located in Santa Fe County, New Mexico, approximately 20 miles southwest of Santa Fe, New Mexico and approximately 40 miles north of Albuquerque, New Mexico. The Galisteo Dam was constructed in 1970 on the Galisteo Creek, a tributary to the Rio Grande for flood and sediment control in accordance with the Flood Control Act of 1960. The USACE is evaluating alternatives for removal of saltcedar and non-native vegetation behind the Galisteo Dam. Removal of the vegetation is expected to result in release of reservoir sediments that may be transported during storm runoff events into the downstream reaches of the Galisteo Creek and the Rio Grande River. Characterization of the Galisteo Reservoir retained sediments that are likely to be released as a result of saltcedar eradication was performed to determine whether the sediments released to Galisteo Creek may pose an adverse risk to human health and the aquatic environment downstream of the Galisteo Dam. Chemical characterization focused on 22 metals due to the possible occurrence of elevated metal concentrations resulting from natural liberalization and historical mining and smelting activities within the Cerrillos Mining District in the drainage basin upstream of the reservoir.

The initial proposed program for saltcedar eradication is for an area of approximately 55 acres immediately upstream of the dam, which is referred to as Segment #1 in this report. Since, selective saltcedar eradication could also be conducted within other portions of the reservoir in subsequent operations, the retained sediments were characterized within other portions of Galisteo Reservoir that exhibit extensive thickets of saltcedar, which are referred to as Segment #2 and #3. Segment #1 is closest to the dam and it was thought that sediment particle size will be finer with higher metals concentrations and that sediment deposits in Segment #3 located furthest from the dam would exhibit coarser sediments with lower metals concentrations. Particle size analysis and metals analysis of composite samples from each reservoir segment confirmed this hypothesis. Reservoir Segment #2 is a transition segment, where the saltcedar thickets are the most likely targets for eradication after successful completion of the eradication program in Segment #1. Therefore, most of the sediment sampling was concentrated within Segment #1 and #2. In addition, “background” sediments from upstream and “baseline” sediments from downstream of the reservoir were characterized for comparison purposes.

It was expected that some spatial variation in particle size distribution and metals concentrations would exist among sample point locations within the vicinity of each sample location. Therefore, the sampling of retained sediments at Galisteo Reservoir and the sampling of background sediments consisted of composite sampling from five co-located points at each designated sampling location. Composite sampling was proposed to obtain samples that are more representative of the average characteristics at each sampling location. A total of 80 surface and subsurface individual reservoir co-located composite sediment samples were collected along a series of transects located perpendicular to

the main Galisteo channel and the south tributary channel. A total of 12 surface individual reservoir co-located composite background and baseline sediment samples were collected from the channel bed of the Galisteo Creek. The sediment samples were analyzed for metal concentration for assessment of potential impact on aquatic organisms and human health. Physical characteristics (particle size distribution and hydrometer testing) were performed for transport assessment. The sediment samples were also tested for leachable metals for environmental assessment of potential impacts on downstream water quality criteria.

The reservoir retained sediments consist of very fine-grained inorganic sands and silts with no clay while the composite samples from the baseline and background channel segments contain higher fractions of medium sand and less silt. The proportion of silt in the composite sample is highest for Segment #1 and lowest for Segment #3. The reservoir retained sediments are highly erodibile with a soil erodibility (K) factor within the range from 0.45 to 0.6.

The metals concentrations in the 92 individual co-located composite sediment samples and in the Reservoir and Background Segment composite samples were all significantly lower than the corresponding soil screening criteria for industrial outdoor workers. Likewise, the metals concentrations in all the Reservoir and Background Segment composite samples were all lower than the corresponding aquatic criteria. The average metals concentrations in the composite samples for each of the reservoir Segments do not exceed any of the relevant aquatic based sediment quality criteria and industrial worker soil screening criteria. These results indicate that the reservoir sediments are of low risk to human health and the aquatic environment downstream of the Galisteo Dam. However, the individual co-located samples were also evaluated to determine whether sediments within a given portion of each reservoir segment might pose an adverse risk.

Cadmium, arsenic, and nickel in one or more of the individual co-located composite samples from Reservoir Segment #1 slightly exceeded the Environment of Canada “Threshold Level” but not the USEPA “Consensus-Based Probable Effects Concentration”. Likewise, nickel concentrations in two of the 30 individual co-located composite samples from Reservoir Segment #2 slightly exceeded the Environment of Canada “Threshold Level” but not the USEPA “Consensus-Based Probable Effects Concentration”. All other metals concentrations in the individual co-located composite samples from Reservoir and Background Segments were below all relevant Sediment Quality Guidelines.

The Environment of Canada “Threshold Level” is the sediment chemical concentrations below which no adverse biological effects are expected while the USEPA “Consensus-Based Probable Effects Concentration” is the concentrations above which adverse biological effects can be expected to frequently occur.

The metals analysis results of sediment samples showed that the average nickel in the mid point and end point samples from Reservoir Segment #1 was the only metal that was not statistically below the relevant Environment of Canada (1995) “Threshold Level”. The average nickel in the mid point and end point samples from Reservoir Segment #1 of 18.44 mg/kg slightly exceeds the Environment of Canada (1995) “Threshold Level” of 18 mg/kg. However, it is expected that the erosion of sediments from the mid point and end point locations would be less than from channel bank locations after vegetation removal. Based on these considerations, the average nickel concentrations in reservoir sediments released from reservoir Segment #1 are likely to be below the corresponding Environment of Canada (1995) “Threshold Level” of 18 mg/kg. Thus, it is concluded that the average metals concentrations in reservoir sediments pose no adverse risk to the aquatic environment on the Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir.

This reservoir sediment characterization study also included solubility tests on each of the reservoir segment sediment composite samples and each of the channel segment “background” sediment composite samples. The solubility tests were performed to address the possible increase in metals concentrations in the water in the Galisteo Creek or the Rio Grande that may occur as a result of leaching of the sediments that are removed from the reservoir and physically mixed with the water by erosion and sediment transport processes. The metals concentrations in leachate of composite sediment samples obtained from the synthetic precipitation leaching procedure (SPLP) method 1312 were compared with relevant numeric water quality standards for designated uses in the segment of the Rio Grande from Cochiti Dam downstream to the Angostura diversion works.

Most of the metals concentrations in leachate from composite samples were below detection limits. Aluminum was the only metal that exceeded both the relevant acute and chronic aquatic criteria. The aluminum concentration of 4.3 mg/l in leachate from reservoir Segment #1 was slightly greater than the aluminum concentration of 3.31 mg/l in the leachate from the background composite sample. The aluminum concentrations in leachate from reservoir Segment #2 and #3 were below background levels and below the acute aquatic criteria. The arsenic concentrations in leachate from reservoir Segment #1 and #2 and the baseline stream sediments downstream of the reservoir were also above the background levels and the drinking water criteria. All other metals concentrations in leachate from reservoir Segment #1, #2, and #3 were below detection

The occurrence of arsenic in a sediment leachate at concentrations above the relevant drinking water standard and the occurrence of aluminum in a sediment leachate at concentrations above the relevant aquatic criteria does not imply that these sediments pose an adverse risk to human health and the aquatic environment downstream of the Galisteo Dam if released as a result of salt cedar eradication. The concentration of these metals in the water of the Galisteo Creek and the Rio Grande downstream of the reservoir following release of sediment from the reservoir will be transient and variable depending upon the water to sediment ratios which change during erosion and sediment transport, the water chemistry of the water, the quantity and chemistry of downstream inflows, including the water in the Rio Grande. It is clear that the if reservoir sediments are released to the river, the aluminum and arsenic leached from these sediments during transport would be diluted by at least several orders of magnitude in stream water in comparison with the SPLP results. Furthermore, the aluminum concentration in the leachate from the background composite sample is similar to the concentration in the retained reservoir sediments. Consequently, release of these sediments is unlikely to result in an exceedence of water quality criteria and the sediments do not pose a significant adverse risk to human health or the aquatic environment.

1.0 INTRODUCTION

This report presents the results of the characterization of retained sediments behind the Galisteo Dam. The Galisteo Reservoir is located in Santa Fe County, New Mexico, approximately 20 miles southwest of Santa Fe, New Mexico and approximately 40 miles north of Albuquerque, New Mexico. The Galisteo Dam was constructed in 1970 on the Galisteo Creek, a tributary to the Rio Grande for flood and sediment control in accordance with the Flood Control Act of 1960. The U.S. Army Corps of Engineers (USACE), Albuquerque District, retained AVM Environmental Services, Inc. (AVM) under PO/Contract No. W912PP-04-P-0132 to perform the Galisteo Reservoir retained sediment characterization.

The Galisteo Dam and Reservoir location and Project boundaries are shown in Figure 1. Sediments are retained in the reservoir during high flows as flow velocities are slowed by retention of water in the reservoir. Sediments are removed by channel scouring and bank sloughing when flows are confined to the stream channels that course through the reservoir. The dense thicket of tamarisk (saltcedar), which extends throughout the bottom of the reservoir, except within the stream channels, serves to retain sediments by reduced bank sloughing and erosion of sediment deposits. Saltcedar are a fire-adapted species and have long tap roots that allow them to intercept deep water tables and consume significant amounts of water. Saltcedar disrupts the structure and stability of native plant communities. Salt Cedar degrades native wildlife habitats because it’s foilage and flowers provide little food value for native wildlife species.

The USACE is evaluating removal alternative for saltcedar and non-native vegetation behind the Galisteo Dam, shown as Segment #1 in Figure 1. Removal of saltcedar may facilitate the release of some of the retained sediments from behind the Galisteo Dam during subsequent storm events into the Galisteo Creek and the Rio Grande, downstream of the Galisteo Creek. If sediment is released, it is expected to be beneficial for native wildlife habitats within and downstream of the reservoir. However, the concentration of metals in the retained sediments in the Galisteo Reservoir could be elevated due to natural mineralization and historical mining and smelting activities in the drainage basin upstream of the reservoir. Consequently, chemical and physical characterization of the retained sediment was needed to support the environmental assessment of proposed saltcedar eradication activities.

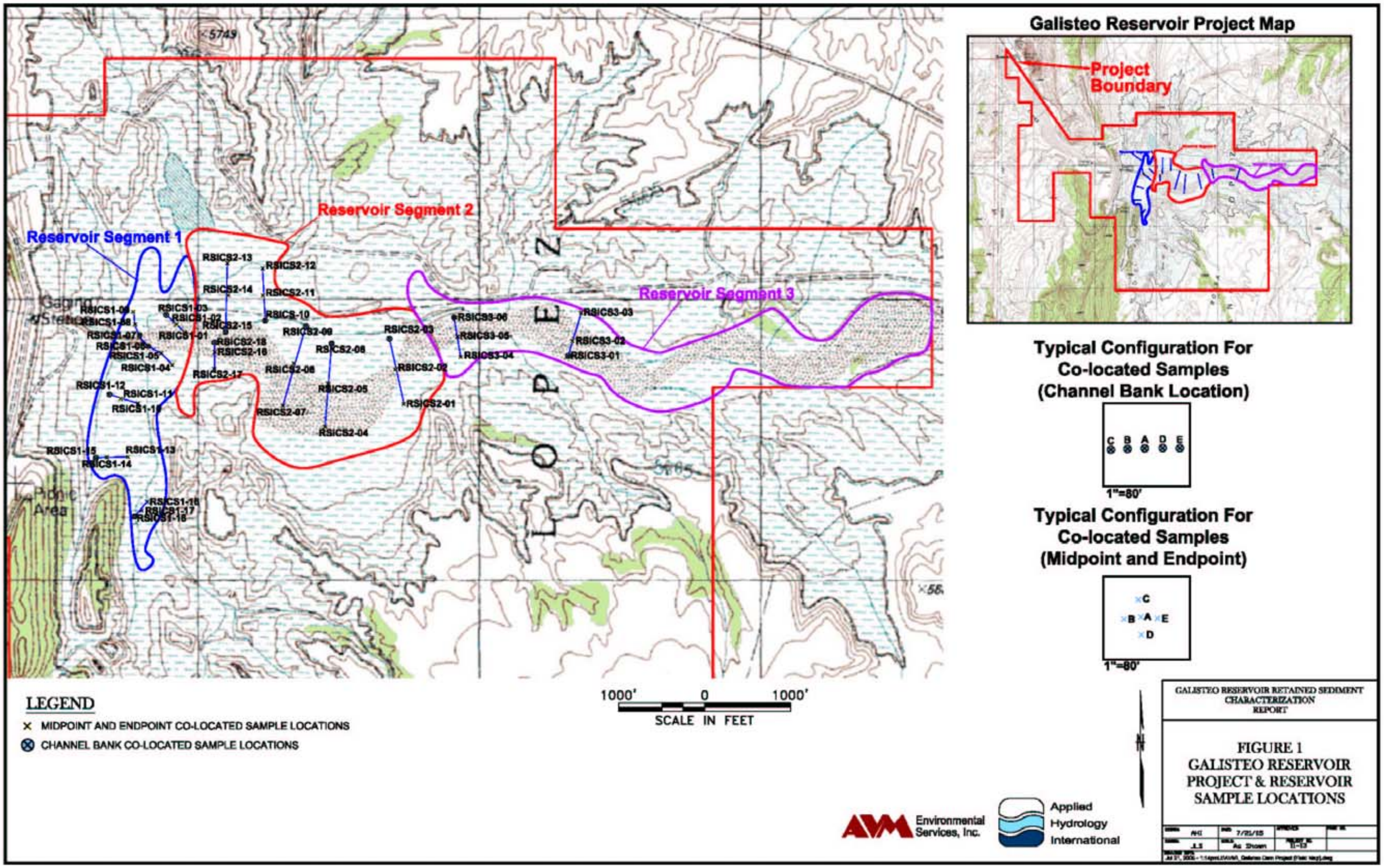


FIGURE 1
GALISTEO RESERVOIR
PROJECT & RESERVOIR
SAMPLE LOCATIONS

2.0 PROJECT OBJECTIVES

The primary objective of this work is to characterize the sediments that are likely to be released from Galisteo Reservoir as a result of saltcedar eradication. A work plan was prepared, which established the specific chemical parameters that were included for analysis based on the constituents that could be present as a result of natural mineralization and historical mining and smelting activities within the watershed and the aquatic and human health criteria relevant to the stream water and bed sediments in the Rio Grande River.

The following specific objectives for the sediment characterization study were established in the Work Plan:

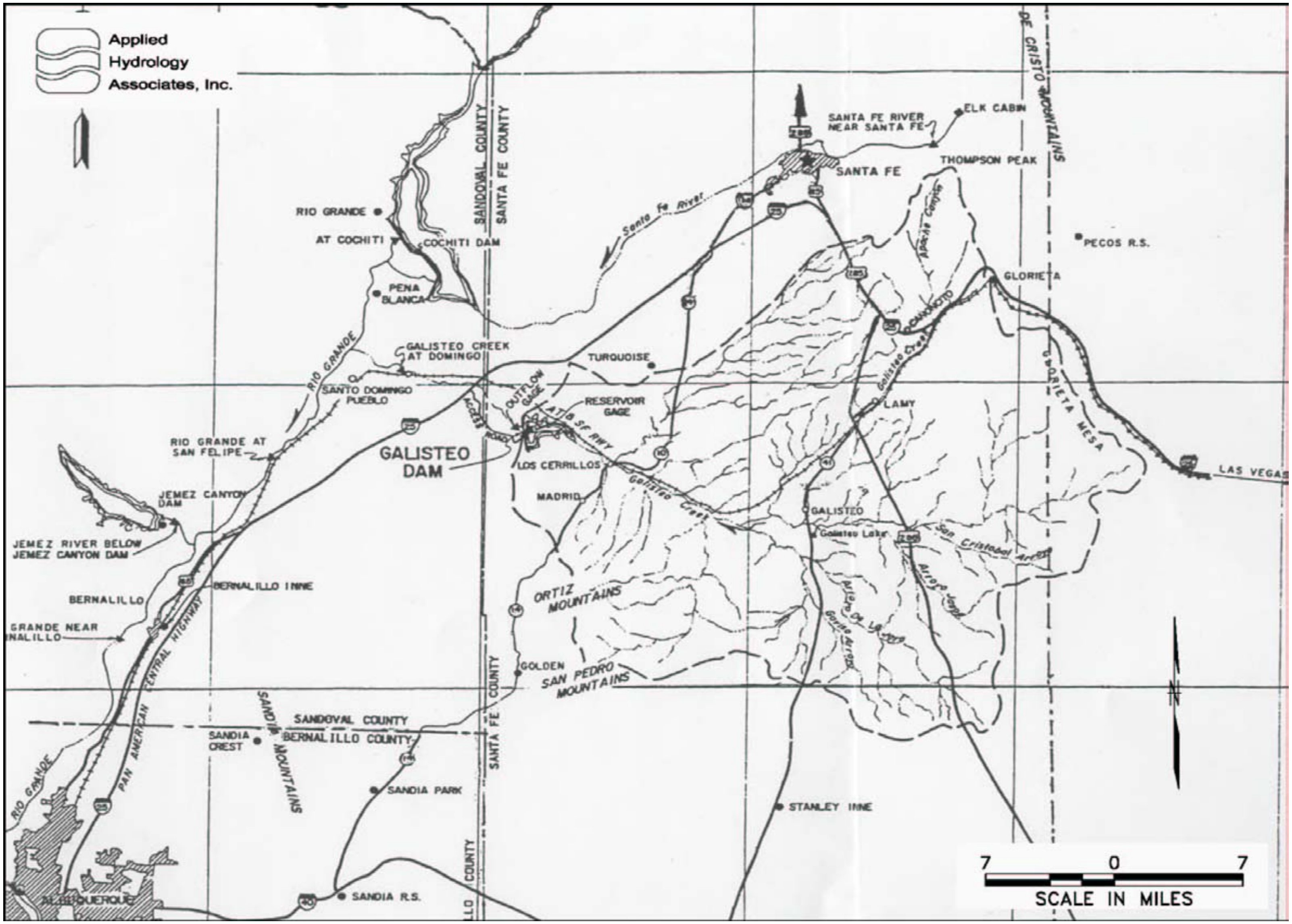
- Determine the median concentration and variability for the selected chemical parameters in the retained sediments that could be released from Galisteo Reservoir.
- Determine the particle size distribution for retained sediments that could be released from Galisteo Reservoir for transport assessment purposes.
- Determine the leachability of metals in the retained sediments that could be released from the Galisteo Reservoir.
- Compare the concentration of selected chemical parameters for sediment samples with relevant sediment quality guidelines for aquatic life, with relevant soil criteria for human health, and with background bed sediments in the Rio Grande, and in the Galisteo Creek and the South Tributary upstream of Galisteo Reservoir.
- Compare the leachate concentrations of retained sediments with relevant water quality standards for the Rio Grande below Galisteo Creek.

Although the initial proposed saltcedar eradication is for an area of approximately 55 acres immediately upstream of the dam, shown as Segment #1 in Figure 1, selective saltcedar eradication also be conducted within other portions of the reservoir in subsequent operations. Therefore, the retained sediments were characterized within all the portions of Galisteo Reservoir that exhibit extensive thickets of saltcedar. In addition, “background” sediments from upstream of the reservoir were characterized for comparison purposes.

3.0 PROJECT BACKGROUND

Galisteo Dam and Reservoir is located on Galisteo Creek 11.8 miles upstream of its confluence with the Rio Grande. Construction of the dam was completed in September 1970. The Galisteo Dam was built for flood and sediment control from the 596 square mile drainage area above the dam (see Figure 2). The project serves to control flooding on Galisteo Creek below the dam and on the Rio Grande

Figure 2
Galisteo Creek Watershed



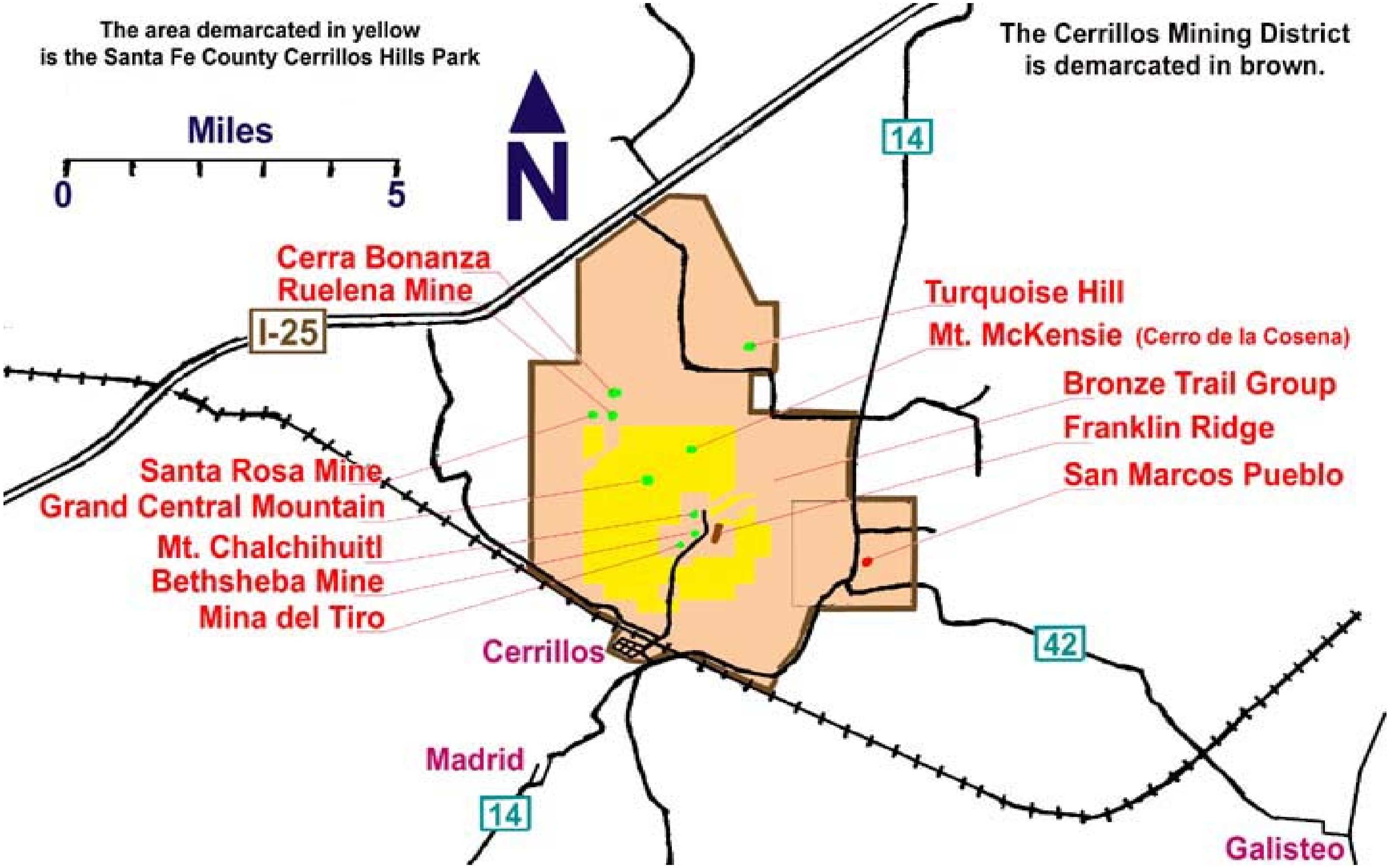
below the confluence with Galisteo Creek. In 1998, the dam height was raised and the spillway capacity was increased to accommodate the probable maximum flood. Flood control releases from the reservoir are uncontrolled and regulated only by the stage-discharge relationships of the principal outlet and the emergency spillway. There is no permanent pool in the reservoir and a dense thicket of saltcedar extends throughout the bottom of the reservoir except within the stream channels.

The elevations within the Galisteo River drainage basin range from about 10,500 feet in the Sangre de Cristo Mountains in the northeast portion of the drainage basin to 5496 feet at the outlet from the reservoir. Vegetation ranges from dense coniferous forests in the mountains, pinion and juniper in the foothills, and semiarid rangeland at the lower elevation in the western and central portions of the drainage basin.

According to USACE (2001), there have been no sediment management activities conducted at the reservoir other than occasional monitoring of sediment accumulation from 7 reservoir sediment ranges (surveyed transects) located above the dam and periodic removal of debris from the intake trashrack at the principal outlet. Estimates of the volume of retained sediment determined from the sediment range surveys performed in 1973, 1983, and 1985 were 810, 832, and 880 acre-feet of sediment, respectively. Sediments are retained in the reservoir during high flows as flow velocities are slowed by retention of water in the reservoir. Sediments are removed by channel scour and bank sloughing when flows are confined to the stream channels flowing through the reservoir. Greater fluctuation in the retained sediment volume is expected to have occurred in the initial 10-15 years following reservoir construction before the saltcedar thickets became well established. The dense thicket of saltcedar extending throughout the reservoir now serves to retain sediments by reduced bank sloughing and erosion of sediment deposits. However, the current volume of retained sediment is unknown.

More than 20 prominent types of geologic formations exposed in the drainage basin above Galisteo Dam contribute sediments to the reservoir. Thunderstorms produce flash flows with high sediment concentrations consisting of nearly equal portions sand, silt and clay (USACE, 2001). Erosion of arroyos and bank sloughing along Galisteo Creek and its tributaries account for much of the sediment reaching Galisteo Reservoir. There is also potential for elevated metals concentrations in sediments due to natural mineralization and historic mining and smelting activities that have occurred upstream of the reservoir. Ore-related metals derived from mining and milling wastes typically accumulate in the bed sediments of streams and reservoirs located downstream from historical mining sites (Nimick et al). The natural mineralization and historic mining is concentrated within an area of approximately 30 square miles, referred to as the Cerrillos Mining District, located along Galisteo Creek near the town of Cerrillos and to the north of Galisteo Creek as shown in Figure 3. The mining history of the Cerrillos Mining District has been documented by Milford (1994 and 1996). Mining of turquoise and

Figure 3
The Cerrillos Mining District



lead minerals occurred during the pre-Columbian period. Silver was mined by the early Spanish colonial miners from a pronounced zone of silver enrichment, "supergene enrichment," near the water table within the silver-lead sulfide (galena) deposits. Silver, zinc, lead and gold were mined at numerous locations throughout the Cerrillos Mining District during the latter part of the 19th Century. During this time, silver, lead, and zinc smelters were established at Cerrillos and Waldo. Mining activities declined during the early part of the 20th Century. Both gold mining and coal mining began in the Madrid area as early as the mid-1850's. Coal mining flourished during the early part of the 20th Century. Coal mining operations closed in the 1950s.

Hard-rock mining for copper, gold, silver, and other minerals and processing of these minerals has contaminated stream sediments and surface water at many active and abandoned mine sites in the Western United States. Some reclamation work has been done in the Cerrillos Mining District (Cerrillos Hills, USACE 2002) and at the Cerrillos Smelter (EPA 2001). Little data exists on the nature and extent of contamination within and downstream of the Cerrillos Mining District or in the vicinity of Madrid. Characterization of the mining and milling wastes associated with the smelters located at Cerrillos found elevated levels of metals with lead and arsenic above target clean-up levels.

4.0 SEDIMENT SAMPLING ACTIVITIES

Sediment sampling activities were performed in accordance with the USACE approved Work Plan, Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP). The Work Plan included rationale for obtaining representative sediment samples, selection of sampling parameters and standards for sediment, and evaluation criteria based on the sediment characterization objectives. The SAP described all field sampling and laboratory analytical activities necessary to meet the project objectives. The SAP outlined sediment sample types and proposed locations with sampling point coordinates. The SAP also described the equipment and supplies needed for field sampling, the sampling procedures, the sample collection method and containers, the field sample preparation procedures, the sampling equipment decontamination procedures, the sample handling and shipping procedures, and the required laboratory analysis. The QAPP for the sediment characterization was prepared and attached to the SAP. The QAPP described the specific quality assurance and quality control procedures for sediment sampling and analysis.

4.1 Sediment Sampling Strategy

The reservoir was subdivided into three segments as shown in Figure 1. Although the current plans for saltcedar eradication are focused on Segment #1, saltcedar thickets within other portions of the reservoir could be eventual targets for eradication in the future. Consequently, retained sediment samples were obtained for all the portions of Galisteo Reservoir that exhibited extensive thickets of saltcedar. As discussed in the work plan, it was thought that sediment particle size will be finer and the metals concentrations higher in the sediments within Segment #1, which is at lowest elevations nearest the dam. Elevations are generally higher, the sediment deposits are thinner, and the metals concentrations are expected to be lower within Segment #3. Segment #2 is a transition segment, where the saltcedar thickets are the most likely targets for eradication after successful completion of the eradication program in Segment #1. Therefore, most of the sediment sampling was concentrated within Segment #1 and 2. However, samples were collected from Segment #3 to test the hypothesis that the Segment #3 retained sediments exhibit a coarser particle size distribution and lower metals concentrations.

To obtain representative samples of the sediments that are likely to be released from Galisteo Reservoir, more samples were taken from the locations immediately adjacent to the main stream channels and fewer samples taken at greater distance from these channels. Also, samples taken adjacent to the channels include representative samples of the entire stream bank profile while the depth of sampling diminishes with distance from the stream channels. Thus individual sampling locations were established at specified locations along transects running perpendicular to the stream bank.

The coordinates for the individual co-located composite sample locations for each Reservoir Segment and for the Background segments were provided in the SAP along with a map of the proposed locations. The proposed midpoint sampling location #2 and endpoint sampling location #3 in the Reservoir Segment #3 were in a marsh area with some standing water. Consequently, these sampling sites were both relocated to the nearest point at the edge of the marsh swamp. The individual co-located composite sediment samples at these two locations were collected from five sample aliquot points in the liner pattern, similar to the channel bank samples.

The background sediment sampling was divided into two segments. The baseline sediment sampling in the Galisteo Creek downstream of the Galisteo Dam as Background Segment #1. Background Segment #1 sediment represents the sediment that is currently transported down Galisteo Creek to the Rio Grande. The background sediment samples upstream of Galisteo Reservoir referred to as Background Segment #2 represents the sediments in Galisteo Creek upstream of the historic mining sites near Cerrillos and Madrid.

4.2 Sediment Sample Type and Locations

It was expected that some spatial variation in particle size distribution and metals concentrations would exist among sample point locations within the vicinity of each sample location. Therefore, the sampling of retained sediments at Galisteo Reservoir and the sampling of background sediments consisted of composite sampling from co-located five point samples at each designated sampling location. Composite sampling was proposed to obtain samples that are more representative of the average characteristics at each sampling location. Composite sampling helped reduce the cost of analysis without loss of information needed for sediment characterization. Although single point sampling is often a preferred sampling method for investigation of contaminated areas for hot spots and removal action, it is not an efficient method of sampling to characterize the sediments that are removed from a large area by erosion and mixed and homogenized by transport and depositional processes.

The individual reservoir co-located composite sediment sampling locations were placed along a series of transects located perpendicular to the main Galisteo channel and the south tributary channel as shown in Figure 1. The individual co-located composite sediment samples consisted of the following:

> **Reservoir Retained Sediment Channel Bank**: A five-point channel bank individual co-located composite sample from the surface sediment at the channel bank. The surface individual co-located composite sediment sample consist of 4” plug or core sample aliquots taken from the surface about one foot inset from the edge of the bank at the transect location and at distances of 15 feet and 30 feet parallel to the channel bank on both sides of the first aliquot location at each bank. For the channel bank greater than 2.0 feet high at the sampling location, one or more five point individual co-located composite samples from the subsurface sediments within the channel bank. The subsurface individual co-located composite sediment sample consisted of five 6-inch core sample aliquot taken at specified depth from the top of the bank at the same sample aliquot points as the five surface co-located sample aliquot points at that sampling location. Channel banks at all sampling locations in the Reservoir Segment #2 and #3 ranged from about 1.5 feet to 3.0 feet. The channel banks at sample locations in Reservoir Segment #1 were up to 8 feet high. The first subsurface individual co-located composite sediment sample consist of a 6” plugs or sample aliquots taken from the channel bank at depth of 2.0 feet from the top of the channel bank in Segment #1 and #2, and at 1.5 in Segment #3 at all channel bank sampling locations. Four sampling locations at channel bank in Reservoir Segment #1 at four feet or higher, a second subsurface individual co-located composite sediment sample was obtained at a depth of 4.0 feet from the top of the bank. For three sampling locations at channel bank in Reservoir Segment #1 at six feet or higher, a second subsurface individual co-located composite sediment sample is obtained at a depth of 6.0 feet from the top of the bank. Two sampling locations at channel bank in Reservoir Segment #1 at eight feet high, a fourth subsurface individual co-located sediment composite is obtained at a depth of 8.0 feet from the top of the bank.

> **Reservoir Retained Sediment Midpoint**: The midpoint individual co-located composite sediment samples were obtained at an intermediate location along the transect at a distance of

approximately 1/3 the length of the transect from the channel bank. Both a surface and a subsurface composite sediment sample were collected at this location. The surface composite sediment sample at each location consisted of a 4" plug or core sample aliquots taken from the surface at the designated sample location and at four additional sample aliquot locations collected at a radial distance of 15 feet from the designated sample location. The direction of the first radial sample aliquot location was random, and the other three locations were separated by 90 degrees from the first (random) location direction. The subsurface co-located composite samples consist of a 6" plug or core sample aliquots collected starting at a depth of 1.5 feet below the surface at each of the surface sample aliquot locations.

Reservoir Retained Sediment Endpoint: The end-point co-located composite sediment samples were collected from locations at a distance of approximately 2/3 the length of the transect from the channel bank. Only a surface composite sediment sample was collected from this transect end-point location because the elevations are higher and sediment deposition are thinner at the endpoint locations. The surface composite sediment sample at each end-point location consist of 4" plug or core sample aliquots taken from the surface at the designated sample location and at four additional sample aliquot locations collected at a radial distance of 15 feet from the designated sample location. The direction of the first radial sample aliquot was random, and the other three were separated by 90 degrees from the first (random) location direction.

The individual co-located composite background sediment samples were collected from six locations within the Galisteo Creek channel upstream of the Cerrillos Mining District and Madrid as shown in Figure 4. These background sediment samples are referred to as Background Segment #2 sediment samples. Individual co-located composite baseline sediment samples were also collected from six locations within the Galisteo Creek channel downstream of Galisteo Reservoir as shown in Figure 5. These baseline sediment samples are representative of the sediment that is currently transported down Galisteo Creek to the Rio Grande and are referred to as Background Segment #1 sediment samples.

The individual co-located composite background and baseline sediment samples at each sampling location consist of 4" plug or core sample aliquots taken from the surface in the center of the channel at the designated sample location and at four additional points located at distances of 15 feet and 30 feet upstream and downstream of the first aliquot location (specified sample location) as shown in Figures 4 and 5. The aliquots collected at distances of 15 feet upstream and downstream of the specified sample location were obtained at locations that are 1/3 of the distance between the channel banks measured from the left bank, as determined facing downstream. The aliquots collected at distances of 30 feet upstream and downstream of the specified sample location were obtained at locations that are 2/3 of distance between the channel banks measured from the left bank.

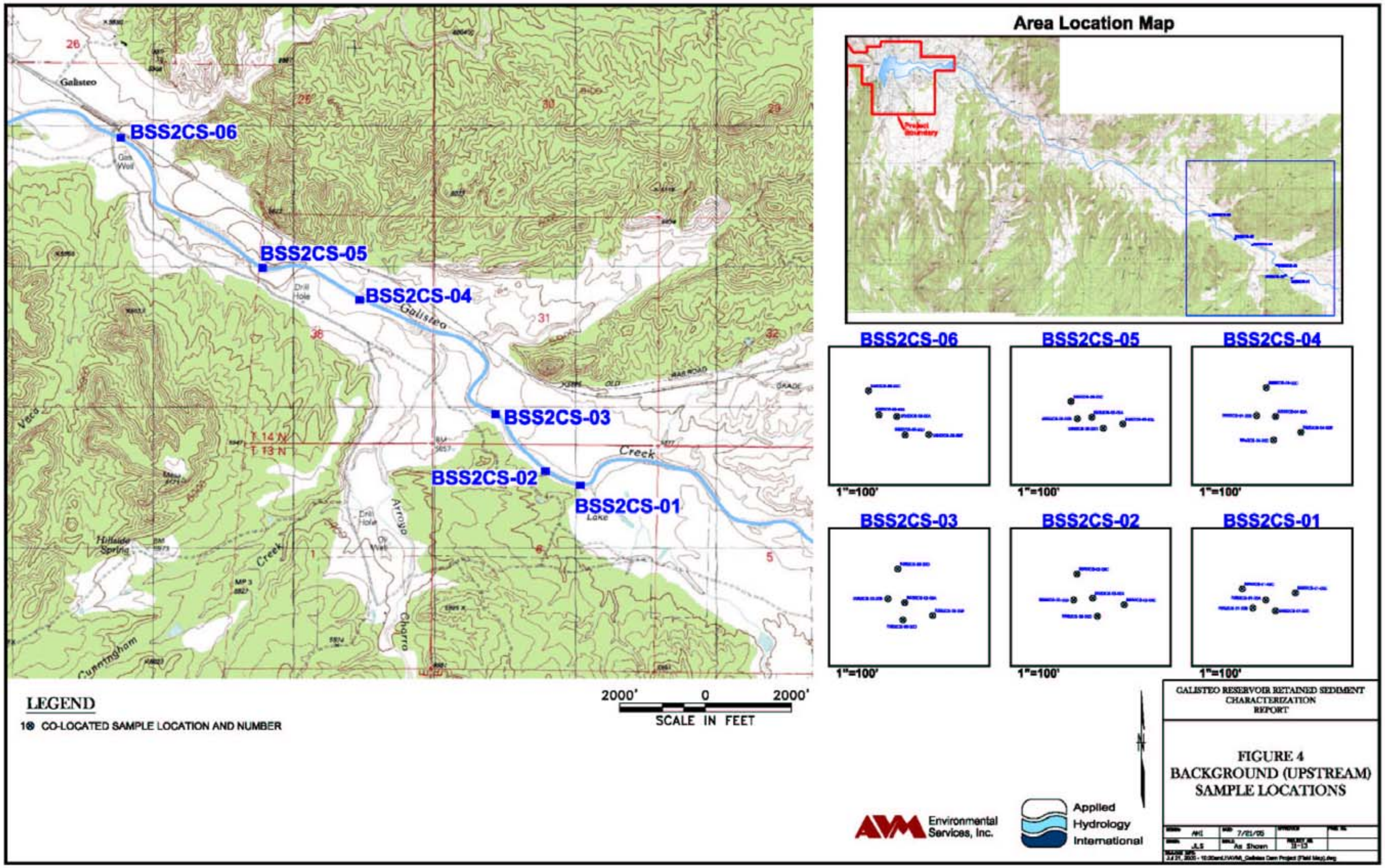
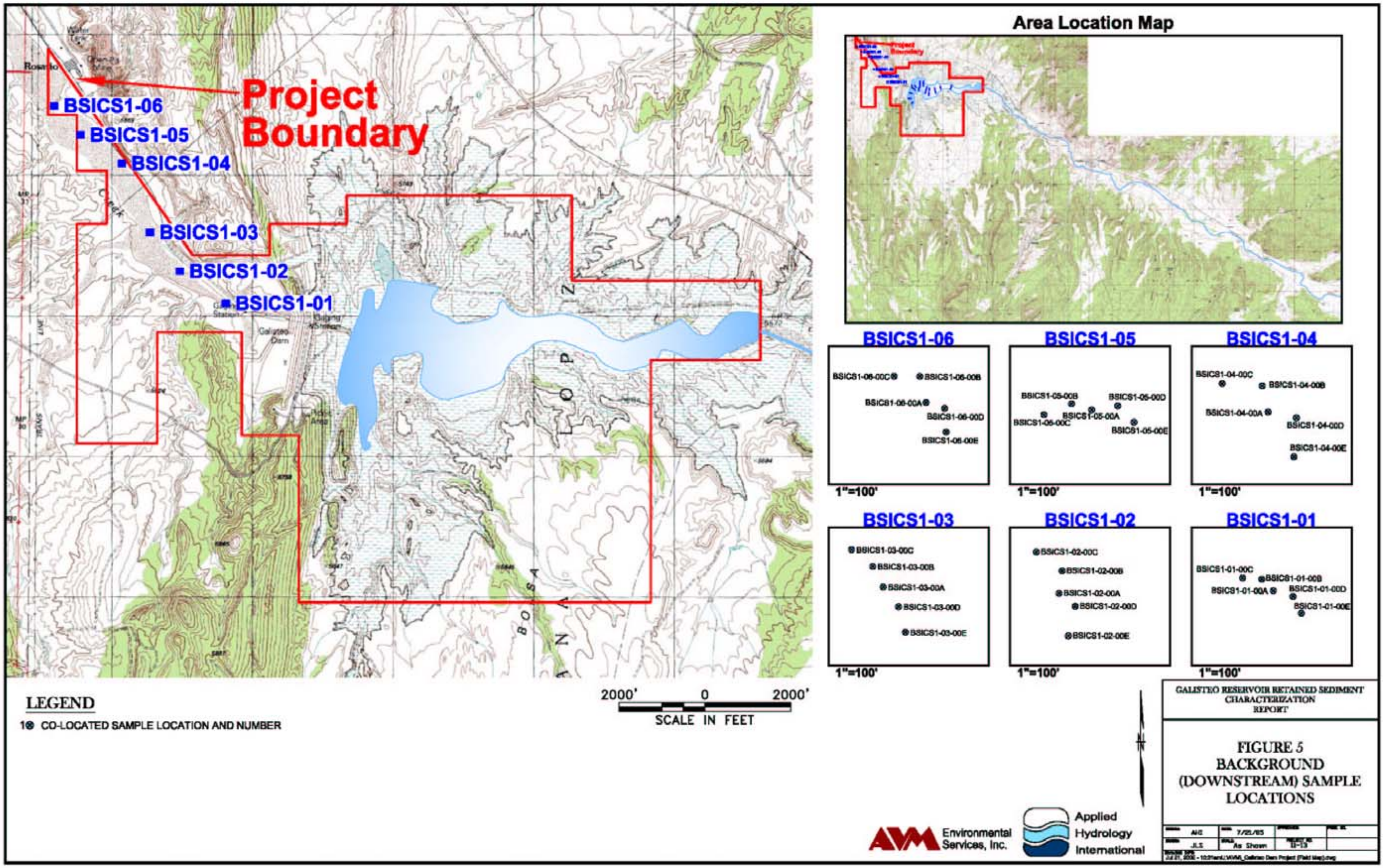


FIGURE 4
BACKGROUND (UPSTREAM)
SAMPLE LOCATIONS



GALISTEO RESERVOIR RETAINED SEDIMENT CHARACTERIZATION REPORT

FIGURE 5
BACKGROUND (DOWNSTREAM) SAMPLE LOCATIONS

4.3 Analyses of Composite Samples

The characterization includes sampling and analyses of the retained sediments and analysis for:

- physical characteristic (particle size distribution) for transport assessment.
- heavy metal concentration for assessment of potential impacts on aquatic organisms and human health.
- leachable metals for environmental assessment of potential impacts on downstream water quality criteria.

The individual co-located composite samples from retained reservoir transacts and from background and baseline locations were analyzed for metals as described in Subsection 4.3.2. In addition, composite samples of the retained sediment from each reservoir segment and from both the background (upstream) and baseline (downstream) locations were prepared for physical and chemical analysis as described in Subsections 4.3.1 and 4.3.2.

The reservoir retained sediment segment composite samples were prepared by combining equal weight aliquots from each of the individual co-located composite sediment samples obtained from that segment. The aliquot weight is determined by number of individual co-located composite sediment samples collected from that segment to obtain a certain amount of sample needed for testing and analysis. The reservoir retained sediment segment composite samples were prepared to determine the particle size distribution and leachable metals for water quality and transport assessment of the sediments that may be released from the Galisteo Reservoir.

Channel bed sediment composite samples were prepared for the baseline (downstream) and background (upstream) segments. The background and baseline sediment segment composite samples were prepared by combining equal weight aliquots from each of the individual co-located composite sediment samples obtained from the respective segment. The background and baseline sediment segment composite samples were prepared to determine the particle size distribution and leachable metals for water quality and transport assessment.

4.3.1 Physical Parameters

The physical parameters include sieve analysis and hydrometer testing for particle size distribution and solubility testing. The composite samples from each reservoir segment and from the baseline and background channel segments were analyzed for particle size distribution using ASTM Method C36. A hydrometer testing was performed on -63 µm fraction from each of the segment sediment composite sample using method ASTM D422.

The solubility test on each of the reservoir segment sediment composite samples and each of the channel segment "background" sediment composite samples was performed using the synthetic precipitation leaching procedure (SPLP) method 1312. The leachate obtained from this test was analyzed for metals as described in Section 4.3.2.

4.3.2 Chemical (Metals) Parameters

Since there is little information to identify the metals that are likely to be present in Galisteo Reservoir sediments from sources in the watershed, retained sediment samples will be analyzed for all metals listed in Table 1. The Table 1 metals were obtained from the relevant water quality standards for the Rio Grande River as described in the Work Plan. All the metals in this table could be present in reservoir sediments due to the historic hard rock mining and smelting activities, past coal mining, past and current agricultural practices or natural sources located within the Galisteo Creek Watershed. Table 1 also includes all metals listed in relevant sediment quality guidelines.

Analyses of Table 1 metals was performed on the following samples:

1. All individual co-located composite reservoir and background sediment samples.
2. The composite samples of the retained sediment from each reservoir segment and from both the background (upstream) and baseline (downstream) locations.
3. Both the +63 µm and –63 µm sieve fractions from the particle size fractioning of the composite samples described in 2.
4. Leachates from the solubility tests (SPLP) performed on the reservoir segment sediment composite samples and the channel segment "background" sediment composite samples described in 2.
5. The equipment decontamination Quality Assurance/Quality Control (QA/QC) rinseate blank samples

4.4 Sampling Planning and Coordination

The field sampling activities began with a meeting on October 1, 2004 with USACE project staff at the Albuquerque District office. AVM discussed a field sampling approach, proposed sampling schedule, coordination, and site access needed to implement sampling. The proposed Background Segment #1 sediment sampling points #2 through #6 in the Galisteo Creek downstream of the Galisteo Dam were located within the Santa Domingo Reservation. The USACE Project Manager agreed to obtain an access arrangement from the Santa Domingo Reservation for sampling at these baseline locations. Access to the proposed Background Segment #2 sediment sampling locations #1, #2 and #3 in the Galisteo Creek upstream of the Cerrillos Mining District were located within private property. AVM agreed to obtain access arrangement into the private property for these locations.

On October 12, 2004, AVM personnel met with Mr. Craig Lykins of the USACE at the Galisteo Dam and discussed site access coordination. A key to the dam gate was provided to AVM. At the request of Mr. Craig Lykins, the AVM Project Manager called the USACE Ranger office on a weekly basis to provide a tentative schedule. AVM personnel conducted a project orientation meeting at the Site and discussed preliminary planning and coordination of field sampling activities and health and safety orientation. The planning included sampling sequence, vehicle access to the sampling area, sampling equipment and supplies, and sampling equipment decontamination supplies, transportation to the sampling locations, sample preparation (screening sample through #10-mesh sieve, sample equipment decontamination, and preparing segment sediment composite samples).

Background Segment #2 sample locations #1, #2 and #3 were on the Earth Work Institute (EWI) property. AVM Personnel met with Mr. Jim Ratchford of EWI and received permission for access to these sampling locations. Background Segment #2 sampling locations #4, #5, and #6 were in the Galisteo Creek at an un-fenced public property.

4.5 Sediment Sample Collection

All sampling and analysis activities were performed in accordance with the Health and Safety Plan (HASP), SAP and QAPP. Any modifications needed were to adjust to field conditions; such modifications were discussed with the USACE Project Manager and implemented during field sampling activities. All modifications are discussed in this report. Necessary field sampling supplies, material and equipment, including safety supplies as listed in the SAP were procured prior to the field sampling mobilization.

Mobilization activities included obtaining all sample containers with appropriate environmental sample labels and assembling and checking all field sampling equipment and supplies. The SAP specified 8-glass jars for collecting sediment samples for metal analysis. However, 8-oz plastic jars were used for collecting the sediment samples for metal analysis because traces of boron from the glass jars may interfere with the analysis. The plastic jars are approved containers for USEPA method 3050, 6010/6020. The field sediment sampling started on October 12, 2004.

4.5.1 Sediment Sample Collection Procedure

The individual co-located sediment sample collection was conducted using the following procedure:

1) Field located the sample location using sample location maps and the proposed sample coordinates provided in the SAP. Used field benchmarks, such as channel bends and topography to locate the general area of sample location. Used the proposed sample coordinates in the Differential Global Position System (DGPS) navigation to locate the accurate sample location. The specified proposed sample location coordinates listed in the SAP are approximate. These sample locations were modified in the field to the channel bank edge nearest the proposed channel bank sample coordinates and to the channel center nearest the proposed channel bed sample coordinates listed in the SAP. The GPS coordinates for these "actual" sample locations were recorded in the field data form.

   As discussed previously, the proposed Background Sediment Segment #1 sediment sampling points #2 through #6 in the Galisteo Creek downstream of the Galisteo Dam were located within the Santa Domingo Reservation. The USACE was unable to obtain an access agreement from the Santa Domingo Reservation. The reach of Galisteo Creek downstream of the Dam before it enters the Santa Domingo Reservation is approximately 1.5 miles. Consequently, the six individual co-located composite samples were obtained within the reach of Galisteo Creek between the reservoir and the Santa Domingo Reservation. The revised Background Segment #1 sediment sampling locations and rationale were discussed with and approved by the USACE project staff. The sampling points were biased to low and flat channel bed areas to obtain finer sediments, which were thought to be more representative of the sediments that are transported to the Rio Grande. Therefore, the six co-located individual composite sediment samples were collected from the revised locations. No trespassing or sampling occurred on the Santo Domingo Pueblo land.

2) Field personnel located each of the co-located sample aliquot sampling point locations, as discussed in Section 4.3. Obtained the actual coordinates of the sample locations using the DGPS. Recorded appropriate sampling information in the field sampling data form and logbook.

3) Removed any surface vegetation and biomass from about a 2-foot diameter area of the sampling location using the hand rake.

4) Collected the surface sediment sample aliquots and channel bed sediment sample aliquots to a depth of 4" at each of the co-located sample locations using the hand auger. The 4" depth sample was collected by driving the auger to a 4" mark on the auger cylinder. Lifted the auger from the hole and removed the sediments from the auger cylinder and placed it in the stainless steel mixing bowl. Combined and mixed all five co-located sample aliquots for an individual co-located composite sediment sample.

5) Screened the composite sediment sample through a #10 (2mm) stainless steel sieve to remove any vegetation, biomass or rocks. Again thoroughly mixed the screened composite sample using a spatula. In order to avoid carrying of excess sampling equipment through the dense saltcedar thicket, the midpoint and endpoint samples were transferred to a marked ziplock bag from the stainless steel mixing bowl and brought back to the channel bed or the truck for screening. The screened individual co-located composite sediment sample was transferred into a one-gallon ziplock bag. The ziplock bag with the sample was marked with sample ID, date and time and placed in a cooler with ice.

   All samples were screened in the field except from six sample locations in Reservoir Segment #1 and two locations in Reservoir Segment #3. These samples were too moist for field screening. These samples were brought back to the office in plastic ziplock bags. The ziplock bags were opened, and the samples were allowed to air dry within the bag until the samples were sufficiently dry to screen through the 10-mesh sieve.
6) Decontaminated the sampling equipment, using the decontamination procedure described in the following subsection.

7) For the subsurface samples at the middle location of the reservoir transects, augered and cleaned the borehole at each of the surface sample aliquot location to a depth of 1.0 foot. Then collected the subsurface sample aliquot from each co-located borehole by hand augering 6 inches to a depth of 1.5’. For the subsurface samples at the channel bank location of the reservoir transects, a shovel was used to clean the exposed sediment from the channel bank. The subsurface sample aliquots were obtained by hand augering 6 inches horizontally into the bank at the specified depth at each of the sample aliquot location. All co-located aliquots from the specified depth interval were combined in the stainless steel mixing bowl and mixed for a subsurface individual co-located composite sediment sample.

8) After all sediment sampling was completed at a given location, the excess (reject) samples were placed back into the boreholes. Placed a survey stake marked with sample location ID for future reference, if needed. For all channel bed sediment sampling sites, the stake was placed on the stream bank adjacent to the center sampling location.

9) For each of the individual co-located composite sediment sample locations a portion of the screened composited sample was transferred from the ziplock bag to an 8-oz plastic sample jar for metal analysis. The sample jars were capped and labeled with appropriate sample information. The sample jar was placed in a refrigerator until delivered to the laboratory for analysis. The ziplock bags with the excess individual co-located composite sediment samples were temporarily stored in a refrigerator.

10) After all of the individual co-located composite sampling was completed for a reservoir segment or for the background (upstream) and baseline (downstream) locations, a segment composite sample was prepared from the excess individual co-located composite sediment sample stored in the refrigerator. The weight of the aliquot from the individual co-located composite sediment samples required to prepare a 7,500 gram segment composite sample was determined based on the number of individual co-located composite sediment samples collected within the segment. A 250 gram aliquot from the individual co-located composite sediment samples was used for the Reservoir Retained Sediment Segment #1; a 300 gram aliquot was used for the Reservoir Retained Sediment Segment #2; a 700 gram aliquot was used for the Reservoir Retained Sediment Segment #3; and a 1,400 gram aliquot was used for the Background Sediment Segment #1 and Background Sediment Segment #2.

    The sediment sample aliquots for each of the specified reservoir and background sediment segment composites were thoroughly mixed in the 5-gallon bucket. Two 8-oz plastic jars were filled from the mixed sediment segment composite sample in the 5-gallon bucket: one for metal analysis and one for SPLP testing. About 5 pounds of the mixed sediment segment composite sample in the 5-gallon bucket was also placed in a 1-gal plastic bag (for particle size analysis and hydrometer testing). The sample jars were capped and 1-gal plastic bags were sealed. Each jar and bag was labeled with appropriate sampling and required analytical information.

11) As discussed in the SAP and QAPP, QA/QC sampling was performed for the sediment characterization sampling. A field duplicate sample was collected for approximately 10% of the sediment samples collected for laboratory analysis. A total of 10 QA/QC field duplicate samples were collected for a total of 92 individual co-located composite sediment samples collected for the sediment characterization project. The QA/QC field duplicates were assigned with a Q prefix for the sample ID.

    For the sediment characterization sampling, one equipment decontamination rinse blank sample was collected for each type of sampling and sample preparation equipment (auger, scoop, mixing bowl and the 10-mesh sieve) used for sample collection. Following completion of one of the sample equipment decontamination process on October 22, 2005, rinsed the decontaminated auger, scoop and mixing bowl with de-ionized water, and collected this rinse blank water sample in a 1-liter plastic jar with 3 ml of HNO_3 as a preservative. The rinse blank for the 10-mesh sieve was collected on October 25, 2005. A field trip blank was collected for the sampling project on October 29, 2005. De-ionized water was provided by the laboratory in a 1-gallon plastic jug. The de-ionized water was transferred into a 1-liter plastic bottle with 3 ml of HNO_3 as a preservative in the field and labeled, and placed with the samples.

Field sampling activities were completed on December 29, 2004 with delivery of the last set of sediment composite samples to the Assaigai Analytical Laboratories, Inc. (AALI). Field sampling dates were adjusted for weather and ground conditions. Sediment samples obtained for the Galisteo Reservoir sediment characterization are listed in Table 1. A total of 92 individual co-located composite sediment samples were collected. The sampling locations are shown in Figures 1, 4 and 5. Tables containing the sample location coordinates are included in Appendix A. Ten field duplicates were collected for QA/QC. Five sediment segment composites were prepared for physical parameter testing. The field sampling data forms with the field sampling information are included in Appendix A. In addition to the sediment samples described in Table 1, four QA/QC equipment decontamination rinse blanks and one trip blank were collected for the sediment characterization sampling.

Table 1
Sediment Samples Collected for Galisteo Reservoir Retained Sediment Characterization

Sediment Segment	Individual Co-Located Composite Samples (For Metal analysis)				Segment Sediment Composite (For Metal, sieve, hydrometer and SPLP analysis)
	Channel Bed	Channel Bank	Mid Point	End Point	
Reservoir Segment #1	-	22	12	6	1
Reservoir Segment #2	-	12	12	6	1
Reservoir Segment #3	-	4	4	2	1
Background Segment #1	6	-	-	-	1
Background Segment #2	6	-	-	-	1
QA/QC	2	5	1	2	-
Total	14	43	29	16	5

4.5.2 Sampling Equipment Decontamination

Equipment used to collect and composite the soil samples, including the soil auger, bucket, and trowel were decontaminated following sampling at each location according to the following procedures:

- Step 1: The equipment was washed with a solution of tap water and Alconox cleaner (biodegradable and rinse completely with no interfering residue), and scrubbed with a stiff bristle or nylon brush.

- Step 2: The equipment was then rinsed with tap water followed by de-ionized water.

Each step utilized a separate wash/rinse basin. A spray bottle was used for final rinsing with de-ionized water. The decontamination water, which contained only the detergent and soil from the sampling location was placed in the sample holes at the corresponding location along with the excess soil remaining after sampling. Decontamination water would help compact the replaced soil and will help prevent wind erosion from the sampling site. This procedure is appropriate because contaminants are not removed from the sampling location and are not added or increased by the sampling activity. Since all equipment were decontaminated following sampling, there was no sampling wastes that needed to be disposed other than used gloves, which were disposed of as solid waste.

4.5.3 Sample Numbering, Identification & Labels

The sample numbering & identification consisted of the following site and sample designation:

"RSICS**X-YY-ZZ**"	Reservoir Retained Sediment Individual Co-Located Composite sample, Segment X, sample No. YY, at depth ZZ (depth 00 indicates surface sample).
"BSICS**X-YY-ZZ**"	Background Sediment Individual Co-Located Composite Sample, Segment No. X, sample No. YY, at depth ZZ (background sediment samples are surface samples only).
"RSS**X**CS-01"	Reservoir Retained Sediment Segment X Composite Sample.
"BSS**X**CS-01"	Background Sediment Segment X Composite Sample.
"SEDRNB-0**X**"	Sampling Equipment Decontamination Rinse blank Sample No.0X.
"GALTRB-0**X**"	Galisteo Trip Blank No.0X.

Sample designations were identified on a map and on the field sampling data form. Recorded sampling information, including sample coordinates, on the field sampling data form.

A completed environmental sample label was affixed to the sample container prior to or at the time of sampling. The purpose of the sample label is to prevent misidentification of samples and provide sufficient information to identify the sample without reference to the sampling logbook. At a minimum, the sample label contained the following information:

- Sample identification;
- Sampler's initials;
- Date sampled;
- Requested analysis (TAL metals USEPA SW846 6020, Particle Size Distribution ASTM C36, and hydrometer testing ASTM D422, Solubility Test SPLP method 1312, etc).

4.5.4. Sample Preservation & Holding Time

Sediment samples do not require any added preservative or maintaining the sample temperature at 4°C. The samples can be maintained and delivered to the laboratory at ambient temperature. However, the sediment samples were kept cool at 4°C until delivered to the laboratory. The equipment decontamination rinse blank and trip blank samples were preserved with HNO_3 and maintained at 4°C. The holding time, before the laboratory starts analysis for these sediment characterization parameters is 28 days for mercury and SPLP analysis, and six months for all other metals for sediment as well as equipment rinse blank samples. All samples were delivered to the laboratory within the required sample holding time.

4.6 Chain of Custody

Chain-of-custody (COC), with all sample necessary sample identification, handling and preservation information and analytical requirement were completed for all samples. The COC record remained with the samples at all times and was placed in a zip-lock bag and taped to the underside of the cooler lid with the name of the person (field technician) assuming responsibility for the samples. Any corrections to the COC was made with a single line through and initialed. To simplify the COC record and eliminate potential problems, as few people as possible handled the sample or physical evidence during the sediment characterization.

4.7 Sample Packaging and Shipping

The laboratory provided the sample jars and shipping containers needed to maintain sample integrity from the time of sample collection through analysis. All samples collected during this sediment characterization were properly labeled and packaged for delivery to the Assaigai Analytical Laboratories, Inc. (AALI) in Albuquerque, New Mexico. Each sample container was placed upright in the cooler with packaging material to provide protection against breakage. Coolers were secured with tape and labeled to ensure the samples are not disturbed during transportation. The sediment samples were delivered to the AALI for the following chemical and physical parameter analysis:

- The five-point individual co-located composite sediment samples of reservoir retained sediments and background sediments, and the reservoir retained sediment segment composites and the background sediment segment composite samples in 8-oz plastic jar for metals listed in Table 2 on a dry weight basis, using USEPA method 3050, 6010-6020 for all metals except mercury. Mercury was analyzed by USEPA method 7421.

- The equipment decontamination rinse blank and the trip blank samples preserved with HON_3 in 1-liter plastic bottle for Table 2 metals using USEPA method 3050, 6010/6020 for all metals except mercury. Mercury was analyzed by USEPA method 7421.

- The reservoir retained sediment segment composite samples and the background channel bed sediment segment composite samples in the 8-oz plastic jars for leachable (soluble) metals using the Synthetic Precipitation Leaching Procedure (Method 1312). The leachate obtained from the SPLP was analyzed for metals listed in Table 2 using USEPA method 6010/6020 for all metals except mercury. Mercury was analyzed by USEPA method 7421.

- The reservoir retained sediment segment composite samples and the background channel bed sediment segment composite samples in 1-gal sediment sample bags for particle size analysis (+425 µ m, +150 µ m, +63 µ m and –63 µ m) using ASTM C36. A hydrometer test was performed on –63 µm faction using ASTM D422. The +63 µ m and –63 µ m fractions of the reservoir segment composite samples and the background channel segment composite samples were analyzed for metals listed in Table 2 using USEPA method 3050, 6010/6020 for all metals except mercury. Mercury was analyzed by USEPA method 7421.

4.8 Investigation-Derived Wastes

No hazardous material was necessary or was brought on site for field sampling activities at the Galisteo Reservoir. The sediments being sampled at the Galisteo Reservoir contained trace levels of metals, which are below the regulatory human health risk based soil screening levels. Thus, the sediment samples are not hazardous waste. Excess (reject) sediment samples and sampling equipment decontamination water was placed back into the corresponding boreholes and segments. All sampling equipment and PPE (gloves) were appropriately decontaminated using biodegradable cleaner (Alconox) at the sampling location. Thus, there was no investigation-derived waste other than gloves and the samples. Gloves were disposed of as solid wastes and the laboratory properly disposed of the samples after completion of the analysis.

Table 2
List of Metals Analyses for Sediment Samples and Leachates

Constituent	Minimum Detection Limit (EPA SW846 3050, 6010/6020)	
	Solid (mg/Kg)	Water (mg/L)
Aluminum	1.0	0.009
Antimony	1.0	0.001
Arsenic	0.5	0.001
Barium	1.0	0.05
Beryllium	1.0	0.0005
Boron	1.0	0.05
Cadmium	0.06	0.002
Chromium	1.0	0.005
Cobalt	0.3	0.005
Copper	1.0	0.001
Iron	1.0	0.01
Lead	1.0	0.005
Manganese	1.0	0.005
Mercury	0.05	0.0002
Molybdenum	1.0	0.005
Nickel	1.0	0.005
Selenium	1.0	0.005
Silver	1.0	0.005
Thallium	1.0	0.0002
Uranium	0.10	0.003
Vanadium	1.0	0.005
Zinc	1.0	0.005

5.0 SEDIMENT SAMPLING RESULTS

Sediment samples were delivered to the AALI for analysis, as discussed in Section 4.7. The laboratory analytical result reports are included in Appendix B. The result reports also include laboratory quality control summary reports. The results are summarized and discussed in subsections below.

5.1 Physical Analysis Results

The physical analysis of composite sediment samples included sieve analysis and hydrometer testing for particle size distribution and solubility testing. The sieve analysis results of composite samples from each reservoir segment and from the baseline and background channel segments are summarized in Table 3, along with the appropriate soil classification. These results show that the composite samples from the baseline and background channel segments contain relatively low amounts of silt and clay material. The reservoir retained sediments are very fine-grained inorganic sediments consisting of very fine sands and silts, and have an ASTM unified soil classification of ML. The proportion of silt in the composite sample is highest for Segment #1 and lowest for Segment #3. Segment #1 is closest to the dam and the sediments are expected to consist of the finest grained material.

The hydrometer tests were performed on -63 μm fraction from each of the segment sediment composite samples. These results together with the sieve analysis results were used to construct the particle size distribution curves provided in Appendix B. These results show that the composite sediment sample for Reservoir Segment #1 is comprised of approximately 76% silt, 23% fine sand and essentially no clay. The composite sediment sample for Reservoir Segment #2 is comprised of approximately 65% silt, 33% fine sand and no clay. The sediments in Reservoir Segment #3 consist of approximately 57% silt, 41% fine sand with no clay. These reservoir retained sediments have very little organic matter and are highly erodibile. Sediments with these characteristics have a soil erodibility (K) factor within the range from 0.45 to 0.6 and are easily detached by raindrop impact and surface flows.

The composite baseline sediment sample from Galisteo Creek downstream of the reservoir consists of approximately 25% silt, 59% fine sand, 11% medium sand and 5% clay. The individual co-located baseline sediment samples were from Galisteo Creek downstream of the reservoir consists of approximately 25% silt, 59% fine sand, 11% medium sand and 5% clay. The Background sediments from Galisteo Creek upstream of the reservoir consist of approximately 8% silt, 50% fine sand, 42% medium sand and no clay. The higher fraction of silt and clay in the baseline composite sample is

Table 3
Particle Size Distribution and Physical Testing Results of Composite Samples

Sample ID	Sample Date	Sample Description	Sieve Analysis, % Passing by Weight				LL	PI	Metallic Particles %	ASTM D2487 Unified Classification	AASHTO M145 Classification	Estimated R-Value
			#10 (2 mm)	#40 (425 µm)	#100 (150 µm)	#230 (63 µm)						
BSS2CS-01	10/20/2004	Background (upstream) sediment Composite	100	58	14	6.5	NV	NP	1.01	SP-SM	A-2-4	50
BSS1CS-01	12/27/2004	Baseline (downstream) sediment Composite	100	89	58	25	NV	NP	1.15	SM	A-2-4	50
RSS1CS-01	11/2/2004	Retained Sediment Segment 1 Composite	100	99	94	71.2	NV	NP	1.14	ML	A-4	45
RSS2CS-01	11/2/2004	Retained Sediment Segment 2 Composite	100	98	86	58.9	NV	NP	1.05	ML	A-4	45
RSS3CS-01	10/29/2004	Retained Sediment Segment 3 Composite	100	98	82	50.4	NV	NP	0.97	ML	A-4	45

partly due to the location of the individual sample points within low areas and flat channel bed segments in order to obtain finer grained sediments. The biased sample locations for the baseline sample composite was used to obtain samples that were thought to be more representative of the sediments that are currently transported to the Rio Grande.

5.2 Solubility Test Results

The solubility test was performed on each of the reservoir segment sediment composite samples and each of the channel segment “background” sediment composite samples. The leachate obtained from the SPLP method 1312 was analyzed for the metals listed in Table 4. These results are included in Table 4. The relevant numeric water quality standards for designated uses in the segment of the Rio Grande from Cochiti Dam downstream to the Angostura diversion works are shown in Table 5. The aquatic criteria for many of metals are dependent upon the hardness of the water. The median hardness value of 130 mg/l as $CaCO_3$ determined from 81 samples from the USGS monitoring station No. 08319000 located at San Felipe, NM was used to calculate the hardness dependent criteria for these metals.

Most of the metals concentrations were below detection limits in the leachate from solubility tests of composite samples from the reservoir and “background” sediment composite samples. Aluminum was the only metal that exceeded relevant acute and chronic aquatic criteria. The aluminum concentration of 4.3 mg/l in leachate from reservoir Segment #1 was slightly greater than the aluminum concentration of 3.31 mg/l in the leachate from the background composite sample. The aluminum concentrations in leachate from reservoir Segment #2 and #3 were below background levels and below the acute aquatic criteria. If reservoir sediments are released to the river, the aluminum from these sediments would be diluted in stream water and is unlikely to result in an exceedence of water quality criteria.

The arsenic concentrations in leachate from reservoir Segment #1 and #2 and the baseline stream sediments downstream of the reservoir were above the background levels and the drinking water criteria. However, if these reservoir sediments are released to the river, the arsenic from these sediments would be diluted in stream water and is unlikely to result in an exceedence of the water quality criteria. All other metals concentrations in leachate from the Reservoir Segment #1, #2, and #3 were below detection limits or relevant water quality standards.

Table 4
Leachate Results of SPLP on Composite Samples

Parameter (mg/L)	Analysis of Leachate from SPLP				
	BSS2CS-01 (Background Sediment Composite)	**BSS1CS-01 (Baseline Sediment Composite)**	**RSS1CS-01 (Retained Sediment Segment 1 Composite)**	**RSS2CS-01 (Retained Sediment Segment 2 Composite)**	**RSS3CS-01 (Retained Sediment Segment 3 Composite)**
Aluminum	3.31	2.29	4.3	0.458	0.243
Antimony	<0.01	<0.001	<0.01	<0.01	<0.01
Arsenic	<0.01	0.004	0.018	0.019	<0.01
Barium	<0.01	0.033	<0.01	<0.01	<0.01
Beryllium	<0.01	<0.001	<0.01	<0.01	<0.01
Boron	<0.01	0.034	<0.01	<0.01	<0.01
Cadmium	<0.01	<0.001	<0.01	<0.01	<0.01
Chromium	<0.01	0.002	<0.01	<0.01	<0.01
Cobalt	<0.01	<0.001	<0.01	<0.01	<0.01
Copper	<0.01	0.002	<0.01	<0.01	<0.01
Iron	2.1	1.4	<0.10	<0.1	<0.01
Lead	<0.1	<0.001	<0.01	<0.01	<0.01
Manganese	0.021	0.018	<0.01	<0.01	<0.01
Molybdenum	<0.01	<0.001	<0.01	<0.01	<0.01
Nickel	<0.01	0.001	<0.01	<0.01	<0.01
Selenium	<0.01	<0.001	<0.01	<0.01	<0.01
Silver	<0.10	<0.001	<0.01	<0.01	<0.10
Thallium	<0.01	<0.001	<0.01	<0.01	<0.01
Uranium	<0.01	<0.001	<0.01	<0.01	<0.01
Vanadium	<0.01	0.009	<0.01	<0.01	<0.01
Zinc	<0.01	0.004	<0.01	<0.01	<0.01
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Table 5

Calculated Site Specific Aquatic Water Quality Criteria for Rio Grande below the Galisteo Greek

Parameter (1)	Aquatic Standards Calculated Using Hardness as $CaCO_3$ of 130 mg/L			NMWQC Water Quality Standards (mg/L)			
	Aquatic Standard (mg/L)		Formula Used	Domestic Water Supply	Irrigation	Livestock	Wildlife
Aluminum (D)	Acute	0.75	Numeric Criteria Specified		5.0	5.0	
	Chronic	0.087	Numeric Criteria Specified				
Antimony (D)	NS	NS	Numeric Criteria Specified	0.006			
Arsenic (D)	Acute	0.340	Numeric Criteria Specified	0.010			
	Chronic	0.150	Numeric Criteria Specified				
Barium (D)	NS	NS	Numeric Criteria Specified	2.0			
Beryllium (D)	Acute	0.130	Numeric Criteria Specified	0.004			
	Chronic	0.0053	Numeric Criteria Specified				
Boron (D)	NS	NS	Numeric Criteria Specified		0.750	5.0	
Cadmium (D)	Acute	0.0057	$[1.136672-.041838\ln(\text{hardness})]\,e^{(1.128(\ln(\text{hardness}))-3.6867)}$	0.005	0.010	0.050	
	Chronic	0.0027	$[1.101672-.041838\ln(\text{hardness})]\,e^{(0.7852(\ln(\text{hardness}))-2.715)}$				
Chromium (D)	Acute	0.706	$e^{(0.819(\ln(\text{hardness}))+2.5736)}$	0.100	0.100	1.0	
	Chronic	0.0919	$e^{(0.819(\ln(\text{hardness}))+0.534)}$				
Cobalt (D)	NS	NS	Numeric Criteria Specified		0.050	1.0	
Copper (D)	Acute	0.0172	$e^{(0.9422(\ln(\text{hardness}))-1.7408)}$		0.200	0.500	
	Chronic	0.0112	$e^{(0.8545(\ln(\text{hardness}))-1.7428)}$				
Lead (D)	Acute	0.0858	$[1.46203-0.145712\ln(\text{hardness})]e^{(1.273(\ln(\text{hardness}))-1.46)}$	0.050	5.0	1.0	
	Chronic	0.0033	$[1.46203-0.145712\ln(\text{hardness})]e^{(1.273(\ln(\text{hardness}))-4.705)}$				
Iron, Total	NS	NS	Numeric aquatic standard not specified				
Manganese, Total	NS	NS	Numeric aquatic standard not specified				
Mercury	Acute	0.0024	Numeric Criteria Specified	0.002		0.010	0.00077
	Chronic	0.000012	Numeric Criteria Specified				
Molybdenum (D)	NS	NS	Numeric Criteria Specified		1.0		
Nickel (D)	Acute	0.585	$e^{(0.846(\ln(\text{hardness}))+2.253)}$	0.100			
	Chronic	0.0649	$e^{(0.846(\ln(\text{hardness}))+0.0554)}$				
Selenium, total recoverable	Acute	0.020	Numeric Criteria Specified				0.005
	Chronic	0.005	Numeric Criteria Specified				
Selenium (D)	NS	NS	Numeric Criteria Specified	0.050		0.050	
Silver (D)	Acute	0.00542	$e^{(1.72(\ln(\text{hardness}))-6.6825)}$				
	Chronic	0.00050	$e^{(1.72(\ln(\text{hardness}))-9.06)}$				
Thallium (D)	NS	NS	Numeric standard specified	0.002			
Uranium (D)	NS	NS	Numeric standard specified	5.0			
Vanadium (D)	NS	NS	Numeric standard specified		0.100	0.100	
Zinc (D)	Acute	0.146	$e^{(0.8473(\ln(\text{hardness}))+0.8618)}$		2.0	25.0	
	Chronic	0.148	$e^{(0.8473(\ln(\text{hardness}))+0.8699)}$				

Note (1): (D) indicates dissolved

5.3 Chemical Analysis Results of Composite Sediment Samples for Reservoir Segments and Background Segments

The composite samples of retained sediments in Reservoir Segments and of channel bed "Background Segments" consisted of equal weight aliquots from each of the individual co-located composite sediment samples for that segment. The results of metals analyses for these Segment composite sediment samples are summarized in Table 6. These results include the total metal concentrations for the segment composite samples and the metals concentrations for both the +63 µ m and –63 µ m sieve fractions from the particle size fractioning of these segment composite samples.

Table 6 also includes two calculated values for each segment. The first calculated metals concentrations for each Segment is the weighted average determined from the corresponding +63 um and –63 um sieve fractions and their relative percentage of the total determined from the particle size fractioning results. The second calculated metals concentrations for each Segment is the average of the metals concentration for the equal weight aliquots from each of the individual co-located composite sediment samples in that Segment. These calculated results should be similar to the composite sediment samples results for the corresponding segment and provide an indication of the accuracy of both the analytical results and the preparation of composite samples and sieve fractions.

The Table 6 results show that the metals concentrations in Segment composite samples, both the +63 um and –63 um sieve fractions, and the calculated values are all less than the corresponding screening criteria. The screening criteria include two aquatic based sediment quality criteria:

- The Environment of Canada (1995) "Threshold Level", which is the sediment chemical concentrations below which no adverse biological effects are expected, and

- The U.S. Environmental Protection Agency (EPA) "Consensus-Based Probable Effects Concentration", which is the concentrations above which adverse biological effects can be expected to be frequently occur.

The criteria from these two sediment quality guidelines provide a practical means of characterizing the potential aquatic toxicity concern for the metals concentrations observed in bed sediments. The USEPA "Consensus-Based Probable Effects Concentration" is the concentrations above which adverse biological effects can be expected to frequently occur. The Environment of Canada (1995) "Threshold Level" is the sediment chemical concentrations below which no adverse biological effects are expected. Due to the differences in the development of these aquatic criteria for sediments, both of these criteria are used for evaluating results and testing hypotheses concerning chemical concentrations in reservoir sediments.

Table 6
Analytical Results for Metals in Composite Samples

Sample Description	Metal Concentration, Total (mg/Kg)																					
	Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
Background Segment 2 Sediment Composite	3680	<0.25	0.46	160	<0.125	1.48	0.09	3.05	2.19	2.9	9250	3.30	314	<0.125	3.39	0.25	<0.125	<0.125	0.40	10.7	13.0	<0.05
+63um fraction (93.5%)	3140	<0.25	1.07	218	<0.125	1.38	<0.125	2.11	2.28	18.7	9380	3.79	289	<0.125	3.11	<0.125	<0.125	<0.125	0.40	15.2	18.7	<0.05
-63um fraction (6.5%)	7940	<0.25	1.02	459	0.29	3.38	0.17	7.65	2.90	444.0	13900	11.70	351	<0.125	9.00	0.16	<0.125	<0.125	0.71	20.9	109.0	<0.05
Calculated (Size Fractions)	3452	<0.25	1.07	234	na	1.51	na	2.47	2.32	46.3	9674	4.30	293	<0.125	3	na	<0.125	<0.125	0.42	15.6	24.6	<0.05
Calculated (Individual Samples)	3167	<0.25	0.78	172	<0.125	1.04	0.11	2.65	2.42	3.6	7722	3.95	322	<0.125	3.21	0.44	<0.125	<0.125	0.46	13.4	13.6	<0.05
Background Segment 1 Sediment Composite	6610	<0.10	1.81	234	0.327	3.39	0.10	5.49	3.35	5.1	10900	6.25	261	<0.05	5.67	0.18	<0.05	<0.05	0.57	19.4	26.1	<0.05
+63um fraction (78.9%)	3980	<0.10	1.52	178	0.179	0.95	0.08	2.72	2.68	15.7	8450	4.66	248	<0.05	3.38	0.18	<0.05	<0.05	0.40	16.0	19.3	<0.05
-63um fraction (21.1%)	7990	<0.10	1.74	475	0.349	3.34	0.15	7.32	3.90	2.1	13900	10.60	290	<0.05	7.06	0.24	<0.05	<0.05	0.76	23.0	76.3	<0.05
Calculated (Size Fractions)	4826	<0.10	1.57	241	0.215	1.45	0.09	3.69	2.94	12.8	9600	5.91	257	<0.05	4.16	0.19	<0.05	<0.05	0.48	17.5	31.3	<0.05
Calculated (Individual Samples)	6597	<0.10	2.45	262	<0.125	3.72	0.11	5.61	3.46	5.4	11093	7.08	284	<0.05	5.67	0.22	<0.05	<0.07	0.60	20.4	27.7	<0.05
Reservoir Segment 1 Sediment Composite	17800	<0.25	2.98	229	0.776	7.21	0.22	7.31	6.05	12.6	18300	14.00	378	<0.125	16.80	0.42	<0.125	<0.125	0.88	23.5	43.2	<0.05
+63um fraction (28.8%)	6000	<0.25	1.68	124	0.29	2.96	0.14	4.95	3.25	15.8	9430	11.20	223	<0.125	6.33	0.42	<0.125	<0.125	0.45	14.3	27.3	<0.05
-63um fraction (71.2%)	8920	<0.25	2.64	231	0.451	4.11	0.15	7.14	4.13	97.8	12500	10.90	279	<0.125	8.76	0.26	<0.125	<0.125	0.64	17.1	50.1	<0.05
Calculated (Size Fractions)	8079.04	<0.25	2.36	200	0.405	3.78	0.14	6.51	3.88	74.2	11616	10.99	263	<0.125	8.06	0.31	<0.125	<0.125	0.59	16.3	43.5	<0.05
Calculated (Individual Samples)	16059	<0.25	2.97	230	0.7566	5.15	0.32	10.10	6.09	12.0	18169	13.64	371	<0.125	14.33	0.54	0.16	0.21	0.86	21.1	45.4	<0.05
Reservoir Segment 2 Sediment Composite	13900	<0.25	1.63	225	0.586	5.67	0.23	4.73	10.00	10.8	13900	10.80	378	<0.125	13.20	0.26	<0.125	<0.125	0.74	22.1	32.6	<0.05
+63um fraction (41.1%)	5530	<0.25	1.00	189	0.254	2.31	0.11	4.30	2.86	14.5	9220	6.42	2	<0.125	5.03	0.19	<0.125	<0.125	0.43	14.5	24.7	<0.05
-63um fraction (58.9%)	8120	<0.25	1.79	280	0.387	3.40	0.13	6.86	3.75	128.0	11600	10.30	290	<0.125	7.34	0.20	<0.125	<0.125	0.63	19.1	55.8	<0.05
Calculated (Size Fractions)	7055.51	<0.25	1.47	243	0.332	2.95	0.12	5.81	3.38	81.4	10622	8.71	172	<0.125	6.39	0.20	<0.125	<0.125	0.55	17.2	43.0	<0.05
Calculated (Individual Samples)	13075	<0.25	1.57	226	0.6631	4.23	0.23	8.14	4.82	9.0	14591	10.17	368	<0.125	11.01	0.30	<0.125	0.13	0.70	19.2	33.5	<0.05
Reservoir Segment 3 Sediment Composite	11600	<0.25	2.59	209	0.464	5.48	0.22	7.67	3.30	10.5	14700	13.20	375	<0.125	11.40	0.26	<0.125	<0.125	0.69	20.0	37.4	<0.05
+63um fraction (49.6%)	5590	<0.25	1.40	171	0.279	2.55	0.15	4.30	3.01	17.3	9440	6.80	254	<0.125	5.76	0.32	<0.125	<0.125	0.45	15.3	28.4	<0.05
-63um fraction (50.4%)	8120	<0.25	1.63	148	0.361	3.18	0.13	6.02	3.45	227.0	11000	11.00	259	<0.125	6.76	0.19	<0.125	<0.125	0.48	16.5	77.8	<0.05
Calculated (Size Fractions)	6865	<0.25	1.52	159	0.320	2.87	0.14	5.17	3.23	123.0	10226	8.92	257	<0.125	6.26	0.25	<0.125	<0.125	0.46	15.9	53.3	<0.05
Calculated (Individual Samples)	11163	<0.25	2.76	204	0.3749	4.51	0.20	7.95	4.40	8.4	11540	11.41	360	<0.125	9.01	0.41	<0.125	<0.125	0.65	20.0	35.5	<0.05
Canada Threshold Level			5.9				0.60	37.3	NS	35.7		35	NS		18.0						123.0	0.17
USEPA Consensus based probable Effect Conc.			33.0				4.98	111	NS	149.0		128	NS		48.6						459.0	1.06
Soil Screening Level. Outdoor workers (EPA)	100000	510	322	83000	2400	69000	630	560	30000	47000	100000	1400	40000	6400	2600	6400	6400	100	NS	8900	100000	380
Soil Screening Level. Outdoor workers (NM)	100000	92	17	15000	440	13000	190	660	13000	8500	69000	1000	14000	1200	4400	1200	1200	18	NS	1600	23000	69

For instance, one hypothesis that was provided in the SAP is that the concentrations of a particular metal in Galisteo Reservoir Sediments pose no adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir. This null hypothesis is presumed to be true in the absence of strong evidence to the contrary. The alternative hypothesis is the hypothesis that bears the burden of proof. In other words, the null hypothesis will be assumed to be true unless the alternative hypothesis is thought to be true due to the preponderance of evidence. Given the null hypothesis stated above, the alternate hypothesis is that the reservoir sediments pose an adverse risk to the aquatic environment on the Galisteo Creek or the Rio Grande downstream of the reservoir, which can be stated as:

Metal concentration in released sediment >the relevant Sediment Quality Guideline (SQG)

The USEPA Consensus-Based Probable Effects Concentration provides the appropriate criteria for this hypothesis test because it is the concentration above which adverse biological effects can be expected to frequently occur.

On the other hand, if the null hypothesis is that the concentrations of a particular metal in Galisteo Reservoir Sediments could pose an adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir, then the alternate hypothesis is that the reservoir sediments do not pose an adverse risk to the aquatic environment. In other words, the sediments are assumed to pose an adverse risk in the absence of strong evidence to the contrary. The Environment of Canada (1995) “Threshold Level” would serve as the appropriate SQG criteria for this hypothesis test because it is the concentration below which no adverse biological effects are expected. The metals concentrations in reservoir sediments must be much lower to accept the alternative hypothesis that the metals concentrations are below levels at which no adverse biological effects are expected than to reject the alternative hypothesis that the metals concentrations are above levels at which biological effects can be expected to frequently occur.

The screening criteria listed in Table 6 also include the EPA and NMED risk-based soil screening criteria for industrial worker scenario. These soil screening criteria provide a means for evaluating any human health concerns from potential exposure to the Galisteo Reservoir released sediments. Soil screening criteria for industrial outdoor worker are relevant for evaluating the potential risk from frequent exposure to stream sediments by irrigators or workers involved in construction activities in the river or the floodplain. The industrial outdoor worker soil screening criteria are also protective for the recreational user that would most likely have lower exposure frequency than the industrial worker.

The calculated average results from individual co-located composite samples for each segment show reasonably good comparison with the composite sediment sample results for the corresponding segment. The calculated average results from the size fractions for each segment show reasonably good comparison with the composite sediment samples results for the corresponding segment for all metals except copper and zinc. The copper and zinc results for the size fractions, specifically for the -63 µm, thought to be elevated due to use of brass sieves by the laboratory for sample preparation. As expected, the concentrations of several metals, including aluminum, copper, iron, lead and zinc, tended to be higher in the –63 µm sieve fraction than in the coarser +63 µm fraction. Also, the concentrations for these metals in the composite samples of retained sediments in Reservoir Segment #1 and #2 tended to be slightly higher than the concentrations of these metals in the retained sediments in Reservoir Segment #3 and in the composite sediment samples of channel bed "Background Segments". These differences appear to be largely the result of the higher proportion of fine sediments (-63 µm fraction) in the composite samples from Reservoir Segment #1 and #2. Nevertheless, the metals concentrations in the fine sediments in the composite samples do not pose a risk to aquatic organisms or workers based on the soil and sediment screening evaluations.

5.4 Chemical Analysis Results of Individual Co-Located Sediment Samples

Sampling of retained reservoir sediments was concentrated within Segment #1 and #2, because these segments are the most likely targets for saltcedar eradication. To obtain representative samples of the sediments that are likely to be released from Galisteo Reservoir, more samples were taken from the locations immediately adjacent to the main stream channels and fewer samples taken at greater distance from these channels. Also, samples taken adjacent to the channels include representative samples of the entire stream bank profile while the depth of sampling diminishes with distance from the stream channels.

5.4.1 Retained Sediment Results for Reservoir Segment #1

The analysis results for the 40 individual co-located composite samples taken in Reservoir Segment #1 are provided in Table 7. The cadmium value for one of the 40 individual co-located composite samples slightly exceeded the Environment of Canada "Threshold Level" for cadmium, but not the USEPA "Consensus-Based Probable Effects Concentration". These aquatic guidelines are not enforceable standards but provide a means of characterizing sediment as being of minimal or of potentially significant toxicological concern. The arsenic value in five of the 40 individual co-located composites samples slightly exceeded the Environment of Canada (1995) "Threshold Level." Likewise, the nickel value in ten of the 40 individual co-located composite samples slightly exceeded the Environment of Canada (1995) "Threshold Level." However, the arsenic and nickel values for these samples were well below the corresponding USEPA

Table 7
Analysis Results for Individual Co-Located Composite Samples, Reservoir Segment #1

Sample ID	Sample Date	Sample Gen Location & Depth (feet)	Metal Concentration, Total (mg/Kg)																					
			Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
RSICS1-01-00	10/22/04	End Point, 0-4"	14000	<0.25	1.19	256	0.379	5.72	0.343	8.83	5.55	9.93	15500	11.00	420	<0.125	10.70	0.356	<0.125	<0.125	0.766	20.1	34.8	<0.05
RSICS1-02-00	10/22/04	Mid Point, 0-4"	19900	<0.25	1.80	286	1.050	6.32	0.570	11.90	6.58	12.80	20300	18.40	507	<0.125	13.40	0.292	<0.125	0.139	0.921	23.7	47.2	<0.05
RSICS1-02-15	10/22/04	Mid Point, 1.5'	8140	<0.25	0.96	162	<0.125	3.61	0.398	5.83	3.71	6.70	11000	9.11	272	<0.125	7.37	0.328	<0.125	<0.125	0.562	16.4	27.8	<0.05
RSICS1-03-00	10/17/04	Chan Bank, 0-4"	13000	<0.30	1.17	244	0.634	4.89	0.224	9.63	5.89	9.98	14200	9.86	427	<0.150	11.50	0.651	<0.150	<0.150	0.719	19.3	33.8	<0.05
RSICS1-03-02	10/17/04	Chan Bank, 2.0'	8240	<0.25	1.29	175	0.373	2.79	0.181	6.30	4.17	8.76	11300	10.10	276	<0.125	7.44	0.406	<0.125	<0.125	0.597	17.2	29.0	<0.05
RSICS1-03-04	10/17/04	Chan Bank, 4.0'	8930	<0.25	1.00	199	0.390	2.99	0.219	6.97	4.51	7.72	11100	9.72	325	<0.125	8.61	0.606	<0.125	<0.125	0.579	16.8	29.0	<0.05
RSICS1-03-06	10/17/04	Chan Bank, 6.0'	9370	<0.25	0.80	216	0.395	3.08	0.203	7.39	4.60	7.92	11200	8.63	354	<0.125	8.92	0.593	<0.125	<0.125	0.565	16.6	27.7	<0.05
RSICS1-04-00	10/23/04	End Point, 0-4"	27600	<0.25	2.10	318	1.360	7.06	0.495	15.00	7.86	13.40	25200	16.50	605	<0.125	17.10	0.374	0.17	0.210	1.110	25.3	45.2	<0.05
RSICS1-05-00	10/23/04	Mid Point, 0-4"	30500	<0.30	1.80	357	1.420	7.99	0.508	16.40	8.54	13.90	26700	17.20	660	<0.15	18.00	0.291	<0.15	0.217	1.190	27.1	46.3	<0.05
RSICS1-05-15	10/23/04	Mid Point, 1.5'	25800	<0.25	2.70	296	1.150	6.23	0.696	13.90	7.60	16.20	25300	29.30	566	<0.125	15.60	0.310	<0.125	0.204	1.080	27.3	65.5	<0.05
RSICS1-06-00	10/17/04	Chan Bank, 0-4"	6950	<0.25	0.59	299	0.351	2.90	<0.25	5.22	3.53	5.33	9240	5.70	285	<0.125	6.43	0.397	<0.125	<0.125	0.483	14.2	21.4	<0.05
RSICS1-06-02	10/17/04	Chan Bank, 2.0'	7780	<0.25	1.50	199	0.408	2.40	0.153	6.01	4.32	8.87	11200	9.40	301	<0.125	7.82	0.494	<0.125	<0.125	0.596	16.6	30.6	<0.05
RSICS1-06-04	10/17/04	Chan Bank, 4.0'	9850	<0.25	1.24	206	0.517	3.10	0.246	7.54	5.03	9.64	12500	12.40	358	<0.125	9.19	0.610	<0.125	<0.125	0.657	17.8	38.9	<0.05
RSICS1-06-06	10/17/04	Chan Bank, 6.0'	11000	<0.25	1.16	237	0.566	2.33	0.275	8.77	5.49	8.84	12700	9.53	368	<0.125	10.80	0.702	<0.125	<0.125	0.733	18.3	31.3	<0.05
RSICS1-06-08	10/31/04	Chan Bank, 8.0'	13900	<0.25	1.17	232	0.562	5.12	0.299	9.70	5.27	8.16	15400	9.59	389	<0.125	10.60	0.242	<0.125	<0.125	0.708	21.6	31.4	<0.05
RSICS1-07-00	10/17/04	Chan Bank, 0-4"	5720	<0.25	0.86	223	0.277	1.86	0.128	4.74	3.29	4.84	8820	6.00	268	<0.125	5.63	0.565	<0.125	0.363	0.524	14.8	20.4	<0.05
RSICS1-07-02	10/17/04	Chan Bank, 2.0'	10900	<0.25	1.94	224	0.605	2.64	0.266	8.30	5.39	10.30	13400	12.10	349	<0.125	10.00	0.822	<0.125	0.290	0.766	20.4	39.4	<0.05
RSICS1-07-04	10/17/04	Chan Bank, 4.0'	8760	<0.25	1.17	228	0.512	2.32	0.136	6.82	4.56	8.72	11500	11.40	316	<0.125	8.02	0.518	<0.125	<0.125	0.646	18.1	34.4	<0.05
RSICS1-07-06	10/17/04	Chan Bank, 6.0'	7870	<0.25	1.02	185	0.451	2.45	0.151	6.23	4.29	7.16	10600	8.79	298	<0.125	7.67	0.548	<0.125	<0.125	0.574	15.3	28.1	<0.05
RSICS1-07-08	10/31/04	Chan Bank, 8.0'	8920	<0.25	1.19	211	0.410	3.54	0.196	7.01	4.33	6.65	11600	8.60	352	<0.125	8.47	0.222	<0.125	<0.125	0.572	17.9	27.4	<0.05
RSICS1-08-00	10/22/04	Mid Point, 0-4"	24600	<0.25	1.06	308	0.778	7.92	0.386	12.30	9.17	14.60	21500	13.20	556	<0.125	19.00	0.471	<0.125	<0.125	0.974	30.4	51.0	<0.05
RSICS1-08-15	10/22/04	Mid Point, 1.5'	26800	<0.25	3.15	321	1.300	6.19	0.772	14.90	8.24	17.00	26100	21.70	618	<0.125	17.20	0.327	<0.125	0.219	1.210	27.6	56.8	<0.05
RSICS1-09-00	10/22/04	End Point, 0-4"	25800	<0.25	1.53	350	1.180	7.20	0.495	14.70	7.80	12.60	23300	15.20	602	<0.125	16.20	0.379	<0.125	0.174	1.060	25.1	42.7	<0.05
RSICS1-10-00	10/26/00	End Point, 0-4"	31900	<0.25	4.69	304	1.440	10.20	0.350	17.20	9.35	20.40	28600	18.90	514	<0.125	27.00	0.276	<0.125	0.238	1.250	29.8	78.3	<0.05
RSICS1-11-00	10/26/00	Mid Point, 0-4"	28800	<0.25	3.88	309	1.300	10.60	0.356	16.10	9.38	19.40	27700	17.80	500	<0.125	25.80	0.316	<0.125	0.204	1.240	28.2	50.8	<0.05
RSICS1-11-15	10/26/00	Mid Point, 1.5'	28900	<0.25	5.25	258	1.280	7.77	0.477	15.40	8.82	25.20	27700	33.10	486	<0.125	24.80	0.406	0.142	0.267	1.290	30.0	106.0	<0.05
RSICS1-12-00	10/26/00	Chan Bank, 0-4"	19600	<0.25	2.80	268	0.807	8.39	0.228	11.50	5.43	13.40	19100	12.40	426	<0.125	16.80	0.350	<0.125	<0.125	0.945	22.3	39.5	<0.05
RSICS1-12-20	10/26/00	Chan Bank, 2.0'	11600	<0.25	1.94	225	0.458	4.33	0.208	7.50	3.55	9.62	14100	9.89	308	<0.125	11.40	0.283	<0.125	<0.125	0.720	18.9	31.6	<0.05
RSICS1-12-40	10/26/00	Chan Bank, 4.0'	13300	<0.25	2.36	238	0.554	5.60	0.286	9.15	3.78	11.00	15500	11.80	350	<0.125	12.80	0.173	<0.125	<0.125	0.777	20.8	34.8	<0.05
RSICS1-13-00	11/01/04	End Point, 0-4"	26100	<0.25	4.69	235	1.310	8.45	0.413	15.40	8.18	14.70	26300	17.90	384	<0.125	19.90	0.453	<0.125	0.259	1.210	27.2	77.8	<0.05

Table 7 (Continued)
Analysis Results for Individual Co-Located Composite Samples, Reservoir Segment #1

Sample ID	Sample Date	Sample Gen Location & Depth (feet)	Metal Concentration, Total (mg/Kg)																					
			Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
RSICS1-14-00	11/01/04	Mid Point, 0-4"	28900	<0.25	4.03	244	1.220	7.04	0.298	14.10	9.54	18.90	27000	15.80	425	<0.125	26.70	0.398	<0.125	0.258	1.130	24.8	76.9	<0.05
RSICS1-14-15	11/01/04	Mid Point, 1.5'	18200	<0.25	5.19	177	0.831	6.22	0.329	8.02	6.52	15.70	21000	13.80	260	<0.125	21.60	0.681	<0.125	0.184	1.030	22.3	48.1	<0.05
RSICS1-15-00	10/20/04	Chan Bank, 0-4"	9230	<0.25	8.42	152	0.603	3.98	0.152	7.82	5.62	12.20	18800	12.60	192	<0.125	14.10	0.886	<0.125	<0.125	0.780	15.4	45.8	<0.05
RSICS1-15-02	10/20/04	Chan Bank, 2.0'	11200	<0.25	6.92	166	0.593	4.66	0.183	8.64	5.82	12.80	17700	12.90	206	<0.125	15.30	0.922	<0.125	0.148	0.831	17.5	48.4	<0.05
RSICS1-16-00	10/30/04	End Point, 0-4"	15900	<0.25	6.42	165	0.799	5.12	0.335	10.60	6.75	13.00	23000	15.70	242	<0.125	18.20	0.990	<0.125	0.209	1.060	21.9	76.6	<0.05
RSICS1-17-00	10/30/04	Mid Point, 0-4"	12700	<0.25	5.48	143	0.604	4.42	0.204	8.34	5.47	10.80	20000	13.10	205	<0.125	14.80	0.790	<0.125	0.129	0.855	17.4	46.6	<0.05
RSICS1-17-15	10/30/04	Mid Point, 1.5'	15000	<0.25	6.65	156	0.742	6.13	0.348	10.30	6.20	12.60	21800	15.50	229	<0.125	18.50	0.877	<0.125	0.267	1.070	21.1	52.8	<0.05
RSICS1-18-00	10/20/04	Chan Bank, 0-4"	11800	<0.25	6.01	139	0.601	3.95	0.220	9.32	6.40	13.10	20000	13.30	207	<0.125	16.20	1.070	<0.125	0.161	0.848	19.1	54.3	<0.01
RSICS1-18-02	10/20/04	Chan Bank, 2.0'	11100	<0.25	5.90	125	0.590	4.00	0.298	9.63	6.18	12.60	18500	12.50	199	<0.125	16.10	1.120	<0.125	0.166	0.885	18.3	52.0	<0.05
RSICS1-18-04	10/20/04	Chan Bank, 4.0'	13800	<0.25	5.94	150	0.707	4.55	0.370	10.40	6.81	13.50	20300	15.00	230	<0.125	17.40	0.944	<0.125	0.162	0.922	20.7	55.8	<0.05
RSS1CS-01	11/02/04	Seg Comp Sample	17800	<0.25	2.98	229	0.776	7.21	0.216	7.31	6.05	12.60	18300	14.00	378	<0.125	16.80	0.423	<0.125	<0.125	0.878	23.5	43.2	<0.05
	Calculated Composite		16059	<0.25	2.97	230	0.75659	5.15	0.318	10.10	6.09	11.97	18169	13.6355	371	<0.125	14.33	0.53598	0.156	0.21276	0.86088	21.1	45.4	<0.05

Maximum Concentration	3.E+04	0.00	8.42	357.00	1.44	1.1E+01	0.77	17.20	9.5E+00	2.5E+01	2.9E+04	33.10	6.6E+02	0.00	27.0	1.12	0.17	0.36	1.29	30.40	1.1E+02	<0.05

SQG (Canada Threshold Level)			5.90				0.600	37.30	NS	35.70		35	NS		18.00						123.0	0.17
SQG (USEPA Onssensus based probable Effect Concentration)			33.00				4.980	111.00	NS	149.00		128	NS		48.60						459.0	1.06
Soil Screening Level. Outdoor workers (EPA)	100000	510	322	83000	2400	6.9E+04	630	560	3.0E+04	4.7E+04	1.0E+05	1400	4.0E+04	6400	2.6E+03	6400	6400	100	NS	8900	1.0E+05	380
Soil Screening Level. Outdoor workers (NM)	100000	92	17	15000	440	1.3E+04	190	660	1.3E+04	8.5E+03	6.9E+04	1000	1.4E+04	1200	4.4E+03	1200	1200	18	NS	1600	2.3E+04	69

Sample ID: RSICS1-XX-YY indicates Retained Sediment Individual (5-pt) Composite Sample from Segment 1, Loxation XX @ YY depth

"Consensus-Based Probable Effects Concentration". All other metals in individual co-located composite samples taken within Reservoir Segment #1 were below the sediment quality aquatic guidelines and the health-based soil screening criteria.

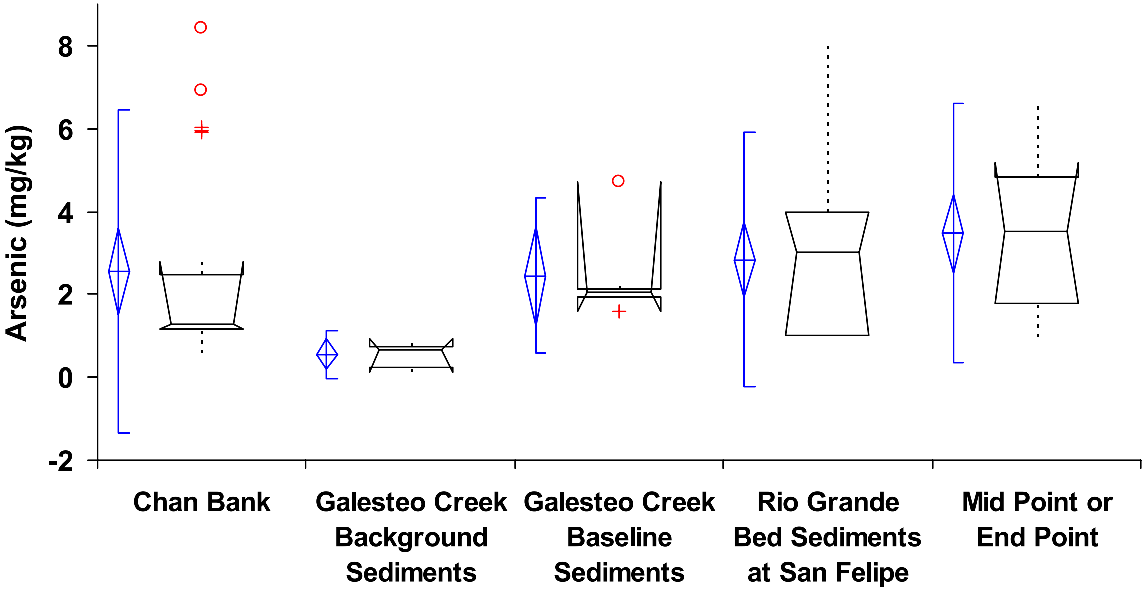
The box whisker plots in Figure 6 graphically show both the parametric and the non-parametric descriptive statistics for the central location and scatter/dispersion of the detected values for the arsenic concentrations in Reservoir Segment #1 retained sediments, and in the Galisteo Creek and Rio Grande bed sediments. The blue diamond shows the confidence interval about the mean and the line through the diamond is the mean. The notched box shows the median, lower and upper quartiles. The notched portion of the box shows confidence interval about the median. The dotted line connects the nearest observations within 1.5 inter-quartile ranges (IQRs). Observations more than 1.5 IQRs, near outliers, and more than 3.0 IQRs, far outliers, from the quartiles are shown red crosses (+) and circles (o), respectively.

The arsenic concentrations in the individual co-located composite samples taken within Reservoir Segment #1 were above the arsenic concentrations in the background (upstream) and baseline (downstream) sediments in the Galisteo Creek, as shown in Figure 6. The arsenic concentrations in the samples taken within Reservoir Segment #1 were similar to the arsenic concentrations in streambed sediments in the Rio Grande River below Cochiti Dam at the U.S. Geological Survey (USGS) monitoring station No. 08319000 located at San Felipe, NM. The arsenic concentrations in sediments from mid point and end point locations appear higher than the arsenic in sediments from the channel bank locations. These differences likely occur as a result of the higher portion of silt and clay fractions at the mid point and end point sample locations. However, the differences between the medians of mid point/end point locations and the channel bank locations are not statistically significant at the 5% significance level using the Mann-Whitney test.

Comparison of the median arsenic concentrations for Galisteo Creek sediments, Rio Grande sediments, and Reservoir Segment #1 sediments in Figure 6 indicates that the median arsenic concentration in the Galisteo Creek Background (upstream) sediment is lower than the other sediments and that the 95% confidence interval of the median does not overlap with the 95% confidence interval of the medians of the other sediments. The median arsenic concentration of 3.52 mg/kg in sediments from mid point and end point locations within Reservoir Segment #1 was the highest of the sediment types in Figure 6. The upper 95% CI of 5.19 mg/ kg for arsenic in sediments from mid point and end point locations within Reservoir Segment #1 is below the Environment of Canada (1995) "Threshold Level" of 5.9 mg/kg and well below the USEPA "Consensus-Based Probable Effects Concentration" of 33 mg/kg.

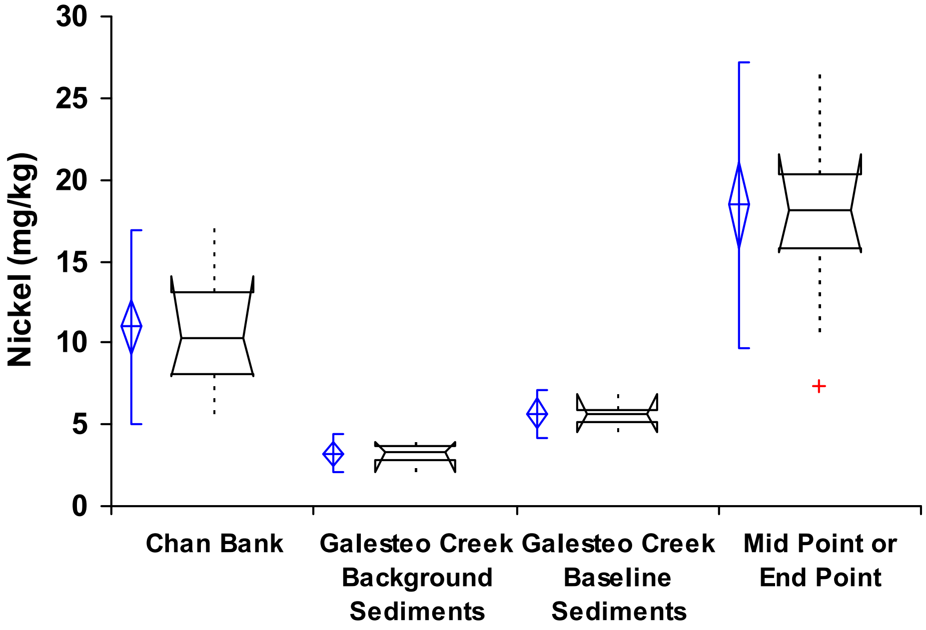
The box whisker plots of nickel concentrations in Figure 7 show that the concentrations in the individual co-located composite samples taken within Reservoir Segment #1 are above the nickel

Figure 6. Comparison of Arsenic in Sediment Samples at Reservoir Segment #1 with Galisteo Creek and Rio Grande Bed Sediments



Sediment Location/Type	n	Mean	SD	Median	IQR	95% CI of Median
Chan Bank	22	2.56	2.37	1.27	1.31	1.16 to 2.80
Galesteo Creek Background Sediments	6	0.56	0.35	0.67	0.51	0.13 to 0.92
Galesteo Creek Baseline Sediments	6	2.45	1.14	2.04	0.19	1.60 to 4.73
Rio Grande Bed Sediments at San Felipe	19	2.84	1.86	3.00	3.00	1.00 to 4.00
Mid Point or End Point	18	3.48	1.90	3.52	3.02	1.80 to 5.19

Figure 7. Comparison of Nickel in Sediment Samples at Reservoir Segment #1 with The Galisteo Creek Bed Sediments



Sediment Location/Type	n	Mean	SD	Median	IQR	95% CI of Median
Chan Bank	22	10.96	3.60	10.30	4.99	8.02 to 14.10
Galesteo Creek Background Sediments	6	3.21	0.71	3.36	0.93	2.13 to 3.90
Galesteo Creek Baseline Sediments	6	5.67	0.88	5.67	0.76	4.50 to 6.88
Mid Point or End Point	18	18.44	5.35	18.10	4.58	15.60 to 21.60

concentrations in the Galisteo Creek at the background (upstream) and baseline (downstream) sediments. Nickel was not included in the analysis of streambed sediments in the Rio Grande River at San Felipe, NM, so these "background" concentrations could not be included for comparison. The 95% confidence intervals for the medians do not overlap for any of the sediment types shown in Figure 7, indicating measurable differences among median nickel concentrations for each sediment category.

The median nickel concentration of 18.1 mg/kg in sediments from mid point and end point locations within Reservoir Segment #1 was the highest of the sediment types in Figure 7. The concentration is approximately the same as the Environment of Canada (1995) "Threshold Level" of 18 mg/kg but well below the USEPA "Consensus-Based Probable Effects Concentration" of 48.8 mg/kg. The Environment of Canada (1995) "Threshold Level" is the sediment chemical concentrations below which no adverse biological effects are expected while the USEPA "Consensus-Based Probable Effects Concentration" is the concentrations above which adverse biological effects can be expected to frequently occur (Ingersoll et al 2000). Consequently, the nickel in sediments from mid point and end point locations within Reservoir Segment #1 does not appear to pose a significant risk for downstream contamination because concentrations are at or near levels where no adverse biological effects are expected.

As described above and in the Sampling and Analysis Plan (SAP), hypotheses can be developed for comparing the metals concentrations in retained sediments likely to be released from the reservoir with appropriate SQGs. To evaluate the potential aquatic concerns associated with the release of sediments as a result of the proposed saltcedar eradication, the SAP proposed a null hypothesis that concentrations of a particular metal in Galisteo Reservoir Sediments pose no adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir. This null hypothesis is presumed to be true unless the alternative hypothesis is thought to be true due to the preponderance of evidence. The alternate hypothesis is that concentrations of a particular metal in Galisteo Reservoir Sediments could pose an adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir, or:

Mean metal concentration in retained sediment > the relevant SQG

As indicated in the SAP and in Section 5.3 of this Report, the relevant SQG for this test is the USEPA Consensus-Based Probable Effects Concentration. Thus, the sediments are assumed to be below the SQG unless the data indicate that the average concentrations of retained sediments are most likely above the SQG with a relatively low probability (5% significance level) of being wrong.

A one-sample t-test of the alternate hypothesis was performed for both arsenic and nickel concentrations in channel bank samples. The alternative hypotheses that mean arsenic and nickel concentrations are greater than or equal to the USEPA Consensus-Based Probable Effects Concentration are both rejected at the 5% significance level. Thus, the null hypotheses that mean of arsenic and nickel concentrations in channel bank samples pose no adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir is presumed to be true on the basis of these results.

On the other hand, for the null hypothesis that the concentrations of arsenic and nickel in channel bank samples could pose an adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir, the alternate hypothesis is:

Mean metal concentration in retained sediment < the relevant SQG

In other words, the sediments are assumed to pose an adverse risk in the absence of strong evidence to the contrary. The Environment of Canada (1995) “Threshold Level” would serve as the appropriate SQG criteria for this hypothesis test because it is the concentration below which no adverse biological effects are expected. A one sample t-test of the alternate hypotheses that the mean of arsenic and nickel concentrations in channel bank samples is equal to or less than the corresponding Environment of Canada (1995) “Threshold Level” cannot be rejected at the 5% significance level. Thus, the null hypotheses that mean of arsenic and nickel concentrations in channel bank samples could pose an adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir is rejected on the basis of strong evidence to the contrary.

Likewise, a one-sample t-test was performed to test the null hypothesis that concentrations of arsenic and nickel in mid point and end point samples poses no adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir. The alternative hypotheses that the mean arsenic and nickel concentrations in mid point and end point samples are greater than or equal to the USEPA Consensus-Based Probable Effects Concentration are both rejected at the 5% significance level. Thus, the null hypotheses that mean of arsenic and nickel concentrations in mid point and end point samples are less than USEPA Consensus-Based Probable Effects Concentration is presumed to be true.

A one sample t-test of the alternate hypotheses that the mean of arsenic and nickel concentrations in mid point and end point samples is equal to or less than the corresponding Environment of Canada (1995) “Threshold Level” was performed to test the null hypothesis that the concentrations of arsenic and nickel in mid point and end point samples could pose an adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir. The one sample t-test of the alternate hypotheses that the mean of arsenic concentrations in mid point and end point samples is equal to or less than the corresponding Environment of Canada (1995) “Threshold Level” cannot be rejected at the 5% significance level. Thus, the null hypotheses that mean of the arsenic concentration in mid point and end point samples is greater than the relevant SQG is rejected. On the other hand, the one sample t-test of the alternate hypotheses that the mean of nickel concentrations in mid point and end point samples is equal to or less than the corresponding Environment of Canada (1995) “Threshold Level” is rejected at the 5% significance level. Thus, the null hypotheses that mean of the arsenic concentration in mid point and end point samples is greater than the relevant SQG is presumed to be true.

These hypothesis test results provide similar conclusions to those reached earlier in this section based on the statistical summaries presented in Figures 6 and 7 and comparison of these results with the relevant SQGs. The mean and median of arsenic and nickel concentrations in all the Galisteo Reservoir Sediment samples are significantly less than USEPA Consensus-Based Probable Effects Concentration. Likewise, the mean and median of arsenic and nickel concentrations in all the Galisteo Reservoir Sediment samples except for nickel in the mid point/end point samples were all less than Environment of Canada (1995) “Threshold Level.” Thus, we cannot say with a relatively high level of confidence that the nickel in the mid point/end point samples are completely safe and below levels at which no adverse biological effects are expected. On the other hand we can say that the metal concentrations, including nickel, in the Reservoir Sediments are below concentrations above which adverse biological effects can be expected to frequently occur.

5.4.2 Retained Sediment Results for Reservoir Segment #2

The analysis results for the 30 individual co-located composite samples taken in Reservoir Segment #2 are provided in Table 8. All metals except for nickel in individual co-located composite samples taken within Reservoir Segment #2 were below relevant sediment quality aquatic guidelines and the health-based soil screening criteria. Nickel concentrations in two of the 30 individual co-located composite samples slightly exceeded the Environment of Canada “Threshold Level” but not the USEPA “Consensus-Based Probable Effects Concentration”.

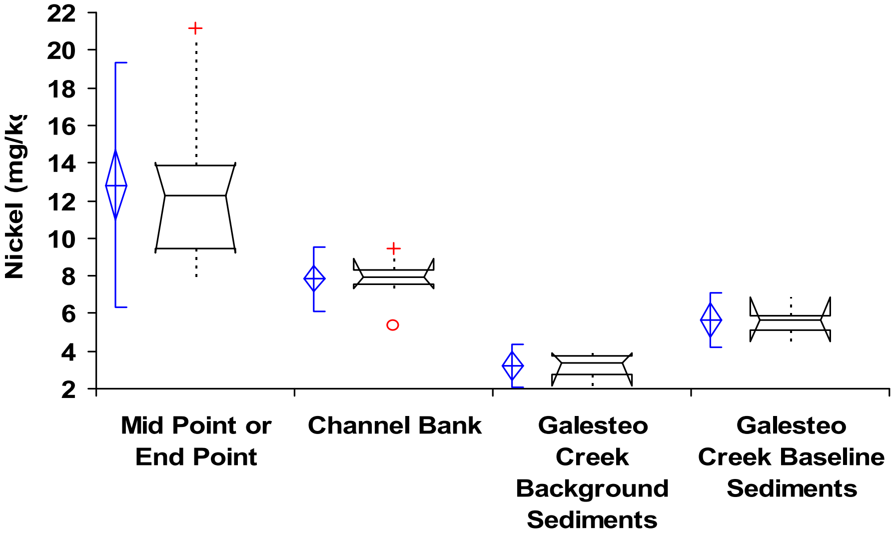
The box whisker plots of nickel concentrations in Figure 8 graphically show that the concentrations in the individual co-located composite samples taken within Reservoir Segment #2 are above the nickel concentrations in the Galisteo Creek at the Background (upstream) and

Table 8
Analysis Results for Individual Co-Located Composite Samples, Reservoir Segment #2

Sample ID	Sample Date	Sample Gen Location & Depth (feet)	Metal Concentration, Total (mg/Kg)																					
			Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
RSICS2-01-00	10/31/04	End Point, 0-4"	28400	<0.25	2.59	334	1.21	8.71	0.366	16.70	8.40	13.80	26500	16.00	820	<0.125	17.5	0.269	<0.125	0.147	1.08	29.1	46.2	<0.05
RSICS2-02-00	10/31/04	Mid Point, 0-4"	17300	<0.25	2.21	272	0.736	6.94	0.321	11.30	6.45	9.99	19200	12.40	862	<0.125	13.3	0.34	<0.125	<0.125	0.847	23.4	35.4	<0.05
RSICS2-02-15	10/31/04	Mid Point, 1.5'	12500	<0.25	2.89	235	0.548	4.16	0.389	8.26	4.92	13.70	16200	28.80	356	<0.125	9.2	0.347	<0.125	<0.125	0.727	23.1	81.2	<0.05
RSICS2-03-00	10/21/04	Chan Bank, 0-4"	8920	<0.25	0.50	220	<0.275	1.90	0.185	5.54	4.11	6.92	10600	7.92	276	<0.125	7.9	<0.125	<0.125	<0.125	0.576	17.6	27.3	<0.05
RSICS2-03-02	10/21/04	Chan Bank, 2.0'	8240	<0.25	0.77	209	<0.275	3.08	0.198	4.75	4.04	8.56	10900	8.09	322	<0.125	7.7	<0.125	<0.125	<0.125	0.528	18.5	30.6	<0.05
RSICS2-04-00	10/31/04	End Point, 0-4"	33600	<0.25	1.92	349	1.37	7.52	0.325	17.40	8.30	13.80	29300	16.40	663	<0.125	17.4	0.274	<0.125	0.157	1.18	27.5	44.4	<0.05
RSICS2-05-00	10/31/04	Mid Point, 0-4"	17500	<0.25	1.77	252	0.727	6.27	0.255	10.40	5.98	11.20	17100	11.20	439	<0.125	12.0	0.314	<0.125	<0.125	1.02	23.9	36.4	<0.05
RSICS2-05-15	10/31/04	Mid Point, 1.5'	11900	<0.25	1.61	204	0.488	4.88	0.242	8.35	4.95	8.32	13700	9.85	383	<0.125	9.6	0.357	<0.125	<0.125	0.796	19.4	30.9	<0.05
RSICS2-06-00	10/21/04	Chan Bank, 0-4"	8040	<0.25	0.67	234	<0.25	1.68	0.131	4.96	3.83	6.30	10600	6.17	271	<0.125	7.3	<0.125	<0.125	<0.125	0.511	17.8	29.9	<0.05
RSICS2-06-02	10/21/04	Chan Bank, 2.0'	7080	<0.25	0.92	204	<0.25	1.56	0.188	4.46	3.77	7.19	11000	7.76	253	<0.125	7.8	0.401	<0.125	<0.125	0.487	18.4	31.0	<0.05
RSICS2-07-00	10/30/04	End Point, 0-4"	17700	<0.25	1.31	176	0.614	4.10	<0.125	9.95	4.98	7.94	14900	7.91	341	<0.125	14.0	0.214	<0.125	<0.125	0.643	12.8	25.9	<0.05
RSICS2-08-00	10/30/04	Mid Point, 0-4"	14400	<0.10	2.67	249	0.769	5.64	0.220	11.40	6.67	11.20	16100	11.90	445	<0.125	12.8	0.306	<0.125	<0.125	0.949	14.2	32.6	<0.05
RSICS2-08-15	10/30/04	Mid Point, 1.5'	7620	<0.25	1.43	190	0.236	2.83	0.135	5.93	3.74	5.36	10700	6.23	294	<0.125	7.9	0.252	<0.125	<0.125	0.51	13.9	21.4	<0.05
RSICS2-09-00	10/21/04	Chan Bank, 0-4"	10800	<0.25	0.65	218	<0.275	2.55	0.156	6.70	4.67	8.01	12200	9.54	306	<0.125	9.4	<0.125	<0.125	<0.125	0.63	20.0	31.9	<0.05
RSICS2-09-02	10/21/04	Chan Bank, 2.0'	8650	<0.25	0.90	237	<0.25	1.75	0.182	5.77	4.53	7.53	11700	8.03	296	<0.125	8.9	<0.125	<0.125	<0.125	0.593	19.5	31.6	<0.05
RSICS2-10-00	10/21/04	Chan Bank, 0-4"	8670	<0.25	0.71	241	<0.25	2.74	0.225	5.46	4.26	7.52	11400	7.05	289	<0.125	7.9	<0.125	<0.125	<0.125	0.569	20.3	30.3	<0.05
RSICS2-10-02	10/21/04	Chan Bank, 2.0'	7010	<0.25	1.05	183	<0.25	2.81	0.358	4.30	3.90	7.17	10500	7.24	261	<0.125	7.5	0.179	<0.125	<0.125	0.509	17.1	38.9	<0.05
RSICS2-11-00	10/26/04	Mid Point, 0-4"	26700	<0.25	2.57	314	1.16	9.64	0.338	15.10	7.87	18.80	24200	16.20	548	<0.125	20.4	0.201	<0.125	0.145	1.16	28.3	43.6	<0.05
RSICS2-11-15	10/26/04	Mid Point, 1.5'	11400	<0.25	1.73	207	0.514	4.80	0.208	8.40	3.43	8.67	13400	9.09	352	<0.125	11.6	0.236	<0.125	<0.125	0.74	18.4	27.0	<0.05
RSICS2-12-00	10/26/04	End Point, 0-4"	22800	<0.25	3.54	258	0.985	8.48	0.303	13.20	6.87	17.00	23200	16.30	415	<0.125	21.2	0.262	<0.125	<0.125	1.05	24.8	45.0	<0.05
RSICS2-13-00	10/30/04	End Point, 0-4"	11000	<0.25	3.31	126	0.396	3.31	0.208	8.49	3.49	8.18	14000	8.39	182	<0.125	13.7	0.474	<0.125	<0.125	0.566	11.8	32.0	<0.05
RSICS2-14-00	10/30/04	Mid Point, 0-4"	16600	<0.25	1.48	192	0.539	4.17	0.185	9.09	4.86	7.88	15000	7.91	351	<0.125	13.5	0.341	<0.125	<0.125	0.584	17.4	26.8	<0.05
RSICS2-14-15	10/30/04	Mid Point, 1.5'	8340	<0.25	1.95	145	0.31	2.86	0.154	6.06	2.81	6.95	11700	8.52	233	<0.125	8.8	0.323	<0.125	<0.125	0.508	14.4	28.2	<0.05
RSICS2-15-00	10/21/04	Chan Bank, 0-4"	8690	<0.25	0.74	226	<0.25	1.80	0.170	5.58	4.28	6.88	11000	6.84	293	<0.125	8.0	<0.125	<0.125	<0.125	0.556	18.4	28.1	<0.05
RSICS2-15-02	10/21/04	Chan Bank, 2.0'	5700	<0.25	0.57	250	<0.125	2.62	0.351	4.34	3.04	4.85	9920	6.40	262	<0.125	5.3	0.418	<0.125	<0.125	0.481	16.4	21.2	<0.05
RSICS2-16-00	10/29/04	Mid Point, 0-4"	12700	<0.25	1.87	216	0.531	6.44	0.218	8.28	4.40	8.03	14000	8.80	371	<0.125	11.7	0.361	<0.125	<0.125	0.722	20.8	29.9	<0.05
RSICS2-16-15	10/29/04	Mid Point, 1.5'	8950	<0.25	2.02	205	0.315	3.00	0.182	6.65	3.02	7.20	13000	10.40	264	<0.125	8.9	0.338	<0.125	<0.125	0.537	15.7	32.6	<0.05
RSICS2-17-00	10/29/04	End Point, 0-4"	14300	<0.25	1.32	190	0.487	4.91	0.146	6.92	4.37	7.36	13900	7.65	341	<0.125	12.3	0.211	<0.125	<0.125	0.575	15.5	26.0	<0.05
RSICS2-18-00	10/21/04	Chan Bank, 0-4"	8580	<0.25	0.49	236	<0.275	2.70	0.090	5.72	4.26	6.72	10400	8.25	270	<0.125	8.3	0.237	<0.125	0.09	0.615	18.2	27.8	<0.05
RSICS2-18-02	10/21/04	Chan Bank, 2.0'	8160	<0.25	0.93	222	<0.25	3.18	0.146	4.88	4.35	7.92	11400	7.73	281	<0.125	8.3	0.196	<0.125	<0.125	0.637	17.9	30.8	<0.05
RSS2CS-01	11/02/04	Seg Comp Sample	13900	<0.25	1.63	225	0.586	5.67	0.226	4.73	10.00	10.80	13900	10.80	378	<0.125	13.2	0.255	<0.125	<0.125	0.738	22.1	32.6	<0.05
	Calculated		13075	<0.25	1.57	226	0.66306	4.23	0.227	8.14	4.82	9.03	14590.7	10.17	368	<0.125	11.0	0.29787	<0.125	0.13475	0.6962	19.2	33.5	<0.05
Maximum Concentration			3.E+04	0	3.54	349	1.37	1.E+01	0.389	17.4	8.E+00	2.E+01	3.E+04	28.8	9.E+02	0	2.E+01	0.474	0	0.157	1.18	29.1	8.E+01	<0.05
SQG (Canada Threshold Level)					5.90				0.600	37.30	NS	35.70		35	NS		18.00						123.0	0.17
SQG (USEPA Consensus based probable Effect Concentration)					33.00				4.980	111.00	NS	149.00		128	NS		48.60						459.0	1.06
Soil Screening Level. Outdoor workers (EPA)			100000	510	322	83000	2400	6.9E+04	630	560	3.0E+04	4.7E+04	1.0E+05	1400	4.0E+04	6400	2.6E+03	6400	6400	100	NS	8900	1.0E+05	380
Soil Screening Level. Outdoor workers (NM)			100000	92	17	15000	440	1.3E+04	190	660	1.3E+04	8.5E+03	6.9E+04	1000	1.4E+04	1200	4.4E+03	1200	1200	18	NS	1600	2.3E+04	69

Sample ID: RSICS2-XX-YY indicates Retained Sediment Individual (5-pt) Composite Sample from Segment 2, sample Loxation XX @ YY depth

Figure 8. Comparison of Nickel in Sediment Samples at Reservoir Segment #2 with The Galisteo Creek Bed Sediments



Sediment Location/Type	n	Mean	SD	Median	IQR	95% CI of Median
Mid Point or End Point	19	12.83	3.938	12.30	4.42	9.23 to 14.00
Channel Bank	11	7.85	1.042	7.90	0.70	7.34 to 8.93
Galesteo Creek Background Sediments	6	3.21	0.709	3.36	0.93	2.13 to 3.90
Galesteo Creek Baseline Sediments	6	5.67	0.885	5.67	0.76	4.50 to 6.88

Baseline (downstream) sediments. Furthermore, the 95% confidence intervals for the median nickel concentrations in the Channel Bank, the Mid-point/End-Point, the Background (upstream) and Baseline (downstream) sediments do not overlap, indicating measurable differences among median nickel concentrations for each sediment category.

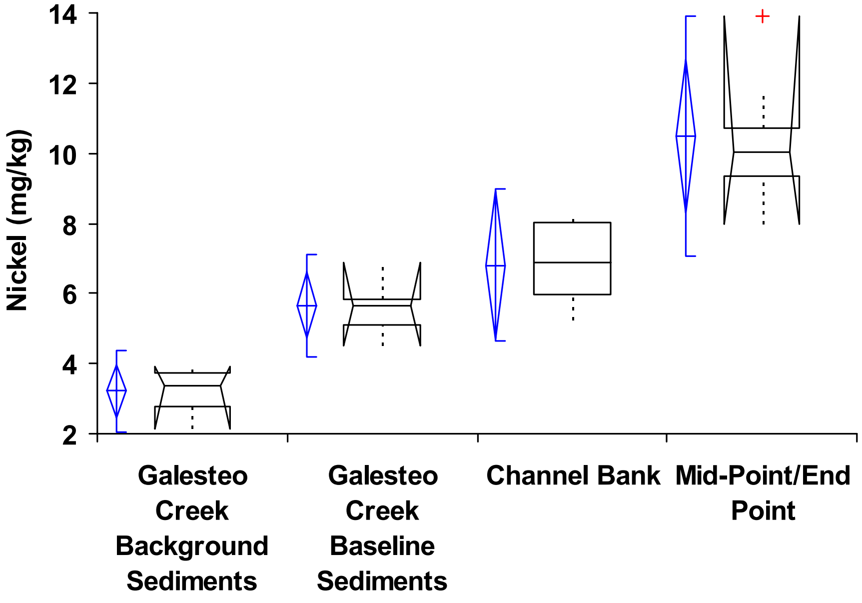
The median nickel of 12.3 mg/kg in sediments from mid point and end point locations within Reservoir Segment #2 is still below the Environment of Canada (1995) “Threshold Level” of 18 mg/kg. A one sample t-test of the alternate hypotheses that the mean of nickel concentrations in mid point and end point samples is equal to or less than the corresponding Environment of Canada (1995) “Threshold Level” was performed to test the null hypothesis that the concentrations of nickel in mid point and end point samples could pose an adverse risk to the aquatic environment within Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir. The one sample t-test of the alternate hypotheses that the mean of nickel concentrations in mid point and end point samples is equal to or less than the corresponding Environment of Canada (1995) “Threshold Level” cannot be rejected at the 5% significance level. Thus, the null hypotheses that mean of the nickel concentration in mid point and end point samples is greater than the relevant SQG is rejected. These results indicate that the metal concentrations in sediments within Reservoir Segment #2 do not pose a significant risk for downstream contamination because concentrations are below levels where no adverse biological effects are expected.

5.4.3 Retained Sediment Results for Reservoir Segment #3

The analysis results for the 10 individual co-located composite samples taken in Reservoir Segment #3 are provided in Table 9. All metals in individual co-located composite samples taken within Reservoir Segment #3 were below relevant sediment quality aquatic guidelines and the health-based soil screening criteria. Sediments in Reservoir Segment #3 do not pose a significant risk for downstream contamination because concentrations are below levels where no adverse biological or health effects are expected.

The median nickel from mid point and end point locations within Reservoir Segment #3 is above the nickel concentrations in the Galisteo Creek at the Background (upstream) and Baseline (downstream) sediments as shown in the box whisker plots in Figure 9. The 95% confidence interval for the median could not be determined for the Channel Bank locations because of insufficient number of samples. However, the median nickel concentration of 6.88 mg/kg for the Channel Bank locations is within the 95% confidence interval of the median value for the Galisteo Creek Baseline (downstream) sediments, indicating no significant differences in nickel concentrations in these sediments.

Figure 9. Comparison of Nickel in Sediment Samples at Reservoir Segment #3 with The Galisteo Creek Bed Sediments



Sediment Location/Type	n	Mean	SD	Median	IQR	95% CI of Median
Galesteo Creek Background Sediments	6	3.210	0.7089	3.360	0.928	2.130 to 3.900
Galesteo Creek Baseline Sediments	6	5.667	0.8849	5.665	0.760	4.500 to 6.880
Channel Bank	4	6.805	1.3253	6.880	2.075	- to -
Mid-Point/End Point	6	10.477	2.0850	10.020	1.370	7.960 to 13.900

Table 9
Analysis Results for Individual Co-Located Composite Samples, Reservoir Segment #3

Sample ID	Sample Date	Sample Gen Location & Depth (feet)	Metal Concentration, Total (mg/Kg)																					
			Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
RSICS3-01-00	10/25/04	Chan Bank, 0-4"	8060	<0.25	2.26	183	0.423	3.23	0.141	5.75	3.42	5.80	11900	6.85	270	<0.125	6.20	0.332	<0.125	<0.125	0.577	18.9	24.3	<0.05
RSICS3-01-15	10/25/04	Chan Bank, 1.5'	6480	<0.25	1.87	191	0.356	2.64	<0.125	4.45	2.92	5.15	10900	5.88	257	<0.125	5.26	0.255	<0.125	<0.125	0.485	15.9	21.4	<0.05
RSICS3-02-00	10/25/04	Mid Point, 0-4"	12100	<0.25	2.29	225	0.382	5.72	0.169	8.66	4.74	7.49	12100	8.47	364	<0.125	9.26	0.359	<0.125	<0.125	0.775	20.2	29.0	<0.05
RSICS3-02-15	10/25/04	Mid Point, 1.5'	12700	<0.25	3.18	197	0.337	5.50	0.211	9.39	4.76	9.17	11400	14.00	381	<0.125	10.40	0.484	<0.125	<0.125	0.769	21.0	40.0	<0.05
RSICS3-03-00	10/25/04	End Point, 0-4"	14400	<0.25	3.46	152	0.362	4.94	0.266	9.47	4.77	10.00	12000	13.20	334	<0.125	11.70	0.661	<0.125	<0.125	0.630	18.1	44.1	<0.05
RSICS3-04-00	10/25/04	End Point, 0-4"	15300	<0.25	2.95	195	0.446	6.19	0.201	11.00	6.08	9.61	12700	11.00	617	<0.125	13.90	0.405	<0.125	<0.125	0.715	21.4	36.3	<0.05
RSICS3-05-00	10/25/04	Mid Point, 0-4"	10500	<0.25	2.30	222	0.384	4.92	0.143	7.72	4.50	6.55	11900	7.83	501	<0.125	7.96	0.339	<0.125	<0.125	0.588	19.9	26.5	<0.05
RSICS3-05-15	10/25/04	Mid Point, 1.5'	13400	<0.25	4.52	222	0.331	4.43	0.391	9.14	4.77	14.90	10400	29.40	292	<0.125	9.64	0.464	<0.125	<0.125	0.700	24.3	77.5	<0.05
RSICS3-06-00	10/25/04	Chan Bank, 0-4"	8960	<0.25	2.24	208	0.360	3.59	0.147	6.69	3.86	6.58	10600	7.56	273	<0.125	7.56	0.353	<0.125	<0.125	0.603	19.8	27.4	<0.05
RSICS3-06-15	10/25/04	Chan Bank, 1.5'	9730	<0.25	2.51	249	0.368	3.98	0.169	7.24	4.13	8.72	11500	9.88	309	<0.125	8.20	0.439	<0.125	<0.125	0.688	20.1	28.2	<0.05
RSS3CS-01	10/29/04	Seg Comp Sample	11600	<0.25	2.59	209	0.464	5.48	0.223	7.67	3.30	10.50	14700	13.20	375	<0.125	11.40	0.262	<0.125	<0.125	0.692	20.0	37.4	<0.05
	Calculated		11163	<0.25	2.76	204	0.375	4.51	0.20422	7.95	4.40	8.40	11540	11.41	359.8	<0.125	9.01	0.409	<0.125	<0.125	0.653	20.0	35.5	<0.05
Maximum Concentration			2.E+04	0	4.52	249	0.464	6.E+00	0.391	11	6.E+00	1.E+01	1.E+04	29.4	6.E+02	<0.125	1.E+01	0.661	<0.125	<0.125	0.775	24.3	8.E+01	<0.05
SQG (Canada Threshold Level)			-	-	5.90	-	-	-	0.600	37.30	NS	35.70	-	35	NS	-	18.00	-	-	-	-	-	123.0	0.17
SQG (USEPA Consensus based probable Effect Concentration)			-	-	33.00	-	-	-	4.980	111.00	NS	149.00	-	128	NS	-	48.60	-	-	-	-	-	459.0	1.06
Soil Screening Level. Outdoor workers (EPA)			100000	510	322	83000	2400	6.9E+04	630	560	3.0E+04	4.7E+04	1.0E+05	1400	4.0E+04	6400	2.6E+03	6400	6400	100	NS	8900	1.0E+05	380
Soil Screening Level. Outdoor workers (NM)			100000	92	17	15000	440	1.3E+04	190	660	1.3E+04	8.5E+03	6.9E+04	1000	1.4E+04	1200	4.4E+03	1200	1200	18	NS	1600	2.3E+04	69

Sample ID: RSICS3-XX-YY indicates Retained Sediment Individual (5-pt) Composite Sample from Segment 3, sample Loxation XX @ YY depth

5.4.4 Background and Baseline Sediment Results for the Galisteo Creek

Background sediment samples were collected from six locations within the Galisteo Creek channel upstream of the Cerrillos Mining District and Madrid and baseline sediment samples were collected from six locations within the Galisteo Creek channel downstream of The Galisteo Reservoir. These baseline sediment samples are representative of the sediment that is currently transported down The Galisteo Creek to the Rio Grande and are referred to as Background Segment #1 sediment samples.

The analysis results for the individual co-located composite Baseline and Background sediment samples taken from The Galisteo Creek are provided in Table 10. Although the metals concentrations in the Baseline sediment samples are generally higher than the metals concentrations in the Background sediment samples, all metals in individual co-located composite samples taken from the Galisteo Creek were below relevant sediment quality aquatic guidelines and the health-based soil screening criteria. Sediments in the Galisteo Creek do not pose a significant risk because concentrations are below levels where no adverse biological or health effects are expected.

In previous sections the metals concentrations in the Baseline and Background sediment samples were compared with retained reservoir sediments within Segment #1, #2 and #3. The metals concentrations in the retained reservoir sediments were generally higher than the metals concentrations in the Baseline and Background sediment samples from the Galisteo Creek. Nevertheless, the median concentrations for all metals in individual co-located composite sediment samples from reservoir Segment #1, #2 and #3 were below relevant sediment quality aquatic guidelines and the health-based soil screening criteria.

5.5 Quality Assurance/Quality Control Sampling Results

Since the data will be used for assessment of potential impact on human health and the environment, the objective is to generate representative and accurate data in accordance with the Data Quality Objectives described in the QAPP. The QAPP described the field and laboratory quality assurance sampling requirements that are applied to determine the accuracy and precision of the field and laboratory data. The QAPP also describes the data quality objectives that provide the basis for the sample locations, number of samples and sample composites that are utilized in the SAP. The quality assurance objectives for the field sampling program are to ensure that the data are reasonably representative of sediments that may be released from the reservoir as a result of proposed saltcedar eradication programs. The SAP provided the conceptual model of sediment release from the reservoir that served to develop the sampling locations.

Table 10
Analysis Results for Individual Co-Located Composite Samples, Background and Baseline Segments

Sample ID	Sample Date	Metal Concentration, Total, mg/Kg																					
		Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
BSICS1-01-00	12/27/04	5480	<0.10	2.070	164	0.256	2.62	0.082	4.240	2.76	4.83	8660	6.82	236	<0.05	4.50	0.184	<0.05	<0.05	0.472	14.9	24.2	<0.05
BSICS1-02-00	12/27/04	5830	<0.10	1.600	256	0.308	2.90	0.083	4.800	3.14	4.45	9900	5.93	254	<0.05	4.91	0.218	<0.05	0.079	0.528	16.9	23.7	<0.05
BSICS1-03-00	12/27/04	6660	<0.10	1.940	312	0.351	3.74	0.110	5.680	3.54	5.50	11500	7.00	324	<0.05	5.68	0.212	<0.05	0.084	0.631	23.8	26.9	<0.05
BSICS1-04-00	12/27/04	6660	<0.10	2.000	267	0.342	3.55	0.093	5.510	3.66	5.04	11200	6.29	306	<0.05	5.65	0.193	<0.05	0.082	0.603	20.3	25.5	<0.05
BSICS1-05-00	12/27/04	7450	<0.10	2.380	307	0.368	4.84	0.131	6.270	3.69	6.04	12600	7.86	287	<0.05	6.38	0.267	<0.05	0.092	0.659	23.8	31.2	<0.05
BSICS1-06-00	12/27/04	7500	<0.10	4.730	268	0.436	4.65	0.139	7.170	3.97	6.70	12700	8.60	296	<0.05	6.88	0.246	<0.05	<0.05	0.718	22.6	34.6	<0.05
BSS1CS-01 (segment Composite	12/27/04	6610	<0.10	1.810	234	0.327	3.39	0.104	5.490	3.35	5.09	10900	6.25	261	<0.05	5.67	0.183	<0.05	<0.05	0.566	19.4	26.1	<0.05
	Calculated	6596.67	<0.10	2.453	262	<0.125	3.72	0.10633	5.612	3.46	5.43	11093.33	7.08	284	<0.05	5.67	0.22	<0.05	<0.07	0.60183	20.4	27.7	<0.05
BSS2CS-01-00	10/16/04	1720	<0.25	<0.125	124	<0.125	<0.75	0.116	1.440	1.68	2.39	4260	3.26	289	<0.125	2.13	0.423	<0.125	<0.125	0.423	8.0	7.4	<0.05
BSS2CS-02-00	10/16/04	3150	<0.25	0.611	335	<0.125	1.19	0.137	3.660	2.86	3.15	9410	4.25	324	<0.125	3.68	0.492	<0.125	<0.125	0.466	18.1	16.8	<0.05
BSS2CS-03-00	10/16/04	2720	<0.25	0.728	113	<0.125	0.90	0.096	2.310	1.91	3.31	7140	3.40	319	<0.125	3.04	0.412	<0.125	<0.125	0.467	11.0	11.3	<0.05
BSS2CS-04-00	10/16/04	4250	<0.25	0.841	204	<0.125	1.24	0.104	2.980	3.08	4.23	9230	4.62	364	<0.125	3.90	0.451	<0.125	<0.125	0.471	15.7	17.5	<0.05
BSS2CS-05-00	10/16/04	2860	<0.25	<0125	110	<0.125	<0.75	0.113	2.300	2.48	4.32	8080	3.43	338	<0.125	2.70	0.432	<0.125	<0.125	0.504	15.3	14.2	<0.05
BSS2CS-06-00	10/16/04	4300	<0.25	0.924	143	<0.125	0.82	0.113	3.190	2.48	4.04	8210	4.72	297	<0.125	3.81	0.414	<0.125	<0.125	0.444	12.4	14.5	<0.05
BSS2CS-01 (segment Composite	10/20/04	3680	<0.25	0.457	160	<0.125	1.48	0.091	3.050	2.19	2.86	9250	3.30	314	<0.125	3.39	0.248	<0.125	<0.125	0.398	10.7	13.0	<0.05
	Calculated	3166.67	<0.25	0.776	172	<0.125	1.04	0.11317	2.647	2.42	3.57	7721.667	3.95	322	<0.125	3.21	0.43733	<0.125	<0.125	0.4625	13.4	13.6	<0.05

		Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
Maximum Concentration		8.E+03	0	4.73	335	0.436	5.E+00	0.139	7.17	4.E+00	7.E+00	1.E+04	8.6	4.E+02	0	7.E+00	0.492	0	0.092	0.718	23.8	3.E+01	0
SQG (Canada Threshold Level)				5.90				0.600	37.30	NS	35.70		35	NS		18.00						123.0	0.17
SQG (USEPA Onssensus based				33.00				4.980	111.00	NS	149.00		128	NS		48.60						459.0	1.06
Soil Screening Level. Outdoor workers (EPA)		100000	510	322	83000	2400	7.E+04	630	560	3.E+04	4.7E+04	1.0E+05	1400	4.0E+04	6400	2.6E+03	6400	6400	100	NS	8900	1.0E+05	380
Soil Screening Level. Outdoor workers (NM)		100000	92	17	15000	440	1.E+04	190	660	1.E+04	8.5E+03	6.9E+04	1000	1.4E+04	1200	4.4E+03	1200	1200	18	NS	1600	2.3E+04	69

Sample ID: BSICS1-XX-YY indicates Background Sediment Individual 5-pt Composite Sample from Segment 1 Baseline), Sample Loxation XX @ YY depth

Sample ID: BSS2CS-XX-YY indicates Background Sediment Individual 5-pt Composite Sample from Segment 2 Background), Sample Loxation XX @ YY depth

The data quality objective with respect to precision and accuracy is to obtain the most accurate and precise data practical. The overall precision of measurement data is a mixture of sampling and analytical factors. The measurement precision was determined by collecting and analyzing field replicate samples. Field duplicate samples were collected for 10% of the samples to determine measurement precision.

A rinseate blank sample was also collected from each type of sampling equipment (hand auger, trowel, etc) decontamination. The rinseate blank sampling was performed to determine adequacy of sampling equipment decontamination. Following decontamination of the sampling equipment, the equipment was rinsed with de-ionized water and the rinseate water was analyzed for metals.

The metals analysis results for the duplicates (splits) of the individual sediment composite samples and the equipment decontamination rinseate blanks are listed in Table 11. Several metals, Al, Pb, Mn, and Zn were observed at low concentrations above the detection limits in the 10-mesh SS sieve rinseate blank sample. However, Mn and Zn were also detected at similar concentrations in the trip blank sample. Mn and Zn were also detected at similar concentrations in the SS Mixing bowl rinseate blank sample. All other metals in equipment decontamination rinseate blank samples were below detection limits. The concentrations for metals detected in the equipment decontamination rinseate blanks and the field blank are three order of magnitude or more below the corresponding metal concentrations observed in the field duplicates (splits) of the individual sediment composite samples as shown in Table 11. Furthermore, the analytical variation observed between field duplicates (splits) is greater than the magnitude of the metal concentrations detected in the equipment decontamination rinseate blanks and field blank. The rinaste blank sample results indicate that the sampling equipment was adequately decontaminated during sampling.

The analytical result agreement for 22 metals for ten field duplicates (splits) with the corresponding samples are within established criteria of 50% for field duplicates, except arsenic analysis and one cadmium analysis in one field duplicate. Out of 220 QA/QC metal analysis, 201 QA/QC analysis showed analytical difference of <20%, 11 QA/QC analysis showed analytical difference within 21 to 30%, five QA/QC analysis showed analytical difference within 31 to 40%, one showed difference within 41% to 50%, and two above 50%. Although analytical differences for arsenic and cadmium of greater than the criteria were observed in one field duplicate, these metals occur at low concentrations so that even though the percentage difference is higher, the magnitude of the differences is insignificant and lower than for the metals such as Al, Cu, Fe and Mn, that are observed at higher concentrations in the samples. The field duplicate QA/QC results show adequate field sample preparation and laboratory analytical precision.

Table 11
Analysis Results for Field QA/QC Duplicates and Equipment Decontamination Rinsate Blanks

Sample ID	Sample Date	Description	Metal Concentration																					
			Unit	Al	Sb	As	Ba	Be	B	Cd	Cr	Co	Cu	Fe	Pb	Mn	Mo	Ni	Se	Ag	Tl	U	V	Zn	Hg
SEDRNB-01	10/22/04	Auger decon rinsate blank	mg/L	<0.01	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.0002
SEDRNB-02	10/22/04	SS Mixing bowl decon rinsate blank	mg/L	<0.01	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.009	<0.0002
SEDRNB-03	10/22/04	Trowel/scoop decon rinsate blank	mg/L	<0.01	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.0002
SEDRNB-04	10/25/04	10-mesh SS sieve decon rinsate blank	mg/L	0.026	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.001	<0.001	<0.001	<0.01	0.005	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.011	<0.0002
GALTRB-01	10/29/04	Field/Trip Blank	mg/L	<0.01	<0.005	0.002	<0.001	<0.001	<0.003	<0.001	0.001	<0.001	<0.001	<0.01	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.014	<0.0002
RSICS1-07-04	10/17/04	Chan Bank, 4.0'	mg/Kg	8760	<0.25	1.17	228	0.512	2.32	0.136	6.82	4.56	8.72	11500	11.40	316	<0.125	8.02	0.518	<0.125	<0.125	0.646	18.1	34.4	<0.05
QSICS1-07-04	Field Dup of RSICS1-07-04			9160	<0.25	1.18	230	0.477	2.78	0.197	7.00	4.52	8.92	12000	11.60	324	<0.125	8.28	0.538	<0.125	<0.125	0.692	18.2	35.3	<0.05
RSICS1-12-40	10/26/00	Chan Bank, 4.0'		13300	<0.25	2.36	238	0.554	5.60	0.286	9.15	3.78	11.00	15500	11.80	350	<0.125	12.80	0.173	<0.125	<0.125	0.777	20.8	34.8	<0.05
QSICS1-12-40	Field Dup of RSICS1-12-40			13500	<0.25	2.21	238	0.533	5.32	0.218	8.73	3.94	10.70	15500	11.50	355	<0.125	13.30	0.226	<0.125	<0.125	0.743	20.0	34.4	<0.05
RSICS1-16-00	10/30/04	End Point, 0-4"		15900	<0.25	6.42	165	0.799	5.12	0.335	10.60	6.75	13.00	23000	15.70	242	<0.125	18.20	0.990	<0.125	0.209	1.060	21.9	76.6	<0.05
QSICS1-16-00	Field Dup of RSICS1-16-00			16100	<0.25	6.17	156	0.792	5.71	0.413	10.80	6.53	12.90	22500	15.50	234	<0.125	18.20	0.970	<0.125	0.217	1.020	22.0	72.9	<0.05
RSICS1-18-02	10/20/04	Chan Bank, 2.0'		11100	<0.25	5.90	125	0.590	4.00	0.298	9.63	6.18	12.60	18500	12.50	199	<0.125	16.10	1.120	<0.125	0.166	0.885	18.3	52.0	<0.05
QSICS1-18-02	Field Dup of RSICS1-18-02			11700	<0.25	6.21	133	0.638	4.10	0.211	9.26	6.36	13.10	19700	13.00	209	<0.125	17.00	0.991	<0.125	0.176	0.922	19.1	54.2	<0.05
RSICS2-08-00	10/30/04	Mid Point, 0-4"		14400	<0.10	2.67	249	0.769	5.64	0.220	11.40	6.67	11.20	16100	11.90	445	<0.125	12.8	0.306	<0.125	<0.125	0.949	14.2	32.6	<0.05
QSICS2-08-00	Field Dup of RSICS2-08-00			14700	<0.10	2.70	258	0.789	6.15	0.223	11.60	6.65	11.30	16500	11.90	449	<0.125	13.0	0.308	<0.125	<0.125	0.959	15.8	33.3	<0.05
RSICS2-15-02	10/21/04	Chan Bank, 2.0'		5700	<0.25	0.57	250	<0.125	2.62	0.351	4.34	3.04	4.85	9920	6.40	262	<0.125	5.3	0.418	<0.125	<0.125	0.481	16.4	21.2	<0.05
QSICS2-15-02	Field Dup of RSICS2-15-02			5690	<0.25	1.28	273	<0.125	1.83	0.264	3.15	2.46	3.88	9880	4.54	261	<0.125	4.2	0.295	<0.125	<0.125	0.371	14.0	16.5	<0.05
RSICS2-18-00	10/21/04	Chan Bank, 0-4"		8580	<0.25	0.49	236	<0.275	2.70	0.090	5.72	4.26	6.72	10400	8.25	270	<0.125	8.3	0.237	<0.125	0.09	0.615	18.2	27.8	<0.05
QSICS2-18-00	Field Dup of RSICS2-18-00			8920	<0.25	0.59	214	<0.275	1.85	0.195	5.77	4.25	6.94	11100	7.80	290	<0.125	8.3	0.228	<0.125	<0.125	0.577	18.4	28.5	<0.05
RSICS3-03-00	10/25/04	End Point, 0-4"		14400	<0.25	3.46	152	0.362	4.94	0.266	9.47	4.77	10.00	12000	13.20	334	<0.125	11.70	0.661	<0.125	<0.125	0.630	18.1	44.1	<0.05
QSICS3-03-00	Field Dup of RSICS3-03-00			14000	<0.25	3.48	148	0.336	4.56	0.248	8.95	4.62	9.93	12000	13.60	335	<0.125	11.40	0.653	<0.125	<0.125	0.609	17.6	44.3	<0.05
BSICS1-04-00	12/27/04	Baseline surface		6660	<0.10	2.000	267	0.342	3.55	0.093	5.510	3.66	5.04	11200	6.29	306	<0.05	5.65	0.193	<0.05	0.082	0.603	20.3	25.5	<0.05
QBICS1-04-00	Field Dup of BSICS1-04-00			6710	<0.10	2.780	268	0.339	3.52	0.102	5.470	3.71	5.23	12700	6.96	296	<0.05	5.87	0.208	<0.05	<0.05	0.69	22.6	34.6	<0.05
BSS2CS-04-00	10/16/04	Background surface		4250	<0.25	0.841	204	<0.125	1.24	0.104	2.980	3.08	4.23	9230	4.62	364	<0.125	3.90	0.451	<0.125	<0.125	0.471	15.7	17.5	<0.05
QSS2CS-04-00	Field Dup of BSS2CS-04-00			4200	<0.25	0.892	203	<0.125	1.14	0.117	2.860	3.24	4.32	10100	6.23	323	<0.125	4.04	0.416	<0.125	<0.125	0.502	16.2	19.2	<0.05

6.0 DISCUSSION AND CONCLUSIONS

The USACE is evaluating removal alternative for saltcedar and non-native vegetation behind the Galisteo Dam. Removal of the vegetation is expected to result in release of reservoir sediments that may be transported during storm runoff events into the downstream reaches of the Galisteo Creek and the Rio Grande River. Chemical characterization focused on metals due to the possible occurrence of elevated metal concentrations resulting from natural liberalization and historical mining and smelting activities in the drainage basin upstream of the reservoir.

Current plans for saltcedar eradication are focused on Segment #1, although saltcedar thickets within other portions of the reservoir could be eventual targets for eradication in the future. Segment #1 is closest to the dam and it was thought that sediment particle size will be finer with higher metals concentrations and that sediment deposits in Segment #3 located furthest from the dam would exhibit coarser sediments with lower metals concentrations. Particle size analysis and metals analysis of composite samples from each reservoir segment confirmed this hypothesis. Reservoir Segment #2 is a transition segment, where the saltcedar thickets are the most likely targets for eradication after successful completion of the eradication program in Segment #1. Therefore, most of the sediment sampling was concentrated within Segment #1 and #2.

The fundamental question to be resolved by the sediment characterization study is whether the sediments released to Galisteo Creek as a result of the proposed saltcedar eradication program may pose an adverse risk to human health and the aquatic environment downstream of the Galisteo Dam.

6.1 Physical and Chemical Analysis of Reservoir Sediments

Particle size distributions of composite samples from Reservoir and Background Segments was performed by sieve analysis and hydrometer testing. These results were presented in Section 5.1. The reservoir retained sediments consist of very fine-grained inorganic sands and silts with no clay while the composite samples from the baseline and background channel segments contain higher fractions of medium sand and less silt. The proportion of silt in the composite sample is highest for Segment #1 and lowest for Segment #3. The reservoir retained sediments are highly erodibile with a soil erodibility (K) factor within the range from 0.45 to 0.6.

Sections 5.3 and 5.4 of this report provided comparisons of metals in sediment samples with two aquatic based sediment quality criteria and two industrial worker soil screening criteria. Soil screening criteria for industrial outdoor worker were thought to be relevant for evaluating the potential risk from frequent exposure to stream sediments by irrigators or workers involved in construction activities in the river or the floodplain. The industrial outdoor worker soil screening criteria are also protective for the recreational user that would most likely have lower exposure frequency than the industrial worker.

The metals concentrations in the 92 individual co-located composite sediment samples and in the Reservoir and Background Segment composite samples were all significantly lower than the corresponding soil screening criteria for industrial outdoor workers. Likewise, the metals concentrations in all the Reservoir and Background Segment composite samples were all lower than the corresponding aquatic criteria. However, the copper concentrations in the in the –63 μ m sieve fraction for the Segment composite samples exceeded one or both of the aquatic sediment quality guidelines for copper. As discussed in Section 5.3, copper and zinc concentrations in the –63 μ m sieve fraction for the Segment composite samples are thought to be elevated due to the use of brass sieves by the laboratory in preparing these samples. The bias in the copper and zinc in the –63 μ m sieve fraction is indicated by the much higher weighted average for these metals calculated from the size fraction results for a given Segment as compared to the measured results for the Segment composite samples and average concentrations determined from the individual co-located samples for the Segment.

The average metals concentrations in the composite samples for each of the reservoir Segments do not exceed any of the relevant aquatic based sediment quality criteria and industrial worker soil screening criteria. These results indicate that the reservoir sediments are of low risk to human health and the aquatic environment downstream of the Galisteo Dam. However, the individual co-located samples were also evaluated to determine whether sediments within a given portion of each reservoir segment might pose an adverse risk.

Cadmium, arsenic, and nickel in one or more of the individual co-located composite samples from Reservoir Segment #1 slightly exceeded the Environment of Canada “Threshold Level” but not the USEPA “Consensus-Based Probable Effects Concentration”. Likewise, nickel concentrations in two of the 30 individual co-located composite samples from Reservoir Segment #2 slightly exceeded the Environment of Canada “Threshold Level” but not the USEPA “Consensus-Based Probable Effects Concentration”. All other metals concentrations in the individual co-located composite samples from Reservoir and Background Segments were below all relevant Sediment Quality Guidelines.

The Environment of Canada (1995) “Threshold Level” is the sediment chemical concentrations below which no adverse biological effects are expected while the USEPA “Consensus-Based Probable Effects Concentration” is the concentrations above which adverse biological effects can be expected to be frequently occur. These differences in the development of the aquatic criteria were utilized to develop different hypotheses concerning the risk to the aquatic environment on the Galisteo Creek or the Rio Grande downstream of the reservoir associated with the release of reservoir sediments.

A statement of a hypothesis includes both a null hypothesis and an alternative hypothesis. The null hypothesis is presumed to be true in the absence of strong evidence to the contrary. The alternative hypothesis is the hypothesis that bears the burden of proof. In other words, the null hypothesis will be assumed to be true unless the alternative hypothesis is thought to be true due to the preponderance of evidence. For the null hypothesis that the average metals concentrations of reservoir sediments pose no risk to aquatic environment on the Galisteo Creek or the Rio Grande downstream of the reservoir upon release from the reservoir, the alternate hypothesis is that the reservoir sediments pose an adverse risk to the aquatic environment on the Galisteo Creek or the Rio Grande downstream of the reservoir, which can be stated as:

Metal concentration in released sediment >the relevant Sediment Quality Guideline (SQG)

where the appropriate SQG is the USEPA Consensus-Based Probable Effects Concentration.

The USEPA Consensus-Based Probable Effects Concentration provides the appropriate criteria for this hypothesis test because it is the concentration above which adverse biological effects can be expected to frequently occur.

The metals analysis results of sediment samples reported in Sections 5.3 and 5.4 of this report provide a preponderance of evidence that metals concentrations in reservoir sediments do not exceed the USEPA Consensus-Based Probable Effects Concentrations. Thus, the null hypothesis that the reservoir sediments pose no adverse risk to the aquatic environment on Galisteo Creek or the Rio Grande downstream of the reservoir is presumed to be true in the absence of evidence to the contrary.

On the other hand, if the null hypothesis is that the average metals concentrations in reservoir sediments pose an adverse risk to the aquatic environment on the Galisteo Creek or the Rio Grande downstream of the reservoir then the alternate hypothesis is that the metals concentrations in reservoir sediments do not pose an adverse risk to the aquatic environment. The Environment of Canada (1995) “Threshold Level” would serve as the appropriate SQG criteria for this hypothesis test because it is the concentration below which no adverse biological effects are expected. In other words, the sediments are assumed to pose an adverse risk in the absence of strong evidence to the contrary.

The metals analysis results of sediment samples reported in Section 5 of this report provided a preponderance of evidence that average concentrations of all metals except nickel are below the relevant Environment of Canada (1995) “Threshold Level” in reservoir sediments. The average nickel concentrations in the mid point and end point samples from Reservoir Segment #1 is the only metal that is not statistically lower than relevant Environment of Canada (1995) “Threshold Level.” Nevertheless, the average nickel concentrations in mid point and end point locations is 18.44 mg/kg, which is very close the Environment of Canada (1995) "Threshold Level" of 18 mg/kg below which no adverse biological effects are expected. Furthermore, it is expected that the rate of erosion of sediments from the reservoir deposits would diminish with distance from the channel bank. Thus, the proportion of sediments from the mid point and end point locations would be less than from channel bank locations. Based on these considerations, it is expected that the average nickel concentrations in reservoir sediments released from reservoir Segment #1 are likely to be below the corresponding Environment of Canada (1995) "Threshold Level" of 18 mg/kg. Thus, the null hypothesis that the average metals concentrations in reservoir sediments pose an adverse risk to the aquatic environment on the Galisteo Creek or the Rio Grande downstream of the reservoir can be rejected based on the strong evidence to the contrary that the metals concentrations in reservoir sediments do not pose an adverse risk to the aquatic environment upon release from the reservoir.

6.2 Metals Leaching of Reservoir Sediments

To fully address whether the sediments released to Galisteo Creek as a result of the proposed saltcedar eradication program may pose an adverse risk to human health and the aquatic environment downstream of the Galisteo Dam, it is also necessary to examine the likely increase in metals concentrations in the water in the Galisteo Creek or the Rio Grande that may occur as a result of leaching of the sediments that are removed from the reservoir and physically mixed with the water by erosion and sediment transport processes.

To help address this concern, solubility tests were performed on each of the reservoir segment sediment composite samples and each of the channel segment "background" sediment composite samples. The metals concentrations in leachate of composite sediment samples obtained from the SPLP method 1312 were compared with relevant numeric water quality standards for designated uses in the segment of the Rio Grande from Cochiti Dam downstream to the Angostura diversion works. As reported in Section 5.2, most of the metals concentrations in leachate from composite samples were below detection limits. Aluminum was the only metal that exceeded both the relevant acute and chronic aquatic criteria. The aluminum concentration of 4.3 mg/l in leachate from reservoir Segment #1 was slightly greater than the aluminum concentration of 3.31 mg/l in the leachate from the background composite sample. The aluminum concentrations in leachate from reservoir Segment #2 and #3 were below background levels and below the acute aquatic criteria. The arsenic concentrations in leachate from reservoir Segment #1 and #2 and the baseline stream sediments downstream of the reservoir were also above the background levels and the drinking water criteria. All other metals concentrations in leachate from reservoir Segment #1, #2, and #3 were below detection

The occurrence of arsenic in a sediment leachate at concentrations above the relevant drinking water standard and the occurrence of aluminum in a sediment leachate at concentrations above the relevant aquatic criteria does not imply that these sediments pose an adverse risk to human health and the aquatic environment downstream of the Galisteo Dam if released as a result of salt cedar eradication. The concentration of these metals in the water of the Galisteo Creek and the Rio Grande downstream of the reservoir following release of sediment from the reservoir will be transient and variable depending upon the water to sediment ratios which change during erosion and sediment transport, the water chemistry of the water, the quantity and chemistry of downstream inflows, including the water in the Rio Grande. It is clear that the if reservoir sediments are released to the river, the aluminum and arsenic leached from these sediments during transport would be diluted by at least several orders of magnitude in stream water in comparison with the SPLP results. Furthermore, the aluminum concentration in the leachate from the background composite sample is similar to the concentration in the retained reservoir sediments. Consequently, release of these sediments is unlikely to result in an exceedence of water quality criteria and the sediments do not pose a significant adverse risk to human health or the aquatic environment.

7.0 REFERENCES

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Appendix A

Sediment Sample Location Coordinates

Field Sampling Data Forms

Sediment Sample Location Coordinates, Reservoir Segment #1

Sample Aliquot Point ID	Northing (ft)	Easting (ft)	Sample Aliquot Point ID	Northing (ft)	Easting (ft)
RSICS1-01-00A	**1,623,914**	**1,654,593**	**RSICS1-10-00A**	**1,623,079**	**1,654,058**
RSICS1-01-00B	1,623,924	1,654,581	RSICS1-10-00B	1,623,069	1,654,071
RSICS1-01-00C	1,623,905	1,654,581	RSICS1-10-00C	1,623,086	1,654,074
RSICS1-01-00D	1,623,904	1,654,600	RSICS1-10-00D	1,623,085	1,654,045
RSICS1-01-00E	1,623,924	1,654,602	RSICS1-10-00E	1,623,070	1,654,045
RSICS1-02-00A	**1,623,999**	**1,654,495**	**RSICS1-11-00A**	**1,623,130**	**1,653,853**
RSICS1-02-00B	1,624,000	1,654,476	RSICS1-11-00B	1,623,144	1,653,855
RSICS1-02-00C	1,623,986	1,654,494	RSICS1-11-00C	1,623,125	1,653,871
RSICS1-02-00D	1,623,998	1,654,509	RSICS1-11-00D	1,623,111	1,653,855
RSICS1-02-00E	1,624,016	1,654,495	RSICS1-11-00E	1,623,125	1,653,840
RSICS1-03-00A	**1,624,115**	**1,654,372**	**RSICS1-12-00A**	**1,623,178**	**1,653,723**
RSICS1-03-00B	1,624,113	1,654,363	RSICS1-12-00B	1,623,191	1,653,725
RSICS1-03-00C	1,624,109	1,654,344	RSICS1-12-00C	1,623,215	1,653,729
RSICS1-03-00D	1,624,133	1,654,389	RSICS1-12-00D	1,623,163	1,653,721
RSICS1-03-00E	1,624,125	1,654,385	RSICS1-12-00E	1,623,150	1,653,715
RSICS1-04-00A	**1,623,532**	**1,654,450**	**RSICS1-13-00A**	**1,622,454**	**1,653,947**
RSICS1-04-00B	1,623,543	1,654,464	RSICS1-13-00B	1,622,463	1,653,937
RSICS1-04-00C	1,623,522	1,654,462	RSICS1-13-00C	1,622,462	1,653,959
RSICS1-04-00D	1,623,521	1,654,439	RSICS1-13-00D	1,622,444	1,653,957
RSICS1-04-00E	1,623,543	1,654,438	RSICS1-13-00E	1,622,444	1,653,938
RSICS1-05-00A	**1,623,666**	**1,654,321**	**RSICS1-14-00A**	**1,622,446**	**1,653,703**
RSICS1-05-00B	1,623,679	1,654,322	RSICS1-14-00B	1,622,457	1,653,691
RSICS1-05-00C	1,623,665	1,654,336	RSICS1-14-00C	1,622,435	1,653,692
RSICS1-05-00D	1,623,651	1,654,320	RSICS1-14-00D	1,622,435	1,653,712
RSICS1-05-00E	1,623,666	1,654,306	RSICS1-14-00E	1,622,456	1,653,712
RSICS1-06-00A	**1,623,745**	**1,654,166**	**RSICS1-15-00A**	**1,622,437**	**1,653,573**
RSICS1-06-00B	1,623,748	1,654,150	RSICS1-15-00B	1,622,452	1,653,575
RSICS1-06-00C	1,623,749	1,654,136	RSICS1-15-00C	1,622,467	1,653,573
RSICS1-06-00D	1,623,742	1,654,184	RSICS1-15-00D	1,622,421	1,653,571
RSICS1-06-00E	1,623,742	1,654,199	RSICS1-15-00E	1,622,401	1,653,581
RSICS1-07-00A	**1,623,848**	**1,654,072**	**RSICS1-16-00A**	**1,621,934**	**1,654,178**
RSICS1-07-00B	1,623,850	1,654,049	RSICS1-16-00B	1,621,946	1,654,167
RSICS1-07-00C	1,623,848	1,654,035	RSICS1-16-00C	1,621,921	1,654,167
RSICS1-07-00D	1,623,846	1,654,083	RSICS1-16-00D	1,621,920	1,654,190
RSICS1-07-00E	1,623,840	1,654,105	RSICS1-16-00E	1,621,943	1,654,189
RSICS1-08-00A	**1,623,992**	**1,654,007**	**RSICS1-17-00A**	**1,621,829**	**1,654,117**
RSICS1-08-00B	1,623,984	1,654,020	RSICS1-17-00B	1,621,818	1,654,129
RSICS1-08-00C	1,623,983	1,653,996	RSICS1-17-00C	1,621,838	1,654,129
RSICS1-08-00D	1,624,006	1,653,998	RSICS1-17-00D	1,621,840	1,654,105
RSICS1-08-00E	1,624,006	1,654,018	RSICS1-17-00E	1,621,819	1,654,103
RSICS1-09-00A	**1,624,134**	**1,653,999**	**RSICS1-18-00A**	**1,621,758**	**1,654,033**
RSICS1-09-00B	1,624,150	1,653,996	RSICS1-18-00B	1,621,743	1,654,032
RSICS1-09-00C	1,624,139	1,654,014	RSICS1-18-00C	1,621,730	1,654,029
RSICS1-09-00D	1,624,118	1,654,002	RSICS1-18-00D	1,621,774	1,654,032
RSICS1-09-00E	1,624,129	1,653,984	RSICS1-18-00E	1,621,788	1,654,031

Projection: 1983 State Plane, NM Central

A, B, C, D and E indicate five sample aliquot points of the Individual composite sample with A as the primary (center) aliquot point

Sediment Sample Location Coordinates, Reservoir Segment #2

Sample Aliquot Point ID	Northing (ft)	Easting (ft)	Sample Aliquot Point ID	Northing (ft)	Easting (ft)
RSICS2-01-00A	**1,623,110**	**1,657,156**	**RSICS-10-00A**	**1,624,085**	**1,655,520**
RSICS2-01-00B	1,623,118	1,657,173	RSICS2-10-00B	1,624,084	1,655,502
RSICS2-01-00C	1,623,124	1,657,146	RSICS2-10-00C	1,624,081	1,655,482
RSICS2-01-00D	1,623,104	1,657,140	RSICS2-10-00D	1,624,086	1,655,541
RSICS2-01-00E	1,623,097	1,657,162	RSICS2-10-00E	1,624,085	1,655,562
RSICS2-02-00A	**1,623,511**	**1,657,053**	**RSICS2-11-00A**	**1,624,355**	**1,655,498**
RSICS2-02-00B	1,623,523	1,657,056	RSICS2-11-00B	1,624,368	1,655,505
RSICS2-02-00C	1,623,514	1,657,037	RSICS2-11-00C	1,624,359	1,655,485
RSICS2-02-00D	1,623,501	1,657,047	RSICS2-11-00D	1,624,346	1,655,491
RSICS2-02-00E	1,623,510	1,657,065	RSICS2-11-00E	1,624,352	1,655,510
RSICS2-03-00A	**1,623,867**	**1,656,979**	**RSICS2-12-00A**	**1,624,672**	**1,655,491**
RSICS2-03-00B	1,623,867	1,656,966	RSICS2-12-00B	1,624,667	1,655,476
RSICS2-03-00C	1,623,867	1,656,959	RSICS2-12-00C	1,624,660	1,655,498
RSICS2-03-00D	1,623,868	1,656,993	RSICS2-12-00D	1,624,684	1,655,485
RSICS2-03-00E	1,623,870	1,657,005	RSICS2-12-00E	1,624,679	1,655,504
RSICS2-04-00A	**1,622,823**	**1,656,244**	**RSICS2-13-00A**	**1,624,727**	**1,655,079**
RSICS2-04-00B	1,622,810	1,656,240	RSICS2-13-00B	1,624,718	1,655,089
RSICS2-04-00C	1,622,828	1,656,229	RSICS2-13-00C	1,624,737	1,655,087
RSICS2-04-00D	1,622,838	1,656,244	RSICS2-13-00D	1,624,734	1,655,070
RSICS2-04-00E	1,622,823	1,656,259	RSICS2-13-00E	1,624,718	1,655,070
RSICS2-05-00A	**1,623,335**	**1,656,271**	**RSICS2-14-00A**	**1,624,351**	**1,655,093**
RSICS2-05-00B	1,623,350	1,656,269	RSICS2-14-00B	1,624,365	1,655,091
RSICS2-05-00C	1,623,336	1,656,256	RSICS2-14-00C	1,624,349	1,655,104
RSICS2-05-00D	1,623,318	1,656,272	RSICS2-14-00D	1,624,337	1,655,092
RSICS2-05-00E	1,623,337	1,656,285	RSICS2-14-00E	1,624,351	1,655,079
RSICS2-06-00A	**1,623,805**	**1,656,306**	**RSICS2-15-00A**	**1,623,924**	**1,655,068**
RSICS2-06-00B	1,623,813	1,656,297	RSICS2-15-00B	1,623,928	1,655,082
RSICS2-06-00C	1,623,820	1,656,280	RSICS2-15-00C	1,623,931	1,655,096
RSICS2-06-00D	1,623,791	1,656,321	RSICS2-15-00D	1,623,921	1,655,054
RSICS2-06-00E	1,623,782	1,656,345	RSICS2-15-00E	1,623,915	1,655,039
RSICS2-07-00A	**1,623,071**	**1,655,748**	**RSICS2-16-00A**	**1,623,689**	**1,654,943**
RSICS2-07-00B	1,623,058	1,655,734	RSICS2-16-00B	1,623,676	1,654,944
RSICS2-07-00C	1,623,056	1,655,756	RSICS2-16-00C	1,623,692	1,654,961
RSICS2-07-00D	1,623,077	1,655,763	RSICS2-16-00D	1,623,703	1,654,942
RSICS2-07-00E	1,623,082	1,655,737	RSICS2-16-00E	1,623,689	1,654,930
RSICS2-08-00A	**1,623,569**	**1,655,868**	**RSICS2-17-00A**	**1,623,490**	**1,654,942**
RSICS2-08-00B	1,623,556	1,655,855	RSICS2-17.00B	1,623,481	1,654,952
RSICS2-08-00C	1,623,561	1,655,876	RSICS2-17-00C	1,623,499	1,654,955
RSICS2-08-00D	1,623,580	1,655,883	RSICS2-17-00D	1,623,499	1,654,926
RSICS2-08-00E	1,623,580	1,655,857	RSICS2-17-00E	1,623,477	1,654,926
RSICS2-09-00A	**1,623,971**	**1,655,979**	**RSICS2-18-00A**	**1,623,799**	**1,654,941**
RSICS2-09-00B	1,623,968	1,655,997	RSICS2-18-00B	1,623,793	1,654,928
RSICS2-09-00C	1,623,962	1,656,013	RSICS2-18-00C	1,623,787	1,654,913
RSICS2-09-00D	1,623,982	1,655,962	RSICS2-18-00D	1,623,804	1,654,955
RSICS2-09-00E	1,623,986	1,655,946	RSICS2-18-00E	1,623,812	1,654,970

Projection: 1983 State Plane, NM Central

A, B, C, D and E indicate five sample aliquot points of the Individual composite sample with A as the primary (center) aliquot point

Sediment Sample Location Coordinates, Reservoir Segment #3

Sample Aliquot Point ID	Northing (ft)	Easting (ft)
RSICS3-01-00A	**1,623,694**	**1,659,062**
RSICS3-01-00B	1,623,706	1,659,049
RSICS3-01-00C	1,623,713	1,659,031
RSICS3-01-00D	1,623,686	1,659,081
RSICS3-01-00E	1,623,678	1,659,095
RSICS3-02-00A	**1,623,870**	**1,659,107**
RSICS3-02-00B	1,623,860	1,659,104
RSICS3-02-00C	1,623,870	1,659,120
RSICS3-02-00D	1,623,884	1,659,110
RSICS3-02-00E	1,623,877	1,659,094
RSICS3-03-00A	**1,624,201**	**1,659,211**
RSICS3-03-00B	1,624,207	1,659,198
RSICS3-03-00C	1,624,207	1,659,181
RSICS3-03-00D	1,624,200	1,659,222
RSICS3-03-00E	1,624,201	1,659,236
RSICS3-04-00A	**1,623,666**	**1,657,812**
RSICS3-04-00B	1,623,659	1,657,824
RSICS3-04-00C	1,623,676	1,657,825
RSICS3-04-00D	1,623,677	1,657,800
RSICS3-04-00E	1,623,658	1,657,799
RSICS3-05-00A	**1,623,904**	**1,657,771**
RSICS3-05-00B	1,623,920	1,657,768
RSICS3-05-00C	1,623,902	1,657,756
RSICS3-05-00D	1,623,888	1,657,772
RSICS3-05-00E	1,623,903	1,657,786
RSICS3-06-00A	**1,624,123**	**1,657,746**
RSICS3-06-00B	1,624,125	1,657,730
RSICS3-06-00C	1,624,122	1,657,715
RSICS3-06-00D	1,624,124	1,657,762
RSICS3-06-00E	1,624,124	1,657,778

Projection: 1983 State Plane, NM Central

A, B, C, D and E indicate five sample aliquot points of the Individual composite sample with A as the primary (center) aliquot point

Sediment Sample Location Coordinates, Baseline and Background Sediment Segments

Baseline Sediment Segment			Background Sediment Segment		
Sample Aliquot Point ID	**Northing (ft)**	**Easting (ft)**	**Sample Aliquot Point ID**	**Northing (ft)**	**Easting (ft)**
BSICS1-06-00A	**1,629,106**	**1,646,779**	**BSS2CS-01-00A**	**1,596,897**	**1,707,693**
BSICS1-06-00B	1,629,136	1,646,772	BSS2CS-01-00B	1,596,888	1,707,678
BSICS1-06-00C	1,629,135	1,646,742	BSS2CS-01-00C	1,596,910	1,707,666
BSICS1-06-00D	1,629,099	1,646,801	BSS2CS-01-00D	1,596,885	1,707,704
BSICS1-06-00E	1,629,072	1,646,803	BSS2CS-01-00E	1,596,906	1,707,726
BSICS1-05-00A	**1,628,440**	**1,647,401**	**BSS2CS-02-00A**	**1,597,209**	**1,706,883**
BSICS1-05-00B	1,628,446	1,647,378	BSS2CS-02-00B	1,597,206	1,706,861
BSICS1-05-00C	1,628,433	1,647,346	BSS2CS-02-00C	1,597,237	1,706,864
BSICS1-05-00D	1,628,444	1,647,431	BSS2CS-02-00D	1,597,188	1,706,888
BSICS1-05-00E	1,628,426	1,647,450	BSS2CS-02-00E	1,597,202	1,706,919
BSICS1-04-00A	**1,627,792**	**1,648,380**	**BSS2CS-03-00A**	**1,598,524**	**1,705,705**
BSICS1-04-00B	1,627,822	1,648,372	BSS2CS-03-00B	1,598,528	1,705,686
BSICS1-04-00C	1,627,824	1,648,327	BSS2CS-03-00C	1,598,563	1,705,696
BSICS1-04-00D	1,627,786	1,648,412	BSS2CS-03-00D	1,598,504	1,705,703
BSICS1-04-00E	1,627,741	1,648,410	BSS2CS-03-00E	1,598,510	1,705,737
BSICS1-03-00A	**1,626,187**	**1,649,039**	**BSS2CS-04-00A**	**1,601,145**	**1,702,504**
BSICS1-03-00B	1,626,210	1,649,027	BSS2CS-04-00B	1,601,146	1,702,482
BSICS1-03-00C	1,626,229	1,649,002	BSS2CS-04-00C	1,601,178	1,702,493
BSICS1-03-00D	1,626,164	1,649,057	BSs2CS-04-00D	1,601,118	1,702,502
BSICS1-03-00E	1,626,135	1,649,065	BSS2CS-04-00E	1,601,128	1,702,533
BSICS1-02-00A	**1,625,288**	**1,649,749**	**BSS2CS-05-00A**	**1,601,873**	**1,700,221**
BSICS1-02-00B	1,625,314	1,649,752	BSS2CS-05-00B	1,601,871	1,700,204
BSICS1-02-00C	1,625,335	1,649,723	BSS2CS-05-00C	1,601,891	1,700,197
BSICS1-02-00D	1,625,273	1,649,768	BSS2CS-05-00D	1,601,861	1,700,234
BSICS1-02-00E	1,625,239	1,649,760	BSS2CS-05-00E	1,601,866	1,700,256
BSICS1-01-00A	**1,624,554**	**1,650,834**	**BSS2CS-06-00A**	**1,604,866**	**1,696,885**
BSICS1-01-00B	1,624,567	1,650,821	BSS2CS-06-00B	1,604,867	1,696,865
BSICS1-01-00C	1,624,568	1,650,799	BSS2CS-06-00C	1,604,895	1,696,852
BSICS1-01-00D	1,624,548	1,650,857	BSS2CS-06-00D	1,604,844	1,696,895
BSICS1-01-00E	1,624,529	1,650,866	BSS2CS-06-00E	1,604,845	1,696,922

Projection: 1983 State Plane, NM Central

A, B, C, D and E indicate five sample aliquot points of the Individual composite sample with A as the primary (center) aliquot point

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-16-04	0850	BSS2CS-01-00	BKG Seg. 2	N 1596897 E 1707692	Surface	NP ANP VP	metals	Sandy loam
"	0956	BSS2CS-02-00	"	N 1597212 E 1706886	"	ANP VP	"	Sandy loam
"	1104	BSS2CS-03-00	"	N 1598527 E 1705708	"	ANP VP	"	Sandy loam
"	1220	BSS2CS-04-00	"	N 1601145 E 1702504	"	ANP VP	"	Sandy loam
"	1338	BSS2CS-05-00	"	N 1601873 E 1700221	"	ANP VP	"	Sandy loam
"	1450	BSS2CS-06-00	"	N 1604866 E 1696885	"	ANP VP	"	Sandy loam
"	1525	QSS2CS-04-00	"	N E —	"	ANP VP	"	QA/QC Field split from BSS2CS-04-00
—	—	—	—	N E —	—	—	—	—
10-20-04	1710	BSS2CS-01	BKG Seg. 2	N E —		ANP VP	Metals, SPLP, Sulfide, Hydrometer	BKG 2 Segment Composite Sample Prepared, 1400 gms from
—	—	—		N E —	—	—		each of the above six individual Composites

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-17-04	0815	RSICSI-07-00	Res. 1	N 1623848 E 1654072	Surface	AWP VP	Metals	Sandy loam, cb heigth: 8.0'
"	0846	RSICSI-07-02	"	N E "	2.0'	"	"	Sandy loam, cb,
"	0914	RSICSI-07-04	"	N E "	4.0'	"	"	QA/QC Field split taken at 1315 named QSICSI-07-04. Sandy loam, cb.
"	0950	RSICSI-07-06	"	N E "	6.0'	"	"	Sandy loam, cb
"	1021	RSICSI-06-00	"	N 1623745 E 1654166	Surface	"	"	Sandy loam, cb heigth = 8.0
"	1050	RSICSI-06-02	"	N E "	2.0'	"	"	Sandy loam, cb
"	1145	RSICSI-06-04	"	N E "	4.0'	"	"	clay loam, cb
"	1216	RSICSI-06-06	"	N E "	6.0'	"	"	clay loam, cb
"	1242	RSICSI-03-00	"	N 1624115 E 1654372	Surface	"	"	Sandy loam, cb heigth = 7.0
"	1324	RSICSI-03-02	"	N E "	2.0'	"	"	Sandy loam, cb

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-17-04	1401	RSICSI-03-04	Res. 1	N 1624115 E 1654 372	4.0'	ANP VP	Metals	sandy loam, cb.
"	1450	RSICSI-03-06	"	N E "	6.0'	"	"	sandy loam, cb
10-20-04	1359	RSICSI-15-00	"	N 1622437 E 1653573	Surface	"	"	clay loam, grey tint cb height 5.0'
"	1433	RSICSI-15-02	"	N E "	2.0'	"	"	clay loam, grey tint, cb
"	1548	RSICSI-18-00	"	N 1621758 E 1654033	Surface	"	"	clay loam, grey tint cb height = 3.0'
"	1615	RSICSI-18-02	"	N E "	2.0'	"	"	QA/QC field split taken QSICSI-18-02 @1700; clay loam cb.
"	1648	RSICSI-18-04	"	N E "	4.0'	"	"	clay loam, grey tint, cb.
"	1700	QSICSI-18-02	"	N E –				QA/QC Field dup of RSICSI-18-02
				N E				
				N E				

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-21-04	0901	RSICS2-18-00	Seg 2	N 1623799 E 1654941	Surface	WG/AG	Metls	QA/QC Split Sampled & Named QSICS2-18-00, @ 0910, CB, 3.0' Sandy loam
"	0935	RSICS2-18-02	"	N E "	2.0	"	"	CB Sandy loam
"	1015	RSICS2-15-00	"	N 1623924 E 1655068	Surface	"	"	Sandy loam, CB height = 3'
"	1040	RSICS2-15-02	"	N E "	2.0	"	"	QA/QC split, Named ~~QSICS2-15~~ QSICS2-15-02 @1050, cb, Sandy loam
"	1128	RSICS2-10-00	"	N 1624085 E 1655520	Surface	"	"	Sandy loam, Cb = 3'
"	1159	RSICS2-10-02	"	N E "	2.0	"	"	CB, Sandy loam
"	1248	RSICS2-09-00	"	N 1623971 E 1655979	Surface	"	"	Sandy loam, Cb = 2'
"	1316	RSICS2-09-02	"	N E "	2.0	"	"	Clay loam, CB
"	1412	RSICS2-06-00	"	N 1623805 E 1656306	Surface	"	"	Sandy loam, CB = 2'
"	1440	RSICS2-06-02	"	N E "	2.0	"	"	Sandy loam, CB

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-21-04	1530	RSICS2-03-00	Seg 2	N 1623867 E 1656979	Surface	AP/NP	Metals	Sandy loam, CB = 2'
"	1602	RSICS2-03-02	"	N E "	2.0'	AP/NP	"	Sandy loam, CB.
10-22-04	0910	RSICS1-09-00	Seg 1	N 1624134 E 1653999	Surface	AP/NP	Metals	Clay loam, ep
"	0940	RSICS1-08-00	"	N 1623992 E 1654007	Surface	"	"	Clay loam, mp
"	1020	RSICS1-08-15	"	N E "	1.5'	"	"	Clay loam, mp
"	1041	SEDRNB-01	"	N E —	—	"	"	Sampling auger decon rinsate Blank sample
"	1052	SEDRNB-02	"	N E —	—	"	"	Mixing bowl decon rinsate blank
"	1116	SEDRNB-03	"	N E —	—	"	"	Sampling Trowel/scoop decon rinsate blank
"	1133	SEDRNB-04	"	N E —	—	"	"	Sample screen sieve decon blank rinsate
				N E			"	

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-22-04	1310	RSICS1-01-00 mp ~~RSSICS-1-01-00~~	Seg 1	N 1623914 E 1654593	Surface	NP/KD		Clay loam, ep
"	1348	RSICS1-02-00	"	N 1623999 E 1654495	Surface	"		Clay loam mp
"	1455	RSICS1-02-15	"	N E "	1.5'	"		Clay loam, mp
10-23-04	0930	RSICS1-05-00	"	N 1623666 E 1654320	Surface	NP/VP		Clay loam, mp
"	1020	RSICS1-05-15	"	N E "	1.5	"		Clay loam, mp
"	1140	RSICS1-04-00	"	N 1623534 E 1654451	Surface	"		Clay loam, ep
				N E				
				N E				
				N E				
				N E				

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-25-04	0930	RSICS3-06-00	Seg 3	N 1624123 E 1657746	Surface	AP/NP	Metals	Channel Bank Sample, Chnl 1.5' high Sandy w/clay, Sandy loam
"	1001	RSICS3-06-15	"	N E "	1.5'	AP/NP	"	" Sandy loam, CB
"	1045	RSICS3-05-00	"	N 1623904 E 1657771	Surface	"	"	mid point Sample Clay loam
"	1116	RSICS3-05-15	"	N E "	1.5'	"	"	Mid point Clay loam
"	1208	RSICS3-04-00	"	N 1623666 E 1657812	Surface	"	"	End point Sample. Clay loam
"	1317	RSICS3-01-00	"	N 1623694 E 1659062	Surface	"	"	Channel Bank (1.5') hgt Sample Sandy loam
"	1350	RSICS3-01-15	"	N E "	1.5'	"	"	Sandy loam
"	1455	RSICS3-02-00	"	N 1623870 E 1659107	Surface	"	"	South Edge of Marsh Swamp. Sample too moist to Screen in field. Clay w/ gray, mp
"	1535	RSICS3-02-15	"	N E "	1.5'	"	"	Clay w/ gray, mp
"	1645	RSICS3-03-00	"	N 1624201 E 1659211	Surface	"	"	North Edge of Marsh Swamp Liner 5pt Composite. Too moist for field Screen. Sieve @ office

1983 NM State Plane Coordinates

Clay w/ gray tint, ep

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-26-04	0920	RSICS1-11-00	1	N 1623130 E 1653853	0.0	ANP/NP	metals	MP, Clay w/ gray Tint
	0945	RSICS1-11-15	1	N E "	1.5			MP, Clay w/ gray Tint
	1046	RSICS1-10-00	1	N 1623079 E 1654058	0.0			ep, Clay w/ Gray Tint
	1155	RSICS1-12-00	1	N 1623178 E 1653723	0.0			Channel Bank ≈ 4.5' clay loam
	1230	RSICS1-12-20	1	N E "	2.0			clay loam, CB
	1305	RSICS1-12-40	1	N E "	4.0			QA/QC split @ 1319 - QSICS1-12-40 Clay loam, CB
	1430	RSICS2-12-00	2	N 1624672 E 1655491	0.0			ep Sandy loam
	1535	RSICS2-11-00	2	N 1624355 E 1655498	0.0			MP Sandy loam
	1615	RSICS2-11-15	2	N E "	1.5			MP clay loam
10-25-04	1654	QSICS3-03-00	3	N E —	0.0			QA/QC Field duplicate of RSICS3-03-00

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Individual Composite Primary Sample Aliquot Location Coordinates	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-29-04	1428	RSICS2-16-00	Seg 2	N 1623689 E 1654943		AP/LD LD	Metals	MP Sandy loam
"	1510	RSICS2-16-15	"	N E "		"	"	MP Sandy loam
"	1625	RSICS2-17-00	"	N 1623490 E 1654942		"	"	CP Clay loam
"	1650	GAL TRB-01	"	N E —		"	"	Prepared Field Blank by Using DI Water Provided by Lab. (1 Liter Plastic w/HNO3)
10-29-04	1727	RSS3CS-01	Seg 3	N E —	—	AP/VP	Metals SPLP PSD Hyd.	Prepared Seg 3 Composite from 10 Seg 3 Individual 5 pt Composites
10-30-04	0845	RSICS2-08-00	Seg 2	N 1623569 E 1655868		AP/VP VP		Field QA/QC duplicate taken, MP QSICS2-08-00 @ 1755, Clay loam
"	0917	RSICS2-08-15	"	N E "		"		MP Sandy loam
"	1020	RSICS2-07-00	"	N 1623071 E 1655748		"		CP Sandy loam
"	1228	RSICS2-14-00	"	N 1624351 E 1655093		"		MP Clay loam, Silt; Gray
				N E				

1983 NM State Plane Coordinates

Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-30-04	1310	RSICS2-14-15	Seg 2	N 1624351 E 1655093	1.5'	AP/VD MP	Metals	Clay/silt w/grey MP
"	1445	RSICS2-13-00	"	N 1624727 E 1655079	Surface	"	"	Clay w/grey tint ep
"	1558	RSICS1-16-00	Seg 1	N 1621934 E 1654178	Surface	"	"	Field QA/QC duplicate, Clay QSICS1-16-00 @ 1825, ep
"	1710	RSICS1-17-00	"	N 1621829 E 1654117	Surface	"	"	clay loam, grey mp
"	1745	RSICS1-17-15	"	N " E	1.5'	"	"	Clay loam, Grey mp
10-31-04	0930	RSICS2-05-00	Seg 2	N 1623335 E 1656271	Surface	AP/VP MP	Metals	Sandy loam, MP
"	1026	RSICS2-05-15	"	N " E	1.5'	"	"	MP, Clay loam
"	1148	RSICS2-04-00	"	N 1622823 E 1656244	Surface	"	"	Clay loam, ep
"	1258	RSICS2-01-00	"	N 1623110 E 1657156	Surface	"	"	Clay loam, ep
"	1406	RSICS2-02-00	"	N 1623571 E 1657053	Surface	"	"	Clay loam, MP

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Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Composite Sample Center Aliquot Point Location Coordinates (ft)	Sample Depth (feet)	Tech	Sample Analytes	Comments
10-31-04	1449	RSICS2-02-15	Seg 2	N 1623511 E 1657053	1.5'	AP/VD VP	Metals	Clay/loam, mp
"	1625	RSICS1-07-08	Seg 1	N 1623848 E 1654072	8.0'	"	"	Sandy/loam, cb
	1715	RSICS1-06-08	"	N 1623745 E 1654166	8.0'	"	"	Sandy loam, cb
11-1-04	0901	RSICS1-14-00	1	N 1622446 E 1653703	0.0	AP/VP	metals	clay with grey tint, mp
"	0955	RSICS1-14-15	1	N E "	1.5	↓	↓	fine-clay loam, Gray, mp
"	1116	RSICS1-13-00	1	N 1622454 E 1653947	0.0	↓	↓	clay with grey tint, ep
11-2-04	1430	RSS1CS-01	Seg 1	N E —	—	AP/VP	Metals	Prepared Seg 1 Composite from 40 Seg 1 Individual 5-pt Composites
"	1700	RSS2CS-01	Seg 2	N E —	—	"	"	Prepared Seg 2 Composite from 30 Seg 2 ICs (5 pt)
				N E				
				N E				

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Field Sampling Data Form
Individual Five-pt Co-Located Composite Samples
Galisteo Reservoir Retained Sediment Characterization Sampling, Galisteo Reservoir, New Mexico

Sample Date	Sample Time	Sample ID	Reservoir Segment	Individual Composite Primary Sample Aliquot Location Coordinates	Sample Depth (feet)	Tech	Sample Analytes	Comments
12-27-04	1105	BSICSI-06	BKG Seg 1	N 1629106 E 1646779	surface	ANP, VP, NP, BB	metals	sandy loam
"	1207	BSICSI-05	"	N 1628440 E 1647401	"	"	"	sandy loam
"	1302	BSICSI-04	"	N 1627792 E 1648380	"	"	"	sandy loam
"	1312	QBICSI-04	"	N — E	"	"	"	QA/QC field duplicate from BSICSI-04. sandy loam
"	1412	BSICSI-03	"	N 1626187 E 1649039	"	"	"	sandy loam
"	1518	BSICSI-02	"	N 1625288 E 1649749	"	"	"	sandy loam
"	1630	BSICSI-01	"	N 1624554 E 1650833	"	"	"	sandy loam.
—	—	—	—	N — E	—	—	—	—
12-27-04	1840	BSSICS-01	BKG Seg 1	N E	surface	ANP, VP BB, NP-	metals SPLP [illegible]	BKG 1 Segment Composite, sample prepared, 1400 gms
—	—	—	—	N — E	—	—	particle size.	from each of the above six individual composites

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Appendix B

Laboratory Analytical Results SEDD Files

Sediment Analytical Result Reports, pdf files