

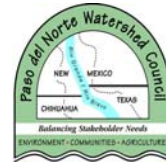
November 2009

NMWRRI Report No. 348, Part II  
TWRI TR 359, Part II

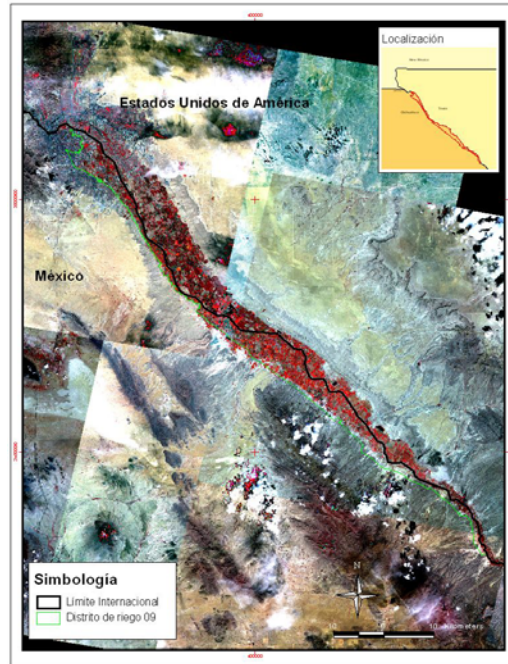
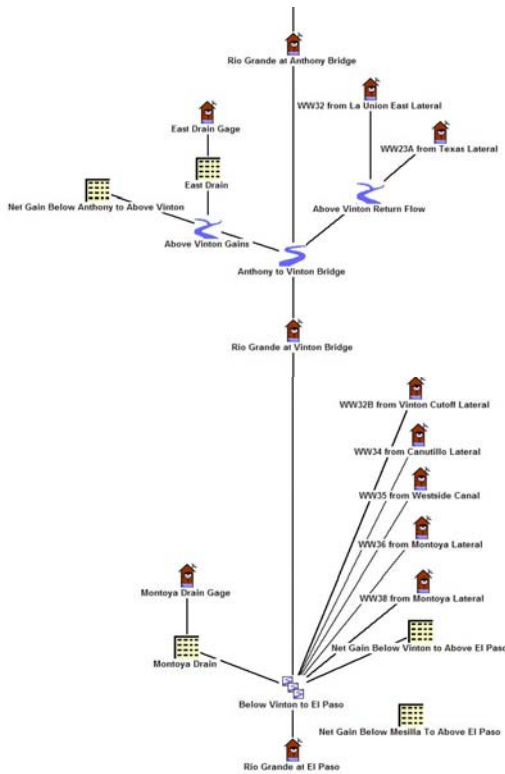
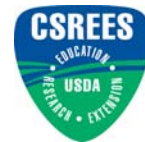
# The Development of a Coordinated Database for Water Resources and Flow Model in the Paso Del Norte Watershed (Phase III)

New Mexico Water Resources Research Institute  
Technical Completion Report No. 348, Part II

Texas Water Resources Institute  
Technical Report 359, Part II



US Army Corps  
of Engineers®



**THE DEVELOPMENT OF A COORDINATED DATABASE  
FOR WATER RESOURCES AND FLOW MODEL  
IN THE PASO DEL NORTE WATERSHED  
(Phase III)**

**Part II**

**Availability of Flow and Water Quality Data  
for the Rio Grande Project Area**

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Technical Completion Report

Account Number: TAES/03-PL-02, Modification No. 3

November 2009

New Mexico Water Resources Research Institute  
Texas Water Resources Institute

This report was prepared by  
The Coordinated Water Resources Database Technical Committee  
on behalf of the Paso del Norte Watershed Council  
with funding support provided by the U.S. Army Corps of Engineers and  
U.S. Department of Agriculture CSREES through Texas AgriLife Research,  
and the U.S. Department of Interior, Geological Survey  
through the New Mexico Water Resources Research Institute

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# **Availability of Flow and Water Quality Data for the Rio Grande Project Area**

**Phase III Final Project Report of Work Completed  
under the Cooperative Agreement between  
the U.S. Army Corps of Engineers  
and  
Texas AgriLife Research**

**(TAES/03-PL-02)  
Modification No. 3**

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## Acknowledgement

This document and the underlying project activities detailed in this report reflect the joint efforts of many people working with the Paso del Norte Watershed Council (PdNWC). The authors wish to acknowledge and extend our gratitude to the U.S. Army Corps of Engineers for the generous financial support extended to the PdNWC for development of the Coordinated Water Resources Database and Model Development Project (called Project herein). Special thanks go to Project Manager at the U.S. Army Corps of Engineers, Mrs. April Fitzner for her management and support. This Project complements the Coordinated Water Resources Database project supported by El Paso Water Utilities and the U.S. Bureau of Reclamation in collaboration with many other governmental agencies and organizations. The Project is also based on the work in part supported by the Rio Grande Basin Initiative, which is administrated by Texas Water Resources Institute and sponsored by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Agreement Numbers 2005-34461-15661.

Special mention should be made of the members of the Technical Committee who either conducted, reviewed, or supported this work. Ari Michelsen and Bobby Creel provided needed Project management oversight and coordination. In addition, numerous agencies and organizations have provided access to data incorporated in the Project, and the authors wish to acknowledge the contributions by the Centro de Información Geográfica at the Universidad Autónoma de Ciudad Juárez, City of Las Cruces, Elephant Butte Irrigation District, El Paso County Water Improvement District #1 (EPCWID No. 1), El Paso Water Utilities, New Mexico Water Resources Research Institute (NMWRRI, which also houses the Project on its data server), Project del Rio, Texas A&M University/Texas AgriLife Research, United States Bureau of Reclamation (USBR), United States Geological Survey (USGS), and the United States Section of the International Boundary and Water Commission (USIBWC). Many people were involved in the process of collecting this data. The authors would like to acknowledge and thank those whose assistance and cooperation made this work possible: Filiberto Cortez and Javier Grajeda at the U.S. Bureau of Reclamation; Ken Rakestraw at the U.S. International Boundary and Water Commission; James Narvaez and Danny Carrillo at Elephant Butte Irrigation District; Milos Novotny at S. S. Papadopoulos & Associates, Inc. (who was working with EBID); Edward Nickerson and Linda Beal (NM Dist. Database Manager) with the U.S. Geologic Survey; Chuy Reyes and Robert Rios of El Paso County Water Improvement District #1; Zach Libbin, Thelma Castro, Gary Gegenfurtner, and Janelle Prude of New Mexico State University, and Marisela Bacenas, Estrella Molina Cuellar, and Joshua Villalobos of TAMU for their invaluable assistance in compiling and verifying the data collected. Special thanks go to Dr. Conrad Keyes, Jr. and Mr. Wayne Treers for their thorough review and constructive comments.

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## Abstract

This report fulfills the deliverables required by the cooperative agreement between the U.S. Army Corps of Engineers and Texas AgriLife Research (TAES/03-PL-02: Modification No. 3) on behalf of the Paso del Norte Watershed Council. Tasks accomplished in this phase include (a) assess the data availability for expansion of the URGWOM model, identify data gaps, generate data needed from historic data using empirical methods, compile and verify the water quality data for reaches between the Elephant Butte reservoir, New Mexico and Fort Quitman, Texas; (b) develop the RiverWare physical model for the Rio Grande flow for the selected reaches between Elephant Butte Reservoir and El Paso, beginning with a conceptual model for interaction of surface water and groundwater in the Rincon and Mesilla valleys, and within the limits of available data; (c) implement data transfer interface between the coordinated database and hydrologic models.

This Project was conducted by researchers at Texas A&M University (TAMU) and New Mexico State University (NMSU) under the direction of Zhuping Sheng of TAMU and J. Phillip King of New Mexico State University. It was developed to enhance the coordinated database, which was originally developed by the Paso del Norte Watershed Council with support of El Paso Water Utilities to fulfill needs for better management of regional water resources and to expand the Upper Rio Grande Water Operations Model (URGWOM) to cover the river reaches between Elephant Butte Dam, New Mexico and Fort Quitman, Texas. In Phases I and II of this Project (TAES/03-PL-02), hydrological data needed for flow model development were compiled and data gaps were identified and conceptual model was developed. The objectives of this phase were to develop a physical model of the Rio Grande flow between Elephant Butte Dam and American Dam by using data collected in the first development phase of the PdNWC/Corps Coordinated Water Resources Database and to enhance the data portal capabilities of the PdNWC Coordinated Database Project.

This report is Part II of a three part completion report that combines data compilation of the Phase I report prepared by Sue Tillery and J. Phillip King and part of the completion report for Phase III prepared by Z. Sheng, J.P. King and B. Creel. It identifies and evaluates the availability of historical flow and water quality data that has been collected at different sites along the Rio Grande between Elephant Butte Dam, New Mexico and Fort Quitman, Texas. This includes monitoring sites from associated canals, drains, and dams along the Rio Grande. Flow data for the years from 1908 through 2002 and water quality data for the years 1938 to 2005 collected periodically by different agencies include historic chemical analytical results and real-time monitoring values. This report includes a description of the agencies that collected water quality data, a summary of the sites found along the Rio Grande, and finally a data matrix and parameter summary for each site. Data downloaded were collected from the U.S. International Boundary and Water Commission (USIBWC), El Paso, Texas; US Geological Survey (USGS), U.S. Bureau of Reclamation, Elephant Butte Irrigation District (EBID), El Paso County Water Improvement District No. 1, and Parsons Engineering Science, Inc. compiled for the New Mexico-Texas Water Commission by contract through El Paso Water Utilities.

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# **Availability of Flow and Water Quality Data for the Rio Grande Project Area**

## **Introduction**

Historical and real-time flow and water quality data have been collected by multiple agencies on different sites along the Rio Grande between Elephant Butte Dam, New Mexico and Fort Quitman, Texas. Data have also been collected at sites associated with canals, laterals, drains, wasteways, and dams along the Rio Grande (Figure 1). Initially, historic flow data for the years 1975 to the most recent data available were formatted and verified. Then data for the entire period of record (1908 to 2002) were formatted and verified. Water quality data for the years 1938 to 2005 collected periodically by different agencies include historic chemical analytical results and real-time monitoring values.

This report identifies each site for which data were acquired, which agency(s) provided the data, and the years of record for the data. This document also describes the file format for the collected data. Finally Appendix A (contained on CD) provides Flow Data Availability Matrices and Flow Data Summaries. Appendix B (contained on CD) provides Water Quality Data Availability Matrices, Water Quality Data Summaries, and Water Quality Parameters Tested and Monitored.

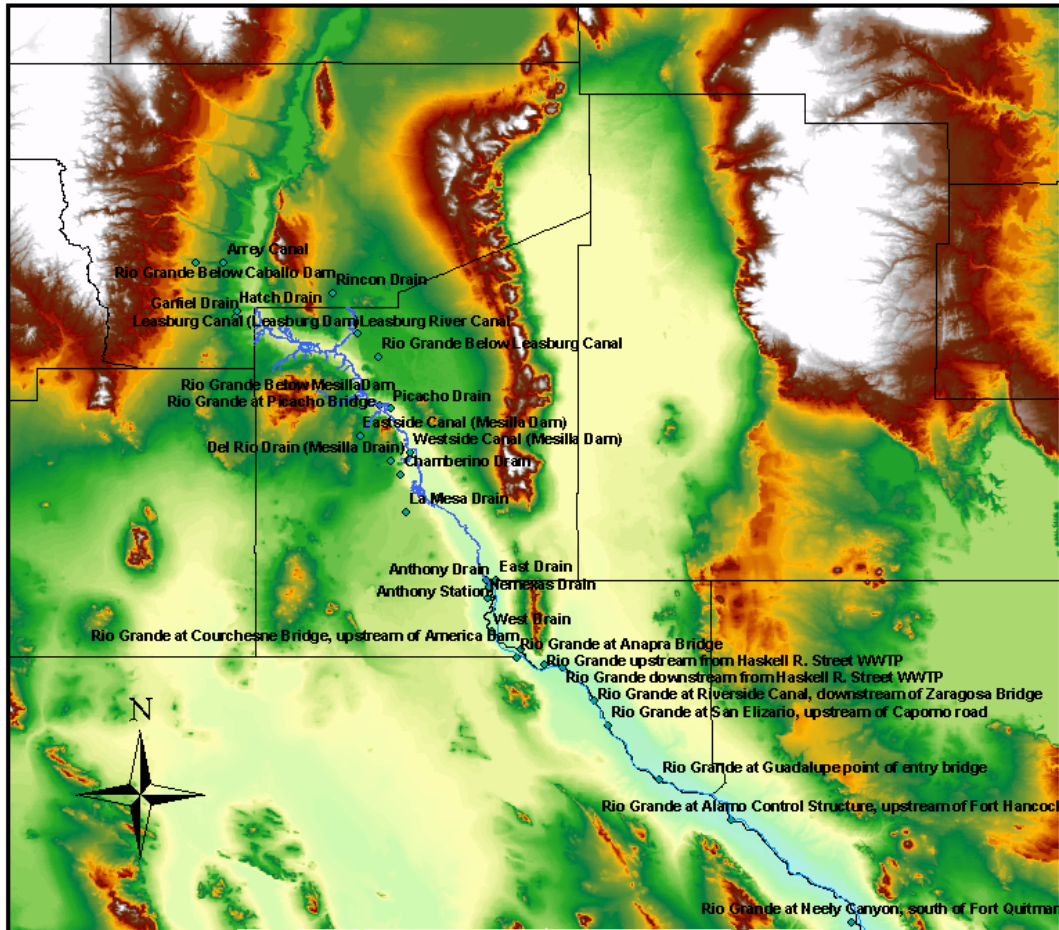
## **Flow Data Collection**

The first step in acquiring this data was to contact the agencies responsible for the actual data collection. The agencies contacted were:

- U.S. Bureau of Reclamation (USBR), El Paso, TX
- U.S. International Boundary and Water Commission (USIBWC), El Paso, TX
- U.S. Geological Survey (USGS), Las Cruces, NM; and the NM District Database Manager for USGS
- Elephant Butte Irrigation District (EBID), Las Cruces, NM
- El Paso County Water Improvement District #1 (EP #1), El Paso, TX.

Data were collected from each of these agencies in various electronic data formats. The USBR also provided paper copies of their data. In addition to this data, electronic data from a previous data collection effort completed by Parsons Engineering Science, Inc. and Boyle Engineering Corporation (Final – August 1996) was included.

In general, the electronic data were converted to a common electronic format so all data could be presented in the same manner. Details for collecting and processing the data from each agency are presented in the following sections.



**Figure 1. Gage stations and water quality sampling locations along the Rio Grande between Elephant Butte Dam and Fort Quitman, TX**

***USBR Data Collection***

The USBR provided both paper and electronic data. The electronic data for the flow data were provided as separate data files for each year from 1908 through 1999. However, not all sites had data for all of these years. Electronic data for Elephant Butte Storage and Caballo Storage were provided in two files, one for each reservoir. Even though this data had been entered electronically, it had not been thoroughly checked for accuracy. We requested the corresponding original paper data in order to verify, and correct as necessary, their electronic data.

The method used to verify this data was to compare for each site the monthly acre-feet (AF) totals of the electronic data to the monthly AF totals on the paper data. When these monthly totals did not match, the electronic daily data for that month was compared to the paper daily data for that month. When any daily values were found in error, they were corrected in the electronic data. Occasionally the monthly totals didn't match because the total on the paper data was incorrect.

A complete list of all daily electronic data in error was created as well a list of all monthly totals on the paper data that were in error. Once the electronic data were verified and

corrected, they were copied to a set of Microsoft Excel files in a format that would be common to the final data.

The paper data received from the USBR were entered in the common electronic format, and also scanned into *PDF* type files to provide access to the original data in a convenient manner.

### ***IBWC Data Collection***

All data collected and maintained by the IBWC were downloaded from their website.

### ***USGS Data Collection***

Data published by the USGS for the Rio Grande below Elephant Butte and below Caballo were downloaded from the USGS website. Additional data provided by the USGS were acquired via their FTP site.

### ***EBID Data Collection***

A variety of electronic data were acquired from the EBID. Data for the time period between 1993 and 1999 were provided in a single Excel data file. Some data for the time period 2001 thru 2003 were provided in three Excel data files (one file for each year). Some of the sites in these files had two sets of data for the year; normally (regularly collected in person) collected data and real-time data from an electronic data logger. Sometimes this data overlapped and sometimes it did not. Additional data for some sites for the time period March 2001 thru September 2003 were downloaded from EBID's website.

The time period 2001 thru 2003 resulted in multiple sets of data for the same time period, in which some of the overlapping data matched and some of it did not. Also, some of the data in this time period were clearly incorrect. Usually this occurred in the data logger and website data when flow for a site went dry. The explanation was that the electronics interpreted the dry site as negative values, which resulted in large positive values in the data file. Whatever the reason, values that were clearly incorrect or very questionable were replaced with the '—' designation in the data file.

In general, when data overlapped and were not identical, the normally collected data were chosen first as the data to use. If there were no normally collected data, then the data logger data were chosen. If the only data were the website data, then these data were used.

### ***EP#1 Data Collection***

Data for the time period between 1997 and 2002 were provided in two Excel data files for each year. Real time data for some gage stations are also available on line now. <http://www.epcwidl.org/telemetry>

## **WATER QUALITY DATA COLLECTION**

Most of the water quality data were provided at the agencies website. Electronic data downloaded were converted to Microsoft Excel™ files so all data would be presented in the same manner. Details for collecting and processing the data from each agency are presented in the following sections.

Water quality data in paper format were not compiled and are not included in the report. It is recommended that such data be compiled and verified in future project phases. The processed data will be provided through the Paso del Norte Watershed Council website (<http://www.pdnwc.org>).

### ***U.S. IBWC Data Collection***

A segment list of monitoring stations in the Rio Grande basin was found at the website. Each segment had a station ID number to download as an Excel format file. Each file contains all of the available historical water quality data for each station from 1995 to present. The stations downloaded at the IBWC (United States and Mexico) website were between El Paso and Fort Quitman, Texas. The URL for this data is <http://www.ibwc.state.gov/html/environment.html>

### ***EBID Data Collection***

Data from EBID were downloaded from its website. There were three Telemetry sites containing real time water quality readings for different stations along the Rio Grande. Daily average format with range of 2001 to present was downloaded. Each file downloaded was converted to Excel format. One station was established and equipped by EBID in collaboration with El Paso Water Utilities/Public Service Board (EPWU/PSB) and more stations will be added as part of ongoing projects supported by the U.S. Bureau of Reclamation 2025 Challenge Grant.

### ***USGS Data Collection***

Data published by the USGS for the Rio Grande below Elephant Butte and below Caballo were downloaded from the USGS website: <http://nwis.waterdata.usgs.gov/nwis/qw>.

### ***Parson's Data Collection***

Water quality data from above-mentioned agencies were also compiled by Parsons Engineering, Inc. (PARSONS thereafter) for the El Paso-Las Cruces Regional Sustainable Water Project; Data Collection Technical Memorandum prepared for New Mexico – Texas Water Commission (Final – August 1996) by Boyle Engineering Corporation and Parsons Engineering, Inc. It is available at the Paso del Norte Watershed project website (<http://www.pdnwc.org> or [ftp://river.nmsu.edu/LRG/WAT\\_QUAL/](ftp://river.nmsu.edu/LRG/WAT_QUAL/))

## **DATA FORMAT**

The common format selected for the collected data would use Microsoft Excel as the application software. The database will be available at <http://www.pdnwc.org/>. This format would consist of a single Excel file for each data site, with daily, monthly and annual data

included in the file. Within each Excel file, these data would be included on separate tabs, with the format of the data on each tab described in the following sections.

### ***Daily Data Tab***

The *Daily Data* tab provides the data in columns, with a single day value of data in each row. There are columns in this tab for the **Day, Month, Year** and **Date** for each day. Then there is a column allowed for data from each agency: **Parson's Data, USGS Data, IBWC Data, USBR Data, EBID Data** and **EP#1 Data**. It should be noted that **Parson's Data** included data from agencies and other sources.

If an agency did not provide data for this site, then the daily data would consist of the letters **NR**, indicating **No Record**. This designation was also used when an agency had a gap in the data provided. For example, if an agency provided data for the years 1970 through 1990 with no record provided for the year 1982, then each day of 1982 would have **NR** entered into it. Within any year that contains data provided for it, missing data for any day are represented by '—'. This would correspond to blank entries in the paper or electronic data, where it is not clear that it is blank because it is the end of the irrigation season.

A column is also included with the heading **NMSU Data**. The intent of this column is to combine data from the various agencies that collected data into a single record. For example, data collection for many sites was transferred from the USBR to EBID and EP#1 between 1993 and 1996. Thus we may have a site with data from the USBR from 1960 thru 1992, and then from EBID for 1993 thru 2001. For this case, the **NMSU Data** column would contain the USBR data for the period 1960 thru 1992 and it would contain the EBID data for the period 1993 thru 2001.

The units used for daily flow data is cubic-feet-per-second (cfs). The units used for daily storage data is AF.

### ***Monthly Data Tab***

The *Monthly Data* tab provides the data in columns, with a single month value of data in each row. There are a couple of columns with values used for calculating the monthly data from the daily data in the *Daily Data* tab. These columns are **Index** and **NumDays**. Then there are columns in this tab for the **Month, Year** and **Date** for each month. There are also columns allowed for data from each agency: **Parson's Data, USGS Data, IBWC Data, USBR Data, EBID Data** and **EP#1 Data**. The **NMSU Data** column for the composite data is also present.

The **NR** designation is used for the monthly data is the same way as it was used for the daily data. The '—' designation is entered for any month that had '—' entered for any day of that month. This is to prevent inadvertently using partial monthly totals when analyzing monthly data.

The units used for both flow and storage data is AF.

### ***Annual Data Tab***

The *Annual Data* tab provides the data in columns, with a single annual value of data in each row. There are a couple of columns with values used for calculating the annual data from the monthly data in the *Monthly Data* tab. These columns are **Index** and **NoMos**. Then there are columns in this tab for the **Year** and **Date** for each year. There are also columns

allowed for data from each agency: **Parson's Data, USGS Data, IBWC Data, USBR Data, EBID Data** and **EP#1 Data**. The **NMSU Data** column for the composite data is also present.

The **NR** designation is used for the annual data in the same way as it was used for the daily data. The '—' designation is entered for any year that had '—' entered for any month of that year. This is to prevent inadvertently using partial annual totals when analyzing annual data. The units used for both flow and storage data is AF.

### ***File Description Tab***

The *File Description* tab provides information about the data collected for the site. Information included on this tab includes:

- File - the name of the Excel file with the data for this site.
- Location - for some sites, the location of the site (Lat. and Long.).
- NMSU Data – the data selected for the composite NMSU record.
- Parson's Data – if any Parson's data are available for this site, the period of record of the data, along with the name of the file containing the original data.
- USGS Data – if any USGS data are available for this site, the period of record of the data, along with the source location or name of the file containing the original data.
- IBWC Data – if any IBWC data are available for this site, the period of record of the data, along with the source location or name of the file containing the original data.
- USBR Data – if any USBR data are available for this site, the period of record of the data, along with the source location or name of the file containing the original data. This entry also gives the name of the *PDF* file that the paper data was scanned into.
- EBID Data - if any EBID data are available for this site, the period of record of the data, along with the source location or name of the file(s) containing the original data.
- EP #1 Data - if any EP#1 data are available for this site, the period of record of the data, along with the source location or name of the file(s) containing the original data.

### **WATER QUALITY PARAMETERS**

The parameters available from the Parsons Engineering Inc. (PARSONS) historic data included Total Dissolved Solids (TDS), Sodium, Sulfate, and Chloride for most of the sites except some that only include TDS. Stations found at the USGS data site contain complete chemical parameters for all of the stations and are available on a weekly, bi-weekly, and monthly basis. Stations found at the EBID website have very little real-time monitoring parameters data, it only contains Total Dissolved Solids (TDS) and Electrical Conductivity (EC) data. EBID parameters are available in a daily basis. The chemical parameter found at the IBWC data site also has very complete chemical analysis parameters available for all of the stations found at there web site. A summary of the Records for the chemical parameters for each of the stations along the Rio Grande are show in Appendix B – Water Quality Parameters Tested and Monitored.



## **DATA VERIFICATION**

After all of the data were collected, verified, and reformatted into the common Excel spreadsheet format, a second verification of the data was performed. This was deemed necessary due to the large amount of data being manipulated, copied, and reformatted. The second verification of the data consisted of comparing the monthly AF totals of the final electronic data to the monthly AF totals of the original data. For the USBR data, the original data compared to was the paper data. For all of the other data, the original data compared to was the electronic data provided by the agency.

Availability of flow data at different locations along the Rio Grande and irrigation networks of the Rio Grande Project was listed in Table 1 (Brown, et al. 2004). Availability of water quality data at different locations along the Rio Grande and irrigation networks of the Rio Grande Project are listed in Table 2.

**Table 1. Availability of Flow Data along in the Rio Grande Project area**  
(Brown, et al. 2004)

<i>Site</i>	<i>Available Data Since 1975<sup>1</sup></i>
<i>Rio Grande Below Caballo Dam</i>	1975-5/2005 (d)
<i>Arrey Canal (Percha Div. Dam)</i>	1975-1999 (d), 2000 (n), 2001-2004 (d)
<i>Percha Lateral (Percha Div. Dam)</i>	1979-1999 (d), 2000 (n), 2001-2004 (d)
<i>WasteWay (WW) #5 (Garfield Canal)</i>	1979-1984 (d), 1985-1986 (n), 1987 (d), 1988-1992 (n) 1993-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>Garfield Drain</i>	1975-1981 (m), 1982-1999 (d), 2000 (n), 2001-2004 (d)
<i>WW #16 (Hatch Canal)</i>	1979-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>Hatch Drain</i>	1975-1981 (m), 1982-1999 (d), 2000 (n), 2001-2004 (d)
<i>Angostura Drain</i>	1975-1983 (m)
<i>WW #18 (Rincon Canal)</i>	1979-1999 (d), 2000 (n), 2001-2004 (d)
<i>Rio Grande at Hayner Bridge</i>	2001-5/2005 (d)
<i>Rincon/Tonuco Drain</i>	1975-1981 (m), 1982-1999 (d), 2000 (n), 2001-2004 (d)
<i>Rio Grande Above Leasburg Dam</i>	1975-1983 (d)
<i>Leasburg Canal (at Heading)</i>	1975-1995 (d), 1996 (n), 1997-1999 (d), 2000 (n) 2001-6/2003 (d)
<i>WW #1A (Leasburg Canal)</i>	1989-1992 (d), 1993 (n), 1994-1997 (d), 1998-2000 (n) 2001-2002 (d)
<i>WW #1 (Leasburg Canal)</i>	1997-1999 (d), 2000 (n), 2001-2002 (d)
<i>Rio Grande Below Leasburg Dam</i>	1975-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>Selden Drain</i>	1975-1983 (m)
<i>WW #5 (Leasburg Canal)</i>	1979-1999 (d), 2000 (n), 2001-6/2003 (d)
<i>WW #8 (Taylor Lateral)</i>	1979-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>Rio Grande at Picacho Bridge</i>	1991-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>City of Las Cruces WWTP</i>	5/1976-2/1996 (d)
<i>WW #40 (Picacho Lateral)</i>	1991-1999 (d)
<i>Picacho Drain</i>	1975-1983 (m), 1984-1990 (n), 1991-1999 (d) 2000 (n), 2001-6/2003 (d)
<i>Rio Grande Above Mesilla Dam</i>	(n)
<i>Westside Canal (Mesilla Div. Dam)</i>	1975-1983 (d), 1984 (n), 1985-1999 (d), 2000 (n) 2001-6/2003 (d)
<i>Eastside Canal (Mesilla Div. Dam)</i>	1975-1999 (d), 2000 (n), 2001-6/2003 (d)
<i>Del Rio Lateral (Mesilla Div. Dam)</i>	1975-1992 (d), 1993 (n), 1994-1999 (d), 2000 (n) 2001-6/2003 (d)
<i>Rio Grande Below Mesilla Dam</i>	1985-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>WW #15 (Eastside Canal)</i>	1985-1999 (d), 2000 (n), 2001-6/2003 (d)
<i>Santo Tomas River Drain</i>	1985-1990 (d)
<i>WW #25 (Santo Tomas Lateral)</i>	1985-1999 (d), 2000 (n), 2001 (d)
<i>WW #26 (Upper Chamberino)</i>	1979-1999 (d), 2000-5/2001(n), 6/2001-5/2005 (d)

<sup>1</sup> d - daily data, m - monthly data, n – no data

<i>Site</i>	<i>Available Data Since 1975<sup>1</sup></i>
<i>Lateral)</i>	
<i>WW #16B (Brazito Lateral)</i>	1985-1990 (d)
<i>WW #18 (Eastside Canal)</i>	1985-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>Leasburg / Mesilla / Del Rio Drain</i>	1975-1980 (m), 1981-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>WW #19 (Three Saints Lateral)</i>	1982-1999 (d), 2000 (n), 2001-6/2003 (d)
<i>WW #29 (Chamberino East Lateral)</i>	(n)
<i>WW #30 (Chamberino East Lateral)</i>	1985-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>Santo Tomas/Chamberino/La Mesa Drain</i>	1975-1980 (m), 1981-1999 (d), 2000 (n), 2001-5/2005 (d)
<i>WW #31 (La Union Main Canal)</i>	1981-1999 (d), 2000 (n), 2001-6/2003 (d)
<i>WW #20 (Three Saints West Lateral)</i>	1979-1980 (d), 1981-1984 (n), 1985-1988 (d)
<i>WW #21 (Three Saints West Lateral)</i>	1985-1991 (d), 1992-1996 (n), 1997-6/2003 (d)
<i>WW #31B (Jimenez Lateral)</i>	1985-1988 (d), 1989-2000 (n), 2001-5/2005 (d)
<i>Rio Grande at Anthony Bridge</i>	1986-1989 (d), 1990-2000 (n), 2001-5/2005 (d)
<i>WW #32 (La Union East Lateral)</i>	1979-1992 (d), 1993-1996 (n), 1997-1999 (d), 2000 (n) 2001-6/2003 (d)
<i>WW #23 (Three Saints East Lateral)</i>	(n)
<i>WW #32A (Rowley Lateral)</i>	1985-1988 (d)
<i>WW #23A (Texas Lateral)</i>	1985-1992 (d), 1993-1996 (n), 1997-1999 (d), 2000 (n) 2001-6/2003 (d)
<i>Mesquite/Anthony/East Drain</i>	1975-1980 (m), 1981-1992 (d), 1993 (n), 1994-5/2005 (d)
<i>Rio Grande at Vinton Bridge</i>	1985-1992 (d)
<i>WW #32B (Vinton Cutoff Lateral)</i>	1985-1992 (d), 1993-1996 (n), 1997-2002 (d)
<i>Vinton River Drain</i>	(n)
<i>WW #34 (Canutillo Lateral)</i>	1983 (d), 1984 (n), 1985-1992 (d), 1993-1996 (n) 1997-2002 (d)
<i>WW #34A (Pence Lateral)</i>	1985-1988 (d)
<i>WW #35 (Westside Canal)</i>	1980-1992 (d), 1993-1996 (n), 1997-2002 (d)
<i>WW #35C (Schutz Lateral)</i>	1985-1988 (d)
<i>WW #36 (Montoya Lateral)</i>	1985-1992 (d), 1993-1996 (n), 1997-2002 (d)
<i>Nemexas / West /Montoya Intercept./ Montoya Drain</i>	1975-1980(m), 1981-1995 (d), 1996 (n), 1997-2002 (d)
<i>WW #38 (Montoya Lateral)</i>	1985-1992 (d), 1993-1996 (n), 1997-2002 (d)
<i>Rio Grande at El Paso</i>	1975-3/2003 (d)
<i>Rio Grande Below American Dam</i>	1975-2003 (d)
<i>American Canal</i>	1975-2003 (d)
<i>Franklin Canal</i>	1975-1994 (d), 1995-1996 (n), 1997-2002 (d)
<i>Franklin Drain</i>	1975-1983 (m), 1984-2002 (n)
<i>Acequia Madre (International Div. Dam)</i>	1975-2003 (d)
<i>Ascarate Wasteway</i>	1975-1994 (d), 1995-1996(n), 1997-2002 (d)
<i>Rio Grande at Coffey Dam</i>	1975-1987(n), 1988-1993 (d), 1994-1996 (n), 1997-

<i>Site</i>	<i>Available Data Since 1975</i> <sup>1</sup>
	2002 (d)
<i>Riverside Canal</i>	1975-1995 (d), 1996 (n), 1997-2002 (d)
<i>Wasteway #1 (Riverside Canal)</i>	1975-1980 (n), 1981-1984 (d), 1985-1997(n), 1998-2002 (d)
<i>Wasteway #2 (Riverside Canal)</i>	1975-1980 (n), 1981-1984 (d), 1985-1997(n), 1998-2002 (d)
<i>Fabens Waste Channel</i>	1975-1992 (d), 1993-1996 (n), 1997-2002 (d)
<i>Fabens Drain ( Fabens Waste Drain)</i>	1975-1983 (m), 1984-1991 (d), 1992-1996 (n), 1997-2002 (d)
<i>River Drain</i>	1975-1983 (m), 1984-2002(n)
<i>Tornillo Canal at Heading</i>	1975-1983 (d), 1984-1995 n), 1996-1999 (d), 2000-2002(n)
<i>Wasteway #1 (Tornillo Canal)</i>	1975-1980 (n), 1981-1986 (d), 1987-2002(n)
<i>Tornillo Canal at Alamo Alto (WW#2)</i>	1975-1994 (d), 1995-1996(n), 1997-2002 (d)
<i>Tornillo Drain</i>	1975-1994 (d), 1995-1996 (n), 1997-2002 (d)
<i>Hudspeth Feeder Canal</i>	1975-1994 (d), 1995-1996 (n); 1997-2002 (d)
<i>Rio Grande at Fort Quitman</i>	1975-2005 (d)

**Table 2. Availability of Water Quality Data along in the Rio Grande Project area**

<i>Site</i>	<i>Available Data Since 1938</i> <sup>2</sup>
<i>Rio Grande Below Elephant Butte Dam</i>	2/1980-5/1994 (m)
<i>Rio Grande Below Caballo Dam</i>	1/1939-7/1996 (m)
<i>Arrey Canal</i>	1/1980-2/1996 (m)
<i>Garfield Drain</i>	2/1938-12/1996 (m)
<i>Hatch Drain</i>	2/1938-2/1996 (m)
<i>Angostura Drain</i>	2/1938-12/1982 (m)
<i>Rincon Drain</i>	2/1938-2/1996 (m)
<i>Leasburg River Canal</i>	3/1980-2/1996 (m)
<i>Leasburg River Cable</i>	9/2004-12/2005 (d)
<i>Rio Grande Below Leasburg Dam</i>	1/1938-12/1963 (m), 1/1980-12/1995 (m)
<i>Selden Drain</i>	2/1938-10/1942 (m), 6/1970-1/1971 (w,m)
<i>Rio Grande at Picacho Bridge</i>	1/1994-12/1995 (m)
<i>Picacho Drain</i>	1/1938-7/1942 (m), 6/1966-1/1984 (w,m)
<i>Westside Canal (Mesilla Div. Dam)</i>	3/1980-10/1995 (m)
<i>Eastside Canal (Mesilla Div. Dam)</i>	3/1980-10/1995 (m)
<i>Rio Grande Below Mesilla Dam</i>	1/1980-5/1994 (m), 2005 (d)
<i>Santo Tomas River Drain</i>	8/1939-7/1942 (m), 1966 (w,m), 1/1980-2/1985 (m)
<i>Rio Grande Above Vado Bridge</i>	2/1994-12/1995 (m)
<i>Mesilla Drain</i>	2/1938-12/1942 (m)

<sup>2</sup> d - daily data, w – weekly data, m - monthly data, n – no data

<i>Site</i>	<i>Available Data Since 1938</i> <sup>2</sup>
<i>Del Rio Drain</i>	2/1938-12/1942 (m), 6/1966-12/1991 (w,m), 1/1994-12/1995(m)
<i>Chamberino Drain</i>	2/1938-12/1942 (m)
<i>La Mesa Drain</i>	2/1938-12/1942 (m), 1-1966 - 12/1967 (m), 4/1969-12/1990 (m), 1/1994-12/1995 (m)
<i>Rio Grande Upstream of East Drain</i>	3/1995-10/2004 (m)
<i>East Drain</i>	2/2002-12/2005 (d)
<i>Anthony Drain</i>	7/2001 (m), 2/2002-12/2005 (d,m)
<i>Rio Grande Immediately Upstream of the confluence with Anthony Drain</i>	2/2002-8/2003 (d,m)
<i>Nemexas Drain</i>	2/1938-10/1942 (m)
<i>West Drain</i>	2/1938-10/1942 (m), 5/1970-2/1985 (m), 2/2002-12/2005(d,m)
<i>Rio Grande at Anapra Bridge</i>	12/1999-8/2003 (m)
<i>Montoya Drain</i>	2/1938-10/1942 (m), 6/1966-12/1991 (m)
<i>Rio Grande at El Paso (Rio Grande at Courchesne Bridge, 1.7 mi. upstream of America Dam)</i>	1/1938-12/1972 (m), 1980 (m), 1/1988-12/1991 (w,m), 2/1995-8/2005 (d,w,m)
<i>Rio Grande 2.4 km upstream from Haskell R. Street WWTP outfall, south of Bowie High School football stadium at El Paso</i>	12/1995-12/1966 (m), 1/1998-10/2004 (w,m)
<i>Rio Grande 1.3 km downstream from Haskell R. Street WWTP Outfall</i>	12/2003-8/2005 (w,m)
<i>Rio Grande at Riverside Canal 1.8 km downstream of Zaragoza International Bridge</i>	12/1996-8/2005 (w,m)
<i>Rio Grande at San Elizario</i>	11/2000-5/2005 (m)
<i>Rio Grande at Alamo Control Structure</i>	11/1997-5/2005 (w,m)
<i>Rio Grande at Guadalupe Point of Entry Bridge at FM 1106 West of Tornillo</i>	11/2000-6/2005 (m)
<i>Rio Grande at Alamo Control Structure, 9.7 km upstream of Fort Hancock Port of Entry</i>	12/1995 (m), 12/1996 (m), 1997 (m), 1998 (m), 2004 (m)
<i>Rio Grande at Fort Quitman</i>	Data starts from 1/1934, 1/938-12/1963 (m) with few gaps in 1952, 1954-1959. 4/1966-9/1993 (m)
<i>Rio Grande At Neely Canyon, South of Fort Quitman</i>	6/1992 (m), 12/1993-11/2004 (m)
<i>Rio Grande at Little Box Canyon</i>	11/2000-8/2001 (m)
<i>Rio Grande at Calendario</i>	11/2000-8/2001 (m)
<i>Rio Grande 2.4 mi upstream from Rio Conchos Confluence</i>	1/1992-8/2005 (w,m)

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## **Appendix A (contained on CD)**

### **Flow Data Availability Matrices**

#### **Flow Data Summary**

Appendix A (contained on CD) provides summaries of the source(s) of data for each website. The stations are ordered in approximately the same manner as they occur physically, going from north to south along the Rio Grande.

Data summary are grouped by the reservoirs and river reaches:

- RESERVS
- PERCHA
- LEASBURG
- MESILLA
- EL PASO, TX

## **Appendix B (contained on CD)**

### **Water Quality Data Availability Matrices**

#### **Water Quality Data Summary**

Appendix B provides summaries of the source(s) of data for each website. The stations are ordered in approximately the same manner as they occur physically, going from north to south along the Rio Grande.

Data summary are grouped by the reservoirs and river reaches:

- RESERVS
- PERCHA
- LEASBURG
- MESILLA
- EL PASO, TX

#### **Water Quality Parameters Tested and Monitored**