San Luis Valley - Water Resources Development Timeline

Mar 01 1855 — First surface water right appropriation from the Conejos River

Mar 12 1866 — First surface water right appropriation from the Rio Grande

1891 — Estimated that there were 2000 confined wells in the SLV used primarily for irrigation and stock

1900 — Approximate date when all surface streams in the SLV are over-appropriated

Mar 18 1938 — Rio Grande Compact Signed

1928 - 1937 — Rio Grande Compact Study Period

1969 — State Engineer authorized to administer wells under the Water Right Determination and Administration Act

1972 — Moratorium on new well permits for the confined and unconfined aquifers outside of the Closed Basin

1981 — Moratorium on new well permits for the unconfined aquifer inside the Closed Basin, ending new appropriations of groundwater in the SLV

1988 — Closed Basin Project begins delivery of water to the Rio Grande

1998 - 2013 — Rio Grande Decision Support System (RGDSS) Development; includes 79 Technical Advisory Committee meetings held from 1999 through 9/2013

1862 1867 1862 1867 1872 1877 1882 1887 1892 1897 1902 1907 1912 1917 1922 1927 1932 1937 1942 1947 1962 1967 1962 1967 1972 1977 1982 1987 1992 1997 2002 2007 2017

Apr 10 1852 — First Surface Water Right in the State (Culebra Creek-San Luis Peoples Ditch)

1880 - 1891 — Most extensive development of surface water irrigation systems

1903 — The first irrigation well in the unconfined aquifer was constructed

1966 - 1968 — Texas and New Mexico sued Colorado for being 900,000 acre-feet behind in delivery commitments. Case was continued provided Colorado annually meets its delivery commitments

1975 - 1985

SEO & Water Users work on resolution of compact compliance issues

- -1975 SEO proposes rules and regulations.
- -1979 Trial on proposed rules. Separate delivery schedules defined for the Rio Grande and Conejos Rivers; and proposed rules disapproved.
- -1980 Closed Basin Project decree signed.
- -1985 60/40 Agreement signed between Rio Grande and Conejos water users on the use of Closed Basin Project water

1991 — AWDI's application to pump 200,000 acre-feet of water per year from the SLV's aquifers and transport to Denver was dismissed.

2004 - 2013 — Senate Bill 04-222: Implementation of Groundwater Measurement Rules, Confined Aquifer Rules, and encouraging the use of subdistricts (See Expanded Timeline Below)

Abbreviations
AWDI: American Water Development Inc.
DWR: Division of Water Resources
SEO: State Engineers Office
SLV: San Luis Valley

Senate Bill 04-222 Implementation - Expanded Timeline

Jun 2004 — State Engineer adopts Confined Aquifer New Use Rules

Jun 2005 — State Engineer adopts Well Measurement Rules

Aug 2006 — Water Court approves Well Measurement Rules

Nov 2006 — Water Court approves Confined Aquifer New Use Rules. Appealed to Supreme Court Feb 2007

Mar 2007 — Flow meters required on all non-exempt wells in SLV pumping more than 50 gpm

Mar 2008 — Supreme Court upholds Confined Aquifer New Use Rules

Dec 2008 — SEO establishes SLV Rules Advisory Commitee

May 2012 — SEO approves First Annual Replacement Plan for Subdistrict No. 1

May 2012 — Protests to Subdistrict No. 1's first Annual Replacement Plan filed in Water Court

Oct 2012 — Trial on protests to Subdsitrect No.1's first Annual Replacement Plan

Apr 2013 — Water Court rejects protests and appoves Subdistrict No. 1's first Annual Replacement Plan

May 2013 — Water Court approval of Subdistrict No. 1's first Annual Replacement Plan Decree appealed to Supreme Court

May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Aug Nov Feb May Nov

2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

24 TAC Meetings prior to May, 2004

6 SAC Meetings in 2010

5 TAC Meetings in 2010

May 2004 — Senate Bill 04-222 signed which requires maintaining sustainable underground water supplies and encouraging the use of groundwater management subdistricts

Jul 2006 — Subdistrict No. 1 Formation Approved By Alamosa County District Court

TAC

5 TAC Meetings in 2008

10 TAC Meetings in 2009

9 SAC Meetings in 2009

SAC

21 TAC Meetings in 2011

4 TAC Meetings in 2012

9 TACs in 2013

Oct 2008 — First Trial starts on Subdistrict No.1's Plan of Water Management

Sep 2009 — Second Trial starts on Subdistrict No. 1's Plan of Water Management

May 2010 — Water Court approves Subdistrict No. 1's Plan of Water Management

Jul 2010 — Water Court approval of Subdistrict No. 1's Plan of Water Management appealed to Supreme Court

Dec 2011 — Supreme Court upholds Subdistrict No. 1's Plan of Water Management

Apr 2013 — SEO Approves 2nd Annual Replacement Plan for Subdistrict No.1

Sep 2013 — Preliminary Annual Stream Depletion Volumes Released for 4 additional areas

Oct 2013 — SLV Rules Advisory Committee Meetings Resume

Expanded Timeline Color Key
SB 04-222 and Advisory Committee Events
Rules Events
Subdistrict No. 1 Groundwater Management Plan
Subdistrict No. 1 First Annual Replacement Plan
Subdistrict No. 1 Second Annual Replacement Plan
Other Groundwater Management Areas

Expanded Timeline Meeting Key	
TAC	Technical Advisory Committee (TAC), also known as Peer Review Team (PRT), Meetings
SAC	SLV Rules Advisory Committee Meetings

Date Prepared: Sep 25, 2013

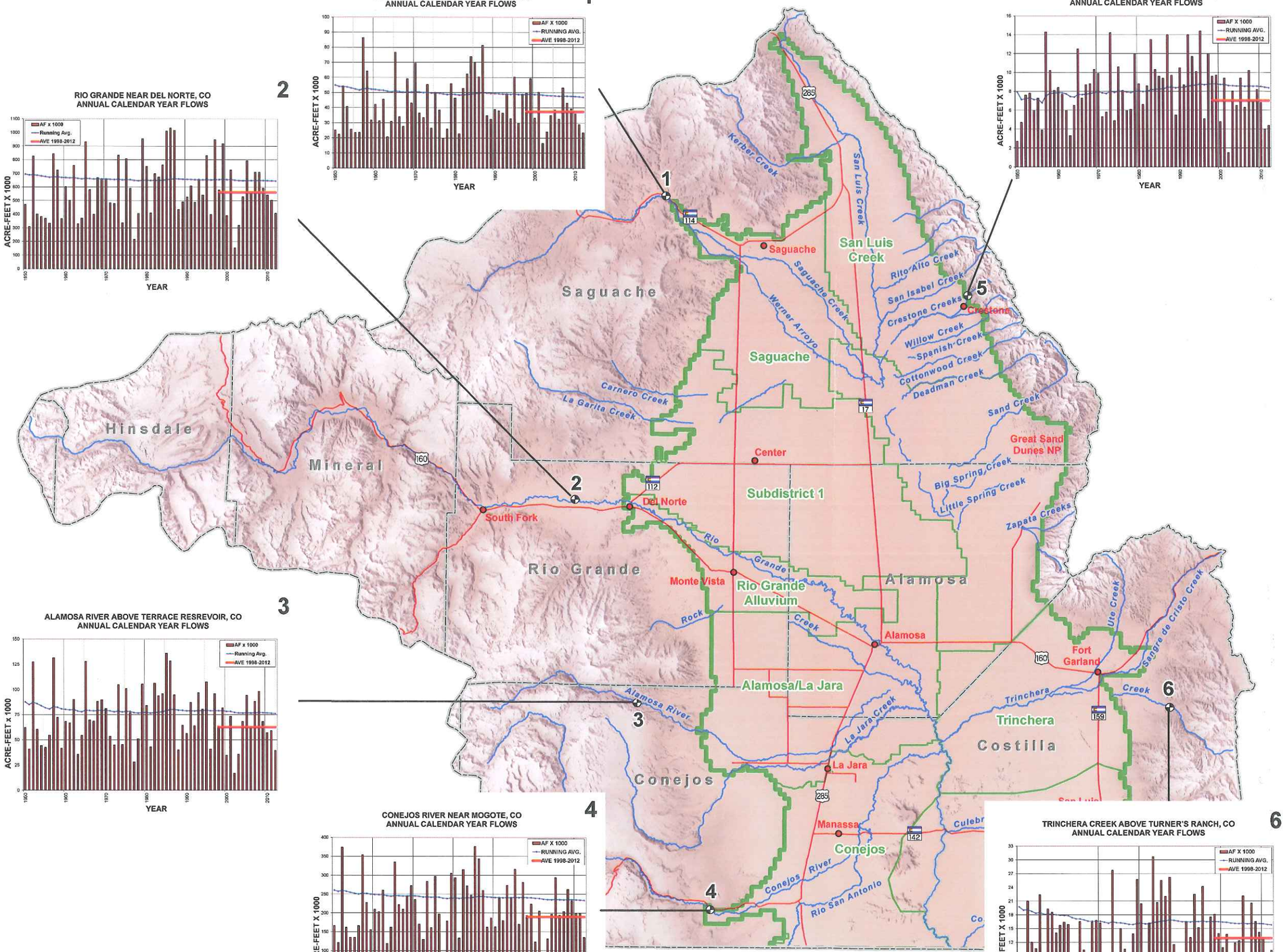
Attachment L

San Luis Valley— Rio Grande Decision Support System (RGDSS)
Groundwater Flow Model Development Outline

Phase 1 **1998-2000**	A 1998 feasibility study by Colorado Water Conservation Board (CWCB) and Colorado Division of Water Resources (CDWR) provided the framework for the RGDSS. This study incorporated significant input from SLV water user groups to ensure the RGDSS represented SLV interests. Phase 1 tasks included: • Incorporated a data-centered groundwater modeling approach using HydroBase (CDWR's database) and other Colorado's Decision Support System tools •Installed 3 confined aquifer wells and conducted 3 aquifer tests •Calibrated and tested the Enhanced San Luis Valley Groundwater Model
Phases 2 & 3 **2000-2003**	In Phases 2 and 3 model development continued with an emphasis on data collection and data-centered processes. The following tasks were completed in Phase 2 and 3. •Constructed 12 confined aquifer wells, conducted 12 aquifer tests, installed 14 new stream gages and 10 new diversion gages. United States Geological Survey (USGS) conducted geophysical logging study • Technical Advisory Committee/Peer Review Team (PRT) process began in earnest in Phase 3 •Calibrated steady-state, average monthly and monthly models •First documented product report
Phase 4 **2003-2004**	The Phase 4 model was enhanced with significant input from the water user groups and their consultants. The following tasks were completed in Phase 4. •Set study period from 1950 to 2002 with a calibration period of 1970 to 2002 •Prepared a second enhanced report. Model and report documented on CWCB website and used in Confined Rules trial
Phase 5 **2004-2009**	The model continued to be updated and improved in Phase 5. Specific Phase 5 improvements include: •Investigated additional areas including the Mesita fault, Manassa fault, Seven Mile Plaza and Rio San Antonio geology •Extended study period to 2005 and included new parameter and geology data collected as part of a Great Sand Dunes model •Generated Response Functions for Subdistrict No. 1's Plan of Water Management
Phase 6 **2010 - 2013**	Phase 6 incorporated metered pumping data for 2009 and 2010 resulting in additional data checking and analysis. The PRT met over 34 times from 2011 to 2013. Specific tasks included: •Extended study period to 2010 •Improved the understanding of the complex geology with targeted hydrogeologic studies conducted in several of the major river basins •Improved the understanding of the irrigated acreage, crop irrigation water requirements, and water supplies •Released preliminary annual stream depletion volumes •Generated Response Functions for Subdistrict No. 1, which have been utilized in their 2012 and 2013 Annual Replacement Plans •Version will be used for the Groundwater Rules for Division 3 and the generation of Response Functions for the remaining Response Areas.

Date Prepared: September 25, 2013

State of Colorado
Division of Water Resources
RGDSS
General Location Map



Map Key

- Model Boundary/ Response Areas
- Stream Gage
- County Boundary

N
W E
S

0 5.5 11 22 Miles

1" = 11 Miles

Date: 9/25/13

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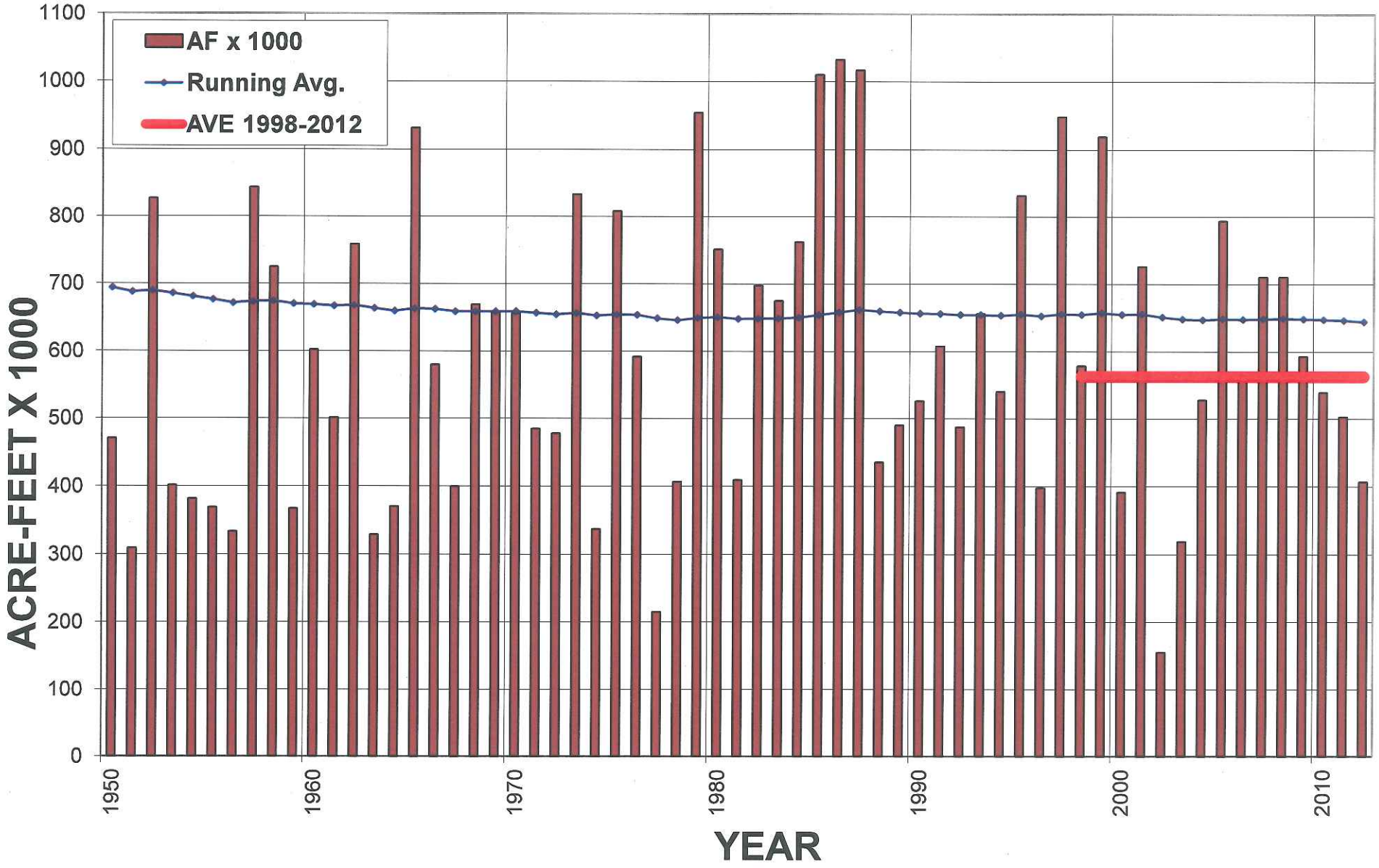
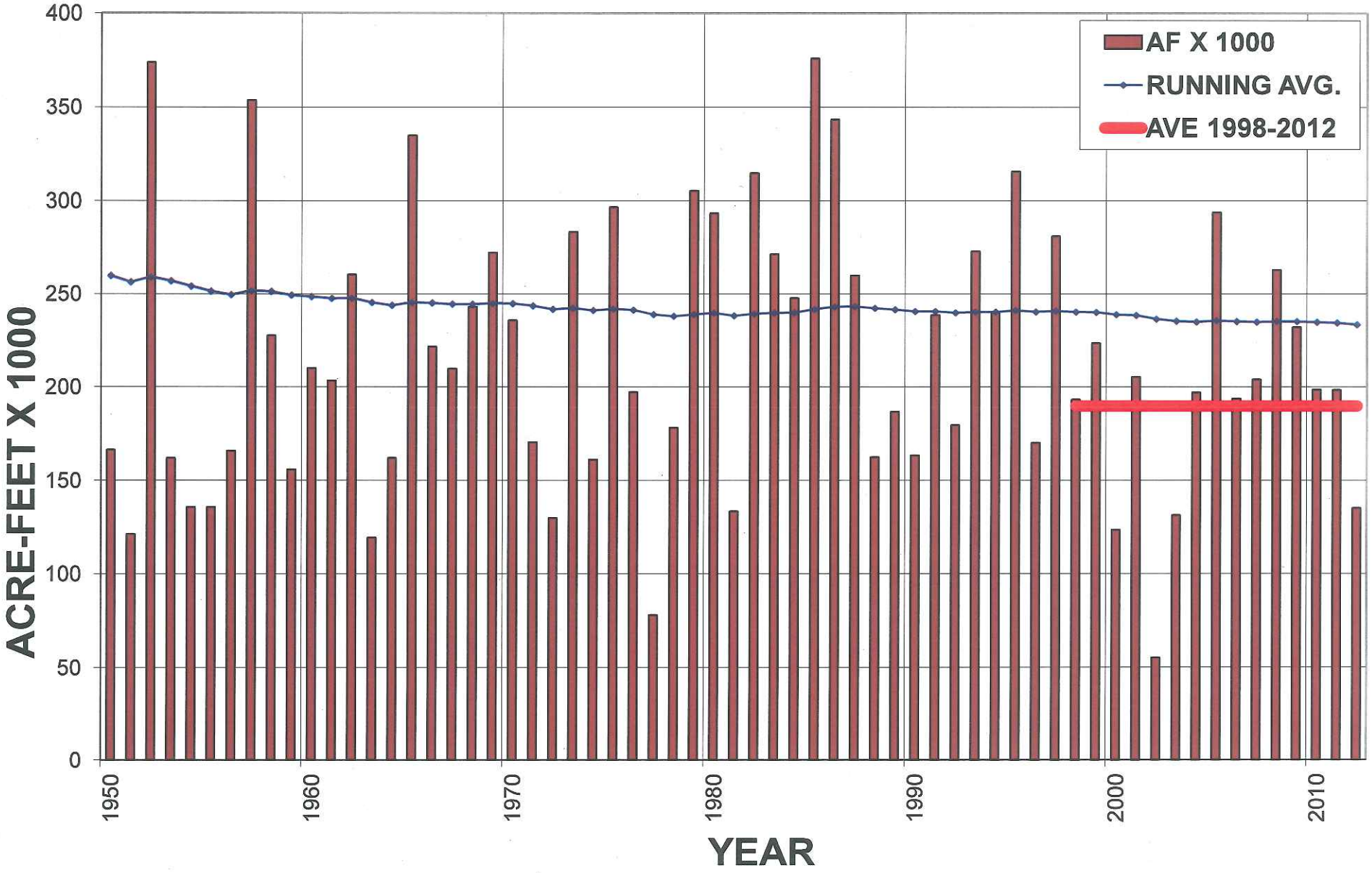
RIO GRANDE NEAR DEL NORTE, CO
ANNUAL CALENDAR YEAR FLOWS



CONEJOS RIVER NEAR MOGOTE, CO
ANNUAL CALENDAR YEAR FLOWS



DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RESOURCES

John W. Hickenlooper
Governor

Mike King
Executive Director

Dick Wolfe, P.E.
Director/State Engineer

September 25, 2013

Steve Vandiver, Manager
Rio Grande Water Conservation District
10600 Hwy 160
Alamosa, CO 81101

RE: Estimated Range of Stream Depletions for Four Proposed Responses Areas: Conejos Response Area, the Alamosa-La Jara Response Area, the Trinchera Response Area, and the Rio Grande Alluvium Response Area

Dear Steve,

This letter is to provide the Rio Grande Water Conservation District ("District") with estimated stream depletion ranges for four of the planned Response Areas in the San Luis Valley. This information will help the District provide guidance to those forming groundwater management subdistricts in those Response Areas and developing draft Plans of Water Management for those subdistricts. We understand that the subdistricts need this information both for planning and for development of their financial structures.

BACKGROUND:
As you know, the RGDSS groundwater model is operated in paired runs to determine the impact of net groundwater consumptive use by wells in the various response areas. A comparison between a Response Area's 'no-pumping' and 'pumping ' runs generates a list of differences in items such as stream flow, aquifer storage, native evapotranspiration, sub-irrigation, etc. Of interest to the District will be the difference between the streamflow in the 'pumping' and 'no-pumping' runs, which are the depletions to impacted stream reaches caused by well pumping. These stream depletions may injure senior water rights, and any injurious stream depletions must be replaced or otherwise remedied through a subdistrict's plan of water management.

The Rio Grande Decision Support System (RGDSS) utilizes data from 1936 through 2010. The comparative runs made for this analysis for each Response Area used the hydrology, streamflows, aquifer conditions, diversion data, climate data, crop demands, etc. for the period 2001-2010 to estimate the range of stream depletions. This time period has excellent data, is reflective of recent conditions in the valley, and should provide a range of stream depletions caused by well pumping that can be used for your planning purposes. Actual stream depletions will vary from year-to-year, sometimes very much so, depending on climatic conditions, crop demands, aquifer conditions, and available water supplies. With that year-to-year variability in mind, we are providing the maximum and minimum annual values from a suite of the model runs for your planning purposes.

Please recognize that it is possible that the RGDSS groundwater model will predict stream depletions in future years that are outside the ranges provided in this letter. While providing fixed ranges at this time is not possible, my staff and I understand that the District needs the enclosed estimates as a starting point from which to begin the planning necessary for forming new subdistricts and developing their plans of water management.

RANGES PROVIDED:
The table below provides information for the Conejos Response Area, the Alamosa-La Jara Response Area, the Trinchera Response Area, and the Rio Grande Alluvium Response Area. The impacts are divided into the various rivers or streams on which the RGDSS groundwater model estimates the depletions occur.

We are still incorporating into the model the recent borehole drilling/geologic work the District funded last month in the northern part of the basin in the Saguache and San Luis Creek areas. Incorporating into the model the data provided by this recent work will help the model more accurately predict impacts in those areas. We are not providing estimated ranges of depletions for those Response Areas, but will do so when the Division of Water Resources ("DWR") finishes incorporating the new data and calibrating the model for those two areas. Our overall review indicates that the information being incorporated in the Saguache and San Luis Response Areas will not affect the results in the southern part of the basin to any large degree, so we are comfortable with the information we are providing for the southern Response Areas at this time.

Please note that we have broken La Jara Creek into 'Upper' and 'Lower' administrative reaches. Confined aquifer pumping can put extra water into a stream, generally as return flows from irrigation. This condition manifests itself particularly in lower La Jara Creek where there is a large volume of confined aquifer well pumping. That well pumping can deplete the upper end of the creek while the return flows add to the water supply in the lower end of the creek. The return flows are represented as 'negative' values in the table because here the well pumping results in more water in those reaches of the stream rather than stream depletions. Thus, we separated La Jara Creek into administrative reaches because if we simply looked at the entire stream for stream depletions, confined aquifer pumping return flows at the lower end would obscure the potential for injurious depletions in the upper stream reach.

The table below provides estimated stream depletions by administrative reach for La Jara Creek so that the District understands that future subdistricts will be required to replace or otherwise remedy injurious stream depletions in administrative reaches in which they occur even if a different administrative reach on the same stream experiences gains due to groundwater withdrawals made by subdistrict wells.

The table below lists the maximum and minimum values of stream depletions to the various streams for the four Response Areas based on recent runs of the RGDSS groundwater model as described above. These runs of the groundwater model have some variability as DWR continued incorporating new or improved information and calibrating the model. These values represent the annual variability across the suite of model runs.

Annual Stream Impact Ranges by Response Area for Impacted Streams
(all values in acre-feet/year)

			Response Areas			
			Rio Grande Alluvium	Conejos	Alamosa-La Jara	Trinchera
Impacted Stream Systems	Rio Grande	Min	1,400	330	4,900	1,200
		Max	2,800	920	11,800	2,000
	Conejos River System	Min		2,900	4,000	190
		Max		6,500	9,000	610
	Alamosa River	Min		***	-780	
		Max		110	440	
	La Jara Creek Upper	Min		***	***	
		Max		150	1,100	
	La Jara Creek Lower	Min		-250	-1,400	
		Max		***	80	
	Trinchera Creek	Min				140
		Max				990

- *Minimum and maximum values are derived from a suite of model runs, do not represent actual replacement obligations, and are provided for planning purposes only*
- *Conejos River System includes the Conejos, Los Pinos, and San Antonio Rivers*
- *La Jara Creek is divided into upper and lower administrative reaches at the Hardtack Ditches (WDIDs 2100537 and 2100538)*
- **** Near zero impact*

RESPONSE AREAS:
The enclosed map illustrates the planned Response Areas used in the model runs. The Response Areas have been delineated based on common hydrologic conditions, similar aquifer characteristics, well completion depths, ditch service areas, groundwater information, etc., so that they group wells that have similar impacts on stream flows.

SUSTAINABILITY:
C.R.S. 37-92-501(4) directs the State Engineer to regulate use of the confined and unconfined aquifers so as to maintain a sustainable water supply in each aquifer system. The legislature further directed the State Engineer to regulate use of the confined aquifer such that artesian pressure is allowed to fluctuate in the same range and manner as it did between 1978 and 2000. Accordingly, each subdistrict's Plan of Water Management must address the sustainability of the aquifers from which its wells withdraw groundwater. DWR anticipates discussing with the San Luis Valley Advisory Committee in October how future subdistricts will meet the statutory sustainability requirements and achieve any necessary recovery in aquifer conditions.

DWR understands that sustainability requirements will impact the financial planning of the subdistricts. We will provide additional guidance on sustainability as soon possible.

We believe that the information provided above will assist your constituents as they work toward forming subdistricts and developing Plans of Water Management. As DWR develops more detailed information, including Response Functions for the various Response Areas, we will provide that more detailed data to you for your planning purposes.

Thank you for your patience in this process.

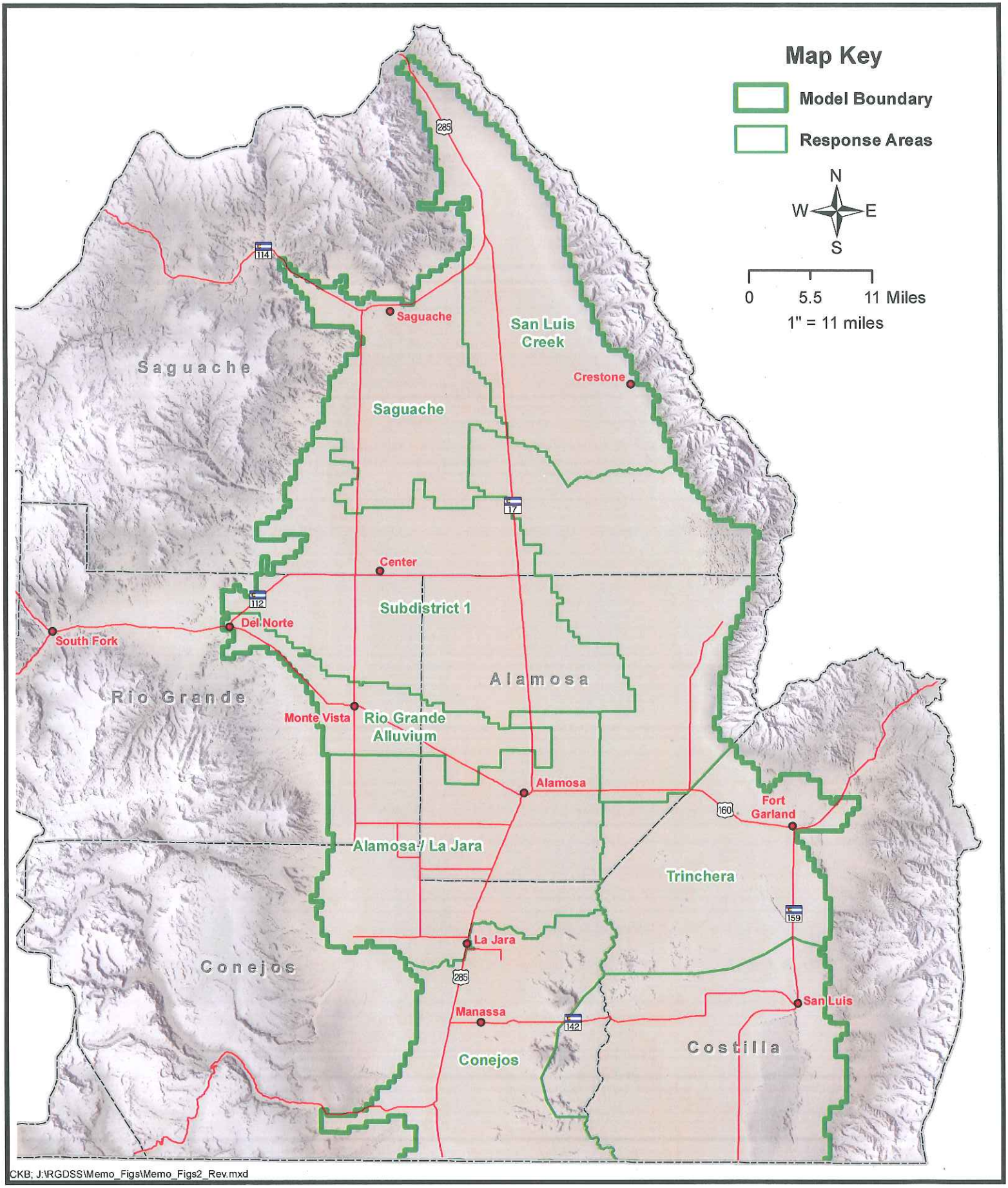
Sincerely,

Dick Wolfe

Dick Wolfe, P.E.
State Engineer, Director
Colorado Division of Water Resources

Cc: AAG Hartman
Div 3 Cotten
SLVAC

Encl: Response Area Map



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State of Colorado -- Division of Water Resources

RGDSS -- Response Areas

Date: 9/25/13