

SPECIAL IMPROVEMENT DISTRICT #1 OF THE  
RIO GRANDE WATER CONSERVATION DISTRICT

ANNUAL REPLACEMENT PLAN  
2017 PLAN YEAR

Prepared

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By

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### **Abbreviations**

ARP	Annual Replacement Plan
CPW	Colorado Parks and Wildlife
CREP	Conservation Reserve Enhancement Program
Divide	Hydraulic Divide
DWR	Division of Water Resources
NRCS	Natural Resources Conservation Service
Plan Year	The ARP for the period May 1, 2017 through April 30, 2018
PWM	Plan of Water Management
RF	RF Application A_RANo1_6P98_V1.1
RGCWUA	Rio Grande Canal Water Users Association
RGDSS	Rio Grande Decision Support System
RGWCD	Rio Grande Water Conservation District
SEO	State Engineer's Office
Subdistrict #1	Special Improvement District #1
Subdistrict Wells	Wells irrigating Subdistrict #1 land
SWC	Surface Water Credit
SWSP	Substitute Water Supply Plan
WDID	Water District Structure Identification Number

## **INTRODUCTION**

The purpose of this report is to satisfy the requirements for an Annual Replacement Plan (ARP) for May 1, 2017 through April 30, 2018 (Plan Year) under the provisions of the Plan of Water Management (PWM) for the Rio Grande Water Conservation District (RGWCD) Special Improvement District No. 1 (Subdistrict #1) decreed by the Division No. 3 Water Court in Case Nos. 2006CV64 and 2007CW52 on May 27, 2010, and upheld by the Colorado Supreme Court on December 19, 2011. Further, the ARP has been drafted in accordance with the requirements of the State Engineer, PWM, and the pertinent court decrees.

As required by the referenced decrees, this report includes information needed by the Subdistrict #1 staff and the Rio Grande Decision Support System (RGDSS) modeling team for calculating stream depletions attributable to Subdistrict #1 Wells (Subdistrict Wells), as that term is defined in the PWM, and information to assess progress toward other PWM objectives. This ARP includes a series of tables created by Subdistrict #1 staff and the RGDSS modeling team tabulating stream replacement quantities and locations resulting from Subdistrict #1 well groundwater pumping and a water portfolio to be used to replace such stream depletions.

Further, this report describes a plan to replace injurious stream depletions caused by the withdrawal of groundwater from Subdistrict Wells. This ARP includes details of the water portfolio to be used to replace injurious depletions identified by the State of Colorado, Division of Water Resources (DWR) and supporting information as required by the rulings and decree in Case Nos. 2006CV64 and 2007CW52.

## **1.0 DATABASE OF SUBDISTRICT WELLS**

A comprehensive listing of wells included in the ARP is necessary for DWR to identify which wells are permitted to continue operating in accordance with the above referenced court decrees and any future well regulations promulgated by the DWR. Further, the list of wells is a necessary input to the RGDSS Groundwater Model.

The following language was copied from the 06CV64 and 07CW52 Decree and describes the evolving nature of the Subdistrict #1 Well list:

“Subdistrict #1, in cooperation with the DWR, prepared a list of Subdistrict #1 Wells by category. The data accumulated for the Subdistrict #1 Well Database comes from several sources and this is the first such comprehensive collection of well information pertaining to Subdistrict #1. Accordingly, the well database is “considered a draft and will continue to be updated.”

Subdistrict #1 must report each Plan Year’s updated Subdistrict #1 Well Database to the State and Division Engineers as a part of the approval of any ARP and must incorporate all of the changes to the Subdistrict #1 Well Database.”

Appendix A is the most current tabulation of the Water District Identification Number (WDID) and the irrigation well pumping of each Subdistrict #1 well. The WDIDs of the wells added to and removed from the 2017 Subdistrict #1 Wells list are noted at the end of Appendix A.

Each year, as producers report information for their farm units and additional data is accumulated from other sources regarding well use and ownership, the Subdistrict Well list is updated. Several wells, which were identified and confirmed in 2016, were added to the 2017 list of Subdistrict Wells. Requests for Farm Unit updates will be mailed out April 17, 2017. Any reported corrections regarding wells are incorporated into the Subdistrict #1 Well list if appropriate. All wells added or removed from the Subdistrict Well list are referenced in the Appendix A footnote.

### **1.1 AUGMENTATION WELLS**

The Subdistrict Wells include some wells that are part of an augmentation plan. The augmentation plans vary in their conditions, but they associate surface rights with Subdistrict Wells and other wells in administration of the respective plan. They are included in the list for fee determination, and if any portion of their legally decreed pumping is not covered by their individual augmentation plans, it is subject to Subdistrict #1 fees and Subdistrict #1 will replace injurious depletions caused by the non-augmented pumping as part of this ARP. Some wells in this list had independent water rights prior to becoming included in an augmentation plan.

Appendix B contains the list of augmentation wells, links to their decrees and a map of the fields associated with those augmentation plans. The 2016 Annual Report for Subdistrict #1 contains details regarding each augmentation well and is available on the Subdistrict #1 website at <http://rgwcd.org>.

## **2.0 CALCULATIONS OF PROJECTED 2017 PLAN YEAR DEPLETIONS FROM SUBDISTRICT WELLS TO THE RIO GRANDE**

The purpose of this section of the 2017 ARP is to present data showing projected 2017 depletions to the Rio Grande resulting from Subdistrict #1 well pumping. Depletions are calculated by a Response Function spreadsheet that outputs total depletions for the Plan Year and a breakdown of monthly depletions for three reaches of the Rio Grande. Subdistrict #1 was directed to use the current 6P98 Response Function for calculating projected stream depletions by the Colorado Division of Water Resources for the 2017 Annual Replacement Plan.

Forecasted calendar year flow through the Rio Grande near Del Norte gage (index gage) was the primary benchmark used to make depletion projections. From this forecast, estimates of total well pumping, canal diversions and annual recharge credit were prepared. This information is utilized in the Response Function spreadsheets to provide an estimate of depletions caused by groundwater pumping from Subdistrict Wells.

### **2.1 2017 STREAM FLOW FORECASTS**

#### **2.1.1 2017 RIO GRANDE STREAM FLOW FORECAST**

As indicated in Appendix 1 of the Plan of Water Management for Special Improvement District No. 1 of the Rio Grande Water Conservation District, a copy of the April 1, 2017 USDA NRCS National Water & Climate Center (NRCS) forecast for stream flows of the Rio Grande Basin in Colorado is required for the estimate of recharge in Subdistrict #1 that offsets groundwater consumption based upon hydrologic conditions for the current Plan Year. In addition to the NRCS Forecast, the Division #3 Division Engineer's estimate of the annual flow of the Rio Grande at the index gage identified in the April 11, 2017 Rio Grande Compact Ten Day Report is required to assist in projecting hydrologic conditions of the Rio Grande for the current Plan Year. The Division Engineer's April 11, 2017 forecast are higher for both the Rio Grande gage near Del Norte and the Conejos River system than the NRCS April 1 forecast supporting a higher river flow potential in 2017 than the NRCS is projecting.

Data collected from the Division #3 Engineer's Rio Grande Compact Ten Day Report on April 11, 2017 estimates the flow for the period April – September for the Rio Grande gage near Del Norte at 645,000.0 acre-feet. Also, from data contained in the Division #3 Engineer's Rio Grande Compact Ten Day Report, 115,000 acre-feet is added to the April - September forecast for the Rio Grande near Del Norte gage to obtain the projected annual flow. Therefore, using the Division #3 Division Engineer's April 11, 2017 forecast, the projected annual flow of the Rio Grande at the index gage near Del Norte is 760,000 acre-feet and will be the basis for estimating recharge in Subdistrict #1 that offsets groundwater consumption in the 2017 ARP .

A copy of the NRCS April 1, 2017 Forecast as well as the April 11, 2017 Division #3 Division Engineer's Rio Grande Compact Ten Day Report is attached in Appendix C.

### 2.1.2 2017 CONEJOS RIVER STREAM FLOW FORECAST

Based on the same forecast documents referenced above, the Division #3 Division Engineer’s April 11, 2017 forecasts for the Conejos River for the period April – September and the annual values are tabulated below. The NRCS forecast as well as the Division #3 Division Engineer’s Rio Grande Compact Ten Day Report for the Conejos River Basin in Colorado is included in Appendix C.

Data contained in the Division #3 Engineer’s Rio Grande Compact Ten Day Report indicates that 40,000.0 acre-feet is added to the April – September Division #3 forecast to obtain the total Conejos River basin projected annual flow. Table 2.1 includes the forecasted flows for the referenced rivers and the forecast for total projected annual flow during the 2017 calendar year.

**Table 2.1  
Conejos River Basin Estimated Annual Flow**

Forecast Point	Period	Forecast (acre-feet)	% of avg.	Estimated Flow outside of Apr-Sept (acre-feet)	Total Annual Estimated Flow (acre-feet)
Conejos R. near Mogote	Apr-Sep	280,000	144		
San Antonio R. at Ortiz	Apr-Sep	25,000	160		
Los Pinos R. near Ortiz	Apr-Sep	110,000	150		
Total		415,000		40,000	455,000

### 2.2 PROJECTED 2017 GROUNDWATER PUMPING

For Subdistrict Wells listed in the 2017 ARP, DWR metered pumping as of February 24, 2017, for the 2016 Irrigation Year reported was 236,749 acre-feet. Based on projected Subdistrict #1 operations, weather predictions and antecedent conditions, it is anticipated that 2017 well pumping will be very close to the same at 238,000 acre-feet.

As during 2016, it is projected that the vast majority of metered well pumping in 2017 will be used for irrigation through center pivot sprinklers. Only a small percentage of well pumping if any will be applied to flood irrigation.

### 2.3 PROJECTED ANNUAL RECHARGE CREDIT

Recharge credit is available to four canals/ditches that divert from the Rio Grande into Subdistrict #1 in accordance with their respective decrees. This recharge credit is used as an offset to groundwater consumption in accordance with the respective decrees and the method used to calculate depletions. The canals/ditches and their decrees are listed in the following tabulation:

<u>Canal/Ditch</u>	<u>Decree</u>
Rio Grande Canal	Case No. W-3979
San Luis Valley Irrigation District	Case No. W-3980
Prairie Ditch	Case No. 96CW45
San Luis Valley Canal	Case No. 96CW46



To prepare a projection of credits, a review of historical river flow records and corresponding annual recharge credit quantities was conducted to find similar river flow conditions that permit estimates of recharge credit that will be available during 2017. The review indicated that canal/ditch diversions varied in relation to river flows, but the relationships were also influenced by the timing and amplitude of the peak snow melt flows, temperatures and precipitation during the irrigation season and where the water right priorities of the canals/ditches fell within the river flow.

To provide a reasonable method for predicting probable recharge credit quantities for 2017, trend lines were developed for each canal/ditch by plotting historical annual river flows and corresponding recharge credits. As a general pattern, it has been observed that river peak flows in the spring occur earlier in recent years, particularly since the severe drought in 2002. Therefore, to reflect recent river flow trends that are likely to continue into 2017, the period 2002 through 2016 is used. The mathematical process used to develop the trend lines is a statistical method called regression analysis. Regression trend lines were developed for each of the four canals/ditches and resulting equations describing the trend lines are included in Appendix D. The best fit trend line equation for all canals except the San Luis Valley Canal was a power equation. For San Luis Valley Canal, a linear equation was the best fit.

The projected recharge credit for each canal is adjusted through the following steps resulting in total consumable credit:

Information used in calculating total consumable credit for each canal/ditch was prepared using the entire irrigated service areas of each canal/ditch. Then, the totals were reduced based on the best estimated percentages of total pro rata ditch shares located within the Subdistrict # 1 boundary provided by each ditch company. The following percentages were used:

Rio Grande Canal = 91.68%  
San Luis Valley Irrigation District = 100%  
Prairie Ditch = 99.20%  
San Luis Valley Canal = 78.82%

Further, it was necessary to reduce the totals by the consumptive use attributable to surface water used directly through sprinklers and for flood irrigation, projecting that 2017 water usage will be similar to that measured for 2016. The following information obtained from irrigators during 2016 was used as estimates of surface water use:

- 1) Rio Grande Canal: Surface water through sprinklers = 5,182.91 ac-ft. and surface water applied to flood irrigation = 160.40 ac-ft.
- 2) San Luis Valley Irrigation District: Surface water through sprinklers = 129.12 ac-ft. and surface water applied to flood irrigation = 10.0 ac-ft.
- 3) Prairie Ditch: Surface water through sprinklers = 318.67 ac-ft. and surface water applied to flood irrigation = 0.0 ac-ft.
- 4) San Luis Valley Canal: Surface water through sprinklers = 484.41 ac-ft. and surface water applied to flood irrigation = 6.0 ac-ft.

Using the Total Consumable water derived from each of the canals/ditches in accordance with the procedure described in the Court’s ruling in Case Numbers 06CV64 & 07CW52, and reducing those totals using the above information and the approved estimated consumption for sprinkler (83%) and flood irrigation (60%), the following tabulation in Table 2.2 shows the resulting projected total individual canal/ditch consumable credits and the total for all of the systems.

**Table 2.2**  
**Calculated Projected Recharge Decree Credits for Subdistrict #1 During 2017**  
**(Units of acre feet)**

	Rio Grande Canal	San Luis Valley I.D.	Prairie Ditch	SLV Canal	Totals
<b>Total Consumable</b>	168,409.24	35,447.50	19,873.66	24,461.30	248,191.69
<b>% Within Subdistrict #1</b>	91.68%	100%	99.20%	78.82%	
<b>Total Consumable Within Subdistrict #1</b>	154,397.59	35,447.50	19,714.67	19,280.40	228,840.15
<b>Surface Water Through Sprinklers @83%</b>	-4,301.82	-107.17	-264.47	-402.06	-5,075.52
<b>Surface Water Used for Flood @60%</b>	-96.24	-6	0	-3.6	-105.84
<b>Totals</b>	149,999.53	35,334.33	19,450.20	18,874.74	223,658.80

Therefore, the calculated consumable credit under the four recharge decrees for 2017 is 223,658.80 ac-ft.

#### 2.4 CLASSIFICATION AS “WET,” “AVERAGE,” OR “DRY” YEAR

Response Functions generated from the RGDSS Groundwater Model Phase 6P98 were used in determining stream depletions as described in this section based on three types of weather conditions during the ARP year. These conditions are “Wet,” “Average,” or “Dry.” A year is classified as being “Wet,” “Average,” or “Dry” based on the amount of Net Groundwater Consumptive Use for Subdistrict wells using the following criteria<sup>(1)</sup>:

**Table 2.3**  
**Definition of “Wet,” “Average” or “Dry” Year**

Year Type	Net Groundwater Consumptive Use (ac-ft./yr)
Wet	Less than 10,000
Average	Between 10,000 and 180,000
Dry	Greater than 180,000

<sup>(1)</sup> Reference: Updated information obtained March 20, 2012 from James R. Heath, P.E., Division of Water Resources Lead Modeler.

The projected Net Groundwater Consumptive Use for the 2017 Plan Year is -26,119 acre-feet as shown in Table 2.4. Referencing the ranges in Table 2.3, the 2017 Plan Year is classified as “Wet”.

## **2.5 PROJECTED 2017 STREAM DEPLETIONS**

As anticipated by the Division 3 Water Court, since the Court entered the Decree, the RGDSS Groundwater Model Peer Review Team (RGDSS Model PRT) has continued to enhance the RGDSS Groundwater Model (RGDSS Model). RGDSS Phase 6P98 provides a higher level of confidence in the predictions of depletions caused by Subdistrict Well groundwater pumping, in time, location and amount, than the previous version that was used to develop the Response Function approved by the Water Division 3 Court. Subdistrict # 1, in consultation with the RGDSS Model PRT, determined that the improved predictive ability of RGDSS Model Phase 6P98 warranted the development of an improved Response Function. The 6P98 Response Function was generated by the same technique the Division 3 Water Court approved for previous Response Functions. The RGDSS Model PRT and the Subdistrict #1 engineering consultant approved the development, use and results of this calibrated Response Function.

As in 2016, Subdistrict #1 staff was instructed by the State Engineer’s Office to utilize the response functions developed under RGDSS Groundwater Model Phase 6P98 for predicting injurious depletions to the Rio Grande during the 2017 Plan Year. Stream depletions attributable to the groundwater pumping through Subdistrict Wells were calculated within this Plan using the Response Function spreadsheet produced by the RGDSS Groundwater Model Phase 6P98 as operated by DWR.

The first step in calculating depletions using the Response Function spreadsheet is updating Table 2.4 to derive the annual Net Groundwater Consumptive Use. For reference, actual values are entered for years 2011 - 2016. Projected values are utilized for 2017. Notes at the bottom of the table provide a description of the calculations within this table. Values in columns 5 through 9 of Table 2.4 for year 2017 are obtained from Table 2.2. Following determination of the net groundwater consumption data for 2017, the data was applied to the Response Function spreadsheet contained in Table 2.5 to calculate projected stream depletions for the 2017 Plan Year and into the future.

**Table 2.4**  
**Estimated Net Groundwater Consumptive Use**  
 (Units in acre-feet)

Year	Subdistrict #1 Total				Recharge that Offsets Groundwater Pumping					Net Groundwater Consumptive Use
	Irrigation Pumping to Center Pivots	Irrigation Pumping to Flood Irrigation	Other Pumping	Groundwater Consumption	Rio Grande Canal	San Luis Valley Irrigation District	Prairie Ditch	San Luis Valley Canal	Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2011	327,863	0	0	272,126	83,801	9,981	8,325	8,204	110,310	161,816
2012	260,530	0	0	216,240	54,870	6,748	4,795	3,620	70,034	146,206
2013	229,287	0	0	190,308	84,919	5,477	4,227	4,782	99,404	90,904
2014	237,697	0	0	197,289	110,566	28,596	14,133	12,777	166,072	31,216
2015	205,494	0	0	170,560	122,980	34,685	15,139	15,608	188,412	-17,852
2016	236,749	0	0	196,502	125,562	32,064	12,873	14,396	184,894	11,608
2017	238,000	0		197,540	150,000	35,334	19,450	18,875	223,659	-26,119
Avg.	247,946	0	0	205,795	104,671	21,841	11,277	11,180	148,969	56,826

Explanation of Columns

- (1) Calendar Year
- (2) Determined from metered groundwater pumping
- (3) Determined from metered groundwater pumping
- (4) Determined from metered groundwater pumping
- (5) Calculated as  $0.83 \times \text{Col 2} + 0.60 \times \text{Col 3}$   
 (0.83 and 0.60 are the consumptive use ratios of total pumping associated with sprinkler irrigation practices, respectively)
- (5) – (9) Determined from analysis of historical diversions and recharge decrees  
 (W-3979, W-3980, 96CW0045, and 96CW0046)
- (10) Calculated as  $\text{Col 6} + \text{Col 7} + \text{Col 8} + \text{Col 9}$
- (11) Calculated as  $\text{Col 5} - \text{Col 1}$

How wells that are added or deleted affect historical pumping figures:

- Any wells that are added to the ARP must add their 2010 through present pumping to the Subd1 historical pumping
- Any wells that are deleted from the ARP will have their historical pumping included in Subd1's pumping until the year that the wells are dropped
- If any wells that were deleted from a previous ARP list are added back in, any historical pumping from the years they were out will have to be included in Subd1's pumping

As noted in Table 2.5, the Net Groundwater Consumptive Use derived in Table 2.4 is input into Column 3 in the row for 2017. The projected annual stream depletions resulting from Subdistrict #1 well pumping for the respective reaches of the Rio Grande and the total are shown in Columns 4 through 7.

**Table 2.5**  
**Estimated Historical and Projected Net Stream Depletions from**  
**Groundwater Pumping in Subdistrict #1**  
 (Units in acre-feet)

Annual Net Stream Depletions (May-Apr) <sup>a)</sup>						
Year	Rio Grande near Del Norte Stream Gage (Apr-Sep)	Net Groundwater Consumptive Use (Jan-Dec)	Rio Grande Del Norte- Excelsior	Rio Grande Excelsior- Chicago	Rio Grande Chicago- State Line	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1970	561,150	101,275	225	341	-116	450
1971	389,397	135,541	420	714	-169	965
1972	373,031	169,393	619	1,069	-223	1,465
1973	755,509	38,851	479	878	-91	1,266
1974	270,942	220,567	2,366	1,325	-285	3,406
1975	730,848	23,753	2,294	1,028	-137	3,185
1976	512,997	65,760	2,016	938	-164	2,790
1977	163,635	240,127	3,825	1,513	-347	4,991
1978	340,660	155,492	3,828	1,627	-328	5,127
1979	886,617	11,835	3,093	1,222	-153	4,162
1980	672,668	63,873	2,726	1,100	-189	3,637
1981	310,945	170,010	2,681	1,423	-300	3,804
1982	572,474	36,314	2,286	1,211	-156	3,341
1983	578,510	32,273	2,031	994	-138	2,887
1984	652,637	40,219	1,869	902	-137	2,634
1985	864,564	2,568	1,648	717	-87	2,278
1986	865,371	-37,341	-90	669	16	595
1987	907,650	109,992	43	858	-115	786
1988	346,087	177,158	593	1,246	-226	1,613
1989	407,389	169,478	883	1,485	-243	2,125
1990	424,033	88,971	886	1,371	-166	2,091
1991	529,567	46,509	826	1,117	-117	1,826
1992	415,482	67,128	861	1,040	-136	1,765
1993	577,831	-21,380	-193	847	-6	648
1994	444,629	100,660	-115	924	-117	692
1995	734,492	-68,610	-2,899	893	140	-1,866
1996	313,441	205,238	-960	1,265	-111	194
1997	781,596	-1,949	-462	906	9	453
1998	466,821	112,457	-70	1,003	-122	811
1999	799,489	-50,972	-2,204	916	110	-1,178
2000	312,094	213,180	-208	1,325	-142	975
2001	655,233	65,822	415	1,184	-91	1,508
2002	96,717	322,490	3,276	1,932	-378	4,830
2003	261,300	234,308	5,234	2,191	-388	7,037
2004	431,675	126,966	4,837	1,967	-322	6,482
2005	682,540	70,356	4,059	1,661	-234	5,486
2006	411,656	119,657	3,660	1,626	-273	5,013
2007	593,239	23,116	3,064	1,311	-155	4,220
2008	623,333	49,201	2,700	1,148	-166	3,682
2009	513,058	-4,448	2,119	911	-90	2,940
2010	453,063	76,286	2,013	968	-166	2,815
2011	415,182	161,816	2,117	1,316	-266	3,167
2012	328,382	146,206	2,101	1,508	-261	3,348
2013	344,435	90,904	1,980	1,403	-205	3,178
2014	518,599	31,216	1,790	1,130	-134	2,786
2015	555,700	-17,852	906	892	-47	1,751
2016	540,000	11,608	692	716	-52	1,356

2017	<b>645,000</b>	<b>-26,119</b>	<b>-348</b>	<b>623</b>	<b>20</b>	<b>295</b>
2018			-300	467	11	178
2019			-3	343	-6	334
2020			22	251	-7	266
2021			29	197	-6	220
2022			-132	159	0	27
2023			-208	128	4	-76
2024			-183	108	4	-71
2025			-163	91	4	-68
2026			-152	76	4	-72
2027			-133	54	4	-75
2028			-116	29	4	-83
2029			-96	11	4	-81
2030			-103	2	5	-96
2031			-123	0	6	-117
2032			-136	-1	6	-131
2033			-136	-1	6	-131
2034			-114	0	5	-109
2035			-72	0	3	-69
2036			-49	0	2	-47
2037			0	0	0	0
2038			0	0	0	0
2039			0	0	0	0
2040			0	0	0	0
Avg 2001-2017	474,654	87,149	2,389	1,323	-189	3,533
Avg. 2001- 2010	472,181	108,375	3,138	1,490	-226	4,401
Post Plan Depletion			-2,168	1,914	50	-201

- a) Estimated net stream depletions shown in this table are greater than the stream depletions that potentially cause injury to surface water rights.

#### Explanation of Columns

- (1) Year
- (2) Rio Grande near Del Norte Gage streamflow in acre-feet for the NRCS streamflow forecast period of April through September. The streamflow value for 2017 is from the April 11, 2017 Rio Grande Compact Ten Day Report.
- (3) Net Groundwater Consumptive Use (NetGWCU) for January through December. NetGWCU values for 2001 through 2010 were taken from the RGDSS Groundwater Model output. NetGWCU values for 2011 through 2016 were calculated using well meter data, diversion data, and irrigated acreage information. NetGWCU data for 2017 was estimated from 2016 well meter data and projected diversions based on the projected Rio Grande streamflow from the April 11, 2017 Rio Grande Compact Ten Day Report.
- (4) Net Stream Depletions in the Rio Grande Del Norte to Excelsior Ditch reach for the plan year (May through April) in ac-ft.
- (5) Net Stream Depletions in the Rio Grande Excelsior Ditch to Chicago Ditch reach for the plan year (May through April) in ac-ft.
- (6) Net Stream Depletions in the Rio Grande Chicago Ditch to the State Line reach for the plan year (May through April) in ac-ft.
- (7) Total Net Stream Depletions columns (4 + 5 + 6) in ac-ft.

Table 2.6 is an output from the Response Function spreadsheet that provides the annual total depletions into monthly replacement obligations for the three impacted reaches of the Rio Grande. This table lists the 2017 Plan Year stream depletions as required under the Decree.

**Table 2.6**  
**Subdistrict #1 Monthly Net Stream Depletions for Plan Year**  
 (Units in acre-feet)

Stream Reach	Subdistrict #1 Total												Total
	2017								2018				
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Rio Grande Del Norte-Excelsior	56	35	1	-37	-50	-57	-56	-51	-52	-44	-54	-40	-349
Rio Grande Excelsior-Chicago	72	51	54	42	47	43	39	49	55	54	63	53	622
Rio Grande Chicago-State Line	1	-8	10	4	4	21	10	7	0	-5	-9	-14	21
<b>Total</b>	<b>129</b>	<b>78</b>	<b>65</b>	<b>9</b>	<b>1</b>	<b>7</b>	<b>-7</b>	<b>5</b>	<b>3</b>	<b>5</b>	<b>0</b>	<b>-1</b>	<b>294</b>

Explanation of Columns

- (1) Stream reach
- (2) - (13) Monthly Net Stream Depletions in acre-feet
- (14) Total Plan Year Net Stream Depletions in acre-feet

As indicated in lower right hand corner of Table 2.6, the estimated total net depletions that will impact the Rio Grande during the Plan Year due to both past pumping and the projected 2017 pumping using the 6P98 Response Function is 294.0 acre-feet. The locations of the net depletions and monthly quantities are tabulated in Table 2.6.

According to the RGDSS Groundwater Model, if Subdistrict #1 wells were shut off today, there would be a continuing depletion to the river for approximately 19 years. This is the calculated time required to recover to conditions that existed before well pumping started. The volume of water required to replace depletions during this recovery period is called post-plan stream depletions. Based on predictions from the RGDSS Model 6P98 Response Functions, Table 2.7 illustrates that there would be no total post-plan net stream depletion anticipated at this time, rather a total post-plan net return. The portions of the total depletions impacting the three designated reaches of the river are also included in the table.

**Table 2.7**  
**Subdistrict #1 Post Plan Net Stream Depletions**  
 (Units in acre-feet)

Years (May-Apr)	Rio Grande Del Norte-Excelsior	Rio Grande Excelsior-Chicago	Rio Grande Chicago-State Line	Total
2018-2037	-2,168	1,914	53	-201

Past SEO Expectations Letters may be read to anticipate remedies at this time sufficient to also cover total post-plan stream depletions caused by groundwater pumping that deplete the streams after this Plan Year. As described in Table 4.1, the Board of Managers of Subdistrict #1 has acquired multiple years' worth of depletion replacement water that is currently in storage and available for release well over the amount needed to cover the current total post-plan stream depletions to the Rio Grande. The Board will continue to work diligently towards obtaining permanent and/or renewable supplies to remedy future depletions caused by present or future groundwater pumping by Subdistrict Wells.

6P98 Response Functions provided by the SEO and utilized in the 2017 ARP demonstrate that post plan impacts of past and present groundwater pumping by Subdistrict Wells will fluctuate depending on climatic conditions effecting river flows on the Rio Grande and unconfined aquifer recovery within the closed basin area. Subdistrict #1 does not believe that a financial guarantee agreement provided by the Rio Grande Water Conservation District is necessary to assure that all post-plan depletions will be remedied if Subdistrict #1 were to fail or otherwise be unable to replace injurious post-plan depletions. Subdistrict #1 will continue to review the necessity to acquire replacement water for replacing existing water supplies released for the prior year's depletions to the Rio Grande and also for post-plan depletions as the RGDSS Groundwater Model deems necessary. As specified in this plan, 7 ditches within Stream Reaches #1 and #2 on the Rio Grande have entered into forbearance agreements with Subdistrict #1 to remedy depletions during the 2017 Plan Year, if needed. Some of these same ditches have been approached to consider permanent forbearance agreements for the future.

If Subdistrict #1 were to fail, the individual well owners of the former Subdistrict #1 would have to obtain plans for augmentation or take other measures to comply with future rules and regulations governing existing groundwater withdrawals. Presumably, those plans would be required to replace these post plan depletions into the future. In the interim, Subdistrict #1 would provide water to remedy injurious post-plan depletions.

### **3.0 FARM UNIT DATA**

Information collected for Subdistrict #1 Farm Units included identification of the wells and surface rights allocated to the irrigated fields on the lands comprising of each farm unit. A summary of the ditches and pro rata shares of surface water allocated to fields in the 2016 Farm Units is included in Appendix E. This represents the "surface water source" for Subdistrict #1.

The groundwater source is represented by the database of Subdistrict Wells described in Section 1.0 above and found in Appendix A. The groundwater amount or the diversions (in acre-feet) for each well during the 2016 irrigation year are included for each WDID in that Appendix.

Each irrigation season, the RGWCD conducts a field survey of the irrigated acreage on the Valley floor to record crop types grown. Table 3.1 is the summary of "irrigated acres, cropping patterns and irrigation methods" on parcels that are part of the 2016 Subdistrict Farm Units. The data was derived from the irrigated agriculture field survey by spatially "capturing" any fields that lie within any of the landowner parcels that are part of the Farm Units. The crop information



and acreage from the irrigated agriculture shapefile attribute tables was compiled and is shown in Table 3.1.

**Table 3.1  
Cropping Patterns within Subdistrict #1 for 2016**

<b>Crop Type</b>	<b>Total Acres</b>	<b>Sprinkler</b>	<b>LEPA</b>	<b>Flood</b>
<b>Alfalfa</b>	31519	31292	31	197
<b>Canola</b>	1853	1853	0	0
<b>Carrots</b>	1175	1175	0	0
<b>Corn</b>	82	82	0	0
<b>Fallowed</b>	4781	4781	0	0
<b>Grain</b>	50324	50254	60	10
<b>Grass hay/pasture</b>	1498	1026		472
<b>Green manure</b>	9819	9819	0	0
<b>Lettuce</b>	1457	1457	0	0
<b>Oats</b>	1470	1370	0	100
<b>Pasture</b>	1185	518	59	607
<b>Potatoes</b>	48900	48864	29	6
<b>Sudan grass hay</b>	3381	3381	0	0
<b>Triticale</b>	604	604	0	0
<b>Vegetables</b>	1339	1339	0	0
<b>CREP</b>	5958	5958	0	0
<b>Quinoa</b>	200	200	0	0
<b>Totals</b>	165,545	163,973	179	1392

The RGWCD Field Survey is done at one point in the growing season. If crops are mixed or observed at an immature stage, it is likely to get clumped into a large category like grain, vegetables, or green manure.

### **3.1 TOTAL IRRIGATED ACRES**

Subdistrict #1 wells irrigated approximately 165,545.0 acres in 2016. See Table 3.1

### **3.2 TOTAL DIVERSIONS BY DITCH**

Table 3.2 shows the ditch service areas that have diversions in Subdistrict #1. The diversions shown are total irrigation water for the ditch for the 2016 irrigation year, but only a portion is delivered within Subdistrict #1.

**Table 3.2  
Ditch Service Areas with Diversions in Subdistrict #1  
Total Ditch Diversions 2016 Irrigation Year**

WDID	Ditch Name	Diversions in Acre-Feet	Irrigation Year
2000546	Billings Ditch	5,417.10	2016
2000556	Butler Ditch	1,680.60	2016
2000627	Excelsior Ditch	23,137.50	2016
2000631	Farmers Union Canal	45,883.00	2016
2000699	Kane Callan Ditch	2,518.40	2016
2000736	McDonald Ditch	6,048.50	2016
2000798	Prairie Ditch	18,539.00	2016
2000812	Rio Grande Canal	167,204.00	2016
2000814	Rio Grande Ditch #2	1,451.50	2016
2000829	San Luis Valley Canal	22,467.00	2016
2700518	Green D #1	2,029.83	2016
2700523	Johnnie Smith D 1	1,080.25	2016
2700533	McLeod No 3	60.16	2016
2700714	McLeod No 4 & 5	565.58	2016

Notes:  
New structure (2700714) replaced (2700534) McLeod No 4 and (2700535) McLeod No 5

### **3.3 DITCHES AND PRO RATA SHARES**

The known pro-rata surface water allocated to Subdistrict #1 farm units is shown in Appendix E.

### **3.4 SURFACE WATER CREDIT**

The amount of Surface Water Credit (SWC) exchanged between farm units for the 2016 fees was 13,330.87 acre-feet.

The surface water exchanged for 2017 is not available until May and is not included in this report.

### **4.0 AMOUNTS AND SOURCES OF REPLACEMENT WATER FOR 2017 PLAN YEAR**

Table 4.1 shows the amounts and sources of replacement water carried over from the 2016 Plan Year and sources that have been acquired by Subdistrict #1 since the summer of 2012 that will be available to replace injurious depletions as directed by the Division Engineer of Water Division No. 3. Sections 4.1 through 4.12 further explain the water quantities and sources.

**Table 4.1**  
**Amounts and Sources of Replacement Water Acquired by Subdistrict #1**

<b>Water Right(s) Name</b>	<b>Quantity (Acre Feet)</b>	<b>Estimated Usable Water After Transportation Losses @ 10%</b>	<b>Water Previously Controlled by:</b>	<b>Decree(s)</b>	<b>Current Location</b>
<b>Williams Creek Squaw Pass TM</b>	1,698.0	1,528.2	Navajo Development	CA73, CA308, W-1869-78	Rio Grande Reservoir
<b>Williams Creek Squaw Pass TM</b>	48.0	43.2	Private Owner: Rominger	CA73, CA308, W-1869-78	Rio Grande Reservoir
<b>Williams Creek Squaw Pass TM</b>	56.49	50.84	San Luis Valley Irrigation District	CA73, CA308, W-1869-78	Rio Grande Reservoir
<b>Tabor Ditch No. 2, Tabor Ditch No. 2 Enlargement TM</b>	105.3	94.77	San Luis Valley Irrigation District	W-3549	Rio Grande Reservoir
<b>Tabor Ditch No. 2, Tabor Ditch No. 2 Enlargement TM</b>	272.5	245.25	Colorado Parks and Wildlife	W-3549	Rio Grande Reservoir
<b>Piedra River TM, Piedra Water Rights</b>	500.0	450.0	Colorado Parks and Wildlife	W-3549	Rio Grande Reservoir
<b>Pine River Weminuche Pass TM</b>	1000.0	900.0	SLV Water Conservancy District	CA 1248-B, 84CW62, 94CW62	Rio Grande Reservoir
<b>Treasure Pass Trans- basin Diversion</b>	730.76	657.68	Evelyn Underwood and Patti Cook	CA 0308	Rio Grande Reservoir
<b>Treasure Pass Trans- basin Diversion</b>	100.0	90.0	Sid Klecker	CA 0308	Rio Grande Reservoir
<b>SMRC 2015 Leases of 3095.8 shares in RG Canal @ 1.86 af/share</b>	5,568.2	5,011.38	Santa Maria Reservoir Co		Santa Maria & Continental Reservoirs
<b>SMRC 2016 Leases of 1645 shares in RG Canal @ 0.968 af/share</b>	1,556.2	1,400.58	Santa Maria Reservoir Co		Santa Maria & Continental Reservoirs
<b>SMRC 2017 Leases of 835 shares in RG Canal @ 1.084 af/share</b>	875.14	787.63	Santa Maria Reservoir Co		Santa Maria & Continental Reservoirs
<b>Farmers Union Canal Forbearance</b>	1,000.0	1,000.0			
<b>San Luis Valley Canal Forbearance</b>	400.0	400.0			
<b>Monte Vista Canal Forbearance</b>	300.0	300.0			
<b>Empire Canal Forbearance</b>	500.0	500.0			

<b>Centennial Ditch Company</b>	100.0	100.0			
<b>Excelsior Ditch Company</b>	1000.0	1000.0			
<b>Rio Grande Lariat Ditch Company</b>	100.0	100.0			
<b>Closed Basin Project Allocation as of March 30, 2017</b>	1,000.0	1,000.0	RGWCD		Closed Basin Project
<b>Total Water Available</b>	16,852.45	15,607.2			

**4.1 WILLIAMS CREEK SQUAW PASS TRANSBASIN DIVERSION CURRENTLY HELD IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 1,698.0 ACRE- FEET**

This trans basin water was stored under the decree held by Navajo Development Company in Rio Grande Reservoir. This water was originally decreed by the Archuleta County District Court as part of Case No. 73 and 308, Adjudication Water District No. 29, San Juan River (April 19, 1962). This water is now decreed for municipal (including commercial, industrial, domestic and sewage treatment), recreation and the replacement under a decreed plan for augmentation of stream depletions caused by well pumping for these uses. *See*, In the Matter of the Application for the Water Rights of Navajo Development Co., Inc., Water Court, Water Division No. 7, Case No. W-1869-78 (February 28, 1979). Subdistrict #1 controls 1,690.0 acre-feet of this Squaw Pass trans basin water. Subdistrict #1 purchased the right to use the first 1,000 acre-feet of water from Navajo Development Co., owned by John H. Parker II in early March 2012. This water was carried over into 2013. A pool of 300 acre-feet was purchased in August, 2012, 350 acre-feet in July 2013, 481.31 acre-feet in December 2014, and 453.5 acre feet in December 2015 all from the same owner. See Appendix F for documentation of purchase. An application for a SWSP is pending/has been approved by the State Engineer for the additional uses of augmentation and recharge for this water. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 1,698.0$  acre feet = **1,528.2** acre-feet. The portion of this water carried forward from the last five years will be released in April 2017 under the 2016 ARP.

**4.2 WILLIAMS CREEK SQUAW PASS TRANSBASIN DIVERSION CURRENTLY HELD IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 48.0 ACRE-FEET**

This trans basin water was stored under the decree held by Navajo Development Company in Rio Grande Reservoir. This water, like that listed in 4.1, was originally decreed by the Archuleta County District Court as part of Case Nos. 73 and 308, Adjudication Water District No. 29, San Juan River (April 19, 1962). Vern Rominger purchased 48.0 acre-feet of this water from John H. Parker II and left it in storage in Rio Grande Reservoir. Subdistrict #1 purchased the right to use 28.0 acre-feet in June 2013, 10.0 acre-feet in November 2014, and 10 acre-feet in December 2015 all from the Rominger family. See Appendix F for documentation of purchase. An

application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the additional uses of augmentation and recharge for this water. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 48.0 = 43.2$  acre-feet.

#### **4.3 WILLIAMS CREEK SQUAW PASS TRANSBASIN DIVERSION STORED IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 56.49 ACRE-FEET**

This 56.49 acre-feet of trans basin water is held by San Luis Valley Irrigation District in Rio Grande Reservoir. This water, like that listed in section 4.1, was originally decreed by the Archuleta County District Court as part of Case No. 73 and 308, Adjudication Water District # 29, San Juan River (April 19, 1962). Subdistrict #1 purchased the right to use this water from the San Luis Valley Irrigation District in February 2014. See Appendix F for documentation of purchase. An application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the additional uses of augmentation and recharge for this water. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 56.49 = 50.84$  acre-feet.

#### **4.4 TABOR DITCH NO. 2 TRANSBASIN DIVERSION STORED IN RIO GRANDE RESERVOIR, IN THE AMOUNT OF 105.3 ACRE-FEET**

This trans basin water is stored under the Tabor Ditch No. 2 and the Tabor Ditch No. 2 Enlargement, decreed by the District Court, in and for Montrose County in the Matter of the Adjudication of Priorities for Water Rights in Water District No. 62, in the State of Colorado, Case No. CA6981 (March 30, 1960), held by San Luis Valley Irrigation District in Rio Grande Reservoir. Subdistrict #1 purchased the right to use 60.53 acre-feet of this water in February 2013. Subdistrict # 1 purchased an additional right to use 50.48 acre-feet of this water from the San Luis Valley Irrigation District in February 2014. See Appendix F for documentation of purchase. An application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the additional uses of augmentation and recharge for this water. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 105.3 = 94.77$  acre-feet.

#### **4.5 PINE RIVER WEMINUCHE PASS DITCH TRANS-BASIN DIVERSION HELD IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 1000 ACRE-FEET**

This trans basin water was owned and controlled by the San Luis Valley Water Conservancy District and is currently held in Rio Grande Reservoir. This water was decreed by the District Court in and for La Plata County in the Matter of the Supplemental Adjudication of Priorities of Water Rights to the Use of Water in Water District 31, Pine River and its Tributaries in Colorado, Case No. CA1248-B (March 7, 1966); subsequent decrees include 1984CW16 and 1994CW62. Subdistrict #1 purchased the right to use 500.0 acre-feet of this water in April 2014 and another 500.0 acre-feet in April 2015 from the San Luis Valley Water Conservancy District.

See Appendix F for documentation of purchase. An Application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the additional uses of augmentation and recharge for this water. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 1000 = 900.0$  acre-feet.

#### **4.7 TABOR DITCH NO. 2 TRANSBASIN DIVERSION HELD IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 272.5 ACRE-FEET**

This trans basin water is stored under decrees held by the Colorado Parks and Wildlife (CPW) in Rio Grande Reservoir. The Tabor Ditch No. 2 and the Tabor Ditch No. 2 Enlargement, decreed by the District Court, in and for Montrose County in the Matter of the Adjudication of Priorities for Water Rights in Water District No. 62, in the State of Colorado, Case No. CA6981 (March 30, 1960). Such water rights were subsequently changed through a decree entered on December 29, 1979, in Case No. W-3549 in the District Court for Hinsdale County. Subdistrict #1 leased the right to use 250.0 acre-feet of this water held in Rio Grande Reservoir and 22.5 acre-feet held in Beaver Park Reservoir by CPW in May 2013. See Appendix F for documentation of purchase. The 22.5 acre-feet of water in Beaver Park Reservoir was exchanged up to the Rio Grande Reservoir during the summer months of 2014 while the reservoir was drained on account of CPW's dam reconstruction project commencing May of 2014. An application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the subsequent use of this water for augmentation and recharge. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 272.5 = 245.25$  acre-feet.

#### **4.8 TREASURE PASS DIVERSION DITCH AND FEEDER LATERALS DIRECT FLOW WATER STORED IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 730.76 ACRE-FEET**

This trans basin water originates in Water Division No. 7 and is currently used in Water Division No. 3. The Treasure Pass Ditch water rights were originally decreed on April 19, 1962, in Case No. CA-0308 in the District Court for Hinsdale County for the irrigation of lands in the San Luis Valley, Colorado, and is currently assigned Administrative No. 28645.26510, Priority No. 284. Under the previously approved SWSP, the amount of water was measured and recorded as the water brought from the Colorado River Basin into the Rio Grande Basin. When the water reached the confluence with the Rio Grande, the water was exchanged into and stored in Rio Grande Reservoir, less appropriate transit losses. This diversion and exchange operated for 2013, 2014, and 2015 until December 31, 2015, and all water stored under the exchange for all years remain as property and under the control of Subdistrict #1. See Appendix F for documentation of purchase. This water will be subsequently released to replace injurious depletions under the direction of the Division Engineer for Water Division No. 3 to meet the requirements of the Subdistrict's Annual Replacement Plan. An application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the subsequent use of this water for augmentation and recharge. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 730.76 = 657.68$  acre-feet.

#### **4.9 TREASURE PASS DIVERSION DITCH AND FEEDER LATERALS DIRECT FLOW WATER STORED IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 100.0 ACRE-FEET**

This fully consumable water was purchased from the Klecker Ranch owned by Sid and Jan Klecker in March of 2014 and is currently held in Rio Grande Reservoir. See Appendix F for documentation of purchase. Sid Klecker had stored this water in Rio Grande Reservoir in years past. This trans basin water originates in Water Division No. 7 and is currently used in Water Division No. 3. The Treasure Pass Ditch water rights were originally decreed on April 19, 1962 in Case No. CA-0308 in the District Court for Hinsdale County for the irrigation of lands in the San Luis Valley, Colorado and is currently assigned Administrative No. 28645.26510, priority No. 284. When the water reached the confluence with the Rio Grande, the water was exchanged into and stored in Rio Grande Reservoir, less appropriate transit losses. This water will be subsequently released to replace injurious depletions under the direction of the Division Engineer for Water Division No. 3 to meet the requirements of the Subdistrict's Annual Replacement Plan. An application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the subsequent use of this water for augmentation and recharge. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 100.0 = 90.0$  acre-feet.

#### **4.10 PIEDRA WATER RIGHTS STORED IN RIO GRANDE RESERVOIR IN THE AMOUNT OF 500 ACRE-FEET**

This trans basin water is stored under decrees held by CPW in Rio Grande Reservoir. It originates in Water Division No. 7 and is decreed to the South River Peak Ditch, the South River Peak Ditch Enlargement, the Don La Font Ditch No. 1, the Don La Font Ditch No. 2 and the Don La Font Ditch No. 2 Enlargement (collectively "Piedra Water Rights"). The Piedra Water Rights originate in Water Division No. 7 and are used in Water Division No. 3. The Piedra Water Rights were decreed on December 19, 1968 in Case No. 73-308D in the District Court for Archuleta County for irrigation use. This water was leased from CPW in June of 2014. See Appendix F for documentation of purchase. This water will be subsequently released to replace injurious depletions under the direction of the Division Engineer for Water Division No. 3 to meet the requirements of the Subdistrict's Annual Replacement Plan. An application for a Substitute Water Supply Plan is pending/has been approved by the State Engineer for the subsequent use of this water for augmentation and recharge. Based upon the standard loss factors used within Water Division 3 for releases from Rio Grande Reservoir, the water available to Subdistrict #1 at Del Norte to replace depletions would be  $0.9 \times 500.0 = 450.0$  acre-feet.

#### **4.11 SANTA MARIA RESERVOIR COMPANY SHARES**

There is a remaining balance of 15,600.12 acre-feet of fully consumable water from the original 17,254.0 acre-feet of Santa Maria Reservoir Company water leased by Subdistrict #1. This water is in storage in Santa Maria and Continental Reservoirs and was accumulated from 2011 through 2016 storage seasons. The remaining balance of accretion replacement water for in storage from

the shares representing the Rio Grande Canal portion of Santa Maria Reservoir Company for the 2016 shares is 3.41 acre-feet.

The Subdistrict proposes to make available for use in its 2017 Annual Replacement Plan the consumable water remaining in storage regarding the 2015 and 2016 leases on November 1, 2016 (2016 carry over) plus the consumable water derived from leases of SMRC shares in 2017.

Currently, the Subdistrict holds leases for 835 SMRC shares in 2017. The allocation per share set April 11, 2017 by the SMRC Superintendent is 1.084 acre-foot per share. The leased volume totals 905.14 acre-feet and the accretion replacement obligation would be 30.0 acre-feet ( $905.14 \text{ acre-feet} \times 3.3\% = 30.0 \text{ acre-feet}$ ). The fully consumable portion of the leased water supplies would be 875.14 acre-feet ( $905.14 \text{ acre feet} - 30.0 \text{ acre feet} = 875.14 \text{ acre feet}$ ) for the 2017 leases.

The additional fully consumable water supply from the 2017 leases combined with the carryover water supplies derived from the 2015-16 leases total 7,999.5 acre-feet. The Santa Maria fully consumable water delivered to Del Norte available to replace depletions would be  $0.9 \times 7,999.5 \text{ acre feet} = 7,199.6 \text{ acre-feet}$ . A SWSP has been filed and is pending/approved to enable use of this water during the 2017 Plan Year.

The Santa Maria Reservoir Company filed an application with the Division 3 Water Court, Case No. 13CW3002, to add augmentation and recharge as additional uses under their current decrees. In March of 2014, the Santa Maria Reservoir Company filed an application for a Substitute Water Supply Plan pursuant to section 37-92-908(4), C.R.S. for the temporary use of this water for augmentation and recharge and it was approved by the State Engineer's Office in April 2014. Subdistrict #1 was then given approval by the State Engineer to use this water as a replacement water source to replace depletion obligations beginning the 2014 Plan Year.

The Santa Maria Reservoir Company filed another application for a SWSP pursuant to section 37-92-908(4) in February of 2017 for the temporary use of this water for augmentation and recharge. Subdistrict #1 acknowledges that this water may not be used under this plan until either the application for a SWSP is approved by the State Engineer for the Plan Year or the Water Court for Water Division No. 3 approves the request to add additional uses and enters an amended decree. However, as shown above, the Santa Maria shares are not strictly necessary for this Plan Year to assure replacement of injurious depletions, although they might provide additional administrative options in making those replacements. Santa Maria Reservoir shares not used in the current Plan Year can be carried forward and will be available to Subdistrict #1 for future ARP's.

## **4.12 FORBEARANCE AGREEMENTS**

### **4.12.1 FORBEARANCE-SAN LUIS VALLEY IRRIGATION DISTRICT**

A forbearance agreement has been reached with the San Luis Valley Irrigation District: Farmers Union Canal, a copy of which is included in Appendix H. Pursuant to section 37-92-501(4)(b)(I)(B), C.R.S. Subdistrict #1 has reached agreement with the San Luis Valley Irrigation



District whereby the Farmers Union Canal accepts that, subject to the specific provisions of the forbearance agreement, injury to its water rights resulting from the use of groundwater by Subdistrict Wells may be remedied by means other than providing water to replace stream depletions, when the Farmers Union Canal is the calling right on the Rio Grande. Based upon climate projections and historical diversion patterns in the 2017 ARP, this agreement with the Farmers Union Canal was predicted to result in a reduction of 50-100.0 acre-feet to the amount of water Subdistrict #1 would otherwise have to supply to the Rio Grande-Del Norte to Excelsior Ditch Head gate reach.

#### **4.12.2 FORBEARANCE-SAN LUIS VALLEY CANAL COMPANY**

A forbearance agreement has been reached with the San Luis Valley Canal Company, a copy of which is included in Appendix H. Pursuant to section 37-92-501(4)(b)(I)(B), C.R.S. Subdistrict #1 has reached agreement with the San Luis Valley Canal Company whereby the San Luis Valley Canal accepts that, subject to the specific provisions of the forbearance agreement, injury to its water rights resulting from the use of groundwater by Subdistrict Wells may be remedied by means other than providing water to replace stream depletions when the San Luis Valley Canal is the calling right on the Rio Grande. Based upon climate projections and historical diversion patterns in the 2017 ARP, this agreement with the San Luis Valley Canal was predicted to result in a reduction of 50-100.0 acre-feet to the amount of water Subdistrict #1 would otherwise have to supply to the Rio Grande-Del Norte to Excelsior Ditch Head gate reach.

#### **4.12.3 FORBEARANCE-MONTE VISTA WATER USERS ASSOCIATION**

A forbearance agreement has been reached with the Monte Vista Water Users Association, a copy of which is included in Appendix H. Pursuant to section 37-92-501(4)(b)(I)(B), C.R.S. Subdistrict #1 has reached agreement with the Monte Vista Water Users Association whereby the Monte Vista Canal accepts that, subject to the specific provisions of the forbearance agreement, injury to its water rights resulting from the use of groundwater by Subdistrict Wells may be remedied by means other than providing water to replace stream depletions, when the Monte Vista Canal is the calling right on the Rio Grande. Based upon climate projections and historical diversion patterns in the 2017 ARP, this agreement with the Monte Vista Canal was predicted to result in a reduction of 100-200.0 acre-feet to the amount of water Subdistrict #1 would otherwise have to supply to the Rio Grande-Del Norte to Excelsior Ditch Head gate reach.

#### **4.12.4 FORBEARANCE-COMMONWEALTH IRRIGATION COMPANY- EMPIRE CANAL**

A forbearance agreement has been reached with the Commonwealth Irrigation Company: Empire Canal, a copy of which is included in Appendix H. Pursuant to section 37-92-501(4)(b)(I)(B), C.R.S. Subdistrict #1 has reached agreement with the Commonwealth Irrigation Company whereby the Empire Canal accepts that, subject to the specific provisions of the forbearance agreement, injury to its water rights resulting from the use of groundwater by Subdistrict Wells may be remedied by means other than providing water to replace stream depletions, when the Empire Canal is the calling right on the Rio Grande. Based upon climate projections and historical diversion patterns in the 2017 ARP, this agreement with the Empire Canal was

predicted to result in a reduction of 200-300.0 acre-feet to the amount of water Subdistrict #1 would otherwise have to supply to the Rio Grande-Del Norte to Excelsior Ditch Headgate reach.

#### **4.12.5 FORBEARANCE-EXCELSIOR DITCH COMPANY**

A forbearance agreement has been reached with the Excelsior Ditch Company, a copy of which is included in Appendix H. Pursuant to section 37-92-501(4)(b)(I)(B), C.R.S. Subdistrict #1 has reached agreement with the Excelsior Ditch Company whereby the Excelsior Ditch accepts that, subject to the specific provisions of the forbearance agreement, injury to its water rights resulting from the use of groundwater by Subdistrict Wells may be remedied by means other than providing water to replace stream depletions, when the Excelsior Ditch is the calling right on the Rio Grande. Based upon climate projections and historical diversion patterns in the 2017 ARP, this agreement with the Excelsior Ditch was predicted to result in a reduction of 100-200.0 acre-feet to the amount of water Subdistrict #1 would otherwise have to supply to the Rio Grande-Del Norte to Excelsior Ditch Headgate reach.

#### **4.12.6 FORBEARANCE-CENTENNIAL DITCH COMPANY.**

A forbearance agreement has been reached with the Centennial Ditch Company, a copy of which is included in Appendix H. Pursuant to section 37-92-501(4)(b)(I)(B), Subdistrict #1 has reached agreement with the Centennial Ditch Company whereby the Centennial Ditch accepts that, subject to the specific provisions of the forbearance agreement, injury to its water rights resulting from the use of groundwater by Subdistrict Wells may be remedied by means other than providing water to replace stream depletions, when the Centennial Ditch is the calling right on the Rio Grande. Based upon climate projections and historical diversion patterns in the 2017 ARP, this agreement with the Centennial Ditch was predicted to result in a reduction of 100.0 acre-feet to the amount of water Subdistrict #1 would otherwise have to supply to the Rio Grande-Del Norte to Excelsior Ditch Headgate reach.

#### **4.12.7 FORBEARANCE-RIO GRANDE LARIAT DITCH COMPANY.**

A forbearance agreement has been reached with the Rio Grande Lariat Ditch Company, a copy of which is included in Appendix H. Pursuant to section 37-92-501(4)(b)(I)(B), C.R.S. Subdistrict #1 has reached agreement with the Rio Grande Lariat Ditch Company whereby the Rio Grande Lariat Ditch accepts that, subject to the specific provisions of the forbearance agreement, injury to its water rights resulting from the use of groundwater by Subdistrict Wells may be remedied by means other than providing water to replace stream depletions, when the Rio Grande Lariat Ditch is the calling right on the Rio Grande. Based upon climate projections and historical diversion patterns in the 2017 ARP, this agreement with the Rio Grande Lariat Ditch was predicted to result in a reduction of 100.0 acre-feet to the amount of water Subdistrict #1 would otherwise have to supply to the Rio Grande-Del Norte to Excelsior Ditch Headgate reach.

#### **4.13 CLOSED BASIN PROJECT PRODUCTION OF CALENDAR YEAR 2017**

According to the Division #3 Engineer's Rio Grande Compact Ten Day Report on April 11, 2017, the projected production of the project delivered to the Rio Grande is 9,500.0 acre-feet during the calendar year 2017. The division of the Closed Basin Project production in accordance with agreements with Conejos River and Rio Grande water users' organizations and special districts is 60% to the Rio Grande and 40% to the Conejos River over the long term with provisions for adjustments in the division during individual years. Pursuant to the Resolution Regarding Allocation of the Yield of the Closed Basin Project, the management and allocation of the Rio Grande's share of the Project's usable yield is made by the Rio Grande Water User's Association in consultation with the San Luis Valley Water Conservancy District. At a meeting of the Rio Grande Water User's Association Board of Directors on March 30<sup>th</sup>, 2017, the Board of Directors passed a motion to specifically allocate 1,000 acre-feet of the Rio Grande's share of the usable yield of the Closed Basin Project to replace the stream depletions under Subdistrict #1's 2017 Annual Replacement Plan. Similarly, the Board of Directors of the San Luis Valley Water Conservancy District agreed to the allocation as stated in their letter to the Rio Grande Water Conservation District on March 29, 2017. See Appendix I for a copy of the letters. Therefore, 1,000 acre-feet of water is available to Subdistrict #1 to replace injurious depletions by augmentation, substitution and exchange during the 2017 Plan Year.

#### **5.0 OPERATION OF THE SUBDISTRICT #1, 2017 ANNUAL REPLACEMENT PLAN**

The Subdistrict replacement water that is currently in storage will be released from Rio Grande Reservoir located in the Upper Rio Grande at the direction of the Division 3 Engineer, based on predictions from the RGDSS Model 6P98 Response Functions, to offset injurious stream depletions on the Rio Grande during the 2017 Plan Year. All 2017 Plan Year injurious depletions predicted to occur by the accepted 6P98 Response Functions will be replaced in the time, location and amount that they occur, beginning May 1, 2017. The reaches, amounts and time that these depletions occur are described in Section 2.0, Table 2.6. These releases of water will be performed under the provisions contained in section 37-87-103, C.R.S.

At times when there is a monthly, negative depletion in Stream Reach #3, Subdistrict #1 would request the Division #3 Division Engineer to exchange a daily amount upstream to Stream Reach #2 to offset a positive daily depletion in the reach when the exchange potential exists under the protocol of DWR. At times when there is a monthly, negative depletion in Stream Reach #1, Subdistrict #1 would request the Division #3 Division Engineer to exchange the daily amount downstream to Stream Reach #2 to offset a positive daily depletion in the reach when the exchange potential exists under the protocol of DWR.

Sections 37-80-120, 37-83-104, and 37-83-106, C.R.S., allow for exchanges to occur between reservoirs without a decree and if recognized by the Division Engineer. Appropriate accounting between the Division Engineer's Office and Subdistrict #1 will occur on a regular and routine basis if these exchanges do occur. Any reservoir exchanges done in the 2017 ARP Year will be documented and reported in the 2017 Annual Report. The Division Engineer's Office will be notified in advance of any reservoir exchanges.

As shown above, Subdistrict #1 has implemented seven Forbearance Agreements with major canals located on the main stem of the Rio Grande for the 2017 Plan Year. Upon its sole discretion, the Subdistrict will exercise these agreements if conditions exist which could save an additional 300-400.0 acre-feet of replacement water during the 2017 irrigation season.

The most current RGDSS 6P98 Model Runs and Response Functions do not predict depletions caused by the withdrawal of groundwater by Subdistrict Wells to streams other than the Rio Grande in amounts above the minimum threshold established by the Water Court, Water Division No. 3 in Case Nos. 2006CV64 and 2007CW52. Therefore, Subdistrict #1 is not required to make replacements to any stream other than the Rio Grande.

At times when there is no requirement to deliver water to the Lobatos Gage to meet the requirements of the Rio Grande Compact, no water will be delivered to the lower reach of the Rio Grande for replacement of injurious stream depletions from Subdistrict #1. However, the CBP may continue to deliver salvaged water to the stream as directed by the CBP Operating Committee or other laws and policies.

## **6.0 GROUNDWATER LEVELS IN UNCONFINED AND CONFINED AQUIFER AND UNCONFINED AQUIFER CHANGE IN STORAGE VOLUMES**

### **6.1 GROUNDWATER LEVELS IN THE UNCONFINED AND CONFINED AQUIFERS**

A tabulation of groundwater levels measured in unconfined and confined wells both within the boundaries of Subdistrict #1 and the study area for the Change in Unconfined Aquifer Storage – West Central San Luis Valley are provided in Appendix J. This tabulation includes measured values for each of the wells obtained during the previous 12-months. A map showing the location of each well is also included in Appendix J.

### **6.2 UNCONFINED AQUIFER CHANGE IN STORAGE VOLUMES.**

One of the primary goals of Subdistrict #1 is to cause groundwater levels in the unconfined aquifer to recover within the Subdistrict #1 boundary to a level that will maintain a sustainable irrigation supply for Subdistrict #1 wells. The PWM includes a required objective of recovering groundwater levels to the extent necessary to achieve unconfined aquifer storage levels between 200,000 and 400,000 acre-feet below the storage level that existed on January 1, 1976.

The success of the program to achieve the above described objective is measured by a Study of the Change in Unconfined Aquifer Storage updated monthly by Davis Engineering Service, Inc. personnel. The study utilizes measured groundwater levels from RGWCD monitoring wells located throughout the study area which is approximately the same area included within Subdistrict #1. Wells are occasionally dry, inaccessible, damaged or have been removed so the number of wells measured on a monthly basis varies. A map showing the study area for the Change in Unconfined Aquifer Storage – West Central San Luis Valley and a tabulation of the data is included in Appendix J.

Figure 6.1 is a map showing the study area. Assigning an area of influence and multiplying that area times the monthly change in groundwater level times a specific yield value of 0.2 derives the change in storage calculated for each well. This calculated change in groundwater storage volume is then added to volumes obtained for each well within the study. The total change from all wells is the total change in unconfined aquifer storage for the study area for a given month. The areas for each of the wells in the study are determined by constructing a polygon around each well in accordance with the Thiessen mean method. The area of the polygon was calculated and assigned to the respective well.

The study period begins in January 1976 at which time an adequate number of RGWCD monitoring wells were available to conduct a study that provided a reasonable representation of unconfined aquifer storage change.

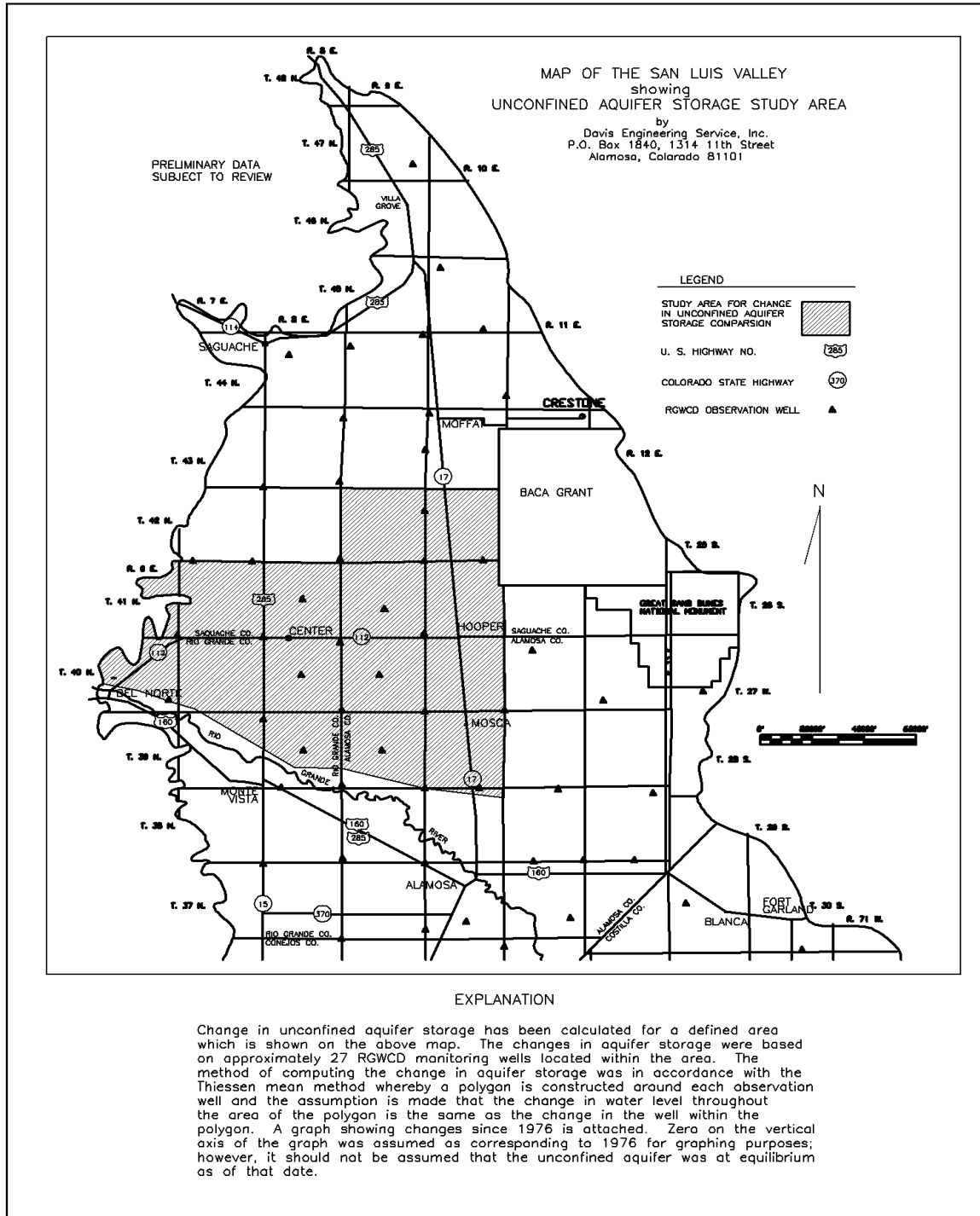
The calculated monthly change in unconfined aquifer storage volumes have been accumulated and plotted on a chart and included in Figures 6.2 and 6.3. The monthly change in storage volumes are plotted on the chart and connected by a line on the chart with the horizontal axis divided into years and the vertical axis divided into change in storage in acre-feet

In addition, as required by the PWM, a line is plotted representing the 5-year running average of the annual average of the monthly change in unconfined storage volume.

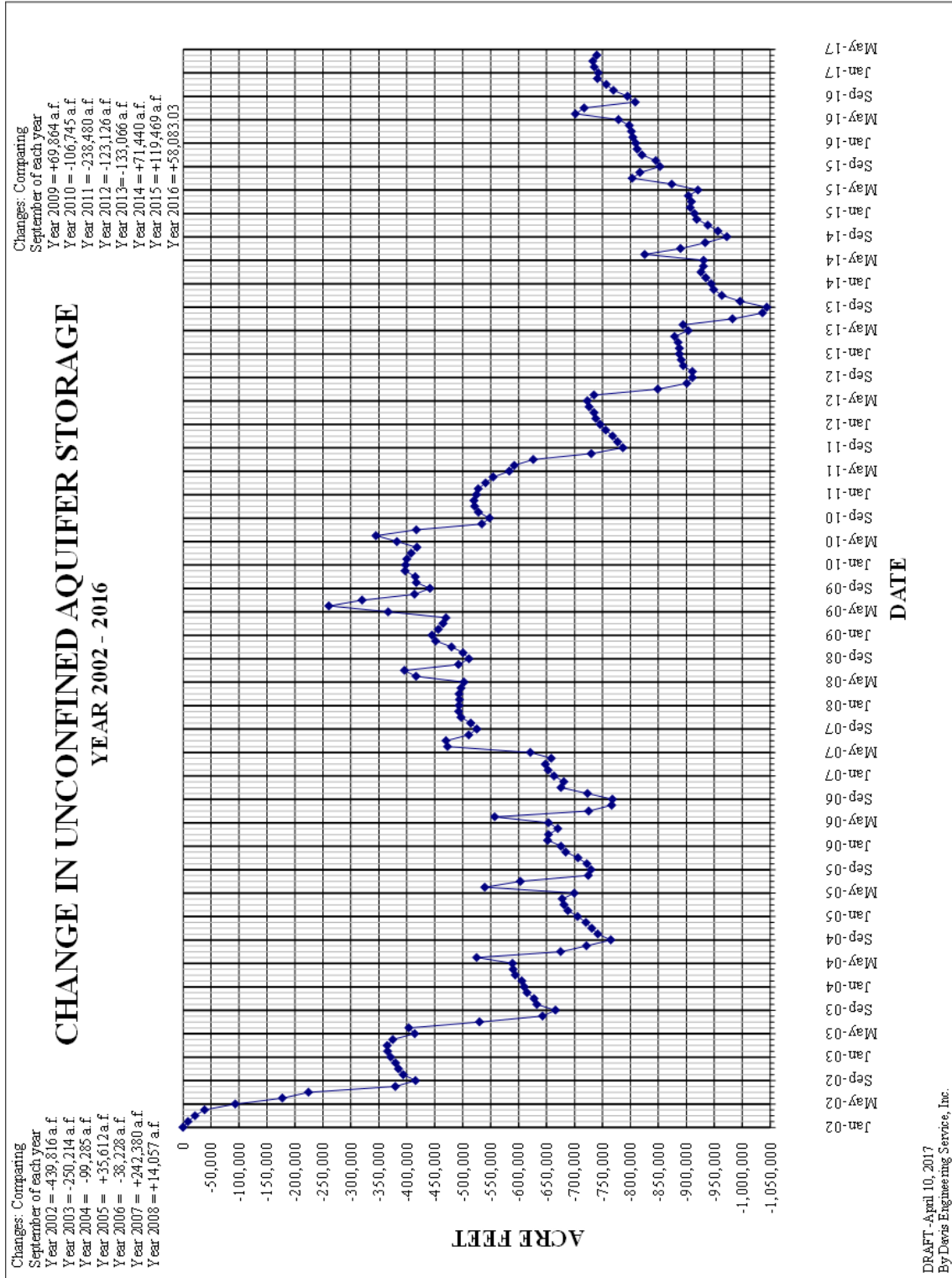
The change in unconfined aquifer storage based on measurements from January 1976 through April 1, 2017 was -1,029,791 acre-feet on an accumulated month basis.

As described in the PWM, the accumulated 5-year running average of the annual average of the monthly change through December 1, 2016 was -1,153,878 acre-feet. As previously noted, the goal in the PWM is to achieve a recovery and maintain storage at a level between -200,000 and -400,000 acre-feet. The December 1, 2016 five year running average storage value is 753,878 acre-feet below the lowest goal level.

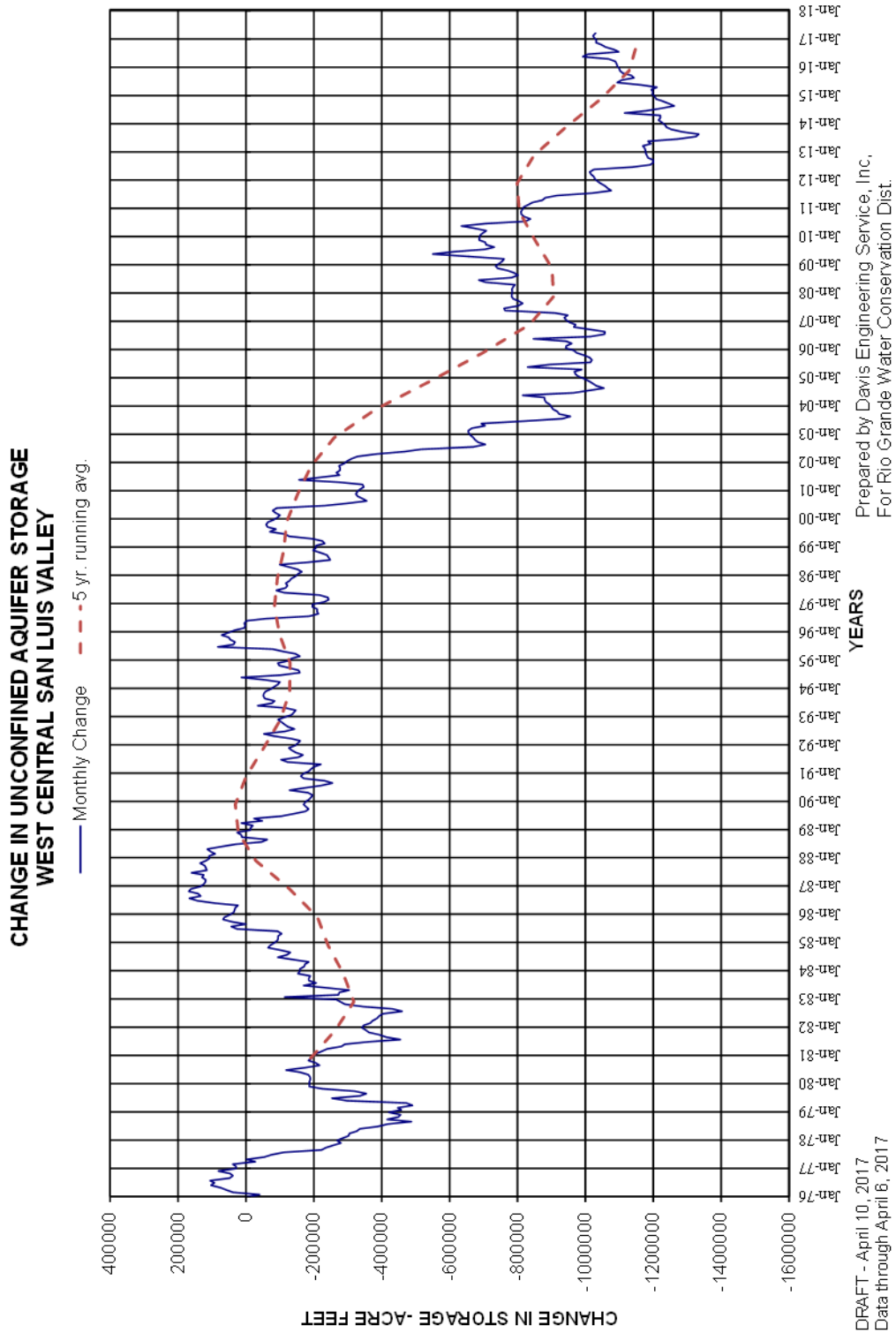
**Figures 6.1**  
**Unconfined Aquifer Storage Study Area Map**



**Figure 6.2**  
**Charts Showing Change in Unconfined Aquifer Storage**



**Figure 6.3**  
**Change in Unconfined Aquifer Storage Chart**





## **7.0 HYDRAULIC DIVIDE STUDY**

The hydraulic divide (divide) is a shallow groundwater divide, that when present, separates the closed basin in the San Luis Valley from the remainder of the Rio Grande Basin. The divide has been historically mapped generally paralleling and lying northerly of the Rio Grande  $\pm\frac{1}{2}$  to  $\pm 2$  miles through the reach from near Del Norte to Alamosa. The divide extends northwest of Del Norte to the Continental Divide and from Alamosa northeast to the basin divide along the Sangre de Cristo Mountains. Recent water level measurements in wells along the north side of the Rio Grande indicate that the divide has retreated south to the Rio Grande or very near the river. A goal of the Plan of Water Management is to recover and re-establish the divide northerly of the river which is likely to reduce depletions to the Rio Grande from well pumping within Subdistrict #1.

Since the spring of 2007, the RGWCD has retained Davis Engineering Service, Inc., with assistance from Agro Engineering, Inc., to collect groundwater level measurements in wells lying northerly of the Rio Grande within the area where the divide has historically been mapped. After the initial measurements performed during the spring of 2007, Davis Engineering Service, Inc. prepared a report entitled “Engineering Report on San Luis Valley Groundwater Level Study” which described both the historical evidence of the divide and the current location and condition of the divide. In summary, during the study in 2007, a well-defined divide along the northerly side of the Rio Grande was not identified.

Appendix K contains maps showing the results of groundwater measurements collected during spring 2016. These maps include interpreted groundwater elevation contours and vectors showing direction of groundwater flow. If a well-defined divide lying northerly of the Rio Grande exists, groundwater flow vectors would indicate a groundwater flow from the divide along the southerly side toward the river and on the northerly side toward the Closed Basin. The groundwater flow vectors do not provide evidence of a well-defined divide with the possible exception of an area between Monte Vista and Alamosa where there is some evidence for a few miles. The interpreted location of the divide is shown on the maps prepared from the 2016 groundwater measurements. The approximate divide location in the area between Del Norte and the 7-Mile Plaza is uncertain due to the perched river condition, so it is shown as a dotted line on the maps included in Appendix K.

## **8.0 FALLOWING OF SUBDISTRICT #1 IRRIGATED LAND-TEMPORARY AND PERMANENT**

### **8.1 2016 CONTRACTED CONSERVATION RESERVE ENHANCEMENT PROGRAM LANDS**

Section III, Part D of the Subdistrict #1’s Plan of Water Management concerns the “Restoration of Groundwater Levels and Groundwater Storage”. The PWM states: “It is anticipated that to achieve sufficient reduction of well withdrawals to accomplish the Unconfined Aquifer storage goal, dry-up of approximately 40,000 acres of land previously irrigated during calendar year 2000 will be required.”

RGWCD Staff are continuing to compile irrigated acreage coverage for the year 2000 by digitizing past RGWCD irrigated cropland census maps for the area within the Subdistrict's boundary. This information will serve as a basis to determine the previously irrigated lands in the year 2000 that have been fallowed as part of the PWM through the Conservation Reserve Enhancement Program (CREP), other conservation programs or Subdistrict #1 programs. The RGWCD has urged voluntary dry-up since the early 2000's. Across the Valley, producers have voluntarily altered farming practices by removing corner systems and end guns from their sprinklers and other actions to reduce acreage and water consumption.

The Subdistrict #1 Board of Managers decided to focus their monetary resources towards Rio Grande CREP signup incentives during the 2016 Plan Year. Temporary fallow programs that were implemented in 2012 and 2013 for Subdistrict #1 were not applied in 2016. Preventive Planting Insurance programs within the Subdistrict did partially retire groundwater use on approximately 7,868 acres in 2016.

Local USDA FSA field offices located in Alamosa, Rio Grande, and Saguache Counties, and Subdistrict #1 staff implemented the Rio Grande CREP signup process beginning in May 2013, under the 2008 Farm Bill. Subdistrict #1's Board of Managers immediately began soliciting interest in this program by offering additional sign-up incentives for CREP contracts executed in the Subdistrict by September 30, 2013. As of September 30, 2013, the Subdistrict had finalized FSA CRP-1 Contracts for 1,103.3 acres in Permanent Water Retirement and 1,049.9 acres in 15-Year Water Retirement for a total of 2,153.2 acres, reducing consumption approximately 4,300 acre-feet. The start date for all of these contracts was October 1, 2013.

On November 1, 2013, Congress did not extend the 2008 Farm Bill and CRP-CREP signup throughout the nation was discontinued. As of the November 1, 2013, FSA Field Offices in the San Luis Valley could no longer authorize CREP CRP-1 contracts until a New Farm Bill was passed. The United States Congress passed the new Farm Bill in early February 2014. In May 2014, State and local FSA Offices resumed sign-up for the Rio Grande CREP under the new Farm Bill.

As of April 11, 2017, Subdistrict #1 has finalized FSA CRP-1 Contracts for 2,763.0 acres in Permanent Water Retirement and 3,572 acres in 15 Year Water Retirement terms for a total of 6,335.0 acres reducing water consumption by approximately 12,670 acre-feet per year. Subdistrict #1 Rio Grande CREP signup is ongoing. The Subdistrict Board of Managers increased additional cash incentives for both permanent and temporary groundwater retirement Contracts offered in 2017. A map and legal descriptions for these CREP parcels is included in Appendix L.

## **8.2 2015 PERMANENT LAND AND WATER PURCHASES**

Subdistrict #1 is still actively pursuing opportunities to acquire water rights. However, there were no land or water right purchases completed by the District on behalf of the Subdistrict in 2016. Based on total head gate diversions for the Rio Grande Canal during the irrigation season netting approximately 22.0 acre-feet/share in 2016, the Subdistrict with their 59.5 shares of surface water diverted approximately 1300.0 acre-feet to recharge of the aquifer on the White,

McConnell, and Lacy properties during the irrigation season. Subdistrict #1 did not use the wells located on these parcels for any purpose in 2016. A map identifying the locations of the permanent land purchases acquired by the Rio Grande Water Conservation District for Subdistrict #1 is included in Appendix M. The District staff will continue experimenting with different aquifer recharge strategies within DWR regulation on these properties to increase surface water recharge efficiencies.

**9.0 ADDITIONAL INFORMATION TO EVALUATE 2017 ARP**

No additional information was requested by the Engineers or deemed reasonably necessary to evaluate the proposed ARP.

**10.0 ANTICIPATED FUNDING FOR 2017 PLAN YEAR**

Subdistrict #1 created a Water Activity Enterprise. The Subdistrict assesses three different fees on those well owners within the boundaries of the Subdistrict that are benefited from the activities of Subdistrict #1. The fees are as follows:

- a. Administrative Fee: This revenue is used to offset the cost of administering the PWM.
- b. CREP Fee: This revenue will provide the required match to the federal funds that are paid by the USDA directly to those groundwater irrigators that have been approved for the CREP program.
- c. Variable Fee: This fee is charged per acre-foot of groundwater pumped in excess of surface water credits in a Farm Unit. This fee is set every year by the Board of Managers in an amount necessary to purchase replacement water to offset injury to those senior water rights in the San Luis Valley affected by the groundwater pumping of Subdistrict #1 Wells and to fund additional programs with the purpose of reducing groundwater consumption within Subdistrict #1.

The fees are set by the Board of Managers and certified to the three counties, Alamosa, Rio Grande and Saguache, which collect these fees on their tax rolls. For the 2016 irrigation season, the Administrative Fee was set at \$2.00 per irrigated acre, the CREP Fee was set at \$2 per irrigated acre and the Variable Fee was set at \$75 per acre-foot of groundwater pumped in excess of available surface water credits. The 2016 assessed fees that will be collected in 2017 are:

Fee Type	Amount of 2016 Assessments
Administrative Fees	<b>\$ 335,777.22</b>
Conservation Reserve Enhancement Program Fees	<b>\$335,777.22</b>
Variable Fees	<b>\$ 4,781,631.71</b>