DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RESOURCES

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APPLICATION FOR APPROVAL OF AN AUGMENTATION PLAN AND RELATED ACCOUNTING PROCEDURES UNDER SUBSECTION III.B.I.K. OF THE FINAL SETTLEMENT STIPULATION IN KANSAS V. NEBRASKA AND COLORADO, NO. 126, ORIGINAL

The Republican River Compact Compliance Pipeline

Submitted by

The State of Colorado
And
The Republican River Water Conservation District, acting by and through its Water Activity Enterprise

March 2008

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1.0 INTRODUCTION

1.1. The Republican River Compact Compliance Pipeline

Subsection III.B.1.k of the Final Settlement Stipulation in *Kansas v. Nebraska and Colorado*, No. 126, Original (U.S. Sup. Court) allows the acquisition or construction of wells for the purpose of offsetting stream depletions in order to comply with a State's Compact Allocations. Subsection III.B.1.k states that these wells "shall not cause any new net depletion to stream flow either annually or long-term." It further states: "The determination of net depletions from these Wells will be computed by the RRCA Groundwater Model and included in the State's Computed Beneficial Consumptive Use. Augmentation plans and related accounting procedures submitted under this Subsection III.B.1.k shall be approved by the RRCA [Republican River Compact Administration] prior to implementation."

The Republican River Water Conservation District (RRWCD) was formed in 2004 to assist the State of Colorado to comply with the Compact, and the RRWCD, acting through its Water Activity Enterprise (WAE), has entered into contracts to purchase rights to ground water located north of the North Fork of the Republican River in the Republican River Basin in Colorado. These rights have an historical consumptive use of approximately 15,000 acre-feet per year. The RRWCD WAE is currently in the process of completing the engineering design of a 12.7 mile Compact Compliance Pipeline to deliver this water to the North Fork of the Republican River to offset stream depletions in order to comply with Colorado's Compact Allocations. The general location of the compact compliance pipeline is shown in Figure 1. The design is scheduled for completion in August of this year. Selection of the construction contractor is anticipated to be finalized by the first of October and construction on the pipeline and related facilities will commence in November. Construction of the pipeline is scheduled for completion of June of 2009 and approximately 11,000 ac-ft will be delivered between June and December to allow Colorado to meet its compact obligation in 2009.

The RRWCD WAE has applied for, and received preliminary approval, a $60.6 million loan from the Colorado Water Conservation Board Water Project Construction Fund to purchase these rights to and to construct the Compact Compliance Pipeline to offset stream depletions in order to comply within Colorado's Compact Allocations.

The State of Colorado on behalf of the RRWCD WAE requests that the RRCA approve an augmentation plan and related accounting procedures described in this

application under Subsection III.B.1.k of the Final Settlement Stipulation for the Republican River Compact Compliance Pipeline.

1.2. Project Sponsor – The Republican River Water Conservation District, acting by and through its Water Activity Enterprise

The RRWCD is managed and controlled by a 15-member board of directors comprised of one member appointed by the county commissioners of each of the seven counties wholly or partially within the RRWCD, one member appointed by the boards of the seven ground water management districts within the RRWCD, and one member appointed by the Colorado Ground Water Commission. The RRWCD Board of Directors established the RRWCD Water Activity Enterprise (WAE) in October 2004.

The RRWCD Board of Directors imposed a use fee on the diversion of water within the District of $5.50 per assessed irrigated acre on diversions of ground water for irrigation use by post-compact wells within the District. The RRWCD Board recently increased the use fee to $14.50 per assessed irrigated acre to pay for the Republican River Compact Compliance Pipeline. There are approximately 500,500 assessed irrigated acres in the basin irrigated by post-compact wells and the RRWCD fee will generate approximately $7.3 million per year for operating expenses and to pay back the loans used to acquire the water rights and construct the compact compliance pipeline.

The RRWCD WAE uses a portion of the revenues collected from use fees to provide local cost-sharing for federal programs designed to retire irrigated acreage in the basin, including the Republican River Conservation Reserve Enhancement Program (CREP) and the Environmental Quality Improvement Program (EQIP). To date, approximately 30,000 irrigated acres have been voluntarily retired in the basin under CREP and EQIP, or approximately five percent (5%) of the irrigated acreage in the basin. An amendment to the Republican River CREP designed to retire an additional 30,000 irrigated acres has been submitted to the U.S. Department of Agriculture for approval. The RRWCD WAE has committed to provide local cost-sharing for a second Republican River CREP amendment that is proposed to retire an additional 30,000 acres. The CREP program is an important part of the RRWCD efforts to implement conservation measures in the basin to reduce groundwater pumping in Colorado to assist in meeting compact compliance obligations.

The RRWCD is located in northeastern Colorado and includes all of Yuma and Phillips Counties and those portions of Kit Carson, Lincoln, Logan, Sedgwick, and Washington Counties that overlie the Ogallala Aquifer. The RRWCD encompasses about 7,761 square miles or about 7.5% of Colorado's 104,247 square miles. There is currently about 545,000 irrigated acres within the Ogallala Aquifer in Colorado with 500,500 irrigated acres located within the RRWCD boundaries. With the exception of approximately 3,000 acres irrigated by surface water, virtually all the acreage in the basin is irrigated with ground water from the Ogallala Aquifer. A map of the RRWCD boundaries is shown in Figure 2.

2.0 AUGMENTATION PLAN AND RELATED ACCOUNTING PROCEDURES

The State of Colorado has exceeded its compact allocation by approximately 11,000 ac-ft/yr for period of 2003-2007. In order to comply with the State of Colorado's Compact Allocations, the RRWCD WAE has entered into contracts to acquire ground water rights that were historically used for irrigation in the Republican River Basin. The location of the lands that were historically irrigated with the water rights acquired by the RRWCD WAE is shown in Figures 3 and 4.

The RRWCD WAE will change the use of these existing rights and consolidate these rights at fifteen existing Republican River Compact Compliance Wells (Compact Compliance Wells) that will be used for the sole purpose of offsetting stream depletions in order to comply with the State of Colorado's Compact Allocations. Initially only eight of the wells will be active with an additional seven existing wells that will serve as backup if additional well capacity in needed in the future. The locations of the 15 wells are shown in Figure 4 (wells A1 through A8 are the initial wells, and the wells numbered B1 through B7 are the backup wells).

The compact compliance wells are located in the area of the Ogallala Aquifer in Colorado that has the greatest saturated thickness. The wells typically have 250 to 300 feet of saturated thickness. The well field is also located in the sand hills region of Colorado that has the highest recharge rates of any location in the Republican River Basin.

The Computed Beneficial Consumptive Use of the compact compliance wells, specifically the ground water impacts of these wells upon the stream system, will be

determined by use of the RRCA Groundwater Model as the difference in streamflows using two runs of the model that is consistent with Section III.D.1 of the Republican River Compact Administration Accounting Procedures and Reporting Requirements.

The historical consumptive use of the rights that will be diverted at the Compact Compliance Wells was determined based on irrigation system and pump efficiency tests, power records, and crop records for ten year period from 1998 to 2007 as summarized in Table 1. The procedures for changing the use of existing rights to designated ground water based on historical consumptive use are established in the current Colorado Ground Water Commission rules. The Compact Compliance Wells will cause no new net depletions because pumping will be limited to the historical consumptive use of the existing rights.

The pumping under this plan for augmentation will be limited to the historical consumptive use of existing groundwater rights as determined by the Colorado Ground Water Commission pursuant to its rules and regulations, which permit banking of ground water once a change has been based on historical consumptive use. Pumping from the Compact Compliance Wells will be metered and included in the RRCA Groundwater Motel. The groundwater pumped by the Compact Compliance Wells will be delivered by a pipeline to the North Fork of the Republican River a short distance upstream from the streamflow gage at the Colorado-Nebraska state line (USGS gaging station number 06823000, North Fork Republican River at the Colorado-Nebraska State Line). The augmentation discharge will be measured and subtracted from the gaged flow of the North Fork of the Republican River to calculate the Annual Virgin Water Supply. The augmentation discharge to the North Fork of the Republican River from the Compact Consumptive Pipeline will be the Augmentation Credit for the purpose of offsetting stream depletions to comply with the State of Colorado's Compact Allocations and shall be counted as a credit/offset against the Computed Beneficial Consumptive use of water allocated to Colorado

3.0 ENGINEERING ANALYSIS FOR THE COMPACT COMPLIANCE PIPELINE

Approximately 11,000 acre-feet of water per year needs to be supplied by the compact compliance pipeline to meet Colorado's Compact obligation. The initial capacity of the main trunk of the pipeline will be 15,000 acre-feet per year using a nine-month delivery season. The pipeline is being designed so that it will be capable of

delivering up to 25,000 ac-ft/yr by adding a pumping facility to deliver the water under a higher pressure.

3.1. Water Quality

All of the streamflow in the North Fork of the Republican River, with the exception of the occasional rainstorm event, is derived from groundwater inflow from the Ogallala Aquifer. The compact compliance pipeline will deliver groundwater from the Ogallala aquifer to the North Fork of the Republican River at the state line. Table 2 presents the ground water quality of the Ogallala aquifer relative to the water quality standards for the North Fork of the Republican River, as published by the Colorado Water Quality Control Commission. The water quality of the Ogallala Aquifer meets or exceeds drinking water standards. This is to be expected because the groundwater management districts in Colorado carefully monitor the water quality in the Ogallala Aquifer since the groundwater supplies agriculture uses along with domestic, municipal, and industrial uses. Thus, the water quality of ground water for the Republican River Compact Compliance Pipeline is appropriate for delivery to the North Fork of the Republican River to offset stream depletions.

3.2. Pipeline Design

The RRWCD WAE contracted with GEI Consultants to perform a preliminary feasibility study for the design of a compact compliance pipeline. The $50,000 study was completed in January of 2008. Based on the recommendations in this report, the RRWCD WAE has contracted with GEI Consultants to proceed with the final design of the compact compliance pipeline. The final design of the compact compliance pipeline is scheduled to be completion in August of 2008 and is budgeted to cost approximately $1 million dollars.

The preliminary design of the Republican River Compact Compliance Pipeline has been completed and is summarized in the following paragraphs. This summary is based on the preliminary design and the design refinements made in the last two months. The final design is currently under way and the general description included in this report will probably somewhat in the next few months as the design is finalized.

The well field to pump the water will consist of 8 wells numbered A1 through A8 as shown in Figure 4. The design of the pipeline will also allow for an additional 7 wells

numbered B1 through B7 in Figure 4. These 7 additional wells will not initially be connected to the pipeline, but are available for future use if needed.

Water pumped from the individual wells will be collected in a series of pipes that will vary in size from 12” to 18” and the water will then be conveyed to a 1 million gallon re-regulating storage tank. The storage tank will provide reserve capacity allowing the main pipeline to operate for 2 hours at two-thirds capacity with no inflow to the tank from the well field. The storage tank will also provide protection of the main pipeline from surge and negative pressures that could develop if the main pipeline were connected directly to the well field collection system.

From the storage tank the water will flow by gravity through the main water 36-inch diameter conveyance pipeline approximately 12.7 miles to the North Fork of the Republican River following the general alignment shown on Figure 3. Releases from the tank will be regulated by a valve located near the tank, and an ultra-sonic flow meter will be provided approximately 30 feet downstream of the release valve. The main conveyance pipeline will be designed so that a pump could be added at the outlet of the storage tank to increase the capacity of the pipeline to approximately 25,000 ac-ft/yr in the future.

At this time, the most likely type of pipe material is PVC. The pipeline will be buried with minimum cover of three feet above the crown of the pipe. To assure integrity, the pipe will be properly bedded prior to filling the trench with well-compacted backfill. Access manholes, air release valves, and drain valves will be provided at appropriate locations along the pipeline, as determined during the final design and confirmed during construction.

Table 3 contains summaries of the preliminary cost estimates developed by GEI during the preliminary feasibility study for the Compact Compliance Pipeline project. The final cost estimates will be dependent upon the final design and the bids received by the contractors. The key milestone dates discussed in previous sections of this report are summarized Table 4. Achieving this schedule will enable full delivery of water to begin in the latter part of June 2009. The project should be able to deliver close to 11,000 acre-feet of water in by year-end 2009.

4.0 REQUEST FOR APPROVAL

The State of Colorado on behalf of the RRWCD WAE requests that RRCA approve an augmentation plan and related accounting procedures described above under Subsection III.B.1.k of the Final Settlement Stipulation for the Republican River Compact Compliance Pipeline.

Table 1

Rights to Designated Groundwater Purchased by the RRWCD WAE

Field Number (1)	Permit #1 (2)	Permit #2 (3)	Acreage in Change of Use Form (4)	Historical Consumptive Use (ac-ft/yr) (5)	
1-1	12967-FP	16920-FP	194	345	
1-2	14403-FP		181	306	*
1-3	14019-FP		133	217	
1-4	14018-FP		164	252	
1-5	19372-FP		136	218	
1-6 and 1-7	18780-FP		127	192	
Subtotal			**935**	**1,529**	
2-1	14396-FP		130	192	
2-2	13858-FP		133	228	
2-3	13859-FP	16069-FP	188	270	
2-4	13857-FP		147	229	
2-5	14398-FP		144	240	
2-6	13856-FP	16067-FP	164	249	
Subtotal			**906**	**1,408**	
3-1	14397-FP		127	192	
3-2	14027-FP		153	251	
3-3	14022-FP		180	289	
3-4	14023-FP		133	219	
3-5	14600-FP		124	197	
3-6	15285-FP		98	161	
3-7	20896-FP		107	169	
Subtotal			**922**	**1,479**	
4-1	13513-FP	16074-FP	186	302	
4-2	14028-FP		146	218	
4-3	14753-FP		185	310	
4-4	13522-FP		135	204	
4-5	14024-FP		93	141	
4-6	13509-FP	16075-FP	179	284	
4-7	13511-FP		123	192	
4-8	18781-FP		128	216	
4-9	21476-FP		88	144	
5-1	18783-FP		173	273	
Subtotal			**1,437**	**2,285**	

Table 1

Rights to Designated Groundwater Purchased by the RRWCD WAE

(continued)

Field Number (1)	Permit #1 (2)	Permit #2 (3)	Acreage in Change of Use Form (4)	Historical Consumptive Use (ac-ft/yr) (5)	
6-0	19004-FP		82	129	*
6-1	19005-FP		124	178	
6-2	18966-FP		94	172	
6-3	18018-FP		148	230	
6-4,6-5	18017-FP	19001-FP	245	361	
6-6, 6-7	23222-FP		148	171	*
6-8	18019-FP		107	173	
6-9, 6-10	18014-FP		176	259	
6-11,12,13,14	18013-FP		250	350	
6-15, 6-16	18011-FP		244	431	
6-17, 6-18, 6-19	18015-FP		329	549	
6-20, 6-21	18012-FP	19000-FP	208	322	
Subtotal			**2,155**	**3,326**	
7-1	13813-FP	16923-FP	126	206	
7-2, 7-2A	13814-FP		219	334	
7-3, 7-3a	13815-FP		197	291	
7-13, 7-14	14718-FP		358	526	
7-15, 7-16	14121-FP		285	437	
7-17, 7-18	14719-FP		263	455	
7-19 [a)]	14122-FP		131	215	
7-21, 7-21A	12589-FP		251	376	
7-23	12567-FP		126	201	
Harsh	20299-FP		167	234	*
Wiley	4319-FP		62	75	*
Wilder1	20198-FP		124	170	*
Wilder2	20196-FP		165	230	*
Subtotal			**2,476**	**3,750**	
4 Additional Pivots the RRWCD is in the process of acquiring			**667**	**993**	*
Total			**9,497**	**14,770**	

* indicates value estimated for the purpose of this study

Explanation of Columns

(1) Field Number as shown on Figure 4

(2) Final permit for the Northern High Plains Designated Ground Water Basin. See permit for well location, priority

(3) Second permit associated with the permit shown in column 2. Typically, these are permits for additional acreage, but see permit for details.

(4) Average acreage reported in change of use form.

(5) Historical consumptive use determined from irrigated acreage, crop records and power records.

Table 2

Comparison of stream water quality in the North Fork to the ground water quality in the Ogallala Formation.

Surface Water Classification and Associated In-Stream or Drinking Water Standards [1]	
Classifications:	
Aquatic Life -- Cold Water 1	N/A
Recreation -- 1a	N/A
Water Supply – Agriculture	N/A
Physical and Biological Standards:	
Dissolved Oxygen = 6.0 mg/l	0.2 to 8.6 mg/l; 50% > 5.4 mg/l
pH = 6.5-9.0	7.0 – 7.9
Fecal coliforms = 200/100 ml	
E Coli = 126/100 ml	
Inorganic Standards:	
Ammonia (acute) = Table Value Standard (TVS)	
Ammonia (chronic) = 0.02 mg/l	0.01 to 0.244 mg/l; 50% < 0.015 mg/l
Chlorine (acute) = 0.019 mg/l	
Chlorine (chronic) = 0.011 mg/l	
Cyanide = 0.005 mg/l	
Sulfide = 0.002 mg/l	
Boron = 0.75 mg/l	Dissolved boron: 20 – 130 µg/l
Nitrate NO_2 = 0.05 mg/l	< 0.01 mg/l
Nitrate NO_3 =10 mg/l	1.1 to 8.9 mg/l
Chloride = 250 mg/l	1.4 to 29.5 mg/l
Sulfate = 250 mg/l	5.5 to 95.7 mg/l
Total Dissolved Solids = 500 mg/l	219 to 461 mg/l
Metal Standards:	
Arsenic (acute) = 50 µg/l (total recoverable)	Dissolved arsenic: <5-12 µg/l
Cadmium (acute) = TVS (trout)	
Cadmium (chronic) = TVS	
Trivalent Chromium (acute) = 50 µg/l (total)	
Hexavalent Chromium (acute/chronic) = TVS	
Copper (acute/chronic) = 1.3 mg/l	Dissolved copper: <5-35 µg/l
Iron (chronic) = 300 µg/l	Dissolved iron: <3-60 µg/l
Iron (chronic) =1000 µg/l (total recoverable)	
Lead (acute/chronic) = TVS (dissolved 15µg/l)	Dissolved lead <5 µg/l
Manganese (acute/chronic) = TVS (dissolved 50µg/l)	Dissolved manganese <3-40 µg/l
Manganese (chronic) = WS (dissolved)	
Mercury (chronic) = 0.01 µg/l (total)	
Nickel (acute/chronic) = TVS	
Selenium(acute/chronic) = TVS (dissolved 50 µg/l)	Dissolved selenium: <5 µg/l
Silver (acute) = TVS	
Zinc (acute/chronic) = TVS	Dissolved Zinc < 5-124 µg/l

Notes:

1. Stream classifications and water quality standards obtained from a report by David Litke, U.S. Geological Survey, and Historical Water-Quality Data for the High Plains Regional Ground-Water Study Area (1930 – 1998) or from CDPHE/WQCC – Colorado Primary Drinking Water Standards.
2. Blanks indicate data that were not reported in the reference.
3. Reported ground water quality data is from Litke, USGS (see Note 1).

Table 3

Cost Estimates for the Compact Compliance Pipeline Project

Alternative 1
REPUBLICAN RIVER COMPACT COMPLIANCE PIPELINE
OPINION OF PROBABLE PROJECT COST

(Excluding Acquisition of Water Rights)

Delivery Rate = 15,000 AF/yr; 9-month Delivery Period

Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Rights-of-way and easements	180	Ac	$500	$90,000
2	Wells, pumps and motors	6	Ea	$150,000	$900,000
3	1 MG storage tank	1	Ea	$500,000	$500,000
4	Furnish and Install 36-in pipe (1)	67,060	Ft	$160	$10,730,000
5	Furnish and Install 24-in pipe (1)	5,280	Ft	$82	$433,000
6	Furnish and Install 18-in pipe (1)	7,920	Ft	$62	$491,000
7	Valves and appurtenances	1	LS	$608,000	$608,000
8	Road and utility crossings	4	Ea	$15,000	$60,000
9	Drainage crossings	4	Ea	$25,000	$100,000
10	Reclamation of disturbed areas	180	Ac	$1,000	$180,000
11	Outfall structure	1	LS	$150,000	$150,000
12	New access roads	15	Mi	$25,000	$380,000
13	Control building and yard	1	LS	$200,000	$200,000
14	Land for control building and yard	5	Ac	$8,000	$40,000
15	Montoring and SCADA system	1	LS	$100,000	$100,000
---	Unlisted Items (10% of subtotal of listed items)				$1,496,000
Base Construction Subtotal (BCS)					**$16,458,000**
	Mobilization, Bonds, Insurance (4.0% of BCS)				$660,000
	Contingencies (10% of BCS + Mobilization ...)				$1,710,000
Direct Construction Subtotal (DCS)					**$18,828,000**
	Design Engineering (5% of DCS)				$940,000
	Permitting (2% of DCS)				$190,000
	Legal and Administrative Costs (2% 0f DCS)				$380,000
	Construction Administration and Engineering (5% of DCS)				$940,000
TOTAL ESTIMATED PROJECT COST					**$21,278,000**

(1) Includes trench excavation, pipe installation, bedding, and backfill

Table 4

Compact Compliance Pipeline Key Milestone Dates

Milestone	Date
Begin Final Design	January 1, 2008
Complete 50% Design	May 1, 2008
Complete 90% Design	July 15, 2008
Finalize Contract Documents	August 15, 2008
Issue Bid Documents	August 15, 2008
Receive Bids	October 15, 2008
Award Construction Contract	October 20, 2008
Begin Pipeline Construction	November 15, 2008
Complete Construction	June 15, 2008
Begin Full Water Delivery	July 1, 2008

Kimball County
Cheyenne County
Deuel County
Keith County
Perkins County
Lincoln County
Sedgwick County
Weld County
Logan County
Phillips County
Chase County
Hayes County
Morgan County
Washington County
Yuma County
Dundy County
Hitchcock County
Cheyenne County
Rawlins County
Kit Carson County
Sherman County
Thomas County
Lincoln County
Cheyenne County
Wallace County
Logan County
Greeley County
Wichita County

I80
I76
I70
US HWY 385
US HWY 138
US HWY 6
US HWY 34
US HWY 36
US HWY 40
STATE HWY 14
STATE HWY 61
STATE HWY 59
STATE HWY 63

Red Willow Creek
North Fork Frenchman Creek
Frenchman Creek
Rock Creek
Republican River
North Fork Republican River
South Fork Republican River
North Fork Driftwood Creek
Beaver Creek
North Fork Sappa Creek
South Fork Sappa Creek
Middle Beaver Creek
Arikaree River
Buffalo Creek
Sand Creek

NORTH FORK REPUBLICAN RIVER AT COLORADO-NEBRASKA
ARIKAREE RIVER AT HAIGLER, NEBR.
SOUTH FORK REPUBLICAN RIVER NEAR BENKELMAN, NEBR
SF REPUBLICAN R NR CO-KS ST LINE, KS

FIGURE 1
GENERAL LOCATION MAP

Prepared by
HELTON & WILLIAMSEN, P.C.

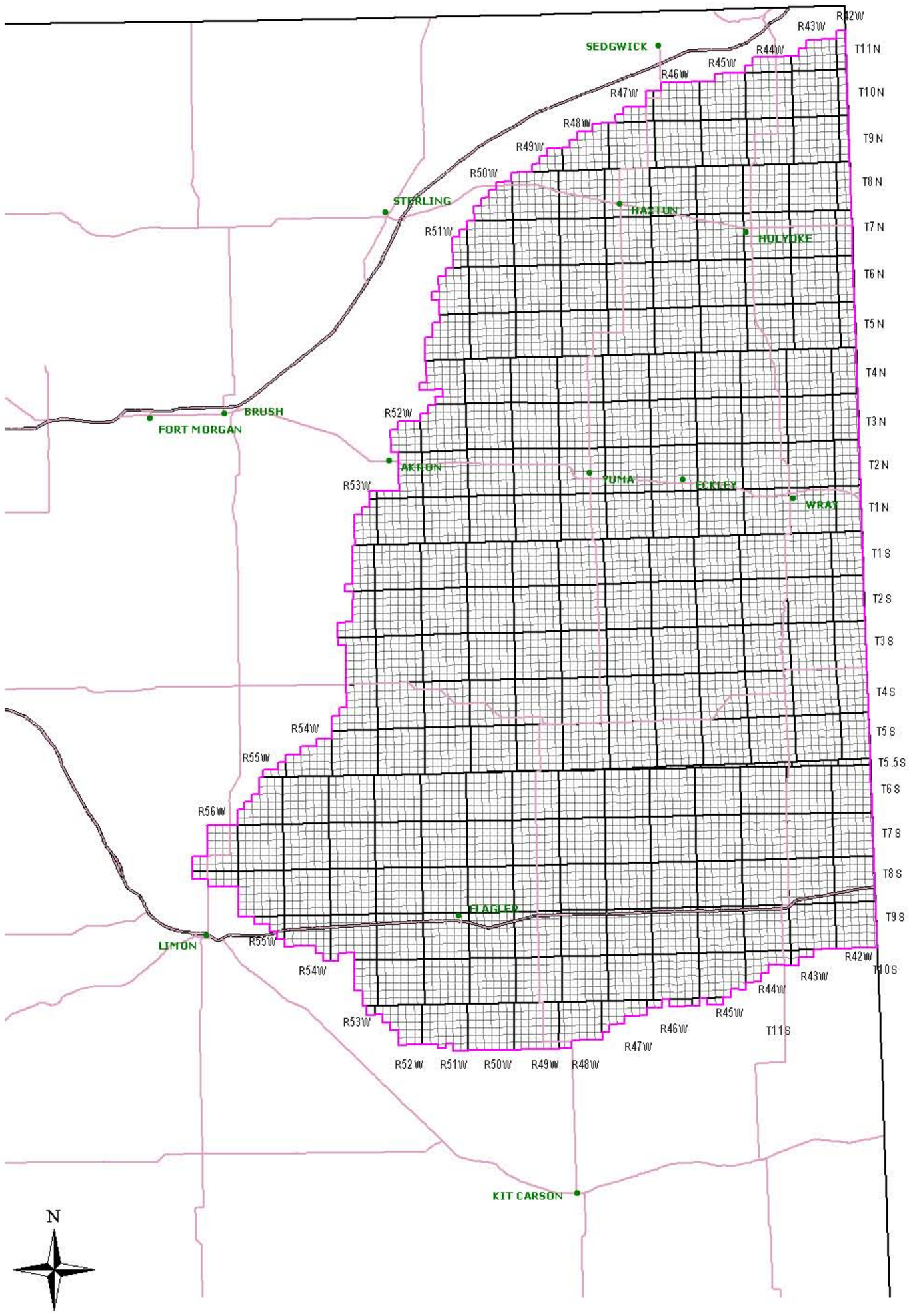
0 2.5 5 10 15 20 Miles

Legend

- States
- Counties
- Ogallala Aquifer
- Drainage Basins
- Reservoirs
- Streams
- USGS Stream Gages
- Compact Compliance Pipeline

d:\projects\ken\conservancy\redo2\map.apr Layout: c_port LAT 4/13/04

Republican River Water Conservation District



DIVISION OF WATER RESOURCES
STATE OF COLORADO

Office of the State Engineer
Division of Water Resources
Department of Natural Resources

Republican River Water Conservation District
Township
Section

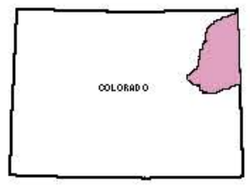


FIGURE 2

REPUBLICAN RIVER WATER CONSERVATION DISTRICT BOUNDARIES

R 44 W

R 43 W

R 42 W

T 4 N

T 3 N

T 2 N

FIGURE 3

IRRIGATED LANDS

Prepared by
HELTON & WILLIAMSEN, P.C.

Data Sources:
County Digital Raster Graphics from USDA;
Irrigated acreage from Helton & Williamsen

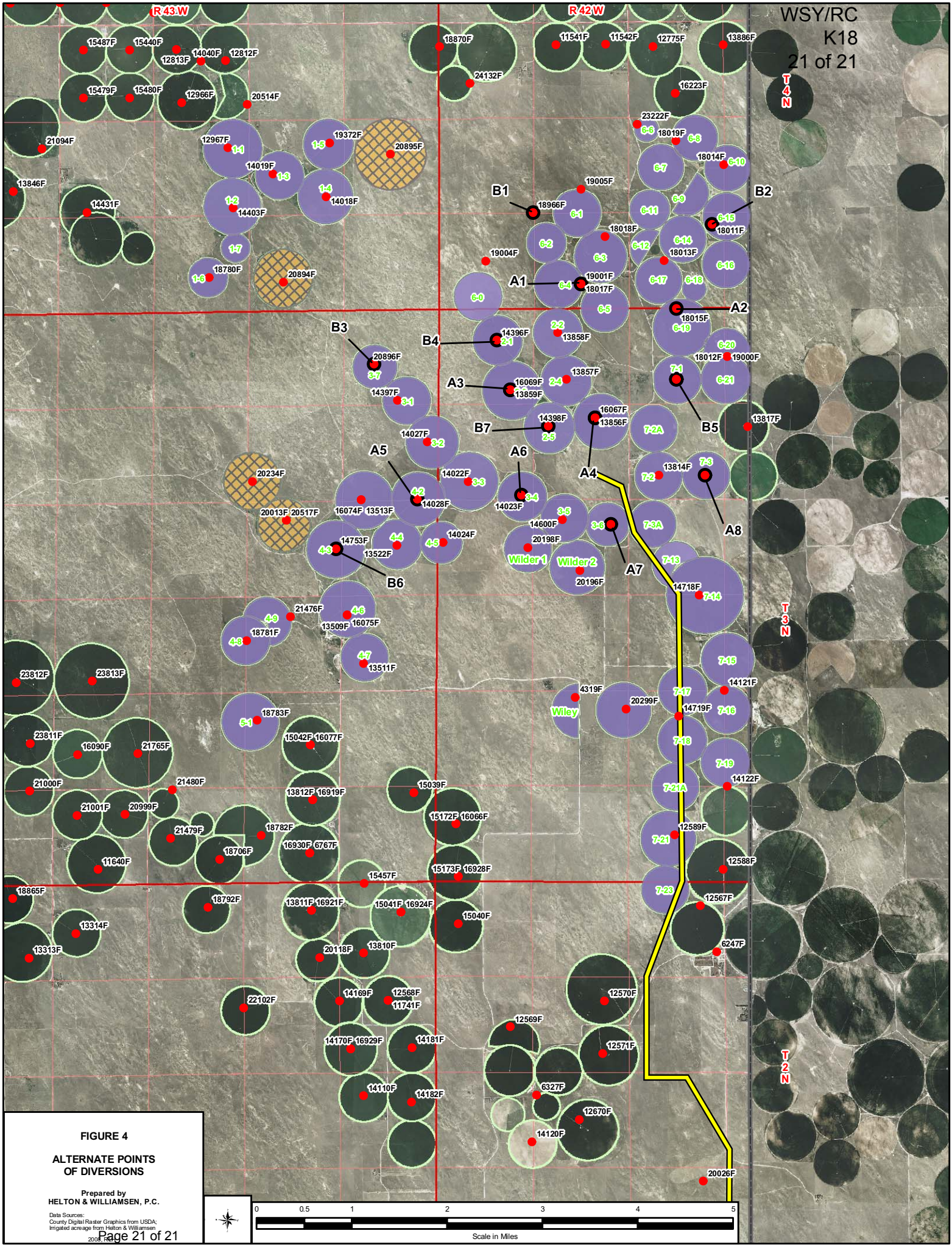
2008, RLH

0 0.5 1 2 3 4 5

Scale in Miles

Legend

- Compact Compliance Pipeline
- Dry-Up
- Future Dry-Up


R 43 W
R 42 W
T 4 N
T 3 N
T 2 N
WSY/RC
K18
21 of 21
B1
B2
B3
B4
B5
B6
B7
A1
A2
A3
A4
A5
A6
A7
A8
Wilder 1
Wilder 2
Wiley
15487F
15440F
12813F
14040F
12812F
15479F
15480F
12966F
20514F
21094F
12967F
1-1
19372F
1-5
20895F
14019F
1-3
13846F
1-4
14018F
1-2
14403F
14431F
1-7
1-6
18780F
20894F
18870F
24132F
11541F
11542F
12775F
13886F
16223F
23222F
6-6
18019F
6-8
6-7
18014F
6-10
19005F
18966F
6-1
6-9
6-11
6-15
18011F
18018F
6-2
6-12
6-14
18013F
6-3
19004F
6-16
6-17
6-18
19001F
6-4
18017F
6-0
6-5
18015F
6-19
14396F
2-1
13858F
2-2
6-20
18012F
19000F
20896F
3-7
13857F
2-4
7-1
6-21
16069F
13859F
14397F
3-1
16067F
14398F
13856F
2-5
7-2A
13817F
14027F
3-2
7-2
13814F
7-3
20234F
14022F
3-3
14028F
4-2
16074F
13513F
14023F
3-4
20013F
20517F
3-5
14600F
3-6
7-3A
A8
14753F
4-3
4-4
4-5
14024F
13522F
20198F
20196F
7-13
14718F
7-14
21476F
4-6
4-9
16075F
13509F
18781F
4-8
4-7
13511F
7-15
23812F
23813F
4319F
20299F
7-17
14121F
18783F
5-1
14719F
7-16
23811F
16090F
21765F
15042F
16077F
7-18
7-19
21000F
21480F
13812F
16919F
15039F
14122F
7-21A
21001F
20999F
15172F
16066F
21479F
18782F
12589F
7-21
18706F
16930F
6767F
11640F
15173F
16928F
12588F
15457F
18865F
7-23
18792F
13811F
16921F
15041F
16924F
12567F
15040F
13314F
13313F
6247F
20118F
13810F
12570F
22102F
14169F
12568F
11741F
12569F
14170F
16929F
14181F
12571F
14110F
14182F
6327F
12670F
14120F
20026F
FIGURE 4
ALTERNATE POINTS
OF DIVERSIONS
Prepared by
HELTON & WILLIAMSEN, P.C.
Data Sources:
County Digital Raster Graphics from USDA;
Irrigated acreage from Helton & Williamsen
2008 Field
0
0.5
1
2
3
4
5
Scale in Miles