DNR Form APA-001
August 2008

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
APPLICATION FOR A PERMIT TO APPROPRIATE WATER

Complete items 1 through 10 by printing in ink or typing the appropriate information and by placing an X in the appropriate box.

For Department Use Only

1. Name and address of owner of land under proposed project. Names must be exactly as described on the deed or document transferring ownership of property. Landowner must sign the application.

Gering Irrigation District
981 Rundell Rd
Gering NE 69341

E-mail address: gidmud@allophone.com Telephone No. (308) 436-5125

Filed in the office of the Department of Natural Resources at 8:53 a.m./p.m.
on April 10, 2017
Application No. A-19508
Map No.
Water Division 1-A
Receipt No. A-4922 Amount $10.00
Right ID 13204

2. Name, address, and telephone number of applicant if different than landowner.

E-mail address: Telephone No. ( )

3a. A permit is sought to:
☑ Use natural flow ☐ Use impounded water*

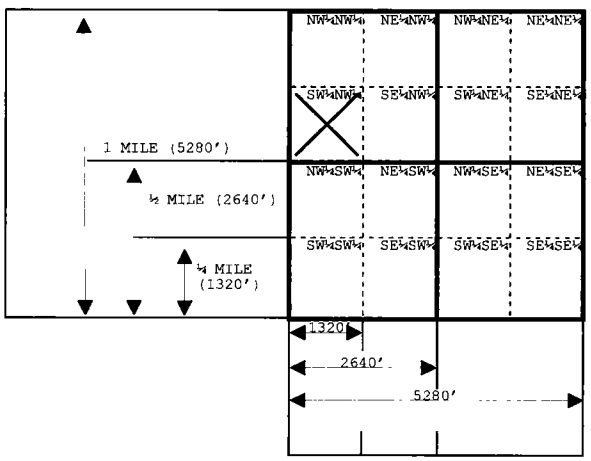
3b. A permit is sought for the purpose of:
☐ Irrigation ☐ Manufacturing ☐ Domestic
☐ Other
☑ Temporary** Baseflow enhancement through GW recharge

4a. Identify the source of water (name of stream or reservoir).
Mitchell Canal North Platte River

4b. If applicable, identify the facility name for transporting water from the source (portable pump, name of canal or pipeline).
Gering Canal

5. Identify the location of the ☑ Headgate ☐ Pump
Section ~~28~~ 10, Township ~~22~~ 23 North, Range ~~55~~ 60 E ☐ W ☑ County ~~Scotts Bluff~~ Goshen County WY

JM 4/19/2017



The box at left represents one square mile (section). Place an X within each appropriate 40-acre tract to indicate the location(s) of each headgate or pump.

If applicable, indicate the height, in feet, of any diversion or check dams on the line below.

no gate, measuring device at entrance monitored by the state

* A separate permit to impound water must be obtained.
** A temporary permit maybe granted for a maximum of one year.

SW-04102017-13204-app.(3)

6. If applicable, identify the location of lands by 40-acre subdivisions that will be irrigated.

LEGAL SUBDIVISIONS	Sec.	Twp.	Rge.	No. of Acres	LEGAL SUBDIVISIONS	Sec.	Twp.	Rge.	No. of Acres
					TOTAL NUMBER OF ACRES TO BE IRRIGATED:			0.0	

☐ Enclosed is an aerial photograph that I have marked to show the approximate location of land to be irrigated as described above.

7. State the approximate quantity of water desired for appropriation. 75

☐ Gallons per minute
☑ Cubic feet per second
☐ Acre-feet (impounded water)

8a. State the estimated time required for completion of all water diversion facilities.

Completed

8b. State the earliest date when water will have been used for beneficial purposes.

April 1, 2017, or as soon as water is available

9. Will this project be constructed under a federal program, receive federal funding, or have federal planning assistance?

☑ No ☐ Yes If yes, explain: _____

10. I certify that am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete and accurate.

4-4-17
Date

Melvin Knauf
Signature of owner or owner's authorized agent (with proper documentation)

A final project map may accompany this application or must be filed within six months following departmental approval of this application, drawn in accordance with NAC Title 457 – Rules for Surface Water, Chapter 10, (http://dnr.nebraska.gov/swr/surface-water-rules). At the request of the applicant, the Department will assist with preparation of the project map.

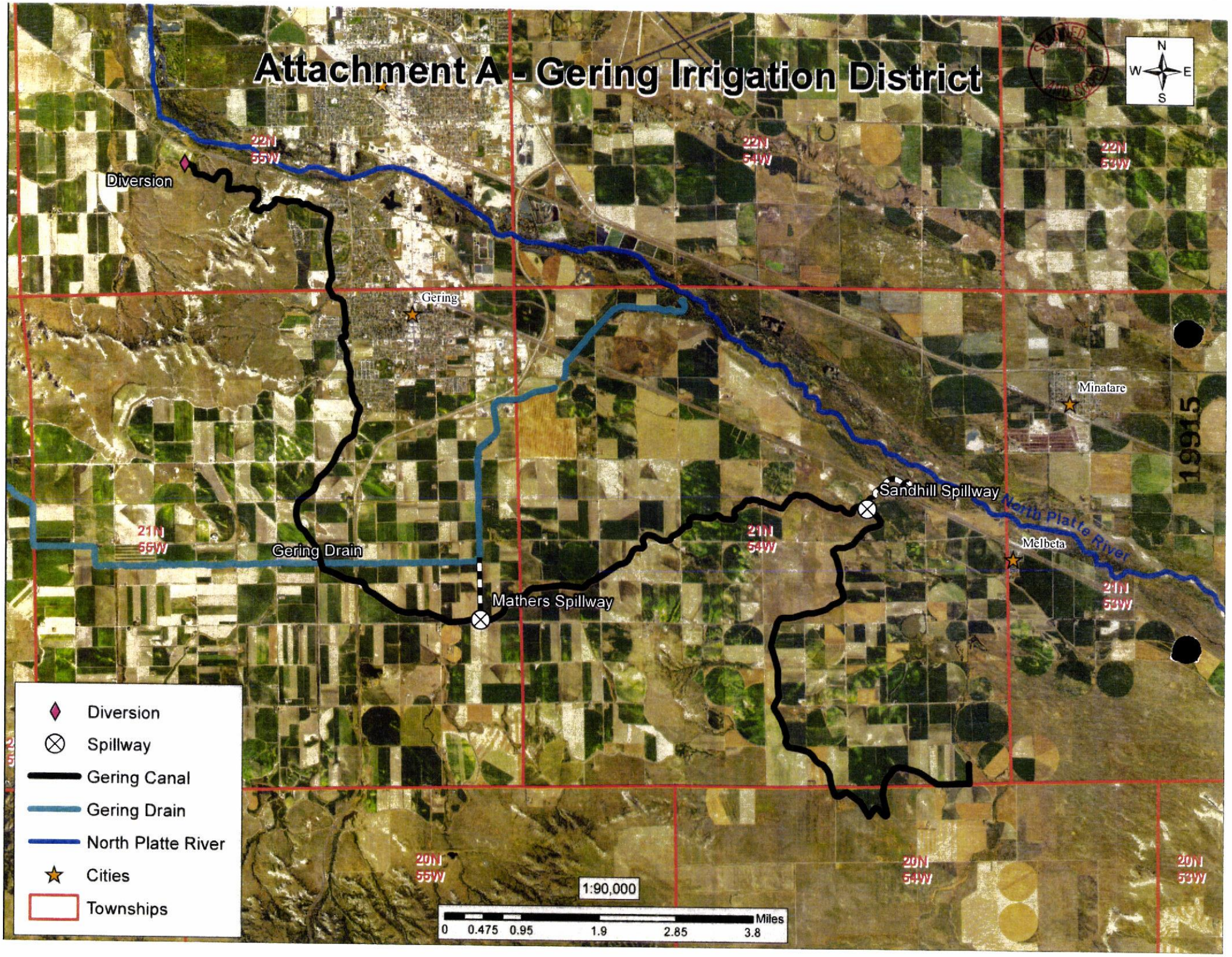
This form must be completed in full. An incomplete or defective application will be returned with 90 days being allowed for resubmission. Failure to resubmit a corrected application within this period shall cause dismissal of the application and consequent loss of priority and fees.

A non-refundable filing fee, payable to the Department of Natural Resources, computed from the table below must accompany this application. Forward this application and applicable fees to:

State of Nebraska
Department of Natural Resources
301 Centennial Mall South / P.O. Box 94676
Lincoln, Nebraska 68509-4676
(402) 471-2363

Nature of Use	Cost
Domestic	$10
Agricultural	
Irrigation from Stream	
0-1,000 acres	$200
Each additional 1,000 acre unit or portion thereof in excess of the first 1,000 acre unit	$100
Irrigation from Storage Reservoir	
0-1,000 acres	$50
Each additional 1,000 acre unit or portion thereof in excess of the first 1,000 acre unit	$25

Nature of Use	Cost
Manufacturing	
General	$10
Power Generation for each theoretical 50 horsepower	$5
Other	$10


Attachment A - Gering Irrigation District
Diversion
Gering
Minatare
Sandhill Spillway
North Platte River
Gering Drain
Mathers Spillway
Melbeta
22N 55W
22N 54W
22N 53W
21N 55W
21N 54W
21N 53W
20N 55W
20N 54W
20N 53W
1995
Diversion
Spillway
Gering Canal
Gering Drain
North Platte River
Cities
Townships
1:90,000
Miles
0 0.475 0.95 1.9 2.85 3.8

Attachment B

1.0 Introduction

Gering Irrigation District (Applicant) submits this application for a temporary appropriation to divert anticipated excess flows for groundwater recharge and stream baseflow enhancement in the North Platte River. This application includes the following supplemental components, in addition to the application form DNR Form APA-001:

Map of canal (Attachment A)

Application narrative discussing excess flows and beneficial use (Attachment B)

DNR Order granting Variance Petition VAR-6157, allowing Gering Irrigation District to file the attached application (Attachment C)

Agreement and 2017 Task Order executed by Gering Irrigation District and North Platte NRD for excess flow diversion (Attachment D)

Upper Platte River Recharge and Flood Mitigation Demonstration Project: Part of the Conjunctive Management Toolbox, DNR January 2013 Technical Memorandum (Attachment E)

Gering Irrigation District desires to obtain a temporary, one-year, appropriation to divert excess natural flow during the nonirrigation season, for the purpose of groundwater recharge and stream baseflow enhancement. Applicant has partnered with the North Platte Natural Resources District (NRD) again this year to take advantage of anticipated excess flows, and the recharge benefits to be realized from the proposed diversions will assist the NRD in meeting its integrated management plan (IMP) obligations. In addition, the stream baseflow enhancement that will be realized will provide water toward meeting Nebraska's obligations under the Platte River Recovery Implementation Program (PRRIP).

Applicant proposes to divert up to 75 cfs at ~~its~~ the Mitchell-Gering headgate located in the SW¼NW¼ of Section 28, Township 22 North, Range 55 West of the 6th P.M., ~~Scotts~~ Bluff County, ~~Nebraska~~ Wyoming, on the Mitchell Canal. Of the total amount diverted, an anticipated 20 cfs will be spilled back to the North Platte River at the two spill locations, first on the Mathers Spillway, located in the SE1/4SW1/4 of Section 24, Township 21 North, Range 55 West of the 6th P.M., and the second on the Sandhill Spillway, located in the NE1/4SW1/4 of Section 14, Township 21 North, Range 54 West of the 6th P.M. both in Scotts Bluff County, Nebraska. The locations of the Applicant's main canal, river diversion, and spill(s) are shown on the map labeled Attachment A. Water will be diverted at the headgate and run through the main canal but not through the system laterals. That water which does not spill back to the North Platte River will be allowed to soak through the canal perimeter, providing recharge to the underlying aquifer, as has occurred on these projects in previous years.

2.0 Excess flows

Attachment B

The Applicant believes that excess flows will be available along the North Platte River prior to the beginning of the 2017 irrigation season; the potential for excess flows following the 2017 irrigation season cannot be assessed at this time. As of February 22, 2017, the snowpack in the upper North Platte Basin was at 124% of average, and more snow is expected in the mountains which feed the North Platte drainage before snowmelt season begins (Figure 1). This level of snowpack is in line with previous years in which spring excess flows have occurred. This forecast does not include any spring precipitation event that may add to the total water supply in the North Platte Basin prior to the beginning of irrigation season.

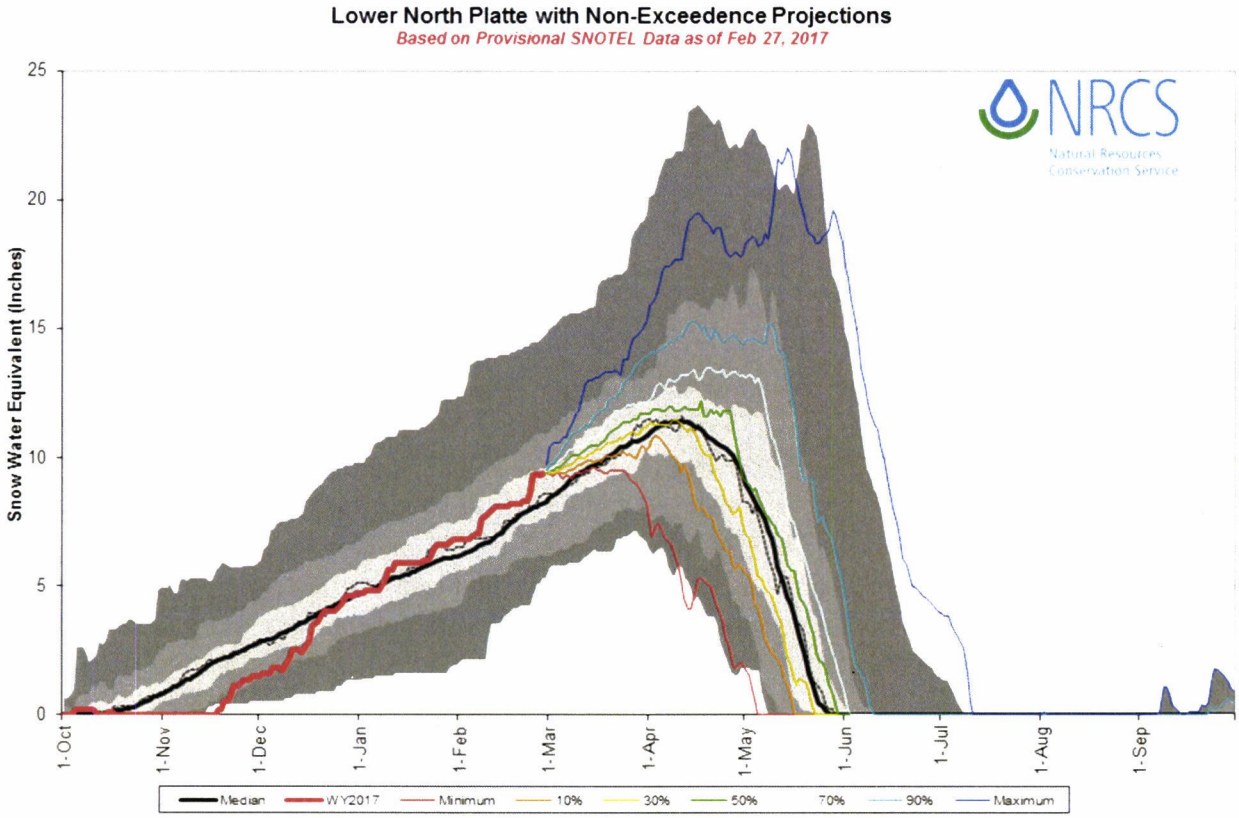


Figure 1: Current and projected snow-water equivalent of snowpack in the lower North Platte Basin below Seminoe Reservoir. (*http://www.weather.gov/riw/cms_snotel_quicklinks_graphs*, accessed February 27, 2017)

To compound the current state of above-average snowpack, all the US Bureau of Reclamation reservoirs in Wyoming are already full, except for Guernsey, which has been drained for spillway reconstruction (Figure 2).

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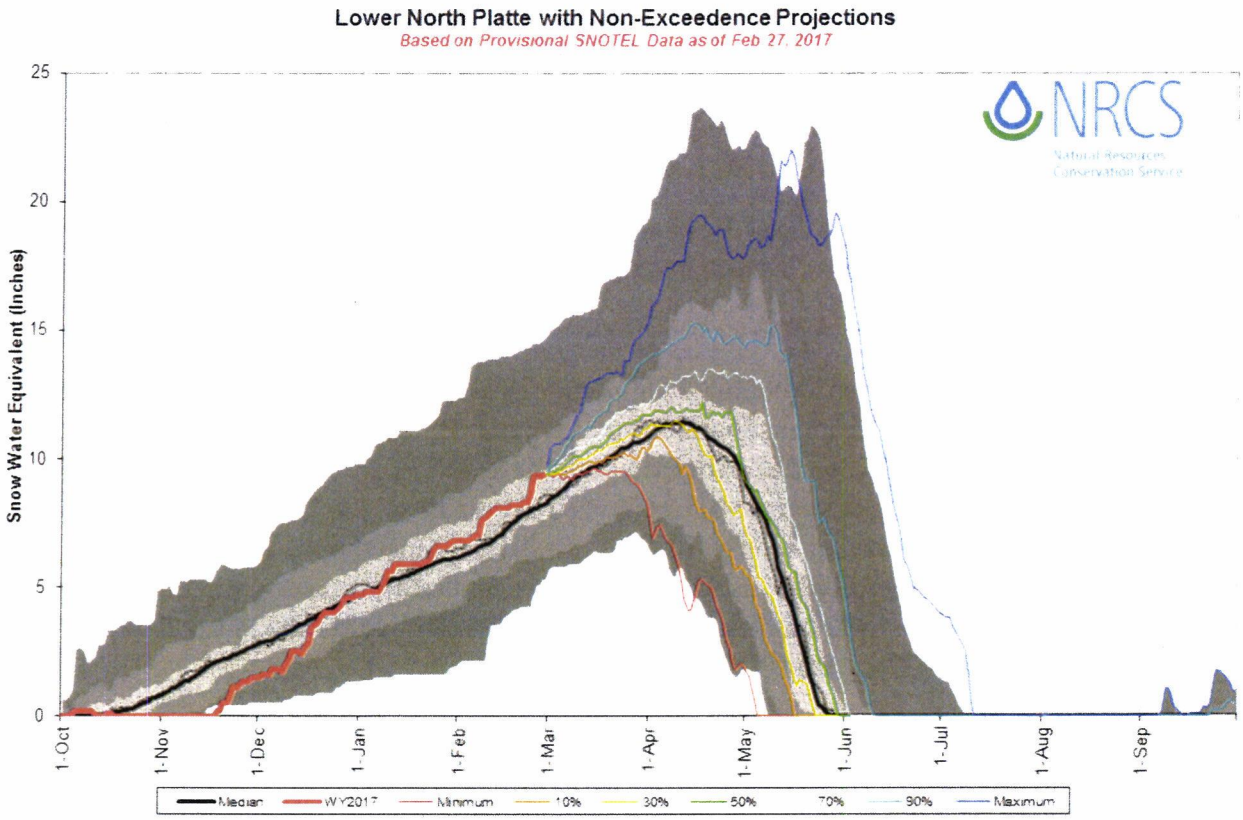

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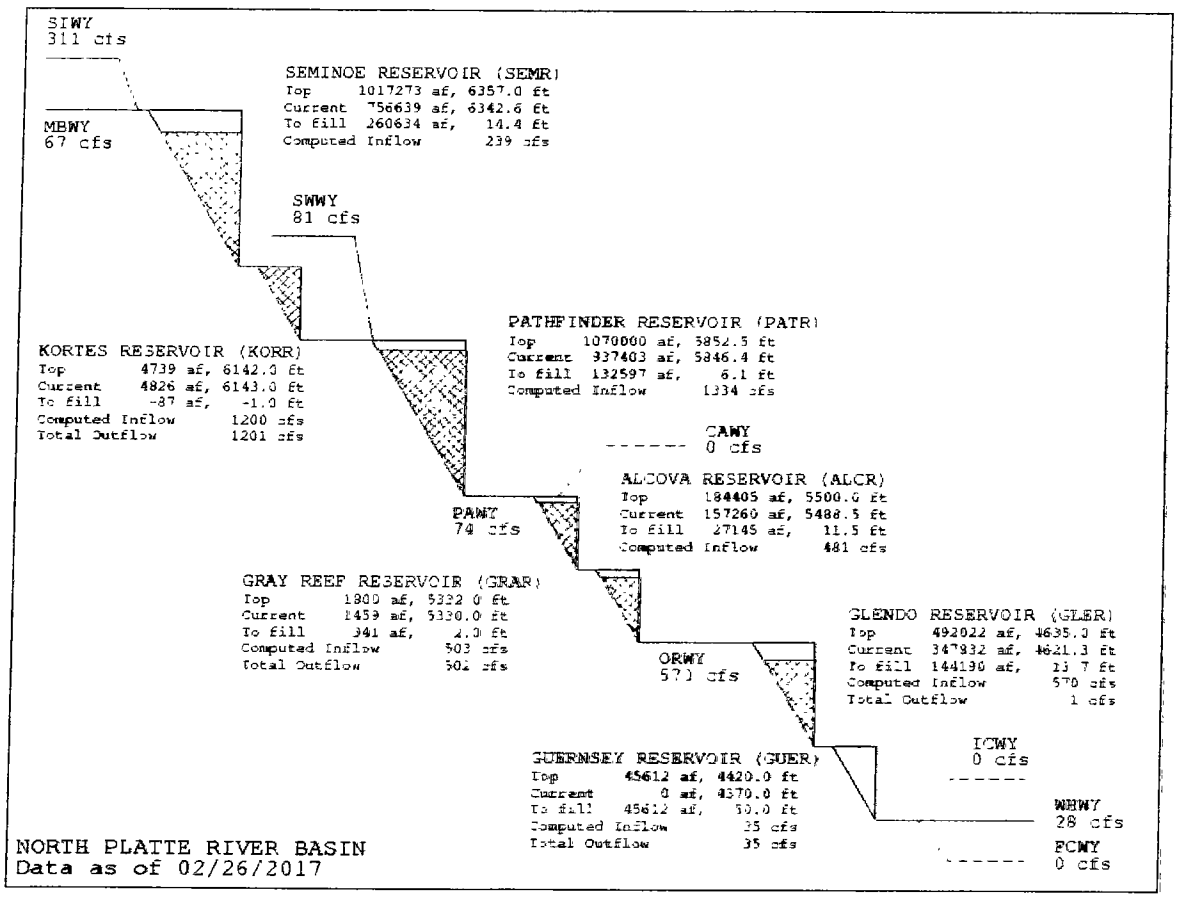

Figure 2: TEACUP model of current Wyoming reservoir levels in the North Platte River system. (*https://www.usbr.gov/gp-bin/hydromet_teacup.pl*, accessed February 27, 2017)

The Bureau has stated that it will need to release water from storage to make room for snowmelt runoff later in the season, though no flooding conditions are currently forecast for the North Platte system as a result of these releases or snowmelt runoff (Figure 3). These releases, along with any additional releases that may be required to maintain the desired level of storage in the reservoir system through spring and early summer, may generate additional excess flows through the North Platte River system beyond what existing appropriations could either store or beneficially use.

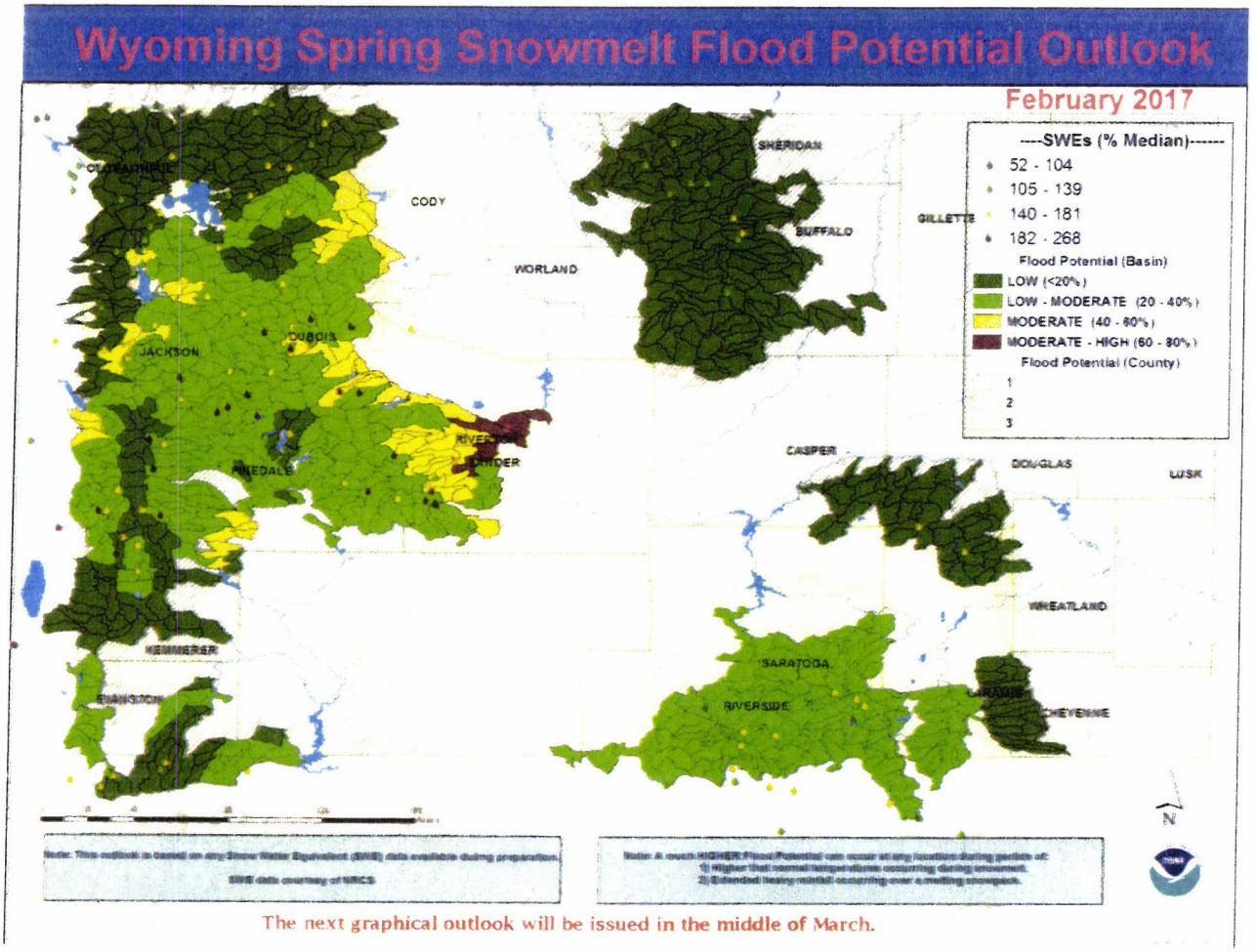

Figure 3: Spring flood potential forecast for the upper North Platte basin, based on anticipated rate of snowmelt and reservoir storage. Note that this outlook does not incorporate abnormally high temperatures, which would accelerate snowmelt, or heavy precipitation events occurring during the snowmelt season. (*http://www.weather.gov/riw/cms_snotel_quicklinks_graphs*, accessed February 27, 2017)

Because of the factors discussed above, high spring flows along the North Platte River are anticipated to occur before the 2017 irrigation season begins. The Applicant and its partner, the North Platte NRD, believe that these flows will be in excess of both PRRIP target flows and state-protected flows that are required to be available prior to June 1.

3.0 Beneficial Use of Canal Recharge

3.1 Canal Recharge and Stream Baseflow Accretions

Applicant and the North Platte NRD have previously partnered to divert excess flows for groundwater recharge, which subsequently enhances the stream baseflow in the North Platte

River. Previous diversion projects in the North Platte NRD occurred in the spring and fall of 2011, as well as the spring of 2016. Below is a set of tables detailing the canals that were used for groundwater recharge during these previous events, along with the estimated amount of recharge that occurred for each canal.

Table 1: Diversion and recharge data from Spring 2011 excess flow diversion project. Estimated recharge values may be refined based on Robust Review of integrated management activities, currently being undertaken by the Platte Basin Coalition and its consultants.

Spring 2011 Excess Flow Diversion Data					
Irrigation District/ Canal Company	**Diversion Dates**	**Total Days Diverted**	**Total Diversion (AF)**	**Estimated Canal Loss %**	**Estimated Recharge (AF)**
Pathfinder	4/1/11 - 4/15/11	15	12,718	55%	6,995
Farmers	4/5/11 - 5/7/11	33	20,288	49%	9,941
Enterprise	4/1/11 - 5/1/11	31	2,443	42%	1,026
Central	4/6/11 - 5/15/11	40	627	42%	263
Castle Rock	4/3/11 - 5/3/11	31	1,497	41%	614
Minatare	4/1/11 - 4/30/11	30	2,437	24%	585
Nine Mile	4/15/11 - 5/14/11	30	1,579	68%	1,074
Chimney Rock	4/1/11 - 5/1/11	31	1,004	45%	452
Belmont	4/1/11 - 5/1/11	31	2,084	53%	1,105
Lisco	4/13/11 - 5/13/11	31	2,229	32%	713
Total			**46,906**		**22,767**

Attachment B

Table 2: Diversion and recharge data from Fall 2011 excess flow diversion project. Estimated recharge values may be refined based on Robust Review of integrated management activities, currently being undertaken by the Platte Basin Coalition and its consultants.

Fall 2011 Excess Flow Diversion Data					
Irrigation District/ Canal Company	**Diversion Dates**	**Total Days Diverted**	**Total Diversion (AF)**	**Estimated Canal Loss %**	**Estimated Recharge (AF)**
Central	9/24/11 - 10/29/11	36	1,028	34%	350
Castle Rock	10/5/11 - 11/12/11	39	1,077	43%	463
Minatare	10/1/11 - 11/2/11	33	2,380	29%	690
Nine Mile	9/14/11 - 10/24/11	41	1,106	68%	752
Chimney Rock	9/24/11 - 11/9/11	47	2,963	30%	874
Belmont	9/24/11 - 11/9/11	47	2,009	51%	1,015
Lisco	9/23/11 - 10/23/11	31	1,516	47%	713
Winters Creek	9/23/11 - 11/7/11	46	882	31%	269
Total			**12,961**		**5,125**

Attachment B

Table 3: Diversion and recharge data from Spring 2016 excess flow diversion project. Estimated recharge values may be refined in the future based on additional model analyses.

Spring 2016 Excess Flow Diversion Data					
Irrigation District/Canal Company	**Diversion Dates**	**Total Days Diverted**	**Total Diversion (AF)**	**Estimated Canal Loss %**	**Estimated Recharge (AF)**
Minatare	5/17/16 - 5/19/16	3	50	24%	12
Lisco	4/14/16 - 4/18/16	5	155	32%	50
Mitchell	5/27/16 - 6/8/16	13	3,590	28%	1,005
Castle Rock	5/16/16 - 6/20/16	36	2,701	41%	1,108
Northport	5/17/16 - 6/6/16	21	3,905	81%	3,174
Belmont	4/1/16 - 6/09/16	70	7,150	53%	3,790
Farmers	6/1/16 - 6/15/16	15	19,765	94%	18,580
Total			**37,316**		**27,718**

Note that the recharge values in Tables 1 through 3 indicate the amount of water infiltrated into the aquifer and do not represent anticipated changes in stream baseflow that will result from these recharge projects. Anticipated stream baseflow benefits from previous excess-flow diversions will be calculated as part of the integrated management plan Robust Review, which is currently ongoing. DNR published a Technical Memorandum in January 2013 entitled, *Upper Platte River Recharge and Flood Mitigation Demonstration Project: Part of the Conjunctive Management Toolbox*, that provides some preliminary methods for calculating the streamflow benefits anticipated from the 2011 excess-flow diversions (Attachment E). Tables 2 and 3 of this Technical Memorandum summarize these initial calculations and are abstracted as Tables 4 and 5 below for reference.

Attachment B

Table 4: Reproduction of Table 2 from DNR January 2013 Technical Memorandum, showing estimated annual baseflow accretions to Platte River system, in acre-feet, from 2011 excess-flows diversions. (*Upper Platte River Recharge and Flood Mitigation Demonstration Project: Part of the Conjunctive Management Toolbox*, DNR January 2013 Technical Memorandum, p. 9)

Year	NPNRD	SPNRD	TPNRD	TBNRD	CPNRD	Annual
2011	3	3	422	0	634	1,062
2012	83	44	853	21	671	1,672
2013	229	89	868	69	590	1,844
2014	328	105	805	104	511	1,853
2015	381	107	724	121	445	1,777
2016	405	102	644	126	392	1,669
2017	414	95	574	125	348	1,555
2018	413	88	513	121	311	1,446
2019	406	81	461	115	281	1,344
2020	396	75	416	109	255	1,251
2021	384	69	378	103	233	1,167
2022	371	64	345	97	214	1,091
2023	357	59	316	91	198	1,022
2024	343	55	291	86	183	959
2025	330	51	269	81	171	903
2026	317	48	250	77	159	851
2027	305	45	233	72	149	804
2028	293	42	218	68	140	761
2029	281	40	204	65	132	722
2030	271	38	191	62	124	685
2031	260	36	180	59	118	652
2032	251	34	170	56	111	621
2033	241	32	161	53	106	593
2034	233	30	152	51	100	567
2035	224	29	145	48	96	542
2036	216	28	138	46	91	519
2037	209	26	131	44	87	498
2038	202	25	125	43	83	478
2039	195	24	119	41	80	460
2040	189	23	114	39	77	442
2041	183	22	109	38	74	426
2042	177	21	105	36	71	410
2043	171	21	101	35	68	396
2044	166	20	97	34	66	382
2045	161	19	93	33	63	369
2046	157	18	90	32	61	357
2047	152	18	86	30	59	346
2048	148	17	83	30	57	335
2049	144	17	80	29	55	324
2050	140	16	78	28	53	315
2051	136	16	75	27	52	305
2052	132	15	73	26	50	296
2053	129	15	70	25	48	288
2054	126	14	68	25	47	280
2055	122	14	66	24	46	272

Attachment B

Year	NPNRD	SPNRD	TPNRD	TBNRD	CPNRD	Annual
2056	119	13	64	23	44	265
2057	117	13	62	23	43	258
2058	114	13	61	22	42	251
2059	111	12	59	21	41	244
2060	108	12	57	21	40	238
10yr	**3,056**	**787**	**6,281**	**911**	**4,439**	**15,474**
50yr	**11,341**	**1,913**	**11,991**	**2,753**	**8,171**	**36,168**

Table 5: Portion of Table 3 from DNR January 2013 Technical Memorandum, showing estimated baseflow accretions to Platte River system, in acre-feet, from 2011 excess-flows diversions, by individual canals located in the North Platte NRD. Canals downstream of Lake McConaughy have been removed. Data for certain canals shown in this table may differ from that shown in Tables 1 and 2 above; this likely reflect additional sources of information used to generate the values in Tables 1 and 2, which was not used in the DNR Technical Memorandum. (*Upper Platte River Recharge and Flood Mitigation Demonstration Project: Part of the Conjunctive Management Toolbox*, DNR January 2013 Technical Memorandum, p. 10)

Project	Spring Diversion	Fall Diversion	Total Diversion	Total Recharge	10-year Benefit	50-year Benefit
Pathfinder Canal	12,718	0	12,718	5,087	178	1,690
Farmers Canal	18,425	0	18,425	8,660	1,470	4,471
Enterprise Canal	2,559	0	2,559	1,689	287	872
Winters Creek Canal	0	882	882	42	7	22
Central Canal	524	1,022	1,545	331	56	171
Castle Rock Canal	1,595	1,069	2,664	1,198	42	398
Minatare Canal	2,709	2,338	5,048	1,207	205	623
Nine Mile Canal	1,521	1,114	2,635	1,850	314	955
Chimney Rock Canal	948	2,965	3,913	1,049	178	542
Belmont Canal	2,241	2,965	5,206	2,789	98	926
Lisco Canal	2,229	1,516	3,746	1,301	221	672
Totals:	**45,469**	**13,871**	**59,341**	**25,203**	**3,056**	**11,342**

The information presented in Tables 4 and 5 will also be reviewed during the Robust Review process and may not represent final accepted values. The magnitude and timing of streamflow benefits from excess-flow diversion events are clear from these tables, however, and indicate the streamflow benefits that may be expected from additional excess-flow diversions, such as that proposed in this application.

3.2 Integrated Management Plan and PRRIP Benefits

The recharge and baseflow accretion benefits described in Section 3.1 above provide offsets for groundwater depletions to streamflow from post-1997 uses, as required by the joint IMP adopted

by the North Platte NRD and DNR, as well as the basinwide integrated management plan, to which the North Platte NRD and DNR are parties. In addition, the streamflow accretions realized from canal recharge provide water toward PRRIP goals of reducing shortages to target flows by 130,000 to 150,000 acre-feet per year. Because streamflow benefits accrue to the river over a long period of time, the total benefits from excess-flow diversions for recharge continue to materialize decades after the diversion events themselves. These long-term accretions will ensure that the North Platte NRD and the State of Nebraska continue to meet their respective depletion-offset obligations into the future.

The proposed temporary appropriation for excess-flow diversion will provide additional depletion-offset water toward meeting IMP and PRRIP goals. As with previous excess-flow diversions, the benefits from diverting excess flows under the proposed appropriation will continue to accrue to the North Platte River for many years, which will assist the NRD and Nebraska in meeting the goals of the next increment of IMPs. Groundwater recharge, streamflow accretion, and depletion offsets are all recognized beneficial uses of surface water, particularly in a fully or overappropriated area. The temporary appropriation requested here, if granted, will be put to beneficial use through the partnership between Applicant and the North Platte NRD, as outlined in the contract and 2017 task order included as Attachment D to this application.

4.0 Effects on other appropriators

The excess flows discussed in Section 2.0 above are expected to be more than sufficient to provide for PRRIP target flows, as well as for "state-protected flows," a term of art intended to encompass flows needed to satisfy appropriators whose appropriations may be in priority at a given point in time. During the nonirrigation season, this term includes water that Central Nebraska Public Power and Irrigation District could expect to flow into Lake McConaughy, when its appropriations are in priority. These flows also include water for instream-flow and other excess-flow appropriations held by entities downstream of Lake McConaughy, including the Central Platte NRD.

The temporary appropriation sought under this application will receive a 2017 priority date, if granted, and will be permitted to divert when the appropriation is in priority. Just as with any other surface-water appropriation along the North Platte River, the Applicant will not be able to divert excess flows unless and until senior downstream appropriators are satisfied, and the appropriation will be subject to water administration. In an excess-flow event, however, streamflow is consistently present in quantities that will satisfy all in-priority appropriations, as well as PRRIP target flows. Consequently, the granting of this proposed temporary appropriation will have no adverse effect on downstream senior appropriators.

Attachment B

5.0 Conclusion

Gering Irrigation District requests this temporary appropriation for the purpose of diverting excess flows during the nonirrigation season. Diverted water will be run through the Applicant's main canal, and that water which is not spilled back to the river will be allowed to soak away through the canal perimeter to recharge the aquifer. The Applicant has partnered with the North Platte NRD to accomplish this project, which will provide streamflow accretions that assist the NRD and the State of Nebraska in meeting IMP and PRRIP streamflow goals. The Applicant has presented information showing the likelihood of excess flows being available during the nonirrigation season, as well as an outline of the benefits to be expected from the beneficial use of water under the proposed appropriation.

Attachment C

STATE OF NEBRASKA

DEPARTMENT OF NATURAL RESOURCES

ORDER GRANTING LEAVE TO FILE AN APPLICATION FOR

A NEW SURFACE WATER APPROPRIATION WITHIN AN AREA SUBJECT TO A

MORATORIUM BY PETITION VAR-6157

WATER DIVISION 1-A

BACKGROUND

1. On July 14, 2004, the Department of Natural Resources (Department) issued a formal moratorium on all new surface water appropriations in the Platte River Basin upstream of the confluence with the Loup River near Columbus, Nebraska. The moratorium included all tributary streams above the Loup River confluence including the North and South Platte Rivers and tributaries.

2. On September 11, 2009, a Basin-Wide Integrated Management Plan (BWIMP) for the overappropriated area of the Platte River Basin was adopted by order of the Department. The BWIMP was also adopted by the following NRDs: the North Platte NRD, the South Platte NRD, the Twin Platte NRD, the Central Platte NRD, and the Tri-Basin NRD. These NRDs are collectively referred to in the BWIMP as the "Platte River Basin NRDs." The individual integrated management plans referenced in the next paragraph are required to be in conformance with the goals and objectives of the BWIMP.

3. On August 13, 2009, the initial integrated management plans (IMPs) were adopted by order of the Department, pursuant to *Neb. Rev. Stat.* § 46-718(2) for the following natural resources districts (NRDs): the North Platte NRD, the South Platte NRD, the Twin Platte NRD, the Central Platte NRD, and the Tri-Basin NRD. There have been subsequent revisions to the IMPs. As part of the surface water controls adopted by the Department pursuant to *Neb. Rev. Stat.* § 46-716(1)(b), the moratorium on issuing new surface water appropriations was continued.

4. On January 1, 2007, work officially commenced on the Platte River Recovery and Implementation Program (PRRIP or Program). PRRIP's goals include reducing shortages to U.S. Fish and Wildlife Service target flows and providing additional land habitat for endangered species in the Lexington to Chapman reach of the Platte River. In order to meet these goals, each signatory to PRRIP has adopted depletions plans to address the mitigation of the adverse impacts of water-related activities on streamflows in the Platte River. The State of Nebraska, through the Department will utilize the integrated management process to achieve the goals of PRRIP (BWIMP and IMPs).

5. On March 21, 2017, Gering Irrigation District (Petitioner) filed petition VAR-6157 for Leave to File or Consider an Application for a Permit to Appropriate Water within a Moratorium Area or Stay Area. The petition requests leave to file an application for a temporary permit to appropriate water for the purpose of groundwater recharge via the Mitchell and Gering Canals.

6. When the flows are adequate to supply senior appropriations and satisfy the USFWS target flows, for the purposes of this order "Desired Minimum Discharge" describes the water parameter that will be used to determine whether, and to what extent diversion may occur for projects such as that proposed under VAR-6157. Table A (see attached) lists the DMD values for the Platte River, measured in cubic feet per second at the Grand Island streamgage, for specific time periods. The magnitude of these flows differs according to the PRRIP's designation of dry, normal or wet hydrologic conditions, derived from the USFWS's recommendations for species flows and annual pulse flows and found in the PRRIP Water Plan Reference Materials Attachment 5, Section 11, Appendix A-5. These flow values also include instream flow appropriations which must also be met in order for unappropriated water to be considered available for possible diversion.

ANALYSIS

1. The formal moratorium issued by the Department in 2004 has been continued in the surface water controls included in the individual NRD IMPs adopted by the Platte River Basin NRDs and the Department.

   Because the Platte River Basin is currently undergoing integrated management for the purposes of reducing depletions to streamflow, any new consumptive use must be examined for its potential effects on extant surface and groundwater users and upon all matters of significant public interest and concern. This includes assessing both positive and negative impacts on the State's ability to comply with interstate agreements, programs, decrees and compacts, including PRRIP. Thus, any proposed project must be scrutinized to prevent conflict with (a) the goals and actions necessary to implement the IMPs adopted by the Platte River Basin NRDs and the Department and (b) the water needs of Water Action Plan projects that will be implemented under PRRIP. Applications for potential beneficial uses that are not clearly non-consumptive will be presumed to be at least partially consumptive. Therefore, an analysis of the effects of a proposed new diversion on these existing uses and responsibilities is required in order to determine whether sufficient good cause exists to grant a variance to apply for a new use.

2. Petitioner provided information that indicates the presence of unappropriated water throughout the Platte River Basin upstream of the confluence of the Loup and Platte Rivers. The information shows that U.S. Fish and Wildlife Service target flows and State protected instream flow appropriations held by the Central Platte NRD and the Nebraska Game and Parks Commission are likely to be exceeded based on historical analysis and experience with temporary permits that were previously utilized. Petitioner acknowledges that protection of target flows must be maintained throughout the year, and Petitioner expects

such to be a condition of any permit approval, if a permit was allowed to be filed and was ultimately granted.

3. Petitioner requests a permit to divert water for the purpose of groundwater recharge to assist in optimizing water management.

4. Petitioner proposes to divert unappropriated water prior to the normal irrigation season and possibly after the irrigation season concludes, if river conditions are such that unappropriated water is available.

CONCLUSIONS

1. Petitioner has provided evidence that indicates there is likely to be unappropriated water in the future on the Platte River prior to and after some irrigation seasons because of flows in excess of appropriated water and Desired Minimum Discharge, as defined above.

2. The diversion project proposed on the attached draft application does not appear to be in conflict with integrated management plan goals and potential conjunctive management projects. In addition, recharge from this project should assist NRDs in meeting their offset responsibilities under the BWIMP and individual NRD IMPs.

3. The potential benefits of groundwater recharge that Petitioner expects to result from the proposed project outweigh the effects of any stream depletions from temporarily diverting the water during times described above.

4. For these reasons, Petitioner should be granted leave to file an application to divert flows in excess of appropriated water and Desired Minimum Discharge for the purpose of groundwater recharge.

ORDER

IT IS HEREBY ORDERED:

1. Petition VAR-6157 meets the requirements of *Department of Natural Resources Rules of Surface Water, Title 457 Neb. Admin. Code* Chapter 23, § 001.03, has shown sufficient good cause, and is GRANTED.

2. This Order granting leave to file or consider an application for a new surface water appropriation within a moratorium or stay area pursuant to petition VAR-6157 shall be in effect for one year from the date this order is signed.

3. This decision shall not bind the Director to approve any application to which it relates, or in any way be used as evidence of prejudice for the Director's future decisions concerning the specific approval requirements of such an application.

DEPARTMENT OF NATURAL RESOURCES

March 29, 2017

Gordon W. Fassett, P.E., Director

A copy of this Order was posted on the Department's website. A copy of this Order was provided to the Department's field office in Bridgeport, Nebraska. A copy of this Order was mailed on March 27, 2017, to the following:

Melvin Knaub, President
Gering Irrigation District
981 Rundell Road
Gering, Nebraska 69341

John Berge, General Manager
North Platte Natural Resources District
100547 Airport Road
Scottsbluff, Nebraska 69363

Table A - Desired Minimum Discharge of the Platte River in cfs Measured at the Grand Island Stream Gage Relevant to VAR-6157

Period	PRRIP Target Flows Grand Island		
	Wet*	**Normal***	**Dry***
January 1 - January 31	1,000	1,000	600
February 1 - February 14	1,800	1,800	1,200
February 15 - February 28	3,350	3,350	2,250
March 1 - March 15	3,350	3,350	2,250
March 16 - March 22	1,800	1,800	1,200
March 23 - March 31	2,400	2,400	1,700
April 1 - April 14	2,400	2,400	1,700
April 15 - May 3	2,400	2,400	1,700
May 4 - May 10	2,400	2,400	1,700
May 11- May 19	1,200	1,200	800
May 20 - May 31	3,700	3,400	800
June 1 - June 20	3,700	3,400	**1,000****
June 21 - June 23	1,200	1,200	**1,000****
June 24 - July 31	1,200	1,200	**1,000****
August 1 - August 22	1,200	1,200	800
August 23 - August 31	1,200	1,200	800
September 1 - September 15	1,200	1,200	800
September 16 - September 30	1,000	1,000	600
October 1 - October 11	2,400	1,800	**1,350****
October 12 - November 10	2,400	1,800	**1,500****
November 11 - November 15	2,400	1,800	1,300
November 16 - December 31	1,000	1,000	600

* The current Hydrologic Condition, (Wet Normal or Dry) determined by PRRIP can be found at: *http://platteriverprogram.org/PubsAndData/Pages/CurrentHydrologicCondition.aspx*

**Represents the minimum discharge required by instream flow appropriation, which is greater than PRRIP Target Flows, and senior to VAR-6157

Attachment D

THIS AGREEMENT entered into on this 12th day of May, 2016, by the **NORTH PLATTE NATURAL RESOURCES DISTRICT**, hereinafter referred to as the **"DISTRICT,"** and **GERING IRRIGATION DISTRICT**, hereinafter referred to as the **"IRRIGATOR."**

WITNESSETH:

WHEREAS, the Irrigator has surface water appropriation(s) for natural flow from the North Platte River and/or its tributaries and the necessary conveyance structure(s) to transmit such natural flow; and

WHEREAS, the District and the Nebraska Department of Natural Resources have jointly developed and agreed to implement an integrated management plan (IMP) which describes investigating projects to enhance and improve water supply, including the development of new infrastructure and other groundwater projects for the purpose of providing net accretions to the river; and

WHEREAS, the District or the Nebraska Department of Natural Resources may request the Irrigator to 1) divert natural flow into the Irrigator's delivery system during periods when streamflow is in excess of US Fish and Wildlife Service target flows and state-protected flows, without subsequent consumptive use for irrigation, in order to assist the District in its efforts to 1) achieve flood prevention and study groundwater recharge and/or groundwater discharge to streamflow, or 2) other projects with the purpose of meeting the goals and objectives of the IMP; and

WHEREAS, the Irrigator is willing to assist the District to meet the objectives of the IMP in exchange for compensation; and

NOW THEREFORE, in consideration of the mutual covenants made, the compensation agreed to, and other good and valuable consideration the receipt of which is hereby acknowledged, the parties agree as follows:

I. SCOPE OF SERVICES

The Irrigator will make available the diversion structures of the Gering Irrigation canal and the services of a ditch rider or staff member, for the term of this Agreement, to assist District efforts to meet the objectives of the IMP, which may include, but not be limited to, the diversion of streamflows in excess of target flows and state-protected flows for the purpose of retiming streamflow, and any monitoring activities necessary to further understanding of the effects of such activities on streamflow. These efforts will be carried out in accordance with Task Authorizations developed under this Agreement and approved by the Irrigator and District. The purpose of this Agreement is to set forth the terms and conditions applicable to such efforts. During the term of this Agreement, the details of timing and payment shall be described and set forth in separate, numbered Task Authorizations, issued pursuant to the terms of this Agreement. Should a particular Task Authorization ever require revision, such revision shall be accomplished through an amendment to that individual Task Authorization.

II. DURATION OF AGREEMENT

This Agreement is effective on the date signed by the last party and remains effective for five (5) years from the effective date. There will be no extension or renewal of this Agreement unless further agreed to in writing by the parties.

III. THE IRRIGATOR AGREES TO PERFORM AS FOLLOWS:

A. The Irrigator agrees to divert, only upon request from the District and in accordance with a particular Task Authorization then in operation, up to 75 cfs of natural flow surface water and convey such water through its delivery system.

B. The Irrigator further agrees not to apply to consumptive use for irrigation any of the water diverted subject to this Agreement.

C. The Irrigator represents and affirms that, in accordance with all relevant regulations, statutes, and/or procedures, the Irrigator has complied or will comply with all requirements necessary to allow it to enter into this Agreement and perform all actions herein required. If the Irrigator has not complied, or in the future fails to comply, with all relevant regulations, statutes, and/or procedures, this contract is null and void.

D. The Irrigator retains the right to suspend or terminate its performance under this Agreement 1) in the event of threatened damage to any of its facilities; 2) threatened injury or damage to the person or property of third parties; 3) if any provisions of the Agreement subjects any part of the Irrigator's appropriation to cancellation, reduction, or loss under the laws of the State of Nebraska then in effect; or 4) adversely affects its ability to provide irrigation service during its irrigation season. The Irrigator's sole judgement in these matters will control. In the event that the Irrigator must suspend or terminate its performance pursuant to this paragraph, then it shall promptly notify the District by telephone and in writing.

IV. THE DISTRICT AGREES TO PERFORM AS FOLLOWS:

A. The District's total annual payment under the five (5) year term of this contract cannot exceed $150 per cfs of excess flows diverted for flood relief and canal recharge.

B. Payment will be made according to the terms of each Task Authorization, but not later than 6 months after the last date the Irrigator has diverted under the terms of any individual Task Authorization.

C. The District will assist the Irrigator in obtaining all necessary permits from the Department for the purpose of diverting excess flows under this agreement.

V. THE PARTIES MUTUALLY AGREE AS FOLLOWS:

A. The parties agree that Irrigator has retained and reserved the rights to any additional water that it would be entitled to receive under agreements and contracts between the Bureau of Reclamation or any other entity and the Irrigator that are outside of the provisions of this Agreement.

B. In executing this Agreement, the parties shall comply with all other applicable state and federal laws.

GERING IRRIGATION DISTRICT (IRRIGATOR)

[illegible] President — 5-12-16

Name and Title — Date

NORTH PLATTE NATURAL RESOURCES DISTRICT (DISTRICT)

John Berge — 5/16/16

John Berge, General Manager — Date

MARCH 1, 2017, TASK ORDER #17-1 TO NORTH PLATTE NATURAL RESOURCES DISTRICT AGREEMENT #11 FOR EXCESS FLOW DIVERSIONS

I. THE IRRIGATOR AGREES TO PERFORM AS FOLLOWS:

A. The Irrigator agrees to divert natural flow surface water and convey such water through its delivery system, beginning when directed by the Nebraska Department of Natural Resources (NDNR) Bridgeport Field Office Supervisor after April 1, 2017, as needed to alleviate flooding conditions on the North Platte River, or to take advantage of excess flows available in the North Platte River. The period of diversion for this purpose will be the duration of the excess flow event, from the beginning date of this task order and until the excess flows of such event are no longer available. To receive any compensation under North Platte Natural Resources District (District) Agreement 11, the Irrigator must in good faith divert flows into its system and convey such water for the period of time designated above and as directed by NDNR's Bridgeport field office and the District but which cannot be quantified precisely at this time. A flat rate fee payable to the Irrigator will be agreed upon by all parties prior to diversion of any excess flows.

B. Prior to the date of the end of the excess flow event, as determined by NDNR, the Irrigator retains the right to suspend or terminate its performance under this Agreement 1) in the event of threatened damage to any of its facilities; 2) threatened injury or damage to the person or property of third parties; 3) if any provisions of the Agreement subjects any part of the Irrigator's appropriation to cancellation, reduction or loss under the laws of the State of Nebraska, then in effect; 4) adversely affects its ability to provide irrigation service during its irrigation season; or 5) the Irrigator commences irrigation deliveries. The Irrigator's sole judgement in these matters will control. In the event that the Irrigator must suspend or terminate its performance pursuant to this paragraph, then it shall promptly notify the District by telephone and in writing. In such events, the District will accordingly determine, based upon the benefit received, any reduction in the payment made to Irrigator.

II. THE DISTRICT AGREES TO PERFORM AS FOLLOWS:

A. Payment will be for no more than $150 per cfs diverted for flooding mitigation and canal recharge, and will be provided not later than ninety (90) days following the conclusion of diversion for these purposes.

B. The District will work with NDNR to determine the measurements or methods needed to estimate project benefits (e.g. diversions and return flows). The District will make the agreed-upon measurements in conjunction with NDNR.

III. OTHER CONDITIONS

A. FORCE MAJEURE - The Irrigator shall not be liable for any delay or failure to perform its obligations under this Agreement caused by an event or condition beyond the reasonable control, and not caused by the fault or negligence, of the Irrigator, including, but not limited to, failure of facilities, flood, earthquake, storm, lightning, fire, severe cold or other weather event, which delays or prevents performance, which the Irrigator could not reasonably have avoided by exercise of due diligence and foresight. Upon the occurrence of such an event or condition, the obligations of the Irrigator under this Agreement shall be excused and suspended without penalty or damages, provided that the Irrigator shall give the District prompt notice of such event or condition. In such events, the District will accordingly determine, based upon the benefit received, any reduction in the payment made to Irrigator.

B. LIABILITY – Except for injury or damage caused by the District's intentional or grossly negligent acts, the District shall not be liable or held responsible for any injury or damage to the Irrigator's facilities, personnel, or equipment, or any other person or entity's property.

GERING IRRIGATION DISTRICT (Irrigator)

President — 3-15-17

Name and Title — Date

NORTH PLATTE NATURAL RESOURCES DISTRICT (District)

John Berge — 3/16/17

John Berge, General Manager — Date

Attachment E

January 2013

Nebraska Department of Natural Resources

Integrated Water Management Division

Upper Platte River Recharge and Flood Mitigation Demonstration Project:

Part of the Conjunctive Management Toolbox

Technical Memorandum- January 2013

Nebraska Department of Natural Resources

Integrated Water Management Division
Nebraska Department of Natural Resources

Technical Memorandum

This technical memorandum (TM) is intended to provide a brief or preliminary summary of a project or experiment without extensive technical analysis. It is not intended to be so in depth that one be able to recreate the experiment based upon the information given, but rather to present a broad overview of the methods and analysis while highlighting the results and conclusions. Although the content is of a technical manner, the TM should be understood by an audience with a general scientific background.

Acknowledgements

The Department would like to thank the natural resources districts and the Irrigation Districts for their hard work, collaborative efforts, and perseverance in carrying out this project. Cooperators include: Central Platte, North Platte, South Platte, Tri-Basin, and Twin Platte Natural Resources Districts; Bridgeport Irrigation District; Castle Rock Irrigation District; Central Irrigation District; Central Nebraska Public Power and Irrigation District; Chimney Rock Irrigation District; Cozad Canal Company; Enterprise Irrigation District; Farmers Irrigation District; Keith Lincoln County Irrigation District; Lisco Irrigation District; Minatare Canal Company; Nebraska Public Power District; Nine Mile Irrigation District; Pathfinder Irrigation District; Paxton-Hershey Water Company; Platte Valley Irrigation District; South Side Irrigation Company; Suburban Irrigation District; Thirty Mile Canal Company; Western Irrigation District; and Winters Creek Canal Company. Without the efforts of all of these parties, this project would not have been as successful.

Funding for the project includes the Central Platte, North Platte, South Platte, Tri-Basin, and Twin Platte Natural Resources Districts; and the Nebraska Environmental Trust.

1.0 Summary

Twenty-one irrigation districts participated in the Spring 2011 Recharge and Flood Mitigation project during the months of April and May. Twenty irrigation districts participated in the Fall 2011 Recharge and Flood Mitigation project during the months of September through December. In order to quantify the volume of water that was recharged by the canals, canal losses were developed for each canal. Canal losses were calculated using diversion and spill discharge measurements or were estimated from existing data sources. Based on the diversion records and calculated losses, recharge volumes were calculated by canal and summarized by natural resource district (NRD). Recharge volumes for each canal were used in conjunction with response functions developed by the technical committee under the Platte Basin Habitat Enhancement Program (PBHEP) to calculate estimated accretions/depletions to the Platte River.

2.0 Method

A total of 23 canals that divert water from the North Platte River, the South Platte River, and Platte River participated in the 2011 Recharge Project in the spring, fall, or both. Each individual canal began diverting at different times depending upon permit requirements and readiness of the canal and its operators. Average daily diversions were used to determine the amount of water that entered each canal for a total of 30 days during the spring. Average daily diversions were used to determine the amount of water that entered each canal subsequent to irrigation operations during the fall. Average daily diversions were used until diversions stopped in the fall, regardless of the number of days. Several of the canals were forced to shut down their canals during the recharge time period due to extreme weather conditions or to make repairs on the canal. The period of time for those canals was extended to include 30 days of actual diversions, with the exception of Pathfinder Irrigation District. Pathfinder Irrigation district did not participate for the full 30 days during the spring due to additional operational requirements of the district.

The Department of Natural Resources' (Department) Bridgeport Field Office was tasked with conducting and coordinating discharge measurements at the spill locations for each canal in order to do water balance calculations. Due to demands on the field office associated with the high water levels during the 2011 water year, a number of canal spills went unmeasured. If canal spill measurements were available, water balance calculations were conducted to determine the percentage of the total diversion that was lost. If measurements were not available, estimates of canal loss were taken from the STELLA model developed under the COHYST 2010 project. Estimated and calculated canal losses were compared against historical seepage measurements and operational efficiencies used and developed by the irrigation districts. Table 1 summarizes the participating projects, the method used to determine canal loss, and the total number of days considered during the spring and fall.

Irrigation Project	Method	Spring Diversion Days	Fall Diversion Days
Pathfinder Canal	Measurement	15	0
Farmers Canal	Measurement	30	0
Enterprise Canal	Measurement	30	0
Winters Creek Canal	Measurement	0	46
Central Canal	Measurement	30	36
Castle Rock Canal	Measurement	30	39
Minatare Canal	Measurement	30	33
Nine Mile Canal	Measurement	30	41
Chimney Rock Canal	Measurement	30	47
Belmont Canal	Seepage Runs	30	47
Lisco Canal	Measurement	30	31
Keith Lincoln Canal	Measurement	30	37
Suburban Canal	Measurement	30	33
North Platte Canal	Model	30	31
Paxton Hershey Canal	Model	30	45
Phelps County Canal	Measurement	0	100
Thirty Mile Canal	Model	30	32
Orchard Alfalfa Canal	Model	30	38
Gothenburg Canal	Model	30	34
Cozad Canal	Model	30	31
Dawson Co. Canal	Model	30	34
Kearney Canal	Model	30	9
Western Canal	Measurement	30	75
Western Ponds	Measurement	41	49

Table 1: Projects diverting excess Platte River basin flows for flood mitigation and seepage demonstration during the spring and fall of 2011.

2.1 Measured Canal Loss & Recharge Volume

Water balance calculations were performed on the canals when and where discharge measurements of the spills were available. Some canals had only one spill measurement while other canals had several. For each spill measurement taken the rate of water measured at the canal spill was subtracted from the average daily diversion rate to determine the rate of canal loss. The loss was then divided by the average daily rate of diversion to calculate a daily loss as a proportion of the total volume of water diverted. The equations used are shown below. For canals with multiple measurements the average loss was calculated and used in the next step of the analysis. An example is given below from the Minatare Canal. Four spill measurements were taken with loss rates calculated as 21 percent, 25 percent, 23 percent, and 36 percent. The average value for these calculations is 26 percent. To estimate a total volume of diverted water that seeped into the ground or recharged, the average loss value was multiplied by the volume

diverted. The volume diverted was calculated based upon multiplying the average daily diversion rate (in cubic feet per second) for each day by 1.9835, converting it to a daily volume (acre-feet per day). The daily volumes were summed to calculate the total volume diverted. For Minatare, the total spring diversion was 2,709 acre-feet (AF) and the average loss value was 26 percent. The resultant recharge volume is 704 AF.

$$Canal\ Loss\ \% = \left(\frac{daily\ diversion\ rate - rate\ measured\ at\ spill}{daily\ diversion\ rate}\right) * 100\%$$

This equation simplifies as follows:

$$Canal\ Loss\ \% = \left(\frac{daily\ diversion\ rate}{daily\ diversion\ rate} - \frac{rate\ measured\ at\ spill}{daily\ diversion\ rate}\right) * 100\%$$

$$= \left(1 - \frac{rate\ masured\ at\ spill}{daily\ diversion\ rate}\right) * 100\%$$

The final simplified equation is the version used in the spreadsheet calculations (see appendix A).

Minatare				
Date	Diversion Rate (cfs)	Measured at Spill (cfs)	Spill Location	Loss
4/5/2011	48	37.7	Minatare Spill	21%
4/13/2011	44	33.1	Minatare Spill	25%
4/20/2011	40	30.9	Minatare Spill	23%
4/26/2011	49	31.3	Minatare Spill	36%
			Measured:	**26%**
			***Estimated:**	
			Used:	**26%**

$$Canal\ Recharge = Canal\ Diversion * \frac{Canal\ Loss\ \%}{100\%}$$

$$Minatare\ Canal\ Recharge = 2709\ AF * \frac{26\%}{100\%} = 704\ AF$$

2.2 Modeled Canal Loss & Recharge Volume

Estimates of average canal loss based upon total water diverted were obtained from the STELLA model. The loss estimates in the STELLA model were developed by HDR Engineering, Inc. for

the COHYST study. Loss estimates from the STELLA model were calculated at 32 percent[1] of the canal's total diversion. For example, Paxton Hershey Canal did not have measured spill data, the total volume diverted was 1724 AF and the loss rate, from STELLA, was 32 percent so the calculated volume of water recharged was 552 AF.

2.3 Western Canal and Pond Loss & Recharge Volume

Western Canal losses were calculated using the water balance method based on discharge measurement at the canal's spill. In addition to the canal recharge, nine ponds were used as recharge pits to increase the overall amount of recharge to the system. Twin Platte Natural Resource District (TPNRD) placed staff gages at each of the pond sites and established volume quantities at each respective gage height. The staff gages were then read by TPNRD weekly to determine the rate of seepage per day for each pond. Recharge activities varied for each pond, but most of the ponds operated for 41 days. The recorded number of days for each pond was used to calculate the recharge at each site. Diversions into the pond were not used to adjust the water balance calculation when determining the loss along Western Canal. Most of the recharge ponds were not diverting water on the days where discharge measurements were conducted at the canal spill. In addition, the quantity of water diverted from the canal into the ponds was within the discharge measurement error band at the spill.

2.4 Accretions to the Platte River

Estimates of canal and pond recharge volume were combined with depletion functions developed by the technical committee under the PBHEP program to estimate the recharge effects on flows in the Platte River, or accretions. The depletion functions are defined for six zones within each NRD. Legal sections corresponding to the extent of the canal where water was routed were used to calculate an average zone number to determine the appropriate response curve. The depletion functions represent a fixed change that persists through time; therefore, an accretion function was developed to represent the recharge water occurring as a discrete pulse during a single year. This was accomplished by shifting the depletion function curve by one year (one time increment on the curve) and subtracting the shifted value from the original depletion function, thus creating a response function. The response function was then multiplied by the canal loss value to estimate Platte River accretions for the next 50 years. Figure 1 provides an example. Different canals and different distribution patterns regarding diverted flows create different temporal patterns of accretions (figure 2).

[1] Engel, J., unpublished data, COHYST 2010, Canal Seepage Estimates.

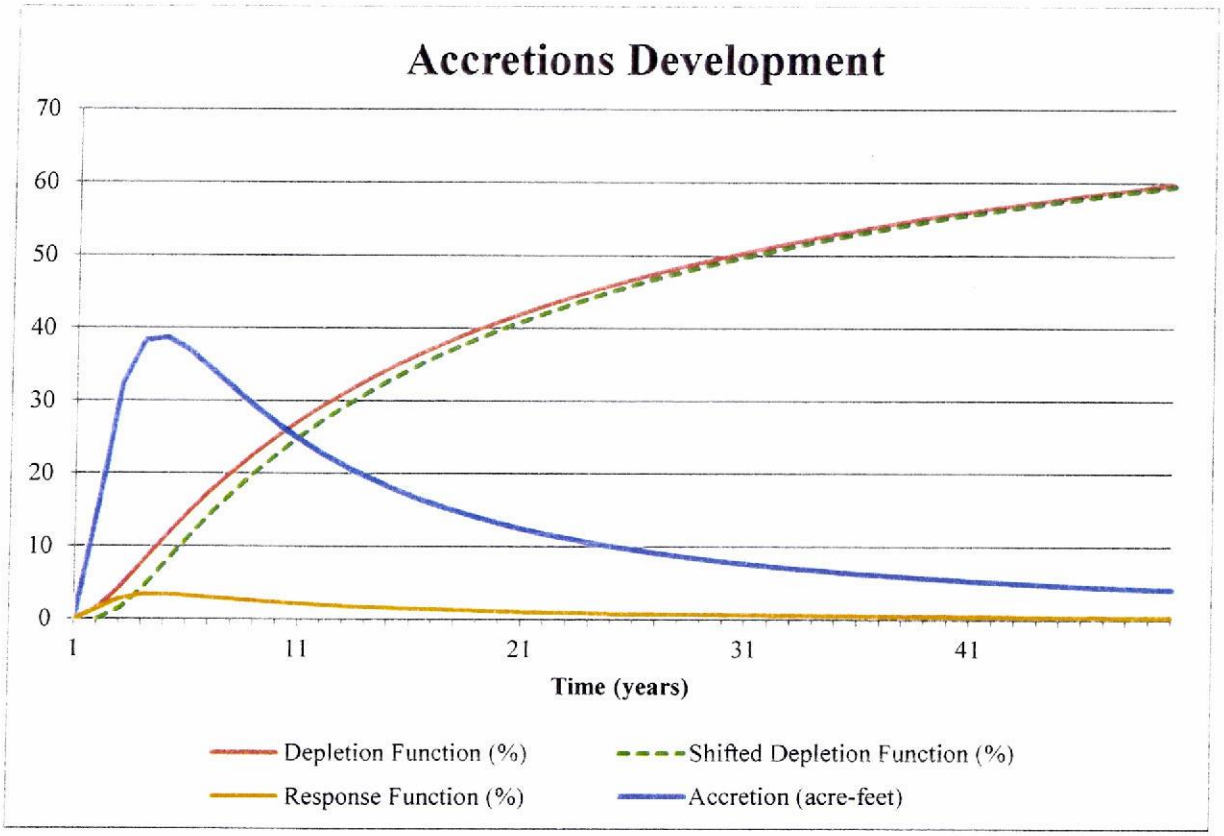

Figure 1: Cartoon illustrating temporal accretions estimation process using PBHEP zone functions (Depletion Functions) to create response function and estimated accretions. Below is a table showing the numbers used to generate the response function and an example of the calculations done to get the estimated accretions.

Year	1	2	3	4	5	6	7	8	9	10
Depletion Function (%)	0.083	1.496	4.353	7.737	11.155	14.412	17.442	20.234	22.800	26.684
Shifted Depletion Function (%)	0.000	0.083	1.496	4.353	7.737	11.155	14.412	17.442	20.234	22.800
Response Function (%)	0.083	1.413	2.857	3.384	3.419	3.257	3.030	2.792	2.565	2.357

Canal Loss = 1132 AF in year 1

$$Accretion_{Year\ 1} = 1132\ AF * \frac{0.083\%}{100\%} = 0.94\ AF$$

$$Accretion_{Year\ 10} = 1132\ AF * \frac{2.357\%}{100\%} = 26.68\ AF$$

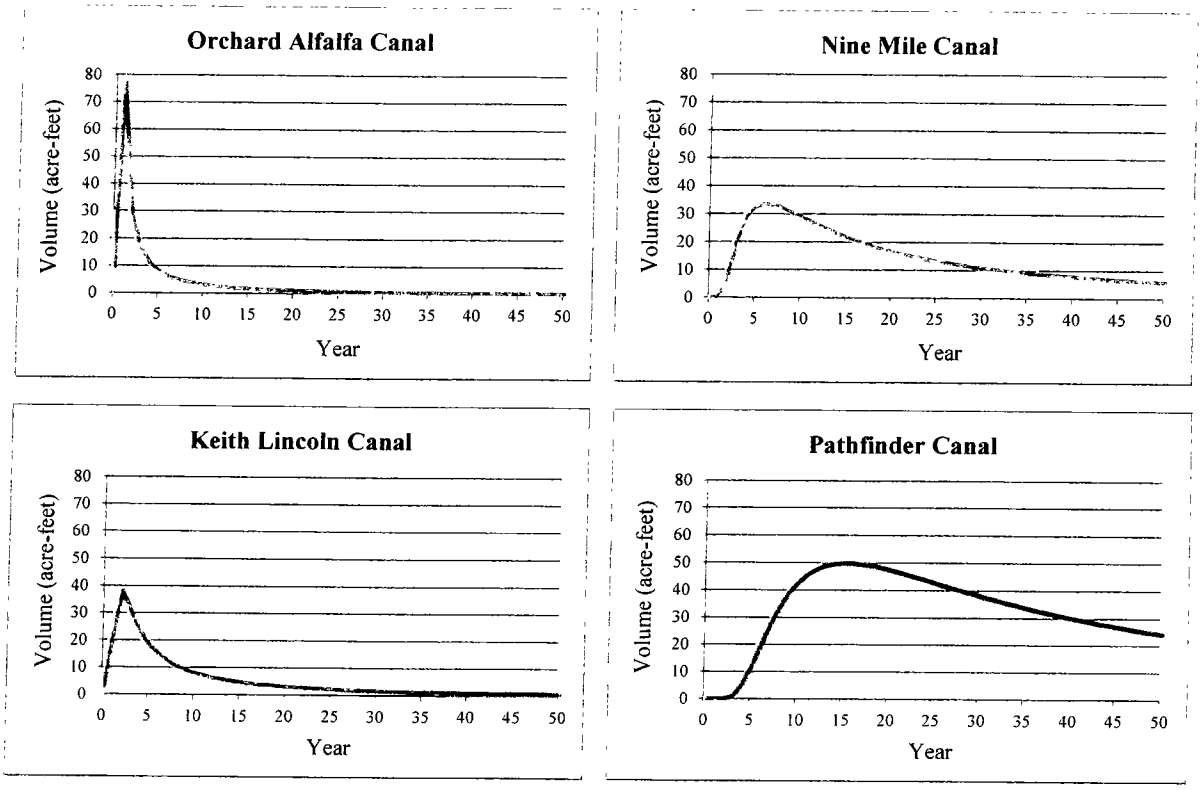

Figure 2: Accretions estimated from four different canals illustrating a variety of temporal patterns in estimated accretions to the Platte River.

3.0 Summary of Results

Results are summarized for each canal and the Western Canal Pond seepage project. These results are then aggregated by natural resources district. The estimated accretions to Platte River streamflow in each natural resources district is shown in table 2. These results estimate that the annual accretion during the first decade is approximately 1,000 to 1,500 AF per year and residual accretions greater than 500 AF per year will persist for 25 years. NRD specific estimates show a 50-year benefit to streamflow of between 2,000 and 12,000 AF, with total 50-year benefits around 36,000 AF. Table 3 presents the canal specific source data indicating that approximately 140,000 AF of water was diverted, of which about 65,000 AF is estimated to have seeped into groundwater storage. This indicates that much of the benefit from this single seepage demonstration may persist well beyond the 50-year planning horizon presented here. Water use and management practices in the interim will fundamentally effect the realization of these benefits, though this project has provided options that would not have been available if the Department and its collaborating partners had not taken the opportunity to divert and store abundant excess flows in the Platte River throughout 2011.

Year	NPNRD	SPNRD	TPNRD	TBNRD	CPNRD	Annual Total
2011	3	3	422	0	634	1062
2012	83	44	853	21	671	1672
2013	229	89	868	69	590	1844
2014	328	105	805	104	511	1853
2015	381	107	724	121	445	1777
2016	405	102	644	126	392	1669
2017	414	95	574	125	348	1555
2018	413	88	513	121	311	1446
2019	406	81	461	115	281	1344
2020	396	75	416	109	255	1251
2021	384	69	378	103	233	1167
2022	371	64	345	97	214	1091
2023	357	59	316	91	198	1022
2024	343	55	291	86	183	959
2025	330	51	269	81	171	903
2026	317	48	250	77	159	851
2027	305	45	233	72	149	804
2028	293	42	218	68	140	761
2029	281	40	204	65	132	722
2030	271	38	191	62	124	685
2031	260	36	180	59	118	652
2032	251	34	170	56	111	621
2033	241	32	161	53	106	593
2034	233	30	152	51	100	567
2035	224	29	145	48	96	542
2036	216	28	138	46	91	519
2037	209	26	131	44	87	498
2038	202	25	125	43	83	478
2039	195	24	119	41	80	460
2040	189	23	114	39	77	442
2041	183	22	109	38	74	426
2042	177	21	105	36	71	410
2043	171	21	101	35	68	396
2044	166	20	97	34	66	382
2045	161	19	93	33	63	369
2046	157	18	90	32	61	357
2047	152	18	86	30	59	346
2048	148	17	83	30	57	335
2049	144	17	80	29	55	324
2050	140	16	78	28	53	315
2051	136	16	75	27	52	305
2052	132	15	73	26	50	296
2053	129	15	70	25	48	288
2054	126	14	68	25	47	280
2055	122	14	66	24	46	272
2056	119	13	64	23	44	265
2057	117	13	62	23	43	258
2058	114	13	61	22	42	251
2059	111	12	59	21	41	244
2060	108	12	57	21	40	238
10yr Benefit	**3056**	**787**	**6281**	**911**	**4439**	**15474**
50yr Benefit	**11341**	**1913**	**11991**	**2753**	**8171**	**36168**

Table 2: Estimated annual accretions to the Platte River summarized by Natural Resources District. Units are acre-feet.

Project	Spring Diversion	Fall Diversion	Total Diversion	Total Recharge	10 year Benefit	50 year benefit
Pathfinder Canal	12718	0	12718	5087	178	1690
Farmers Canal	18425	0	18425	8660	1470	4471
Enterprise Canal	2559	0	2559	1689	287	872
Winters Creek Canal	0	882	882	42	7	22
Central Canal	524	1022	1545	331	56	171
Castle Rock Canal	1595	1069	2664	1198	42	398
Minatare Canal	2709	2338	5048	1207	205	623
Nine Mile Canal	1521	1114	2635	1850	314	955
Chimney Rock Canal	948	2965	3913	1049	178	542
Belmont Canal	2241	2965	5206	2789	98	926
Lisco Canal	2229	1516	3746	1301	221	672
Keith Lincoln Canal	1349	1914	3263	1676	833	1259
Suburban Canal	1230	1781	3010	1527	759	1147
North Platte Canal	2842	4245	7088	3616	1798	2716
Paxton Hershey Canal	1724	2483	4207	1691	425	1011
Western Ponds (TP)	0	0	0	3013	758	1801
Thirty Mile Canal	4134	5141	9275	2968	1640	2317
Orchard Alfalfa Canal	732	1871	2603	833	592	716
Gothenburg Canal	4641	5729	10370	3318	741	1915
Cozad Canal	1335	1714	3049	976	364	663
Dawson Co. Canal	2652	3450	6101	1952	104	741
Kearney Canal	4528	3832	8360	2675	997	1818
Phelps Canal	0	5558	5558	5163	911	2753
Western Canal (30% SP, 70% TP)	4528	15158	19687	9695	2439	5796
Western Ponds (SP)	0	0	0	392	55	174
Totals:	**75,165**	**66,746**	**141,911**	**64,699**	**15,474**	**36,168**

Table 3: Estimation of 10 and 50 year accretions to the Platte River by canal or contracting entity. Units are acre-feet.

Appendix A – Spreadsheet Calculations

A spreadsheet named *Recharge_2011_Final.xlsx* was developed to conduct the recharge calculations and is summarized according to the individual tabs of the spreadsheet below.

Tab 1: "2011_Seepage Extent"

This table is a tabulation of legal sections where water was routed in each canal. It is based upon data contained in maps provided by Irrigation Districts in coordination with the Department's Bridgeport Field Office showing locations where water was routed during the project. These maps are available with the permit filings and can be obtained by contacting the Department.

Tab 2: "Response zone f'n"

Response functions corresponding to six zones for each natural resources district are included in this tab. Functions assume a permanent introduced stress and were developed by the PBHEP technical committee[2] using COHYST databases and the Hunt[3] (1999) equation. Zone averages calculated by relating the section data from Tab 1 to the response function zone maps (Appendix B) are reported in this tab as well. The spatial relation was performed in ArcGIS. This tab also notates the natural resources district assigned to each canal, as well as the Response Function Zone.

Tab 3: "Total Diversions Spring"

Average daily diversion rates in cubic feet per second from April 1, 2011, through May 31, 2011, for each canal were imported into the spreadsheet from the Platte Water Accounting Program (PWAP) database[4]. Those rates were used to generate a daily volume of water, in acre-feet, diverted using the conversion factor of 1.9835. The gray cells represent the 30 days of diversions that were used to calculate the total acre-feet of water diverted during the recharge period.

Tab 4: "Recharge Rates Spring"

Data from the discharge measurement conducted by Department field office staff and provided by Tom Hayden were entered into the spreadsheet to determine the daily and average percentage of canal loss. Each measurement rate was compared to the average daily diversion rate to calculate a loss value for that day. Multiple daily loss values for one canal were averaged to arrive at a final loss values for a single canal. For canals where measurements were not available,

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[2] Approved by the PBHEP administrators as part of the "Trial Protocol for PBHEP Funds" at the April 7, 2010, meeting in North Platte, NE (Platte Basin Habitat Enhancement Project. *Meeting of the PBHEP Administrators*. 7 April 2010) and, after editorial changes (Czaplewski, Mark. "FW: Revised PBHEP Protocol with Depletion Zone Figures." Email to PBHEP Administrators. June 17, 2010), finalized on June 30, 2010 (Czaplewski, Mark. "PBHEP." E-mail to PBHEP Sponsors and Partners. June 30, 2010).

[3] Hunt, B. (1999), Unsteady Stream Depletion from Ground Water Pumping. Ground Water, 37: 98–102.

[4] PWAP is an accounting program used by the Department of Natural Resources Bridgeport Field Office to apportion natural flow and track storage.

estimates from the COHYST 2010 STELLA model were entered. The canals are organized by natural resource districts.

Tab 5: "Div + Recharge by NRD Spring"

Based upon the data in the "Total Diversions Spring" tab and "Recharge Rates Spring" tab, the total volume of water recharged is calculated and listed in acre-feet for each canal. The canal diversions and recharge rates are then summarized and listed by natural resources district. Individual canal values relating to each of the NRDs were assigned according to the table in Tab 2 and are reported in the sheet. Because Western Canal is within the bounds of two NRDs, the canal recharge was distributed as 70 percent Twin Platte NRD and 30 percent South Platte NRD. Of the nine ponds utilized under Western Canal, seven of the ponds were located inside Twin Platte NRD and two ponds were located in South Platte NRD. The ponds were measured individually and diversions and canal recharge were assigned according to the NRD where they exist.

Tab 6: "Total Diversions Fall"

Average daily diversions rates in cubic feet per second from September 1, 2011, through November 14, 2011, for each canal were imported into the spreadsheet from the PWAP database. Those rates were used to generate a daily volume of water, in acre-feet, diverted using the conversion factor of 1.9835. Average daily diversions from September 1, 2011, through January 5, 2012, for the Phelps Canal were imported into the spreadsheet from the PWAP database. January diversions for the Phelps Canal are included in this report for 2011. The gray cells represent the days of diversions that were used to calculate the total acre-feet of water diverted during the recharge period.

Tab 7: "Recharge Rates Fall"

Data from the discharge measurement conducted by Department field office staff and provided by Tom Hayden were entered into the spreadsheet to determine the daily and average percent of canal loss. Each measurement rate was compared to the average daily diversion rate to calculate a loss value for that day. Multiple daily loss values for one canal were averaged to arrive at a final loss values for a single canal. For canals where measurements were not available, estimates from the STELLA model were entered. For the Phelps canal, daily monitoring and spill estimation information was provided by Cory Steinke from Central Nebraska Public Power and Irrigation District (CNPPID).

Tab 8: "Div + Recharge by NRD Fall"

Based upon the data in the "Total Diversions Fall" tab and "Recharge Rates Fall" tab, the total volume of water diverted and recharge is calculated and listed in acre-feet for each canal. The

canal diversions and recharge rates are then summarized and listed by natural resource districts. Individual canal values relating to each of the NRDs were assigned according to the table in Tab 2 and are reported in the sheet. Because Western Canal is within the bounds of two NRDs, the canal recharge was distributed as 70 percent Twin Platte NRD and 30 percent South Platte NRD. Of the nine ponds utilized under Western Canal, seven of the ponds were located inside Twin Platte NRD and two ponds were located in South Platte NRD. The ponds were measured individually and diversions and canal recharge were assigned according to the NRD where they exist.

Tab 9: "Total Recharge by NRD 2011"

Data from the "Div + Recharge by NRD Spring" and "Div + Recharge by NRD Fall" tabs are listed in this tab by canal and summed to show the total recharge during 2011.

Tab 10: "Spring Response"

Data from the "Div + Recharge by NRD Spring" and "Response zone f'n" tabs are incorporated in this tab by canal to create annual accretion functions and accretions by canal.

Tab 11: "Fall Response"

Data from the "Div + Recharge by NRD Fall" and "Response zone f'n" tabs are incorporated in this tab by canal to create annual accretion functions and accretions by canal.

Tab 12: "2011summary"

Data from the "Spring Response" and "Fall Response" tabs are incorporated in this tab to aggregate annual accretions by NRD. Data from the "Spring Response" and "Fall Response" tabs, as well the "Div + Recharge by NRD Spring," "Div + Recharge by NRD Fall," and the "Total Recharge by NRD 2011" tabs were used to create a diversions and benefits summary by canal.

Appendix B – Response Function Zone Maps by NRD

The following maps were drafted by the PBHEP administrators for the purpose of evaluating the expected relative effects of proposed projects. The maps were developed using simple distance calculations as well as location-specific information believed to influence the relative similarity or difference among projects geographically. The maps are considered draft and while informative are not intended to represent a definitive quantitative assessment of relative response. Modeling tools currently in development are anticipated to provide a more robust measure of the spatial distribution of meaningful response function zones that are expected to supersede these maps upon their completion. The attached maps illustrate the response function zones one (1) through five (5). Response zone 6 is assumed to be any remaining area within the respective natural resources districts.

Appendix B – Response Function Zone Maps by NRD

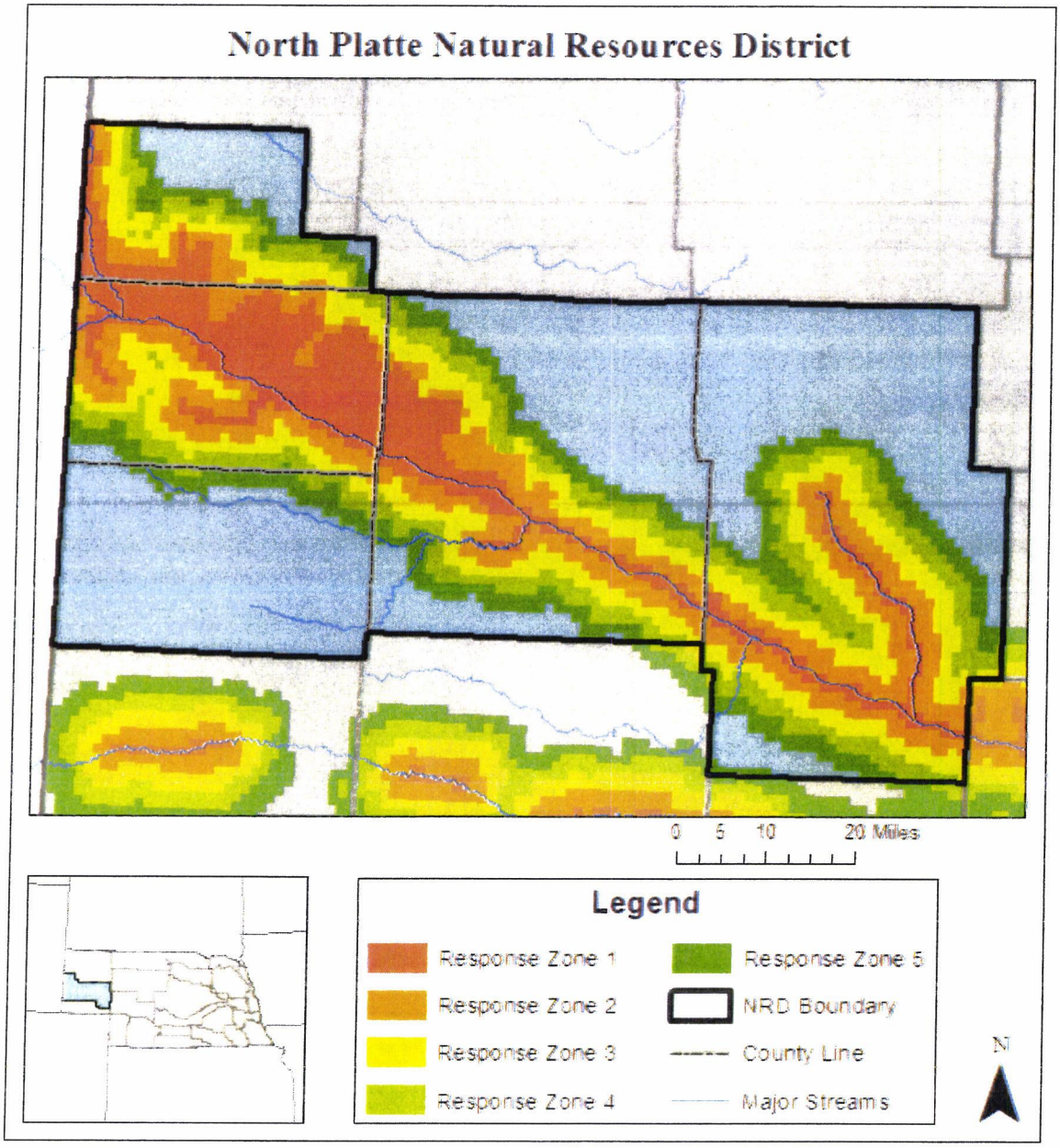

Figure 1: North Platte Natural Resources District response function zones.

Appendix B – Response Function Zone Maps by NRD

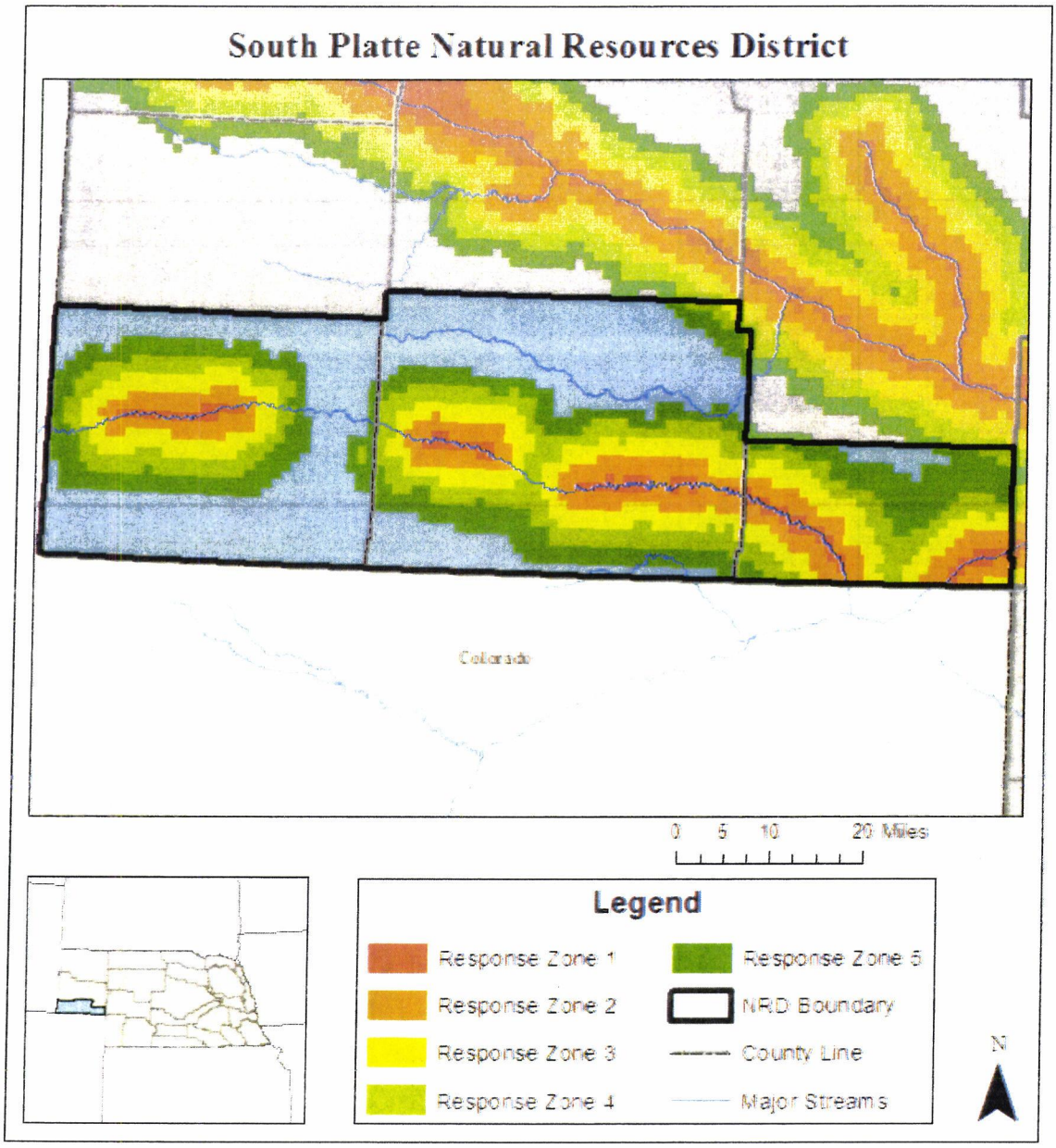

Figure 2: South Platte Natural Resources District response function zones.

Appendix B – Response Function Zone Maps by NRD

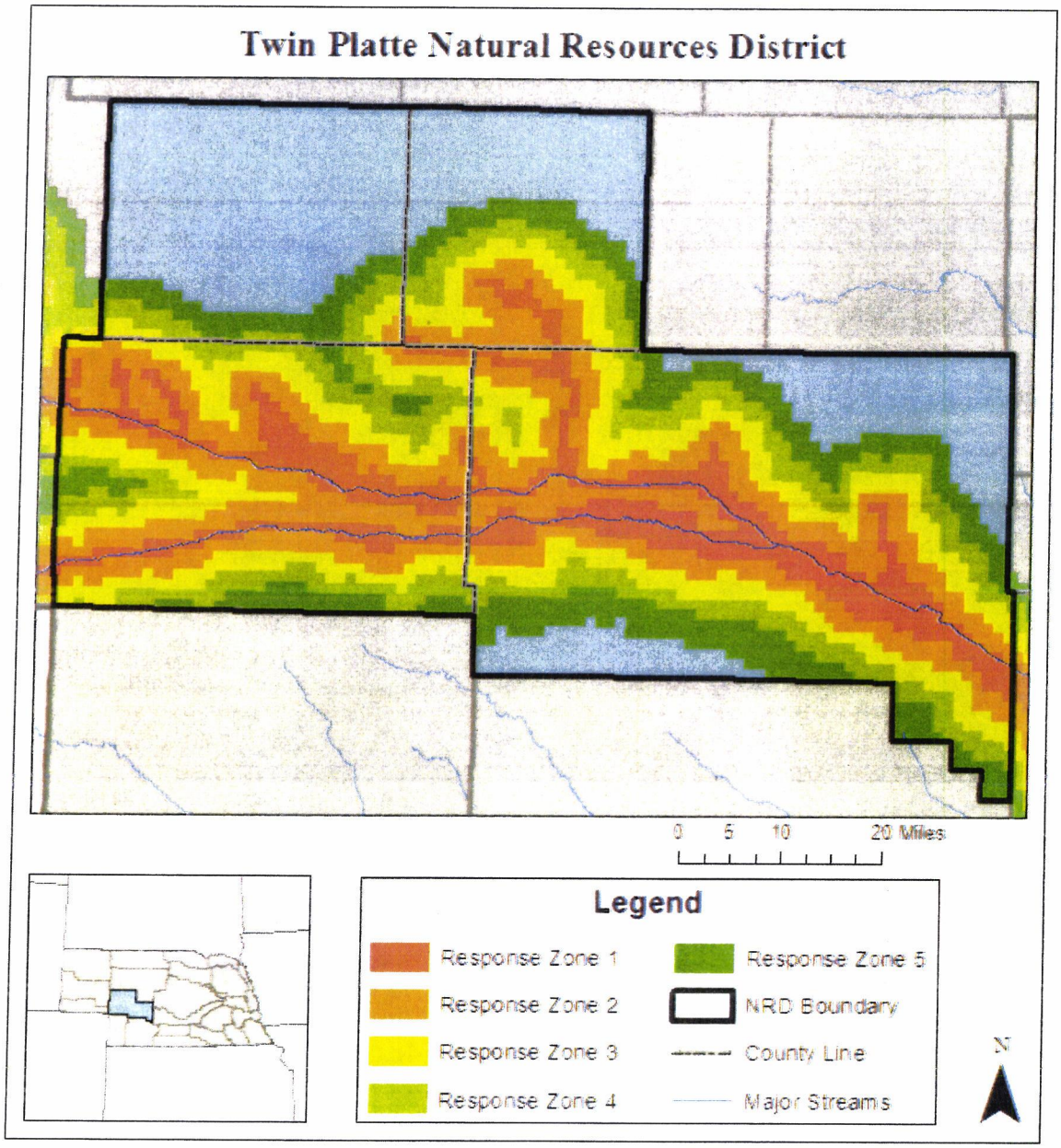

Figure 3: Twin Platte Natural Resources District response function zones.

Appendix B – Response Function Zone Maps by NRD

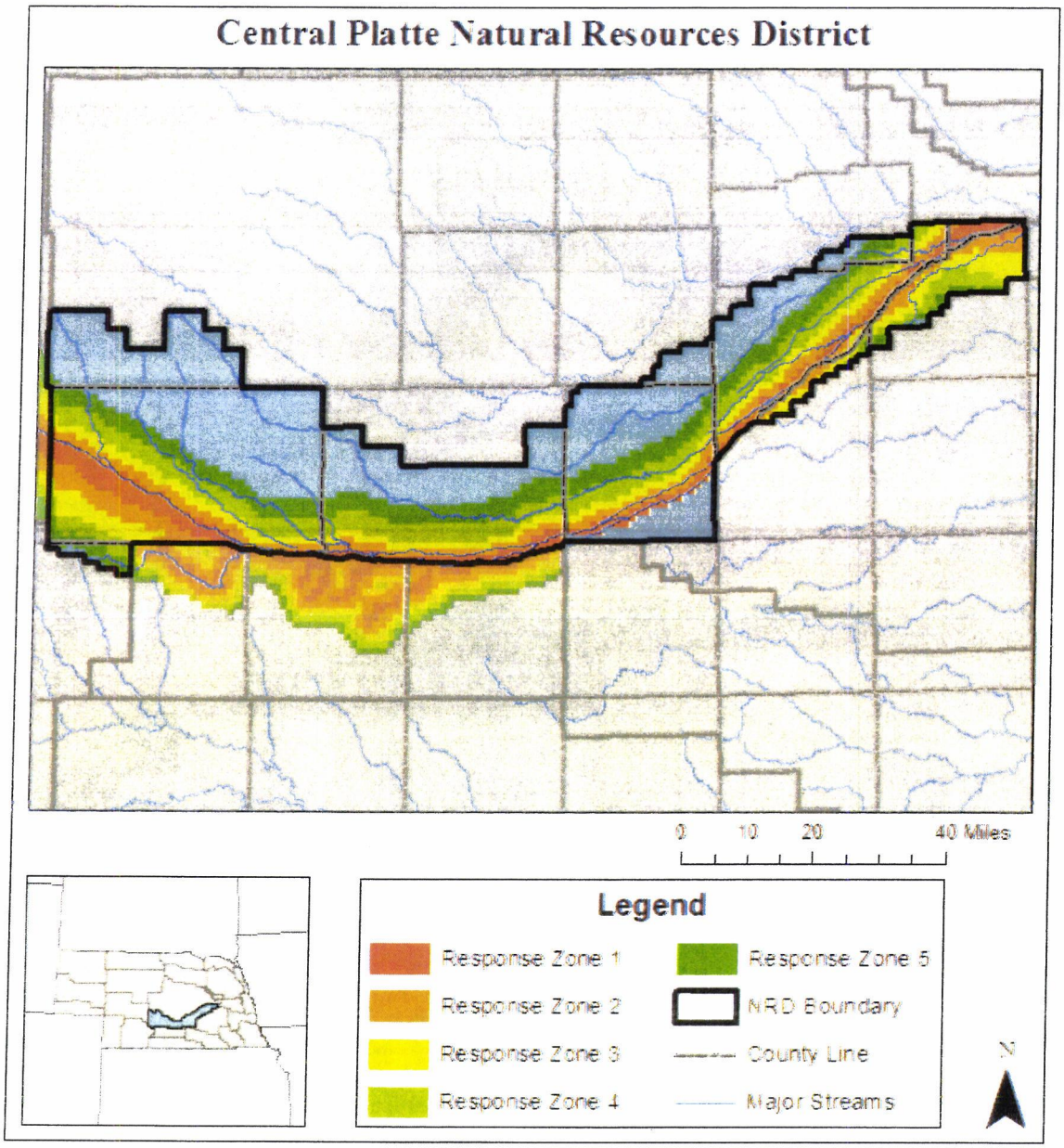

Figure 4: Central Platte Natural Resources District response function zones.

Appendix B – Response Function Zone Maps by NRD

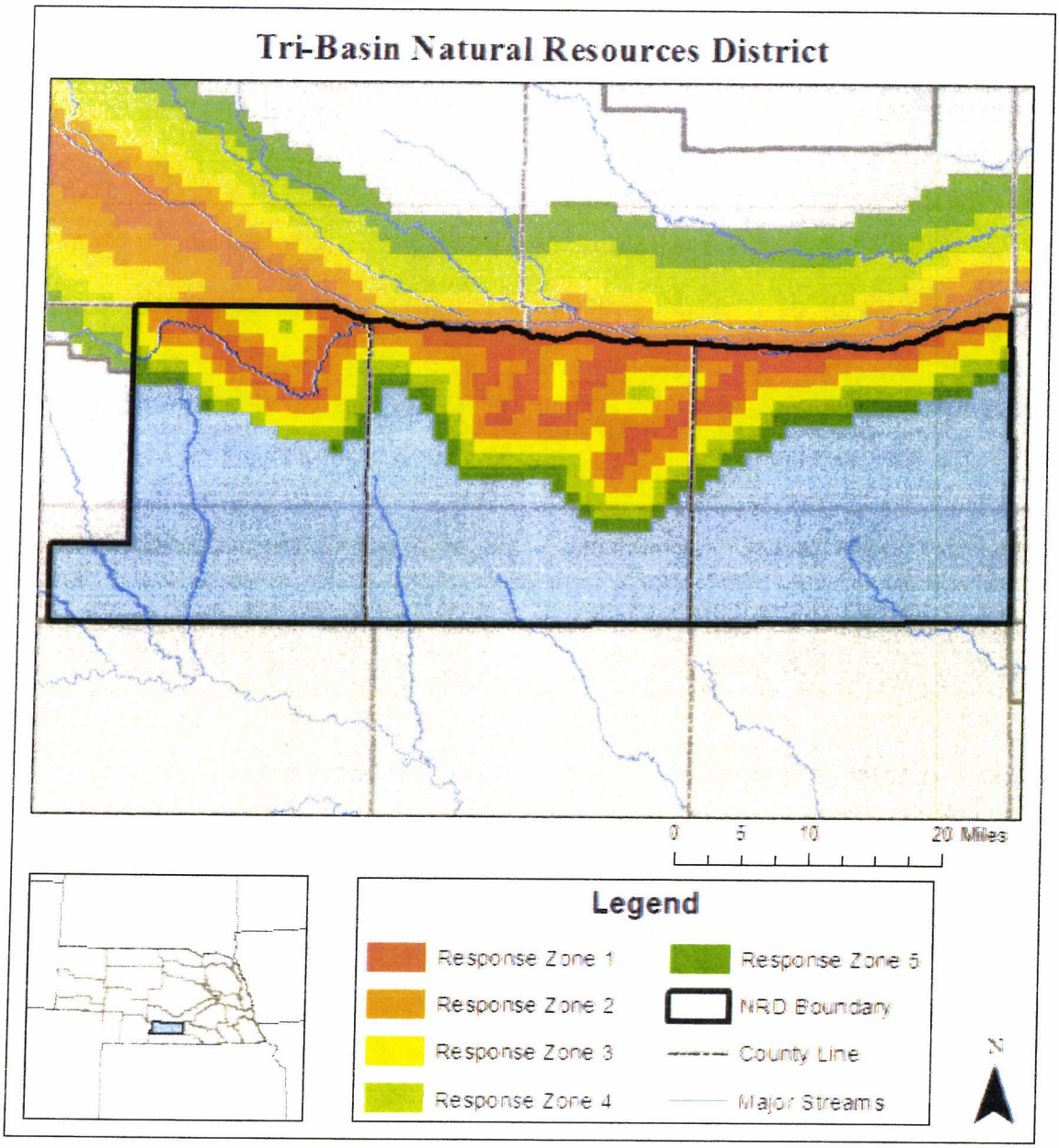

Figure 5: Tri-Basin Natural Resources District response function zones.