STATE OF NEBRASKA

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Governor

DEPARTMENT OF NATURAL RESOURCES
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IN REPLY TO:

VIA ELECTRONIC MAIL ONLY

Date: January 6, 2012

TO: Governance Committee (GC) of the Platte River Recovery Implementation Program (PRRIP)

FROM: Jim Schneider, State of Nebraska's Representative to the GC
Deputy Director, Nebraska Department of Natural Resources

SUBJECT: Nebraska Update on Continued Implementation of the Nebraska New Depletion Plan (NNDP)

Nebraska is meeting the terms of the Nebraska New Depletions Plan (NNDP). Based upon current estimates, the amount of accretions due to mitigation measures exceeds the amount of depletions from new or expanded uses. Details on the analysis and Nebraska's continued efforts to implement the NNDP are discussed in this memo. This memo also contains a general description of Nebraska's continuing work to conduct a complete and comprehensive assessment of all post-July 1, 1997, activities.

This update is being provided to the Governance Committee to outline Nebraska's depletive activities and mitigation measures through November 1, 2011, resulting from new and expanded uses of water as defined in the NNDP. This update utilizes information from previous memos and annual reports as well as additional information developed by Nebraska to summarize the net effect (difference between depletive activities and mitigation measures) through the end of the first increment (2019). The four sections in this update are described in detail below. If there are questions on the contents of this document please contact Jennifer Schellpeper at 402-471-2899 or jennifer.schellpeper@nebraska.gov.

MEMO ORGANIZATION

Section 1 includes updates on 3 separate items: a) an update to the Nebraska annual report for the period 2006 to 2009 (12/30/2010) on the estimated depletions due to activities permitted between 2006 and 2009; b) a review of the estimated depletions of unpermitted new or expanded uses since July 1, 1997 (some of which were previously reported in Nebraska's December 2, 2008, memo (2008 Memo) to the Governance Committee (GC)); and c) new values for the depletive effects due to changes in human and livestock populations through 2010.

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Section 2 reviews the mitigation measures currently in place to offset the depletions from the activities described in Section 1 (some of which were also previously reported in the 2008 Memo to the GC). Section 2 also discusses the institutional mechanisms and inter-agency programs and projects (federal, state, and local Nebraska Natural Resource Districts (NRDs)) that are being implemented to mitigate depletions.

Section 3 summarizes the net effect of the combined depletions and mitigation measures from Sections 1 and 2 and the resulting effect of these activities on streamflows of the Platte River in Nebraska.

Section 4 describes the continued efforts currently in process to refine assessment methodologies. This section describes the development and refinement of datasets and modeling projects that Nebraska is currently pursuing to comprehensively assess the effects of all new or expanded activities that have occurred since July 1, 1997.

1.0 UPDATE ON NEW OR EXPANDED ACTIVITIES

1.1 Net effect to streamflow of permitted new or expanded water use activities between 2006 and 2010

The NNDP specifies that Nebraska is to supply an annual report of all permitted new or expanded water uses, their associated depletive effects, and the mitigation measures supplied to offset those depletions. Nebraska's first annual report (12/30/2010) for activities permitted in 2006 through 2009 listed the permits, but it did not include their associated depletive effects and the mitigation measures supplied as offset. An analysis of depletions and mitigations is necessary to understand the net effect of permitted activities, and Nebraska has now completed that analysis. Table 1 includes those depletions and mitigations, along with the depletions and mitigations from permits issued in 2010 that are reported in Nebraska's second annual report (1/6/2012) for activities permitted in calendar year 2010. Nebraska's 1/6/2012 annual report describes the methodology used to calculate the depletion and mitigation values. A negative value in the tables represents depletion to the stream, and a positive value represents an accretion to the stream. Table 1 shows that the net effect of the permitted activities is positive in years 2007 through 2019; therefore, no additional mitigation measures are needed to maintain a neutral balance to streamflow.

Table 1. 2006-2010 permitted new and expanded groundwater and surface water use depletions and mitigations (acre-feet).

	Upstream of Critical Habitat Reach			Within Critical Habitat Reach			**Net effect of permitted activities**
Year	Depletions	Mitigations	Net	Depletions	Mitigations	Net	**Total**
2006	-9	25	15	-206	4	-202	**-187**
2007	-25	66	41	-11	15	4	**45**
2008	-84	180	95	-31	38	7	**102**
2009	-190	377	187	-60	55	-5	**182**
2010	-285	522	237	-94	124	30	**267**
2011	-346	618	272	-125	157	33	**304**
2012	-393	689	295	-151	179	28	**323**
2013	-434	745	311	-174	196	21	**332**
2014	-469	790	322	-194	208	14	**337**
2015	-499	829	331	-213	219	7	**337**
2016	-526	862	337	-229	228	-1	**336**
2017	-549	891	342	-244	236	-8	**334**
2018	-571	916	345	-258	243	-15	**330**
2019	-591	938	348	-270	248	-22	**326**

1.2 Update on other new or expanded water use activities

In addition to the post-2005 permitted activities, the NNDP states that Nebraska will mitigate for various permitted and unpermitted new or expanded water use activities occurring after July 1, 1997. In the 2008 Memo, Nebraska assessed various water use activities (from irrigated acres, human population, and livestock population) between 1997 and 2005 within the COHYST modeled area. Since then, Nebraska has updated the population data for humans and livestock through 2010 and made preliminary estimates of their depletive effects, -500 acre-feet annually due to human population change and -15 acre-feet annually due to livestock population change. The irrigated acres data has not been updated through 2010 and will be as discussed in more detail in section 4 of this report. The estimated depletive effect from the original 1997 to 2005 change in irrigated acres and the updated human and livestock depletive effects are summed in table 2 under "Depletive effect from other activities".

Table 2. Net effect of permitted activities, and the depletive effect of other activities through 2019 (acre-feet).

Year	Net effect of permitted activities	Depletive effect[1] from other activities
2012	323	-19,285
2013	332	-19,691
2014	337	-20,002
2015	337	-20,206
2016	336	-20,398
2017	334	-20,804
2018	330	-21,277
2019	326	-21,554

2.0 MITIGATION MEASURES FOR NEW OR EXPANDED WATER USE ACTIVITIES

2.1 Introduction / Background

This section summarizes various mitigation measures that Nebraska has implemented to address the depletive effects described in Section 1. This summary supplements previously reported information and includes a discussion of commitments to implement Water Action Plan projects and other projects for which Nebraska is currently contracting. This section does not include the mitigation measures for new or expanded water use activities permitted between 2006 and 2010 described in Section 1.

2.2 Mitigation Measures Implemented through November 1, 2011

Nebraska has in place the funding and the institutional mechanisms (integrated management plans (IMPs), monitoring protocols, projects, etc.) that provide for implementing mitigation measures, meeting the terms of NNDP and meeting the broader objectives of Nebraska's IMPs. The accretive effect of all mitigation measures described in this section is summarized in table 3.

[1] Human population numbers are from U.S. Census Bureau data, and consumptive use per person is assumed to be 100 gallons per capita/day. Livestock population numbers are estimated from cattle population reported by National Agricultural Statistics Service, and consumptive use is assumed to be 7 gallons/day.

Table 3. Accretive effect from other mitigation measures through 2019 (acre-feet).

Year	Accretive effect from other mitigation measures
2012	21,427
2013	21,940
2014	38,374
2015	38,567
2016	38,500
2017	38,524
2018	38,605
2019	38,707

Nebraska has several projects in various stages of implementation to provide mitigation for new and expanded uses. Most of the projects are funded through the Platte Basin Habitat Enhancement Project (PBHEP). From 2009-2011, through cash contributions from the NRDs, the Department of Natural Resources (Department) water resources cash fund (WRCF), and a grant from the Nebraska Environmental Trust, PBHEP committed $15 million to water acquisition, some of which remains to be implemented. A new funding mechanism, the Platte Basin Water Management Action Initiative (Initiative), is intended to replace PBHEP once all the funding from PBHEP is utilized. The Department, via the WRCF, and the NRDs have committed $16.5 million over the next three-year period to the Initiative.

The Department and the NRDs are retiring water use on irrigated land utilizing several programs in addition to PBHEP. Federal programs include the Agricultural Water Enhancement Program (AWEP), Conservation Reserve Enhancement Program (CREP), and Environmental Quality Incentives Program (EQIP). Enrollment in these programs has resulted in both temporary and permanent retirements of irrigated acres throughout the Platte River Basin (table 4). These retirements reduce the consumptive use of irrigation water and subsequently the amount of streamflow depletion due to those uses. AWEP, CREP, and EQIP have temporarily retired 16,271 acres, retirements which last anywhere from three to 15 years, and they have permanently retired 3,862 acres. Some NRDs have also retired irrigated acres through other conservation easements, which have permanently retired 1,348 acres and temporarily retired 358 acres.

Table 4. Total acres in various types of irrigation retirement through November 1, 2011.*

	AWEP	CREP	EQIP	PBHEP	Other
Total	**4,121**	**10,718**	**5,293**	**2,485**	**1,706**

* A grand total of all acres retired by all these programs are not presented because some acres are enrolled in more than one program. This overlap has been accounted for in the estimate of streamflow accretions resulting from retirements in the "Accretive effect from other mitigation measures" column in tables 3 and 5.

Beyond the permanent retirement of irrigated acres (table 4), PBHEP has approved funding for the North Dry Creek Augmentation Project, Cozad Canal Conjunctive Management Project, and the Thirty-Mile Canal Conjunctive Management Project. According to analysis completed by individual NRDs, these three projects are estimated to supply 16,972 acre-feet of water[2] annually in the critical habitat reach of the central Platte River.

In 2011, with funding through PBHEP, Nebraska also initiated a groundwater recharge demonstration project that diverted flows of the Platte River in excess of PRRIP target flows. Diverted water was directed into existing canals so that the water would seep through the canals, laterals, and ponds into the groundwater and eventually return to the Platte River. Diversions were made before and after normal irrigation season diversions in 2011. Current diversion data (from before irrigation season only) and analysis estimate that approximately 77,000 acre-feet of excess flow was diverted and about 31,000 acre-feet of the diverted flows seeped into the groundwater system.

In 2008 and 2009, Tri-Basin NRD (TBNRD) contracted with Central Nebraska Public Power and Irrigation District (CNPPID) to divert water from the Platte River into Elwood Reservoir for purposes of increasing groundwater recharge from the reservoir. A total of 9,800 and 2,900 acre-feet of water were diverted in 2008 and 2009, respectively, and were above and beyond normal diversions into the reservoir for irrigation deliveries. These diversions were made from the Platte River when streamflows exceeded target flows or when irrigation deliveries were suspended due to heavy rainfall in the irrigated area of the CNPPID. The recharge to groundwater will provide future accretions to the Platte River.

Nebraska is also working closely with PRRIP and CNPPID to develop the J-2 re-regulating reservoir, a Water Action Plan project. The Department will subcontract with several NRDs who will implement portions of Nebraska's share of the project. Nebraska is committed to providing adequate funding so that approximately one-quarter of the project yield will be for the benefit of Nebraska toward meeting the terms of the NNDP. At this time, one-quarter of the project is estimated to yield 10,200 acre-feet of water annually[3], intended to meet Nebraska's commitment to offset new and expanded uses since July 1, 1997.

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[2] North Dry Creek Project yields 972 AF/year (from letter dated October 3, 2011, from John Thorburn, Manager, Tri-Basin NRD to Jim Schneider, Deputy Director, Nebraska Department of Natural Resources).
Cozad Canal yields 8,000 AF/year and Thirty-Mile Canal yields 8,000 AF/year (from letter dated September 20, 2011, from Mark M. Czaplewski, PBHEP Coordinator to Mark Brohman, Executive Director, Nebraska Environmental Trust).

[3] Analysis by the Department

The North Platte NRD (NPNRD) has established regulatory measures designed to meet the mitigation requirements of the NNDP. The regulatory measures put into place an allocation of all groundwater withdrawals within the COHYST 28/40 modeled area in the NPNRD such that, over the long-term, consumptive water use on all groundwater irrigated lands within the area will be reduced by approximately 7% to offset for newly added irrigated acreage subsequent to 1997.

3.0 SUMMARY OF DEPLETIVE ACTIVITIES AND MITIGATION MEASURES

3.1 Net Effect of Depletions and Mitigations Through 2019

Table 5 summarizes the net effect of all activities discussed in Section 1 and all mitigation measures discussed in Section 2. A basic premise of the NNDP is that depletions to the river be offset in time; therefore, Nebraska is reporting depletions and offsets from the current year forward. The results of this preliminary assessment indicate that current and projected mitigation measures exceed the current depletions by approximately 17,000 acre-feet per year at the end of the first increment (2019). Section 4 will further discuss Nebraska's efforts to refine this assessment.

As mentioned at the beginning of Section 2.0, beyond meeting Nebraska's obligations in the NNDP, there are broader IMP objectives the Department and the NRDs are working to attain with the mitigation measures described here. Therefore, the 17,000 acre-feet of estimated mitigation measures in excess of depletive effects are intended to be available to meet Nebraska's own water planning objectives.

Table 5. Net effect through 2019 of depletions and accretions from mitigation measures (acre-feet).

Year	Net effect of permitted activities	Depletive effect[4] from other activities	Accretive effect from other mitigation measures	**Net effect of permitted and other activities**
2012	323	-19,285	21,427	**2,466**
2013	332	-19,691	21,940	**2,582**
2014	337	-20,002	38,374	**18,707**
2015	337	-20,206	38,567	**18,697**
2016	336	-20,398	38,500	**18,437**
2017	334	-20,804	38,524	**18,054**
2018	330	-21,277	38,605	**17,658**
2019	326	-21,554	38,707	**17,478**

[4] Human population numbers are from U.S. Census Bureau data, and consumptive use per person is assumed to be 100 gallons per capita/day. Livestock population numbers are estimated from cattle population reported by National Agricultural Statistics Service, and consumptive use per animal is assumed to be 7 gallons/day.

4.0 NEBRASKA'S CONTINUED EFFORTS TO REFINE ASSESSMENT METHODOLOGIES

Nebraska continues to develop and refine datasets and modeling tools that will provide for a more comprehensive assessment of the net depletive effects of water use activities since 1997 through two projects, the Western Water Use Modeling (WWUM) project and the COHYST 2010 modeling project. Many of the refinements Nebraska is pursuing have been previously reported[5], and updates on these activities are summarized in the discussion below. Section 4.1 discusses dataset development and refinement, Section 4.2 provides an update on the status of the modeling tools, and Section 4.3 presents the general process that will utilize the refined datasets and modeling tools.

4.1 Datasets

Several datasets are currently being refined and further developed for inclusion in modeling projects in order to provide a more comprehensive and accurate assessment of the combined effects of depletive and mitigative activities in Nebraska. These datasets, described below, do not include all the datasets that will be incorporated into the modeling projects. When the refined and updated datasets become available, they will be incorporated into the models spatially and temporally.

Irrigated Acres: Both the COHYST 2010 project and WWUM project have nearly completed the development of irrigated acreage datasets. Significant efforts were made by both groups over the past year to refine previous estimates by utilizing newly available information (geospatial certified acreage) and refined methods.

Municipal/Industrial Consumptive Water Use and Rural Domestic Consumptive Water Use: The Department has compiled human population change statistics and completed preliminary assessments of rural and municipal population growth through 2010. The NRDs are compiling information to identify per capita use in their respective municipal public water systems to estimate consumptive use changes due to population growth as well as data from industrial uses in the basin.

Livestock Consumptive Use: The Department has compiled livestock population change statistics and completed a preliminary assessment of the population changes and resulting consumptive use changes through 2010.

Small Reservoirs and Sand Pits: The Department is developing methodology to quantify the change in surface area since 2005 of small reservoirs and sand pits. Once this assessment is completed, changes in consumptive use will be calculated.

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[5] Schellpeper, J.J., 2008. *Nebraska New Depletions Plan Report, Memo to Platte River Governance Committee*, December 2, 2008. 11 pp.; a letter dated December 30, 2010 from Jim Schneider, Deputy Director, Nebraska Department of Natural Resources to Jerry Kenny, Executive Director, Platte River Recovery Implementation Program Governance Committee. Letter includes *Nebraska New Depletion Plan Annual Permit Activity Report* and *Nebraska Update on Bullets 2,4, and 5 under Section IV of the Nebraska New Depletion Plan*; and a memo dated February 218, 2011from Jim Schneider to the GC dated February 28, 2011, *Overview of the Nebraska New Depletion Plan Implementation Process.*

Recharge due to Canal Seepage Demonstration Project: The Department has compiled diversion information and developed preliminary seepage estimates from the spring 2011 basin canal recharge project. Additional work is proceeding on compiling this information for the fall 2011 basin canal recharge project.

4.2 Model Refinements

Previous comprehensive assessments by Nebraska focused on the use of modeling tools developed through the COHYST modeling project. This modeling group has now formed two separate modeling groups to implement the Western Water Use Modeling project (for the area upstream of Lake McConaughy) and COHYST 2010 modeling project (for the area downstream of Lake McConaughy to the Loup River confluence). The need for two distinct modeling projects was largely due to differing physical settings and management strategies in the two regions. Below are descriptions of the modeling tools being developed through each of these projects and the current status of the tools.

COHYST 2010 Modeling Tools: The COHYST 2010 suite of modeling tools includes four component tools: 1) watershed (CROPSIM and custom post processing); 2) routing (STELLA); 3) groundwater (MODFLOW); and 4) integrated (CROPSIM, STELLA and MODFLOW together). The CROPSIM tool is fully developed and being utilized to provide inputs for the MODFLOW tool. The MODFLOW tool is currently finishing calibration and documentation. The STELLA tool is also finishing calibration. Node rules are being refined to improve observations matches, and information transfers between the respective component tools are continually updated with any component changes.

Western Water Use Modeling Tools: The Western Water Use suite of modeling tools includes four component tools: 1) watershed (CROPSIM and custom post processing); 2) surface water operation (StateMod); 3) groundwater (MODFLOW); and 4) integrated (CROPSIM, StateMod and MODFLOW together). The CROPSIM tool is fully developed and being utilized to provide inputs for the MODFLOW tool. The MODFLOW tool is nearing completion of the pre-development period and transitioning to calibration of the development period (1953-2010). The StateMod tool is in the beginning phases of the development period calibration. Node rules are being refined to improve observations matches, and information transfers between the respective component tools are continually updated with component changes.

4.3 General Approach for Implementation of Modeling Tools and Datasets

Nebraska is finalizing a guidance document to outline the general process by which a more robust assessment of all water use activities and mitigation measures will be evaluated once datasets are finalized and model tools are completed. This process will provide a means to temporally and spatially refine Nebraska's assessment of the combined effects of depletive activities and mitigation measures summarized in Section 3 above. This approach will utilize integrated groundwater, watershed, and operations models to assess the timing, amount, and location of depletive effects and mitigation measures. Modeling tools will be peer reviewed by independent experts.

Once all data has been compiled, the model(s) will be populated with compiled data and an assessment will be made of the impacts of new or expanded uses (depletive activities) and all mitigation measures since July 1, 1997 on the streamflow of the Platte River and its tributaries. The assessment will incorporate the effects of all depletive activities and mitigation measures that have been estimated in Sections 1 through 3 of this update.