

Responses to the North Dakota State Water Commission

Comments on the Draft Report on the Red River Valley Water Supply Project Needs and Options



State of North Dakota

Office of the State Engineer

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September 29, 2005

Red River Valley Water Supply Project
Bureau of Reclamation
P. O. Box 1017
Bismarck, ND 58502-1017

To Whom It May Concern:

Enclosed please find comments prepared by North Dakota State Water Commission staff regarding the "Report on the Red River Valley Water Needs and Options." If you have any questions regarding these comments, please contact Bob Shaver, Director, Water Appropriation Division at 328-2754.

Sincerely,

Dale L. Frink
State Engineer

DLF:mb
Encl.

Responses to the North Dakota State Water Commission

Comments and suggestions on the
DRAFT REPORT on RED RIVER VALLEY WATER NEEDS and OPTIONS
through Dale Frink, ND State Engineer

Chapter Two, Needs Assessment

There are no comments on chapter 2.5 Water Conservation Measures.

Chapter Three, Hydrology

Pg 3-3 paragraph 2; "NDCC chapter 61-04 requires that an appropriation of water involve an actual diversion and works before a water permit is issued." This statement is not correct. The issuance of a water permit is required "before commencing any construction for the purpose of appropriating waters of the state" (61-04-02). Works are required to obtain a Perfected Water Permit.

Pg 3-3 paragraph 5; "when there are competing applications for water from the same source, and the source is insufficient to supply all applicants, the State Engineer is required to adhere to the following order in determining whether the proposed appropriation is in the public interest (NDCC 61-04-06.1 Preference in granting permits)." Remove " in determining whether the proposed appropriation is in the public interest" and add, "of priority".

Pg 3-8 last paragraph on Elk Valley Aquifer, last sentence "Grand Forks-Traill Water, Tri-County Water, and several small individual communities use the aquifer." For this aquifer, and for all of the others described in this report, there should be a reference to the fact that there are also local domestic and stock wells that use the aquifer as a water supply. Even though they are not required by state law to have a water permit, these users have the same water right protections as permitted users.

Pg 3-9 & 3-10 tables 3.2.1 & 3.2.2
There is no relationship between these two tables. Text pertaining to Table 3.2.2 is found after page 3-18. Table 3.2.2 should be moved back many pages.

Pg 3-12 paragraph 3, Milnor Channel Aquifer, 8th sentence
When a number like the "50,000 ac-ft per year" is discussed, there should be a reference to what report that figure comes from, or a basis for the estimate or calculation.

Pg 3-16 last paragraph on page, "Wahpeton Buried Valley Aquifer"
Schoenberg (1998) says:

Responses to the North Dakota State Water Commission

Response to Comment 1

This has been corrected in the Final Needs and Options Report.

Response to Comment 2

This has been corrected in the Final Needs and Options Report.

Response to Comment 3

A reference to domestic and stock wells was added to page 3-8 in the Final Needs and Options Report.

Response to Comment 4

This has been corrected in the Final Needs and Options Report.

Response to Comment 5

A reference was added.

Response to Comment 6

Corrections have been made and references have been added.

pg 1, Abstract, paragraph 4; "The Wahpeton Shallow Sand, the Wahpeton Sand Plain, and the Wahpeton Buried Valley aquifers comprise the Wahpeton aquifers ..."

pg 2, Introduction, paragraph 1; "The Wahpeton aquifers, in descending order consist of the Wahpeton Shallow Sand, Wahpeton Sand Plain, and Wahpeton Buried Valley aquifers ..."

pg 26, Hydrogeology, paragraph 1; "The Wahpeton Shallow Sand, the Wahpeton Sand Plain, and Wahpeton Buried Valley aquifers compose..."

pg 26, Aquifer Description, paragraph 1; The Wahpeton Buried Valley, Wahpeton Sand Plain, and Wahpeton Shallow Sand aquifers are composed ..."

pg 33, Summary, 6th paragraph; "The Wahpeton Shallow Sand, the Wahpeton Sand Plain, and the Wahpeton Buried Valley aquifers comprise the Wahpeton aquifers"

There are no references in the entire Schoenberg report to the Colfax unit or the Dakota Sandstone. The only references vaguely related to the Dakota Sandstone are references made to Cretaceous bedrock, of which the Dakota Sandstone is a part. This section is highly misleading and erroneous and needs to be rewritten.

Pg 3-17 2nd paragraph, last 2 sentences

While the last two sentences are a direct quote (except for the missing "of the North") from Schoenberg, if one looks at the context in which he is making these statements, I believe that he should have used the term "aquitard" in place of "aquifer" thickness. It is clear from his report and the reports that he cites that aquifer thicknesses and their hydraulic properties are known, thus he would have been able to have made the calculations.

3rd paragraph, 1st sentence

Current (2005) permitted ground-water use for Cargill is 3000 ac-ft/yr, not 3250 ac-ft/yr. Additionally, there are permits for both the city of Wahpeton and for Minn-Dak Farmers Coop that should be referred to. Finally, all analyses of the aquifer system have taken into account the use that the city of Breckenridge makes of the Wahpeton Buried Valley aquifer from its location in Minnesota, even though they do not have a North Dakota water permit.

Pg 3-17 paragraph 5: What is the basis for the 415 billion gallon estimate? A reference is recommended.

Pg 3-18 last paragraph (Minnesota Aquifers), 4th sentence

This is a minor point, but I wonder why the summary that is done in this sentence for Minnesota, is not done in a parallel manner on pg 3-8 for North Dakota Aquifers.

Pg 3-25 paragraph 2; A analysis based on natural recharge versus total withdrawal is rapidly losing favor in the hydrologic community. Safe or sustained

Responses to the North Dakota State Water Commission

Response to Comment 7

Comment noted.

Response to Comment 8

This has been corrected in the Final Needs and Options Report.

Response to Comment 9

A reference was added to the Final Needs and Options Report.

Response to Comment 10

In the Final Needs and Options Report a parallel summary of the amount of groundwater used from select North Dakota aquifers was added, but is slightly different in the sense that North Dakota has both a permitted amount and a historical use of groundwater. See the Literature Cited Section, pages 5-12 through 5-28, for a list of reports referenced in the North Dakota aquifers section of the final report.

Response to Comment 11

Reclamation generally concurs with this comment. In terms of individual aquifer development strategies, Reclamation has explained in the report that water from an aquifer is a finite quantity and that any use of water, either surface or groundwater, requires a rebalancing of the water budget to reflect inflows and outflows from the system.

yield in now thought of as the amount of natural discharge that can be effectively captured from the system. This amount is significantly less than total recharge.

Pg 3-25 paragraph 2, last sentence; "Only extensive field investigations will be able to quantify amounts available and the effects of increased use on other users and the environment." Recommend changing sentence to read, "Ground-water models will need to be developed for each aquifer to provide better estimates of both the availability of ground water and the effects of increased use on other users in the environment. More comprehensive field data sets will be required to drive the ground water models."

Pg 3-25 paragraph 5; "conversion of a water permit to a higher beneficial use" should read, "provides for a change in purpose of use only for a superior use as determined by the order of priorities specified in 61-004-06.1"

Pg 3-25 last paragraph, 5th sentence
It is inappropriate to say, "By policy", when the change of use statute is dictated by Century Code, as is noted out in the following sentence (6th sentence) in that same paragraph that refers to "NDCC 61-04-15".

Pg 3-27 2nd paragraph, 1st sentence
suggest using "Choosing the Elk Valley aquifer" over "Choosing Elk Valley Aquifer"

last paragraph, 4th sentence, 2nd clause
change "less prone evapotranspiration" to "less prone to evapotranspiration"

Pg 3-29 legend in upper right-hand corner
It is a little misleading to call the well field depicted in this figure the Wahpeton well field. The Wahpeton well field is many miles to the east. This section refers the reader to the appendix where they would read about the "Wahpeton Industrial Demand", and possibly "Wahpeton Industrial well field" would be better.

Pg 3-30 last paragraph, 1st sentence
"... on a system undergoing rapid depletion ..." While some portions of the aquifer that are still in confined conditions have WL declines measured in terms of 1 or 2 ft per year, most of the portions of the aquifer system that have been in use for a long time have WL declines measured in terms of a few tenths of a foot per year, which in a system with 100+ feet of available drawdown doesn't seem indicative of "rapid" depletion. Possibly substitute "long-term" for "rapid".

Pg 3-31 1st full paragraph, 1st and only sentence
It is usually not a good idea to have a paragraph composed of only one sentence. In the end, however, the sentence isn't really a sentence, or maybe it is two sentences run-on. I am not sure of what is being said, so I'd recommend rewriting this section.

Responses to the North Dakota State Water Commission

Response to Comment 12

The sentence was changed to reflect that there is a possibility that groundwater modeling may be needed to quantify amounts available and effects of increased use on other users and on the environment.

Response to Comment 13

The suggested sentence was added to the Final Needs and Options Report.

Response to Comment 14

This has been corrected in the Final Needs and Options Report.

Response to Comment 15

This editorial suggestion has not been implemented because of consistency in naming and referencing other aquifers in North Dakota and Minnesota.

Response to Comment 16

This has been changed in the *Final Report on Red River Valley Water Needs and Options*, but it should not be confused with the city of Wahpeton's municipal wellfield. There is no mention of the municipal wellfield in the text.

Response to Comment 17

The wording has been changed in the Final Needs and Options Report.

Response to Comment 18

This has been corrected in the Final Needs and Options Report.

2nd full paragraph

Because I am unsure of what is being said in the previous paragraph, I'm not sure of what is being referred to here. However, I wonder if "Using the above spacing pattern with figure 3.2.5, ..." should read, "Using the above spacing pattern with figure 3.2.6, ..."

3rd paragraph, 1st sentence

The first sentence is a viable sentence. However, it probably needs a few assumptions. Two important ones are: assuming that West Fargo does not switch to surface water, and assuming that a significant number of additional wells into the West Fargo North aquifer are not installed.

Pg 3-32 only paragraph

"West Fargo North" is used 3 times in this paragraph, and each occurrence should read, "West Fargo North aquifer".

Pg 3-33 1st paragraph, 1st sentence

"West Fargo North" should read, "West Fargo North aquifer".

2nd paragraph

The heading, where it says, "West Fargo South" should read, "West Fargo South aquifer".

3rd paragraph, 1st and 2nd sentences

Where it says, "West Fargo South" it should read, "West Fargo South aquifer".

Pg 3-34 3rd paragraph, 1st sentence

Where it says, "West Fargo South" it should read, "West Fargo South aquifer".

Pg 3-35 2nd paragraph, first full paragraph

It is hard to believe that one can have a discussion of the disadvantages of ASR, and not address the nature of the water supply to be introduced into the aquifer, and to not address problems associated with clogging. We believe clogging may significantly limit the effectiveness of ASR.

Pg 3-36 2nd paragraph, 4th sentence

The Middle River aquifer is viewed as having an overall yield insufficient to "warrant further consideration." It is about 11 percent as large as the Elk Valley aquifer. The maximum drought proofing needs for Grand Forks and Grand Forks-Traill Water Users District is about 10% of the total water allocated from the Elk Valley aquifer. The two aquifers are about the same distance from Grand Forks. It seems premature to eliminate this aquifer, when it seems to have some potential to supply the needs that are currently viewed as being possible to meet through the Elk Valley aquifer. Until more is known, the significant difference is that currently developed economic output from the Elk Valley aquifer would not

Responses to the North Dakota State Water Commission

Response to Comment 19

This section has been modified to improve clarity.

Response to Comment 20

Comment noted. Changes in the text have been made to address these assumptions.

Response to Comment 21

This has been corrected in the Final Needs and Options Report.

Response to Comment 22

Comment noted.

Response to Comment 23

This has been corrected in the Final Needs and Options Report.

Response to Comment 24

Comment noted.

Response to Comment 25

This has been corrected in the Final Needs and Options Report.

Response to Comment 26

The issue is geochemical modification of recharge water. The issue of clogging from ASR is addressed in the Final Needs and Options Report, Appendix B.

Response to Comment 27

The Middle River Aquifer is evaluated in chapter three, pages 2-23 through 3-24. The aquifer is not considered a good water supply candidate given its low per-well yield and the high number of wells needed to replace the Elk Valley Aquifer as a Project feature.

need to be disrupted. Such disruption would not occur, if the Middle River aquifer were the water supply envisioned to drought proof Grand Forks.

Pg 3-73 paragraph 3; first sentence, "A water right specifies", change to "A water permit specifies". Second sentence, "The terms of a water right cannot be changed without state approval" Change to, "The terms of a water permit cannot be changed without the approval of the State Engineer." Third sentence; "What is not limited, however is the life of the water right". Change to "life of water permit". Sentence 4; " Once granted, a water right lasts forever, unless it is abandoned or forfeited for lack of use" Change to, " Once granted, a perfected water permit continues indefinitely unless it is abandoned or forfeited for lack of use."

Pg 3-92 last paragraph, second sentence; " Priority is defined in North Dakota water law as the date that the water permit was either issued or was perfected". Change to, " Priority is defined in North Dakota water law as the date on which the State Engineer receives the water permit application."

Appendix B.2 - GROUNDWATER

Pg B-25 section on Converting Irrigation Permits..., first two sentences section 89-03-02-01 is part of the North Dakota Administrative Code, and section 61-04-06.1 is part of the North Dakota Century Code.

Pg B-30 & 31 legend in upper right-hand corner
It is a little misleading to call the well field depicted in these two figures the Wahpeton well field. The Wahpeton well field is many miles to the east. This section is called the "Wahpeton Industrial Demand" section, and possibly "Wahpeton Industrial well field" would be better.

Pg B-31 Figure B.2.4; The four wells shown in figure B2.4 in the Milnor aquifer should be less than 100 feet deep. Review local test drilling to confirm.

Pg B-32 section B.2.3, first paragraph, 4th sentence
"...both aquifers are rapidly depleting water resources..." It is the pumping of the aquifers that is depleting the water resource. Additionally, while some portions of the aquifer that are still in confined conditions have WL declines measured in terms of 1 or 2 ft per year, most of the portions of the aquifer system that have been in use for a long time have WL declines measured in terms of a few tenths of a foot per year, which in a system with 100+ feet of available drawdown doesn't seem indicative of "rapidly" depleting water resources.

Pg B-33 first paragraph, third sentence

Responses to the North Dakota State Water Commission

Response to Comment 28

This has been corrected in the Final Needs and Options Report.

Response to Comment 29

This has been corrected in the Final Needs and Options Report.

Response to Comment 30

This has been corrected in the Final Needs and Options Report.

Response to Comment 31

This has been corrected in the Final Needs and Options Report.

Response to Comment 32

Reclamation took a conservative approach to estimating well depths, well placement, and the depths to which those wells would need to be screened. A review of test drillings and well logs indicated that the Milnor Channel Aquifer may not be the deepest sand/gravel layer that could be developed as a water source. Well depths in figure B.2.4 are estimates of the deepest potential water bearing formation in that area.

Response to Comment 33

This has been corrected in the Final Needs and Options Report.

Response to Comment 34

This has been corrected in the Final Needs and Options Report.

This sentence is contradicted by last sentence in "Conclusions" on page B-51. We believe that the statement in "Conclusions" is the more defensible statement.

Pg B-38, 39, & 40 the section on "Water Removed under Confined Conditions..."

This section has some serious, fatal flaws. It would take pages of notes to address it properly. We suggest a total rewrite, and Bob Shaver (ND SWC) would be willing to help with that revision. It is important that this section not go out as is.

Pg B-44 sec on the "Description of the West Fargo N...", 1st sentence "... detail description the ..." should read, "... detailed description of the ..."

last sentence in the same paragraph

"... and could be assumed to be about half of total in storage." Capturing half of what is in storage would require an incredibly dense and comprehensive set of wells that would be inordinately expensive. Without an incredibly large and open checkbook, the amount that could be effectively captured would be a much lesser percentage.

Pg B-51 last sentence in "Conclusions"

This sentence contradicts the third sentence in "Principles of Aquifer Storage and Recovery". We believe that this sentence in "Conclusions" is the more defensible sentence.

Pg-B-111 2nd paragraph, first sentence
"ask" should be "asked"

GENERAL COMMENTS

General Statement on Section 3.2.2.

In Section 3.2.2, Potential for Project Groundwater Development in North Dakota, three important "features" with respect to ground-water development are discussed. These are:

- 1) conversion of existing water rights to a higher use,
- 2) reservation of ground-water for future needs, and
- 3) aquifer storage and recovery.

The discussion needs to be expanded to describe practical constraints associated with each of the three "features". This will provide the reader with a

Responses to the North Dakota State Water Commission

Response to Comment 35

This has been corrected in the Final Needs and Options Report.

Response to Comment 36

This has been corrected in the Final Needs and Options Report.

Response to Comment 37

Comment noted, but the point of the text is that the total water in storage does not equal the amount of water readily available from the aquifer. This is an important message and discussion of the complexities involved in chasing water levels sufficient to meet yields in the aquifer is unwarranted.

Response to Comment 38

This has been corrected in the Final Needs and Options Report.

Response to Comment 39

This has been corrected in the Final Needs and Options Report.

Response to Comment 40

Legal, political, and socioeconomic constraints and obstacles of developing a water resource are outside of the scope of the *Final Report on Red River Valley Water Needs and Options*. Section 3.2.2 is intended to only address scientific and technical aspects of developing water supply features.

more balanced assessment regarding the implementation of these three features. It should also improve the cost estimates developed for each option involving these features.

The following additions are recommended:

Conversion of Existing Use (Pg. 3-25)

When addressing the issue of converting irrigation water rights to municipal water rights, the text should include 61-01-01.2 which declares "necessary and in the public interest that the state by and through the state water commission strongly discourages the conversion of agricultural water permits to any other use".

In addition, during the Ground Water Breakout session, the cost of converting water rights for agricultural to municipal use was discussed. It was suggested that the cost of land could be as much as 10 times its agricultural value. Projected conversion costs should be included in the estimated budget that incorporates the water rights conversion concept.

Reservation of Known Resources for Future Needs (Pg. 3-27)

I recommend that the following be added to this section.

North Dakota Century Code 61-04-31 reads as follows: Reservation of waters – Public Hearing – Notice.

1. Whenever it appears necessary to the state engineer, or when so directed by the Commission, the state engineer may by regulation:
 - a. Reserve and set aside waters for beneficial utilization in the future; and
 - b. When sufficient information and data are lacking to allow for the making of said decisions, withdraw various waters of the state from additional appropriations until such data and information are available.
2. Prior to the adoption of a regulation under this section, the state engineer shall conduct a public hearing in each county in which waters relating to the regulation are located. The public hearing shall be preceded by a notice placed in a newspaper of general circulation published within each of the counties.
3. Regulations adopted hereunder shall be subject to chapter 28-32.

Note: (Chapter 28-32 is the Administrative Agencies Practice Act).

Responses to the North Dakota State Water Commission

Response to Comment 41

Comment noted, however the reference to 61-01-01.2 was not added to the discussion of Conversion of Existing Use (page 3-26 in the Final Needs and Options Report) because it does not affect the technical viability of the feature.

Response to Comment 42

Reclamation used a cost differential of \$2,500 per acre to estimate the cost of buying irrigated crop land and selling it back for dry land farming. See Appendix C, Attachment 6 in the Final Needs and Options Report for a detailed discussion on how the land procurement costs of the Elk Valley Aquifer conversion feature were estimated.

Response to Comment 43

Comment noted, but the suggested text was not added to the Final Needs and Options Report, because it does not address the technical validity of the features.

In the past, ground/surface waters have not been set aside by the state engineer for beneficial utilization in the future as allowed in 61-04-31-1a. Municipalities and rural water systems can hold water permits for annual use quantities in excess of current needs. According to 89-03-03-04, "The total quantity of water a municipality or rural water system may hold under all permits for municipal use may not exceed the quantity the municipality or rural water system can reasonably expect to use thirty years in the future."

In the past, the State Engineer has not "reserved water" as allowed under 61-04-31-1b. When sufficient information and data are lacking to allow for "the making of sound decisions" with respect to the allocation of water, action by the State Engineer on pending permits is deferred or portions of requested permits are held in abeyance pending the acquisition of additional hydrological data and analysis.

As described in 61-04-31-2, prior to the state engineer reserving or setting aside water in an area, the state engineer must conduct a public hearing in the county where the proposed water reservation is to occur. If the state engineer initiated action to reserve a substantial amount of water in an area to be used by a distant municipality or rural water system, considerable local opposition would probably result. "Locking up" water supplies and preventing local beneficial use and development likely will garner little support in the withdrawal area.

Implementation of ASR (Pg. 3-30)

The discussion of ASR does not include specific reference to "case studies" that would provide a better understanding of operational and maintenance problems associated with ASR. The USBOR funded a number of artificial recharge/ASR projects in their "High Plains States Groundwater Demonstration Program. I recommend incorporating the following quote from the Program Summary Report – Part I, Overview, Results, Findings, U.S. Department of Interior, Bureau of Reclamation, June 2000.

Executive Summary – PE7

- Direct Well Injection (which is the proposed type of ASR for West Fargo North, West Fargo South, Wahpeton Buried Valley aquifer and other aquifers in Minnesota) – "This is the most intensive type of recharge with the highest level of technology and requires greater investment in construction, operations, and maintenance. When the water source is other than treated drinking water, on-line monitoring and automated shutdown systems are needed to protect groundwater from direct contamination."

Responses to the North Dakota State Water Commission

Response to Comment 44

References to the suggested ASR projects, as well as others, have been added to the *Final Report on Red River Valley Water Needs and Options*.

The Huron Recharge Project – Huron, South Dakota is discussed in, High Plains States Groundwater Demonstration Program – Project Summary Reports, U.S. Department of Interior, Bureau of Reclamation, 1999.

The hydrologic/hydrogeologic environment associated with the Huron project is similar to that associated with the buried aquifers in the Red River Valley targeted for ASR. Reference should be made to this study with regard to reported conclusions that will have transfer value to proposed ASR in aquifers in the Red River Valley. The study concluded, in part, the following:

- 1) The rate of treated surface water recharge injected into the aquifer gradually decreased as the recharge event progressed.
- 2) One “flushing” event was conducted during the second recharge event in an attempt to improve the hydraulics of the system. This resulted in only short-term improvement.
- 3) Aquifer transmissivity decreased about 20% after the first recharge event. The decrease was attributed to air entrainment in the aquifer during injection and to some physical clogging within the filter pack around the well due to settling and shifting.

Operation and maintenance (replacement) costs for “Direct Well Injection” ASR projects often greatly exceed design/construction costs. Maintaining target recharge rates can be extremely difficult and costly. Until comprehensive pilot studies are completed in an area proposed for ASR, it is very difficult to estimate costs for construction, operation and maintenance of ASR facilities. This should be stated in the “Implementation of ASR” section of the report.

Importing Minnesota Water

When addressing the option of importing Minnesota surface and ground water, the report should articulate the legal and political “hurdles” to provide some basis for assessing the potential for implementing this option. A firm commitment from Minnesota should be a prerequisite for determining if importing Minnesota ground water is a viable option. If a firm commitment cannot be given, the importation of Minnesota ground water is no longer a viable option.

A Draft Memorandum was prepared for the Garrison Conservancy District by Tami Norgard regarding the process involving the importation of Minnesota waters. I would consider using this document, in final form, as an Appendix to the report or as excerpts as deemed necessary throughout the text to provide the reader some understanding of the legal hurdles that must be dealt with to import Minnesota waters.

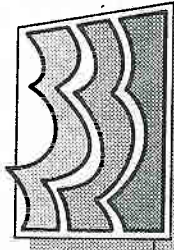
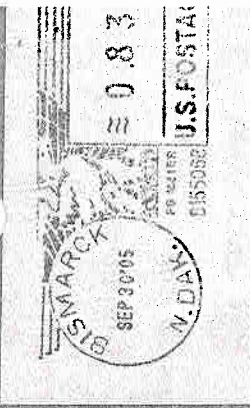
Responses to the North Dakota State Water Commission

Response to Comment 45

The existing costs for the ASR features are sufficient for this level of study.

Response to Comment 46 and 47

Discussion of legal obstacles using Minnesota water sources is outside the scope of the *Final Report on Red River Valley Water Needs and Options*. Almost all of the proposed water sources have legal obstacles associated with their use. This is not an issue that is unique to Minnesota water sources. The DEIS identifies laws, regulations, and executive orders that have been considered and that apply to the Project.



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