BUREAU OF RECLAMATION

Final Environmental Impact Statement

Eastern North Dakota Alternate Water Supply Project

Volume 4: Appendices C, D, E, F, G, H, I, J, K, and L

McClusky Canal, Garrison Diversion Unit, North Dakota

Missouri Basin Region
Dakotas Area Office
Bismarck, North Dakota

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Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Appendix C

Preferred Alternative

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix C Rationale for Identification of the Preferred Alternative

To identify a preferred alternative for the Eastern North Dakota Water Supply (ENDAWS) Project (Project), Reclamation chose a matrix evaluation method that has been established to evaluate several factors (i.e., cost, reliability, and potential impacts) and compare the alternatives to determine the best recommendation for the Project. The process includes four basic steps, which include:

1) Decision Factors – Developing the decision factors that influence the decision.

2) Weight Decision Factors – Comparing the decision factors to each other to determine their relative weight in the decision.

3) Alternative Ranking – Giving each of the alternatives a score for each of the decision factors.

4) Alternative Total Score – Multiplying the decision factor weight by the alternative ranking, resulting in a total score for each alternative. The alternative with the highest score is identified as preferred.

Information presented in this appendix describes the consideration given to each factor in the matrix evaluation process of identifying a preferred alternative. The following alternatives, as described in Chapter 2, were considered for this Project:

- Alternative A - No Action – Central North Dakota Water Supply Project (CNDWSP)
- Action Alternatives:
  - Alternative B - State Red River Valley Water Supply Project (RRVWSP)
  - Alternative C - McClusky Canal Only North
  - Alternative D - McClusky Canal Only South
  - Alternative E - McClusky Canal and Missouri River North
  - Alternative F - McClusky Canal and Missouri River South

Alternatives C, D, E and F would include a Biota Water Treatment Plant (WTP) to ensure compliance with the Boundary Water Treaty. Reclamation first determined which Biota WTP to include within these alternatives before comparing the alternatives to each other.

Biota WTP Evaluation

Four Biota WTP options were evaluated as described in Chapter 2 and Appendix B. Factors Reclamation considered to identify the preferred Biota WTP option were costs (construction and Operation, Maintenance and Replacement), environmental impacts associated with construction, level of risk reduction for a Project-related transfer of aquatic invasive species, and ability of the options to target aquatic invasive species of concern in the most cost effective manner.

The United States federal government has not developed water treatment standards, rules, or regulations specifically for use in reducing the risk of an introduction of aquatic invasive species through interbasin water transfers.

The four Biota WTP options increase the level of treatment with each option and would provide a corresponding higher level of risk reduction; however, the construction and OM&R cost would also increase with each option. The footprint of the Biota WTP would be very similar for each of the options; therefore, the construction impacts would essentially be the same. As discussed in Chapter 3, the construction-related environmental impacts would be minor.

Reclamation's analysis of risks and consequences associated with aquatic invasive species (Chapter 3) concludes that the Project-related risk of transfer of aquatic invasive species associated with the Project is very small in relation to risks associated with existing and future non-Project pathways. It is also acknowledged that there are no treatment regulations regarding control of aquatic invasive species. Therefore, Reclamation proposed in the Draft Environmental Impact Statement (Draft EIS) to construct the Biota WTP option that would effectively inactivate the identified aquatic invasive species of concern at the lowest cost. The aquatic invasive species of concern include seven major taxonomic groups exhibiting a range of sizes and susceptibilities to disinfection and cover a broad range of life histories to protect against a variety of species, including unknown and emerging organisms. The preferred option identified that would achieve that goal is the Enhanced Disinfection option.

The next step was to compare the alternatives based on several factors important to the decision, each is discussed below.

Alternative Evaluation

Permanent Environmental Impacts due to Alternative Construction

Permanent environmental impacts associated with the alternatives due to construction of components would be relatively small for all alternatives as discussed in detail in the Land Resources section of Chapter 3. Because the permanent construction impacts would be relatively small and would be similar for all action alternatives, this factor had a minimal influence on the identification of a preferred alternative.

Risk of Project-Related Transfer of Aquatic Invasive Species

The risk associated with Project-related transfer and establishment of aquatic invasive species is discussed in detail in Chapter 3 and Appendix F. For all of the alternatives, the risk of Project-related transfer and establishment is comparatively much smaller than the risk of transfer and

establishment through existing non-Project pathways. The No-Action Alternative (CNDWSP) and Alternative B include a water treatment plant proposed by the state of North Dakota that includes grit removal and disinfection. The other action alternatives (C, D, E, and F) include a Biota WTP identified by Reclamation that includes grit removal, chemical disinfection and Ultraviolet (UV) disinfection; therefore, these alternatives slightly decrease the overall transfer risk due to the increased level of proposed treatment. Although this factor is important, it was not the controlling factor in choosing a preferred alternative, due to their similarity.

Source Water Reliability

Water quantity reliability (the amount of water available on a consistent basis) is a controlling factor in the planning of water supply projects and was a major consideration in the identification of a preferred alternative. As described in Chapter 2, flows in the McClusky Canal are dependent on the water levels in Lake Audubon. The hydraulic modeling completed by the U.S. Army Corp of Engineers (Corps) in support of this EIS (Chapter 3) shows that at times water levels in Lake Audubon would be reduced due to limitations on the Snake Creek Embankment and differential between Lake Audubon and Lake Sakakawea. Under Alternative C and Alternative D, the Project would need to withdraw 100 percent of the Project need out of the McClusky Canal and it would not always be available during a 1930's type drought.

In contrast to the McClusky Canal, the Missouri River System contains a much larger volume of water, and storage capacity within Lake Sakakawea makes it much more reliable as a source for a water supply project because it doesn't have the limitations mentioned above. As described in Chapter 3, throughout the entire period of record, the Missouri River would have sufficient water to meet future Project water demands. Alternative E and Alternative F have been designed to utilize the McClusky Canal under Phase 1, but also have the ability to include Phase 2, which would provide a back-up source of water (Missouri River).

When considering future Project operations and water delivery, the two alternatives that include both phases of construction are preferable to the alternatives that do not, because of the uncertainty in the reliability of the McClusky Canal as a sole water source.

Impacts to Missouri River Resources

The alternatives would each utilize 165 cfs from the McClusky Canal or the Missouri River, or some combination to equal a total of 165 cfs. Therefore, when comparing the alternatives evaluated in the Draft EIS, all the alternatives would have no additional impacts on the Missouri River and associated resources. Due to these similarities, this factor did not influence the identification of a preferred alternative.

Use of Existing Federal Facilities

The use of existing federal facilities previously authorized and constructed was a consideration in the identification of the preferred alternative. The use of existing facilities is a benefit to the United States federal government and would require the Project pay a proportionate share of the annual Operations &Maintenance, as well as a proportionate share of capital repayment for the facilities used. The Bureau of Reclamation considered this benefit when identifying a preferred alternative.

Preferred Alternative

Following the process outlined above, the Bureau of Reclamation identified Alternative E, including the Enhanced Disinfection Biota WTP, as the preferred alternative. This alternative is reliable due to the nature of the proposed two phase construction that would allow the project to develop a backup source of water if the McClusky Canal water was unavailable due to limitations posed by the operating differential for the Snake Creek Embankment. This alternative utilizes existing features of the GDU principal supply works and a slightly lower cost than Alternative F.

Appendix D

Best Management Practices and Environmental Commitments

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix D Best Management Practices and Environmental Commitments

Introduction

This appendix describes best management practices (Table D-1) and environmental commitments (Table D-2). The following definitions apply to best management practices and environmental commitments in this EIS.

Best Management Practices - Methods intended to avoid or reduce effects while an action is being implemented. These methods are commonly implemented in projects of this nature.

Environmental Commitment - Methods or plans to reduce, offset, or eliminate adverse project effects. Action taken to avoid, reduce the severity of, or eliminate an adverse effect. Environmental commitments could include one or more of the following:

- Avoiding effects.
- Minimizing effects by limiting the degree or magnitude of an action.
- Rectifying effects by restoration, rehabilitation, or repair of the affected environment.
- Reducing or eliminating effects over time.
- Compensating for the effect by replacing or providing substitute resources or environments to offset the loss.

Implementation

The Bureau of Reclamation has entered into a cooperative agreement with the Garrison Diversion Conservancy District to construct the North Dakota State Municipal, Rural, and Industrial (MR&I) Program. Garrison Diversion has been authorized under state law as the organization to administer rural water projects for the Garrison Diversion Project (which includes the Project). Individual rural water organizations and the North Dakota State Water Commission, under agreements with Garrison Diversion, typically perform the direct design and construction activities. These agreements facilitate the best management practices included in this appendix. The cooperative agreement (R17AC00049) with Garrison Diversion ensures that all projects constructed under the agreement will be reviewed and approved by the Bureau of Reclamation. The cooperative agreement also requires Garrison Diversion to adhere to all applicable federal regulations and ensures requirements have been met, including but not limited to the National Environmental Policy Act, National Historic Preservation Act, and application of these best management practices and environmental commitments.

Table D-1: Best Management Practices

Resource	Best Management Practices
General	Construction activities would comply with all appropriate federal, state, and local laws and regulations. This list may include but is not limited to stormwater discharge permits, National Pollution Discharge Elimination System permits, Clean Water Act, and the Migratory Bird Treaty Act.
	Erosion control measures would be employed as appropriate and at stream crossings at all times: (a) Care would be exercised to preserve existing trees along the streambank. (b) Stabilization, erosion controls, restoration, and revegetation of all streambeds and embankments would be performed as soon as a stream crossing is completed and maintained until stable. (c) Riparian woody shrubs and trees would be replanted as necessary to preserve the shading characteristics of the watercourse and the aesthetic nature of the streambank. (d) At locations where soil conditions or slopes are such that erosion may occur along the pipeline trench, construction contractors would be required to construct earth berms perpendicular to the trench line at intervals sufficient to divert water from the trench. (e) In pasture and hayland, straw wattles shall be furnished and installed within 14 days of pipeline installation, at approximately the following intervals: Slope (%) Interval (feet) 7-10 120 10+ 50 (f) Straw wattles shall be a minimum of 6" diameter, and shall be installed across the entire width, plus 3' either side, of the disturbed area.
	Dump grounds, trash piles, and potential hazardous waste sites would be avoided.
	All construction waste materials and excess or unneeded fill associated with construction would be disposed of on uplands; non-wetland areas.
	Standard construction, industry measures would be taken to minimize fugitive dust emissions during construction activities. Any complaints that may arise would be dealt with by the project sponsor and contractor in a timely and effective manner.
	New pipeline, to the extent possible, would be placed just outside and parallel to the road right of way.
	To the extent possible, construction would avoid wetlands; federal, state, and local wildlife areas and refuges; designated critical habitats; migratory bird habitat during the critical nesting season; known cultural resources and historic sites; hazardous material sites; and other resource sensitive areas noted below.
	During the final engineering design phase, Project components would be sited to minimize impacts on or avoid permanent structures and limit, to the extent practicable, impacts on existing land use.
	Construction limits would be clearly marked with stakes or fencing prior to beginning ground disturbing activities. No disturbance would occur beyond these limits other than non-destructive protection measures for erosion/sediment control.
	Material and equipment storage would be only within well-defined, designated staging areas placed outside of wetlands and other sensitive areas.

Resource	Best Management Practices
	Structures affected by pipeline construction, including utilities, roads, highways, rivers, canals, railroads, agricultural irrigation facilities, fences, and other structures, would be replaced, repaired, or restored to their current condition or better after construction.
	Construction debris would be hauled from the work site to a disposal location approved by the Contracting Officer or his/her representative.
	If established survey benchmarks must be removed or should any monuments be dislodged or damaged during construction, the National Geodetic Survey (Attn: N/CG 162, Rockville, Maryland 20852) would be contacted.
	No above ground structures that would interfere with the above ground movement of floodwaters would be placed in the flood plain or would be protected with flood protection.
Surface Water	Contractors would be required to make at least two boring attempts before using an alternate wetland, stream or river crossing method.
	Intermittent streams would be crossed only during low-flow periods and preferably when the streambeds are dry.
	Identified river or stream crossings would be performed by horizontal directional drilling operations whenever practicable, which would not disturb the stream channel or the adjacent wetlands.
Groundwater	Established ground water monitoring wells would be avoided. However, if any monitoring wells are inadvertently damaged or impacted during project construction, the Water Appropriation Division of the North Dakota Office of the State Engineer would be contacted.
Water Quality	As part of the National Pollution Discharge Elimination System permitting requirement, a Stormwater Pollution Prevention Plan would be developed and submitted to the ND Department Environmental Quality prior to commencing construction activities.
	The Stormwater Pollution Prevention Plan would include erosion control measures to prevent or reduce erosion, soil loss, and nonpoint source pollution. These practices may include, but are not limited to, silt fencing, filter fabric, sediment logs, hay bales, temporary sediment ponds, check dams, and/or immediate mulching of exposed areas to minimize sedimentation and turbidity effects as a result of construction activities. The placement and specific measures used would be dictated by site specific conditions.
	In-stream flows would be maintained during stream crossing construction. Spoil, debris piling, construction materials, and any other obstructions would be removed from stream crossings to preserve normal water flow.
	Stream crossings would be routed, as practicable, to minimize disturbance. Intermittent streams would be crossed only during low-flow periods and preferably when streambeds are dry.
	Disturbed portions of the stream banks and beds of rivers, streams, and other waterways would be protected by rock riprap of adequate size and type to minimize erosion and scour. Any slopes greater than 3:1 would be protected with erosion-control blankets after seeding.
Aquatics	In-stream flows would be maintained during stream crossing construction. Water would be allowed to flow around or past stream crossings to preserve normal water flow downstream from construction.
	To minimize impacts to fisheries resources any stream identified as a fishery (confer with ND Game and Fish Department) that cannot be directionally bored would be avoided from April 15 to June 1 and crossed later in the summer or fall when flows are low or the stream is dry.

Resource	Best Management Practices
	Avoid work in Class II or higher waters (fisheries – confirm with ND Game and Fish Department) April 15 – June 1, or directionally bore. (ND Century Code: CHAPTER 33-16-02.1 STANDARDS OF QUALITY FOR WATERS OF THE STATE)
	In consultation with the Service, the following screen and velocity recommendations would be incorporated into the design of intake structure(s) of the Project: 1) Intakes shall be screened and maintained with 1/4-inch or smaller mesh size opening. 2) Johnson intake screens shall have wire spacing 1/8 inch or smaller. 3) Intake velocities shall not exceed 1/2 foot per second with 20 feet of overhead water. 4) Intake velocities shall not exceed 1/4 foot per second where 20 feet of overhead water cannot be achieved. 5) Intakes shall be marked so they are observable during day and night hours, as appropriate.
Wetlands/Riparian Areas	Long- and short-term effects on wetlands and riparian areas would be avoided to the extent practicable and in compliance with Section 404 of the Clean Water Act
	Erosion control measures would be employed as appropriate and at stream crossings prior to construction activities. In addition: Preserve, if feasible, existing trees along the stream bank. Stabilize, control erosion, restore, and revegetate streambeds and embankments as soon as a stream crossing is completed, following vegetation best management practices, and maintain until stable. Replant riparian, as necessary, woody shrubs and trees appropriate to ecological characteristics of the site to preserve shading characteristics of the watercourse and the aesthetic nature of the stream bank.
	Any equipment used previously in a water body that is jurisdictional under the Clean Water Act or a water body designated as infested by the North Dakota Game and Fish Department would be disinfected prior to entering Reclamation lands or facilities to prevent the spread of invasive aquatic species. Disinfection will occur as stated in the Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species. The manual may be accessed at: http://www.usbr.gov/mussels/prevention/docs/EquipmentInspectionandCleaningManual2012.pdf
	All temporarily disturbed wetlands would be reestablished following construction by doing the following: Restore contours to previous elevations Compact trenches sufficiently to prevent drainage along the trench or via bottom seepage Salvage and replace topsoil Backfill in such a manner as to not drain wetland or stream Reestablish wetlands to similar type of wetland and wetland function
Vegetation and Land Use	To the extent practicable, construction would avoid: Wetlands Federal, state, and local wildlife areas and refuges Native prairie However, if these areas are disturbed during pipeline construction, topsoil would be replaced, and revegetation plans would be specifically designed for these areas to ensure

Resource	Best Management Practices
	reestablishment of a similar type and quality of native vegetation recommended by local National Resources Conservation Service (NRCS) office and approved by the landowner. Impacts to federal or state wildlife areas may require additional agency review.
	Vegetated areas temporarily disturbed by construction (except cropland) would be revegetated with species appropriate to ecological conditions of the surrounding area, and in a manner that prevents erosion and noxious weed invasion. Reclamations Integrated Pest Management Plan would be utilized as a guide in preventing the spread of noxious weeds. Revegetation would occur as soon as practicable after construction and would follow all pertinent local and state regulations. Temporary seeding may be required when areas remain disturbed for more than 30 days.
	All equipment and recreational vehicles should be free of invasive species prior to entering Reclamation lands or facilities as stated in the Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species. The manual may be accessed at: http://www.usbr.gov/mussels/prevention/docs/EquipmentInspectionandCleaningManual2012.pdf
	Woody species including those bordering wetlands, shelterbelts, riparian woodlands, woody draws, or woodland vegetation would be avoided to the extent practicable. For unavoidable impacts to woody habitats, credit for equal value or environmental equivalent: (a) would be applied toward the impact and deducted from Reclamation's Mitigation Enhancement Ledger **or** (b) the Project sponsor may develop separate acceptable mitigation.
	Prior to beginning construction through PLOTS, Conservation Reserve Program lands, program or private wetlands, the project sponsor would consult with: (a) respective landowners, NRCS, and U.S. Department of Agriculture Farm Services Agency to ensure that landowner eligibility in farm subsidy programs (if applicable) would not be jeopardized by project actions and (b) ensure that Swampbuster requirements would not be violated by construction activities
	Topsoil would be removed and stockpiled separately from surface soils for reapplication following construction. In-stream flows would be maintained during stream crossing construction. Water would be allowed to flow around or past stream crossings to preserve normal water flow downstream from construction.
	If Project construction cannot avoid North Dakota Sate Trust Lands, then easements would need to be obtained prior to construction.
	Topsoil, soil amendments, fertilizers, and mulches would be reapplied selectively as appropriate, prior to revegetation during favorable plant establishment climate conditions to match site conditions and revegetation goals.
Wildlife	Identified potential habitat for federal or state threatened, endangered, critical habitat and sensitive species would be avoided if feasible.
	Construction would be prohibited within 1/2 mile of designated piping plover or interior least tern breeding areas during the breeding season (April 15 through August 31) when these species are present.
	If threatened or endangered species are identified and encountered during construction, all ground-disturbing activities in the immediate area would be stopped to consult with the U.S. Fish and Wildlife Service (Service) and determine appropriate steps to avoid affecting the species.

Resource	Best Management Practices
	Project sponsor is responsible for compliance with the Migratory Bird Treaty Act. Sites for project features would be selected to minimize potential for environmental impacts to nesting migratory birds. Construction would be timed to avoid migratory bird nesting. Avoid work around wetlands April 1 through July 15.
	Project sponsor is responsible for identifying bald eagle and raptor nests to ensure construction within 660 feet of visible nesting bald eagles or other raptors would be avoided from February through August.
	Project sponsor would coordinate with the Service's appropriate Refuges and Wetland Management Districts and provide the latest map version of project features to avoid impacts to Service lands, including wetland and grassland easements, national wildlife refuges, and waterfowl production areas (WPAs), allowing for identification of an avoidance route for the contractor. Any impacts to national wildlife refuges or WPAs would have to go through a refuge compatibility determination.
	The Project sponsors utility company is responsible for providing an Avian Protection Plan that follows the guidelines below. Project power lines would be: (a) Buried (Service 2010a) to minimize electrocution hazards to raptors and minimize impacts to all birds, bats, and particularly benefit whooping cranes. Use *Suggested Practices for Avian Protection on Power Lines - The State of the Art in 2006*, Avian Power Line Interaction Committee, Edison Electric Institute, Raptor Research Foundation, Washington, D.C., or similar standards would be used. Available online at https://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf ***or*** (b) Any new, aboveground power lines and an additional equal length of existing power lines in the same vicinity must be marked with visibility enhancement devices to benefit migrating whooping cranes as well as all migratory birds and bats. Use *Reducing Avian Collisions with Power Lines – The State of the Art 2012*, Avian Power Line Interaction Committee, Edison Electric Institute, Raptor Research Foundation, Washington, D.C., or similar standards. Available online: https://www.aplic.org/uploads/files/15518/Reducing_Avian_Collisions_2012watermarkLR.pdf.
	If forested habitat is identified prior to construction activities, Reclamation would determine if bat surveys are required. If any tree (with a diameter of greater than 3 inches) removal activities cannot be avoided between April and September, then northern long-eared bat surveys would be conducted to confirm absence of the species. If any suitable roost sites, possible hibernacula, or the species are observed during the onsite meeting, then any steps taken to avoid and minimize disturbance of this habitat would be documented.
Noise and Vibration	Night construction would be avoided near residential and populated areas.
Visual Resources	As noted for vegetation, short-term disturbances associated with constructing facilities would be revegetated and/or landscaped.
	Existing topographic grades would be restored following pipeline excavation.
	Constructed facilities would be designed to blend with the architectural characteristics of surrounding structures.
	Valve boxes would be left above grade in a cultivated field if agreeable to the landowner or moved to the nearest fence or right-of-way. Valves would not be located adjacent to or in close proximity to a paved or graveled road and would be painted a neutral color that blends with the background, reduces visibility, and maintains the viewshed.

Resource	Best Management Practices
Historic Properties	Direct disturbance to historical properties would be avoided to the extent feasible.
	All known burials or cemeteries would be avoided to the extent possible. All such burials or cemeteries would be avoided to the extent possible. If a burial or cemetery cannot be avoided or is encountered during construction, Reclamation would comply with the Native American Graves Protection and Repatriation Act if graves are discovered on federal or trust lands or within reservation boundaries. Reclamation would comply with North Dakota Century Code 23-06-27: "Protection of Human Burial Sites, Human Remains, and Burial Goods" for graves on private or state-owned lands.
	If unrecorded cultural resources or traditional cultural properties are encountered during construction, all ground disturbance activity within the area would be stopped, Reclamation and appropriate authorities would be notified, and all applicable stipulations of the Section 106 programmatic agreement would be followed. Activities in the area would resume only when compliance has been completed.
Paleontological Resources	All previously recorded paleontological resources and paleontologically sensitive zones within the path of the alternative selected in the Record of Decision would be inspected in the field by a qualified paleontologist. Avoidance measures would be developed to avoid significant resources.
	Reclamation would consult with North Dakota Geological Survey to identify areas for paleontological survey where significant fossils are likely. Paleontological surveys would be completed prior to construction. Based upon survey data, Reclamation would consult with a qualified paleontologist about revising routes to avoid damaging significant fossil locations.
Hazardous Materials	A Hazardous Spill Plan or Spill Prevention, Control and Countermeasures Plan, whichever is appropriate, would be in place, stating what actions would be taken in the event of a spill, notification measures, and preventive measures to be implemented, such as the placement of refueling facilities, storage, and handling of hazardous materials.
	All equipment would be maintained in a clean and well-functioning operating condition to avoid or minimize contamination from automotive fluids.
	Before construction, a more detailed hazardous materials assessment in conformance with the scope and limitations of American Society for Testing Materials (ASTM) 1527-05: "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" would be conducted to identify sites with soil and/or groundwater contamination not documented in readily ascertainable agency files (ASTM 2005).
	Any known solid waste disposal areas identified in the construction sites would be avoided or removed and properly disposed at a permitted solid waste disposal facility
	Equipment or vehicles would not be refueled within 100 feet of rivers, streams, or identified wetlands. If onsite fuel tanks are used, approved containment devices would be required.
	Identified evidence of hazardous materials, petroleum product spills, or other contamination would be avoided or excavated and properly disposed at a permitted waste disposal facility.
	If soil and/or groundwater contamination is encountered during construction, mitigation procedures would be implemented to minimize the risk to construction workers and to future operations.
Unique and Prime Farmland/ Agricultural Lands	To the extent feasible, construction activities on irrigated lands would be avoided during the growing season.
	Cropland disturbed by construction would be restored with topsoil to the depth, quality, grade, and relative density as the original surface as described for soils below. Pipelines

Resource	Best Management Practices
	crossing agricultural fields would be backfilled and compacted to prevent settling when the field is irrigated.
	Long-term effects on prime and unique farmland would be avoided to the extent feasible. If avoidance is not possible, Reclamation would complete and submit a Farmland Conversion Form (AD-1006) to the NRCS in compliance with the Farmland Protection Policy Act for any long-term change in land use.

Table D-2: Environmental Commitments

Resource	Environmental Commitments
Surface Water	When pipeline construction through a stream or wetland basin is unavoidable, existing basin contours would be restored and trenches would be sufficiently compacted to prevent any drainage along the trench or through bottom seepage.
	Where open trench crossing of stream is required, the stream channel would be reestablished following pipe installation.
Vegetation and Wetlands	Where construction cannot avoid: Wetlands Federal, state, and local wildlife areas and refuges, and Native prairie. If these areas are disturbed during pipeline construction, topsoil would be replaced, and revegetation plans would be specifically designed for these areas to ensure reestablishment of a similar type and quality of native vegetation recommended by local NRCS office and approved by the landowner.
	Effects on jurisdictional wetlands and waters of the United States would require authorization from the U.S. Army Corps of Engineers. A compensatory mitigation plan may be required for the loss of any wetlands and would include methods to replace specific functions of affected wetlands.
	Lost wetlands would be replaced acre for acre with ecological equivalency or 1/2 acre for acre with ecological equivalency (adversely affected wetlands) as required by the Project's authorizing legislation: (a) by crediting previously completed wetland restoration for the Garrison Diversion Unit (GDU) and deducting those credits from Reclamation's Mitigation and Enhancement Ledger (MEL)[1] **or** (b) the Project sponsor may develop separate acceptable mitigation.
	Lost woodlands would be mitigated 2:1 (acres) in accordance with MEL[1]
	Lost grasslands would be mitigated 1:1 in accordance with MEL[1]
Wildlife	Pipelines, water treatment plants, and pump station facilities would be realigned, where feasible, to avoid sensitive wildlife habitat. If sensitive wildlife habitat cannot be avoided, then mitigation would be determined in coordination and agreement with Reclamation and the Project sponsor, including pertinent regulatory agencies.
	Preconstruction surveys may occur with the Project sponsor and Reclamation to identify sensitive habitats and wildlife use before construction to allow implementing best management practices and mitigation measures.

[1] Reclamation has credits for created and restored wetlands in the MEL that can be used to mitigate impacts to wetlands. The GDU MEL was developed according to the 1985 memorandum of understanding between Reclamation, the U.S. Fish and Wildlife Service (Service), and the North Dakota Game and Fish Department regarding the establishment of mitigation and enhancement debits and credits for wildlife purposes. The MEL documents GDU project impacts, mitigation requirements, and concurrence for planning purposes and for review by other agencies and the public. Projected impacts listed were first presented in the GDU Commission Report. The GDU Reformulation Act of 1986 resulted in the adjustment of the projected impacts to reflect modifications to the project. Impacts to date reflect modifications to the project.

Resource	Environmental Commitments
Historic Properties	Reclamation will continue complying with stipulations in *Programmatic Agreement Between the Bureau of Reclamation, The Advisory Council on Historic Preservation, and the North Dakota State Historic Preservation Officer for the Implementation of Reclamation Undertakings in North Dakota* for the life of the project and in consultation with tribes.
	Avoidance will be the preferred method for treating historic properties. However, should that not be possible, the programmatic agreement identifies the standards to be used in developing mitigation plans.
	Reclamation will consult under Section 106 of the National Historic Preservation Act with appropriate Indian Tribes regarding the locations of and potential impacts to properties of traditional religious and cultural importance. If any such properties cannot be avoided and must be mitigated, Reclamation will invite the appropriate Tribes to participate in development of an appropriate treatment plan.
	All gravel, fill, and rock materials will be obtained from a source approved by Reclamation to ensure compliance with Section 106 of the National Historic Preservation Act.

Appendix E

Other Minor Issues

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix E Other Minor Issues

Introduction

The Eastern North Dakota Alternate Water Supply Project (Project) Environmental Impact Statement (EIS) provides an in-depth analysis of issues determined to be of concern through internal and external scoping. National Environmental Protection Act of 1969 (NEPA) regulations call for identifying, at an early state in the NEPA process, the significant environmental issues deserving of detailed study and deemphasizing insignificant issues; thus, narrowing the scope of the EIS analysis (40 CFR 1501.1(d)). During the initial stages of preparing this EIS, Reclamation conducted preliminary analyses on several issues that were not identified during public scoping (i.e., aesthetics, air quality, earth resources, noise, public services and utilities, transportation, greenhouse gas emissions, wildlife, paleontological resources, Indian Trust Assets and Environmental Justice. The Project would not result in significant impacts on these resources for the reasons discussed below, and they are not considered further in the EIS. The following analyses focus on the potential impacts of constructing, operating, and maintaining new Project components. Best Management Practices (BMPs) that would be implemented to minimize potential impacts were considered in the following discussion. A detailed list of these BMPs is included in Appendix D. They include compliance of construction activities with all appropriate federal, state, and local laws and regulations.

Aesthetics

Aesthetics is considered a minor issue since visual changes from new components would be temporary or the new components would be visually compatible with the character of their surroundings or located underground and therefore not visible. The pipeline corridors would avoid population centers and would be routed primarily along highways and roads where existing aboveground transmission lines and other utilities are in view. New pipelines would be buried, and disturbed areas would be revegetated. Existing topographic grades would also be restored following pipeline excavation; thus, visual qualities of the pipeline corridor would be restored after construction was completed. Disturbed areas would be revegetated as noted above.

The aesthetic environment in the vicinity of Project aboveground structures (such as the intake and pump station and Biota Water Treatment Plant (WTP) are characterized by rural areas. These facilities would be located on the McClusky Canal or adjacent to it in an agricultural area. All disturbed areas associated with Project facilities would re-vegetated and/or landscaped, and constructed facilities would be designed to blend with the surrounding environment. Implementing the BMPs included in Appendix D would minimize any potential impacts.

Air Quality

Air pollutants may be emitted from fossil fuel-burning equipment operated during construction. Standard construction industry measures would be taken to minimize fugitive dust emissions during construction activities. Any complaints that may arise would be dealt with by the Project sponsor and contractor in a timely and effective manner. Emissions would cease once construction was completed. The State of North Dakota is in attainment or unclassifiable / attainment for all criteria pollutants, including the particulate matter less than two microns in diameter (PM-2.5) and the 8-hour ozone (O3) standards, and the temporary emissions generated during construction would not cause a violation of any air quality standards.

The Biota WTP and other Project components would be powered by electricity; therefore, their operation would not directly generate air emissions. Facilities that generated the power that would be used by these components would not generate air emissions because they rely on hydropower which is a renewable source. These power-generating facilities could be located a considerable distance from the Project Area and in multiple locations. Their operation would be regulated by local authorities in accordance with their permit conditions. Therefore, no air quality standards would be violated, either directly or indirectly.

Construction activities and operation and maintenance tasks associated with the No Action alternative are very similar to each of the action alternatives; therefore, the impacts to air quality would be very similar for the No Action alternative in comparison to each of the action alternatives.

Greenhouse Gas Emissions as a Contributor to Climate Change

Fossil fuel-burning equipment operated during construction would generate greenhouse gas (GHG) emissions but this would be a temporary impact and would not occur on an annual basis. GHG emissions from operations would occur on an annual basis and therefore, an initial evaluation of the potential impacts was conducted. Currently the guidance from the Council on Environmental Quality (CEQ) on the *Consideration of Green House Gas Emissions and the Effects of Climate Change in NEPA Reviews* is in draft form. The previous guidance (2016) has been rescinded and the proposed draft guidance is currently undergoing review.

Due to the lack of specific guidance from CEQ, Reclamation reviewed the GHG emission evaluation completed for a rural water system project that includes similar type facilities and construction/operation actions. This review was conducted in order to make a comparative evaluation of the potential impacts for the alternatives being evaluated in this EIS. The previous GHG analysis was conducted as part of the Northwest Area Water Supply Project Supplemental EIS (Reclamation 2015). The use of existing analyses to inform this NEPA analysis is in conformance with direction provided in Executive Order 13807 and Secretarial Order 3355.

The ENDAWS Project has been designed to reduce direct GHG emissions, to the extent feasible, by using electricity to power the Project components instead of petroleum-based fuels. Thus, no direct annual emissions would result from the operation of Project components. Negligible amounts of GHG emissions would be generated by vehicles used for periodic maintenance of Project components. An indirect impact could result from emissions generated by the operation of power

plants providing power to the Project components. The results of the analysis completed for the Northwest Area Water Supply Project Supplemental EIS documented the power plants in the United States generated 2,221 million metric tons of CO2-e (GHGs). The ENDAWS project would generate only an extremely small increment when compared to the GHGs emissions already being generated by power plants and thus would not result in a significant contribution to climate change.

Earth Resources

Impacts on earth resources would occur primarily during construction and would be limited to the potential for erosion and sedimentation and the removal of topsoil. The Project would be designed based on detailed, site-specific topographic and geotechnical information; thus, it would be engineered to withstand identified geological hazards.

To minimize construction impacts, the following erosion control measures (documented in Best Management Practices, Appendix E) would be employed as appropriate and at stream crossings at all times:

- Care would be exercised to preserve existing trees along the streambank.
- Stabilization, erosion controls, restoration, and revegetation of all streambeds and embankments would be performed as soon as a stream crossing is completed and maintained until stable.
- Riparian woody shrubs and trees would be replanted as necessary to preserve the shading characteristics of the watercourse and the aesthetic nature of the streambank.
- At locations where soil conditions or slopes are such that erosion may occur along the pipeline trench, construction contractors would be required to construct earth berms perpendicular to the trench line at intervals sufficient to divert water from the trench.
- In pasture and hay land, straw wattles would be furnished and installed within 14 days of pipeline installation, at approximately the following intervals:

% Slope	Interval (feet)
7-10	120
10+	50

- Straw wattles would be a minimum of 6 inches in diameter, and would be installed across the entire width, plus 3 feet on either side of the disturbed area.
- As soon as a stream crossing was completed, streambeds and embankments would be stabilized, erosion controlled, and the area would be restored and re-vegetated, following vegetation BMPs. They would be maintained until stable.

To minimize impacts on topsoil, topsoil would be removed and stockpiled separately from surface soils for reapplication following construction.

Construction activities and operation and maintenance tasks associated with the No Action alternative are very similar to each of the action alternatives; therefore, the impacts to earth resources would be similar for No Action in comparison to each of the action alternatives.

Noise

Construction activities would be the main source of noise. Pipeline construction would primarily occur in sparsely developed rural areas that are not in proximity to human noise-sensitive receptors such as residences, schools, churches, and hospitals. The increased noise levels would be temporary, however, and night construction would be avoided near residential and populated areas; thus, further minimizing the potential for annoyance and sleep disturbance. Moreover, construction activities would comply with all appropriate local laws and regulations, including those intended to minimize noise impacts. The Biota WTP and proposed intakes and pump stations are not in immediate proximity to any noise-sensitive receptors, and the pumps would be enclosed, which would minimize the potential for audible noise to be emitted from these facilities.

Construction activities and operation and maintenance tasks associated with the No Action alternative are very similar to each of the action alternatives; therefore, the noise impacts would be very similar for No Action in comparison to each of the action alternatives.

Public Services and Utilities

Public services include police, fire, medical services, and schools within the Project Area. Utilities include solid waste disposal sites. The Project would not result in additional demands for public services. Neither construction nor operations pose a particular risk and would not result in an undue increase in the demand for police, fire, or medical services.

Construction would generate limited demand for solid waste disposal, and sludge and silt removed from Project facilities would also require disposal. All waste would be disposed of in approved facilities with adequate capacity. Construction debris would be hauled from the work site to a disposal location approved by the Contracting Officer or his/her representative.

Transportation

Existing state highways and county roads in the Project Area would be used to transport materials to and from areas of construction and by workers traveling to and from work sites. Open-trench construction techniques would be used in most locations where the pipeline would cross existing roadways. Traffic impacts would be minimized by keeping at least one lane open through the active work areas and using flaggers as necessary. Major highways and railroads would be crossed using subsurface construction techniques, which would not affect traffic using these travel routes. Traffic though work zones would be controlled by guidelines established by the Federal Highway Administration, the Department of Transportation, and the American Association of State Highway Transportation Officials. Typical traffic control measures include use of signs, cones, drums, flaggers, reduced speed limits, lane closures, pavement markings, variable message signs,

and movable concrete barriers. Such measures are commonly used to ensure the safe passage of vehicles during construction.

During operations, traffic would be generated by the delivery of chemicals and supplies for the biota WTP and the periodic removal of sludge from the lagoons at the site. When these lagoons are cleaned, the residual would be disposed of within the Missouri River Basin. The impact of these maintenance activities would be negligible due to their intermittent nature of the activity and the rural setting of the Biota WTP facility.

Wildlife

Construction, operation and maintenance of any of the alternatives evaluated, including No Action, would have minimal temporary or short-term impacts to local wildlife through the disturbance of potential habitat. The potential effects on wildlife were assessed by considering the effects on their habitat. A majority of the habitat within the affected environment is cropland, followed by grasslands. Environmental commitments and best management practices described in Appendix D will avoid or minimize effects to these habitats. The only habitat permanently affected would be at the location of the biota water treatment plant and facilities and intake on the Canal, which consists of tame grass and cropland. Permanent impacts to wildlife habitat are negligible.

Paleontology

Paleontological resource refers to any fossilized remains, traces, or imprints of organisms preserved in or on the Earth's crust that are of paleontological interest and provide information about the history of life on earth. Paleontological resources generally have not been identified in the proposed action area; however, because most alternatives include soil-disturbing activities, there is potential for encountering unknown paleontological materials during construction actions. No adverse impacts on paleontological resources are anticipated provided the below guidelines are followed.

- Reclamation would consult with the North Dakota Geological Survey to identify areas for paleontological survey where significant fossils are likely. Paleontological surveys would be completed prior to construction if necessary. Based upon survey data, Reclamation would consult with a qualified paleontologist about revising routes to avoid damaging significant fossil locations.
- All previously recorded paleontological resources and paleontologically sensitive zones within the path of the alternative selected in the Record of Decision would be inspected in the field by a qualified paleontologist. Avoidance measures would be developed to avoid significant resources.
- If unknown paleontological resources were discovered during construction activities, construction would be halted until the North Dakota Geological Survey could be notified and appropriate consultations are completed. Additionally, every effort will be made to protect the locality from further impacts; including, looting, erosion, or other human or natural damage.

Indian Trust Assets

The United States has a "trust responsibility" to protect and maintain rights and property reserved by or granted to federally recognized American Indian tribes or to Indian individuals by treaties, statutes, and executive orders. This trust responsibility derives from the historical government-to-government relationship between the federal government and Indian tribes as expressed in treaties and federal Indian law. This responsibility requires that all federal agencies, including Reclamation, take all actions reasonably necessary to protect Indian Trust Assets (ITAs).

ITAs are defined as legal interests in property held in trust by the United States for federally recognized Indian tribes or individuals. Examples of things that may be trust assets include "lands, minerals, hunting and fishing rights, and water rights" (Reclamation 1993). These three ITAs are addressed in this section: 1) trust lands; 2) hunting, fishing, and gathering rights; and 3) water rights.

Trust lands are the most commonly encountered ITA. Trust lands are property set aside for Indians with "…the United States holding naked legal title and the Indians enjoying the beneficial interest" (Canby 1991). Trust lands are most often encountered within or near Indian reservations.

According to Reclamation's (1993) ITA policy, hunting, fishing, and gathering rights, as specifically retained or relinquished in treaties, may qualify as ITAs. This is because the right to continue hunting, fishing, and gathering was often retained in many treaties. Although the courts have not ruled on whether these activities constitute ITAs, they are treated as such here because of Reclamation's ITA policy.

Another ITA that potentially could be affected by the Project is Indian water rights in the Missouri River. Such water rights in the basin are a matter of federal law. The basis for this stems from the U.S. Supreme Court's decision in *Winters v. United States* (1908), which enunciated the Winters Doctrine. According to the doctrine, the establishment of an Indian reservation implied that sufficient water was reserved (or set aside) to fulfill purposes for which the reservation was created, with the priority date being the date the reservation was established. As such, Indian water rights, when quantified, constitute an ITA. In *Arizona v. California* (1963) the U.S. Supreme Court held that water allocated should be sufficient to meet both present and future needs of the reservation to assure the viability of the reservation as a homeland. Case law also supports the premise that Indian reserved water rights are not lost through non-use.

Reclamation reached out to tribes within North Dakota and those who have interests and ties to the Missouri River seeking input on concerns and information they have relative to ITAs and their inclusion in this EIS analysis; however, no input was received prior to the issuance of this Draft EIS.

As defined above, no trust lands were identified within the Project area. All project alternatives are outside of Indian reservations or any trust lands. Many treaties with Tribes within the Missouri River Basin provide for continued hunting, fishing, and gathering on ceded lands. Several tribes within the Missouri River Basin are in various stages of quantifying their water rights. The U.S. Army Corps of Engineers (Corps) is the federal agency responsible for operations of the Missouri River Mainstem Reservoir System. The Corps has recognized that certain Missouri River Basin tribes are entitled to water rights in streams running through and along their reservations under the Winters Doctrine. The Corps' operational decisions concerning the Missouri River Mainstem Reservoir System are

based on the water that is in the system and demands placed upon it. The Corps recognizes tribal water rights to the mainstem irrespective of whether those rights have been quantified. In doing so, the Corps has recognized that future quantification of these rights could affect operations.

Environmental Justice

An evaluation of environmental justice impacts is mandated by Executive Order 12898 on Environmental Justice (February 11, 1994). This Executive Order directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The impacts of an action can be considered disproportionately high and adverse if the percentage of total impacts imposed on a specific group is greater than the percentage of the total population in a given area represented by that group.

The impacts of an action can be considered disproportionately distributed if the percentage of total impacts imposed on a specific group is greater than the percentage of the total population represented by that group. A group can be defined by race, ethnicity, income, community, or some other parameters.

The population and rural nature of these counties is similar to adjacent counties within the state. For this reason, a recently completed environmental justice analyses prepared for the Northwest Area Water Supply Project Supplemental EIS (Reclamation 2015) was reviewed to determine if the results of that analysis could provide a comparative analysis to be used in this EIS evaluation. The use of existing analyses to inform this NEPA analysis is in conformance with direction provided in Executive Order 13807 and Secretarial Order 3355.

The environmental justice analysis for the Northwest Area Water Supply (NAWS) Project Supplemental EIS relied on data from the U.S. Census Bureau to identify county and community population characteristics (population, race, low-income, etc.), as well as data for the entire state of North Dakota and the United States. These data were used to identify minority and low-income communities within that project area. Population statistics for the NAWS project area as described in the Supplemental EIS are noted below. These statistics are very similar to the counties included in the ENDAWS project area, and as illustrated in Table E-1, which shows the population data and data on minorities and low-income levels in the ENDAWS counties.

NAWS Environmental Justice Data (2010 Census):

- ND Population in 2010 = 672,591
- 10 counties were evaluated; McLean County is common in both these analyses. The other nine counties are in close proximity to the ENDAWS project area
- Total population of the ten NAWS counties in 2010 was 123,398.
- Minority populations within these ten counties totaled 14,914 people; representing 12% of the total county population.

- The most prevalent minority population was Native Americans or Alaska Natives with 5,874 people representing 5% of the total county population. In McLean County there were 625 people representing 7.0% of that county.
- The second most common minority was Latino or Hispanic with 2,297 people representing 2% of the total county population. In McLean County there were 111 people representing 1% of that county.
- In the 10 counties evaluated, 10% of the county total populations were identified as low-income populations; and only 3 communities contained low-income populations. In McLean County, 10% of the population at that time was identified as low-income.

Data from the U.S. Census Bureau was accessed to complete a preliminary review of the counties included in the ENDAWS project area. Population estimate data is available at the state and county level at www.census.gov. Estimated population data for the ENDAWS county area as of July 2019 is presented in Table E-1. The population of the State of North Dakota in 2010 was recorded as 672,591 and the 2019 U.S. Census Bureau estimates the state-wide population at 762,062. This is an increase of more than 89,400 people. At the county level, the population of the counties included in the ENDAWS area totals 115,666 people. In these counties, minority populations make up on average approximately 9 percent of the population, and on average, 10 percent of the counties' population is considered low-income. As shown in Table E-1, Native American or Alaskan Native population is the largest majority population and the Hispanic or Latino population is the second largest minority population. The demographics of the ENDAWS project area counties is thus very similar to the counties included in the NAWS Supplemental EIS evaluation; therefore, using that analysis as a comparative analysis is reasonable.

Table E-1: Minority and Low-Income Populations

County	2019 Estimated Census Population	2019 Estimated Minority Population				Low-Income Population
		White	Native American or Alaskan Native	Hispanic or Latino	Other	
Burleigh	95,626	87,020	4,016	2,486	2,104	7%
McLean	9,450	8,505	662	284	-	9%
Sheridan	1,315	1,262	13	13	27	17%
Wells	3,834	3,719	38	38	39	11%
Foster	3,210	3,114	32	64	-	9%
Griggs	2,231	2,187	22	22	-	9%

As demonstrated by the evaluation of other MR&I water systems, activities associated with the construction and operation of a project result in increased employment, wages, and output and have overall economic benefits in the project area. Improvements in water quality and quantity would occur under the No Action and all the action alternatives and these improvements would be similar among the alternatives since they involve the same water source (Missouri River system) and the same volume of water.

All of the alternatives would result in temporary beneficial economic impacts, including employment opportunities and increased income as a result of construction activities. No disproportionately high and adverse human health or environmental impacts on the counties/communities are anticipated within the Project Area as a result of the action alternatives, so this was not investigated further.

Water Quality

The impacts to the water quality of the source water (Missouri River system) for the ENDAWS project were not specifically analyzed; however, Reclamation does not anticipate impacts to water quality of the Missouri River based on a recent analysis of the Missouri River water quality completed for an environmental review of the NAWS project. In this previous analysis (Reclamation, 2015), water quality within the Missouri River system was evaluated and the proposed State RRVWSP withdrawal was considered as part of that analysis. The results of the 2015 analysis are directly applicable to the proposed ENDAWS project; therefore, Reclamation has determined there would not be any impacts to the water quality of the Missouri River. See Chapter 3 for explanation of expected differences in water levels throughout the Missouri River.

Proposed Action Alternatives C, D, E and F would increase flows through Lake Audubon and the McClusky Canal above current levels, which would enhance water quality by freshening both waterbodies.

The impacts to the receiving waters of the Project have not been evaluated in detail due to several factors including:

1) The scope of the ENDAWS project is to provide an alternate source of water to the State RRVWSP, and therefore water quality impacts associated with releasing water into the Hudson Bay Basin are outside the scope of the EIS.

2) All alternatives result in 165 cfs being transferred into the Hudson Bay basin during times of drought so the impacts to water quality in the receiving stream would be equal for all alternatives including the No Action alternative

3) The State RRVWSP is being developed to provide water to eastern North Dakota during times of drought, any impacts from adding water to the basin during those times would be beneficial.

Appendix F

Aquatic Invasive Species Risk and Consequence Analysis

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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AQUATIC INVASIVE SPECIES RISK AND CONSEQUENCE ANALYSIS

Eastern North Dakota Alternate Water Supply

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B&V PROJECT NO. 403761
B&V FILE NO. 40.0200

PREPARED FOR

BUREAU OF RECLAMATION

U.S. Department of the Interior

15 APRIL 2020

PREPARED BY

BLACK & VEATCH

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Acronyms and Abbreviations

AIS	aquatic invasive species
BWTP	biota water treatment plant
CCV	channel catfish virus
cfs	cubic feet per second
CMF	cloth media filtration
CNDWSP	Central North Dakota Water Supply Project
cT	contact time
DBP	disinfection by-product(s)
DCB	disinfection contact basin(s)
DOC	dissolved organic carbon
EIS	Environmental Impact Statement
ENDAWS	Eastern North Dakota Alternate Water Supply
FEIS	Final Environmental Impact Statement
Final EA	Final Environmental Assessment
FONSI	Finding of No Significant Impact
GAC	granular activated carbon
gfd	gallons per square foot of membrane surface per day
GMF	granular media filtration
HBB	Hudson Bay Basin
IHNV	infectious hematopoietic necrosis virus
IPNV	infectious pancreatic necrosis virus
ISAV	infectious salmon anemia virus
MF	microfiltration
mg/L	milligrams per liter
mg-min/L	milligram-minutes per liter
MRB	Missouri River Basin
NAWS	Northwest Area Water Supply
NTU	nephelometric turbidity units
psig	pounds per square inch gauge
Reclamation	United States Department of the Interior, Bureau of Reclamation
Report	Aquatic Invasive Species Risk and Consequence Analysis Report
RRVWSP	Red River Valley Water Supply Project
SVCV	spring viremia of carp virus
TAM	triactinomyxon
TOC	total organic carbon
UF	ultrafiltration
USGS	United States Geological Survey
UV	ultraviolet light

UVT	ultraviolet light transmittance
VHS	viral hemorrhagic septicemia
WAWS	Western Area Water Supply

1.0 Introduction

1.1 PROJECT SUMMARY

The Eastern North Dakota Alternative Water Supply (ENDAWS) was developed as an alternate water source for the state-led Red River Valley Water Supply Project (RRVWSP) to use the McClusky Canal to supplement or replace the Missouri River. ENDAWS would provide an additional 145 cubic feet per second (cfs) water contract, in addition to the 20 cfs water contract previously subjected to Reclamation's environmental review in the Central North Dakota Water Supply Project (CNDWSP), for a total of 165 cfs. ENDAWS would include an intake on the McClusky Canal, a Biota Water Treatment Plant (BWTP), a pumping station, and a pipeline that would terminate where it intersects with the state-led RRVWSP pipeline. Figure 1-1 shows the ENDAWS route options. For context, the state-led RRVWSP route is also shown in grey. A fuller explanation of the ENDAWS Project is provided in the Appraisal Level Design Engineering Report.

As shown on Figure 1-1, the ENDAWS project includes a transfer of water from the Missouri River Basin (MRB), across the continental divide to the Hudson Bay Basin (HBB).

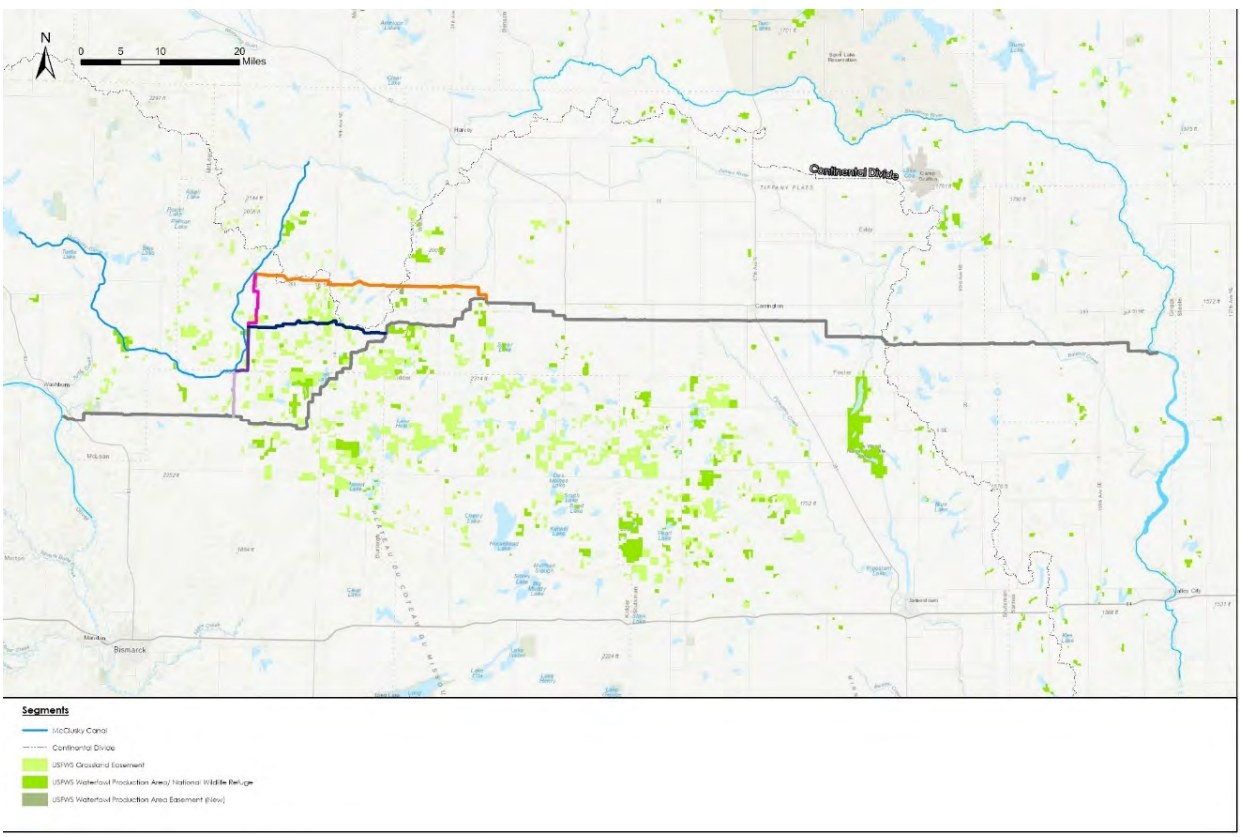

Figure 1-1 Overall Project Layout

1.2 REPORT OBJECTIVE

As explained in the paragraphs below, numerous studies have been completed on the topic of Aquatic Invasive Species (AIS) interbasin transfer between the MRB and the HBB. The intent of this analysis is to use the U.S. Bureau of Reclamation's (Reclamation) most recent technical report - the *Transbasin Effects Analysis Technical Report (Transbasin Effects Analysis)*, completed for the

Northwest Area Water Supply Project (Reclamation 2013) - as the foundation for this Aquatic Invasive Species Risk and Consequence Analysis Report (Report).

The primary objectives for this analysis are to:

- Update the known presence and distribution of AIS in the MRB, HBB, and other adjacent watersheds.
- Update the inventory for both natural and anthropogenic transfer pathways of AIS to the HBB.
- Complete a relative, qualitative risk assessment of the Project's incremental influence on AIS introductions to the HBB.
- Review the qualitative evaluation of the environmental consequences of an AIS transfer event and subsequent establishment.
- Review the qualitative evaluation of the potential economic impacts on commercial fishing, recreational fishing, and non-fishing recreation in the HBB.

The parameters and content for this analysis were established by Reclamation in its 2019 Plan of Study.

1.3 HISTORY OF PREVIOUS STUDIES AS GUIDANCE FOR THIS ANALYSIS

As noted above, the risk of interbasin AIS transfer between the MRB and the HBB has been evaluated as part of previous National Environmental Policy Act compliance reviews completed by Reclamation. The work presented in this analysis is a continuation of these previous studies.

Previous analyses addressing transfer risk include the following:

- Northwest Area Water Supply (NAWS) Project Final Environmental Assessment (Final EA) and Finding of No Significant Impact (FONSI) completed in 2001 (Reclamation 2001).
- Northwest Area Water Supply Project - NAWS Comparative Risk Analysis (Reclamation 2000); in support of the Final EA.
- Technical Report Supporting the Canadian Appellant's Administrative Appeal to the Bureau of Reclamation Regarding the Final Environmental Assessment and Finding of No Significant Impact for the Northwest Area Water Supply Project (TetrES 2001).
- Report on the Review of the Proposed Pre-Treatment Process for the Northwest Area Water Supply Project (Earth Tech and TetrES 2005).
- Analysis of Risks of Interbasin Biota Transfers Potentially Linked to System Failures in the Northwest Area Water Supply Project (United States Geological Survey [USGS] 2007; in support of the NAWS Final Environmental Impact Statement (FEIS) on Water Treatment [Reclamation 2008]).

In addition, the USGS conducted a risk analysis that addressed potential issues of AIS transfer associated with interbasin water diversions between the MRB and Red River basin, which lies within the HBB. That study was termed the Risk and Consequence Analysis Focused on Biota Transfers Potentially Associated with Surface Water Diversions between the Missouri River Basin and Red River Basin (USGS 2005). The report was done in support of the federal Red River Valley Water Supply Project Final EIS (Reclamation and Garrison Diversion Conservancy District 2007).

This analysis set the stage for the NAWS Risk Analysis Report (USGS 2007) in terms of analyses employed and the identification of representative AIS of concern. AIS of concern for NAWS are restricted to microorganisms because the risk of transferring larger, macroscopic organisms through a Project-related water diversion is practically zero for the treatment alternatives evaluated in the Final EIS. Likewise, this project focuses on microscopic organisms.

The NAWS Risk Analysis Report in turn set the context for the most recent work by Reclamation. The 2011 Plan of Study (Reclamation, 2011) was developed by Reclamation with input from the federal and state agencies serving as cooperating agency team members, as well as their consultant. The Transbasin Effects Analysis was a qualitative risk and consequence analysis conducted for Reclamation and it was included as an appendix to Reclamation's Supplemental EIS (Reclamation 2015). This technical report was reviewed by a 3-person panel of independent peer reviewers who are experts in the fields of fish pathogens and parasites, ecological risk and consequence analysis, and surface water treatment and disinfection for waterborne parasites and pathogens. The peer review report (Atkins 2012) contains specific comments from each reviewer. The overall conclusion of their review was that the technical report was "…based on the best available science, and the result and conclusions were supported by that science, given the uncertainties inherent in the available data and topic knowledge."

During this same time period, the International Joint Commission also conducted an extensive biota survey effort for the Devils Lake-Red River Basin Fish Parasite and Pathogen Project in 2011. Like Reclamation's Transbasin Effects Analysis, this study used a qualitative approach to the analysis due to uncertainties in the available data for AIS.

1.4 KEY ASSUMPTIONS

Reclamation developed a list of facts and key assumptions as an integral part of the Transbasin Effects Analysis process for the NAWS Project. The assumptions were developed following a thorough examination of historical documents, invasive species databases, and historical microbial invasions and were determined to be applicable to this Risk and Consequences Analysis.

Key assumptions that are applicable to the ENDAWS Risk and Consequences Analysis are listed below.

- **The spread of aquatic invasive species** - Invasive species movement into new aquatic systems is a common result of ongoing human and other naturally occurring activities (e.g., shipping industry, fish stocking, and bird migrations). Introductions of non-indigenous microbes to the receiving basin are to be expected with or without the Project.
- **Viability of transferred organisms** – There are many processes that can deactivate microbes in the environment. However, for this conservative analysis, it is assumed that cells are viable and that any transfer - no matter how small (volume of water and number of cells, or organisms) - could lead to a negative consequence. Therefore, the analysis will address consequences of transfer, regardless of the probability of the event.
- **Uncertainty** - The best available data and information was gathered as part of the extensive literature review conducted for the Transbasin Effects Analysis. This literature and findings are the foundation upon which this assessment begins. Consequently, reasonable available data (2012 to Present) was acquired and reviewed to support this Risk and Consequence Analysis. The data gathering activities are described in detail in terms of what was acquired as well as any uncertainty associated with the data.

- **Presence of invasive microorganisms of concern in the source waters and the HBB –** The absence of detection records for a particular organism does not rule out the possibility of its existence in an aquatic system. Invasive microorganisms of concern in Reclamation's 2013 Transbasin Effects Analysis were reviewed and was determined to be representative of the taxonomic groups of concern.
- **Water release volume** - The volume of water released is one of many factors affecting risk. The Transbasin Effects Analysis documented that the consequences of a transfer are independent of the volume of water that may contain invasive microorganisms released (inoculum size), because the potential consequences would be the same regardless of water volume or transfer pathway. The conservative approach employed assumed there may be viable microorganisms in even the smallest volume of water.
- **Release location –** Although the release volume may not affect the potential consequences of a transfer, the location of the release and the type of media contacted are critical variables. The main release location evaluated in this analysis is the point of discharge into the Sheyenne River. The ENDAWS project would deliver treated water to the RRVWSP main transmission pipeline which terminates at a control valve and discharge structure near the Sheyenne River upstream of Lake Ashtabula.
- **Qualitative consequence analysis** - The consequence analysis in the Transbasin Effects Analysis was largely qualitative and extrapolated from historical microbial invasions. The impacts of microorganisms of concern in the source waters (e.g., Lake Sakakawea) were reviewed and updated in this consequence analysis as well.
- **Human health impacts** –As stated in Reclamation's 2013 technical report, the human pathogens of concern included Cryptosporidium and Giardia. Both of these pathogens are ubiquitous and are present in both basins. Therefore, it is not possible to directly relate human health exposures and impacts from individual pathways of AIS. This analysis will focus on the impacts of AIS on the aquatic environment.

1.5 REPORT OVERVIEW

The Report chapters are summarized in the following:

Chapter 1- Introduction

- Provides an overview of the Report and the assumptions that guided the study.

Chapter 2 – Life History Characteristics and Distribution

- Presents available data and other information (2012-Present) to document the presence and distribution of aquatic invasive microorganisms of concern in the MRB, Columbia River basin, Great Lakes basin, Upper Mississippi River basin, and the HBB (including Canada).

Chapter 3 – Uncertainty

- Presents limitations of the availability of AIS data and information along with the challenges of predicting the impact of AIS in natural ecosystems.

Chapter 4 - Biota Transfer

- Presents and updates the conceptual risk model described in the Transbasin Effects Analysis to reflect the specifics of the ENDAWS project.

- Evaluates the alternative pipeline routes from the McClusky Canal to the ENDAWS bulk distribution point to characterize associated transfer potential to the HBB.
- Presents a qualitative risk assessment of AIS transfer for the various project and non-project related pathways.

Chapter 5 – Treatment Alternatives Evaluation

- Evaluates the biota water treatment options to characterize their effectiveness for further reducing project-related risk of transferring AIS to the HBB.
- Assesses the probabilities of operational failures of the treatment system.

Chapter 6 – Risk Analysis

- Completes a qualitative assessment of invasive aquatic microorganism transfer risk for project and non-project pathways.

Chapter 7 – Consequences of Analysis

- Reviews and updates the potential environmental and economic consequences of invasive aquatic species introductions and establishments as needed.

Chapter 8 – Conclusions

- Provides a summary of the previous chapters and overall conclusions of the incremental risk of AIS transfer due to the project.

2.0 Life History Characteristics and Distribution

This Chapter presents an update of the distribution of the AIS presented in the Transbasin Effects Analysis. The distribution update uses the most currently available data.

2.1 INVASIVE MICROORGANISMS OF CONCERN

As described in Chapter 1, numerous past studies and reviews led to a technical consensus to focus on a select group of 39 AIS. This list of AIS was reviewed by Reclamation in its 2019 Plan of Study and was considered appropriate for this analysis. The AIS of concern are shown in Table 2-1 and are organized by taxonomic group.

Table 2-1 AIS of Concern

TAXONOMIC GROUP	LATIN NAME	COMMON NAME
Virus	*Aquabinavirus spp.*	Infectious pancreatic necrosis virus
	Novirhabdovirus spp.	Infectious hematopoietic necrosis virus
	Novirhabdovirus spp.	Viral hemorrhagic septicemia
	Ictalurid Herpesvirus 1	Channel catfish virus
	Rhabdovirus carpio	Spring viremia of carp virus
	Isavirus spp.	Infectious salmon anemia virus
Bacteria	*Renibacterium salmoninarum*	Bacterial kidney disease
	Aeromonas salmonicida	Furunculosis
	Streptococcus faecalis	Strep
	Flavobacterium columnare	Columnaris disease
	Pseudomonas aeruginosa	NA
	Vibrio cholera	Cholera
	Edwardsiella spp.	NA
	Mycobacterium spp.	e.g., tuberculosis or leprosy
	Yersinia ruckeri	Enteric redmouth disease
	Escherichia coli	E. coli
	Legionella spp.	e.g., Legionnaire's disease
	Salmonella spp.	Salmonella

TAXONOMIC GROUP		LATIN NAME	COMMON NAME
Animalia	Mollusks	*Dreissena polymorpha*	Zebra mussel
		Dreissena rostriformis bugensis	Quagga mussel
		Potamopyrgus antipodarum	New Zealand mudsnail
	Parasites	*Polypodium hydriforme*	Intracellular parasitic Cnidarian
		Myxobolus cerebralis	Whirling disease
		Actheres pimelodi	Parasitic copepod
		Ergasilus spp.	Parasitic copepod
		Icelanonchohaptor microcotyle	Parasitic flatworm
		Corallotaenia minutia	Parasitic tapeworm
Protozoa		*Gardia lamblia*	Backpacker's diarrhea
		Entamoeba histolytica	NA
		Cryptosporidium parvum	Crypto
		Ichthyophthirius multifiliis	Ich or White spot disease
		Ichthyophonus hoferi	Lchthyophonosis
Fungi		*Branchiomyces spp.*	Branchiomycosis
		Saprolegnia spp.	Saprolegniosis or Winter fungus disease
		Exophiala spp.	Black yeast
		Phoma herbarum	NA
Cyanobacteria		*Anabaena flos-aquae*	Blue-green algea
		Microcystis aeruginosa	Blue-green algea
		Aphanizomenon flos-aquae	Blue-green algea

2.2 DATA SOURCES

Attachment 1 to the Transbasin Effects Analysis presented a detailed spatial distribution of AIS in various watersheds. Each of the taxonomic groups described in Table 2-1 was re-examined to update the presence and distribution of aquatic invasive microorganisms of concern in the MRB, Columbia River basin, Great Lakes basin, Upper Mississippi River basin, and the HBB, including Canada.

This update focused on findings and key assumptions that were an integral part of the Transbasin Effects Analysis. These assumptions were developed following an examination of historical documents, invasive species databases, and historical microbial invasions and were determined to be applicable to the current risk and consequence analysis. Data sources identified to be examined had been previously been examined as part of the Transbasin Effects Analysis:

- The U.S. Fish and Wildlife National Wild Fish Health Survey Database (http://www.fws.gov/wildfishsurvey/)

- The Province of Manitoba (http://www.gov.mb.ca/)
- USGS database (https://nas.er.usgs.gov/)

A contract was issued to the Idaho Fish and Wildlife to maintain the U.S. Fish and Wildlife database (in 2018 the Idaho Fish and Wildlife was changed to Idaho Fish Health) through 2016. Discussions with Idaho Fish Health staff (Personal Communication -Sprague – 2019) indicated that the contract for maintaining the database had expired and the database had not been updated since 2016. At the request of Reclamation, this database was analyzed. Table 2-2 presents a summary of the information available from this database showing the date and location of the last detection of the AIS of concern. The results from the database indicate that no new detection of species identified as the AIS of concern had occurred since 2007.

The Province of Manitoba database was reviewed to update information in the HBB. Discussions with the database manager (Personal Communication – University of Georgia EDDSMAPS-2019) indicated that this database has not been updated since 2011, due to a discontinuation of the funding to update the Manitoba database product. Therefore, no additional information was available on the AIS of concern from this source.

Other databases were examined to determine if additional distribution information for the AIS of concern could be identified. These additional databases included:

- EDDSMAPS (https://www.eddmaps.org/tools/query/)
- https://www.eddmaps.org/alberta/
- https://www.eddmaps.org/ontario/

The Province of Alberta and Province of Ontario AIS databases were developed by the Center for Invasive Species and Ecosystem Health at the University of Georgia from the EDDSMAPS database. The EDDSMAPS database tracks the distribution of invasive terrestrial plants, forest pests, aquatic plants, aquatic animals, and pathogens. Two other database products, the EDDMAPS Ontario and EDDMAPS Alberta were also examined as part of this update. The database manager indicated that the overall EDDSMAPS database has continued to be updated however not with AIS. The results of a data search of the EDDSMAPS databases for the AIS of concern listed potential information on *Renibacterium slamoninarum* (Bacterial kidney disease), *Aeromonas salmnicida* (Furunculosis), *Novirhabdovirus spp*. (Infectious hematopoietic necrosis), *Novirhabdovirus spp* (Viral hemorrhagic septicemia), *Dreissena polymorpha* (Zebra mussel), and *Dreissena rostriformis bugensis* (Quagga mussel). Information in the data base indicated that three of these AIS, *Novirhabdovirus spp* (Viral hemorrhagic septicemia), *Dreissena polymorpha* (Zebra mussel), and *Dreissena rostriformis bugensis* (Quagga mussel) were found to be the Great Lakes basin. The data base indicated if during sampling the species was either positive (identified) or negative (not found). The updated distribution information from EDDMAPS has incorporated into the analysis. A review of the data for the AIS of concern indicated that no additional data had been incorporated into the data base after 2013.

The United States Geological Survey (USGS) maintains a database on NAS (Non indigenous Aquatic Species). This product is jointly funded by USGS and US Fish and Wildlife service. Data for this database is obtained from a variety sources, and the database contains information on over 1,800 species. The three species from Table 2-1 that are included in this database are mollusks, specifically Dreissena polymorpha (zebra mussels), Dreissena rostriformis bugensis (quagga mussel) and Potamopyrgus antipodarum (New Zealand mudsnail). Updated distribution maps have been prepared for these species.

Table 2-2 Summary from the U.S. Fish and Wildlife National Wild Fish Health Survey Database

SPECIES	START DATE OF SAMPLING EVENT IN DATABASE	END DATE OF SAMPLING EVENTS IN DATABASE	TOTAL NUMBER OF SAMPLING EVENTS	NUMBER OF ADDITIONAL SAMPLING EVENTS SINCE 2013	DATE OF LAST DETECTION IN STUDY WATERSHEDS	LOCATION
Aeromonas salmonicida	4/18/1996	8/30/2016	10704	677	Nov-06	Washington
Channel Catfish Virus	4/17/1997	7/11/2016	1181	154	none	none
Edwardsiella ictaluri	4/18/1996	8/30/2016	10701	667	none	none
Edwardsiella tarda	4/18/1996	8/30/2016	10694	677	Jun-07	Montana
Flavobacterium columnaris	5/1/1997	10/29/2015	2817	119	Sep-07	Wisconsin
Infectious Hematopoietic Necrosis Virus	4/18/1996	8/30/2016	17154	2011	Nov-12	Washington
Infectious Pancreatic Necrosis Virus	4/18/1996	8/30/2016	17279	2011	Jul-02	New Mexico
Infectious Salmon Anemia Virus	4/18/1996	8/30/2016	12002	808	none	None
Myxobolus cerebralis	10/24/1996	8/30/2016	5151	205	Jul-00	Idaho
Renibacterium salmoninarum	4/18/1996	10/29/2015	6065	77	none	None
Spring Viraemia of Carp Virus	9/26/1997	7/11/2016	4956	493	May-07	Minnesota
Viral Hemorrhagic Septicemia Virus	4/18/1996	8/30/2016	17279	2011	Jun-06	Ohio
Yersinia ruckeri	4/18/1996	8/30/2016	28606	677	Apr-09	Wisconsin

2.3 AIS DISTRIBUTION

2.3.1 Viruses

Table 2-3 provides the list of AIS viruses that were examined as part of this analysis.

Table 2-3 AIS of Viruses of Concern

TAXONOMIC GROUP	LATIN NAME	COMMON NAME
Virus	*Aquabinavirus spp.*	Infectious pancreatic necrosis virus
	Novirhabdovirus spp.	Infectious hematopoietic necrosis
	Novirhabdovirus spp.	Viral hemorrhagic septicemia
	Ictalurid Herpesvirus 1	Channel catfish virus
	Rhabdovirus carpio	Spring viremia of carp virus
	Isavirus spp.	Infectious salmon anemia virus

A summary of the distribution of the identified viruses from the Transbasin Effects Analysis indicated the following:

- Channel catfish virus (CCV) has been sampled in the US with no detection of CCV in any of the wild fish sampled as of December 2011. This includes samples collected in Red River basin (HBB) which is part of North Dakota and Manitoba waters. It has occurred in catfish production facilities in Arkansas and Mississippi and in Alabama where it was first found.
- Infectious Hematopietic Necrosis Virus (IHNV) is endemic in fish hatcheries and wild fish in the Pacific Northwest region of North America. The virus has been identified in fish from British Columbia, Canada and several U.S. states including Alaska, Washington, Oregon, California, Idaho, Colorado, South Dakota, Minnesota, and West Virginia. It is now found in other parts of the world including Korea, Iran, and parts of China. There are no recorded detections of this virus in fish from states in the MRB and it has not been found in Devils Lake which is part of the Red River Basin (HBB).
- Infectious Pancreatic Necrosis Virus (IPNV) has global distribution and has been found in Idaho, New Mexico, South Carolina, Virginia, Pennsylvania, Alberta, Quebec, Newfoundland, New Brunswick, Nova Scotia, and Prince Edward Island. IPNV was not detected in North Dakota. It has not been identified in Manitoba during a Devils Lake study therefore has not been found in the Red River Basin.
- Infectious Salmon Anemia Virus (ISAV) was first detected in Norway and has since become problematic in Scotland, the Faroe Islands, Chile, New Brunswick (Bay of Fundy), the Northeastern U.S. (Cobscook Bay, Maine) and the Passamaquoddy Bay on the U.S. - Canadian border. The virus has not been documented in either the MRB or HBB.
- Spring Viremia of Carp Virus has been reported in fish from North Carolina, Wisconsin, Illinois, Missouri, West Virginia, Washington, and Ontario, Canada, but not in North Dakota.
- Viral Hemorrhagic Septicema Virus was first detected in the Great Lakes basin in 2003 and appears to be restricted to the Great Lakes region from Wisconsin to New York State. To date, VHSV has not been detected in the MRB or HBB.

Distribution maps were included in the Transbasin Effects Analysis and serve as the basis for the distribution of virus AIS in this analysis. Figure 2-1presents an update to the virus AIS from the U.S. Fish & Wildlife database for the Great Lakes, Upper Mississippi, Pacific Northwest, Missouri and Hudson Bay Basins. The updated distribution maps are based on the most currently available information from the U.S. Fish and Wildlife National Wild Fish Health Survey Database. However, as noted above, there have been no new detections of the AIS considered in this analysis since 2005.

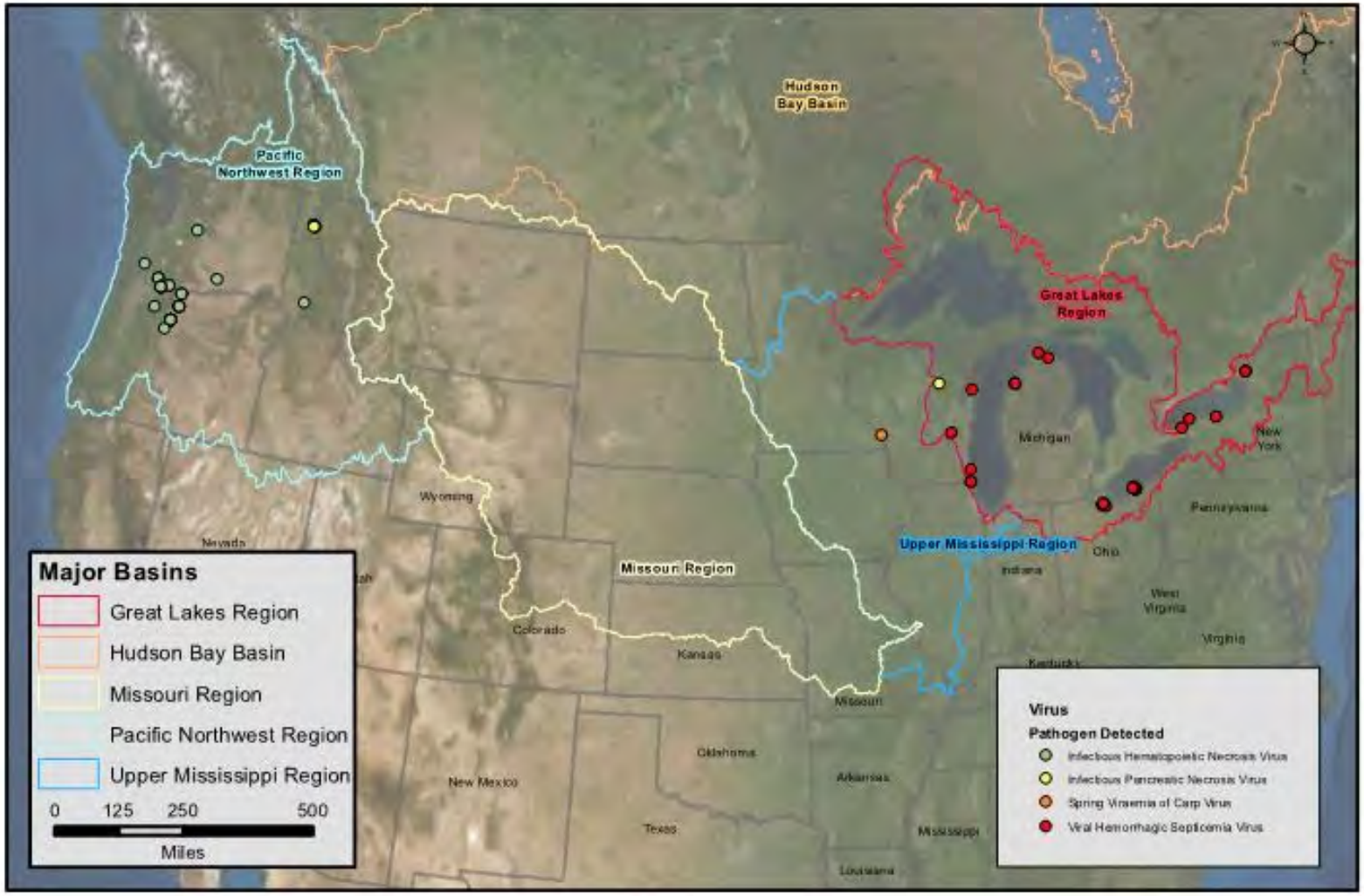

Figure 2-1 Virus Distribution Detection

2.3.2 Bacteria

The bacteria taxonomic group from Table 2-1 is shown in Table 2-4.

Table 2-4 Bacteria AIS

TAXONOMIC GROUP	LATIN NAME	COMMON NAME
Bacteria	*Renibacterium salmoninarum*	Bacterial kidney disease
	Aeromonas salmonicida	Furunculosis
	Streptococcus faecalis	Strep
	Flavobacterium columnare	Columnaris disease
	Pseudomonas aeruginosa	NA
	Vibrio cholera	Cholera
	Edwardsiella spp.	NA
	Mycobacterium spp.	e.g., tuberculosis or leprosy
	Yersinia ruckeri	Enteric redmouth disease
	Escherichia coli	E. coli
	Legionella spp.	e.g., Legionnaire's disease
	Salmonella spp.	Salmonella
	Phoma herbarum	NA

A summary of the bacteria AIS distribution from the Transbasin Effects Analysis is as follows:

- *Renibacterium salmoninarum* has been identified in hatcheries along the west coast of North America, in the Great Lakes region, and throughout the Appalachians north into the Canadian Maritime provinces. One case of Bacterial Kidney Disease, caused by *R. salmoninarum,* was reported in a common carp in Lake Traverse, South Dakota in the HBB in 2011. Additional infections have been reported in a variety of fish from the MRB in Montana, Wyoming, Colorado, Nebraska and Missouri.
- *Aeromonas salmonicida* was first observed in Germany and has been reported from several western and eastern states, none located within the HBB or the MRB. However pathogenic *Aeromonas* spp has been reported in catfish in the Red River near Grand Forks.
- *Streptococcus* spp. have been reported in cultured freshwater fish in the U.S., Japan, Thailand, Indonesia, and South Africa but not in MRB or HBB.
- *Flavobacterium columnare* has been identified in fish from several western states, Wisconsin, and Manitoba. Additionally, it was found in catfish in the Red River near Grand Forks, North Dakota and the Souris River providing evidence for the existence of *F. columnare* in the HBB.
- *Pseudomonas spp.* have a cosmopolitan distribution and are found commonly in nature. *Pseudomonas aeruginosa* was isolated from sand and bathing water from West Grand and Gimli beaches on Lake Winnipeg, part of the HBB.

- *Vibrio cholerae* is endemic to south Asia, Peru, and other warm regions of the globe; however, outbreaks have also occurred in the United Kingdom, U.S., and Russia, where the disease is not endemic.
- Among the *Edwardsiella* spp., *E. tarda* is distributed worldwide while *E. ictaluri* is currently confined to specific areas of the U.S. where catfish are reared. *Edwardsiella tarda* has been detected in fish from Lake Traverse (South Dakota) and Manitoba waters in the HBB as well as in fish from Rhode Island, Minnesota (Upper Mississippi River Region), South Dakota (HBB), Kansas (MRB), and Arizona.
- *Mycobacterium* spp have been found to be ubiquitous in the environment.
- *Yersinia ruckeri* was first reported in Idaho then from hatcheries in Australia, the United Kingdom, mainland Europe, South Africa, and Canada. In Canada, the disease has been detected in British Columbia, Saskatchewan, Ontario, and Nova Scotia. *Yersinia ruckeri* was identified in a black crappie collected from Lake Traverse, near the border of South Dakota within the HBB. The current U.S. distribution includes Alaska, Washington, Montana, Idaho, California, Arizona, South Dakota, Minnesota, Wisconsin, Michigan, Virginia, and New York.
- *Escherichia coli* has been found to have global distribution and less virulent strains are part of a healthy human gut flora. Densities of *E. coli* frequently exceeded the Manitoba Water Quality Objective for recreation, therefore has been found in Manitoba, part of the HBB.
- *Legionella* spp. are ubiquitous in natural and artificial waters worldwide including cooling towers, hotel water systems, homes, ships, factories, respiratory therapy equipment, fountains, misting devices, and spas.
- *Salmonella* spp. have been found to be widely distributed in aquatic system. They were isolated from sand and bathing water at West Grand Beach on Lake Winnipeg and most probably caused stomach illness in swimmer in Manitoba, part of the HBB.

Distribution maps were included in the Transbasin Effects Analysis and serve as the basis for the distribution of bacteria AIS in this analysis. Figure 2-2 presents an update to the bacteria AIS from the US Fish & Wildlife database for the Great Lakes, Upper Mississippi, Pacific Northwest, Missouri and Hudson Bay Basins. The updated distribution maps are based on the most currently available information from the U.S. Fish and Wildlife National Wild Fish Health Survey Database. However, as noted above, there have been no new detections of the AIS considered in this analysis since 2005.

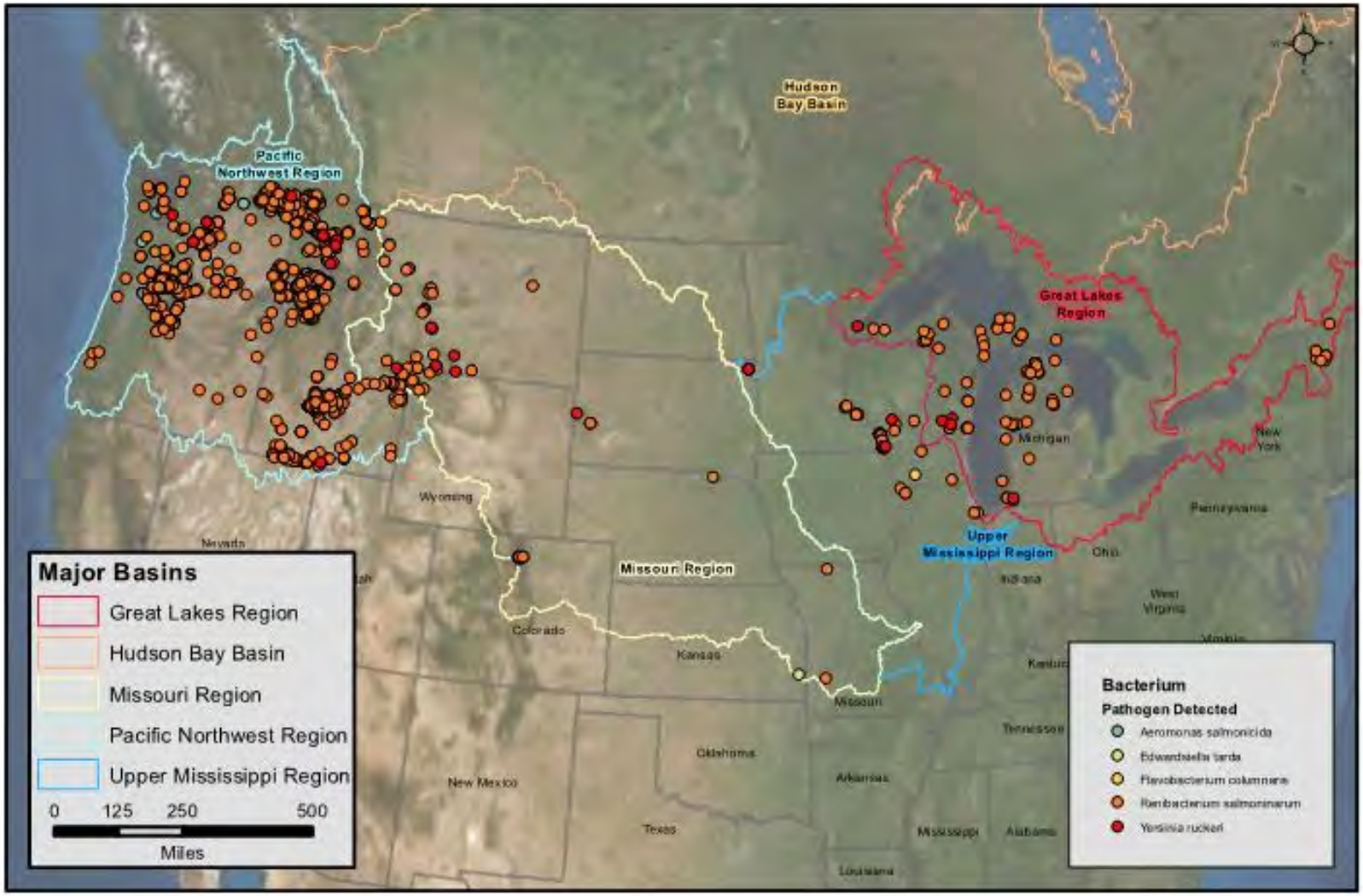

Figure 2-2 Bacteria AIS Distribution from the US Fish and Wildlife Database

2.3.3 Mollusks

Table 2-5 shows the mollusks identified amongst the 39 AIS.

Table 2-5 Mollusk Species of Concern

TAXONOMIC GROUP		LATIN NAME	COMMON NAME
Animalia	Mollusks	*Dreissena polymorpha*	Zebra mussel
		Dreissena rostriformis bugensis	Quagga mussel
		Potamopyrgus antipodarum	New Zealand mudsnail

Mollusk distribution data summarized from the Transbasin Effects Analysis indicates the following:

- New Zealand mud snails are endemic to New Zealand and have become naturalized over much of the globe including the US and Canada. They are locally abundant in western U.S. rivers (found in all western states) from six disparate invasion foci ranging from Oregon to Montana to Arizona and although present are less common in the eastern US. The snails have also been documented in British Columbia, Canada. NZMS were not detected in the HBB or the upper Mississippi Region but had 111 documented occurrences in the MRB. They have not been detected in North Dakota.
- Zebra mussels were introduced to North America in the Great Lakes region and are now common throughout the Mississippi River and the Missouri River. There are 164 records of zebra mussels in the MRB and four records in the HBB. In the U.S. portion of the HBB. Zebra mussels have been found in the Red River near Wahpeton, North Dakota, and in (Big) Pelican Lake, Minnesota. Zebra mussels have not yet invaded the Pacific Ocean basin.
- Quagga mussels are well established in the lower Great Lakes and their range was rapidly expanding in North America, being observed in the Upper Mississippi region. There were two documented detections in the MRB (Colorado), but none within the HBB or the Pacific Ocean basin.

The Zebra and Quagga mussels have had rapid migration across North America in the past 20 years. Quagga mussels appeared to be displacing zebra mussels in some areas, including southern Lake Ontario, and may become the dominant dreissenid species.

Distribution maps were included in the Transbasin Effects Analysis and serve as the basis for the distribution of mollusks AIS in this analysis. Figures 2-3 to 2-5 present an update to the mollusks AIS from the USGS database for the Great Lakes, Upper Mississippi, Pacific Northwest, Missouri and Hudson Bay Basins. The updated distribution maps are based on the most currently available information from the USGS database on Non-indigenous Aquatic Species.

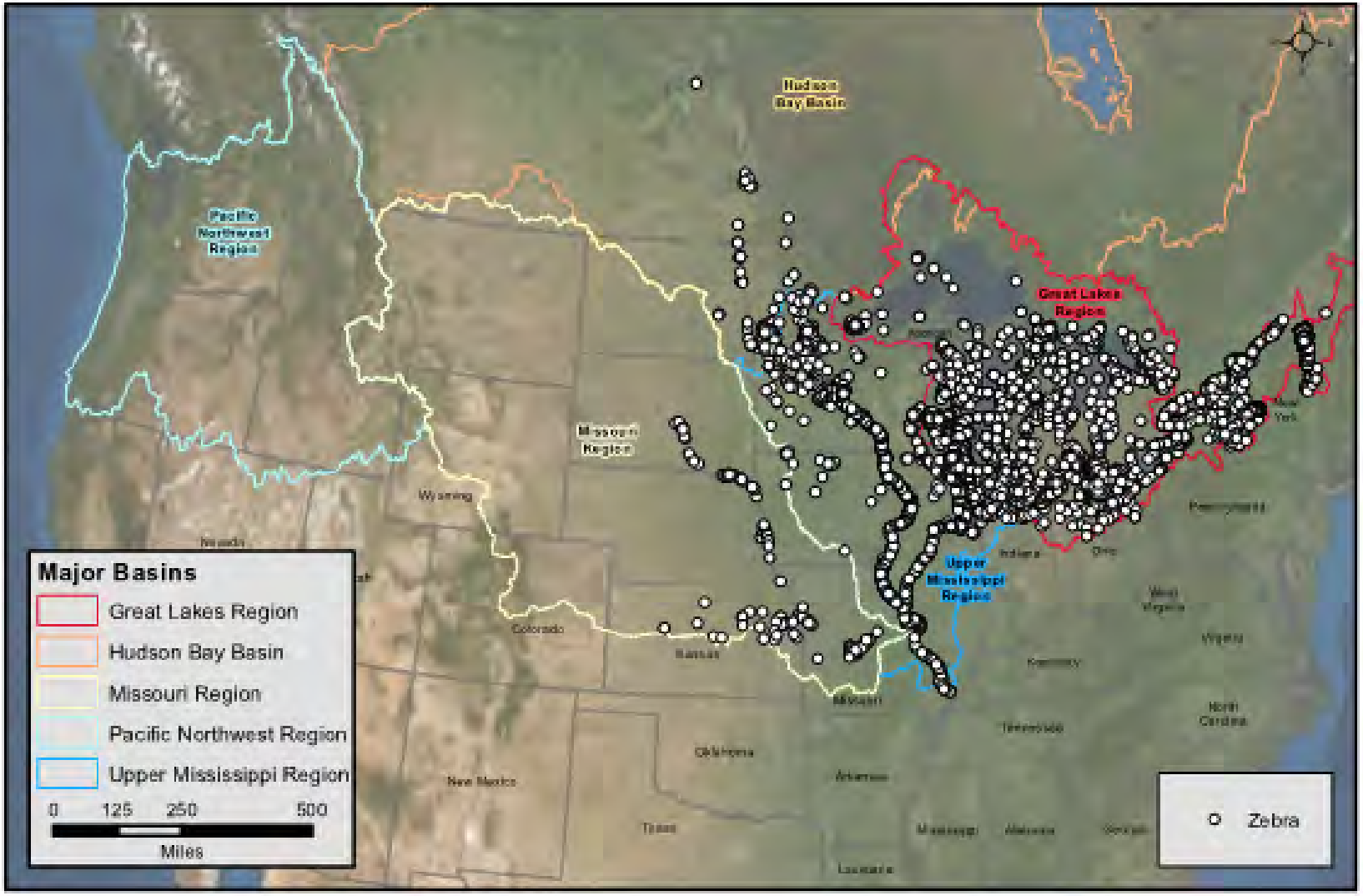

Figure 2-3 Dreissena Polymorpha (Zebra Mussel) Distribution from the USGS Database

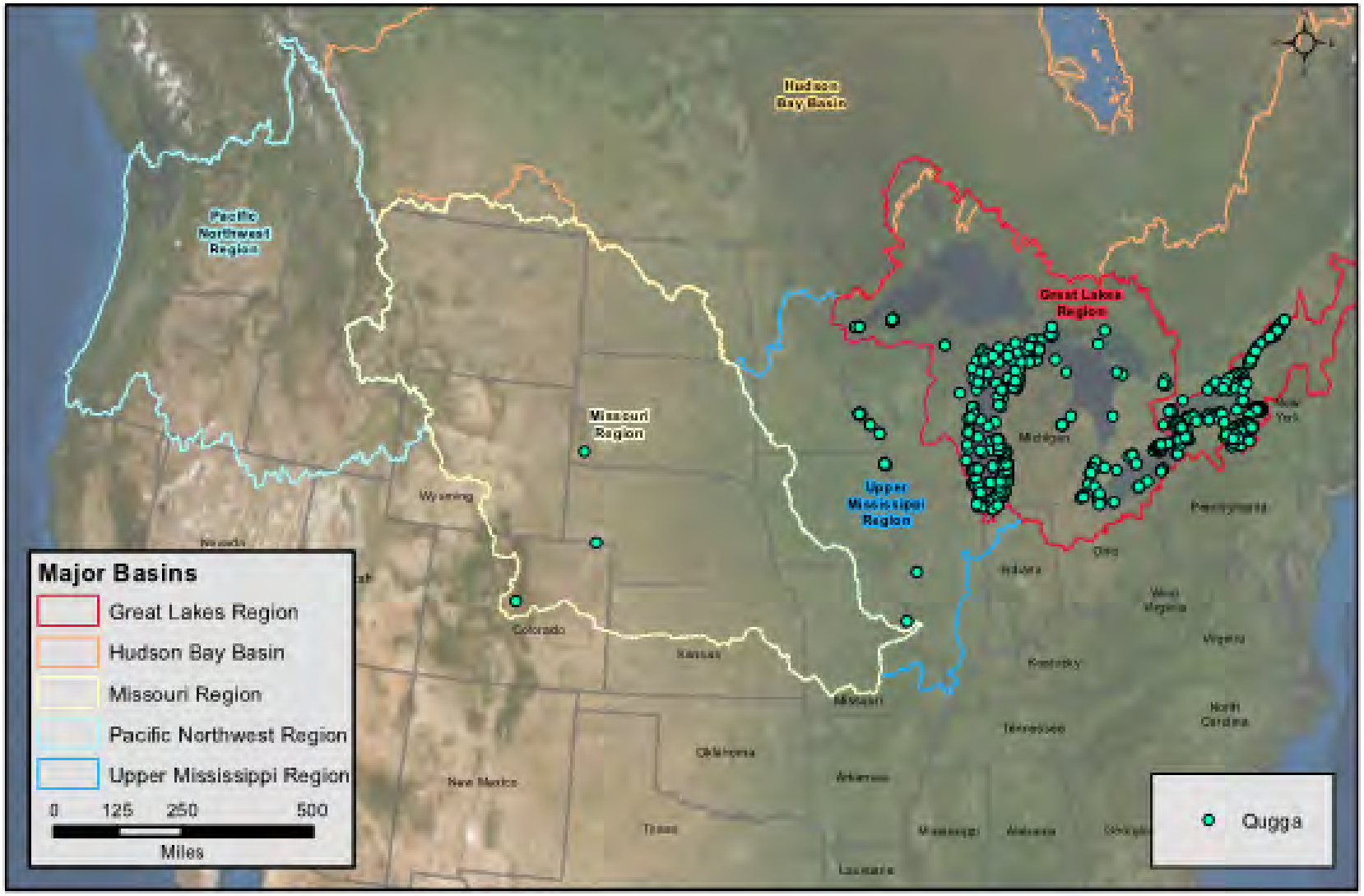

Figure 2-4 Dreissena Rostriformis Bugensis (Quagga Mussel) Distribution from the USGS Database

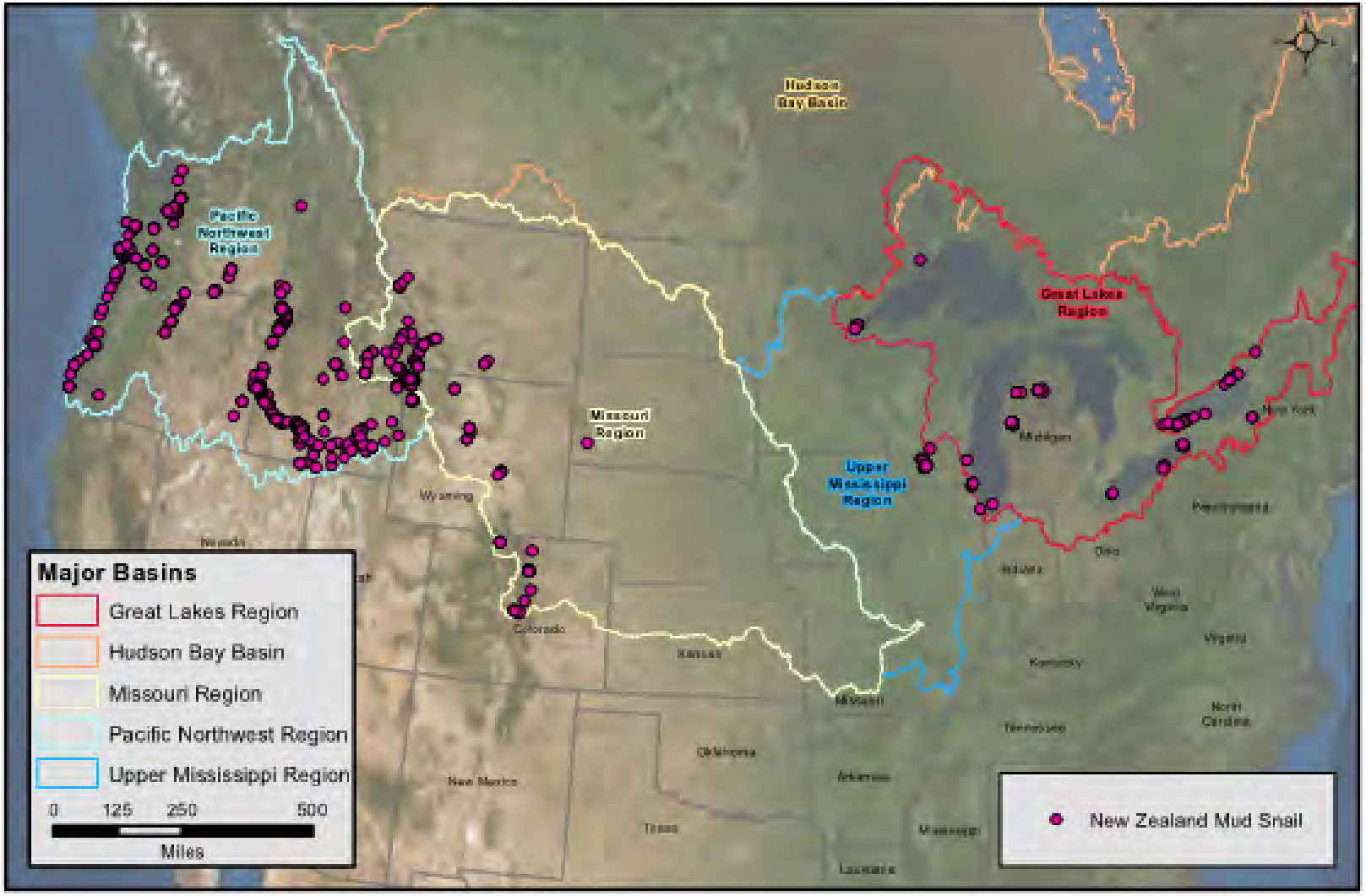

Figure 2-5 Potamopyrgus Antipodarum (New Zealand Mud Snail) Distribution from the USGS Database

2.3.4 Parasitic Animals

Six different parasitic AIS are included in the AIS of concern as shown in Table 2-6.

Table 2-6 Parasite Animals

TAXONOMIC GROUP	LATIN NAME	COMMON NAME
Parasites	*Polypodium hydriforme*	Intracellular parasitic Cnidarian
	Myxobolus cerebralis	Whirling disease
	Actheres pimelodi	Parasitic copepod
	Ergasilus spp.	Parasitic copepod
	Icelanonchohaptor microcotyle	Parasitic flatworm
	Corallotaenia minutia	Parasitic tapeworm

A summary of the distribution data for parasitic animals in the Transbasin Effects Analysis indicated the following:

- *Polypodium hydriforme* is widespread in North America having been found in the HBB and Great Lakes. It also has been observed in the Upper Mississippi region and the Pacific Ocean basin. The parasite has been found in the Black and the St. Clair Rivers, Michigan; the Wabash River, Indiana; the Davis River, California; and the Osage River, Missouri. In Canada, *P. hydriforme* has been identified in the Nelson River, the St. John River, the Saskatchewan River, and the Winnipeg River.
- Parasitic copepods with emphasis on *Achtheres pimelodi* and *Ergasilus* spp. Both *A. pimelodi* and *Ergasilus* spp. are thought to have widespread distribution throughout North America. *Achtheres pimelodi* is distributed east of the Rocky Mountains where sunfish and catfish are found. A recent survey of fish from Manitoba and North Dakota waters found *A. pimelodi* and *Ergasilus* spp. present in fish from both areas including the Red River basin. *Ergasilus cyprinaceus* was found in Alabama, North Dakota, and Florida.
- *Myxobolus cerebralis* has been found in the upper MRB including Montana and Wyoming but has yet to be detected in North Dakota or Canada (Figure 2-6). *Myxobolus cerebralis* has also been observed in the Great Lakes (Figure 2-6), but not in the Upper Mississippi region. With the exception of rainbow trout, which are continually stocked into Manitoba waters, susceptible fish species, such as salmonids, are absent or less common in the Souris River, a subbasin of the HBB. Several species that are resistant to infection by *M. cerebralis* or that are of unknown susceptibility are present in the HBB, including lake trout, lake whitefish, shortjaw cisco, brown trout, and brook trout. Additionally, a large swath of warm, turbid waterways lies between the naturally infected populations of salmonids in western Montana and the stocked populations in the upper MRB in eastern Montana and North Dakota.
- Parasitic monogenes with emphasis on *Icelanonchohaptor microcotyle* and *Corallotaenia minutia*. *Icelanonchohaptor microcotyle* has limited information on its distribution in the MRB in North Dakota but has not been found in the HBB. The last *I. microcotyle* specimens found were collected prior to 1980. *Corallotaenia minutia* specimens were collected in the MRB in North Dakota in the 1970s and more recently in a black bullhead collected from the La Salle River in Manitoba, part of the HBB.

Distribution maps were included in the Transbasin Effects Analysis and serve as the basis for the distribution of parasite AIS in this analysis. Figure 2-6 presents an information included in the data bases for the the one parasite AIS from the US Fish & Wildlife database. It should be noted that the databases have not been updated since 2013.

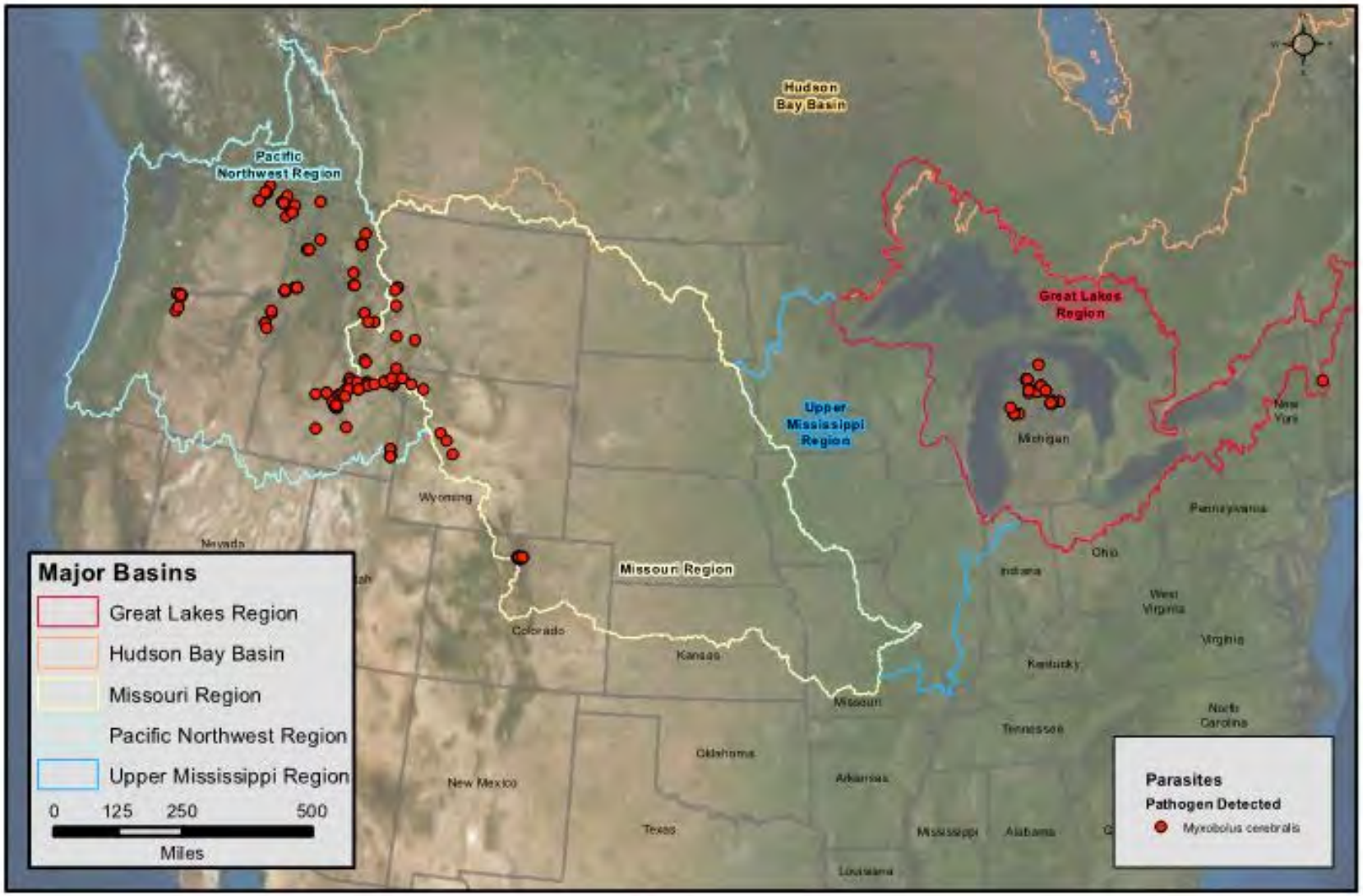

Figure 2-6 Parasite AIS Distribution in the US

2.3.5 Protozoa

Table 2-7 lists the protozoa identified as AIS of concern

Table 2-7 Protozoa

TAXONOMIC GROUP	LATIN NAME	COMMON NAME
Protozoa	*Giardia lamblia*	Backpacker's diarrhea
	Entamoeba histolytica	NA
	Cryptosporidium parvum	Crypto
	Ichthyophthirius multifiliis	Ich or White spot disease
	Ichthyophonus hoferi	Lchthyophonosis

A summary of summary of the distribution of protozoans from the Transbasin Effects Analysis indicated the following:

- *Giardia lamblia* is common throughout North America, including in the MRB and HBB. One notable outbreak in the HBB stemmed from a contaminated pool water slide in Winnipeg, Manitoba in 1986. Shoal Lake and Deacon Reservoir, which supply water to the city of Winnipeg, are tested annually for Giardia, resulting in few positive samples over the years.
- *Entamoeba histolytica* is widely distributed worldwide with recorded outbreaks in the U.S., Sweden, Taiwan, Georgia, and Thailand, but outbreaks are less common in industrialized countries.
- *Ichthyophthirius multifiliis* is widely distributed in North America and throughout the world. It is more common in aquaculture settings than in the wild.
- *Ichthyophonus hoferi* is widely distributed throughout the world. This protozoan has a worldwide distribution and large epizootics of Ichthyophonus have occurred in Europe, the U.S., and Japan.
- *Cryptosporidium parvum* outbreaks have occurred in both the MRB and HBB and occasionally occur throughout Canada and the U.S., including North Dakota. Shoal Lake and Deacon Reservoir, that supply drinking water for Winnipeg, Manitoba, occasionally test positive for this pathogen. Additional outbreaks occurred in Dauphin, Manitoba and a 2003 treatment failure in Lake Michigan resulted in the largest outbreak of cryptosporidiosis in the U.S., occurring in Milwaukee, Wisconsin.
- *Myxobolus cerebralis* has been found in the upper MRB including Montana and Wyoming but has yet to be detected in North Dakota or Canada. *Myxobolus cerebralis* has also been observed in the Great Lakes and the Pacific Ocean basin but not in the Upper Mississippi region. It is established in the Madison River, Montana.

A review of the available information indicated that no new distribution data beyond the information in the Transbasin Effects Analysis was available for the protozoa AIS. Therefore, the distribution of the protozoa is the same as presented in the Transbasin Effects Analysis as the data bases have not been updates since 2013.

2.3.6 Fungi and Cynobacteria

Table 2-8 identifies the fungi and cynobacteria of concern and analyzed in the Transbasin Effects Analysis and assessed in this analysis.

Table 2-8 Fungi and Cynobacteria AIS of oncern

TAXONOMIC GROUP	LATIN NAME	COMMON NAME
Fungi	*Branchiomyces spp.*	Branchiomycosis
	Saprolegnia spp.	Saprolegniosis or Winter fungus
	Exophiala spp.	Black yeast
	Phoma herbarum	NA
Cyanobacteria	*Anabaena flos-aquae*	Blue-green algea
	Microcystis aeruginosa	Blue-green algea
	Aphanizomenon flos-aquae	Blue-green algea

A summary of the distribution findings for fungi and cyanobacteria from the Transbasin Effects Report is as follows:

- *Branchiomyces* spp. were endemic to Eastern Europe but have also been found in the U.S. and worldwide.
- *Saprolegnia* spp. are found in freshwaters worldwide. Outbreaks in fish farms have been documented in the U.S., Norway, Chile, Japan, and Scotland.
- *Exophiala* spp. are distributed worldwide. *Exophiala dermatitidis*, a human pathogen, was isolated from dishwashers in the U.S., South Africa, Japan, Italy, Israel, Germany, Denmark, Brazil, Belgium, Austria, Australia, and Slovenia
- *Phoma herbarum* has a worldwide distribution and has been isolated from soil, water, food and fish tissues. Outbreaks in fish have been recorded along the West Coast of North America from Oregon to Alaska and in the Great Lakes region.
- *Anabaena flos-aquae*, *Aphanizomenon flos-aquae*, and *Microcystis aeruginosa* have a worldwide distribution and are ubiquitous in aquatic systems. The three cyanobacterial species listed are widespread in North America and their presence has been documented in the HBB, including Lake Winnipeg.

2.4 AIS LIFE HISTORIES

The Transbasin Effects Analysis provided detailed discussions of the life histories for the 39 AIS. That information is considered still accurate, adequate, and relevant for this analysis.

3.0 Uncertainty

Studies of, and predictions for, AIS transfer have inherent limitations and uncertainty. Chapter 4 presents a conceptual model for AIS transfer, including the sources of transfer, the transfer pathways, potential transfer media, and receptors of concern. Each part of the AIS transfer model has its own uncertainty. This chapter presents a summary of the uncertainties for AIS transfer. A more detailed discussion of uncertainties was provided in the Transbasin Effects Analysis and in Appendix M of the NAWS Supplemental EIS.

- **Detection Limitations** - The lack of detection or documentation of an organism in the receiving basin does not eliminate the possibility of its presence. It only means it was not detected, which could be for a variety of reasons. For instance, organisms were not present at the specific time and place of testing or were present but below the detection limits of the analytical method.
- **Data Completeness Limitations** - Comprehensive data and information regarding the distribution of AIS in the HBB and surrounding basins are lacking. There have been few systematic surveys for the majority of these AIS. Most of the available data on presence/absence and distribution in publicly accessible databases and published literature is largely anecdotal. In other words, a specific AIS happened to be found, but not as the result of routine and comprehensive sampling.
- **Locating Data Sources** - Even if an AIS has been detected and documented, the documentation may not exist in reasonably accessible databases and literature. The limitations on gathering data from the many potential sources of AIS data was described in Chapter 2.
- **Uncertainty with AIS Transfer Pathways** – There are many potential AIS transfer pathways. Because aquatic systems are complex and local conditions are variable, it is usually not feasible to determine the pathway through which an invasion occurs. Further, little empirical information exists on the time lapse between introduction and establishment for a specific invasive species in a particular location, making it still more difficult to establish the pathway.
- **Uncertainty with Treatment Evaluations** - There is limited data as to the fate of many AIS in the proposed treatment systems since many AIS are studied much less than organisms that affect human health.
- **History of Invasive Species and Environmental Impacts** - Studying the history of invasive species illustrates the uncertainty and challenges with predicting the likelihood and consequence of an AIS transfer. The Transbasin Effects Analysis presents many case studies of AIS invasion and documents how many invasive species have not had the predicted impact on their new habitats.
- **Uncertainty with Economic Impacts** - AIS related economic impacts would generally be associated with a recreational or commercial fish stock. To assess the economic impact, an AIS would have to have a measurable, population-wide impact on recreational or commercial fisheries. As discussed in the Transbasin Effects Analysis, historically AIS have not generally had population level impacts. In addition, the economic measurement of those impacts would involve comparison of pre-AIS and post-AIS conditions. It is challenging to gather and then meaningfully compare such data. Finally, the Interbasin Effects Analysis points out that the same recreational and commercial fisheries that exist in the HBB exist in

the MRB and that AIS that currently exist in the MRB do not appear to be harming those fisheries.

The conclusions of the Transbasin Effects Analysis regarding uncertainty are still considered valid. Consequently, both the likelihood of transfer and the consequence of transfer are treated qualitatively as opposed to quantitatively in this analysis.

4.0 Biota Transfer

4.1 CONCEPTUAL RISK MODEL

A conceptual risk model was developed for the Transbasin Effects Analysis that characterizes the linkages of potential sources of invasive microbes (e.g., transfer pathways) and ecological receptors.

Weather, animal transport, direct discharge, and diversion (project and non-project) pathways were identified as factors in the Transbasin Effects Analysis, in support of the conceptual risk model. For this analysis, further research was conducted to identify additional pathways that could introduce invasive microbes to the receiving basin, such as existing or proposed water diversion project.

This chapter presents an update of the Transbasin Effects Analysis conceptual risk model based on the specific circumstances of the ENDAWS project. The information presented in this chapter will help determine whether an additional project related pathway could increase the risk of transfer over the existing anthropogenic and natural pathways.

Figure 4-1 presents a conceptual risk model. The model addresses the:

- AIS of concern which are viruses, bacteria, mollusks, parasites, protozoa, fungi and cyanobacteria.
- Primary sources of AIS. These are the four main avenues by which AIS can be transferred (weather related phenomena, animal discharge, direct discharge, intra and inter-basin discharges).
- Primary transfer pathways. Each primary source of AIS has a two or more specific transfer pathways. For instance, animal discharge as a primary source includes the primary transfer pathways of fish, birds and mammals.
- Primary impacted media, which are the environmental media of surface soil, subsurface soil and surface water.
- Secondary impacted media refers to the HBB surface water. Some transfer pathways directly affect the HHB surface water and some pathways use an intermediate pathway such as surface soil.
- Receptors of concern include the exposure route (ingestion, contact, or interspecies competition) and which species would be impacted (aquatic microbes, invertebrates and/or fish).

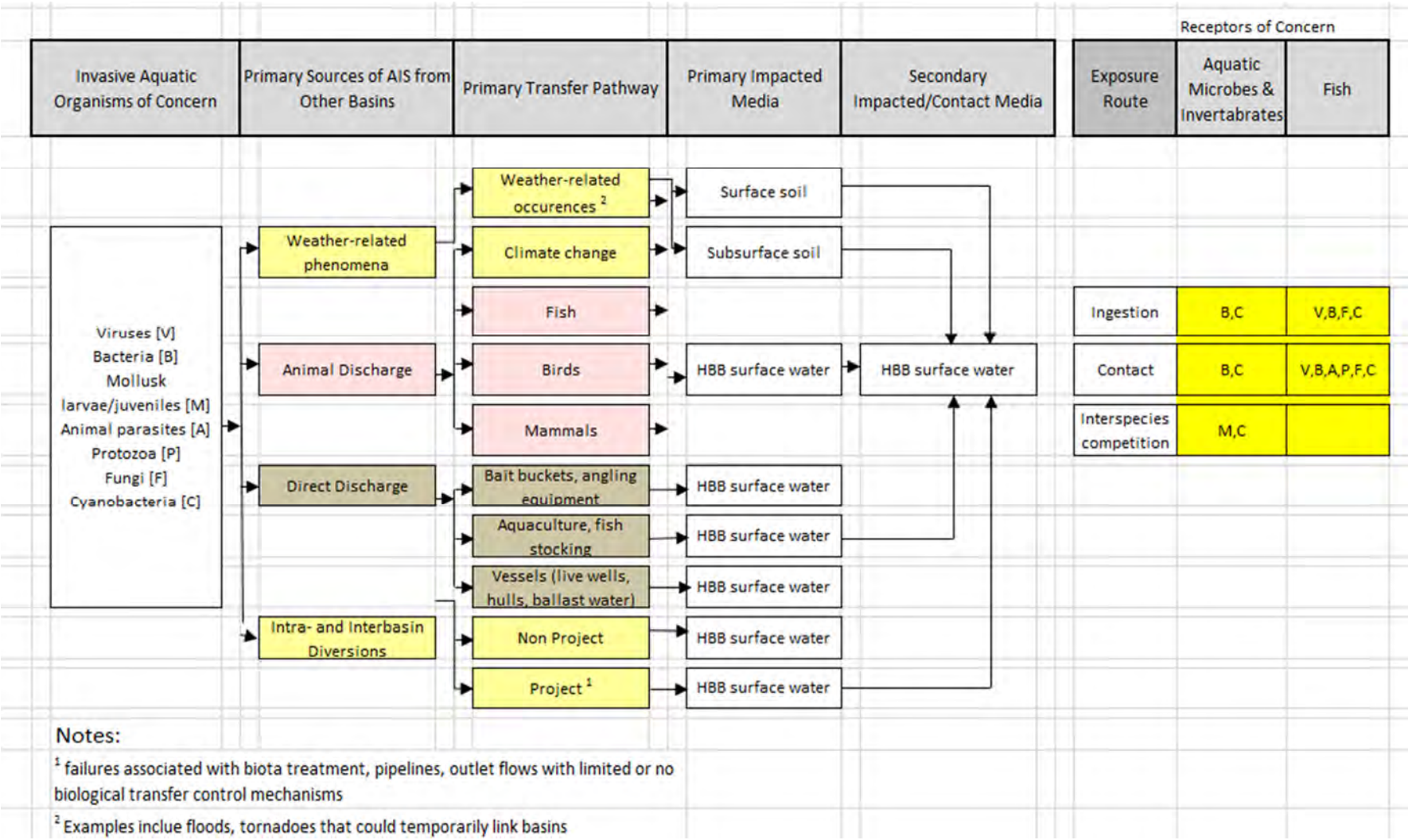

Figure 4-1 Conceptual Risk Model

4.2 BIOTA TRANSFER PATHWAYS

When various natural (weather, climate, animal discharge) and anthropogenic (direct discharge, diversions) transfer pathways are discussed, it is important to understand the proximity of the HBB in relation to other major watersheds. Figures 2-3 through 2-7 show the HBB in relation to the other major watersheds adjacent to it (the MRB, the upper Mississippi, the Pacific Northwest, and the Great Lakes Basin). Because all four of these basins share a boundary with the HBB, each poses a potential transfer risk from natural and anthropogenic sources.

Biota transfer pathways that were analyzed in the Transbasin Effects Analysis included weather, animal discharge, and direct discharge are not considered to have changed since that time and the following Sections 4.2.1, 4.2.2, and 4.2.3 summarize the conclusions in that report. Interbasin and intrabasin pathways were also evaluated as part of the Transbasin Effects Analysis and this analysis has been updated with information regarding the existing pathways and information specific to the proposed ENDAWS project.

4.2.1 Weather Related Transport

Weather related phenomena include natural weather events and climate change. Natural weather events - such as storm events, major floods, and high winds - can provide natural pathways for dispersal of invasive organisms across basin boundaries. During high water and flood events, interbasin water exchange can occur through wetlands, rivers, and streams. The proximity of infected waters to uninfected waters influences the probability of transfer and establishment of invasive species (Davies et al. 1992; Ferguson et al. 2003).

Weather events could indirectly contribute to invasive species expansion by increasing habitat disturbance. This disturbance could allow an opportunity for the establishment and/or spread of existing invasive species (Burgiel and Muir 2010).

Climate change may cause dramatic regional changes including temperature increases and droughts in the Prairie Provinces of Canada (Natural Resources Canada 2012). Several of the pathogens and potential host receptors inhabit aquatic systems with specific physical conditions (e.g., temperature, turbidity, water flow) that determine their distribution and abundance. Therefore, climate change may become a source of chronic, non-Project related ecosystem compositional changes in the HBB, the effects of which are difficult to predict.

4.2.2 Animal Transport

Animal transport can include transport by fish, waterfowl, and mammalian transport. Diffusive dispersal of invasive species could occur with the often gradual intrabasin downstream or upstream movement of introduced fish. This movement provides a mechanism for transferring harbored pathogens and parasites. Factors that can limit diffusive dispersal include unsuitable habitat, competing species, and physical barriers such as dams and fish screens. Fish transport is presumably limited to intrabasin transport.

The receiving waters of the HBB contain important waterbird habitat that support large populations of migrating and resident birds (Environment Canada 2012). Bensley et al. (2011) examined the risk of transferring pathogens and parasites associated with the construction of a water outlet connecting Devils Lake (a closed basin) in North Dakota to the Red River and Lake Winnipeg in the HBB. They concluded that the risk of transfer by piscivorous birds was greater than that posed by the outlet, which is not equipped with treatment mechanisms to prevent the

movement of microorganisms. Likewise, the possibility of passive dispersal of AIS to the HBB, especially via avian-mediated mechanisms, is an important non-Project pathway.

Invertebrate animals may also be transported by mammals. Some hardy invertebrates such as gastropods and mussels may be transported on mud fixed to larger animals (e.g., mammals). Vanschoenwinkel et al. (2008) observed the transfer of several species to new water bodies via mud attached to wallowing wild boar (Sus scrofa) or in their feces. Seventeen viable invertebrate species were isolated from mud samples; 10 viable species were isolated from feces. Similar results were obtained in a separate study of the nutria (Myocastor coypus), an aquatic rodent native to South America. In that study, more than 800 invertebrates represented by 14 different taxa were retrieved from the fur of only ten individual nutria specimens in southern France (Waterkeyn et al. 2010). In addition, bacteria and protozoa are common inhabitants of the gastro-intestinal tract of mammals and they may be released in the manure of livestock and wildlife. (Pachepsky et al. 2006).

Whether attached directly to animals or via their manure, mammalian transport may represent an important pathway for organism dispersal and interbasin transfer. Considering the large, shared boundary between the MRB and HBB, animal transport can contribute to interbasin AIS transfer.

4.2.3 Direct Discharges

4.2.3.1 Maritime Commerce - Ballast Water, Hull/Anchor/Superstructure Fouling

The release of invasive species from shipping ballast tanks has been one of the most important pathways for introducing non-native species into aquatic systems. The HBB contains a single major navigable waterway: the Port of Churchill, located on the west coast of Hudson Bay. The Port of Churchill is Canada's only Arctic seaport (Port of Churchill Hudson Bay Port Company 2012). Therefore, ballast water discharge does not generally represent a direct link between the HBB and adjacent basins. Rather, this pathway has the potential to transfer biota to systems such as the Great Lakes with subsequent transfers to adjacent basins via other pathways.

Invasive species can also be transported from native waters by attaching themselves to hulls, anchors and exterior surfaces. Once a vessel moves to a separate basin, an organism can release its larvae into the non-native water or the organism itself can become dislodged and released into non-native waters.

4.2.3.2 Trade Organisms - Pets/Aquariums/Aquatic Plants

The majority of species available in pet stores and nurseries are non-native in the regions of retail sale. Unwanted species are often released into natural habitats rather than handling them properly and safely. In addition, aquarium water is generally disposed of improperly, which can result in the introduction of aquatic species, including viruses and other pathogens (LSWG 2009).

At least 12 species of exotic plants and animals have been introduced into the Great Lakes region as a result of aquarium releases (Kerr et al. 2005). In addition, the aquarium trade is likely responsible for the introduction of several bivalve diseases in the northern hemisphere. Even a small amount of biomass can distribute potential disease agents including viruses, bacteria, and protozoa. However, since many aquarium species are raised at warmer temperatures, the majority of establishments in the wild occur in tropical and sub-tropical zones (Minchin 2007).

Water gardening can result in the introduction of invasive aquatics. Many gardens utilize exotic plants, fish, reptiles, and invertebrates, which can escape into the natural environment. Water gardens that occur in areas prone to flooding pose the greatest risk, as invasive species are more

likely to be released during flood events. Like the pet and aquarium trade, improper disposal of unwanted species into storm sewers, ditches, or waters could result in an introduction (LSWG 2009).

4.2.3.3 Fishing and Aquaculture – Live Bait/Aquaculture Facilities/Stocking & Hatcheries

Anglers and commercial fishers could potentially transfer invasive species via boats and equipment. Invasive species can accumulate on nets, waders, lures, anchors, boat hulls and trailers, livewells, bilges, motors, and other equipment. Some invasive species can survive for long periods in boat livewells. The release of livewell and bilge contents can lead to invasive species transfer when boats are transported.

Aquaculture is the practice of farming aquatic organisms such as fish, crustaceans, mollusks, and aquatic plants. Populations of organisms are cultivated under controlled and often crowded conditions in either land-based facilities or cage operations within natural and man-made waterbodies. Cultivated species are not usually native to the area and/or waters where they are bred and raised. Historically, the popularity of raising non-native species increased as transportation became more frequent and reliable (Minchin 2007).

Invasive organisms often displace native species by outcompeting them for space and other resources. Farmed fish may also carry diseases not found naturally in some aquatic habitats. Wild fish and other aquatic organisms may therefore exhibit vulnerability due to their lack of natural disease resistance (NMFS and Service 2005).

Private, public, and tribal agencies stock waterways with hatchery fish in an effort to enhance sport and commercial fishing. Stocking may result in the accidental introduction of invasive species to aquatic ecosystems, but the risk is reduced if preventative measures are implemented. However, certain life history characteristics allow some species to survive and pass into non-native waters even when stocking is managed to prevent transfer. Transfer can also occur via contaminated gear, stocking water or in the stomach of stacked fish.

4.2.3.4 Water Recreation

Water recreation activities involving boats, water skis, wake boards, wake surfboards, pull ropes, and personal flotation devices have the potential to transfer non-native hitchhikers, such as larvae or algae if not cleaned or dried properly (LWSG 2009). Recreational boaters represent an important secondary transfer pathway for invasive species. For example, recreational boaters using the Rideau Canal are widely considered the source of zebra mussels from the Great Lakes to the Rideau River (Kerr et al. 2005). Tournament anglers who transport their boats over large geographic distances may pose greater transfer risk than recreational boaters. The growth of boating activities such as wake boating increases the likelihood of interbasin transfer as these recreational boats are trailered between basins.

4.2.4 Inter and Intrabasin Diversions

Major water diversion projects, both across continental divides and those that divert water between sub-basins of the same oceanic drainage basins, are not unique and have the potential to transport invasive species across drainage basins. Narrowing the geographic reach, there are many water transfer projects throughout the north-central portion of North America. In general, these projects have been in existence for several decades (Interbasin Water Transfer Projects in North America, NDSWC, February 22, 2006).

Considering specific country practices in North America, more streamflows are diverted out of their basin of origin in Canada than any other country in the world. The average rate of interbasin transfer flow in Canada is reported to be about 156,000 cfs, which is more than 6 times greater than the United States with a transfer rate of 25,000 cfs (Record of Decision for the Northwest Area Water Supply Project Final Supplemental Environmental Impact Statement, Bureau of Reclamation, August 21, 2015). There are 62 diversion projects developed across Canada, with seven of those in Manitoba.

There are many interbasin water diversion in the US and Canada, many of which are located in the region of the Project. In addition to constructed diversions, it is also possible for basin divides to naturally overflow during flood conditions. Regional interbasin and intrabasin project were described and evaluated in the Transbasin Effects Analysis and are summarized in this section. Most of the projects are considered interbasin projects, except for the Devils Lake Outlet, which is an intrabasin project in that it connects a portion of the HBB that had been historically isolated to downstream portions of the HBB.

The Traverse Gap near the South Dakota and Minnesota borders is an ancient river channel occupied by Lake Traverse (in the HBB), Big Stone Lake (in the Mississippi Basin), and the valley connecting them at Browns Valley, Minnesota. It is a unique valley in that it is crossed by a low continental divide. The floor of Browns Valley is flat, which allows water of one basin to flood across the continental divide in times of high water. While the natural state of the area has been altered by a dike and control structures on the two lakes, interbasin flooding between basins still occurs without any biota controls (Spalding, 2000).

The Saint Mary River Diversion and the Milk River Diversion are part of the Milk River Unit. The Saint Mary River diversion diverts water from the Saint Mary River (a tributary of the Saskatchewan River, which in turn flows into the Nelson River, and then into HBB) into the Milk River, which flows into the upper Missouri River and eventually into the Gulf of Mexico. It was constructed in 1915 for the primary purpose of irrigation at a capacity of 650 cfs. It also supplements the municipal supply from the Milk River for the City of Havre, Montana. There are no biota transfer controls in place to prevent the spread of aquatic organisms between basins. Because the diversion canal is designed with drop structures, it is a physical barrier for macrobiota (i.e. fish) directly from the MRB to the HBB (Interbasin Water Transfer Projects in North America, NDSWC, February 22, 2006).

The Milk River Diversion diverts water from the Milk River, where it loops into Alberta, and puts that water back into a series of irrigation canals to supply water for irrigation systems that eventually feedback into the Saskatchewan River system. The connection is partly natural but was enhanced (dredged and maintained) from the late 1970's through the 1990's, with a capacity thought to be less than 25 cfs. The connection likely only exists for part of the year, during wet years, but it appears to allow biota transfer in either direction. There have never been biota control mechanisms in place (Interbasin Water Transfer Projects in North America, NDSWC, February 22, 2006).

The Western Area Water Supply Project pumps Missouri River water throughout the service area in northwestern North Dakota via a buried pipeline network. Part of this project's service area in Divide and Burke Counties lies within the HBB. Project water is treated at the Williston Regional WTP with conventional treatment supplemented with UV disinfection to meet Safe Drinking Water Act standards. The project has been constructed in a series of phases with the first five phases completed and phase 6 to begin construction in 2020. The portions of the project that served the

project's service area in Divide and Burke Counties with the HBB were included in the first two phases and were operational in 2013.

Devils Lake, in northeast ND, is a terminal lake in the Devils Lake basin, a sub-basin of the Red River basin within the HBB. Water leaves Devils Lake through evapotranspiration or when its elevation is high enough to overflow the basin's boundary. Over the course of the last several decades, water levels within the Devils Lake basin have been rising due to unprecedented precipitation.

A west end outlet from Devils Lake to the Sheyenne River was constructed by the State of North Dakota in the early 2000's and expanded in 2010. The maximum capacity is 250 cfs. In response to rapid increases in lake levels, the State built an additional outlet in 2012 on the east side of Devils Lake, with a maximum capacity of 350 cfs. The combined operating capacity of both the east and west outlets, which serve as intrabasin diversions, is 600 cfs.

Both the east and west outlets from Devils Lake flow through course mesh screens and rock and gravel filters for control of potentially invasive species of macrobiota.

NAWS is a regional water system serving much of north central North Dakota, including the City of Minot and numerous communities and rural water districts, with Missouri River water from Lake Sakakawea. The water system has a capacity of 27 million gallons per day, or approximately 42 cfs.

As the water travels north from Lake Sakakawea in a buried pipeline, it will cross the continental divide from the MRB to the Souris River basin, a sub-basin of the HBB. The water will be treated along the pipeline route and prior to the continental divide in a biota water treatment plant. The biota water treatment plant is being designed to include conventional treatment with dissolved air flotation, granular media filtration, ultraviolet light disinfection, and chlorine disinfection. Additional treatment will occur at the Minot conventional water treatment plant to meet Safe Drinking Water Act standards prior to distribution to the NAWS users.

In contrast to the federal RRVWSP discussed and evaluated in Reclamation's Transbasin Effects Analysis, the currently proposed State RRVWSP is a State and local project developed by the State of North Dakota by and through Garrison Diversion. The project will draw up to 165 cfs of Missouri River to supplement municipal, rural, and industrial water supplies in central and eastern North Dakota. The state-led RRVWSP water will be pumped in a buried pipeline from the Missouri River near Washburn, North Dakota to a hydraulic break tank near the project high point, and then flows by gravity in a buried pipeline to the Sheyenne River above Lake Ashtabula. Lake Ashtabula serves as a regulating reservoir, from which the water enters the lower Sheyenne and Red Rivers where the water can be used by project users.

The State RRVWSP involves the transfer of water from the MRB to the HBB. RRVWSP water will be treated with sand/grit removal and chlorination, providing 3-log *Giardia* inactivation and 4-log virus inactivation, before crossing the continental divide between the MRB and HBB. The sand/grit removal will also remove 95% of particles 100 microns or larger, which includes several of the AIS considered in this report. A draft permit has been issued by the North Dakota Department of Quality (Permit No. ND0026964).

4.3 POTENTIAL ECOLOGICAL RECEPTORS

Ecological receptors represent vulnerable species that could be adversely affected by infection (host; direct effect) or organisms that would suffer from a change in conditions caused by a transbasin movement of a non-indigenous species (e.g., loss of food source prey for a commercially

valuable fish species; indirect effect). Susceptible host species in the receiving basin were identified from scientific literature and other data sources in the Transbasin Effects Analysis are listed in Table 4-1. This list does not include all potential ecological receptors that could be indirectly affected by the introduction of AIS.

Table 4-1 Potential Ecological Receptors of Concern in the Hudson Bay Basin

COMMON NAME	SCIENTIFIC NAME	CRITERIA[A]		
		SPECIAL STATUS	RECREATIONAL/ COMMERCIAL VALUE	SUSCEPTIBLE TO AIS EVALUATED
Brook Trout	*Salvelinus fontinalis*	No	Yes[CA,U.S.]	BKD, whirling disease
Brown Bullhead	*Ameiurus nebulosus*	No	Yes[CA,U.S.]	Edwardsiella infections, VHSV
Brown Trout	*Salmo trutta*	No	Yes[CA,U.S.]	BKD, Ichthyophopthirius multifiliis, ERM, furunculosis, IHNV, ISAV, VHSV, whirling disease[b]
Channel catfish	*Ictalurus punctatus*	No	Yes[CA,U.S.]	CCV, columnaris disease, Edwardsiella infections, ERM, Exophiala spp., I. multifiliis, furunculosis, Saprolegnia spp., VHSV
Common Carp	*Cyprinus carpio*	No	Yes[CA,U.S.]	BKD, furunculosis, SVCV, VHSV
Chinook Salmon	*Oncorhynchus tshawytscha*	No	Yes[US]	BKD, columnaris disease, ERM, furunculosis, IHNV, ISAV, Saprolegnia spp., VHSV, whirling disease[c]
Crappie	*Pomoxis spp.*	No	Yes[CA,U.S.]	Columnaris disease, Edwardsiella infections, ERM, VHSV
Fathead Minnow	*Pimephales promelas*	No	Yes[US]	Furunculosis, VHSV
Lake Sturgeon	*Acipenser fulvescens*	E[CA]	Yes[CA,U.S.]	Polypodium hydriforme

COMMON NAME	SCIENTIFIC NAME	CRITERIA[A]		
		SPECIAL STATUS	RECREATIONAL/ COMMERCIAL VALUE	SUSCEPTIBLE TO AIS EVALUATED
Lake Trout	*Salvelinus namaycush*	SC	Yes[CA,U.S.]	BKD, Exophiala spp., furunculosis, ISAV, IPNV, Phoma herbarum, VHSV, whirling disease[d]
Lake Whitefish	*Coregonus clupeaformis*	No	Yes[CA]	Furunculosis, VHSV, whirling disease[d]
Lake Winnipeg Physa Snail	*Physa winnipegensis*	DD[CA]	No	Zebra mussel, quagga mussel, New Zealand mudsnail
Largemouth Bass	*Micropterus salmoides*	No	Yes[CA,U.S.]	Edwardsiella infections, VHSV
Mapleleaf mussel	*Quadrula quadrula*	SC[CA]	No	Zebra mussel, quagga mussel, New Zealand mudsnail, any pathogens that impact the mussel's fish host (catfish)
Muskellunge	*Esox masquinongy*	No	Yes[CA,U.S.]	VHSV
Northern Pike	*Esox Lucius*	No	YesCA,U.S.	Furunculosis, SVCV, VHSV
Rainbow Trout	*Oncorhynchus mykiss*	No	Yes[CA,U.S.]	Furunculosis, ISAV, VHSV, whirling disease
Sauger	*Sander canadensis*	No	Yes[CA,U.S.]	Furunculosis, columnaris disease, VHSV
Shortjaw Cisco	*Coregonus zenithicus*	T[CA]	No	Zebra mussel, quagga mussel, New Zealand mudsnail, whirling disease[d]
Smallmouth Bass	*Micropterus dolomieu*	No	Yes[CA,U.S.]	Furunculosis, VHSV
Walleye	*Sander vitreus*	No	Yes[CA,U.S.]	ERM, furunculosis, columnaris disease, VHSV
White Bass	*Morone chrysops*	No	Yes[CA,U.S.]	VHSV
White Sucker	*Catastomus commersoni*	No	Yes[CA,U.S.]	VHSV

COMMON NAME	SCIENTIFIC NAME	CRITERIA[A]		
		SPECIAL STATUS	RECREATIONAL/ COMMERCIAL VALUE	SUSCEPTIBLE TO AIS EVALUATED
Yellow Perch	*Perca flavescens*	No	Yes[US]	Columnaris disease, furunculosis, VHSV

Notes:

[a] Criteria pertain only to fisheries and organisms falling within the U.S. portion of the HBB (U.S. HUC-2 Souris-Red-Rainy Region) and the Province of Manitoba.

[b] partial resistance, clinical disease rare or only develops at high parasite doses

[c] susceptible, clinical disease common at high parasite doses but greater resistance is seen at low parasite doses

[d] susceptibility is unknown or unclear at this time due to conflicting reports or insufficient data

[e] highly susceptible; clinical disease common

DD Data Deficient

SC Species of Concern, Montana Department of Fish, Wildlife and Parks

T Threatened Species

E Endangered Species

CA Canada (Manitoba)

U.S. United States (North Dakota, South Dakota, and Minnesota)

Information in this table was reviewed as part of this analysis and no changes were considered necessary.

5.0 Biota Water Treatment Option Analysis

5.1 BIOTA TREATMENT PROCESSES

This chapter presents a summary of four BWTP options, the level of treatment achieved, and how residuals would be handled in each option. Treatment processes selected vary from basic sand/grit removal and free chlorine disinfection to conventional and enhanced water treatment designs that include additional physical removal and inactivation of biological pathogens. Table 5-1 provides a summary of the treatment options and their respective purposes. Table 5-2 presents a summary of the treatment processes associated with each option.

Table 5-1 Treatment Capabilities for Various Options

OPTION	PURPOSE	CAPABILITIES OF BIOTA TREATMENT PLANT	
		Biological Removal	Biological Inactivation
1	Macro-organisms (greater than 100 microns) and Primary Biological Constituents	Sand/Grit Removal (macro)	Chlorine
2	Macro-organisms (greater than 100 microns) and Primary Biological Constituents	Sand/Grit Removal (macro)	UV, Chlorine
3	Macro-organisms, Primary Biological Constituents and Natural Organic Matter	Coagulation/Flocculation, Sedimentation, and Granular Media Filtration	UV, Chlorine
4	Macro-organisms (greater than 100 microns), Primary Biological Constituents, and Natural Organic Matter	Sand/Grit Removal (macro), Coagulation/Flocculation, and Membrane Filtration	UV, Chlorine

Table 5-2 Treatment Processes for Various Options

TREATMENT PROCESS	BIOTA TREATMENT OPTION			
	1	2	3	4
Main Process				
Intake Fine Screening	■	■	■	■
Sand/Grit Removal	■	■		■
High-Rate Sedimentation			■	
Media Filtration			■	
Membrane Filtration				■
UV Disinfection		■	■	■

TREATMENT PROCESS	BIOTA TREATMENT OPTION			
	1	2	3	4
Chlorine Disinfection	■	■	■	■
Residuals Treatment				
Solids Equalization			■	■
High-Rate Sedimentation			■	■
Residuals Lagoon			■	■

Process flow diagrams for the four biota treatment options are shown in **Figure 5-1**; brief descriptions of each option follow in this chapter. Option 1 is the most basic biota treatment option. Options 2, 3, and 4 include UV disinfection as well as additional pretreatment processes to improve the effectiveness of AIS removal. As the biota treatment options progress, additional levels of treatment capabilities are added. The treatment options are discussed in further detail in the following sections.

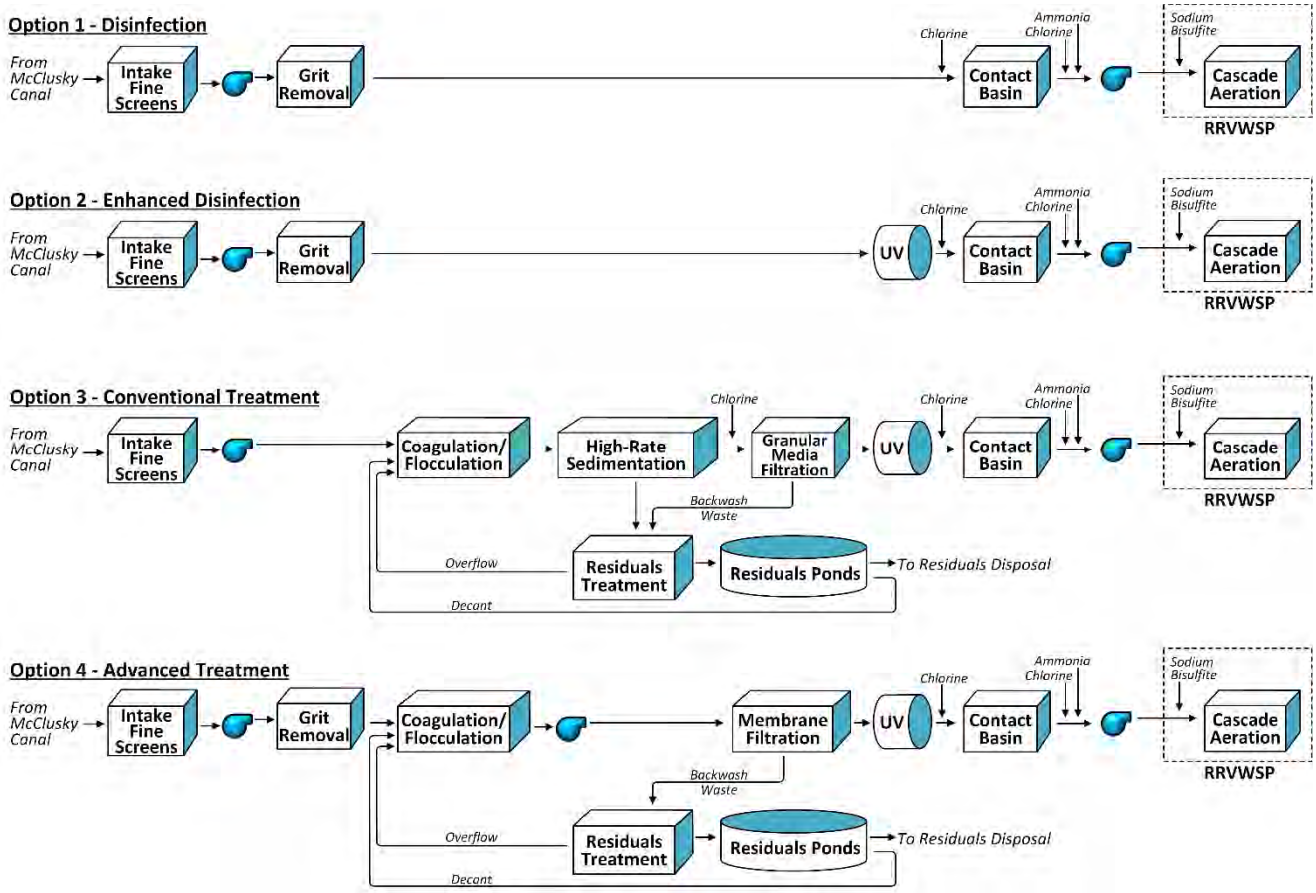

Figure 5-1 Biota Water Treatment Options

Figure 5-2 is from the Transbasin Effects Analysis and shows the relative size of various AIS. The proposed sand/grit removal process would remove particles above 100 microns as described above. The proposed filtration process would remove particles above the 10-micron size. The proposed membrane filtration would remove particles above the 0.001- to 0.1-micron size.

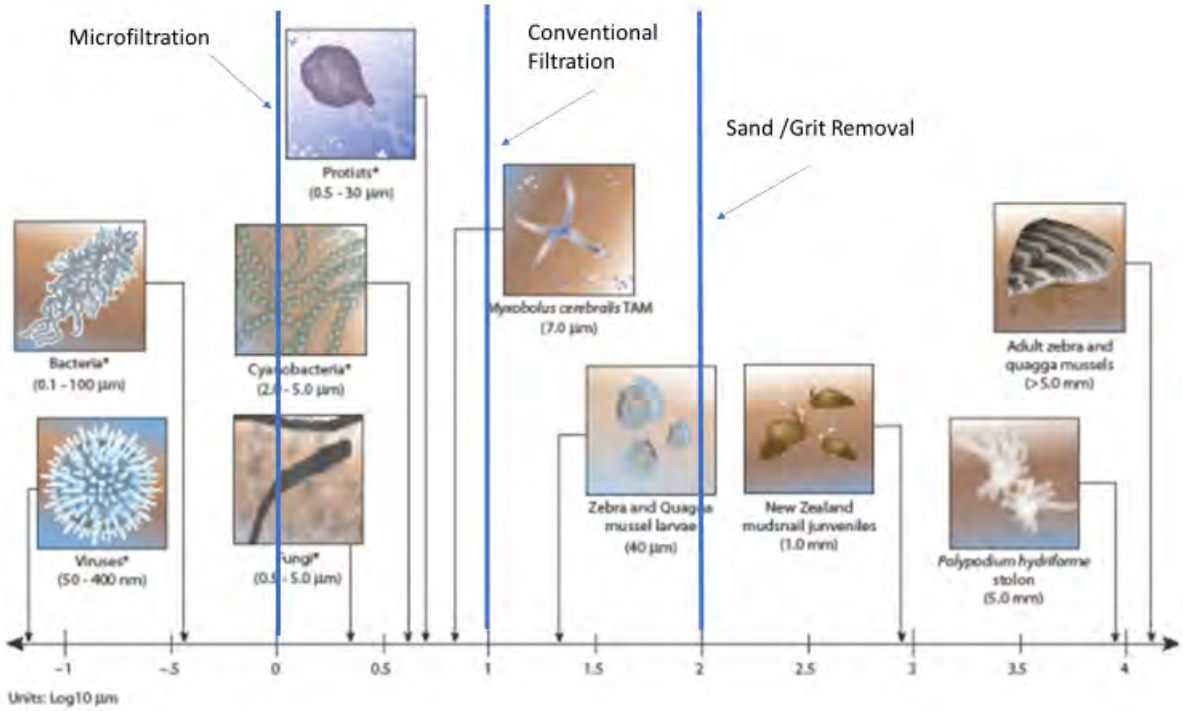

Figure 5-2 Relative Size of AIS

5.2 OPTION 1 – DISINFECTION

Option 1 provides water treatment through sand/grit removal and chlorine disinfection for removal of AIS. Sand/grit removal physically separates macro-organisms and fine material from the inflow before continuing to chlorine disinfection. Removing macro-organisms such as mollusks and mud snails reduces the chlorine demand as well as time required to maintain the treatment equipment. The chlorine disinfection process is designed to meet 3-log *Giardia* and 4-log virus inactivation. Chlorine disinfection provides both the log-inactivation credit and disinfectant residual to reduce the opportunity for re-growth of organisms in the pipeline.

5.2.1 Sand/Grit Removal

Sand/grit includes sand, gravel, or other heavy solid materials that have a higher density than water, which enables it to be physically separated from the raw water inflow. Sand/grit removal can be achieved through several means, the most common of which are with hydraulic settling, aerated grit chambers, mechanical-forced vortex units, and gravity-forced vortex units. Due to the ability to achieve higher removals of smaller particles only vortex removal processes were considered for this project. A mechanical-forced vortex unit uses a paddle to create a vortex that separates sand/grit from the raw water. Gravity-forced units have no moving parts; they passively split the sand/grit from inlet flow using a pressure drop applied over a stack of cones providing a high surface area. Both mechanical forced and gravity forced vortex units have been used for sand/grit removal at water production facilities. To enhance the capture and removal of AIS of

concern, the sand grit system has been designed to remove 95 percent of all particles with a specific gravity greater than 2.1 and size greater than or equal to 100 microns. This conceptual design has been developed using the gravity-forced vortex units selected as the basis of design to achieve the greatest removal through either settling or adsorption of AIS on to the sand/grit particle for removal. Once removed, the sand/grit is pumped to a classifying unit where it is washed, cleaned, concentrated, and dewatered. Dewatered grit is typically collected in a roll-off dumpster and trucked to a landfill. A landfill in the MRB would be used for this application.

5.2.2 Chlorine Disinfection

Free chlorine disinfection will be the primary disinfectant in this option to meet the targeted inactivation. The chlorine disinfection system proposed for the State RRVWSP relies upon a combination of contact basins and pipeline volume to achieve the targeted chlorine residual contact times. For the ENDAWS alternatives, the target chlorine contact times will be achieved only through contact basins. At the discharge of the contact basins, ammonia will be added to consume the free chlorine and generate chloramines. Chloramines are a more stable chlorine residual, and eliminating free chlorine significantly reduces potential disinfection by-products (DBP) formation.

This option provides basic disinfection with 215 minutes of free chlorine contact time at an expected residual of 3.0 mg/L in a serpentine disinfection contact basin with a baffling factor of 0.8, which calculates to a cT of 516 mg-min/L. A cT of 516 mg-min/L is required to achieve greater than 3-log removal/inactivation of *Giardia*, as well as provide greater than 4-log removal/inactivation of viruses. Free chlorine disinfection is followed by ammonia addition to form chloramines.

5.2.3 Residual Chlorine

A chlorine residual will be maintained entering the transmission pipeline for this Option 1 and all subsequent biota treatment options discussed in Chapter 5 (Options 2, 3, and 4). Furthermore, a detectable residual may be present throughout the water delivery pipeline in all options. Prior to the transferred water entering the receiving natural water source, any remaining disinfection residual will be quenched and removed by the State RRVWSP. This is accomplished using a quenching chemical, sodium bisulfite. Additional chemical feed and storage systems will be required at the discharge location to achieve proper quenching of the disinfectant residual before discharge.

5.3 OPTION 2 – ENHANCED DISINFECTION

Option 2 is an enhanced disinfection process, including sand/grit removal and UV light irradiation (UV) and free chlorine disinfection and chloramine formation. UV is an effective disinfection process that provides significant inactivation of *Giardia, Cryptosporidium*, and other chlorine resistant AIS with minimal DBP formation. It provides system flexibility by decreasing the necessary chlorine contact time due to its efficacy at *Giardia* inactivation compared to the sole use of chlorine (Option 1). Unlike chlorine disinfection, UV disinfection is not as effective against viruses at typical UV dosages and does not provide a disinfection residual in the effluent. Post UV chlorine application is necessary to establish a residual in the transmission pipeline. Virus inactivation is possible using UV disinfection, but at the cost of significantly increasing energy usage by an approximate factor of three. Therefore, the UV system will not be designed for virus inactivation. The UV and chlorine disinfection systems are designed for a peak flow of 107 mgd.

5.3.1 UV Disinfection

The UV system capacity is designed to provide a dose of 40 mJ/cm2 at a peak flow of 107 mgd. UV dose requirements are selected in order to achieve greater than 3-log removal/inactivation of

Giardia based upon tables provided by the EPA. In addition, the UV system has been designed to achieve 4-log removal/inactivation of *Myxobolus cerebralis* (Hedrick 2007, Hedrick 2008, Hedrick 2012). In order to provide consistent pathogen removal capabilities, the maximum capacity of the UV system designed for Option 2 is also proposed as the UV system for Options 3 and 4.

5.3.2 Chlorine Disinfection

UV disinfection is followed by chlorination in a contact basin, which provides the log-inactivation of viruses that is not achieved in the UV reactors. The additional disinfection/AIS removal provided by UV reduces the *Giardia* log-inactivation potentially required by the chemical chlorine disinfection alone. In accordance with a conservative approach, the same disinfection contact basin (DCB) design for the chlorine disinfection described in Option 1 will be used in Option 2 as well to provide full disinfection redundancy to the UV system. As with Option 1, this treatment design provides a calculated cT of 516 mg-min/L based on 215 minutes of free chlorine contact time in a serpentine disinfection contact basin with a baffling factor of 0.8 at an expected residual of 3.0 mg/L. Following chlorine disinfection, ammonia is fed into the chlorinated water stream to form chloramines before entering the transmission line.

Enhanced disinfection consisting of UV irradiation followed by chlorination is also proposed as the disinfection/AIS inactivation process for Options 3 and 4.

5.4 OPTION 3 – CONVENTIONAL TREATMENT

Option 3 consists of coagulation, flocculation, high-rate sedimentation, and filtration (granular media filtration (GMF) considered as a representative process) followed by advanced disinfection processes (UV irradiation and chlorination) for AIS removal.

5.4.1 Coagulation/Flocculation

Removal of total organic carbon (TOC), turbidity, and AIS of concern in the treatment process begins with the addition of a coagulant - such as aluminum salts, ferric chloride and/or polymer - mixed in a rapid mix chamber. Rapid mix is followed by flocculation with vertical shaft equipment. This allows for AIS of concern to be attached to the particles being formed so that removal can be enhanced through sedimentation and filtration.

5.4.2 High-Rate Sedimentation

A large percentage of the flocculated particles are then removed in a sedimentation basin equipped with plate settlers, where the floc meets the plates and sluffs off to the bottom of the basin. The basin is equipped with a solids removal system, such as a hose-less vacuum system, that removes settled solids accumulated at the bottom of the basin. The pre-treatment process is optimized to remove as much natural organic matter and AIS of concern, particulates, and other solid material as possible. The use of a coagulant results in additional solids generation and disposal. Plate settlers are a type of high-rate sedimentation and an option to conventional gravity sedimentation. Plate settlers are a proven technology with many successful installations in North Dakota drinking water treatment plants.

5.4.3 Media Filtration

Most surface water treatment facilities in the U.S. generally include a filtration process, such as GMF or cloth media filtration (CMF). Filtration has the benefits of removing a significant percentage of algae, sediment, AIS of concern, and other inorganic and organic particles from the surface water source.

GMF is the process of removing suspended solids passing water through a porous granular medium. The removal of particles is performed by several mechanisms: sedimentation, interception, diffusion, and straining. The use of multiple stratified layers of media with increasing density and decreasing size removes larger solids near the bed top and smaller solids further down the filter bed. Filtration is commonly the final polishing step in the conventional water treatment process. It is designed to meet final treated water turbidity limits. GMF meets the requirements of USEPA drinking water regulations for achieving log-removal credits for *Giardia* and viruses, allowing for removal credits ahead of disinfection and a reduction of required inactivation from the disinfection processes.

The GMF process provided for Option 3 is dual media filtration. Dual media filtration is proven to have high particle removal and filtered water quality. Dual media filtration typically uses a combination of sand and carbon media (anthracite or granular activated carbon (GAC)) with support media and underdrains at the base of the filter bed. This form of conventional media filtration is widely used in North Dakota for drinking water treatment and has been a standard drinking water treatment process in the U.S. for decades. Granular media filters provide good removal of particles, AIS of concern, and eliminate the potential shielding issue of particulates and organics associated with undesirable microbes. Properly operated GMF systems can be expected to produce a filtered water turbidity of less than 0.3 nephelometric turbidity units (NTU). The filtration process results in a gradual accumulation of entrapped solids within the granular media, which require intermittent removal by means of a filter backwash cycle. This cycle typically comprises both air scour and water wash phases to effectively loosen and flush out the retained solids.

CMF utilizes an engineered cloth media made from thick pile fibers. The fibers provide filtration over the surface area and depth of the media. Historically, this process has been used solely in tertiary wastewater treatment processes for the removal of phosphorus and solids in stormwater and wastewater systems. Recently, select manufacturers have begun producing cloth media filtration process units designed for primary wastewater treatment applications. One significant disadvantage of cloth filtration for biota treatment is that no credit is currently given for log-inactivation of the constituents targeted in this treatment unit. CMF vendors indicate that data is available and could be submitted to regulatory agencies to receive the log-removal/inactivation credits. CMF system have shown to have the capability of achieving effluent levels of less than 1 NTU.

Backwash water and solids captured from the sedimentation basin are further concentrated by a side stream plate settler sedimentation basin. The overflow from the sedimentation process will be returned to the head of the plant. The underflow from the sedimentation process will flow by gravity to a lagoon for decanting. The thickened solids in the lagoon are trucked offsite to the nearest landfill in the MRB. Decanted water from the lagoon is also pumped back to the head of the plant.

5.4.4 UV and Chlorine Disinfection

As with Option 2, enhanced disinfection consists of UV disinfection followed by chlorination in contact basins. UV disinfection supplements the filters upstream by adding to the removal/inactivation of Giardia, and chlorine disinfection provides the log-inactivation of viruses and AIS of concern that are not achieved by the UV reactors.

Given the additional removal/inactivation of *Giardia* provided by filtration, the UV system is not required to provide the same dose required in Option 2. The UV system is being designed to

provide the same 40 mJ/cm^2 identified in Option 2 in order to provide the Giardia removal/inactivation necessary in the unlikely event that the entire filtration process needs to be bypassed. Although the UV system is designed for 40 mJ/cm^2, it would operate at 25 mJ/cm^2 if the filtration process remains effective. The system would be designed to increase the UV dose to 40 mJ/cm^2 if water quality monitoring (i.e. turbidity or ultraviolet transmittance (UVT)) indicates limited filtration functionality.

The additional water treatment and disinfection provided by UV reduces the *Giardia* log-inactivation and AIS removal potentially required by the chemical chlorine disinfection process. The serpentine contact basin included in this option is like that of Option 1, with the main difference being a smaller capacity and lower baffling factor as a lower contact time is necessary in this option due to the *Giardia* removal provided by filtration and the inactivation provided by the UV disinfection process. This option provides basic disinfection with 20.2 minutes of free chlorine contact time in a basin with a baffling factor of 0.66 at an expected residual of 1.0 mg/L in a serpentine disinfection contact basin with a calculated cT of 13.3 mg-min/L. Although the target chlorine residual is only 1.0 mg/L, the same chlorine storage capacity and transfer capacity is being assumed as for Options 1 and 2. Following chlorine disinfection, ammonia is fed into the chlorinated water stream to form chloramines in similar fashion to Option 1.

5.5 OPTION 4 – ADVANCED TREATMENT

Option 4 involves sand/grit removal, coagulation, flocculation, and membrane filtration followed by an enhanced disinfection process as defined in Option 3. The process begins with sand/grit removal to help protect the membranes followed by the addition of coagulant(s) in a rapid mix chamber and flocculation to form pin floc. The coagulant is added with enough time to form pin floc that is not large enough to settle but can be easily removed by the membrane. The pin floc increases organic matter removal by the membranes and can also improve flux through the membrane. As is the case with Option 3, the use of a coagulant and a filtration process that will be backwashed requires solids separation and disposal. The membrane process is also an effective barrier for the removal of AIS of concern.

5.5.1 Membrane Filtration

Membrane treatment technologies may be used for particulate or dissolved constituent removal from drinking water, depending on the membrane pore size and material used. Microfiltration (MF) and ultrafiltration (UF) membrane systems, which have pore sizes in the range of 0.1 µm and 0.01 µm, respectively, are used for particulate removal, but do not remove dissolved constituents such as dissolved organic carbon (DOC), hardness, salts, taste and odor compounds, and organic chemicals without the addition of coagulations ahead of the membranes. Pretreatment of low-pressure membrane feedwater is required for source waters that commonly have elevated turbidity or TOC levels. Prior to the MF or UF membranes, the pretreatment processes of coagulation and flocculation will create pin floc enhancing the ability of the membrane system to capture larger sized particles. Membrane filtration systems are very effective barriers against microorganisms such as *Giardia* as well as many of the AIS of concern identified in this study. Ultrafiltration membranes typically remove particles, sediment, algae, protozoa, bacteria, AIS of concern, and viruses. Each individual membrane product, dependent on supplier and model, is certified for a specific log-removal/inactivation of both *Giardia* and viruses.

MF and UF systems typically operate at trans-membrane pressures of 8 pounds per square inch gauge (psig) to 30 psig and are thus classified as low-pressure technologies. Typical average flux rates are in the range of 30 to 70 gallons per square foot of membrane surface per day (gfd) for

polymer-based membrane systems; however, ceramic membrane systems may have flux rates of 100 gal/ft^2·d or more. Overall recovery from low-pressure membrane systems is typically 90 to 95 percent depending on membrane material and configuration and source water quality. Because low-pressure membrane filtration provides an absolute barrier to particulates based on membrane pore size and integrity, filtered water turbidity of less than 0.1 NTU is readily achieved.

There are two primary types of membrane systems used in water treatment, pressurized and submerged. Submerged configurations use open basins to house racks of membrane modules and drive water through the membranes using the static pressure provided by the water column in the basin and use of a vacuum pump. These submerged membrane systems are best used in waters with high solids loading rates. Their use, however, is limited due to the need to operate at atmospheric pressure. This factor reduces flexibility of the membrane system to adjust pressure for situations such as process upsets, a change in inlet water quality, or other changes in plant operation.

In comparison to submerged systems, pressure membrane systems provide a host of benefits specific to the requirements of this project. Pressure membrane systems are comprised of several tubular membranes arranged in racks or skids. These tubular membranes are an engineered compact product, which provides a high density of filter area within each membrane. This provides a significant capacity in a relatively small footprint without the need for basins. The operating pressure of tubular pressurized membranes builds a safety factor into the design allowing for greater ranges of operating pressure to cope with changes in water quality. Pressurized systems also have the benefit of being impacted less by cold water conditions due to the ability of the pressurized system to accommodate the higher viscosity water – a feature that submerged systems do not have. Regarding operation and maintenance, breaches in membrane integrity or broken fibers can be identified easily and replaced without significant downtime.

At this stage of the appraisal-level design, pressurized UF membranes are being considered based on their ability to provide a high degree of particulate and AIS of concern removal prior to the disinfection processes. The higher level of treatment with UF membranes provides many benefits to the biota treatment goals of this proposed BWTP, including virus removal. The membrane product used in this initial appraisal-level design is certified for 4-log removal/inactivation of Giardia and 1.5-log removal/inactivation of viruses. This is subject to change dependent on the final membrane filter product used in the final design. Additionally, the removal of TOC and other organic constituents with UF membranes pretreated with coagulants may reduce the formation of DBPs during disinfection and improve UV disinfection performance through potential impacts on UVT. In the event Option 4 is the treatment technology selected, further consultation with membrane manufacturers and suppliers will be completed to identify the most effective membrane treatment solution to meet the requirements of the BWTP and removal of AIS of concern.

Membrane filtration backwash water will be further concentrated in a side stream plate settler sedimentation basin. The overflow from the sedimentation process will be returned to head of the plant. The underflow from the sedimentation process flows by gravity to a lagoon for decanting. The thickened solids in the lagoon are trucked offsite to the nearest landfill in the MRB. Decanted water from the lagoon is also pumped back to the front of the plant. Cleaning waste generated during normal monthly maintenance of the UF system is neutralized and disposed. An air scour system is typically used to prevent solids buildup on the membrane surface.

5.6 RESIDUALS TREATMENT

The additional water treatment processes incorporated in Options 3 and 4 result in the generation of additional residual solids. Residual solids include organic solids, metal precipitates, and additive chemicals used to assist in the settling processes (e.g., aluminum salts, ferric chloride, and/or polymer). The expected concentrations and rates of residual production are summarized for each process in Table 5-3.

Table 5-3 Estimated BWTP Residuals Generation

BIOTA TREATMENT OPTION(S)	PROCESS	SOLIDS STREAM
3	High-Rate Sedimentation	0.25 – 3.5 percent solids 890 gpm daily average (all units in service) Generated continuously or periodically at staff discretion
3	Granular Media Filtration	<0.1 percent solids 1.1 – 5.4 MG generated daily(1) One backwash per filter per day 15- to 30-minute backwash cycle
4	Membrane Filtration	0.25 – 3.5 percent solids 400 gpm daily average Generated continuously or periodically at staff discretion
Note: 1 to 5 percent of plant throughput at 107 mgd.		

The residual waste streams contain such a low concentration of solids that sending all underflow directly to a lagoon would require a significant amount of land area for storage. Initially, the underflow and backwash waste streams would flow by gravity to a flow equalization tank. Submersible pumps in the equalization tank would continuously feed residuals to a high-rate settling basin, such as an inclined plate settler.

The combined waste flow would be clarified, and the overflow returned to the head of the plant or otherwise utilized as reuse water. The remaining solids underflow would be concentrated (ranging from 2 to 4 percent solids) and would be pumped to residuals lagoons for gravity settling.

Residuals lagoons are an inexpensive and effective non-mechanized form of solids treatment and residuals management in projects where land is readily available and inexpensive. Residuals lagoons are often built directly into the ground onsite and are simple in construction and operation. Lagoons are equipped with basic controls such as inlet control devices and overflow structures. Residuals streams generated from the sedimentation process underflow and the filter backwashes at the plant are discharged, after clarification and solids concentration, into the lagoons where the solids are separated by gravity sedimentation.

Two pairs of two decant ponds would both be sized to provide seven days of detention time. The decant water from the ponds can either be returned to the head of the biota treatment train or used for irrigation on the plant site or a nearby field. The use of residuals lagoons provides passive

gravity thickening and the residual solids would be hauled offsite either for disposal at a landfill or for land application within the MRB.

5.7 BIOTA TREATMENT

The treatment options developed here would address biota treatment using several different unit process combinations and treatment strategies. Biota treatment for *Giardia,* viruses, cryptosporidium and *Myxobolus cerebralis* (whirling disease) were considered and collectively they serve as surrogates for other potential AIS that may be present in McClusky Canal source water or the Missouri River water. Attachment A presents detailed treatability data for each individual AIS.

Biota treatment options assessed in this analysis rely upon chlorine disinfection for the 4-log inactivation credit of viruses, cryptosporidium, and whirling disease, although Option 4 provides some virus removal through membrane filtration and partial credit for 3-log inactivation of *Giardia* (apart from Option 1, which achieves 3-log inactivation of *Giardia* from solely chlorine contact).

The appraisal-level assessment of the estimated log-removal/inactivation credit for each option is based upon established EPA drinking water regulatory criteria as well as a literature review of the removal of AIS of concern identified in this study. Additionally, for this assessment, the cold-water temperature of 0.5°C and high pH of 8.8 from the McClusky Canal were chosen based upon analysis of the available source water quality data. Log-inactivation credit is calculated for disinfectant contact in the UV and DCB only, not including any additional contact in the pipeline at the exit of the BWTP.

Further bench-scale testing of the source water is necessary to better gauge potential water quality interferences with the UV system and chlorine demand of the source water. Bench scale testing will also need to be completed to verify the UV doses for various AIS of concern identified in this study. The conceptual level estimated log-inactivation of biological contaminants with each option is shown in Table 5-4.

Table 5-4 Biota Treatment Options and Associated Log-Removal/Inactivation

BIOTA TREATMENT OPTION	PATHOGEN	INTAKE FINE SCREEN REMOVAL	CONVENTIONAL MEDIA FILTRATION REMOVAL(1)	MEMBRANE FILTRATION REMOVAL(2)	UV LIGHT INACTIVATION (3)	CHLORINE DISINFECTION INACTIVATION	TOTAL
1	*Giardia*	0	0	0	0	>3.0	>3.0
	Cumulative	0	0	0	0	>3.0	
	Viruses	0	0	0	0	> 4.0	> 4.0
	Cumulative	0	0	0	0	> 4.0	
	Cryptosporidium	0	0	0	0	0	0
	Cumulative	0	0	0	0	0	

BIOTA TREATMENT OPTION	PATHOGEN	INTAKE FINE SCREEN REMOVAL	CONVENTIONAL MEDIA FILTRATION REMOVAL(1)	MEMBRANE FILTRATION REMOVAL(2)	UV LIGHT INACTIVATION (3)	CHLORINE DISINFECTION INACTIVATION	TOTAL
	Myxobolus cerebralis(6)	1.0	0	0	0	>3.0	>4.0
	Cumulative	1.0	1.0	1.0	1.0	>4.0	
2	*Giardia*	0	0	0	>3.0	>3.0	>3.0
	Cumulative(5)	0	0	0	>3.0	>3.0	
	Viruses	0	0	0	0	>4.0	>4.0
	Cumulative	0	0	0	0	>4.0	
	Cryptosporidium	0	0	0	3.0	0	3.0
	Cumulative	0	0	0	3.0	3.0	
	Myxobolus cerebralis(6)	1.0	0	0	>4.0	>3.0	>4.0
	Cumulative(5)	1.0	1.0	1.0	>4.0	>4.0	
3	*Giardia*	0	2.5	0	3.0	0.1	>3.0
	Cumulative(5)	0	2.5	2.5	>3.0	>3.0	
	Viruses	0	2.0	0	0	4.0	>4.0
	Cumulative(5)	0	2.0	2.0	2.0	>4.0	
	Cryptosporidium	0	2.5	0	3.0	0	>3.0
	Cumulative(5)	0	2.5	2.5	>3.0	>3.0	
	Myxobolus cerebralis	0	2.5	0	4.0	0	>4.0
	Cumulative(5)	0	2.5	2.5	>4.0	>4.0	
4	*Giardia*	0	0	4.0	3.0	0.1	>3.0
	Cumulative(5)	0	0	>3.0	>3.0	>3.0	
	Viruses	0	0	1.5	0	4.0	>4.0
	Cumulative(5)	0	0	1.5	1.5	>4.0	
	Cryptosporidium	0	0	4.0	3.0	0	>3.0
	Cumulative(5)	0	0	>3.0	>3.0	>3.0	

BIOTA TREATMENT OPTION	PATHOGEN	INTAKE FINE SCREEN REMOVAL	CONVENTIONAL MEDIA FILTRATION REMOVAL(1)	MEMBRANE FILTRATION REMOVAL(2)	UV LIGHT INACTIVATION (3)	CHLORINE DISINFECTION INACTIVATION	TOTAL
	Myxobolus cerebralis	1.0	0	4.0	4.0	0	>4.0
	Cumulative(5)	1.0	1.0	>4.0	>4.0	>4.0	

Notes:

1. Includes coagulation, flocculation, and sedimentation processes.
2. Includes sand/grit removal, coagulation, and flocculation processes and UF membranes.
3. UV log-inactivation is based on an applied dose of 40 mJ/cm^2 for Option 2 and 25 mJ/ cm^2 for Options 3 and 4.
4. The log-inactivation/removal credits shown above are based upon 'expected values' for appraisal-level BWTP designs and are subject to change as the design is further refined.
5. Actual cumulative log-inactivation and/or log-removal values are likely to be higher than the minimum totals shown for each treatment option. Bench- and/or pilot-scale testing would be necessary to confirm higher cumulative values (e.g., *Giardia* removal/inactivation for membrane filtration, UV disinfection, and chlorine disinfection is 4.0-, 3.0-, and 0.1-log, respectively, for Option 4. Total committed cumulative log-removal/inactivation for this approach is >3.0, which is the same as for the single process of UV disinfection in the Enhanced Disinfection approach.).
6. In Options 1 and 2, the log-inactivation is based on the design cT being in excess of literature values for whirling disease removal.

The log inactivation for *Myxobolus cerebralis* on Table 5-4 is based on Hedrick et al 2008 for fish hatcheries. Inactivation with chlorine in the Transbasin Effects Analysis was assumed to be zero as doses employed by Hedrick et al far exceeded those used in development of this option. However, additional research presented in Attachment A has shown studies using a chlorine dosage of 13 mg/L for 10 minutes of contact time achieves a 4-log removal of this AIS (Hoffman, G.L., and J.J. O'Grodnick. 1977). In addition, literature indicated whirling disease when in the triactinomyxon (TAM) stage would require a cT of 131-mg-min/L to achieve inactivation of the organism (Control of whirling disease (*Myxosoma cerebralis*): effects of drying, and disinfection with hydrated lime or chlorine. Journal of Fish Biology 10:175-179). Wagner (2003)). The proposed biota treatment system would provide a cT of between 369 and 2,900 min-mg/L at peak flow and a 3 mg/L chlorine residual so it would adequately inactivate this organism.

5.7.1 Disinfection with Chlorination

This Biota WTP option includes sand/grit removal that would remove 95 percent of the particles greater than 100 microns and chlorination using a free chlorine residual and chloramines as described in the ENDAWS Biota Water Treatment Plant Appraisal-Level Engineering Report. There would be 1-log some removal of *Myxobolus cerebralis*. As shown on Table 5-4, chlorine should provide an effective disinfection against transfer of *Giardia* and virus but is ineffective against the other organisms.

5.7.2 Enhanced Disinfection with Chlorination and UV

This option includes sand/grit removal that would remove 95 percent of the particles greater than 100 microns, UV irradiation, and chlorine disinfection, followed by conversion of the free chlorine residual to chloramines. Treatment with chlorine with UV should provide effective disinfection/inactivation of *Giardia (*greater than 3-log*),* viruses (greater than 4-log), *Cryptosporidium (3-log),* and *Myxobolus cerebralis* (greater than 4-log), as shown in Table 5-4.

5.7.3 Conventional Treatment

This Biota WTP option includes coagulation/flocculation/sedimentation, filtration, UV irradiation, and chlorine/chloramine disinfection. Sedimentation and filtration provide for the removal of particles and microorganisms. There are various types of filtration processes that could be deployed in this plant ranging from granular to cloth media. The AIS removal will be a function of the media size and effective pore size. The inclusion of these processes reduces the chlorine and UV disinfectant demand, thus providing a more efficient disinfection process and one that is less expensive to operate.

Table 5-4 provides the removal/inactivation credits for Option 3 treatment processes. Results of Table 5-4 indicate that the process elements of this treatment option should provide an effective multi-barrier approach against transfer of *Giardia (*greater than 3-log*),* viruses (greater than 4-log), *Cryptosporidium (*greater than 3 log*),* and Myxobolus cerebralis (greater than 4-log).

5.7.4 Membrane Treatment with Advanced Disinfection

Membrane treatment is very similar to the conventional treatment option with the filtration included in the conventional treatment replaced with a membrane process. The sand/grit removal process is included to help keep larger solids from loading on the membranes. Membrane filtration is a pressure-driven separation process that provides a transport barrier to particulates including inorganic and organic suspended solids and microorganisms. The types and sizes of matter retained is a function of the membrane pore size and composition. Typical nominal pore sizes range from 0.05 to 0.5 µm capable of removing protozoan cysts (i.e., *Giardia* and *Cryptosporidium*) and most bacteria. Table 5-4 provides the removal credits for the Option 4 treatment processes.

Membrane processes can remove particles from 0.1 to 0.001 micron and provide an effective barrier to most of the AIS included in this study. Results of Tables 5-4 indicate that membrane process with chlorine and UV should provide the more effective multi-barrier approach against transfer of *Giardia (*greater than 3-log*),* viruses (greater than 4-log), *Cryptosporidium (*greater than 3-log*),* and *Myxobolus cerebralis (*greater than 4-log*)*.

5.8 PROBABILITY OF WTP FAILURE

There are several potential events that could result in failure of the proposed treatment options. One major failure event for all the options is the loss of electricity at the BWTP while the pump station continues to deliver water for treatment. While the treatment options are generally designed to flow by gravity, flow still needs to be pumped into the pipeline after the BWTP. The plant will be designed with pumping interlocks so that a loss of electricity to any part of the plant will shut down the entire plant and the pumping stations.

The other risks of failure relate to the treatment processes operating, but not achieving their desired level of treatment. The rest of this section will address the risks of the plant operating but treated water not achieving the targeted treatment objectives.

In Option 1 (disinfection), water is treated for sand/grit removal and then passes through a contact basin where chlorine is added. The sand/grit process is a function of physics and natural particle settling. As long as there is water flow, the sand/grit removal process will work. To maintain reliability and minimize failure on the chlorine disinfection system, redundant chlorine residual analyzers will be used. If the analyzer measures a chlorine residual that does meet the targeted value, then the treatment plant will automatically be shut off. The automatic shutoff will be programmed into the instrumentation and control system that governs overall plant operations Pump operations will require a signal from the chlorine residual analyzers to verify that the chlorine residual exceeds the minimum concentration. In addition, the chlorine tanks and feed pumps would be designed with redundancy.

Similar to Option1, in the enhanced disinfection approach (Option 2) the sand/grit process is a function of the pumping so there is no possibility of failure aside from loss of pumping. The UV equipment for this option contains instrumentation that will monitor that the established UV dose and water quality parameters are being achieved. If the dose and water quality setpoints are exceeded, then the treatment plant will automatically off. This is common design practice for UV systems. The key to maintaining reliability and minimizing failure on the chlorine disinfection system will be to have a chlorine residual analyzer. If the analyzer measures a chlorine residual that does not meet the targeted value the treatment plant will automatically be turned off.

For Option 3 (conventional treatment), effluent turbidity setpoints will b established that if exceeded, the treatment plant will automatically be shut off in the same manner described above for chlorine. UV and chlorine processes included in this Option would be controlled using methods described in the enhanced disinfection Option.

For Option 4 (membrane filtration), effluent turbidity setpoints will be established that if exceeded the treatment plant will automatically be shut off in the same manner described above for chlorine. UV and chlorine process included in this approach will be controlled using methods described in the enhanced disinfection approach.

5.9 SUMMARY

In summary, four separate biota treatment options were evaluated in this analysis. All four treatment options would reduce the project-related risk of AIS transfer. The options were designed to provide a range of treatment methods, starting with disinfection and incrementally adding water treatment technologies to target different types of pathogens and biota, and increasing the level of protection with each option. The more advanced treatment options have the potential to remove more AIS. Each option further reduces the risk of a project-related transfer of AIS from the MRB to the HBB.

6.0 Risk Assessment

Focus of this Chapter is to consider and qualitatively evaluate the types of risk posed by all biota transfer pathways. As a qualitative risk assessment, risks are categorized as being higher or lower relative to each other. The Project's influence on transfer risk is evaluated as an additive contribution to existing biota transfer pathways. The assigned risk estimates are temporally qualified, as done in the Transbasin Effects Analysis.

6.1 RISK POSED BY POTENTIAL BIOTA TRANSFER PATHWAYS

6.1.1 Risk of Biota Transfer from Natural and Human Pathways

Natural risks are posed by non-project natural transfer pathways such as migratory birds and animals. Even though the volume of material transferred by these pathways is very small, even small volumes of water or other material can carry a large amount of microscopic AIS. The MRB, Upper Mississippi Basin and the Great Lakes Basin all share a boundary with the HBB and can all be a potential source of AIS from natural pathways. As the MRB shares the largest boundary with the HBB, it provides the greatest risk of biota transfer. The risk of biota transfer from natural pathways may be low at any given time but will accumulate over long periods of time.

Human pathways are risks posed by human transfer (recreational fishing and the transfer of fishing boats and bait buckets between basins, aquaculture, and water recreation such as wake boarding and the transfer of recreational boats and other recreational equipment between basins). In such cases, larger amounts of untreated water can be transferred directly from one basin to another than with the natural pathway. The Transbasin Effects Analysis (p. 73) considered risk from human transfer to be higher than risks from natural pathways. The rapid distribution of zebra mussels and the New Zeeland Mudsnail by human pathways throughout multiple North American basins demonstrates the relatively high risk of the human transfer pathway.

6.1.2 Risk of Biota Transfer from Non-Project Interbasin and Intrabasin Diversion Projects

There is a long and complex history of existing interbasin and intrabasin transfers as described in Chapter 4 (WAWS, NAWS, Devils Lake Outlet, Saint Mary's and Milk River Diversion, ect.). Projects such as NAWS and WAWS have a lower risk of biota transfer than other interbasin diversions because of their water treatment systems. For example, the Transbasin Effects Analysis determined the probability for a NAWS related release of water resulting in the transfer of AIS and sequent establishment in the HBB would be extremely low (p 117). However, biota transfer risks from interbasin diversion projects without treatment such as the Saint Mary's and Milk River Diversion are higher because they do not involve treatment. The risk of biota transfer from an intrabasin diversion project such as the Devils Lake Outlet is also higher because it does not provide treatment.

6.1.3 Risk of Biota Transfer from the State RRVWSP/CNDWSP.

The State RRVWSP/CNDWSP can operate in two separate modes. When providing water to the Red River Valley, which is in the HBB, the project will provide treatment through a combination of screens in the Missouri River and a sand/grit removal system designed to remove 95% of the particles with a diameter greater than 100 microns. The State RRVWSP will also use chlorine disinfection for biota treatment. The State RRVWSP treatment system considered the removal or inactivation of giardia, viruses, cryptosporidium and whirling disease. The treatment system is also designed with multiple levels of controls for chlorine addition and monitoring and two emergency discharge locations for water that would not meet treatment requirements before it enters the HBB.

When providing water to Central North Dakota, not treatment is required because Central North Dakota is still within the MRB.

The proposed treatment system and redundant control systems of the State RRVWSP/CNDWSP will reduce the risk of the RRVWSP/CNDWSP transferring AIS to the HBB compared to other existing non-project pathways.

6.1.4 Risk of Biota Transfer from ENDAWS

As described in Chapter 5, there are several treatment technologies that provide an effective barrier to biota transfer and so limit the risk associated with AIS transfer. Chlorination (Option 1), or treatment with uv light followed by chlorination (Option 2) or conventional filtration followed by uv light and chlorination (Option 3) or membrane treatment followed by uv light and chlorination (Option 4) are all effective treatment options. Option 2 provides two fully redundant treatment processes (chlorination and uv) while Options 3 and 4 add still more barriers through physical separation. The Transbasin Effects Analysis determined the risk of AIS transfer from the NAWS Project is extremely low compared to non-project related transfers due to the inclusion of such treatment processes (p. 74.) The same conclusion is valid when comparing the risk of the EDNAWS project, with a biota water treatment plant, to the non-project risks.

6.2 RISK POSED BY AIS OF CONCERN

While the previous section discussed the risk of biota transfer in general based on various pathways, this section discusses the risk posed by specific AIS. This risk analysis draws from the conclusions of the Transbasin Effects Analysis. The risks are not considered to have changed since that Analysis was completed as the list of AIS of concern and the potential ecological receptors are all the same. The virulence of pathogens and parasites and the invasion potential of AIS are unique and variable among strains and individual species relative to movement through the targeted water basins discussed in this analysis. Hosts may impact the speed at which a pathogen or parasite establishes in an aquatic system. Some pathogens and AIS of concern can survive outside of their host organisms, while others have an obligate relationship and perish in the absence of that association. Life cycles of some parasites, pathogens, and AIS of concern require multiple hosts, which can be a significant challenge to survival in a newly encountered ecosystem. There is a tremendous amount of uncertainty regarding both the physiological processes at the individual level and the relationship of biotic and abiotic factors in the environment that influence infection.

The potential risk posed by AIS to HBB receptors is described below with an emphasis on invasive distribution and host susceptibility. AIS are considered a potential threat when 'apparently' absent from receiving waters, however, lack of detection does not rule out the AIS presence within the watershed. Uncertainty mires the understanding of the effects of supplemental or additional transfers on expansion rates and ecosystem effects of AIS residents in the HBB. Therefore, the risk evaluation focused on individual species was primarily based on a presence/absence framework.

6.2.1 Viruses

The viruses identified in the AIS of concern are highlighted below based on their impact to the HBB. One of the key viruses identified for the water basins of interest is Channel catfish virus (CCV) which is present throughout all catfish-growing areas of the U.S. Impacts appear to be primarily limited to farmed catfish as CCV has not been detected in wild fish and impacts are likely to remain in regions of intensive catfish aquaculture such as the southern U.S., which is outside the study area for this analysis and does not include the HBB in North Dakota or Manitoba. Infection rarely leads

to mortality in wild hosts and therefore, this virus does not appear to be of significant concern or risk to HBB catfish.

Infectious hematopoietic necrosis virus (IHNV) has been found in several U.S. states but appears to be most prevalent in western U.S., specifically the Pacific Northwest Region adjacent to the HBB, primarily affecting raised fish including salmonids. The virus has also been found in South Dakota and Minnesota, although these detections were not recorded in the Wild Fish Health Database. Based on its presence in adjacent watersheds, IHNV may pose some risk to susceptible wild and farmed salmonid hosts in the HBB.

Infectious pancreatic necrosis virus (IPNV) may pose some risk to HBB receptors based on its cosmopolitan distribution and presence in salmonid populations in eastern Canada, as well as its potential to cause significant population declines in salmonid hosts. Non-Project pathways would likely be responsible for introduction to the HBB due to the apparent absence of IPNV in the MRB.

Infectious salmon anemia virus (ISAV) has not been observed in the MRB and is generally limited geographically to the coastal northeastern U.S. and Canada, primarily the Atlantic Ocean basin. ISAV does not currently pose a significant threat to receptors in the HBB due to its apparent distance from this drainage basin, as well as its low tolerance for heat, which would likely limit its survival probability in avian or mammalian digestive systems.

Spring viremia of carp virus (SVCV) has already been detected in the Great Lakes region (Ontario) and the Upper Mississippi River (Wisconsin and Minnesota). The close geographic proximity of these systems to the receiving basin suggests a greater likelihood of non-Project pathway transfers of this organism. SVCV can also survive in water or sediment for several weeks. Farmed carp are the primary hosts, but the virus may also infect other fish species. The virus is usually transmitted horizontally but may also be spread by external parasites (e.g., leeches). Due to its presence in adjacent watersheds (other than the MRB), ability to spread via alternate vectors, and survivability outside of hosts, it is probable that SVCV may pose some risk to carp and other fish species in the HBB.

Viral hemorrhagic septicemia (VHS) appears to be geographically limited to the Great Lakes region in North America. Therefore, non-Project pathways that link this area to the receiving basin could exhibit significant transfer risk. The virus is non-host specific and the presence of appropriate hosts and reservoir vectors in the HBB further increases the potential risk of VHS establishment and impacts to fish receptors.

6.2.2 Bacteria

Based on the documented existence of bacterial kidney disease (*Renibacterium Salmoninarum*), *Edwardsiella* spp., and enteric redmouth (*Y. ruckeri*) in the HBB, the threat of impacts related to future introductions (via project or non-project pathways) is considered extremely low.

Streptococcal bacteria, *E. coli*, *Legionella*, Mycobacteria, *Pseudomonas aeruginosa*, and *Salmonella* are ubiquitous in aquatic systems and likely already occupy niche habitat in the waterbodies of the HBB. As a result, these bacteria are not monitored as potentially invasive aquatic species in data repositories. In addition, pathogenic (fish) strains of Strep are uncommon. Furthermore, *Vibrio cholera* is significantly more common in warm, tropical regions. Therefore, the risk of disease outbreaks to fish and humans associated with future introduction of these bacteria are considered extremely low.

Flavobacterium spp. are widely distributed and abundant in aquatic systems throughout the world. These bacteria have the ability to infect a broad range of fish species and, therefore may pose some risk to receptors in the HBB. Although, *F. columnarae* has evaded detection in the HBB, introduction is highly likely and may have occurred previously. A strain of *Flavobacterium* with unknown pathogenecity was detected in the HBB during the Devils Lake Study.

The presence and documentation of impacts to native salmonids in the Great Lakes region indicate the potential for eventual spread of *Aeromonas salmonicida* to the HBB. The risk of transfer from Project water is extremely low due to the use of Missouri River source water, and *Aeromonas* appears to be mainly present in systems along the East and West coasts of North America. Non-project pathways including bait buckets, aquaculture, fish stocking, and avian and mammalian transport of various AIS represent mechanisms with greater inherent risk for facilitating spread between the Great Lakes and the HBB. Particularly for aquatic invertebrates, propagules may remain viable and infectious in or on birds for distances exceeding 1000 km (600 mi).

6.2.3 Mollusks

The probability of New Zealand Mudsnail invasion of the HBB through non-Project pathways is considered low to moderate but with high uncertainty by Fisheries and Oceans Canada. This uncertainty is due mostly to the fact that many transport pathways for the mudsnail are human-mediated, and therefore the control of these snails relies on education of the public. The New Zealand Mudsnail is easily spread by passive means when they attach to and are transported on vegetation or sediment affixed to waders, fishing tackle, boat trailers, or even birds and other wildlife. Their small size, high fecundity, asexual reproduction, low susceptibility to predation, and relative hardiness have enabled the mudsnail to become an effective invader. Ultimately, the spread of this snail is expected to continue, and the species is likely to become established throughout the West, Midwest, and the coastal Northeast U.S.

The zebra and quagga mussel distribution appear to be a hardy and adaptable invader that would likely establish itself in any suitable waterbody encountered. Currently, the risk of introducing quagga or zebra mussels via a Project interbasin water transfer is considered to be extremely low, given their absence in and near the water supply source area (Lake Sakakawea and Lake Audubon).

6.2.4 Parasitic Animals

The general lack of susceptible hosts in the receiving basin, the treatment alternatives identified for the treatment facility, and the environmental barriers that prevent natural expansion contribute to an extremely low likelihood of introduction and establishment via a Project interbasin water diversion. Literature indicates that the susceptibility of transfer differs widely among salmonids and lake whitefish vulnerability remains unknown, however, the species is particularly valuable to Manitoba (commercial and recreational fisheries) and should not be overlooked as a potential host for *M. cerebralis* if it were to spread to the HBB.

The treatment alternatives identified for the Project are capable of excluding parasitic copepods, which are quite large (>1.0 mm) compared to many of the other AIS. Because these copepods are already present in the HBB, the risk of transfer is considered to be extremely low. Additional introductions via a Project water diversion are unlikely due to treatment technologies that exclude macroorganisms, such as parasitic copepods. The current distribution and ecology of *I. microcotyle* is largely unavailable, therefore transfer risk and potential impacts to ecological receptors in the HBB cannot be accurately evaluated. Considering how rare this flatworm appears to be in aquatic systems, the potential risk of transfer is estimated to be extremely low.

6.2.5 Protozoa

It is anticipated that the treatment system identified in that protozoa identified as AIS of concern can be treated to levels to minimize the risk of transfer to the HHB. The Project is not expected to alter the prevalence or incidence of *E. histolytica* in the receiving basin, as the organism is known to have a cosmopolitan distribution. Approximately 10 percent of the world's population is infected with *E. histolytica*. A stool survey in the U.S. indicated that about five percent of the population harbors *E. histolytica* (Public Health Agency of Canada 2012).

The risk of transfer of *I. multifillis* by the Project is extremely low due to the low survival rates of theronts and tomonts outside of their fish hosts. These life stages are also effectively deactivated with common chemical biological treatments, such as chlorine. In addition, the probability of transferring macrobiota such as their fish hosts via a Project water transfer is practically zero. Furthermore, the parasite already has a worldwide distribution and is most commonly a serious problem for intensive aquaculture programs.

6.2.6 Fungi

No risk of increased *Phoma* infections due to the Project is expected due to the vast geographic distribution and common occurrence of this fungus in nature. The risk to HBB receptors posed by these widely distributed and common organisms (*Exophiala* spp., *Saprolegnia* spp., *Achyla* spp., *Branchiomyces* spp., *I. hoferi,* and *P. herbarum*) is low. Most are opportunistic pathogens and are present in nature in a variety of habitats.

6.2.7 Cynobacteria

Additional introductions of cyanobacteria to the HBB are not considered to be significant since the three species of concern are already present. Increased cyanobacterial blooms are partially related the presence of cyanobacteria and concentration of nutrients such as nitrogen and phosphorous. The risk and potential consequences of interbasin transfer of cyanobacterial AIS and their associated toxins would likely be negligible due to the implementation of effective treatment systems and the ubiquity of these organisms in the environment including the receiving basin.

7.0 Consequence Analysis

Invasions of aquatic microorganisms are likely considering the variety of transfer pathways in a system as large as the HBB. In this chapter, potential environmental and economic consequences of an establishment in the HBB, including Canada, are qualitatively assessed. The environmental consequences and the economic consequences presented in this Analysis are drawn from the Transbasin Effects Analysis. The environmental and economic conditions of the HBB have not appreciably changed since that Analysis was complete and so its conclusions are still considered valid.

7.1 POTENTIAL ENVIRONMENTAL CONSEQUENCES IN THE HBB

When introduced into a new environment, most organisms fail to become established and many that succeed only have minor effects on the newly encountered ecosystem. However, some non-indigenous species may become invasive, reproducing and spreading rapidly with significant adverse consequences. Non-indigenous species can alter population, community, and ecosystem structure and function.

Relatively few published observational studies have adequately described disease incidence and dynamics at the population level. Population-level studies are labor-intensive and cost-prohibitive, which typically prevents them from being funded on non-commercial fish species. The inclusion of non-commercial species in population studies would be valuable, because they can act as reservoirs for diseases impacting game fish and commercial fish alike. The lack of baseline data regarding the frequency and prevalence of infections and diseases limits the ability to predict cumulative impacts from invasive species introduction.

When examining the occurrence of disease in fish, it is difficult to assess whether impacts on individuals can or should be scaled to the population level. The health effects caused by abiotic factors and other stressors in aquatic systems are currently not well understood. Another key question in determining the impact of pathogens on wild populations is whether the resulting mortality, reduced fertility, and low recruitment actually culminate in population declines. Taken together, these uncertainties represent barriers to fully understanding the impacts of diseases and infection on the fitness, abundance, reproduction, distribution, and survival of populations of fish.

In addition, environmental factors such as dissolved oxygen, pH, temperature, flow, turbidity, and the presence of toxic contaminants can impact the health of fish populations. Other environmental factors, such as high intensity of infection or stress caused by low dissolved oxygen, high carbon dioxide, high ammonia, elevated temperature, and toxins including pesticides can enhance the probability of a disease outbreak. Many pathogens have the greatest effect on individuals in crowded conditions. Such conditions are encountered in fish farms where the infections are exacerbated by poor water quality and stress. On a population scale, wild fish tend to be less susceptible to these types of diseases, although climate change may cause temperature-induced mortality in wild fish species (e.g. the Arctic grayling) and amplify their susceptibility to pathogens and parasites.

7.1.1 Potential Environmental Consequences of Viruses

Fish viruses tend to have the most significant impact on individuals and populations experiencing stress, such as those contained in aquaculture facilities. Detection of viral infections in rearing facilities usually results in the elimination of contained fish and sterilization prior to returning to normal operations. Therefore, a single observed infection (in a facility within the HBB) could have

'indirect' population-level impacts (anthropogenic eradication rather than population-level effects directly caused by the infectious agent) when fish are euthanized to eradicate a viral pathogen from a aquaculture facility.

Viruses are not exclusive to infecting farm-raised fish, as IPNV, ISAV, and VHSV have caused significant mortality of wild fish. VHSV, in particular, has caused severe impacts in the Great Lakes due to its potential to cause mortality to a variety of host species. The spread of viruses depends upon a suite of criteria including host density, abiotic habitat features, virulence, etc. Most viruses examined herein are transferred either horizontally via feces, urine, or direct contact or vertically from parent to egg/offspring. Transfer is facilitated by crowding and susceptibility appears to increase with stress, which is why hatchery fish appear most affected by viral outbreaks. Because no large aquaculture facilities have been identified in the HBB, the spread of viruses via farmed fish would likely be minimal. In addition, catfish are not intensively farmed in Manitoba, therefore CCV infection, and related impacts, would be unlikely.

7.1.2 Potential Environmental Consequences from Bacteria

Large-scale ecological and environmental impacts related to bacterial fish infections are not well characterized in the published literature. Information gathered was limited to bacterial infections already present in the HBB or ubiquitous in aquatic systems (Strep). Stressful environmental conditions characteristic of impaired water bodies with poor water quality may compromise immune systems of host fish and facilitate outbreaks. Most bacterial infections of fish are spread horizontally, fish-to-fish, and are therefore more likely to negatively impact aquaculture facilities than wild fish located in the HBB. In aquaculture settings, introduced pathogens could include direct mortality of infected individuals or elimination of reared populations as a consequence of standard management actions. Impacts to wild fish including declines of fish stocks are possible; however, there is uncertainty regarding the influence of infection on reproduction and recruitment and how that translates to effects at the population level.

Several of the bacterial AIS were found to be present in the HBB (*Aeromonas* spp., *R. salmoninarum*, *Flavobacterium* spp., *Edwardsiella* spp., and *Y. ruckeri*) or widely distributed and ubiquitous in aquatic systems of North America (*P. aeruginosa*, *V. cholera*, *Mycobacterium* spp., E. coli, *Legionella* spp., and *Salmonella* spp.), and therefore would not pose a "new" risk to HBB receptors. In addition, concentrations of bacterial pathogens are related to environmental factors (e.g., nutrients, sewage) hence, additional transfers would likely have little influence on concentrations in HBB waterbodies and impacts to humans.

7.1.3 Potential Environmental Consequences from Animal Parasites

The primary barrier to whirling disease risk and success in the HBB is the general lack of susceptible salmonid hosts in these receiving waters. Whirling disease is present in the Rocky Mountain region of the western MRB, which is characterized by cooler, oxygenated water and abundant wild trout populations (rainbow, cutthroat, and brown trout). The potential for whirling disease to spread naturally via infected host fish along waterways connecting the current western populations of *M. cerebralis* to the project water transfer site is thought to be seriously limited by the lack of susceptible hosts and the sub-optimal habitat that lies between the two regions. A more likely scenario would involve the accidental stocking of infected salmonids in or near HBB waters. If infected fish or infected *Tubifex* worms (the intermediate host) are present in the eastern MRB or in the HBB, the potential does exist for whirling disease-related impacts to some wild and farmed trout and char populations in the HBB. Population declines of some of the more vulnerable species (e.g., rainbow trout; primarily a farmed species) could result in subsequent increases of other more

resilient species (e.g. brown trout). However, it must be reiterated that these types of larger ecosystem-level impacts are not possible to accurately predict.

The lack of evidence for sensitivity of two of the most common salmonids in the HBB, lake whitefish and lake trout suggest a low likelihood for deleterious effects to their wild populations. Ecological receptors of concern that may exhibit at least some vulnerability to whirling disease may include brook trout, brown trout, Chinook salmon, lake trout, lake whitefish, rainbow trout, and shortjaw cisco. Lake whitefish are one of the most important commercial fish species in the Province of Manitoba, including Lake Winnipeg. Wild lake trout and hatchery brook and brown trout represent important recreational species in the region. Whirling disease has the potential to induce significant mortalities in wild populations; however, the probability of introduction and establishment is extremely low due to the general lack of naturally-reproducing salmonid populations in the HBB, especially the Souris River.

Unlike whirling disease, infection with *P. hydriforme* is rarely lethal to fish hosts (acipenserids such as lake sturgeon) that inhabit the receiving basin. Furthermore, infection does not appear to manifest into adverse population-level impacts and is already well-established among a variety of fishes in the MRB and HBB and throughout North America. Because this parasite is currently present in the receiving waters, it would not represent a new threat if additional transfers occurred.

Parasitic copepods including *Actheres* spp. and *Ergasilus* spp. are widely distributed in North America, including the HBB. Due to the apparent lack of adverse influence on fish populations, the potential impacts to receptors in the HBB are not expected.

Helminths including *I. microcotyle* and *C. minutia* do not appear to represent parasites of major concern for the receiving basin. *Corallotaenia minutia* requires a copepod intermediate host for development prior to its invasion of host tissue. In addition, this parasite has already been detected in North Dakota (Wild Rice River) and Manitoba (La Salle River) within the HBB. *Icelanonchohaptor microcotyle* has only been found in the Missouri River (Dick et al. 2001) and the effects of this parasite have not been observed in the environment. This parasitic flatworm has eluded characterization due to its apparent scarcity (both presence throughout and abundance within hydrologic basins). For these reasons, the potential consequences of an introduction of this organism, no matter what the source of introduction, would not be expected.

7.1.4 Potential Environmental Consequences from Fungi

Fungal infections are more likely to occur under stressful environmental conditions, such as those characteristics of fish-rearing facilities. *Phoma herbarum* and *Saprolegnia* infections could potentially lead to population declines of salmonids such as Chinook salmon and lake trout, as well as channel catfish in the HBB. However, there is significant uncertainty regarding the effects of these fungal pathogens on wild fish individuals and populations, as they are primarily of interest as pathogens of aquacultural facilities. In addition, effects from *P. herbarum* are difficult to predict since it is considered to be only weakly-infectious. Potential impacts associated with fungal infection would likely be most severe to farmed fish where entire populations could be at risk in these controlled systems. However, large rearing facilities have not been identified in the HBB including Lake Winnipeg.

7.1.5 Potential Environmental Consequences from Mollusks

Native invertebrates such as the mapleleaf mussel (*Quadrula quadrula*) could be adversely affected by direct competition from non-indigenous quagga and zebra mussels. Zebra mussels are already present in the HBB and the distribution of quagga mussels is rapidly expanding. Dietary

replacement of native mussels with less nutritional invasive mussels could have impacts on HBB fish, although this possibility has not been thoroughly addressed in the available literature. The introduction of quagga mussels could have an effect on plankton biomass and diversity in the HBB. Plankton decline can lead to decreased dissolved oxygen and organic carbon potentially affecting higher trophic levels, including vertebrates. The presence of mussels could also lead to increased abundance of cyanobacteria, which pose unique challenges to the aquatic environment.

Zebra mussels selectively reject cyanobacteria while filtering. Zebra mussels are one of the most important biological invaders in North America, but quagga mussels have the potential to replace zebra mussels as the dominant dreissenid species due to their broad environmental tolerance and rapid spread.

New Zealand mudsnails could cause ecosystem-level disruptions in waterbodies within the greater HBB. Impacts could include direct crowding of, and competition with, native invertebrates such as pulmonate snails. More severe consequences could include fish population declines associated with food web structure alterations. The New Zealand mudsnail is tolerant of a wide range of environments and has been documented in almost all western states of the U.S., the Great Lakes, and more recently in British Columbia, Canada. However, these effects would be site-dependent, highly variable, and unpredictable due to ecological uncertainty. That said, invasive mussels have the greatest chance of all AIS evaluated to result in adverse environmental impacts in the HBB.

7.1.6 Potential Environmental Consequences from Cyanobacteria

All three species of cyanobacteria are already present in the HBB. Thus, the introduction of additional cyanobacterial cells or toxins would be unlikely to result in deleterious consequences to HBB ecosystems. Increased cyanobacterial abundance is partially linked to nutrient influx, which is characteristic of agricultural runoff and waterbodies near populated areas where periodic or frequent sewage discharges occur.

7.2 ECONOMIC CONSEQUENCE ANALYSIS

Analysis of the economic consequences of increased microorganism transfers will be both quantitative and qualitative. Quantitative economic consequences are taken from the Transbasin Effects Analysis as the economic data are still considered representative of the impacts and provide information to make a relative comparison. As discussed in Transbasin Effects Analysis, the size of the HBB necessitates a limit to the spatial dimensions of the economic analysis. The estimated impacts on Lake Winnipeg were assumed representative of those water bodies throughout the HBB that could potentially be affected by a NAWS project-related transfer.

7.2.1 Recreational and Commercial Fisheries

All reported commercial fishery value is from landings of walleye, whitefish, and sauger, whereas nearly 94 percent of recreational fish caught are walleye, northern pike, channel catfish, smallmouth bass, perch, or lake trout. Any incremental decline in these fish populations due to AIS would likely result in reduced catch rates, with subsequent economic effects (such effects would be mitigated if reductions in any of these fish populations were offset by increased abundance of other economically valuable species). Furthermore, AIS may have effects on fish appearance and fish health, which can affect the value of fish caught both recreationally and commercially.

For commercial fisheries, reductions in catch rate can have several impacts. First, if fishing effort is unchanged, then commercial catch would be lower. Lake Winnipeg accounts for a substantial proportion (approximately two-thirds) of commercial landings in Manitoba. Reduced commercial

fish catch at Lake Winnipeg, if significant, could have adverse ripple effects on industries processing and marketing fish as demand for their services would drop. Similarly, if Lake Winnipeg commercial catch declines were significant, the price of local fish could rise and the availability could decrease, increasing costs to consumers and potentially reducing food choices for fish consumers. Reduced fish quality and/or appearance would also adversely affect fish consumers unless associated with price reductions that offset the quality reduction.

Reduced catch also means lower revenues and thus lower profits for fishermen. Commercial fishermen may respond to reductions in catch rate by increasing fishing effort (hours fishing) to maintain total catch. In this case, revenue may remain constant, but operating costs (both vessel fuel and labor costs) would increase, resulting in lower profits. Reduced profits translate to lower income for fishermen. If profits are significantly lower, then fishermen may exit from the fishery, reducing fish industry employment and resulting in even lower commercial catch. Lake Winnipeg fishermen currently have much higher profits than commercial fishermen elsewhere in Manitoba ($23,280 per fisher compared to $13,372 elsewhere in the province), suggesting that exit of the fishery due to reduced profits would likely be minimal unless AIS effects were severe. In any case, direct impacts on fishery employment would be limited to some portion of the 1,000 to 1,100 total Lake Winnipeg licensed fishers and hired helpers.

While the risk of AIS introduction and the degree of susceptibility of economically important HBB fish stocks to AIS is not completely understood, the fact that most, if not all, of these fish species are present and fished in the MRB suggests that there is low probability for incremental impacts in the HBB. For example, the Corps of Engineers manages flows below Fort Peck and water levels on Lake Sakakawea for fisheries based on recommendations from the state agencies responsible for fisheries management including Montana and North Dakota. The North Dakota and Montana state agencies manage the fishery resources for walleye, sauger, and Chinook salmon primarily, with northern pike, trout, and smallmouth bass also managed. The coexistence of these managed fisheries and several AIS in the MRB suggests that the vulnerability of the same, economically important fish stocks in the HBB to these pathogens may be low.

7.2.1.1 Aquaculture

AIS capable of infecting fish species reared at an aquaculture operation could cause significant mortalities within a fish stock for that year. However, the economic impacts of any effects of AIS on the aquaculture industry would be minor in the context of the regional economy. The aquaculture industry in Manitoba is a very small piece of the province's economy, with gross output value of $31,000 to $95,000 (Transbasin Effects Analysis). Impacts of AIS would therefore be limited to some portion of this small value. Reduced availability of trout fingerlings from the aquacultural industry could adversely affect aquaculture consumers, primarily hobby farmers.

7.2.1.2 Recreation and Tourism

AIS can have two potential types of effects on recreation and tourism: effects on the level of enjoyment and value of the experience to the recreators/tourists themselves, and effects on the recreation and tourism economy that may result from changes in the number of visitors and their expenditures. These two types of effects are closely related as the level of visitor enjoyment also affects the number of visitors and their expenditures.

For recreational fishing, any reduction in the health or abundance of fish species targeted by recreational anglers could adversely affect the level of enjoyment of the angling experience. It is well documented that reductions in fish catch rate reduce recreational enjoyment. For example, one study of anglers in the Great Lakes region found that anglers value each one percent change in fish

abundance at approximately $0.20 to $0.40 per fishing day. Thus, if AIS incrementally reduced catch rates in Lake Winnipeg, even if the number of angler days stayed at the current level of approximately 159,000, there would likely be a reduction in value of each angler day. Using the values from the Great Lakes study of $0.20 to $0.40 and applying this to the 159,000 angler days at Lake Winnipeg, every one percent change in fish abundance could reduce the value of the angler experience in the range of $30,000 to $60,000.

For non-fishing recreation, the primary impacts of AIS would likely be an increase in beach closure days. Incremental beach closures could result if cyanobacteria or human pathogens such as E. coli or *Salmonella* spp. were transferred and thereby resulted in increased concentrations in Lake Winnipeg. However, as noted in earlier sections, several of the bacterial AIS of human health concern are widely distributed and ubiquitous in aquatic systems of North America (*P. aeruginosa*, *Vibrio* spp., *Mycobacterium* spp., E. coli, *Legionella* spp., and *Salmonella* spp.), and therefore pose a potential risk, but not a "new" risk in Lake Winnipeg. In addition, concentrations of bacterial pathogens and cyanobacteria are predominantly determined by other water quality factors (e.g., nutrients and water temperature). Hence, additional transfers of these AIS would likely have little influence on concentrations in a HBB waterbody such as Lake Winnipeg.

Reduced catch rates or reduced health of fish species could also result in fewer fishing trips to Lake Winnipeg, with resulting reductions in angler expenditures. Reduced angler expenditures would adversely affect area businesses that sell goods and services to anglers, such as food and drink establishments, lodging, sporting good stores, etc. As estimated above, the 159,000 fishing days at Lake Winnipeg have an associated estimated fishing trip expenditure of approximately $8 million. However, impacts to the local economy are limited to changes in tourism (non-local) visitation, and it is not known what proportion of the 159,000 trips are non-local. Changes in the number of fishing trips enjoyed by locals would not be expected to impact the local economy since such locals would likely spend their recreation dollars on other local recreational activities. As Lake Winnipeg is not particularly attractive as a recreational fishing destination, there may be more local than non-local anglers fishing at Lake Winnipeg, which would limit the potential effects of AIS on tourism expenditures.

Similar to the effects on recreational fishing, incremental beach closures could cause economic impacts if fewer visitors came to the Lake Winnipeg area to recreate. As Lake Winnipeg has become a recreation and vacation home destination, with beach and shoreline recreation a major draw, AIS impacts on beach access could have measurable effects on the $111 million local Northwest Area

recreation economy. If beach closures resulted in fewer visitors, impacts would likely include reduced expenditures at local businesses for recreation-related goods and services such as transportation, food, lodging, and equipment. Furthermore, if shoreline recreational quality significantly declined, the property values and associated tax revenues for lakeside retirement and recreation communities would also potentially decline.

7.2.1.3 First Nations

First Nations communities rely heavily on Lake Winnipeg fisheries for employment as commercial fishermen, for a subsistence food source, and for cultural value. With such reliance on Lake Winnipeg fisheries, it is expected that First Nations communities would be impacted by AIS effects on fishery resources. A study of the economic value of hunting and fishing for the Mushkegowuk region, Hudson and James Bay Lowlands, highlights that the replacement value of subsistence food resources (cost to replace subsistence foods with store-bought foods) can be equivalent to about one-third of the total cash economy in First Nations communities.

Based on the estimated subsistence harvest of 140 to 402 MT of fish and an average market value of fish of $4,010 per MT, the replacement value of the First Nations subsistence fish harvest may be somewhere in the range of $561,000 to $1.6 million annually. Increased food costs could be a noticeable burden on the First Nations communities around Lake Winnipeg, as these communities are low income and have a high unemployment rate. Furthermore, it is important to note that replacement cost does not take into account the cultural and/or social value of subsistence activity. Thus, replacement food costs represent a lower bound estimate of the value of subsistence use.

8.0 Conclusions

The conclusions in this chapter draw from the conclusions of the Transbasin Effects Analysis because AIS species of concern, the range of project and non-project transfer pathways, the range of treatment options and the environmental and economic consequences are all very similar between that project and this proposed project. The probability of a Project-related release of water resulting in the transfer of AIS and subsequent establishment in the HBB would be extremely low. An introduction and establishment would require a cascade of low probability events, including: an interruption of water treatment; AIS location of a suitable host or substrate to colonize (i.e., invasive mussels); AIS infection of susceptible host; and AIS establishment throughout an aquatic system. The possibility of an interruption of the treatment system is considered very low (Chapter 5).

The numerous and diverse non-Project pathways were determined to exhibit a greater risk (baseline risk) for introducing AIS (present in adjacent drainage basins) to the HBB. Many of the species evaluated are widespread and ubiquitous in aquatic systems and may be both present and abundant in the HBB. Water diversions with minimal or limited biota treatment systems, engineering controls, and mitigation response systems (unlike the Project) were determined to exhibit higher risk for AIS interbasin transfer (Chapter 6).

Potential environmental impacts are considered to be low or minimal due to the lack of potential of some AIS to cause direct mortality, their ubiquity in the environment, and the general lack of susceptible hosts in the HBB (Chapter 7). More substantial impacts are possible from the introduction of quagga mussels and New Zealand mudsnails and additional transfers of zebra mussels especially due to their broad environmental tolerance, rapid spread, and potential to cause metapopulation disruptions. However, impacts would be site-dependent and highly variable, and therefore largely unpredictable.

Although the potential impacts of AIS introductions, or additional transfers (AIS already present in the HBB) could be minimal, the potential exists for pathogens and parasites to cause mortalities significant enough to result in population-level effects. In these cases, there could be impacts on recreational and commercial fisheries, non-fishing recreational activities, and aquaculture operations, all components of the Manitoba economy. The economic impacts on these four sectors would likely differ substantially based on the AIS and the receptor of concern (e.g., susceptible fish hosts). Potential adverse impacts to recreational fisheries could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential impacts to the commercial fishing sector (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers could be adversely impacted by increased price or reduced availability/quality of local fish (Chapter 7).

Table 4-1 summarizes potential ecological receptors of concern in the HBB, their recreational or commercial value, and associated pathogens (AIS). In Table 8-1, this information was expanded to include the primary economic sectors which might be impacted should the specific AIS become established in the HBB, no matter what the source of introduction. Because of the multiple potential pathways and uncertainties regarding AIS establishment and spread, the economic sectors shown must be viewed as those possible from the specific AIS regardless of pathway(s) and temporal patterns of introduction and establishment.

The sectors shown in the table reflect the specific fish listed as important recreational or commercial species in Canadian publications. Those publications exclude some species, and the

economic sectors which might be impacted are therefore not listed. However, the sectors shown are believed to be representative for various recreational and commercial fisheries.

The uncertainty revealed during the current analysis precludes the prediction of definitive results in terms of risks and consequences of AIS establishment in the HBB. Actual concentrations of AIS in drainage basins adjacent to the HBB are not available, which would be vital input parameters for a quantitative analysis. However, the available data and information acquired and evaluated provided the necessary means to conduct a qualitative assessment and comparison of biota transfer pathways. Proper execution of Project operation and maintenance activities and mitigation measures would translate to risk reduction of both Project-related and total aggregate risk of AIS introduction to the receiving basin.

Table 8-1 Aquatic Invasive Species Potential Consequences Summary Table

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Ictalurid Herpesvirus 1 (channel catfish virus)	Virus can cause high mortality of catfish fry and fingerlings. Spread is vertical and horizontal.	Catfish-rearing regions in southern U.S.	Causes limited mortality among wild fish. Primarily a disease of farmed catfish. Environmental impacts not expected.	Economic impacts not expected (pathogen problematic in southern U.S.). Absence of intensive catfish aquaculture in the HBB.
Novirhabdovirus spp. (infectious hematopoietic necrosis virus)	RNA virus that affects wild and captive fish. Can cause mortality in adults and fry. Surviving adults can develop scoliosis.	Endemic in hatchery and wild fish in Pacific Northwest.	Chinook salmon and brown trout hosts for virus could potentially be affected.	Impacts to Chinook salmon and brown trout (both non-native species) recreational fisheries could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Adverse impacts to the commercial fishing sector (e.g., Chinook salmon) (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Aquabirnavirus spp.(infectious pancreatic necrosis virus)	Severe viral disease can affect salmonid fry and post-smolts. Causes abnormal swimming, distended abdomen, and darkened pigmentation. Spread is horizontal.	Widely distributed and primarily affects salmonids.	Salmonid species could be differentially affected due to variable virulence among viral strains.	Impacts to recreational fisheries of salmonids could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Adverse impacts to the commercial fishing sector (salmonids) (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Isavirus spp. (infectious salmon anemia virus)	Virus causes severe anemia, lesions, organ damage, and mortality of hosts, including Atlantic salmon. Spread is horizontal.	Atlantic coastal areas.	Some species of salmonids and non-salmonids may be susceptible.	Impacts to recreational fisheries could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Adverse impacts to the commercial fishing sector (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Rhabdovirus carpio (spring viremia of carp virus)	Viral disease of carp causes organ damage, hemorrhaging, and sometimes mortality. Thought to have been common in carp ponds since the 5th Century A.D.	Sporadically distributed throughout the U.S. Common in Europe.	Primarily a disease of carp and carp aquaculture. Carp species are susceptible and mortalities could occur at high infection rates.	Adverse impacts to the commercially-valuable carp fishing sector (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Novirhabdovirus spp. (viral hemorrhagic septicemia virus)	Viral infection can affect a variety of freshwater fishes. Causes hemorrhages of the skin and internal organs, which can result in mortality. Spread is horizontal.	Throughout the Great Lakes west to Wisconsin and east to New York.	Infection could result in mortalities of valuable game fish, such as crappie or muskellunge.	Impacts to recreational fisheries (e.g., crappie, muskellunge) could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Renibacterium salmoninarum (bacterial kidney disease)	Obligate bacterial salmonid pathogen that causes BKD. Symptoms are ulcers and boils often followed by systemic infection. Spread is horizontal and vertical.	Occurs throughout much of the northern hemisphere, including the HBB.	Present in the HBB. BKD infections could result in salmonid species mortalities. Infected individuals could also be largely asymptomatic.	Adverse impacts would be likely more problematic in aquaculture facilities. Commercial aquaculture is a small component of the Manitoba economy; therefore, potential economic losses would likely be minimal. However, potential impacts to salmonid recreational fisheries could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Adverse impacts to the commercial fishing sector (salmonids) (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Flavobacterium columnare (columnaris disease)	Bacterium causes columnaris disease in freshwater and marine fishes. Manifests as lesions on the gills, skin, and fins.	Western and southeastern U.S. and Wisconsin, including the HBB.	Present in the HBB. More common in hatchery conditions (especially in catfish growing regions). Potential to cause mortalities of wild fish, including channel catfish.	Impacts to recreationally- valuable catfish fisheries (e.g., channel catfish) could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential adverse impacts to the commercial fishing sector (e.g., channel catfish) (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Edwardsiella spp.	Enteric bacteria sometimes pathogenic to fish. Symptoms include lethargy, poor swimming, and lesions.	*Edwardsiella tarda* distributed globally, including the HBB. Common in intense catfish rearing areas of the U.S.	Present in the HBB. Common in catfish rearing regions, but *Edwardsiella* spp. can affect catfish (channel catfish, brown bullhead), as well as other wild species (e.g., black crappie, largemouth bass). Large mortalities do not appear frequent so population declines of recreational fisheries would be unlikely or rare.	Economic effects would not be expected due to the low likelihood of population-level effects to recreational fisheries.
Yersinia ruckeri (ERM)	Bacterium that causes ERM, a systemic infection primarily in salmonids. Causes lethargy and hemorrhages. Spread is horizontal.	Global distribution.	Present in the HBB. May affect salmonid and non- salmonid fish species. Based on its history, outbreak could cause large mortalities or fishery declines. Incremental or additive adverse effects to fish not expected as a result of additional transfers (from any adjacent drainage basin).	Impacts to recreational fisheries (salmonids) could result in decreased expenditures by recreational anglers and decreased revenues, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential adverse impacts to the commercial fishing sector (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Aeromonas salmonicida (furunculosis)	Bacterium that causes the disease furunculosis. Causes boils and ulcerative lesions. Affects wide range of salmonid fishes. Spread is horizontal. Primarily affects salmonids.	Reported from several western U.S. states and Europe. Present in the HBB	Present in the HBB. May affect several species of salmonids, however, native salmonids such as brook trout could be at a greater risk than introduced salmonid species. Incremental or additive adverse effects to fish not expected as a result of additional transfers.	Impacts to recreational fisheries, including brook trout could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Streptococcus spp.	Bacterial infection commonly called strep. Causes abnormal swimming, lethargy, pop-eye, hemorrhaging, etc.	Global	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Escherichia coli	E. coli bacteria cause gastrointestinal distress in humans. Transmitted via fecal contamination of food or water.	Global.	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Legionella spp.	Bacteria that cause diseases of humans such as Legionnaire's disease. Occur in water sources such as cooling towers, spas, etc. Pneumonia is common, but symptoms vary widely.	Global.	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Mycobacterium spp.	A wide range of bacteria, some of which are pathogenic to humans. Cause diseases such as tuberculosis or Crohn's disease.	Global.	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Pseudomonas spp.	Common bacteria found in soil, water, skin, plants, and most man-made environments worldwide. Can cause dermatitis, septicemia, etc.	Global.	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Salmonella spp.	Enteric bacteria that cause human illnesses such as typhoid fever and food poisoning.	Global.	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Vibrio cholera (cholera)	Bacteria causing the human disease cholera, manifested as diarrhea and vomiting.	Global.	Not endemic to the U.S., therefore low chance of introduction and potential associated impacts to HBB.	No adverse economic effects expected from this extremely rare pathogen.
Potamopyrgus antipodarum (New Zealand mudsnail)	The New Zealand mudsnail is invasive in North America. Juveniles are miniscule and adults are small (4-6 mm) and easily dispersed in water.	Abundant in the western U.S., noted in the MRB.	Dense populations of New Zealand mudsnails could threaten (out-compete) native mollusks, overgraze algae, and change energy flows and disrupt food-webs. In extreme situations, fish population declines could occur as a result of food web structure alterations.	Impacts to recreational fisheries (related to population declines in only the most extreme circumstances) could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential adverse impacts to the commercial fishing sector (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Dreissena polymorpha (zebra mussel)	The zebra mussel is a freshwater bivalve native to Eurasia. Highly adaptable to a wide range of environments and can colonize rapidly. Larvae are planktonic and easily dispersed in water.	Great Lakes region, MRB, HBB, Red River in ND, and Pelican Lake, MN	Present in the HBB. Ecosystems could be impacted as populations of zebra mussels remove (filter) phytoplankton disrupting food webs. In extreme situations, fish population declines could occur as a result of food web structure alterations.	Economic impacts could include declines of commercially valuable fisheries, such as lake whitefish. Fishery declines could result in reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish. Zebra mussels could also cause “fouling” of port infrastructure, which is costly to remediate.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Dreissena rostriformis bugensis (quagga mussel)	The quagga mussel is a freshwater bivalve native to Europe. Highly adaptable to a wide range of environments and colonize rapidly. Larvae are planktonic and easily dispersed in water.	Great Lakes region and Colorado.	Ecosystems could be impacted as populations of quagga mussels remove (filter) phytoplankton disrupting food webs. In extreme situations, fish population declines could occur as a result of food web structure alterations.	Impacts to recreational fisheries (related to population declines in only the most extreme circumstances) could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential impacts to commercial fisheries could result in reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Myxobolus cerebralis (whirling disease)	Parasite that causes whirling disease of juvenile salmonids. Symptoms may be severe and include malformations of the head and spine. Complex life cycle of the parasite includes an annelid worm intermediate host. Susceptibility varies among species of salmonids.	Present in most western U.S. states, as well as in New York and Maryland.	The susceptibility of lake whitefish and other native fish (in the HBB) to whirling disease has not been verified. There is a lack of vulnerable salmonid populations in the North Dakota region of the HBB. *Myxobolus cerebralis* could be transferred from drainage basins other than the MRB to regions of the HBB (e.g., Canada) supporting populations of susceptible salmonid species, which could potentially be impacted from infection.	Impacts to recreational fisheries (e.g., rainbow trout) could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential adverse impacts to the commercial fishing sector (e.g., rainbow trout) (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Polypodium hydriforme	Parasite that invades the eggs of sturgeon and paddlefish. Multiple life-stages exist, including a free-living stage.	MRB, HBB, Great Lakes region, Missouri, and California. Also found in Canada in the Nelson, St. John, Saskatchewan, and Winnipeg Rivers.	Present in the HBB. Parasite can reduce the number of viable eggs of sturgeon and paddlefish; however, infection does not appear to cause population-level effects. No adverse effects expected as a result of additional transfers.	Economic impacts not expected due to a lack of potential for population-level effects.
Actheres pimelodi	Parasitic copepod that attached to the mouth cavity, tongue, or gills of fish host.	Considered to be widespread throughout North America	Likely a normal component of fish parisitofauna in the HBB. No records regarding the potential for mortalities in wild fish populations. Unknown potential for environmental impacts, including population-level effects of wild fish.	Unknown potential for economic impacts.
Ergasilus spp.	Parasitic copepod that attached to the mouth cavity, tongue, or gills of fish host.	Thought to be widespread throughout North America	Likely a normal component of fish parisitofauna in the HBB. No records regarding the potential for mortalities in wild fish populations. Unknown potential for environmental impacts, including population-level effects of wild fish.	Unknown potential for economic impacts.
Icelanonchohaptor microcotyle	Parasitic trematode that infects fish. Little known about life history characteristics of this rare organism.	Identified in the Missouri River. Further distribution unknown.	Organism is extremely rare. Unknown potential for environmental impacts, including population-level effects of wild fish.	Unknown potential for economic impacts.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Corallotaenia minutia	Parasitic cestode that infects catfish. Requires a copepod intermediate host. Little known about life history characteristics of this rare organism.	Identified in the Missouri River. Further distribution unknown.	Organism is extremely rare. Unknown potential for environmental impacts, including population-level effects of wild fish.	Unknown potential for economic impacts.
Cryptosporidium parvum (crypto)	Parasitic protozoan that causes gastrointestinal distress in mammals. Transmitted by fecal contamination of food or water.	Global.	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Giardia lamblia (giardia)	Parasitic protozoan that causes gastrointestinal distress in mammals. Transmitted by fecal contamination of food or water.	Global.	Ubiquitous in aquatic systems including the HBB. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Entamoeba histolytica	Parasitic protozoan that causes gastrointestinal distress, liver abscesses, and fever in humans.	Global.	Not common in U.S. and other industrialized countries so low likelihood of transfer to the HBB. Potential to cause human illness through contaminated water (feces).	No adverse economic effects expected from this pathogen that is extremely rare in the U.S.
Ichthyophthirius multifiliis (ich or white spot disease)	A highly pathogenic protozoan ciliate external parasite that causes the disease "ich" in freshwater fishes. Encysts in the skin of hosts forming visible white nodules.	Global.	Could cause mortalities of captive or wild fish, including pre-spawning salmonids.	Impacts to recreational fisheries could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential adverse impacts to the commercial fishing sector (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Ichthyophonus hoferi (ichthyophonosis)	A fungus-like protozoan that causes chronic, progressive internal infection in wild and cultured fish. Symptoms include lesions on the internal organs and skin. Transmitted when the tissue of an infected fish is consumed by another fish.	Northern hemisphere	Could cause mortalities of captive or wild fish. Unknown potential for causing population-level impacts to fish hosts.	Impacts to recreational fisheries could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential adverse impacts to the commercial fishing sector (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Saprolegnia spp. (saprolegniosis or winter fungus disease)	Causes winter fungus disease of fish. Characterized by brownish patches of cottony fungal growth on the skin and gills.	Global.	Infections are most common in captive fish (e.g., catfish aquaculture), so reared populations could be at risk. Unknown potential for causing population-level impacts to wild fish hosts.	Channel catfish are not raised in aquaculture facilities in Manitoba. Therefore no adverse economic effects are expected in the local economy. In addition, aquaculture is a small component of Manitoba's economy.
Branchiomyces spp. (branchiomycosis)	Fungus that primarily infects the blood vessels of the gills of fish. Causes hypoxia due to tissue obstruction of gills.	Global.	Infections are most common in captive fish (e.g., catfish and salmonid aquaculture), so reared populations could be at risk. Unknown potential for causing population-level impacts to wild fish hosts.	Potential adverse impacts to aquaculture and the commercial fishing sector could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.
Phoma herbarum	A weakly infectious, facultative fungal pathogen of fish. Normally a pathogen of plants but sometimes invades the air bladder or digestive tract of fish. Causes gut obstruction, hemorrhaging, etc.	Global.	Potential to impact salmonids including Chinook salmon based on experimental evidence of fingerling mortality (study results may not be indicative of natural effects of infection).	Impacts to recreational fisheries (e.g., Chinook salmon) could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors. Potential adverse impacts to the commercial fishing sector (e.g., Chinook salmon) (including processors, wholesalers, etc.) could include reduced profit, employment, and catch value, while consumers may be adversely impacted by increased price or reduced availability/quality of local fish.

AIS	MAJOR LIFE HISTORY CHARACTERISTICS	DISTRIBUTION	POTENTIAL ENVIRONMENTAL CONSEQUENCES IN HBB	POTENTIAL ECONOMIC CONSEQUENCES IN HBB
Exophiala spp. (black yeast)	Pathogenic fungal species commonly called "black yeasts." Causes ulcers and nodules in fish.	Global.	Potential to cause mortalities of salmonid (e.g., lake trout) and non-salmonid species (channel catfish) in the HBB. Unknown potential for causing population-level effects in fish hosts.	Impacts to recreational fisheries (e.g., lake trout, channel catfish) could result in decreased expenditures by recreational anglers, decreased value of the recreation experience to recreationists, and decreased revenues in associated economic sectors.
Anabaena flos-aquae (blue-green algae)	Blue-green algae that can release neurotoxic and hepatotoxic compounds, which may be harmful to humans.	Global.	Present in the HBB, including Lake Winnipeg. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Aphanizomenon flos- aquae (blue-green algae)	Blue-green algae that can release neurotoxic and hepatotoxic compounds, which may be harmful to humans.	Global.	Present in the HBB, including Lake Winnipeg. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.
Microcystis aeruginosa (blue-green algae)	Blue-green algae that can release hepatotoxic compounds, which may be harmful to humans.	Global.	Present in the HBB, including Lake Winnipeg. Incremental or additive adverse effects not expected as a result of additional transfers.	No adverse economic effects expected as a result of additional transfers.

Attachment A – Treatability Data

Table A-1: UV Dose Summary Table

No.	Species	Common Name	Acronym	Research Supporting UV?	UV Dose mJ/cm2	Log Removal	UV Lamp Technology	Water Quality	Reference	Comments
1	Aquabirnavirus spp.	Infectious pancreatic necrosis virus	IPNV	Yes	82	1	LP	NR	Cited in Mayaleri et al. (2016)	
					165	2	LP	NR	Cited in Mayaleri et al. (2016)	
					246	3	LP	NR	Cited in Mayaleri et al. (2016)	
					325	4	LP	NR	Cited in Mayaleri et al. (2016)	
2	Rhabdovirus	Infectious hematopoietic necrosis	IHNV	Yes	3.84	3	LP	Culture media	Afonso et al. (2012)	
					4	2.26	LP	Processing Effluent Blood Water	Afonso et al. (2012)	
3	Novirhabdovirus spp.	Viral hemorrhagic septicemia virus	VHSV	Yes	3.28	3	LP	Culture media	Afonso et al. (2012)	
					4	3.12	LP	Processing Effluent Blood Water	Afonso et al. (2012)	
4	Ictalurid Herpesvirus 1	Channel catfish virus	CCV	Yes						UV indicated as viable treatment option in NAWS, 2013 Table 3 - Trans Effect Analysis
5	Rhabdovirus carpio	Spring viremia of carp virus	SVCV	Yes	5	3			Kiryu et al. (2007)	
					30	4			Kiryu et al. (2007)	
6	Isavirus spp.	Infectious salmon anemia virus	ISAV	Yes	2.5	1	LP		Cited in Mayaleri et al. (2016)	
					5	2	LP		Cited in Mayaleri et al. (2016)	
					7.5	3	LP		Cited in Mayaleri et al. (2016)	
7	Renibacterium salmoninarum	Bacterial kidney disease	BKD	No						
8	Aeromonas salmonicida	Furunculosis	FUR	Yes	1.5	1	LP		Cited in Mayaleri et al. (2016)	
					2.7	2	LP		Cited in Mayaleri et al. (2016)	
					3.1	3	LP		Cited in Mayaleri et al. (2016)	
					5.9	4	LP		Cited in Mayaleri et al. (2016)	
9	Streptococcus faecalis	Strep		Yes	6.6	1	LP		Cited in Mayaleri et al. (2016)	
					8.6	2	LP		Cited in Mayaleri et al. (2016)	
					9.8	3	LP		Cited in Mayaleri et al. (2016)	
					11.1	4	LP		Cited in Mayaleri et al. (2016)	
10	Flavobacterium columnare	Myxobacterial infections/Columnaris disease	COL	Yes						UV indicated as viable treatment option in NAWS, 2013 Table 3 - Trans Effect Analysis
11	Pseudomonas aeruginosa	(bacteria)		Yes	3.8	1	LP		Cited in Mayaleri et al. (2016)	Multiple spp. cited. Results are reported for ATCC 9027
					6.5	2	LP		Cited in Mayaleri et al. (2016)	
					10	3	LP		Cited in Mayaleri et al. (2016)	
					17	4	LP		Cited in Mayaleri et al. (2016)	
12	Vibrio cholera	Cholera		Yes	0.8	1	LP		Cited in Mayaleri et al. (2016)	Multiple spp. cited. Results are reported for Classical OGAWA 154.
					1.4	2	LP		Cited in Mayaleri et al. (2016)	
					2.3	3	LP		Cited in Mayaleri et al. (2016)	
					3.9	4	LP		Cited in Mayaleri et al. (2016)	
					6.8	5	LP		Cited in Mayaleri et al. (2016)	
13	Edwardsiella spp.	Edwardsiella ictaluri and tarda		No						

Table A-1: UV Dose Summary Table

No.	Species	Common Name	Acronym	Research Supporting UV?	UV Dose mJ/cm2	Log Removal	UV Lamp Technology	Water Quality	Reference	Comments
14	Mycobacterium spp.	Tuberculosis or leprosy		Yes	5.7	1	LP		Cited in Mayaleri et al. (2016)	Multiple spp. cited. Results are for B12CC2.
					7.9	2	LP		Cited in Mayaleri et al. (2016)	
					10	3	LP		Cited in Mayaleri et al. (2016)	
					12	4	LP		Cited in Mayaleri et al. (2016)	
					15	5	LP		Cited in Mayaleri et al. (2016)	
					2.2	1	LP		Cited in Mayaleri et al. (2016)	Multiple spp. cited. Results are for tuberculosis.
					4.3	2	LP		Cited in Mayaleri et al. (2016)	
15	Yersinia ruckeri	Enteric redmouth disease	ERM	Yes	1	1	LP		Cited in Mayaleri et al. (2016)	
					2	2	LP		Cited in Mayaleri et al. (2016)	
					3	3	LP		Cited in Mayaleri et al. (2016)	
					4	4	LP		Cited in Mayaleri et al. (2016)	
16	Escherichia coli	E. coli		Yes	6	1	LP		Cited Mayaleri et al. (2016)	Multiple spp. cited. Results are for ATCC 25922.
					6.5	2	LP		Cited Mayaleri et al. (2016)	
					7	3	LP		Cited Mayaleri et al. (2016)	Removal based on the method and lamp technology. Representative data presented.
					8	4	LP		Cited Mayaleri et al. (2016)	
					9	5	LP		Cited Mayaleri et al. (2016)	
					10	6	LP		Cited Mayaleri et al. (2016)	
17	Legionella spp.	Legionnaire's disease		Yes	1.6	1	LP		Cited Mayaleri et al. (2016)	Multiple spp. cited. Results are for ATC 33152.
					3.2	2	LP		Cited Mayaleri et al. (2016)	
					4.8	3	LP		Cited Mayaleri et al. (2016)	
					6.4	4	LP		Cited Mayaleri et al. (2016)	
					8	5	LP		Cited Mayaleri et al. (2016)	
18	Salmonella spp.	Salmonella		Yes	2.6	1	LP		Cited Mayaleri et al. (2016)	Multiple spp. cited. Results are for ATC 6539.
					4.5	2	LP		Cited Mayaleri et al. (2016)	
					5.8	3	LP		Cited Mayaleri et al. (2016)	
					7	4	LP		Cited Mayaleri et al. (2016)	
					8	5	LP		Cited Mayaleri et al. (2016)	
19	Dreissena polymorpha	Zebra mussel		Yes					Lauria (2009)	
20	Dreissena rostriformis bugensis	Quagga mussel	ZQM	Yes	0				Stewart-Malone et al. (2015)	
					13.1				Stewart-Malone et al. (2015)	
					26.2				Stewart-Malone et al. (2015)	
					79.6	5			Stewart-Malone et al. (2015)	
21	Potamopyrgus antipodarum	New Zealand mudsnail	NZMS	No						
22	Polypodium hydriforme	Intracellular parasitic cnidarian		No						

Table A-1: UV Dose Summary Table

No.	Species	Common Name	Acronym	Research Supporting UV?	UV Dose mJ/cm2	Log Removal	UV Lamp Technology	Water Quality	Reference	Comments
23	Myxobolus cerebralis	Whirling disease		Yes	40	4			Hedrick et al. (2007)	
					80	4			Hedrick et al. (2007)	Paper indicated complete removal of organism at dose of 40 mj/cm2
					120	4			Hedrick et al. (2007)	
					180	4			Hedrick et al. (2007)	
24	Actheres pimelodi	Parasitic copepods		No						
25	Ergasilus spp.	Parasitic copepod		No						
26	Icelanonchohaptor microcotyle	Parasitic flatworm		No						
27	Corallotaenia minutia	Parasitic tapeworm		No						
28	Giardia lamblia	Backpacker's diarrhea		Yes	<10	1	LP		Cited in Mayaleri et al. (2016)	
					10	2	LP		Cited in Mayaleri et al. (2016)	
					20	3	LP		Cited in Mayaleri et al. (2016)	
29	Entamoeba histolytica			Yes	8.8	4	MP		Lavi (2017)	
30	Cryptosporidium parvum			Yes	<3	1	LP		Cited in Mayaleri et al. (2016)	
					<3	2	LP		Cited in Mayaleri et al. (2016)	
					6-Mar	3	LP		Cited in Mayaleri et al. (2016)	
					>16	4	LP		Cited in Mayaleri et al. (2016)	
31	Ichthyophthirius multifiliis	Ich or white spot disease		No						
32	Ichthyophonus hoferi	Ichthyophonosis		No						
33	Branchiomyces spp.	Branchiomycosis		No						
34	Saprolegnia spp.	Saprolegniosis or winter fungus disease		No						
35	Exophiala spp.	Black yeast		No						
36	Phoma herbarum (fungi)			No						
37	Aphanizomenon flos-aquae	Blue-green algae		Yes					Beardall et al. (1997)	UV-a and UV-b appear to achieve .5 log
38	Anabaena flos-aquae	Blue-green algae		Yes					Tak et al. (2018)	
39	Microcystis aeruginosa	Blue-green algae		Yes					Liu et al. (2007)	

Table A-2: Chlorine cT Value Summary Table

No.	Species	Common Name	Acronym	Research Supporting Chlorination?	Chlorine Dose	Dose Measurement	Contact Time	CT	Log Removal	Initial Concentration	pH	Temp
1	Aquabirnavirus spp.	Infectious pancreatic necrosis virus	IPNV	Yes	0.2 mg/l	Residual	10 minutes	2 mg-min/l	>4 log removal	10^4 TCID50/ml	6.9	10C
					0.7 mg/l	Residual	2 minutes	1.4 mg-min/l	>4 log removal	10^5 TCID50/ml	8.2	10C
					4 mg/l	Residual	5 minutes	20 mg-min/l	Complete - 0/6 cultures	10^4 TCID50/ml	7	21C
					16 mg/l	Residual	5 minutes	80 mg-min/l	Complete - 0/6 cultures	10^4.5 TCID50/ml	9	21C
					25 mg/l	Residual	30 minutes	750 mg-min/l	Complete - 0/6 cultures	10^6.3 TCID50/ml	NR	21C
					25 mg/l	Available chlorine	30 minutes	750 mg-min/l	NR - 0/x tubes	10^5 TCID50/ml	<6	NR
					40 mg/l	Available chlorine	30 minutes	1200 mg-min/l	NR - 0/x tubes	10^7.5 TCID50/ml	NR	NR
					200-500 mg/l	Dose	30 minutes	15000 mg-min/l	NR			
2	Rhabdovirus	Infectious hematopoietic necrosis	IHNV	Yes	0.5 mg/l	Residual	5 minutes	2.5 mg-min/l	3 to 4 log removal	10^4 TCID50/ml	6.9	10C
					1 mg/l	Residual	<1 minute	1 mg-min/l	3 to 4 log removal	10^4 TCID50/ml	6.9	10C
					0.5 mg/l	Residual	10 minutes	5 mg-min/l	3 to 4 log removal	10^4 TCID50/ml	8.2	10C
					1 mg/l	Residual	<1 minute	1 mg-min/l	3 to 4 log removal	10^4 TCID50/ml	8.2	10C
					200-500 mg/l	Dose	5 minutes	2500 mg-min/l	NR	NR	NR	NR
3	Novirhabdovirus spp.	Viral hemorrhagic septicemia virus	VHSV	Yes	540 mg/l		20 minutes		NR	NR	NR	NR
					200-500 mg/l	Dose	5 minutes	1000 mg-min/l	NR	NR	NR	NR
					500 mg/l	Dose	5 minutes	1000 mg-min/l	NR	NR	NR	NR
4	Ictalurid Herpesvirus 1	Channel catfish virus	CCV	Yes	20-50 mg/l	Dose	24 hours	1200 mg-min/l	NR	NR	NR	NR
5	Rhabdovirus carpio	Spring viremia of carp virus	SVCV	Yes	500 mg/l	Dose	10 minutes	5000 mg-min/l	NR	NR	NR	NR
					200-500 mg/l	Dose	10 minutes	5000 mg-min/l	NR	NR	NR	NR
6	Isavirus spp.	Infectious salmon anemia virus	ISAV	Yes	100 mg/l		15 minutes	1500 mg-min/l	NR	NR	NR	NR
					200-500 mg/l	Dose	15 minutes		NR			
7	Renibacterium salmoninarum	Bacterial kidney disease	BKD	Yes	0.05 mg/l		< 1 minute	0.05 mg-min/l	3 log removal	3x10^4 CFU/ml - 2x10^6 CFU/ml	7	15C
					0.07 mg/l		<2 minutes	0.14 mg-min/l	3 log removal	5x10^4 CFU/ml	7	7.5C
					0.4-0.5 mg/l		2 minutes	1 mg-min/l	1.5 log removal	5x10^4 CFU/ml	9	15C
					200-500 mg/l	Dose	5 minutes	2500 mg-min/l	NR	NR	NR	NR
8	Aeromonas salmonicida	Furunculosis	FUR	Yes	0.1 mg/l	Residual	<1 minute	0.1 mg-min/L	>3 log removal	10^4 cells/ml	7	20C
					0.2 mg/l	Residual	<1 minute	0.2 mg-min/L	>3 log removal	10^4 cells/ml	7	20C
					200-500 mg/l	Dose	10 minutes	5000 mg-min/l	NR	NR	NR	NR
9	Streptococcus faecalis	Strep		Yes								
10	Flavobacterium columnare	Myxobacterial infections/Columnaris disease	COL	Yes	50 mg/l	Dose (Clorox)	<1 minute	50 mg-min/l	>4 log removal	9.4 X 10^6 CFU/ml		22C
11	Pseudomonas aeruginosa	(bacteria)		Yes						10^7 cells/ml		
12	Vibrio cholera	Cholera		Yes	0.5 mg/l		< 1 minute	0.5 mg-min/L	> 4 log removal		7	20C
					2 mg/l	mg/l	20 minutes	40 mg-min/L	4 log removal		7	20C
13	Edwardsiella spp.	Edwardsiella ictaluri and tarda		Yes	50 mg/l	Dose (Clorox)	<1 minute	50 mg-min/L	>4 log removal	2*10^7 CFU/ml		21C
14	Mycobacterium spp.	Tuberculosis or leprosy		Yes	50 mg/l	Dose (Clorox)	60 minutes	300 mg-min/l	Complete - no growth	Too numerous to count		21C
					50,000 mg/l	Dose (Clorox)	20 minutes	1x10^6 mg-min/l	Complete - no growth	Too numerous to count		21C
15	Yersinia ruckeri	Enteric redmouth disease	ERM	Yes	0.1 mg/l	Residual	<2 minutes	0.2 mg-min/L	>3 log removal	10^4 cells/ml	7	20C

Table A-2: Chlorine cT Value Summary Table

No.	Species	Common Name	Acronym	Research Supporting Chlorination?	Chlorine Dose	Dose Measurement	Contact Time	CT	Log Removal	Initial Concentration	pH	Temp
					0.1 mg/l	Residual	<2 minutes	0.2 mg-min/L	>3 log removal	10^4 cells/ml	7	20C
					200-500 mg/l	Dose	10 minutes		NR			
16	Escherichia coli	E. coli		Yes	0.5 mg/l		<5 minutes	2.5 mg-min/l	4 log removal			
17	Legionella spp.	Legionnaire's disease		Yes	0.5 mg/l		<5 minutes	2.5 mg-min/l	2 log removal			
18	Salmonella spp.	Salmonella		Yes	0.5 mg/l		20 minutes	10 mg-min/l	2 to 3 log removal			
19	Dreissena polymorpha	Zebra mussel		Yes	0.5 mg/l		882 hours		100% mortality			
					1.0 mg/l		570 hours					
					3.0 mg/l		200 hours (approximate)					
20	Dreissena rostriformis bugensis	Quagga mussel	ZQM	Yes	200-500 mg/l	Dose	60 minutes		NR			
21	Potamopyrgus antipodarum	New Zealand mudsnail	NZMS	No								
22	Polypodium hydriforme	Intracellular parasitic cnidarian		No								
23	Myxobolus cerebralis	Whirling disease		Yes	13 mg/l		10 minutes					15-21C
					131 mg/l		1 minute					15-21C
					500 mg/l	Dose (Clorox)	15 minutes		5 log removal		8.1	15C
					5000 mg/l	Dose	10 minutes					
24	Actheres pimelodi	Parasitic copepods		No								
25	Ergasilus spp.	Parasitic copepod		No								
26	Icelanonchohaptor microcotyle	Parasitic flatworm		No								
27	Corallotaenia minutia	Parasitic tapeworm		No								
28	Giardia lamblia	Backpacker's diarrhea		Yes	1.5 mg/l		10 minutes	15 mg-min/l	NR (100% mortality)		8-Jun	25C
					3.0 mg/l		10 minutes	30 mg-min/l	NR (100% mortality)		8-Jun	15C
					Reference LT1ESWTR CT tables by temp and pH				3 log removal			
29	Entamoeba histolytica			Yes	5.1 mg/l	Residual	20 minutes	102 mg-min/l	NR	NR	NR	22C
					5 mg/l	Residual	15 minutes	75 mg-min/l	NR	60-100 cysts/ml	7	10C
					2 mg/l	Residual	15 minutes	30 mg-min/l	NR	60-100 cysts/ml	7	20C
					1 mg/l	Residual	15 minutes	15 mg-min/l	NR	60-100 cysts/ml	7	30C
					2 mg/l	Residual	10 minutes	20 mg-min/l	2 log removal	NR	7	30C
					2.5 mg/l	Residual	10 minutes	25 mg-min/l	3 log removal	NR	7	30C
					7 mg/l	Residual	10 minutes	70 mg-min/l	3 log removal	NR	9	30C
30	Cryptosporidium parvum				80 mg/l		90 minutes	7200 mg-min/L	2 log removal	4 x 10^5 oocysts/ml		25C
31	Ichthyophthirius multifiliis	Ich or white spot disease		No								
32	Ichthyophonus hoferi	Ichthyophonosis		No								
33	Branchiomyces spp.	Branchiomycosis		No								
34	Saprolegnia spp.	Saprolegniosis or winter fungus disease		No								
35	Exophiala spp.	Black yeast		No								
36	Phoma herbarum (fungi)			Yes*	1 mg/l			152 mg-min/l	2 log removal	10^4 spores/ml	7	25
37	Aphanizomenon flos-aquae	Blue-green algae		Yes	2 mg/l			3.6 mg-min/ml		2 x 10^5 cells/ml	8	
38	Anabaena flos-aquae	Blue-green algae		Yes	2 mg/l			7.21 mg-min/ml		2 x 10^5 cells/ml	8	
39	Microcystis aeruginosa	Blue-green algae		Yes	2 mg/l			31 mg-min/l	2 log removal	2 x 10^5 cells/ml	8	

Table A-2: Chlorine cT Value Summary Table

No.	Species	Common Name	Water Quality	Comments	Reference
1	Aquabirnavirus spp.	Infectious pancreatic necrosis virus	Soft water (30 mg/L as CaCO3)		Wedemeyer et al. (1978)
			Hard water (120 mg/L as CaCO3)		Wedemeyer et al. (1978)
					Elliott & Amend (1978)
					Elliott & Amend (1978)
			0.13% calf serum (organic matter)		Elliott & Amend (1978)
			Tap water	Temp specified as "room temperature"	Desautels and MacKelvie (1975)
			Salt water	Temp specified as "room temperature"	Desautels and MacKelvie (1975)
					Bowker et al. (2019)
2	Rhabdovirus	Infectious hematopoietic necrosis	Soft water (30 mg/L as CaCO3)		Wedemeyer et al. (1978)
			Soft water (30 mg/L as CaCO3)		Wedemeyer et al. (1978)
			Hard water (120 mg/L as CaCO3)		Wedemeyer et al. (1978)
			Hard water (120 mg/L as CaCO3)		Wedemeyer et al. (1978)
			NR		Bowker et al. (2019)
3	Novirhabdovirus spp.	Viral hemorrhagic septicemia virus	NR	*"Chlorine is considered to inactivate VHSV, although EPA was unable to identify an accepted concentration to do so. Type-approved systems that use chlorine target concentrations of 1-20 mg/L…Additional studies on the reaction of VHSV to chlorine are needed"*	Cited in USEPA (2019)
			NR		Bowker et al. (2019)
			NR		Cited in Yanong et al. (2012)
4	Ictalurid Herpesvirus 1	Channel catfish virus	NR		Cited in Yanong et al. (2012)
5	Rhabdovirus carpio	Spring viremia of carp virus	NR		Cited in Yanong et al. (2012)
			NR		Bowker et al. (2019)
6	Isavirus spp.	Infectious salmon anemia virus	NR		Torgensen (1998), cited in Smail et al (2004)
					Bowker et al. (2019)
7	Renibacterium salmoninarum	Bacterial kidney disease	NR		Pascho et al. (1995)
			NR		Pascho et al. (1995)
			NR	Limited inactivation at high pH	Pascho et al. (1995)
			NR		Bowker et al. (2019)
8	Aeromonas salmonicida	Furunculosis	Soft water (30 mg/L as CaCO3)	Survival time in untreated water is 2 days	Wedermeyer & Nelson (1977)
			Hard water (120 mg/L as CaCO3)	Survival time in untreated water is 2 weeks	Wedermeyer & Nelson (1977)
			NR		Bowker et al. (2019)
9	Streptococcus faecalis	Strep			
10	Flavobacterium columnare	Myxobacterial infections/Columnaris disease			Mainos et al. (2012)
11	Pseudomonas aeruginosa	(bacteria)			
12	Vibrio cholera	Cholera		Smooth strain	CDC
				Rugose strain	CDC
13	Edwardsiella spp.	Edwardsiella ictaluri and tarda	Distilled water		Mainous and Smith (2011)
14	Mycobacterium spp.	Tuberculosis or leprosy	Distilled water		Mainous and Smith (2005)
			Distilled water		Mainous and Smith (2005)
15	Yersinia ruckeri	Enteric redmouth disease	Soft water (30 mg/L as CaCO3)	Survival time in untreated water > 20 days (length of experiement)	Wedermeyer & Nelson (1977)

Table A-2: Chlorine cT Value Summary Table

No.	Species	Common Name	Water Quality	Comments	Reference
			Hard water (120 mg/L as CaCO3)	Survival time in untreated water > 20 days (length of experiement)	Wedermeyer & Nelson (1977)
					Bowker et al. (2019)
16	Escherichia coli	E. coli			CDC
17	Legionella spp.	Legionnaire's disease			USEPA (2015)
18	Salmonella spp.	Salmonella			CDC
19	Dreissena polymorpha	Zebra mussel			Rajapogal et al. (2002)
20	Dreissena rostriformis bugensis	Quagga mussel			Bowker et al. (2019)
21	Potamopyrgus antipodarum	New Zealand mudsnail			Bowker et al. (2019)
22	Polypodium hydriforme	Intracellular parasitic cnidarian			
23	Myxobolus cerebralis	Whirling disease		Actinospore stage (triactinomyxon, TAM)	Wagner et al. (2002)
				Actinospore stage (triactinomyxon, TAM)	Wagner et al. (2002)
			Well water	Myxospore stage	Hedrick et al. (2008)
				Myxospore stage	Wagner (2002)
24	Actheres pimelodi	Parasitic copepods			
25	Ergasilus spp.	Parasitic copepod			
26	Icelanonchohaptor microcotyle	Parasitic flatworm			
27	Corallotaenia minutia	Parasitic tapeworm			
28	Giardia lamblia	Backpacker's diarrhea			Jarroll et al. (1981)
					Jarroll et al. (1981)
					USEPA (2003)
29	Entamoeba histolytica		NR		Stone (1937) cited in Rubin et al. (1983)
			NR		Chang and Fair cited in Rubin et al. (1983)
			NR		Chang and Fair cited in Rubin et al. (1983)
			NR		Stringer and Kruse cited in Rubin et al. (1983)
			NR		Stringer and Kruse cited in Rubin et al. (1983)
			NR		Stringer and Kruse cited in Rubin et al. (1983)
30	Cryptosporidium parvum				
31	Ichthyophthirius multifiliis	Ich or white spot disease			Durborow et al. (1998)
32	Ichthyophonus hoferi	Ichthyophonosis			
33	Branchiomyces spp.	Branchiomycosis			
34	Saprolegnia spp.	Saprolegniosis or winter fungus disease			
35	Exophiala spp.	Black yeast			
36	Phoma herbarum (fungi)		Surface water	*Results reported for Phoma glomerata - no results found for Phoma herbarum*	Pereira et al. (2013)
37	Aphanizomenon flos-aquae	Blue-green algae	Reservoir water	Chlorination will result in cell lysis and release of cyanotoxins; additional contact time will oxidize cyanotoxins	Zamyadi et al. (2012)
38	Anabaena flos-aquae	Blue-green algae	Reservoir water	Chlorination will result in cell lysis and release of cyanotoxins; additional contact time will oxidize cyanotoxins	Zamyadi et al. (2012)
39	Microcystis aeruginosa	Blue-green algae	Reservoir water	Chlorination will result in cell lysis and release of cyanotoxins; additional contact time will oxidize cyanotoxins	Zamyadi et al. (2012)

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Appendix G

Technical Memorandum on Missouri River Sturgeon Iridovirus

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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To: U.S Bureau of Reclamation

From: Mr. Drew Mitchell, Independent Fisheries Consultant

CC: Paul Boersma, Black & Veatch

Subject: Research Summary on the Missouri Sturgeon Iridovirus

Date: April 17, 2020

Purpose

The purpose of this technical memorandum is to provide the U.S. Bureau of Reclamation with a summary of the Missouri River Sturgeon Iridovirus (MRSIV) in support of their analysis of Aquatic Invasive Species for the Eastern North Dakota Water Alternate Supply Project Environmental Impact Statement. Reclamation has completed previous NEPA analyses (Reclamation 2007 and Reclamation 2008) which included the evaluation of aquatic invasive species. Reclamation collaborated with the USGS to research numerous aquatic species of concern, including the Missouri River Sturgeon Iridovirus, and the results of that research and analysis are presented in two technical reports (USGS 2005 and USGS 2007). The purpose of this current research effort is to determine if additional data are available on this species, and if so, does the data support previous conclusions in terms of the characteristics of this iridovirus and its distribution and treatability.

This technical memorandum was substantially completed when it was submitted on January 31, 2020. Between January 31, 2020 and April 17, 2020, minor changes were made to the text including additional discussion on the potential for vertical transfer of MRSIV. The revisions did not change the conclusions as presented in the January 31, 2020 version of the technical memorandum.

Origins of the Missouri River Sturgeon Iridovirus

The Missouri River Sturgeon Iridovirus (MRSIV) is found in two species of sturgeon: pallid sturgeon (Scaphirhynchus albus) and shovelnose sturgeon (*Scaphirhynchus platorynchus*) (29). The MRSIV was first detected in shovelnose sturgeon in January of 1999 and significant losses among pallid sturgeon also occurred in that same year (1). By 2002, the MRSIV was known to be present in sturgeon at four hatcheries: Gavins Point NFH (Yankton, SD), Miles City State Fish Hatchery (SFH) (Miles City, MT), Garrison Dam NFH (Riverdale, ND), Natchitoches NFH (Natchitoches, LA), and at Valley City NFH (26 and 29). It may also have occurred at Neosho NFH (Neosho, MO) (34). Since that time and for almost two decades, no further sturgeon species or other fish have been found infected with the MRSIV.

By 2001, stress was known to be a contributing factor in the severity and expression of the virus (24). This virus is most often found in a latent or carrier state; it is not pathogenic unless the sturgeon are crowded or otherwise stressed in a hatchery environment where disease signs can be manifested (1; 40; and 41). Mortality among hatchery fish can reach 100 percent (34).

Summary of Testing and Management Since Detection

Prior to the development of an acceptable polymerase chain reaction (PCR) assay - a genetic testing procedure based on comparing short segments of DNA highly specific for a given organism - only histological evaluations (observation of pathognomonic cells in tissue sections) and the use of electron microscopy (observation of enlarged cells observed with hexagonal, double enveloped virus particles with a condensed bar shaped core) were considered valid detection methods for the MRSIV (29). Testing for the presence of the virus was done at water temperatures of 15°C to 20°C where the virus was considered most likely to be present (29). In 2010, T. Kurobe et al., (2) developed a highly sensitive and accurate PCR detection method that became the standard for monitoring the MRSIV in both pallid and shovelnose sturgeon.

Using this PCR method, low levels of this virus have been reported from the fin clips of healthy wild adult sturgeon on occasion (40). Continued monitoring using PCR at the Bozeman Fish Health Center - a major fish health center in the region - has shown decreasing numbers of MRSIV-positive fish over the studied years, so much so that much of the testing has now been discontinued (40). PCR monitoring is still carried out at the Garrison Dam NFH and Miles City SFH (42 and 43). At the Garrison Dam NFH, MRSIV is found yearly in very small numbers of broodstock (43). No disease problems from the virus have occurred at these hatcheries in last 3 or 4 years for the Garrison Dam NFH and in at least nine years for Miles City SFH (42 and 43).

Knowledge of the transmission of MRSIV to sturgeon is important to the understanding of how fish become infected and how infection may be prevented. Two potential sources of MRSIV were suspected for the initial outbreaks that occurred in the pallid sturgeon restoration and recovery hatchery program (1). These were vertical transmission of the virus with gametes from wild adults and the presence of the virus in the water supply from wild sturgeon in the river system (1). In their 2011 study, Kurobe et al. (1) showed that MRSIV was transmitted by feeding of infected tissues, bath exposures to extracts from infected tissues, and cohabitation with MRSIV carriers. Their studies did not evaluate vertical transmission, but such a transmission is suspected because there is evidence that a related sturgeon virus, the white sturgeon iridovirus (WSIV), is transmitted with the gametes (1,2, 8, and 9). Regarding the known methods of transmission for MRSIV, pertinent information such as the amount of virus in the water needed to cause infection and the effects of time, water quality, water temperature, and water flow on the survival of MRSIV in water is still needed in order to access the potential for the spread of MRSIV by waterborne exposure in waters.

As a virus management technique, ultra-violet (UV) irradiation is used for water treatment at fish hatcheries. For example, water is disinfected with UV irradiation at Garrison Dam NFH, Gavins Point NFH, and Miles City SFH. There is no standard UV treatment or even the discussion of the use of UV as a treatment for the MRSIV that we could find in the scientific literature. However, UV treatments for MRSIV and have been used at various doses by some fish hatcheries for MRSIV control. For UV doses used at the hatcheries, see citations 41, 42, and 43. Two of the sturgeon hatchery managers (41 and 43) did not consider UV disinfection effective against the MRSIV because of the assumption (not scientifically determined as discussed above) that the virus is vertically transferred from an infected

adult sturgeon through the egg to its young . If vertical transmission of MRSIV was the case, it would make water disinfection of little value.

Conclusions

The following conclusions are made based on the citations given on the following pages, including the conversations with various experts:

- The MRSIV first was found in January of 1999, a little more than 20 years ago (1 and 29). As with many fish pathogens, the iridoviral agent (*MRSIV*) can be associated with mortalities in cultured sturgeon but has not been identified as a mortality factor in the wild (1 and FEIS Appendix M.1 - Response to Comments). Our search of the available literature found no report of mortality in wild sturgeon and the experience and observations of two hatchery managers involved with MRSIV (40 and 41) further support the understanding that MRSIV causes mortalities in the hatchery but not in the wild.
- The stressful conditions that lead to a MRSIV caused disease and fish mortality have not been evaluated. Stressor such as fish density or crowding have been implicated in the cause of disease among sturgeon infected with the white sturgeon iridovirus, a closely related virus (16), therefore it is suspected that crowding stress among others may also predispose fish to disease caused by the MRSIV (1). Reports of observation by hatchery managers also implicate fish density as a key factor in causing and controlling this disease. Lowering fish densities in the water less than ½ pound of fish per cubic foot of water is a management tool used to keep the infected sturgeon from breaking with disease in the hatchery (41). Fish densities in the wild seldom approach those found in the hatchery. Lowering fish densities in the hatchery and the single use of water (not recirculation of the same water) coincide with decreased incidence of disease caused by MRSIV in recent years (40, 41, 42, and 43).
- Even after 20 years, very little is known about this virus. To date only two research publications have been produced on the MRSIV (1 and 2). However, a publication on the genetic characterization of MRSIV and other associated viruses by Tom Waltzek et al., is in process (37). Waltzek's upcoming publication will not likely offer information practical to the needs of this project as it is more focused on the genetic relationship between viruses.
- In a review of the technical literature and in discussions with various fish health experts and fish hatchery managers, no additional or new information has been found related to the MRSIV. The conclusion of this review supports/affirms conclusions of previous analyses of this species as presented in USGS 2005 (45 and 46), USGS 2007 (44) which are the underlying basis of Reclamation's NEPA analysis (Reclamation 2007, Reclamation 2008).

Citations: Publication, websites, and personal communications.

This list includes cited references as well as other sources that were part of the general search for information on the MRSIV. Citations used to directly support statements in the text have been highlighted in red; those citations are referenced in the text by numbers to keep information concise.

Research publications found on MRSIV:

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2. Kurobe, T., K. T. Kwak, E. MacConnell, T. S. McDowell, F. O. Mardones, and R. P. Hedrick. 2010. Development of PCR assays to detect iridovirus infections among captive and wild populations of Missouri River sturgeon. Diseases of Aquatic Organisms 93:31–42.

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23. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/white-sturgeon and https://www.sciencedirect.com/science/article/pii/B9780128015735000085 -- Hicks, P., J. Becker, R. Whittington. 2016. Iridoviruses of Fish in Aquaculture Virology, Academic Press. p. 127-152. [Part 8.3.7 Diseases of fish caused by white sturgeon iridovirus (WSIV).]
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33. http://www.pallidsturgeon.org/wp-content/uploads/2014/06/UBPSW-2013-2014-Annual-Rpt.pdf - Upper Basin Pallid Sturgeon Workgroup Annual Report August 2013-May 2014.
34. https://gfp.sd.gov/UserDocs/nav/FinalPallidPlan.pdf - South Dakota Pallid Sturgeon (Scaphirhynchus albus) Management Plan South Dakota Department of Game Fish and Parks Pierre, SD 2006 Wildlife Division Report 2006-01.

Personal communications with fish virologist and hatchery managers

35. **USGS Emeritus Virologist r**esponded and left a telephone message on 01/14/20. Suggested contacting Tom Waltzek at the University of Florida whom he described as the iridovirus guru and said Dr. Waltzek was on the International Committee on Taxonomy of Viruses and has studies iridoviruses.
36. **USGS Aquaculture virology** who is very knowledgeable on fish virus issues in the Northwest USA. Contacted by telephone on 01/10/2020. Knew little of this virus but referred me to Tom Waltzek, an expert on iridoviruses.
37. **Fish virologist at the University of Florida at Gainesville, FL.** Who is considered the foremost expert on fish iridoviruses –Called and emailed on 01/10/20. Responded with an email on 01/10/20.: "To my knowledge (and as you said), Dr. Kurobe (*the 2011 publication*) was the last person to work on MRSIV. The only other thing that is happening right now is that we have sequenced the full genomes of MRSIV and WSIV and a couple other related viruses from sturgeon. We have this manuscript and it will be submitted and hopefully published soon."
38. **Fish Health Program Manager for the USFWS Pacific region** who has an extensive knowledge of fish viral issues nation-wide. Emailed and then called and talked to him on 01/10/2020. Heard little about this virus and noted that the 2011 publication on the iridovirus came from the UC Davis Lab. Referred me to Esteban Martinez at UC Davis and Lacey Hopper, a fish pathologist at the Bozeman Fish Health Center.
39. **Fish pathologist working with viruses at UC Davis in California.** Contacted on 01/10/2020 with email and received response on the same day: They did some of the earliest research on this virus. "We haven't done much work with MRSI, mainly since we haven't received any samples since May 2015. If there are samples needing analysis, or if this continues to be an issue personnel would be happy to collaborate. If I recall, Tom Waltzek (he was a student at UC Davis when some of the research took place), now at

University of Florida did some work in the past couple of years. Perhaps you can contact him and ask him".

40. **Supervisory Fish Biologist USFWS-Bozeman Fish Health Center.** Contacted by telephone and email on 01/10/2020 and was called back on 1/13/20. The Bozeman Fish Health Center has probably done more testing for the MRSIV in the pallid and shovelnose sturgeons than any other Lab. The MRSIV infection in pallid sturgeon in 1999 was the first occurrence of this virus known. Not aware of when the first infection occurred in shovelnose sturgeon other than shortly after the finding in pallid sturgeon. Knew of no documented or undocumented mortalities from this virus in wild sturgeon. Only knew of mortalities in hatchery reared juvenile sturgeon. Characterized the virus as primarily a latent virus and mortalities occur when fish were crowded or otherwise stressed as occurs in a hatchery setting (stress mediated pathogen). Mortalities in hatchery could be massive but they are much less common now. Lab personnel tested fin clips from adult wild sturgeon regularly, using PCR (Kurobe et al., 2010), for a number of years but found little (occasionally finding low levels of virus in a few adults) and have since stopped most of that testing. They presently are only testing fin clips from adults from the Blind Pony Hatchery in Missouri. The PCR test is the best for detecting the MRSIV in sturgeon.
41. **Manager of the Gavin Point National Fish Hatchery, Yankton, SD**
Contacted by telephone between January 16-23, 2020. Their hatchery uses UV water disinfection at a minimum of 100,000 microwatts/sec; amount depends on water flow (has used up to 300,000 to 400,000 microwatts/sec). Water is prefiltered. They found when reducing the stress on the fish (reducing crowding -- raising fish at less than ½ pound/square foot) they didn't get diseased fish from the virus and could raise the fish on raw (untreated) water. No present recent reports of the virus at this hatchery.
42. **Manager of the Miles City State Fish Hatchery, Miles City, MT.** Contacted by telephone between January 16-23, 2020. They still test for the MRSIV. The present fish crop was tested last June (negative) and will be tested again. They haven't had a virus problem in years at this hatchery; not since at least 2011. They use UV treatments but are unsure of its effectiveness because in general they do not appear to have an issue with MRSIV.
43. **Manager of the Garrison Dam National Fish Hatchery, Riverdale, ND.** Contacted by telephone between January 16-23, 2020. They still use a four bulb UV system at 120 to 600 megajoules/cm^2 (different system of measure then used at the other two hatcheries). They have a drum filter followed by a boiler, then another drum filter and a UV filter. They also have a second UV filter. They felt that the UV does not treat the iridovirus but helps take care of other pathogens because at least some of the adults used for broodstock test positive for the iridovirus each year. Indicated that they thought the virus was vertically transferred. They said that lower densities and clean water were the best controls for the iridovirus. It was about 3 or 4 years since the last disease episode of MRSIV.

USGS Publications

44. **USGS.** Analysis of Risks of Interbasin Biota Transfers Potentially Linked to System Failures in the Northwest Area Water Supply Projections, August 2007.
45. **USGS**. 2005a. Risk and Consequence Analysis Focused on Biological Invasions Potentially Associated with Surface Water Transfers between the Missouri River and Red River Basins. U.S. Geological Survey, Biological Resources Division, and National Park Service, Environmental Quality Division.
46. **USGS**. 2005b. Risk and Consequence Analysis Focused on Biota Transfers Potentially Associated with Surface Water Diversions Between the Missouri River and Red River Basins. Supplemental Report: Risk Reduction Captured by Water Supply Alternatives and Preliminary Analysis of Economic Consequences Associated with Biota Transfers Potentially Realized from Interbasin Water Diversion. U.S. Geological Survey, Biological Resources Division, and National Park Service, Environmental Quality Division.

Appendix H

Missouri River Basin Depletions

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix H Missouri River Basin Depletions

Introduction

This appendix briefly describes the process including a summary of methods and analysis used by the Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps) to evaluate the potential effects of water withdrawal for the Eastern North Dakota Alternate Water Supply Project (ENDAWS). This evaluation includes the process to quantify the historic, present, and future Missouri River Basin (MRB) depletions (Reclamation 2012) and process used by the Corps Missouri River Water Management Division, a part of the Northwestern Division, to evaluate the cumulative impacts to the Missouri River (Corps 2020) for use in this Environmental Impact Statement (EIS). It contains a summary of information on methods and analyses used in the ENDAWS EIS chapters. This appendix shows the step by step process followed by Reclamation for the ENDAWS EIS analysis of depletion-related impacts. For a detailed description of the modeling narrative, see Reclamation's report, MRB Depletions (Reclamation 2012).

Reclamation has been the lead federal agency in providing depletion estimates for the MRB studies. These estimates are used in modeling studies that assist other agencies like the Corps for hydrologic modeling studies and in making operational decisions on the Missouri River. Reclamation's point of contact for depletion studies is the Hydrology Group in the Missouri Basin Regional Office in Billings, Montana. The Corps operates the Missouri River Mainstem System (System) from their Missouri River Basin Water Management Division, Northwestern Division; coordinating flows, reservoir levels, and dam releases. The Omaha and Kansas City Districts are responsible for management and maintenance of Missouri River Projects, with the Omaha District providing management and maintenance for the Missouri River dams.

Missouri River flow data are maintained by the U.S. Geological Survey (USGS), with daily data going back to 1930 (Missing data was substituted with estimated flows from statistical studies). Based on the flow data at each gaging location, the historic inflows into each reach of the Missouri River can be computed. A requirement for conducting time series analyses using the historic inflow data requires that the inflows for each reach be adjusted to make the data for each year equivalent to the "current" year in the hydrologic analysis being conducted. The historic and a present-level depletion for the period of analysis for the time series analysis, were updated to 2017. The 2017 depletions were held constant to run the modeling through February 2019. Finally, estimates of future depletions of inflows into the Missouri River, or water from the Missouri River, are required to allow the analysis of future impacts; in this case, 2075 impacts.

Reclamation has developed depletion estimates for historic water use, present level water use, and future water use. Depletions were estimated for five different water use categories: 1) irrigated agriculture, 2) public surface water supply systems, 3) other water uses, 4) storage in Reclamation reservoirs, and 5) trans-basin diversions. Reclamation's 2012 depletions report summarizes the development of each of these three depletion files for all of the reaches of the Missouri River from

above Fort Peck, Montana to Hermann, Missouri, which is located 100 miles above the confluence of the Missouri River and the Mississippi River near St. Louis, Missouri.

Finally, this appendix summarizes the use of Reclamation's depletion files by the Corps to conduct an analysis of using the present level depletion conditions through 2017 as a baseline for adding 1) the effects of continuing sedimentation in the Missouri River Mainstem System reservoirs and forecasted non-Project depletions (No Project Year 2075) and, 2) a range of three depletion simulations associated with the ENDAWS Project. This analysis of the cumulative effects of the sedimentation and depletions affecting the operation of the System of dams addresses the hydrologic effects of changes to these factors out to the year 2075.

The following discussion will take the reader through the process from determining System and future depletions to the analysis of how ENDAWS Project depletions may impact Missouri River resources using and analysis of hydrologic factors.

Missouri River Basin Depletions Database

The first step taken in the analysis was organizing and updating the Missouri River depletions database. Reclamation has maintained a Missouri River depletions database for node basins of all tributaries within the MRB (Depletions Database). This database was built upon a 1982 study completed in coordination with the MRB Commission; later known as the Missouri Basin States Association (MBSA)[1].

The updated 2017 Depletions Database calculates historic depletions from 1930 through 2017 for irrigated agriculture and contains calculated depletions from public surface water supply systems. Historic depletions are the estimates of the amount of water actually depleted from the surface water in the MRB. Historic depletions are added to historic inflow data to calculate "natural flows." The natural flow is the inflow that would have been expected if there were no depletions from the surface water.

The Depletions Database also calculates present-level depletions for 2017. The year 2017 is the year of the last census of agriculture and the best available information. The 2017 depletions were held constant to run the modeling simulation through February 2019. The agriculture census is updated every 5 years with 2017 being the most recent data. The agriculture census is the largest and most complete data source available for irrigated acres and is used because most water diversions in the MRB are for irrigation. Present-level depletions are defined as the impact that current development would have had for any past water year.

Prior to development of the current Depletions Database, Reclamation last updated the estimated Missouri River historic and present level depletions in 2012 for the Northwest Area Water Supply Project Supplemental EIS (Reclamation 2012).

[1] U.S. Army Corps of Engineers. Big Dam Era. 1993. Page 186.

Historic Depletions

The year 1930 was selected to show the noticeable difference between the historic depletions early in the period and the present level depletions at the end of the 89-year period of analysis of 1930-2019. The 2017 update to the Depletions Database was only the data distribution and not a narrative report. The narrative for irrigated agriculture and public surface supply comes from the report titled, *Missouri River Depletions Database* (Reclamation 2012), which is a supporting document to this EIS. Reclamation computed the "other" depletion categories by adding an appropriate adjustment to the irrigated agriculture depletions. Reclamation storage represents the "holdouts" (includes water stored or released, evaporation, seepage from, and precipitation into) in the Reclamation reservoirs located on the tributaries to the Missouri River. Finally, trans-basin diversions represent the estimated water added to the MRB through a Reclamation project taking water from the St. Mary River Basin for irrigation in the Fort Peck to Garrison reach and for water transferred from the Colorado River Basin to the MRB that eventually entered the Missouri River in the Omaha to Nebraska City reach. These trans-basin numbers are negative depletions as they added water to the MRB.

Present Level Depletions

The average annual present level depletions in Table H-1 were generated using the same methodology followed for the historic depletions except for some changes that represent current conditions. The 2017 Depletions Database also computed the depletions that would have resulted in each year of the 89-year period (2017- year depletions were held constant from 2018 thru February 2019) used for this EIS analysis of Missouri River effects with the present level of water use development in the basin. These computations are required to convert inflows that occurred historically to those that would have occurred with the present level of water use development. Present level depletion values for agriculture would vary from year to year because the amount of water used on 2017 acres would vary depending on the climatic conditions that occurred historically.

Table H-1: Average Annual Present Level Missouri River Depletions by Reach (thousand acre-feet) for 2020 Development Levels

Missouri River Reaches	Agriculture	Public Supply	Industrial Supply	Reclamation Storage	Trans-basin Diversions	Total Present Level
Above Fort Peck	1441.1	17.7	0.6	-0.9	0.0	1554.5
Ft Peck to Garrison	2793.0	19.9	7.6	3.1	-151.1	2999.4
Garrison to Oahe	317.3	10.0	2.8	-0.4	0.0	345.8
Oahe to Big Bend	2.5	0.0	0.0	0.0	0.0	2.5
Big Bend to Ft Randall	156.9	1.2	0.0	0.0	0.0	158.1
Ft Randall to Gavins Point	210.3	1.7	0.3	-0.1	0.0	212.1

Missouri River Reaches	Agriculture	Public Supply	Industrial Supply	Reclamation Storage	Trans-basin Diversions	Total Present Level
Gavins Point to Sioux City	295.6	4.5	0.7	0.0	0.0	300.9
Sioux City to Omaha	320.1	19.9	0.0	0.0	0.0	340.0
Omaha to Nebraska City	3730.4	326.0	18.4	5.8	-378.7	4537.1
Nebraska City to St Joe	123.8	0.7	0.1	0.0	0.0	124.6
St Joe to Kansas City	1099.1	48.7	0.1	-0.3	0.0	1192.2
Kansas City to Boonville	45.2	62.3	0.3	0.0	0.0	107.8
Boonville to Hermann	78.6	42.4	0.7	0.0	0.0	121.8
Total	**10614.0**	**555.0**	**31.6**	**7.2**	**-529.8**	**11996.9**

Net Depletions

Net depletion values are needed for each reach to allow the conversion of the historic inflow data to present level of development inflow data. This provides the Corps the capability to simulate each year in the period of analysis of 1930-2019 as if each year were under 2017 water use conditions. Natural inflows are computed by adding the historic depletions to the inflows. Subtraction of the present level depletions then results in the reduced inflows under present level water use development. The Corps' HEC-ResSim Model (ResSim Model) for the Missouri River Mainstem System has an input file of the historic inflows and these inflows are modified within the ResSim Model with a net depletions file, which is equivalent to the historic depletion values for each year minus the present level depletion values. Historic and present level depletions are provided as monthly values by the Depletions Database.

Future Water Project Depletions

Reclamation's next step in the analyses was to look at potential future water project depletions for a cumulative effect's analysis. Reclamation collected data on reasonably foreseeable new depletions by specific project within the MRB, which may occur between 2020 and 2075. The year 2075 is the planning horizon for the ENDAWS Project. This section identifies specific future water project depletions (reasonably foreseeable actions) from the System to be addressed in this EIS. Reasonably foreseeable actions are those water withdrawals that meet the criteria identified below. Because these are actions that could potentially occur between 2020 and 2075, they are also identified as resulting in potentially cumulative effects when combined with the effects of the proposed ENDAWS Project. These actions are expected to occur regardless of which alternative is selected, including the

No Action Alternative. For the cumulative effect's analysis of Missouri River resources, a list of reasonably foreseeable actions was developed and is presented in Table H-2. The following criteria (must meet all criteria) were used to define reasonably foreseeable actions:

- Water withdrawal identified could reasonably be implemented between now and 2075.
- Water withdrawal identified could contribute measurably to cumulative effects in the geographic area and on Missouri River resources that would be affected by the ENDAWS EIS alternatives.
- Water withdrawal identified has sufficient specifics about the amount of water proposed for withdrawal and other information available to define the activity and conduct a meaningful analysis.
- Water withdrawal has been identified in some type of planning document.

Reclamation created a future Missouri River water withdrawal spreadsheet and populated the spreadsheet with information on potential new depletions within or from the MRB between 2020 and 2075. These potential projects were identified by canvassing Reclamation offices throughout the MRB, contacting the Bureau of Indian Affairs to document future tribal projects, and state governments. Large-scale projects involving future withdrawals for irrigation and water supply (tribal and state projects) typically need to secure federal funding for assistance in development. Historically, sponsors of large-scale water projects have relied on federal assistance for the development of their projects and this is not likely to change based on the economic situation faced by states and tribes. State or local projects were also included as potential projects, where information was readily available, if the projects were authorized and funded. Using these data, it was possible to estimate the total anticipated withdrawals through the year 2075 for each System reach included in the Corps' ResSim Model.

Reasonably foreseeable future projects are shown in Table H-2. All of these projects are dependent upon government funding and may be subject to compact agreements and/or authorizations; therefore, some of these projects may not be constructed. The information presented here is based on the best available information and represents a conservative approach that may overestimate future depletions.

Twenty-seven tribes are located in the MRB, 13 of which have reservations located directly on the Missouri River. Several of these tribes are in various stages of quantifying their water rights. Tribal projects were considered in Table H-2, but until water rights have been adjudicated or specific projects identified, they will not be included in a futures analysis of depletions for the ENDAWS EIS.

It should be noted that there is uncertainty when trying to predict the future. Reasonably foreseeable adverse impacts must be identified within the "rule of reason" standard. The criteria noted above were used to document reasonably foreseeable projects. Many of the projects identified as reasonably foreseeable are dependent on federal funding and permitting that has yet to be obtained; however, plans are in place for these projects and needs identified such that, if funding did become available, projects could move forward. Additionally, some of the projects, i.e., oil and gas

development, would be temporary in nature and thus limited. The timing of those projects would occur prior to 2075 and a determination was made to include these as reasonably foreseeable during the life of the project. All potential future withdrawals have been identified with the best available information and reasoned managerial decisions and will be applied equally to each alternative.

The data in Table H-2 were designated to System reaches and separated according to water use type (public surface water supply, irrigated agriculture, and other projects). Using these data, it was possible to estimate the total anticipated diversions by year 2075 for each System reach. Estimated future diversions by reach are show in Table H-3.

Table H-2: Missouri River System Withdrawals for Future Public Surface Water Supply, Irrigated Agriculture, and Other Projects

Project	Withdrawals – Maximum Use to 2075 (acre-feet per year)	River Reach
Public Surface Water Supply Projects		
Rock Boys RWS	8,802	Above Fort Peck
City of Helena	8,800	Above Fort Peck
Blackfeet MR&I	9,248	Above Fort Peck
Crow MR&I	5,040	Fort Peck to Garrison
Ft Peck RWS	6,200	Fort Peck to Garrison
Southwest Pipeline Project	10,000	Fort Peck to Garrison
Western Area Water Supply	12,000	Fort Peck to Garrison
Northwest Area Water Supply[1]	15,000	Fort Peck to Garrison
South Central Regional Water District	800	Garrison to Oahe
Standing Rock RWS	4,429	Garrison to Oahe
Rapid City & Western Pennington County	10,000	Garrison to Oahe
City of Pierre	9,000	Oahe to Big Bend
Irrigated Agriculture Projects		
Canyon Ferry Temporary Irrigation	400	Above Fort Peck
Canyon Ferry Irrigation	12,000	Above Fort Peck
Chester Irrigation Project	40,000	Above Fort Peck
Tiber Irrigation Contracts	44,000	Above Fort Peck
Fort Belknap Settlement	60,000	Above Fort Peck
Blackfeet Indian Water Settlement	45,000	Above Fort Peck
Crow Indian Water Settlement	150,000	Fort Peck to Garrison
Northern Cheyenne Settlement	57,500	Fort Peck to Garrison
Eastern Shoshone, Northern Arapaho	210,000	Fort Peck to Garrison
Alkali Creek Reservoir	8,000	Fort Peck to Garrison
Bull Creek Reservoir	14,500	Fort Peck to Garrison
Meadowlark Lake Enlargement	2,791	Fort Peck to Garrison

Project	Withdrawals – Maximum Use to 2075 (acre-feet per year)	River Reach
Leavitt Reservoir Expansion	6,604	Fort Peck to Garrison
GDU Irrigation	32,900	Fort Peck to Garrison
GDU 28,000 Unidentified Acres	56,000	Fort Peck to Oahe
Standing Rock Irrigation	800	Garrison to Oahe
Lake Andes Wagner Irrigation	10,000	Big Bend to Ft Randall
Other Projects		
TransCanada Keystone Pipeline (temporary)	512	Oahe, Big Bend, Fort Randall

[1] This project is a complete diversion with no return flows

Table H-3: Future Project Withdrawals by Reach in the Missouri River System

Missouri River Reaches	Public Surface Water Supply (Acre-Feet per Year)	Irrigated Agriculture (Acre-Feet per Year)	Other (Acre-Feet per Year)
Above Fort Peck	26,850	201,400	
Fort Peck to Garrison	48,240	510,295	
Garrison to Oahe	15,229	28,800	
Oahe to Big Bend	9,000		512
Big Bend to Fort Randall		10,000	
Fort Randall to Gavins Point			
Total	**99,319**	**750,495**	**512**

Depletions by Future Public Surface Water Supply Projects

A portion of the public surface water supply that is withdrawn is generally returned to the river. "Depletion" is defined as the net water loss (i.e., amount withdrawn minus amount returned). Because the Depletions Database operates on a monthly time step, the annual public supply depletions needed to be converted to monthly values. The monthly distribution of public surface water supply diversions and monthly depletion rates used in the Depletions Database are shown in Table H-4. The monthly distribution of diversions was used in the MBSA study (Missouri Basin States Association 1982). The distribution demonstrates that water use is higher during the summer months than the winter months. The 37 percent depletion rate used is taken from a USGS study (2004) of water use in Montana (USGS in Cooperation with the Montana Department of Natural Resources and Conservation. *Estimated Water Use in Montana in 2000* Page 39). A majority of the water diverted (63 percent) is returned to the stream for potential reuse downstream. The Northwest Area Water Supply Project has zero return flow because the water is being transferred to another basin.

Table H-4: Public Surface Water Supply Diversion and Depletion Rates

Month	Monthly Diversion Rate %	Depletion Rate %
January	3	37
February	3	37
March	6	37
April	7	37
May	10	37
June	13	37
July	18	37
August	15	37
September	11	37
October	8	37
November	3	37
December	3	37

These values were used for each reach in the basin to determine the depletions by reach of future public surface water supply projects. The depletions were calculated by month using the following equation:

$$Future\ Monthly\ Depletion = Acre\ Foot\ Withdrawl\ per\ Year\ \times\ Monthly\ Diversion\ Rate \times Monthly\ Depletion\ Rate$$

Depletions by Irrigated Agriculture Projects

Future irrigated agriculture depletions are estimated by calculating the difference between the diversion requirements and the return flows for each project. A diversion requirement is the amount of water that needs to be diverted at the main canal to supply irrigation water to the crop, in lieu of natural rainfall, so the crop can grow to maturity.

Return flows are the portion of the irrigation withdrawals that naturally return to streams and become available for reuse within the MRB. Return flows include excess withdrawals, operational waste, and a portion of the canal seepage and deep percolation.

Irrigated agriculture depletions are the portion of the diversion that is consumptively used by crops and non-beneficial consumptive uses, such as vegetation along the canal. Irrigated agriculture depletions also include the portion of the canal seepage and deep percolation unavailable for return flows to the natural stream in the MRB.

Diversion requirements, return flows, and irrigated agriculture depletions, by month, are calculated for all HUCs within the MRB in the established Depletions Database. Future irrigated agriculture projects were identified in four reaches of the MRB, Above Fort Peck, Fort Peck to Garrison, Garrison to Oahe, and Big Bend to Ft. Randall. Average monthly diversion rates were calculated for each reach by, averaging the diversion rates from the Depletions Database, for each HUC in the reach. These diversion rates are shown in Table H-5.

Table H-5: Irrigation Monthly Diversion Requirement Rates (percent)

Month	Above Fort Peck	Fort peck to Garrison	Garrison to Oahe	Big Bend to Fort Randall
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	1	4	1	1
May	7	24	16	9
June	22	22	20	19
July	34	24	28	32
August	24	17	23	27
September	11	8	11	12
October	1	1	1	1
November	0	0	0	0
December	0	0	0	0
Total	100	100	100	100

Irrigation conveyance system and on-farm efficiencies were used to calculate the amount of water available for return flow. The efficiencies used from the Depletions Database are for surface water sprinkler irrigation systems. These efficiencies are slightly higher than furrow irrigation system efficiencies, resulting in less potential return flow, which in turn, means the return flow estimates of the future irrigated agriculture projects are conservative. The conveyance system and on-farm efficiencies used are shown in Table H-6.

Table H-6: Conveyance System and On-Farm Efficiencies (percent)

Month	Conveyance System Efficiency	On-Farm Efficiency
January	0	0
February	0	0
March	30	0
April	30	65
May	30	65
June	35	65
July	70	65
August	80	65
September	60	65
October	50	65
November	0	0
December	0	0

Non-beneficial consumptive use is a loss that occurs within the irrigation system. These losses are primarily caused by weeds, trees, and other vegetation growing along canals and ditches that use water, which otherwise would have returned to the river. The available return flow is adjusted for these losses. Accurate figures are very difficult to measure and no studies on these water losses have been completed for the MRB. Values between 15 percent and 20 percent have been commonly used in past studies. In the Depletions Database and for this analysis of future irrigated agriculture projects, a non-beneficial consumptive use value of 20 percent was used.

The return flow that is not lost to non-beneficial consumptive use is returned to the river system and used again downstream; however, in many cases the return flows are not instantaneous and may require several months to return to the river. Sixty percent of the return flow occurs during the month of the diversion. The values shown in Table H-7 were used to distribute the remaining return flow. The 60 percent and the values shown in Table H-7 represent a common return flow distribution used in the Depletions Database. To recap, irrigated agriculture depletions equal the amount of water diverted from the river system minus the amount returned to the river system.

Table H-7: Return Flow Distribution

	Percent of Return Flow Returned to River System
Month one following diversion	50
Month two following diversion	15
Month three following diversion	13
Month four following diversion	8
Month five following diversion	4
Month six following diversion	3
Month seven following diversion	2
Month eight following diversion	1
Month nine following diversion	1
Month ten following diversion	1
Month eleven following diversion	1
Month twelve following diversion	1

Depletions by Other Water Use in the Missouri River System

Other water uses identified in the future non-project depletions include diversions for industrial, livestock, mining, evaporation, etc. that are not supplied by public surface water supply systems or irrigation. The Depletions Database incorporated the other depletion categories using the data developed in the MBSA study by adding an appropriate adjustment to the irrigated agriculture depletions.

One future Other water use was reported within the Missouri Basin System as a temporary need to construct energy pipeline infrastructure. Although this infrastructure project was identified as only being a temporary use of water within the System during construction, which typically is excluded in reasonably foreseeable non-project depletions, future Other water use projects may occur with a

similar volume depletion within the System. Thus, the Other 512 acre-feet withdrawal was included in the Future Water Use Project Depletions.

Summary of Future Water Use Project Depletions

The depletions calculated using the methods described above for public surface water supply depletions, irrigated agriculture and other projects are shown in Table H-8.

Table H-8: Future Project Depletions by Reach in the Missouri River System

Missouri River Reaches	Public Surface Water Supply (Acre-Feet per Year)	Irrigated Agriculture (Acre-Feet per Year)	Other (Acre-Feet per Year)	Total (Acre-Feet per Year)
Above Fort Peck	26,850	201,400	0	228,250
Fort Peck to Garrison	48,240	510,295	0	558,535
Garrison to Oahe	15,229	28,800	0	44,029
Oahe to Big Bend	9,000	0	512	9,512
Big Bend to Fort Randall	0	10,000	0	10,000
Fort Randall to Gavins Point	0	0	0	0
Total	**99,319**	**750,495**	**512**	**850,326**

These are the anticipated depletions by future project to the year 2075. The total System depletion for future public surface water supply, irrigated agriculture, and other projects is 850,326 acre-feet or 0.85 million acre-feet (MAF) per year.

Trans-Basin Diversions

There are several existing trans-basin diversions in the MRB. There are significant diversions into the MRB that add to the amount of water available and thus are considered in this analysis. The trans-basin diversions provide a source of water for irrigated agriculture and public surface water supplies. Trans-basin diversions into an MRB reach are counted as a negative depletion for that reach. There are a couple of trans-basin diversions within the MRB that were looked at but determined to not affect depletion analysis outcomes since they occurred within the same MRB reach, Omaha to Nebraska City. Both diversions are from the North Platte to the South Platte River Basin. The following is a list of the major trans-basin diversions into the MRB.

Colorado River Basin into South Platte Basin (Omaha to Nebraska City)

- Adams Tunnel
- Roberts Tunnel
- Moffat Tunnel
- Grand River Ditch
- Berthoud Pass Ditch

Arkansas River Basin into South Platte Basin (Omaha to Nebraska City)

- Aurora Homestake Pipeline

Hudson Bay Basin to Milk River Basin (Fort Peck to Garrison)

- St. Mary Canal

Reservoir Holdouts

Using data from Reclamation's HydroMET database, monthly operational holdouts (depletions) for all Reclamation reservoirs in the MRB were developed. Potential evaporation data from EPA's BASINS program was also used to calculate reservoir evaporation. The reservoir holdouts include the net effects of storage changes, precipitation, and reservoir seepage. Holdouts are calculated as the monthly total change in storage plus reservoir evaporation. Table H-9 is a list of reservoirs included by MRB reach.

Table H-9: Missouri River Basin Reclamation Reservoirs

Missouri River Basin Reach	Reclamation Reservoirs
Above Fort Peck	Clark Canyon, Canyon Ferry, Gibson, Pishkun, Willow Creek, Lake Elwell
Fort Peck to Garrison	Buffalo Bill, Bull Lake, Boysen, Bighorn, Fresno, Nelson
Garrison to Oahe	EA Patterson, Lake Tschida, Shadehill, Belle Fourche, Keyhole, Pactola, Deerfield, Angostura
Oahe to Big Bend	None
Big Bend to Fort Randall	None
Fort Randall to Gavins Point	Box Butte, Merritt
Gavins Point to Sioux City	Jamestown
Sioux City to Omaha	None
Omaha to Nebraska City	Seminoe, Pathfinder, Alcova, Glendo, Guernsey, Horsetooth, Calmus, Davis Creek
Nebraska City to St. Joseph	None
St. Joseph to Kansas City	Bonny, Enders, Trenton, Hugh Butler, Harry Strunk, Keith Sebelius, Kirwin, Webster, Waconda, Cedar Bluff, Lovewell
Kansas City to Boonville	None
Boonville to Hermann	None

Present-level holdouts were assumed to equal to historic holdouts except that median monthly historic holdouts were used for years prior to the reservoir initially filling. There are no current plans by Reclamation to construct any new reservoirs in the MRB, so no additional holdouts were estimated for future depletions.

Depletions Data Use

The collective depletions data developed by Reclamation are used by the Corps in their HEC-ResSim (ResSim Model) to simulate operations of the Missouri River Mainstem System. The Corps used HEC-ResSim version 3.4 to run the ResSim Model. These simulations can then be used to evaluate potential effects of depletions; however, depletions data must be adapted to allow potential simulations and evaluations. Historic depletions can be added to the total historic flows to get "natural" flows of the Missouri River. Historic depletions included in this analysis include irrigated agriculture depletions, public surface water supply depletions, other depletion categories, Reclamation reservoir holdouts, and trans-basin diversions.

Present-level depletions can be subtracted from the natural flows to calculate present-level depleted stream flows. Present-level depletions include all the same categories as historic depletions. Because the Corps' ResSim Model uses historic flows as input, net depletions (historic minus present depletions) are required to simulate present conditions for each of the ResSim Model reaches.

To estimate streamflow conditions in 2075, estimated depletions for future irrigated agriculture, public surface water supply, and other future projects must also be subtracted. Additionally, depletions by public surface water supply systems and other water use, that were estimated by looking at population projections, must also be subtracted.

Analysis of Missouri River Effects

Missouri River Reservoir Simulation Review

A determination on how to evaluate the effects of water withdrawal needed to be evaluated prior to using depletions data in the ResSim Model. As part of the NEPA analysis for the ENDAWS Project, Reclamation considered the tools available to evaluate the potential effects of water withdrawal on the Missouri River and its resources. During the 2018 Final Missouri River Recovery Management Plan and Environmental Impact Statement (Corps 2018a), several impact models were developed and used to look at different operational scenarios and their effects on Missouri River resources. These impact models included cultural resources, fish and wildlife, flood risk management, hydropower, interior drainage, land ownership, navigation, recreation, thermal power, water supply, water quality, climate change, and sedimentation.

Corps Analysis of Depletion Effects on Missouri River Resources

Reclamation initiated a study with the US Army Corps of Engineers, MRB Water Management, Northwestern Division to identify the relative impacts of the withdrawal of water from Missouri River for the ENDAWS Project. This study, *Missouri River Mainstem HEC-ResSim Modeling for ENDAWS EIS, Mainstem Missouri River Reservoir Simulation Scenarios Technical Report: Final* (Simulation Report) (Corps 2020), assessed the hydrologic effects of ENDAWS Project depletions on Missouri

River and these data were used by Reclamation's interdisciplinary team to qualitatively identify the effects on other Missouri River resources as explained in the EIS. For this study, the Corps evaluated 1) the effect of sedimentation and anticipated future non-Project depletions on inflows from the System and, 2) a range of three depletions options associated with the ENDAWS Project. Analysis of these water withdrawals was accomplished using the best available information the Corps and Reclamation has regarding hydrologic effects by the use of water stored in the System – models developed for the Missouri River Recovery Management Plan and Environmental Impact Statement. (Corps 2018a).

Methodology

The Corps analysis simulated two changes affecting System regulation by using historic, present, and future depletions provided by Reclamation. The two simulated changes included the continuing sedimentation in the System reservoirs and the depletion of Missouri River inflows and flows calculated by the use of the ResSim Model. The ResSim Model provides hydrologic data that are then used to provide the data for the delineation of the relative differences between and among the simulations. The ResSim Model contains scripted rules that allow it to simulate reservoir operations based on the Corps 2018 Missouri River Mainstem Reservoir System Master Water Control Manual MRB (2018 Master Manual). An 89-year (spanning March 1, 1930 thru February 28, 2019) period of record was available to use for the analysis of changes affecting System regulation, including the depletions associated with the ENDAWS Project.

The Corps used Reclamation inflow historic and present level depletions data that were updated through 2017. These data were revised by Reclamation for the ENDAWS Project's Missouri River analyses based on the best available and most current data (Reclamation 2017). For this modeling effort, the 2017-year depletion data is extended through February 2019 to allow for a longer period of record simulation. The Corps' ResSim Model adjusts the amount of inflow coming into the Mainstem Reservoir System based on the adjusted depletion values.

The Corps analysis also addresses future sedimentation in the System. As sediments accumulate in each reservoir, the amount of storage available at a given water surface elevation diminishes. Total System storage capacity is affected by sedimentation. For example, estimated System storage in 2017 totaled 72.4 million acre-feet (MAF), and the total System storage will be reduced to 68.9 MAF by 2075. This is illustrated in Table H-10 below (Corps 2020).

The second factor that would change between 2020 and 2075 is additional non-Project depletions to System flows without the additional depletions of the ENDAWS Project. Therefore, cumulative depletion effects are addressed in the Corps Simulation Report. This is accomplished through the identification and consideration of potential future depletions as discussed in the previous section of this appendix. Reclamation estimated future depletions accumulated from various sources, by identifying potential projects throughout the System in various stages of planning for potential implementation by the year 2075. Additional irrigated crop acreage is likely to occur, and water use associated with population growth will result in the growth of public supply depletions in the future. Finally, the "other" category, includes water use to construct an energy pipeline infrastructure project.

Simulation of the combination of the future depletions, and the sedimentation that may occur between 2020 and 2075 using the ResSim, results in what may be the System's hydrologic values

under 2075 conditions without the ENDAWS Project – No Project Year 2075 Simulation. Adding in the anticipated depletion of the ENDAWS Project scenarios to simulation runs would identify the hydrologic and navigation service values for the total cumulative depletions anticipated by 2075.

The Corps analysis used the ResSim Model to simulate an 89-year historic record, while adjusting for depletions and sedimentation, to demonstrate how the System's hydrologic and navigation service values are affected by the ENDAWS Project depletions. Five simulations of the changes that affect System regulation were analyzed. These simulations include:

- **No Project Year 2017 Simulation (NP2017)** – historic flows were adjusted based on the MRB Depletions database. This simulation was necessary for evaluating the consequences that inform Section 7 consultation under the Endangered Species Act.

- **No Project Year 2075 Simulation (NP2075)** - future conditions (2075) with both sedimentation and future non-project depletions.

- **ENDAWS Simulations** -

  ENDAWS Scenario 1 (AWS 1) - simulation that represents depletions up to 119,500 acre-feet per year split by System reach; 105,000 acre-feet per year depletion from the Garrison to Oahe reach of the Missouri River, and 14,500 acre-feet per year depletion from the Garrison Diversion Unit (Fort Peck to Garrison reach), in addition to the NP2075 simulation.

  ENDAWS Scenario 2 (AWS 2) - simulation that represents depletions up to 119,500 acre-feet per year from the Garrison to Oahe reach of the Missouri River in addition to the NP2075 simulation.

  ENDAWS Scenario 3 (AWS 3) - simulation that represents depletions up to 119,500 acre-feet per year from the Garrison Diversion Unit (Fort Peck to Garrison reach) in addition to the NP2075 simulation.

The hydrologic effects impact analyses differences among the five simulations, which looked at the impacts incrementally as the sedimentation and depletion values, are incorporated incrementally into the Existing Conditions simulation. This information was used to look at impacts to Missouri River environmental and economic resources as discussed in Chapter 3 of this EIS.

Summary of Missouri River Analysis Results (Corps 2020)

The volume of water stored in the System varies with changes in annual inflows into the MRB, and the amount of water released from the System to meet its authorized purposes. Daily decisions for the operation of the System depend on the amount of water stored in the System and the distribution of the water among the upper three, larger reservoirs. To maintain the desired levels in the individual reservoirs, and to meet the flow requirements of the authorized purposes on the lower Missouri River downstream from the System, releases are set from each System project. These flow requirements include downstream flow targets for flood control, navigation, water supply, water quality, hydropower requirements, recreation, fish and wildlife, and intrasystem balancing for all authorized purposes. The main stem projects are operated as a hydrologically and electrically integrated system in order to serve the multipurpose benefits for which they were authorized.

Regulation of the mainstem reservoir System follows a repetitive annual cycle that is described in detail in the 2018 Master Manual (Corps 2018).

Thus, the focus of this analysis is centered on the hydrologic variables in view of integrated system operations and its impacts on water resources. The ResSim Model produces over 1,100 time series of output for each alternative. Pool elevation and releases were selected for Fort Peck, Garrison, and Oahe. Only releases were selected for Gavins Point, since the pool elevation follows a guide curve, or specified elevation throughout the year, that will not change with variations in System inflows. River gage flow was selected for: Bismarck, North Dakota; Sioux City, Iowa; Omaha, Nebraska; Nebraska City, Nebraska; and Kansas City, Missouri. Three System parameters were chosen: navigation end date, service level, and System storage. Monthly average releases and end-of-month elevation, storage, service level, and navigation end date were used to further simplify how the data was displayed. A difference between the ENDAWS depletions alternatives and the NP2075 alternative were calculated. Then, a duration curve of the differences was generated to summarize the changes to the System (Corps 2020).

Hydrologic Impacts The Corps Simulations Report concluded that continuing deposition of sediments into the System reservoirs will reduce the storage capacity primarily of the Carryover Multiple Use Zone and the Permanent Pool of each reservoir (See Figure H-1). This will, in turn, reduce the total System storage capacity. System storage is the total storage of all six mainstem reservoirs. Increased sedimentation out to 2075 is estimated to reduce System storage by 3.5 MAF as summarized in Table H-10 (Corps 2020). Because the amount of water stored in the two flood control zones will remain relatively constant, the amount of water stored in the System reservoirs will be diminished annually by increased sedimentation. The amount of storage in each reservoir will be lower, so the net effect of sedimentation will be higher reservoir levels. Due to this effect on Missouri River reservoirs, sedimentation will cause the water surface elevation of the reservoirs to rise, while the sediments would occupy storage space, causing the loss of the volume for water storage. Sedimentation will have essentially no impact on releases from the System reservoirs.

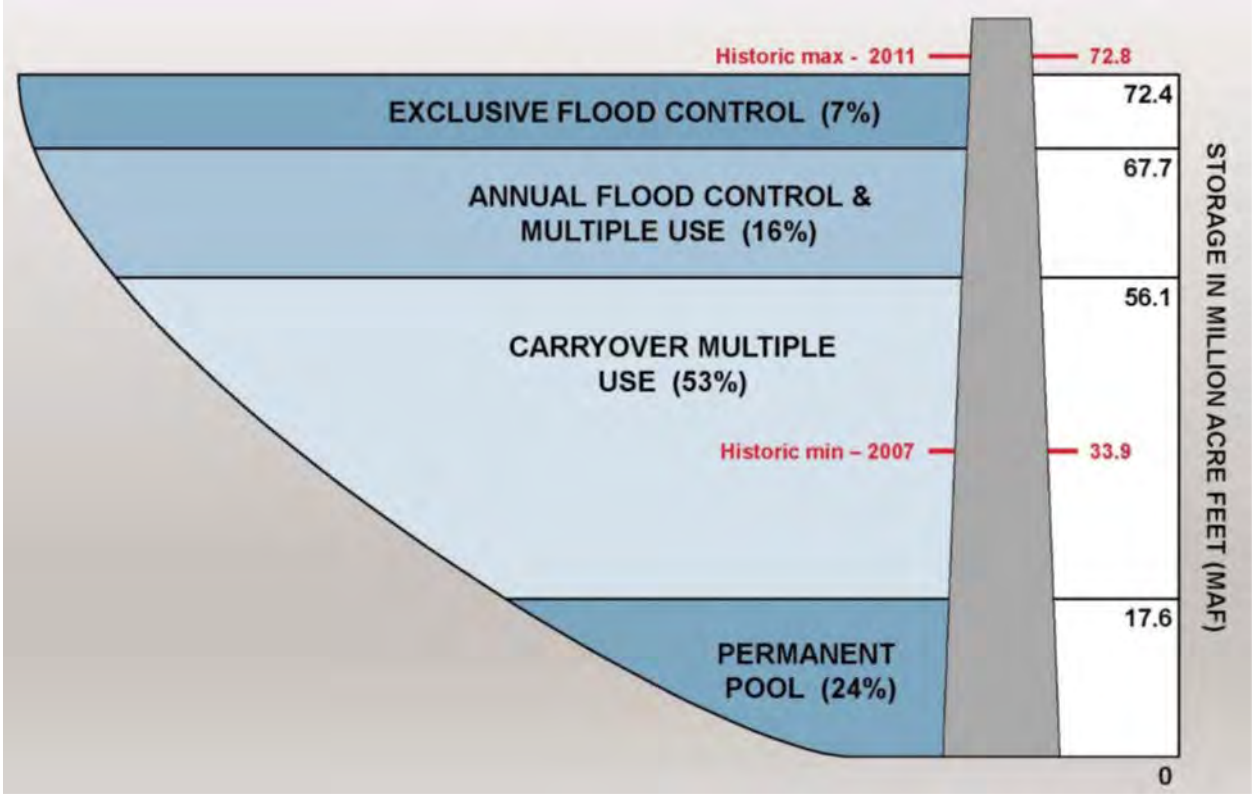

Figure H-1: Missouri River Mainstem System storage zones (Corps 2018)

Non-Project future depletions that would reduce inflows to the System reservoirs are forecasted to reach 0.85 MAF by 2075. These depletions to System inflows will reduce the amount of water in System storage, especially during extended droughts. This reduction in System storage will carry over to the water surface elevations in each of the three, larger System reservoirs (Fort Peck, Garrison, and Oahe), as levels will drop in increasing amounts in the droughts as the depletions continue to accumulate each year. Releases from the System reservoirs will drop with the increasing non-Project depletions, with the amount of release reductions being nearly equivalent to the amount of the cumulative depletions above each reservoir.

Table H-10: Summary of storage curves for all mainstem projects (Corps 2020)

Project	Elevation (ft NGVD 29) (Reservoir Zone)	Baseline Storage (acre-ft)	Future Storage (acre-ft)	Storage Change per Zone
Fort Peck	2250.0 (Exclusive Flood Control)	18,462,840	17,450,981	-18,049
	2246.0 (Annual Flood Control)	17,492,120	16,498,310	-12,629
	2234.0 (Carryover Multi-Use)	14,788,340	13,807,158	-493,387
	2160.0 (Permanent)	4,087,903	3,600,108	-487,795

Project	Elevation (ft NGVD 29) (Reservoir Zone)	Baseline Storage (acre-ft)	Future Storage (acre-ft)	Storage Change per Zone
Garrison	1854.0 (Exclusive Flood Control)	23,451,300	22,554,852	1,153
	1850.0 (Annual Flood Control)	21,956,050	21,058,449	-10,847
	1837.5 (Carryover Multi-Use)	17,744,640	16,857,886	-576,952
	1775.0 (Permanent)	4,793,691	4,483,889	-309,802
Oahe	1620.0 (Exclusive Flood Control)	22,971,040	22,218,948	13,233
	1617.0 (Annual Flood Control)	21,865,292	21,099,967	17,181
	1607.5 (Carryover Multi-Use)	18,665,257	17,882,751	-480,727
	1540.0 (Permanent)	5,311,400	5,009,620	-301,780
Big Bend	1423.0 (Exclusive Flood Control)	1,810,414	1,687,946	961
	1422.0 (Annual Flood Control)	1,749,418	1,625,989	1,200
	1420.0 (Permanent)	1,631,474	1,506,845	-124,629
Fort Randall	1375.0 (Exclusive Flood Control)	5,293,512	4,710,255	-1,857
	1365.0 (Annual Flood Control)	4,309,691	3,728,291	-15,648
	1350.0 (Carryover Multi-Use)	3,000,777	2,435,026	-375,815
	1320.0 (Permanent)	1,469,376	1,279,439	-189,937
Gavins Point	1210.0 (Exclusive Flood Control)	425,863	247,155	-11,838
	1208.0 (Annual Flood Control)	370,285	203,416	-25,224
	1204.5 (Permanent)	287,595	145,950	-141,645

ENDAWS Project depletions will have similar relative effects as the non-Project depletions; however, the amount of the ENDAWS Project depletion is relatively smaller (0.1195 MAF is 14 percent) compared to 0.85 MAF of non-Project depletions.

The amount of ENDAWS Project depletion 0.1195 MAF, or some other value below, would have a relatively smaller effect on the water surface elevations of the upper three, larger System reservoirs when compared to future depletions. More information on Reservoir Level Impacts and System Release Impacts are explained below.

Reservoir Level Impacts Potential System reservoir impacts are evaluated by looking at reservoir storage and reservoir elevations. Decisions on releases from the System are based on the amount of water in System storage. During extended droughts, the amount of water in System storage drops well below the base of flood control storage throughout the year. In the non-drought periods, the goal on March 1 of each year is to have the volume of water in System storage at the base of flood control storage, which is estimated to be 52.6 MAF by 2075 due to sedimentation (Table H-11). The System storage is likely to be further reduced, especially in drought periods, as the water entering the Missouri River is reduced due to depletions from various factors.

Table H-11: Summary of total System storage change due to sedimentation

Total System Storage	Baseline Storage (acre-ft)	Future Storage (acre-ft)	Total Storage Change
Exclusive Flood Control	72,414,969	68,870,137	-3,544,832
Annual Flood Control	67,742,856	64,214,422	-3,528,434
Carryover Multi-Use	56,118,083	52,635,616	-3,482,467
Permanent	17,581,439	16,025,851	-1,555,588

System storage is used in operations to set the level of navigation flow support (service level) for the river below Gavins Point and navigation season length (navigation end date). Drought conservation measures are enacted during persistent droughts, when reservoirs recede into their respective Carryover and Multiple Use Zones. Primarily, the navigation flow support is reduced, and the navigation season length is shortened, to conserve water. Service level is set on March 15th for the first half of the navigation season and reassessed on July 1st for the remainder of the navigation season. Table H-12 summarizes how the service level for both assessment dates vary depending on System storage. Navigation season lengths are determined by a System storage check on July 1st, and the criteria are summarized in Table H-13 (Corps 2020).

Table H-12: Service Level Requirements (Corps 2020)

Date	Service Level (cfs)	Water in System Storage (MAF)
March 15	35,000 (full-service)	54.5 or more
March 15	29,000 (minimum service)	31.0 – 49.0
March 15	No service	31.0 or less
July 1	35,000 (full-service)	57.0 or more
July 1	29,000 (minimum service)	50.5 or less

Table H-13: Navigation Season Length Requirements (Corps 2020)

Date	System Storage (MAF)	Season Closure Date at Mouth of the Missouri River
July 1	36.5 or less	October 1 (6-month season)
July 1	41.0 – 46.8	November 1 (7-month season)
July 1	51.5 or more	December 1 (8-month season)

When comparing ENDAWS depletions to No Project Year 2075, the trend is lower System storage, but approximately 85 percent of the 89-year period of record has less than 0.5 MAF change in System storage. Figure H-2 shows the duration curves of changes to System storage relative to the NP2075 scenario.

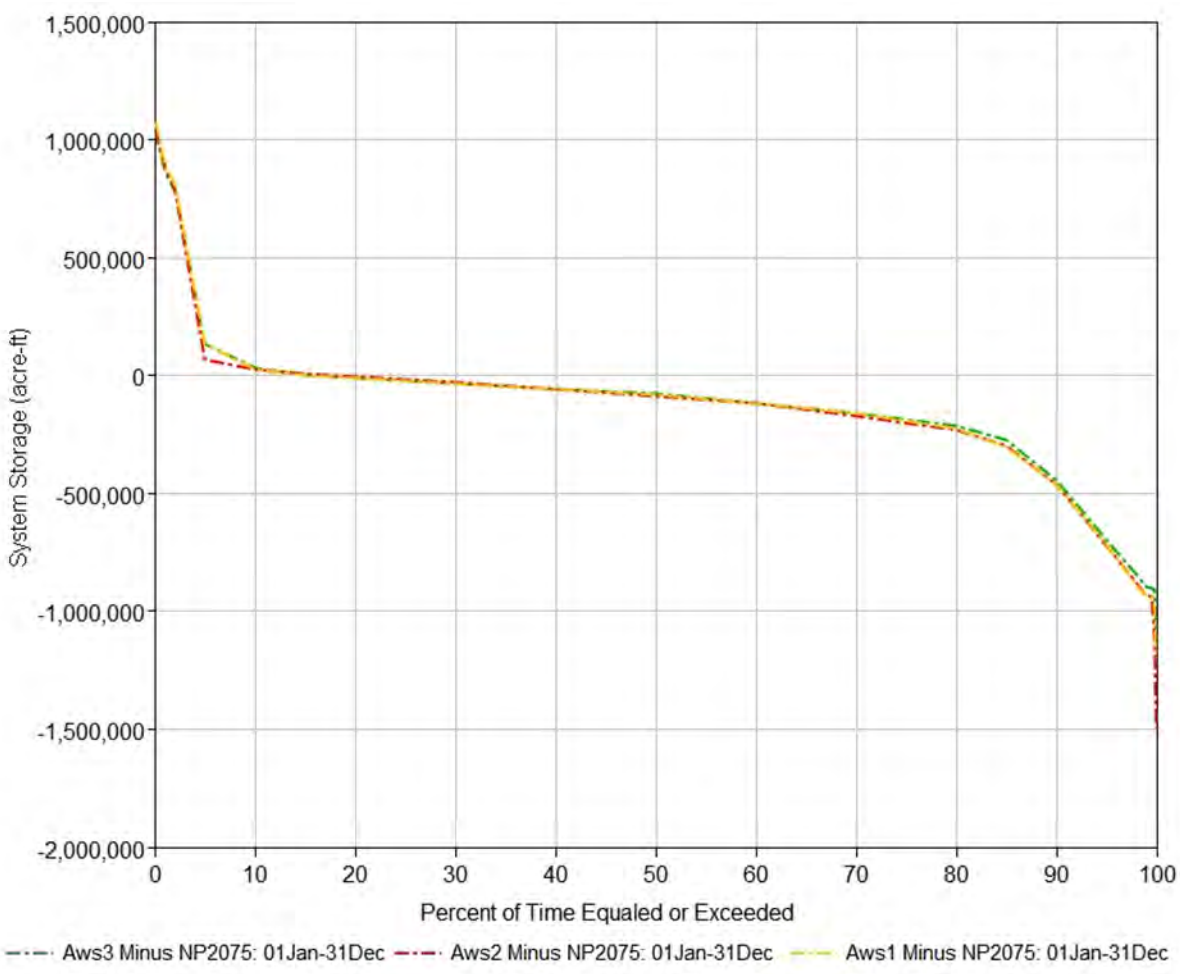

Figure H-2: Duration curves of the change in System Storage relative to NP2075 (Corps 2020)

Total System storage differences for the ENDAWS Project simulations from those of the No Project Year 2017 and No Project Year 2075 simulations for the 1930s drought period of analysis are shown in Figure H-3. In the fall of 1942, System storage, as a result of ENDAWS Project, is approximately 0.9 MAF less than the NP2075. The combination of drought conservation measures and increased runoff reduces this difference in System storage to less than 0.2 MAF by 1946 (Corps 2020).

Extended droughts resulted in System storage changes among the five simulations evaluated in the Corps analysis. The minimum System storage values also varied among the simulations. The minimum System storage changes among the simulations showed decreasing values as the NP2075 to NP2017 and the depletions options associated with the ENDAWS Project to NP2075. Again, it is readily apparent that there is relatively little change in the minimum storage levels of the three ENDAWS Project simulations.

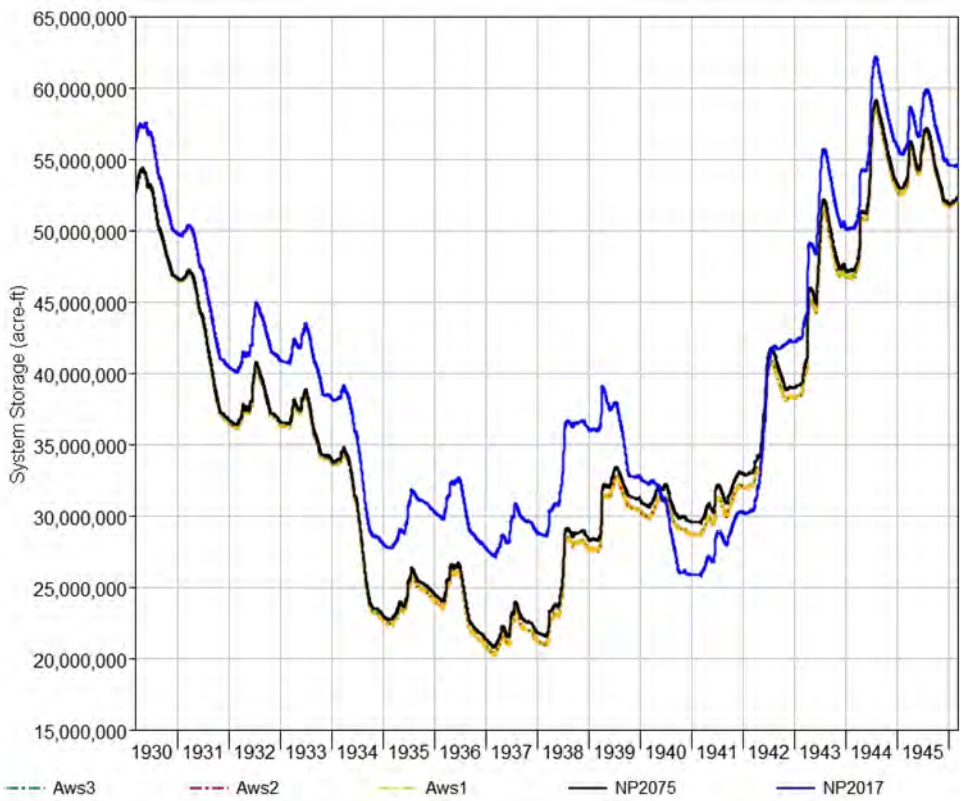

Figure H-3: System storage during the 1930's (Corps 2020)

System storage leads to changes in navigation flow support (service level) as more water is removed from the System. Figure H-4 shows duration curves of the change in service level as a result of the ENDAWS Project simulations relative to NP2075. The curves show that service level changes by 1,000 cubic feet per second (cfs) or less for 98 percent of the 89-year period of record. For less than 2 percent of the period, the service level is either increased or decreased between 1,000 and 5,000 cfs. The increases and decreases of service level greater than 1,000 cfs generally occur during flood evacuation years, when the service level has been increased above full service.

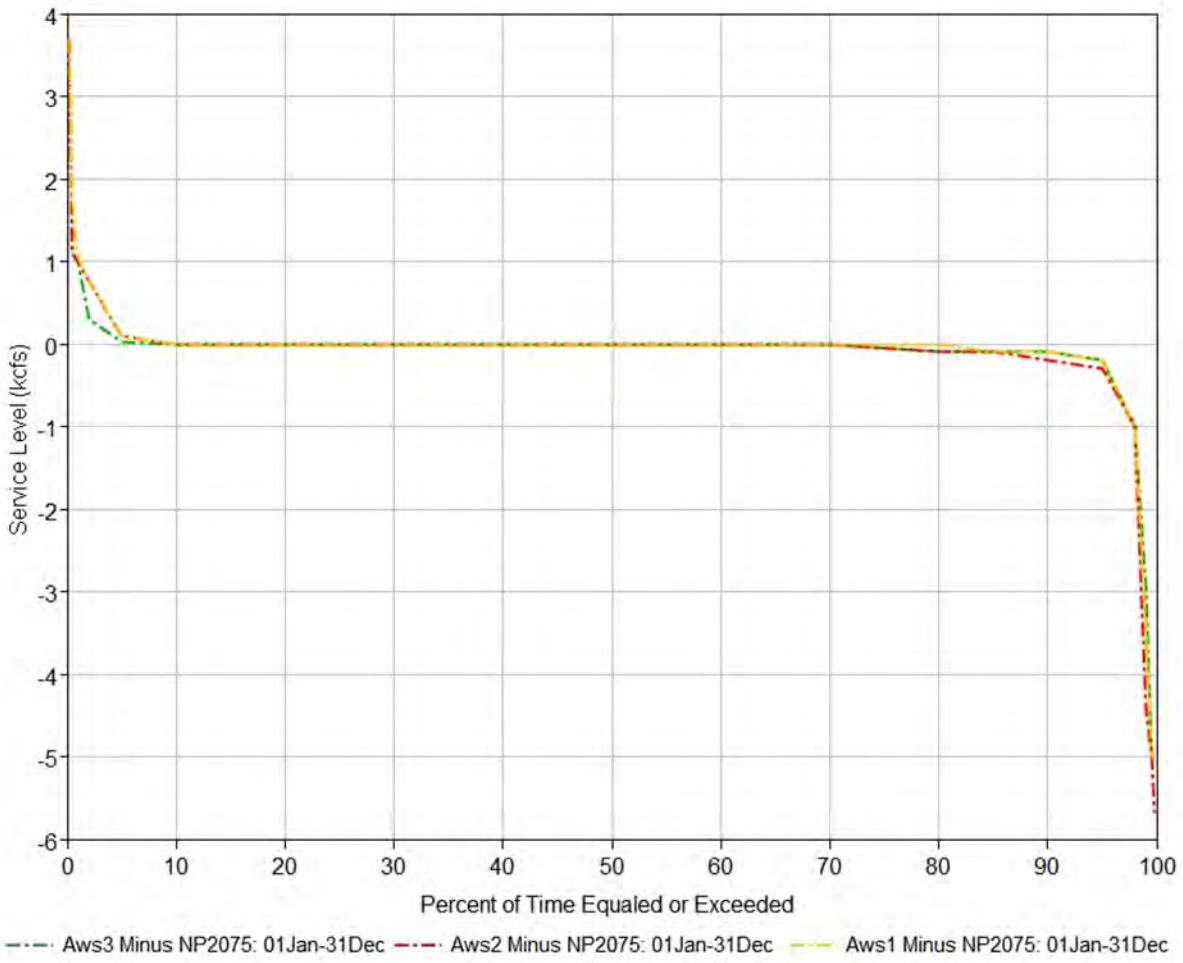

Figure H-4: Duration curves of the change in service level relative to NP2075 (Corps 2020)

Figure H-5 shows duration curves for the change in navigation end date in Julian days. Julian day is the continuous count of days which is commonly used for calculating elapsed days between two events. The duration curve comparing ENDAWS Project simulations to NP2075 show changes of 1 day or less for 90 percent of the 89-year period. Only 3 years in the 89-year period have reductions in season length greater than 2 days. System storage is still lower under the ENDAWS Project simulations compared to NP2075 in 1942 and 1943 as the reservoirs recover from the 1930's drought. Navigation season length is shorter by 4 or 5 days in both of those years. In 2015, the navigation season is extended by 10 days under the NP2075 scenario to evacuate storage; whereas, the ENDAWS Project simulations AWS 1, AWS 2, and AWS 3 indicate a normal 8-month navigation season. (Corps 2020).

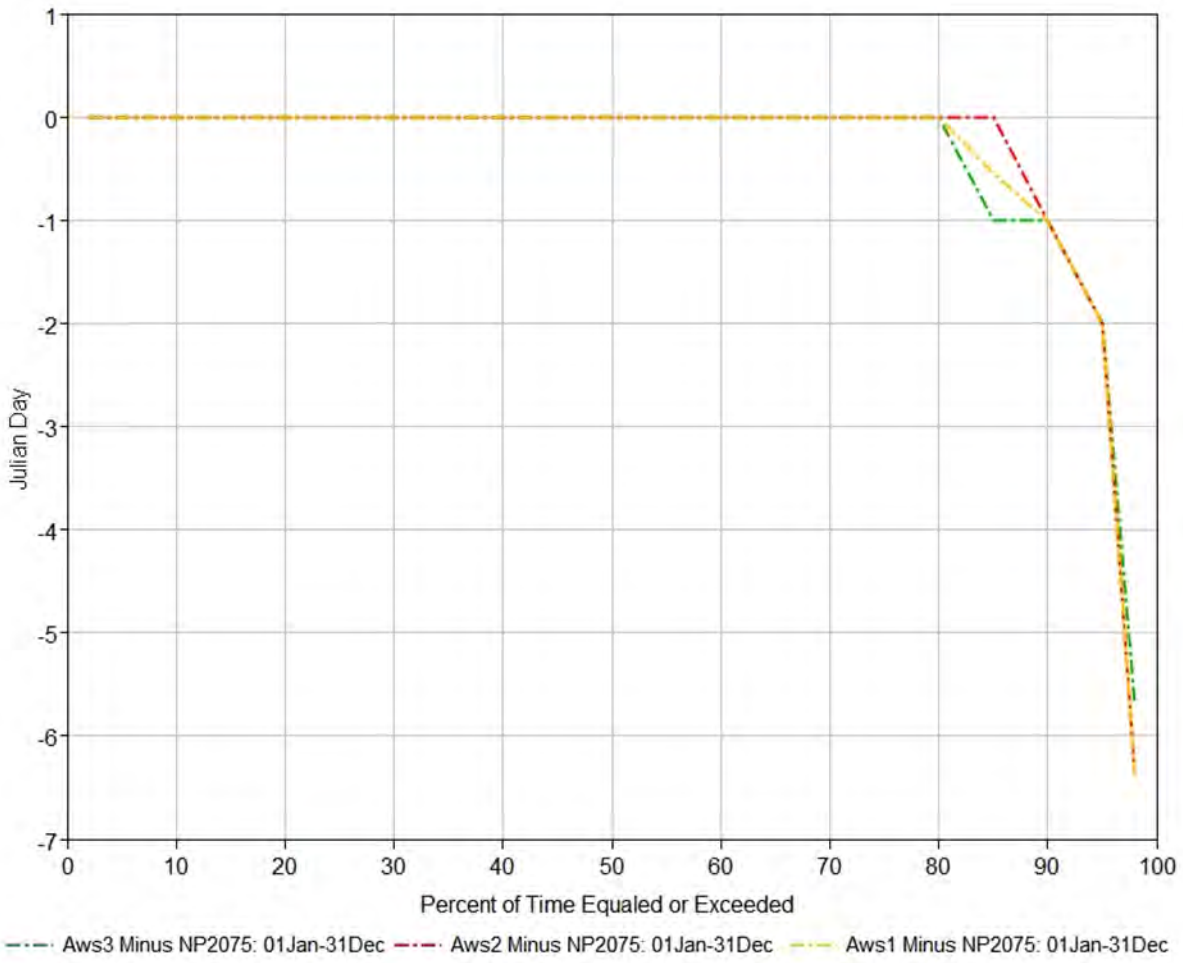

Figure H-5: Duration curves of the change in navigation end date relative to NP2075 (Corps 2020)

Pool elevations in the four largest reservoirs follow the same trend as with System storage since over 90 percent of the System storage resides in those reservoirs. At Fort Peck, 0.5 percent of the 89-year period of record results in higher pool elevations of at least 1.0 foot under simulations AWS 1, AWS 2, and AWS 3 compared to NP2075. These changes occur during flood evacuation years. In these years, changes to System storage causes different rules within the ResSim model to activate or the evacuation service level is lower due to less System storage at the start of the navigation season. The general trend is lower pool elevations due to the ENDAWS depletions, but approximately 90 percent of the 89-year period of record has less than 1.0-foot change in pool elevation. Extended droughts can cause pool elevation reductions greater than 1.0 foot, which occurs during the 1930's drought. Since additional water supply depletions are not occurring from Fort Peck reservoir, all scenarios are relatively the same as shown in Figure H-6.

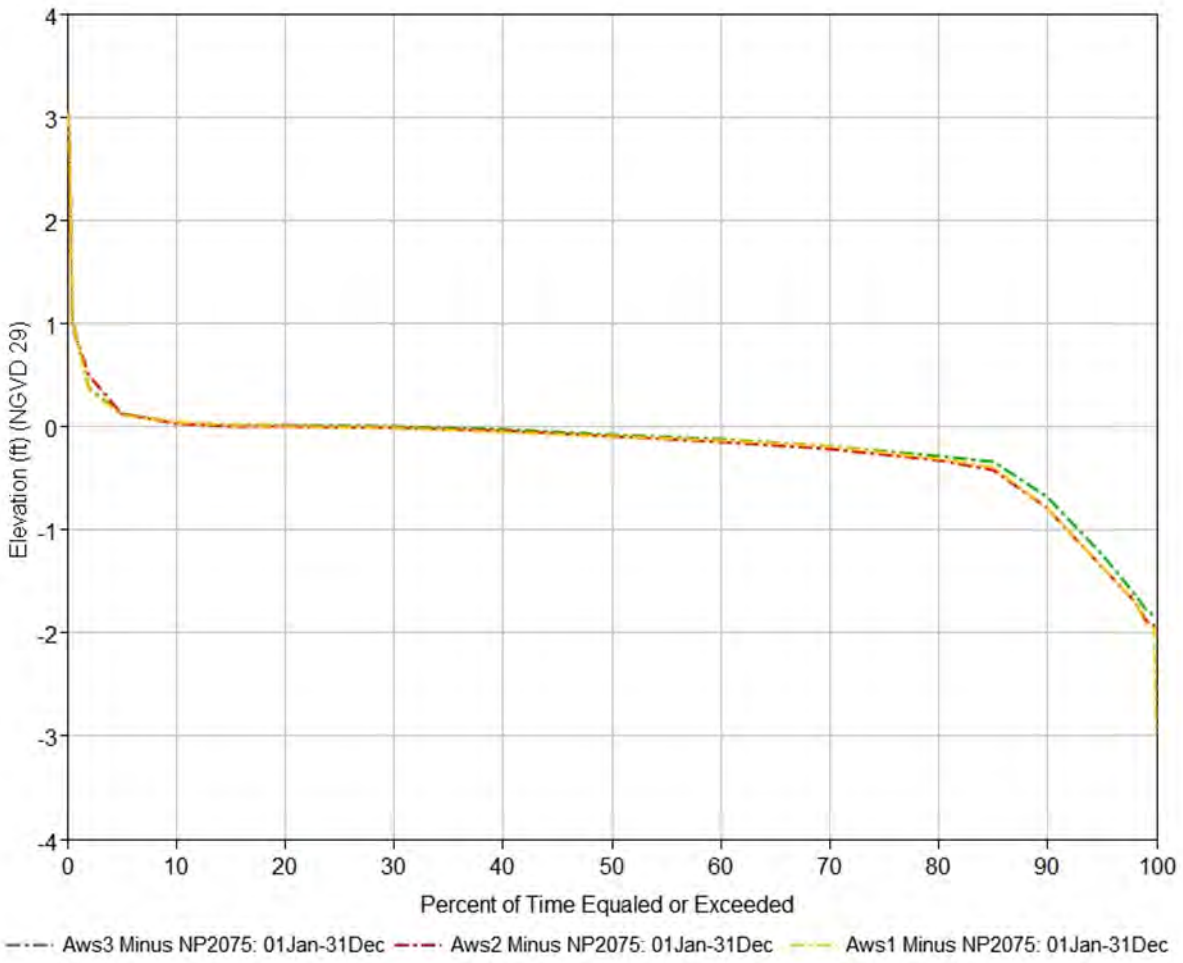

Figure H-6: Duration curves of the change in Fort Peck pool elevation relative to NP2075 (Corps 2020)

At Garrison Reservoir, 1.0 percent of the 89-year period of record results in higher pool elevations of at least 1.0 foot under simulation AWS 1, AWS 2, and AWS 3 compared to NP2075, which occur during flood evacuation years. As with Fort Peck, the general trend is lower pool elevations, but approximately 88 percent of the period has less than 1.0-foot change in pool elevation. The ENDAWS water supply depletions in combination with extended droughts, such as the 1930's drought, results in reductions in Garrison pool elevation greater than 1.0 foot occurring for 5 percent of the period, as shown in Figure H-7. The AWS 3 simulation results in approximately 0.1-foot lower pool elevations than AWS 1 and AWS 2 simulations since all of the ENDAWS water supply depletions are withdrawn via Garrison Reservoir and the Garrison Diversion Unit (GDU).

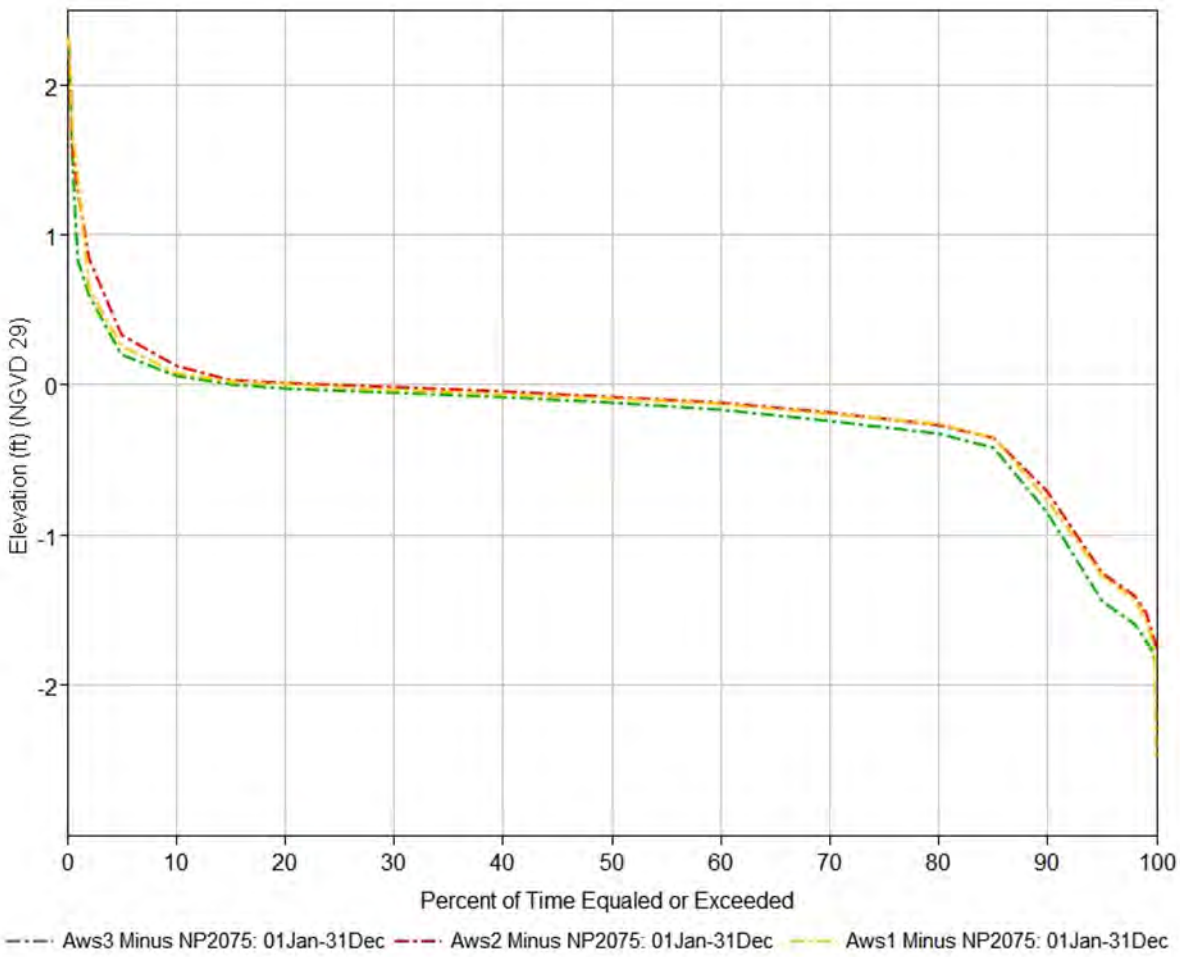

Figure H-7: Duration curves of the change in Garrison pool elevation relative to NP2075 (Corps 2020)

At Oahe, 2.0 percent of the 89-year period of record results in higher pool elevations of at least 1.0 foot under simulations AWS 1, AWS 2, and AWS 3 compared to NP2075, which occur during flood evacuation years. As with Fort Peck and Garrison, the general trend is lower pool elevations, but approximately 88 percent of the period has less than 1.0-foot change in pool elevation. The ENDAWS water supply depletions in combination with extended droughts, such as the 1930's drought, results in reductions of Oahe pool elevation greater than 1.0 foot occurring for 12 percent of the period, as shown in Figure H-8. The AWS 3 simulation results in approximately 0.1- to 0.2-foot higher pool elevations than AWS 1 and AWS 2 simulations since all of the ENDAWS water supply depletions are withdrawn via Garrison Reservoir and the GDU.

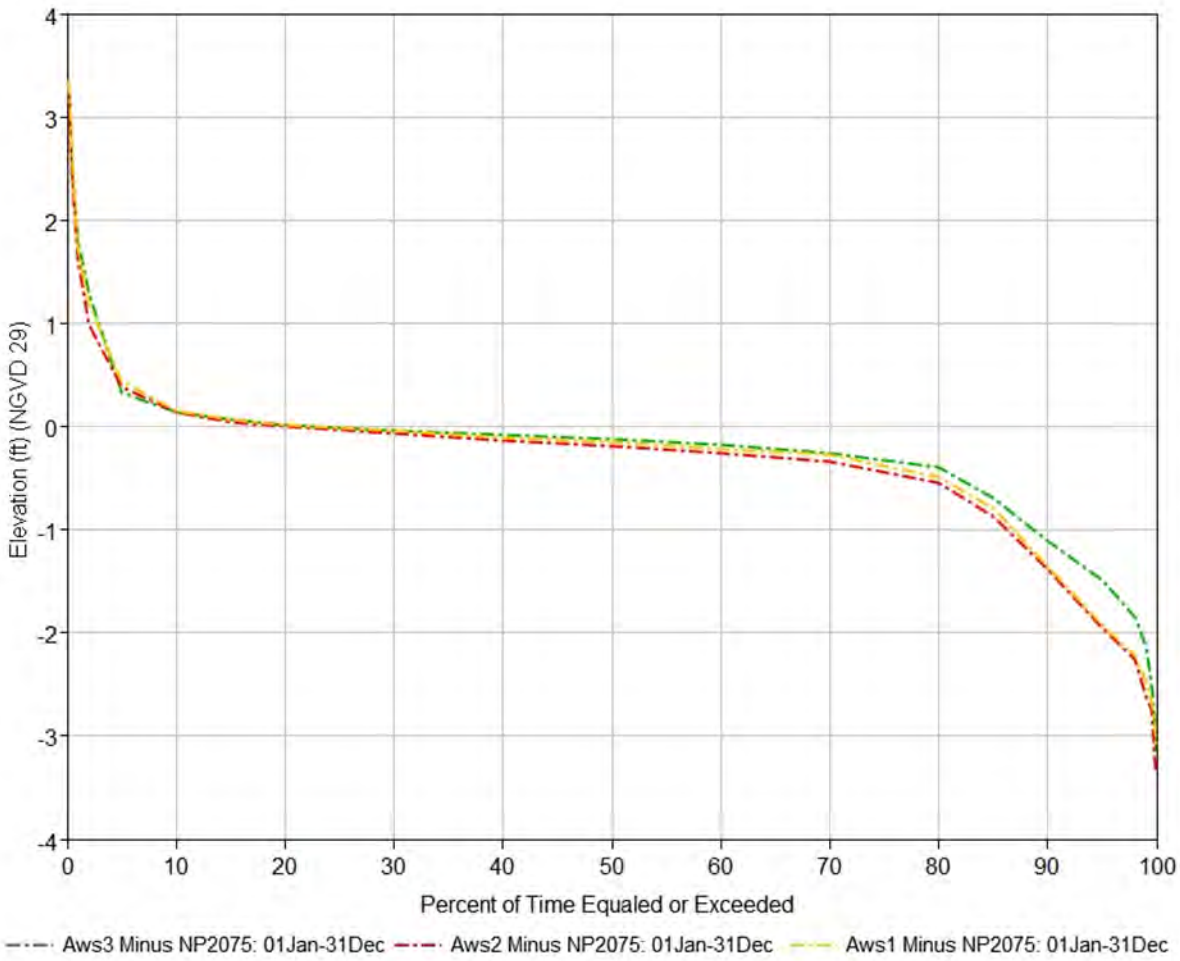

Figure H-8: Duration curves of the change in Oahe pool elevation relative to NP2075 (Corps 2020)

The Corps identified a dam safety issue with the Snake Creek Embankment, the embankment that impounds water for the GDU. An interim risk reduction measure was implemented by the Corps in the 2019 *Snake Creek Dam and Lake Audubon Reservoir Water Control Manual, Section 7 – WATER CONTROL MANAGEMENT* that states:

> *"A dam safety concern arises at the Snake Creek Embankment during drought conditions when Garrison Reservoir's elevation falls more than 43 feet below Lake Audubon's elevation. This dam safety constraint requires Lake Audubon levels be decreased as necessary through operation of the conduit slide gate any time the Garrison Reservoir pool is, or is anticipated to be, more than -43 feet lower than the Lake Audubon pool level. During drought conditions, the performance of the embankment is monitored closely to evaluate the dam's integrity with regard to hydrostatic pressure and under-seepage. Based on the results of the embankment monitoring and the performance of the dam under these loading conditions, the 43-foot differential constraint may be adjusted to ensure safe and efficient operation of the embankment."*

This means during a long-term drought; Audubon Lake would need to be drawn down to maintain less than 43-feet differential between Audubon Lake and Garrison Reservoir. This impacts the GDU's and the ability to deliver water down the McClusky Canal to meet all project needs if Garrison's pool elevation falls below 1804.0 feet. This would affect the ability to deliver water from

the GDU for simulations AWS 1 and AWS 3, unless the embankment is repaired or alternate means to transport water into the McClusky Canal are constructed. Figure H-9 shows the period between 1934 and 1942 when this threshold is not met. During this period, under the NP2075 scenario, the pool elevation falls below 1804.0 feet for 1,287 days. The pool elevation falls below 1804.0 feet for 1,376 days; 1,373 days; and 1,388 days under the AWS 1, AWS 2 and AWS 3 simulations, respectively. This equates to about 42% of the time between 1934 and 1942 that water may not be supplied under AWS 1 and AWS 3. AWS 2 would be able to supply water all times during this period. Garrison pool elevation does not fall below 1804.0 feet during any other years in the 89-year period of record (Corps 2020).

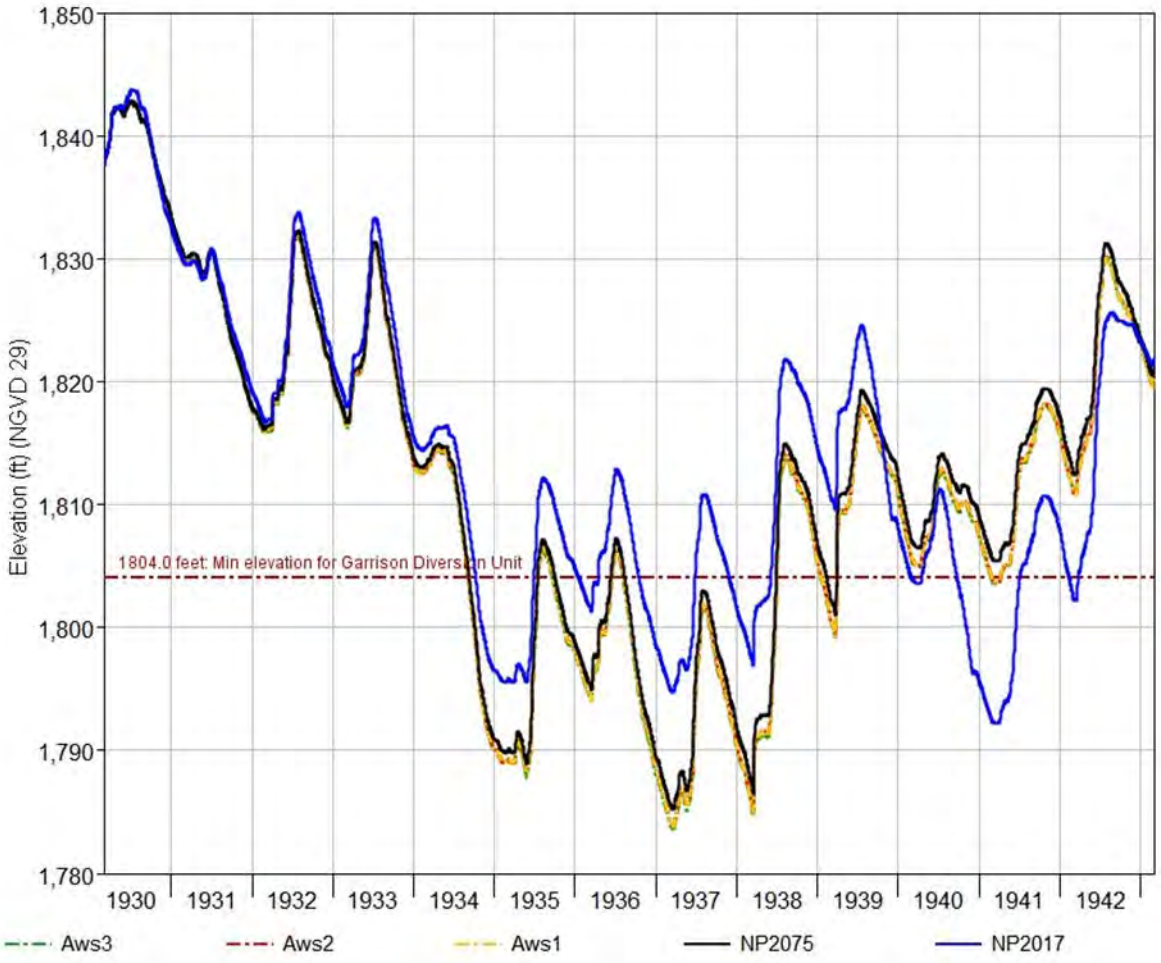

Figure H-9: Annual minimum Garrison Reservoir levels in 1930-1943 for simulations (Corps 2020)

System Releases Impacts The Corps analysis also evaluated dam releases. Releases from the six System dams are affected by cumulative and continuing growth of deposited sediment and System depletions, and lower Missouri inflows. Releases from the upper three reservoirs are based on the need to balance the effects of depletions, sedimentation and flood storage evacuation while ensuring that the water required for meeting the Gavins Point release (to meet downstream navigation) is in Gavins Point Reservoir. The Gavins Point releases are made to meet lower Missouri River navigation and flood control requirements and to meet flood storage evacuation requirements from the System reservoirs, as well as to lower Missouri River flow requirements in non-navigation years.

The Corps analysis also found that relatively small differences in annual releases occur on a monthly basis when comparing the NP2075 simulation releases at the upper 3 dams (Fort Peck, Garrison, and Oahe) to the three ENDAWS simulations. Releases from the mainstem projects under the AWS 1, AWS2, and AWS 3 simulations are nearly identical to the NP2075 releases. Figure H-10 shows the duration curves of differences in releases at Fort Peck and approximately 98 percent of the 89-year period of record has a change less than 1,000 cfs. There is approximately 1 percent of the period with changes greater than 1,000 cfs and 1 percent of the period with changes less than -1,000 cfs (Corps 2020).

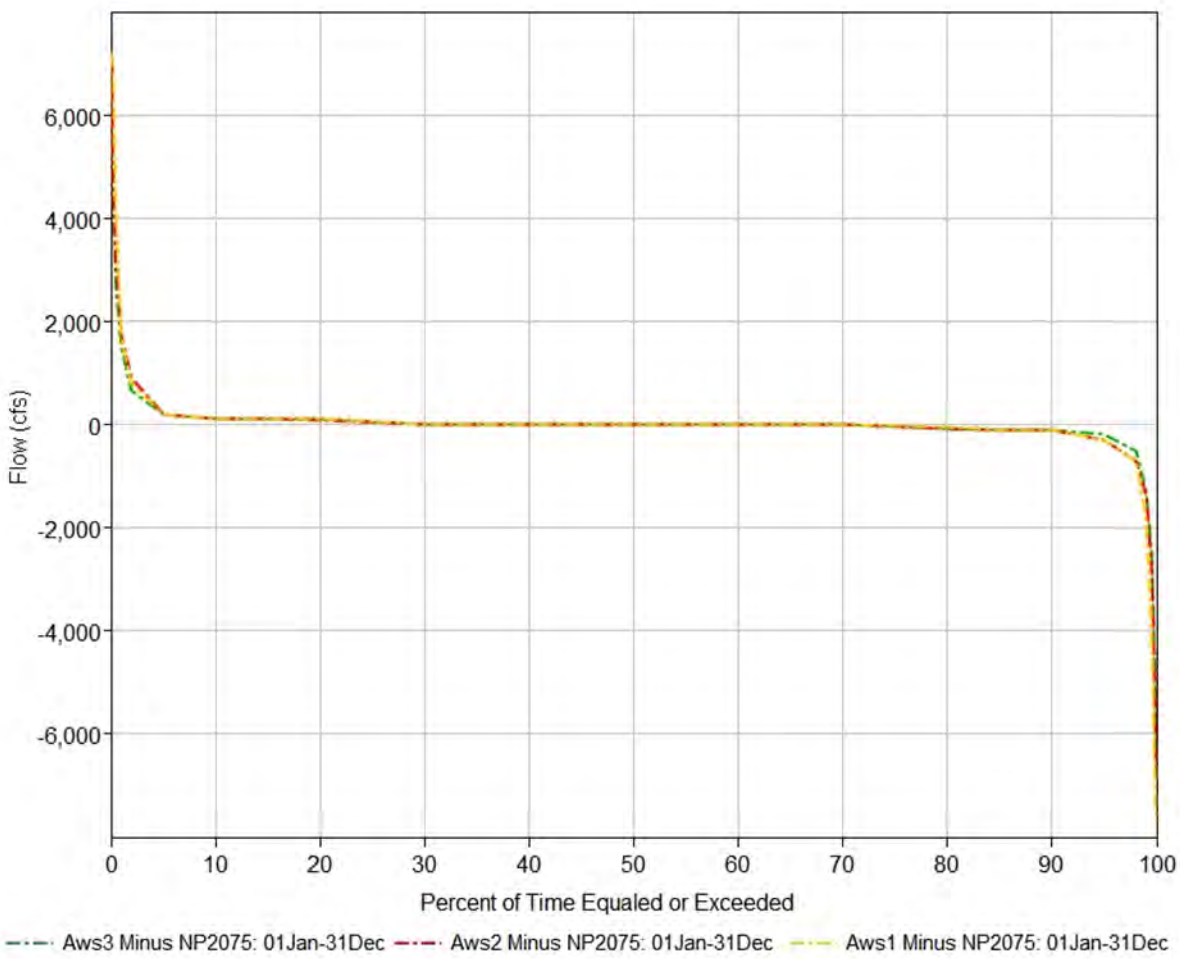

Figure H-10: Duration curves of the change in Fort Peck releases relative to NP2075 (Corps 2020)

Figure H-11 shows the duration curves of differences in releases at Garrison, which are similar to Fort Peck. Approximately 96 percent of the 89-year period of record has a change less than 1,000 cfs. There is approximately 2 percent of the period with changes greater than 1,000 cfs and 2 percent of the period with changes less than -1,000 cfs. Each ENDAWS depletions simulation has a similar effect on releases (Corps 2020).

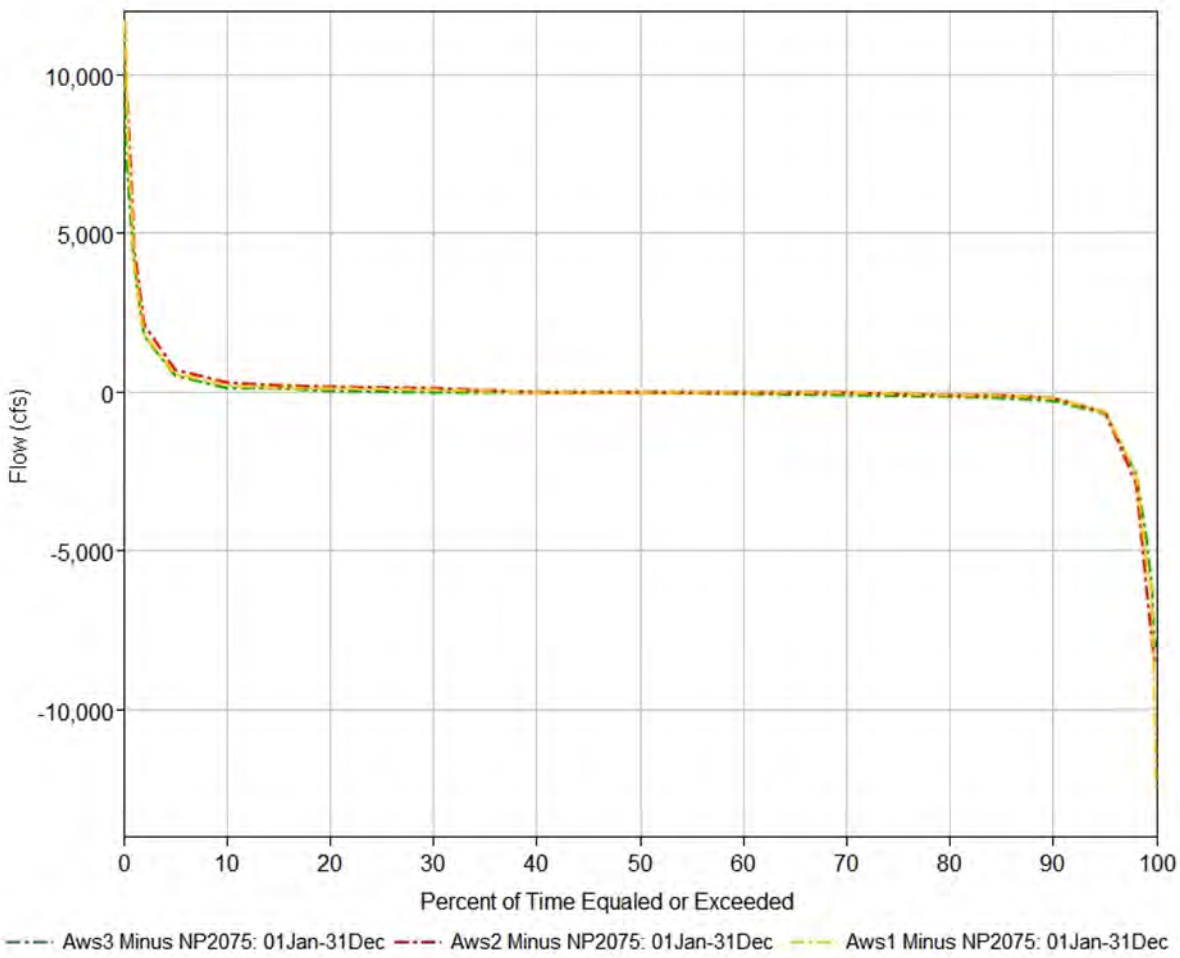

Figure H-11: Duration curves of the change in Garrison releases relative to NP2075 (Corps 2020)

Figure H-12 shows the duration curves of differences in releases at Oahe and similar to Fort Peck and Garrison. Approximately 93 percent of the 89-year period of record has a change less than 1,000 cfs. There is approximately 2 percent of the period with changes greater than 1,000 cfs and 5 percent of the period with changes less than -1,000 cfs. As with Garrison, each ENDAWS water supply depletion scenario has a similar effect on releases (Corps 2020).

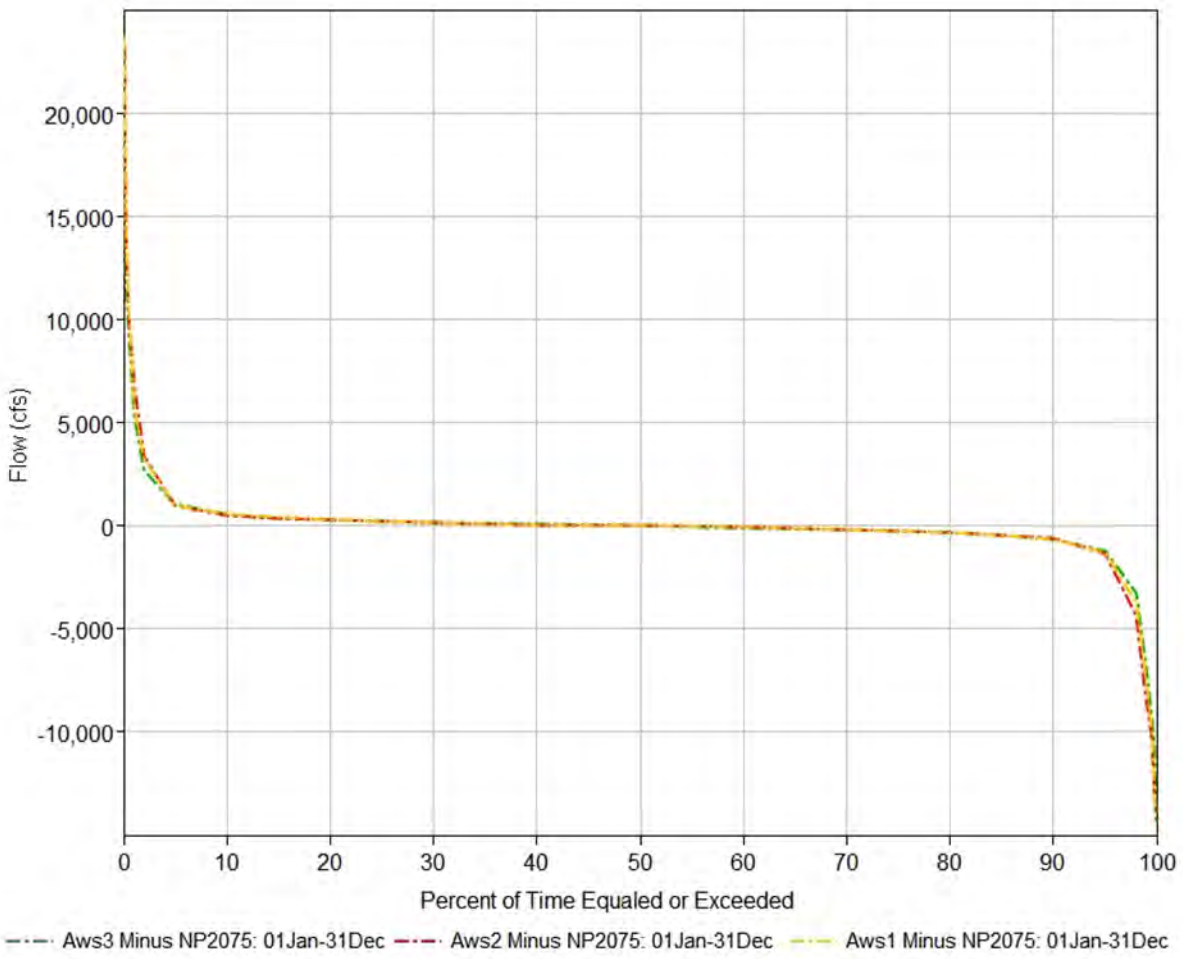

Figure H-12: Duration curves of the change in Oahe releases relative to NP2075 (Corps 2020)

The additional ENDAWS water supply depletion simulations have a similar effect on Gavins Point releases as with the upper three reservoirs: Fort Peck, Garrison, and Oahe. Figure H-13 shows that 96 percent of the 89-year period of record has less than 1,000 cfs difference in Gavins Point releases when compared to NP2075. The remaining 4 percent of the period is split evenly between, greater than a 1,000 cfs change, and less than a -1,000 cfs change (Corps 2020).

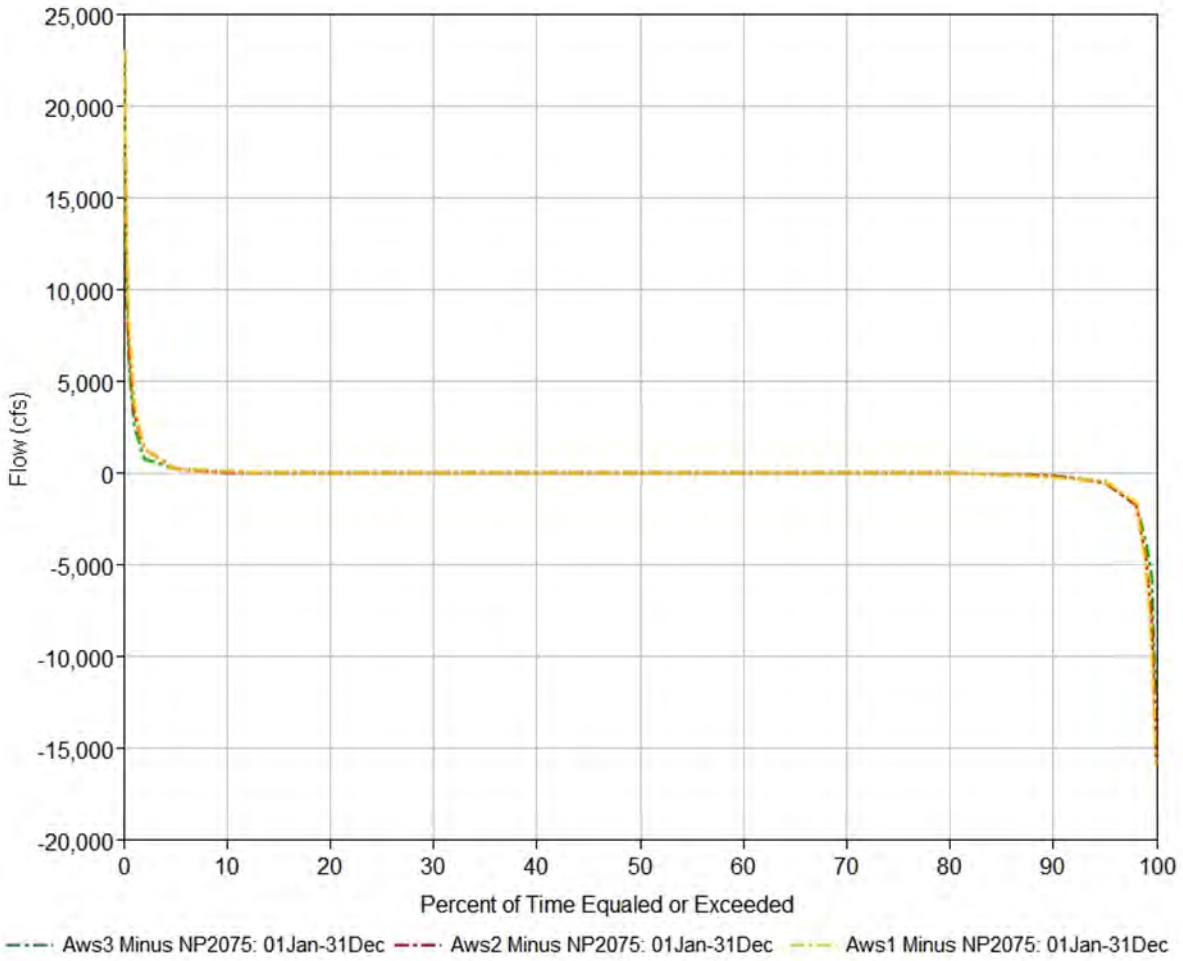

Figure H-13: Duration curves of the change in Gavins Point releases relative to NP2075 (Corps 2020)

The depletions associated with the ENDAWS Project are barely detectable on Figure H-13; therefore, when comparing NP2075 to ENDAWS simulations and between the three ENDAWS Project simulations, they would have a relatively small effect on the Gavins Point releases and downstream river flows (Corps 2020).

River Flow

Differences in river flows will closely resemble the changes in releases at the nearest upstream reservoir. At Bismarck, the changes due to the additional water supply depletions in AWS 1, AWS 2, and AWS 3 simulations are nearly identical to the changes observed at Garrison. Ninety-six percent of the 89-year period of record has changes less than 1,000 cfs as shown in Figure H-14 (Corps 2020).

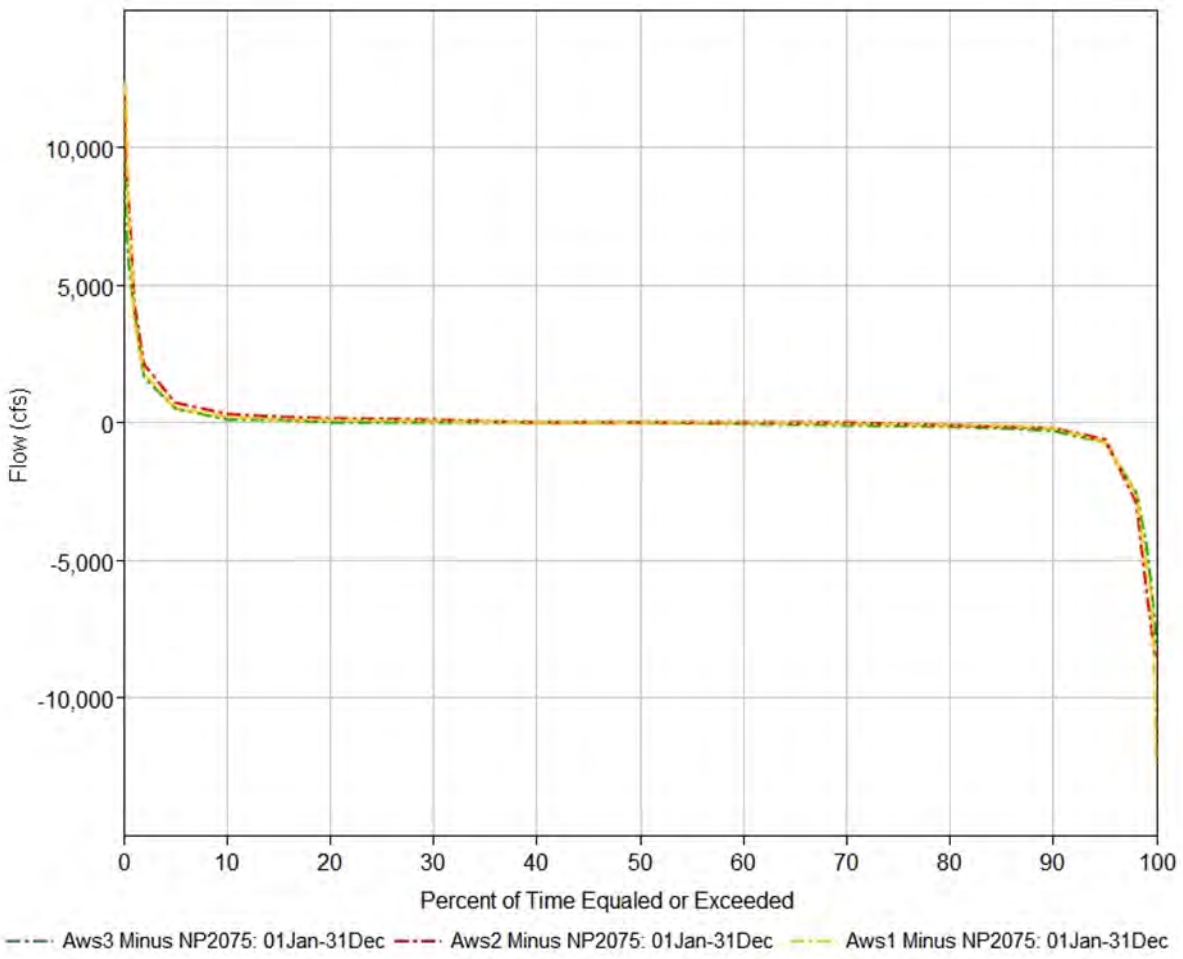

Figure H-14: Duration curves of the change in Bismarck ND flows relative to NP2075 (Corps 2020)

The river flow at Sioux City, Iowa; Omaha, Nebraska; Nebraska City, Nebraska; and Kansas City, Missouri, are nearly identical to the changes observed at Gavins Point, with 96 percent of the 89-year period of record having changes less than 1,000 cfs; as shown in Figure H-13 (Corps 2020).

EIS Alternatives

Alternative A – No Action

In the Alternative A, No Action Alternative, the GDU would deliver up to 20 cfs through the Central North Dakota Water Supply Project from the McClusky Canal to provide water to Central North Dakota water users via the State's RRVWSP. The State's RRVWSP would withdraw 145 cfs from the Missouri River to deliver water to the Sheyenne River. All other alternatives will be compared to this No Action Alternative. This alternative was model simulation ENDAWS Scenario 1 (AWS 1) and is described as No Action in chapter 3. Table H-14 summarizes the five depletion simulations performed for this EIS.

Table H-14: Summary of Simulations

Simulations	Depletion Descriptions
No Project Year 2017 (NP2017)	Existing depletions
No Project Year 2075 (NP2075)	(Existing depletions, minus 3.5 MAF loss of storage capacity due to sedimentation, plus 0.516 MAF of reasonably foreseeable future non-project depletions)
ENDAWS Scenario 1 (No Action)	0.1195 MAF depletions (0.1050 MAF Garrison to Oahe reach and 0.0145 MAF Fort Peck to Garrison reach) + No Project Year 2075 depletions
ENDAWS Scenario 2 (MR Intake Depletions)	0.1195 MAF depletions (Garrison to Oahe reach) + No Project Year 2075 depletions
ENDAWS Scenario 3 (Canal Intake Depletions)	0.1195 MAF depletions (Fort Peck to Garrison reach) + No Project Year 2075 depletions

* Note: MAF = million acre-feet

System Storage

The Corps analysis found, in general, System storage is lower in the No Action than NP2075, but approximately 85 percent of the 89-year period has less than 0.5 MAF change in System storage. During the 1930's drought, the No Action depletion results in System storage difference greater than 0.5 MAF. This is noted in the fall of 1942 when System storage peaked approximately 0.9 MAF less than NP2075. The combination of drought conservation measures and increased runoff reduces this difference in System storage to less than 0.2 MAF by 1946.

Service levels are different mainly in flood evacuation years because of differences in System storage. These differences in System storage can increase or decrease service levels, which determines releases from Gavins Point. Service level changes by 1,000 cfs or less for 98 percent of the 89-year period. For less than 2 percent of the period, the service level is either increased or decreased between 1,000 and 5,000 cfs. The increases and decreases of service level, greater than 1,000 cfs, generally occur during flood evacuation years when the service level has been increased above full service (Corps 2020).

Navigation season length show changes of 1 day or less for 90 percent of the 89-year period and 3 years have greater than 2 days. In 1942 and 1943, as the reservoirs recover from the 1930's drought, the navigation season length is shorter by 4 or 5 days. In 2015, the navigation season is extended by 10 days under the NP2075 simulation to evacuate storage, but a normal 8-month navigation season occurs under No Action.

In summary, simulated minimum System storage for No Action decreased by about 0.1195 MAF compared to NP2075. The differences between the two simulations occur in extended drought periods when the depletions exacerbate the drought effects.

Reservoir Levels

The three largest mainstem reservoirs follow the same trend as the System storage, since nearly 90 percent of the System storage resides in those reservoirs. The general trend is lower reservoir levels

due to the No Action depletions compared to NP2075. Table H-15 summarizes the percentage of reservoir level change for the 3 largest mainstem reservoirs.

Table H-15: Percentage of reservoir level change compared to NP2075

Reservoir	Less than 1-foot change	Greater than 1-foot higher	Greater than 1-foot change during extended droughts
Fort Peck	90	0.5	-
Garrison	88	1	5
Oahe	88	2	12

To put these potential water elevation changes under No Action in perspective, the average annual reservoir level in Fort Peck Reservoir fluctuates about 10 feet. The Garrison Reservoir water level fluctuates on average approximately 11 feet, and the reservoir level at Oahe Reservoir fluctuates approximately 12 feet. Since water surface elevations under No Action are within the range of average pool fluctuations at these reservoirs, consequences of the No Action compared to NP2075 would generally be negligible. Figure H-9 shows the simulated minimum Garrison Reservoir elevation differences during the 1930's drought.

The Corps dam safety issue with the Snake Creek Embankment affects Reclamation's ability to deliver water from McClusky Canal in the No Action Alternative, unless the embankment is repaired, or an alternate means to transport water into the McClusky Canal is constructed. Figure H-9 shows the period between 1934 and 1942 when Garrison Reservoir level falls below elevation 1804. The pool elevation falls below 1804.0 feet for 1,376 days for this Alternative. This equates to about 42% of the time between 1934 and 1942 that the 20 cfs may not be supplied unless the embankment is repaired or alternate means to transport water into the McClusky Canal are constructed. The State's Red River Water Supply Project intake near Washburn, ND may be able provide the additional 20 cfs of water to Central North Dakota water during this period. Garrison pool elevation does not fall below 1804.0 feet during any other years in the 89-year period of record (Corps 2020).

Dam Releases and River Flow

Water releases are needed to meet lower Missouri River navigation and flood control requirements, and to meet flood storage evacuation requirements from the system reservoirs, as well as flow requirements on the lower river in non-navigation years. The analysis found the release differences to be nearly identical in simulated annual releases from all six mainstem dams when comparing the No Action to NP2075 (Corps 2020). Table H-16 summarizes the percentage of dam release change for the 3 largest mainstem and the farthest downstream reservoirs.

Table H-16: Percent of dam releases change compared to NP2075

Dam	Less than 1,000 cfs	Greater than 1,000 cfs	Less than -1,000 cfs
Fort Peck	98	1	1
Garrison	96	2	2
Oahe	93	2	5
Gavins Point	96	2	2

Differences in river flows will closely resemble the changes in releases at the nearest upstream reservoir. At Bismarck, North Dakota; Sioux City, Iowa; Omaha, Nebraska; Nebraska City, Nebraska; and Kansas City, Missouri, 96 percent of the 89-year period have changes less than 1,000 cfs.

Alternative B – State RRVWSP

This alternative was model simulation ENDAWS Scenario 2 (AWS 2) and is described as Missouri River Intake in chapter 3. When comparing the State's RRVWSP depletion impacts to the No Action Alternative, the impacts are nearly identical to the No Action Alternative.

System Storage

Due to the same total volume of water (0.1195 MAF) for this alternative, compared to No Action, the differences between these two simulations are identical. The System storage, navigation service level, and season length are exactly the same as described in No Action (Corps 2020).

Reservoir Levels

No action withdraws 0.105 MAF of water from directly from the Missouri River and the remaining 0.0145 MAF from GDU. Whereas, this alternative withdraws the full 0.1195 MAF from the Missouri River. The Corps analysis showed that 0.0145 MAF whether withdrawn from Garrison or Oahe reservoirs would result in no measurable difference to the mainstem reservoir levels when compared to No Action. In comparison, the 2075 storage volumes of the Garrison and Oahe reservoirs carryover multi-use zones are 16.9 and 17.9 MAF, respectively.

The State's RRVWSP would be able to supply water at all times in the 89-year period of record and is not impacted by the Corps' risk reduction measure on the Snake Creek embankment like the No Action Alternative.

Dam Releases and River Flow

Since System storage and reservoir levels would be identical to No Action, dam releases and river flow would be the same as No Action (Corps 2020).

Alternatives C and D - ENDAWS Route Option Canal Only North or South Alternatives

This alternative was model simulation ENDAWS Scenario 3 (AWS 3) and is described as McClusky Canal Intake in Chapter 3.

System Storage

Due to the same total volume of water (0.1195 MAF) for these alternatives, compared to No Action, the differences between these two simulations are identical. The System storage, navigation service level, and season length are exactly the same as described in No Action (Corps 2020).

Reservoir Levels

The Canal alternatives withdraw the full 0.1195 MAF from Garrison Reservoir. These alternatives result in Garrison Reservoir level approximately 0.1-foot lower than No Action. Conversely, Oahe reservoir level would be 0.1-0.2 feet higher. As mentioned in No Action, Garrison and Oahe typically fluctuate annually 11 and 12 feet, respectively. The other four mainstem reservoirs would have no change in reservoir level. Thus, the effects on reservoir levels would be very small compared to No Action (Corps 2020).

The Corps' interim risk reduction measure implemented to the Snake Creek Embankment reduces the ability of the GDU facilities to deliver water to meet all authorized purposes. As Garrison Reservoir's pool elevation falls below 1804.0 feet, Audubon Lake pool elevation would be lowered not exceed the 43-foot restriction. This would affect the McClusky Canal's ability to deliver a sufficient quantity of water for any of the Canal Alternatives. The Snake Creek embankment would need to be repaired or an alternate means to transport water into the McClusky Canal would need to be constructed to serve as a reliable water source for MR&I purposes. The pool elevation falls below 1804.0 feet for 1,388 of the 3287 days for these alternatives. This compares to 1376 days for a total of 12 more days than the No Action alternative. (Corps 2020). The State's request for water during this period range from 31 to 165 cfs with 79% of the time requiring the full 165 cfs. The time periods when water would not be available via the GDU would be from August 1934 through June 1935 and August 1936 through June 1938.

Dam Releases and river flow

The Corps analysis demonstrates that depletions from the Missouri River via Canal alternatives would have very little effect on System storage, reservoir level compared to No Action. The differences in dam releases and river flow would be nearly identical to No Action.

Alternatives E and F - ENDAWS Route Option Canal and Missouri River North or South Alternatives

When comparing the ENDAWS Route Option Canal and Missouri River North or South Alternatives depletion impacts to the No Action Alternative the impacts are identical to the Missouri River intake and McClusky Canal intake simulations described above. The McClusky Canal intake would be main supply utilized except for the instances when the GDU project could not supply sufficient water to all project purposes. In the event the GDU project cannot supply water than the Missouri River intake would be used to supply water for the State. Operations are thoroughly described in chapter 2 of this EIS.

Garrison and Oahe pool elevations may differ within 0.1-feet from the No Action Alternative. The impact to Garrison or Oahe Reservoir would depend on what intake pump facility was operating. If the McClusky Canal intake was operating than Garrison would be 0.1-foot lower and Oahe 0.1-foot higher. If the State's RRVWSP intake was used to supply the 165 cfs then Garrison would be 0.1-foot higher and Oahe 0.1-foot lower during the 1930's drought.

Water would be supplied at all times by one of the two intakes. The 43-feet restriction on Audubon Lake would not impact the State's ability to deliver water to the Central and Eastern parts of ND.

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Appendix I
Socioeconomics

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix I Socioeconomics

Introduction

This section describes the existing economic conditions in the study area, the methods used to estimate the regional impacts related to construction for each alternative including No Action, and the estimated regional impacts.

Existing Conditions

The existing regional economic conditions of the economic impact area are described in terms of demographics and population, housing and development, and employment and income. Each of these categories of population characteristics are potentially affected by implementation of the project alternatives.

Demographics and Population

Population estimates for July 1, 2019 were obtained from the Bureau of the Census and population projections for 2010 to 2040 were obtained from the North Dakota Department of Commerce, for North Dakota Counties. Population projections for the Expected Migration Scenario and the 2019 Census estimates are shown in Table I-1.

Table I-1: North Dakota County and State Level Population Projections

North Dakota	2019	2020	2025	2030	2035	2040
Burleigh County	95,626	100,986	107,205	110,932	112,983	113,937
Cass County	181,923	188,810	203,784	214,719	222,826	228,895
Foster County	3,210	3,384	3,409	3,434	3,446	3,438
Grand Forks County	69,451	76,955	82,966	89,081	94,535	98,121
Griggs County	2,231	2,196	2,114	2,039	1,965	1,897
McLean County	9,450	10,332	10,870	11,275	11,519	11,673
Sheridan County	1,315	1,336	1,331	1,316	1,300	1,284
Stutsman County	20,704	21,207	21,314	21,379	21,352	21,232
Wells County	3,834	4,143	4,120	4,109	4,087	4,053
Regional Total	**387,744**	**409,349**	**437,113**	**458,284**	**474,013**	**484,530**
North Dakota	**762,062**	**824,344**	**884,874**	**931,506**	**966,375**	**991,522**

The current population of the economic impact region represents slightly over half of the total state population. Population projections indicate the study area will grow into the future. Using the population projection data from the North Dakota Department of Commerce, the average annual population growth from 2010 to 2040 is projected to be 1.195% percent for the 9-county region, compared to 1.302% for all of North Dakota. Although population growth for the study area is projected to be less than for all of North Dakota, there are some areas within the study area that are projected to grow faster than the State average. For example, Cass County, which includes Fargo, has a projected annual growth rate of about 1.424% from 2010 to 2040. The population of the economic impact region is projected to grow in the future but at a rate that is lower than the state as a whole.

Housing and Development

Based on 2018 data from the U.S. Census 5-year American Community Survey, households in the 9-county economic impact region represent a little over one-half (51.4%) of total households in North Dakota, but slightly less than one-half (48.6%) of total housing units in the State. This indicates a relative housing shortage in the region. As a result of the relative housing shortage, the 9-county region accounts for a little over 80% of the building permits issued in North Dakota in 2018. Household and housing characteristic data are shown in Table I-2.

Table I-2: Household and Housing Characteristic Data

County/Region	Households	Percentage of housing that is owner-occupied	Housing units	Building permits	Median value of owner-occupied housing units	Median gross rent
Burleigh	39,495	68.50%	43,152	367	$250,600	$851
Cass	74,205	52.80%	83,894	1,1917	$211,500	$804
Foster	1,440	76.70%	1,838	5	$127,800	$591
Grand Forks	30,215	48.60%	33,390	260	$193,300	$822
Griggs	1,056	72.60%	1,471	2	$98,200	$432
McLean	4,333	80.70%	6,262	34	$163,000	$683
Sheridan	689	80.10%	923	2	$83,400	$445
Stutsman	9,055	64.30%	10,276	11	$146,100	$685
Wells	1,960	79.70%	2,512	1	$97,900	$621
Regional Total	**162,448**	-	**183,718**	**2,599**	-	-
North Dakota	**314,903**	**62.70%**	**377,649**	**3,211**	**$185,000**	**$806**

Owner-occupied housing unit rate, Households, and Persons per household are from the American Community Survey 2014 to 2018 5-year estimates. Building permits are for 2018 and housing units are for July 1, 2018.

The percentage of owner-occupied housing in the economic impact region is higher than the state average in all but two counties in the region. Cass County and Grand Forks County have a lower than average percentage of owner-occupied housing because they include the two largest public universities in the state, where a large percentage of the population would be renting. Housing and rental costs in the region are generally lower than the state average except for Burleigh, Cass and Grand Forks Counties which are the most populous counties in the state.

Employment and Income

Income, poverty, and unemployment data for the economic impact area indicates the area has relatively high unemployment. However, some counties in the region have relatively high income and low poverty while others have low income and high poverty. Income, poverty and unemployment data for the economic impact area and for North Dakota are shown in Table I-3.

Table I-3: Income, poverty, and unemployment in the economic impact region

County/Region	Median household income	Per capita income	Persons in poverty	Unemployment
Burleigh	$69,719	$37,764	7.4%	3.3%
Cass	$62,031	$36,655	10.4%	2.6%
Foster	$60,613	$33,737	8.7%	3.7%
Grand Forks	$51,951	$31,052	12.9%	2.5%
Griggs	$52,794	$35,069	9.2%	2.8%
McLean	$65,648	$35,367	9.2%	4.6%
Sheridan	$49,261	$32,559	16.6%	6.4%
Stutsman	$57,642	$32,001	11.4%	2.8%
Wells	$57,989	$34,602	11.4%	4.3%
North Dakota	**$63,473**	**$35,373**	**10.7%**	**2.4%**

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics

County level unemployment data is from the Bureau of Labor Statistics Local Area Unemployment Median household income, per capita income, median value of owner-occupied housing, and median gross rent are from American Community Survey 2014 to 2018 5-year estimates. Unemployment is from January 2019 to February 2020 and the state level North Dakota data is for 2019 (U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics; 2020).

Two counties in the study area, Burleigh and McLean, have median household that is greater than the average for all of North Dakota and two counties, Burleigh and Cass, have estimated per capita

income that is greater than for all of North Dakota. Cass County, which includes Fargo, is the most populous county in North Dakota and Burleigh County, which includes Bismarck, is the second most populous. McLean County has as much smaller population but includes the town of Garrison. Income in the other counties in the economic impact region are lower than the state average.

Five counties in the economic impact region have a poverty percentage less than the state average and all of the economic impact area counties have an unemployment rate higher than for all of North Dakota. Finally, all of the counties in the area have unemployment rates higher than the North Dakota average.

Methodology

A regional impact analysis is used to evaluate the short-term effects from construction of the Eastern North Dakota Alternate Water Supply Project alternatives. The regional impacts will occur during the period of construction. The primary purpose of a regional impact analysis is to evaluate the effect of an alternative on income, employment, and the value of output produced in the study area. For this analysis, two different impact regions are identified, and the regional impacts are estimated for both regions.

The regional economic impacts from each project proposal are analyzed using the IMPLAN (IMpact analysis for PLANing) model and estimated construction expenditures within the study region. Only expenditures that represent additional expenditures in the region, not including transfers of expenditures from one sector to another, are included in the estimation of regional impacts. The IMPLAN sectors used to estimate regional impacts were construction of other new nonresidential structures.

The regional impacts associated with each alternative are measured in terms of changes in employment, labor income, and value of output. Employment is measured in terms of total jobs, which includes full-time and part-time employment. Part-time employment could be temporary or longer-term jobs working fewer than 40 hours per week. Labor income is measured in terms of employee compensation. Industry output is a measure of the value of industry's total production and is comparable to Gross Regional Product.

The economic effects from construction expenditures are based on cost estimates for each type of activity required to build major components of the project. Portions of the construction costs were determined to be in- or out-of-region expenditures and then modeled to produce an estimate of the overall change to the regional economy, or state economy, resulting from possible implementation the various alternatives.

Construction related activities represent an increase in final demand for goods and services required to build the features associated with the alternatives. However, not all construction activities and materials will be provided by labor and businesses located in the region. Employees and materials brought in from outside the region represent economic leakages.

The percentage of total within region construction expenditures were based on information provided with the construction cost estimates. The percentages of within region expenditures for pump stations, pumps, plants, and other structures are assumed to be 67% for labor and 40% for

materials. The percentages of within region expenditures for pipes, valves, and other activities are assumed to be 50% for labor and 50% for materials. Applying these percentages to expenditure categories for each alternative, the within region expenditures for each alternative can be estimated.

The extent of the impact of each alternative on the regional and state economy is evaluated by comparing the change in the value of output to gross regional product and gross state product. The construction impacts are short-term effects that will occur only during the period of construction.

Environmental Consequences

This section identifies the regional economic impacts resulting from project-related expenditures expected to occur within the local economy under each alternative, defined as the nine-county area consisting of Burleigh, Foster, Cass, Grand Forks, Griggs, McLean, Sheridan, Stutsman, and Wells Counties in North Dakota. In addition, the same construction spending amounts modeled for the nine-county area are modeled separately to display statewide economic impacts for all of North Dakota. The inputs used to estimate the regional economic impacts in IMPLAN were based on conceptual design-level cost estimates for each alternative.

For No Action (Alternative A) and the State RRVWS alternative (Alternative B), the within region expenditures are estimated to be about 49.4% of total expenditures. For the McClusky Canal Only North (Alternative C) and McClusky Canal Only South Alternative (Alternative D), the within region expenditures are estimated to be about 64.3% of total expenditures. For the McClusky Canal and Missouri River North Alternative (Alternative E), the within region expenditures are estimated to be about 59.7% of total expenditures. For the McClusky Canal and Missouri River South Alternative (Alternative F), the within region expenditures are estimated to be about 61.8% of total expenditures.

The project-related changes to employment, labor income and total economic output within the local nine-county region and the state overall, in 2019 dollars, are shown for each alternative in Table I-4. It is important to note that the costs shown in Table I-4 are local, in-region costs only, and do not represent the total estimated costs of the alternatives.

Table I-4: Summary of In-region Economic Impacts by Alternative – IMPLAN Output

Total Estimated Construction Costs	Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Alternative A				
Regional	551,740,514	9,763	603,795,317	1,100,231,969
State	551,740,514	9,308	584,100,299	1,060,377,190
Alternative B				
Regional	539,888,854	9,553	590,825,494	1,076,598,440
State	539,888,854	9,108	571,553,535	1,037,599,762
Alternative C				
Regional	432,480198	7,572	473,283,209	862,413,631
State	432,480,198	7,296	457,845,321	831,173,578
Alternative D				
Regional	437,569,108	7,743	478,852,237	872,561,482
State	437,569,108	7,382	463,232,698	840,953,835
Alternative E				
Regional	613,260,468	10,851	650,404,988	1,222,909,601
State	613,260,468	10,346	649,228,422	1,178,610,951
Alternative F				
Regional	592,725,281	10,488	648,646,857	1,181,960,152
State	592,725,281	10,000	627,488,839	1,139,144,855

The regional economic impact results presented in Table I-4 indicate the regional impacts for the smaller 9-county region are actually larger than the impacts for the entire state. This result can occur when the smaller subset region is surrounded by more rural regions. An evaluation of regional economic impacts for a large study area, such as an entire state, would be expected to have larger impacts than for a smaller area, such as a sub-set of counties within the state because larger geographies typically capture more production as local. However, in some cases the economy of a subset of the larger region may reflect greater indirect and induced impacts than that of the larger region.

In this situation there may be a small difference in production between the smaller geography and the larger one, but a significant increase in demand for the larger area. The supply relative to demand is much higher in the smaller region than in the larger region. As a result, the larger region sees a much larger increase in demand for the products produced in the smaller geography but does not

substantially increase the supply available to meet that demand. This result applies to labor income as well. The regional impacts for the 9-county region and the state-wide regional impacts can be assumed to be essentially the same.

Throughout the report, each alternative has a set of tables: the first tables provide the highest summary level information (as in TableI-4, above), and the second set of tables provide an intermediate summary.

IMPLAN Modeling

The IMPLAN model is a static regional input-output economic model that estimates changes in economic output, income, and employment within a specific region resulting from changes in spending within the specified regional economy (IMPLAN 2018). The IMPLAN model is a widely accepted and used static model that calculates economic impacts resulting from a change in economic activity in a defined regional economy. For the ENDAWS project, estimated construction related expenditures were injected (run through IMPLAN) into the nine-county region to show impacts within the nine-county region and the state separately. Economic impacts were modeled based on conceptual design-level cost estimates.

In-region expenditures expected for the project were aligned with the corresponding IMPLAN construction sector code and entered into the model. The IMPLAN multipliers measure the amount of total economic activity that results from an industry (or household) spending an additional dollar in the local economy. The IMPLAN model generates a series of tables to show the direct, indirect, and induced (and the combination, or total of the three) economic impacts to gross receipts, i.e., economic output, resulting from an injection of dollars into a specific industry, or industries, within a defined economic region.

Direct impacts are the injection of dollars into the regional economy, either as local expenditures or purchases of goods and services that are made by the project. Alternatively stated, direct economic effects are the expenditures made by the Project for purchasing local construction supplies and labor. Indirect impacts constitute inter-industry transactions that occur when supplying industries respond to increased demands from the directly affected industries, or sectors. Induced effects are the impacts of additional household spending generated by employees of all industries affected both directly and indirectly by the change in expenditures, i.e., household spending of employees of the construction industry, as well as employees of the business establishments providing the inputs to the construction businesses involved directly in the project. Induced effects include changes in local spending that result from income changes in the directly and indirectly affected industry sectors, for example, impacts from wage expenditures. The total effects (sum of direct, indirect, and induced economic effects) in this report show the regional economic impacts from local project expenditure amounts by alternative and sector.

IMPLAN Inputs

For IMPLAN modeling, the total estimated project costs by alternative were considered for each construction component to identify which ones or which proportions would be considered in- or out-of-region expenditures. Only expenditures made within the local nine-county region for project components were included and categorized according to IMPLAN sectors for inputs to the model.

IMPLAN Output and Results

The IMPLAN output tables show four major types of impacts (direct, indirect, induced, and total effects) for employment, labor income, value added, and economic output. Employment is the number of jobs generated by the economic activity of the project. A job may be a full-time job, a part-time jobs, temporary employment, or seasonal employment. Total labor income is comprised of employee compensation and proprietor income. Value added was included in the most detailed set of tables only. Value added shows the net income generated after deducting the cost of intermediate inputs of goods and services purchased from other industries or sectors (including those inputs that are imported from other regions) from the total gross revenues of an industry. Total output represents the value of goods and services produced by businesses within a given industry of the regional economy and is measured in terms of sales dollars. Employment and total labor income are often of particular interest to local government officials, whereas total output is the most comprehensive measure of regional economic activity.

Alternative A – No Action

Under Alternative A, about 20 cfs of raw water would be provided from the McClusky Canal at mile marker 42.5 for in-basin use within the Central North Dakota Water Supply Project (CNDWSP). A combined State Red River Valley Water Supply Project (RRVSWP)/CNDWSP would have the ability to provide 145 cfs from the Missouri River for out-of-basin users, with an additional 20 cfs more economically provided at the appropriate time from the Canal if needed for in-basin uses. When out-of-basin water supplies are needed, the CNDWSP would not operate and the State RRVWSP would provide up to 165 cfs from the Missouri River. The CNDWSP is connected to the State RRVWSP with a six-mile long, 30-inch diameter pipeline. The State RRVWSP pipeline is a 72-inch diameter pipeline. The CNDWSP includes an intake and pumping station located on the McClusky Canal near mile-marker 42.5 that would pump 20 cfs to the hydraulic break tank. When combined with the State RRVWSP pipeline segments, the total pipeline length is 172 miles.

Economic Impacts The IMPLAN model, which was described at the beginning of this section, was used to estimate expected regional economic effects resulting from each type of project-related expenditure. Local estimated construction costs were usually a percentage roughly around half of the total construction costs. Project-related spending within the nine-county region was totaled and entered into the IMPLAN model; therefore, expenditure output data in the table below is limited to in-region expenditures that were run to show impacts at the nine-county level and statewide level.

Table I-5 shows aggregated Alternative A construction expenditure impact results. Alternative A could potentially generate up to about 9,763 jobs and 1.1 billion dollars in the region or approximately 9,308 jobs and 1.06 billion statewide. The first column of the summary table includes the two areas of impact: the nine-county region and the state of North Dakota overall. The second column is the total amount of in-region construction cost estimated for Alternative A. The third column is the number of jobs that would be created given the amount spent in the second column. The fourth column shows the total labor income that would be generated. The fifth column shows the total economic effect (direct, indirect, and induced) for the regional economy and the state economy.

Table I-5: Summary of Regional Alternative A Costs or Expenditures and Impacts – IMPLAN Output

Alternative A Regional and Statewide Impacts	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Regional	551,740,514	9,763	603,795,317	1,100,231,969
State	551,740,514	9,308	584,100,299	1,060,377,190

Tables I-6 and I-7 show the same economic indicators as the summary table in more detail by including the major construction component costs. For example, the pipeline D segment is the single most expensive major construction component, which in turn would generate the most employment, labor income, and economic output in the region or in the state.

Table I-6: Alternative A Regional: Costs or Expenditures and Regional Impacts by Major Construction Components – IMPLAN Output

Regional Alternative A Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Missouri River Intake Pump Station	27,788,275	491.7	30,410,002	55,412,912
Red River Valley Water Treatment Plant	18,544,565	328.1	20,294,180	36,979,925
Main Pump	17,752,586	314.1	19,427,482	35,400,635
Central ND Intake and Pump Station	4,166,441	73.7	4,559,530	8,308,347
Hydraulic Break Tank	7,940,056	140.5	8,689,173	15,833,355
Control Valve Structure and Discharge Structure	4,792,351	84.8	5,244,493	9,556,481
Pipeline Segment A	64,516,149	1,141.6	70,603,024	128,652,378
Pipeline Segment B	83,367,284	1,475.2	91,232,698	166,243,639
Pipeline Segment C	45,565,969	806.3	49,864,960	90,863,611
Pipeline Segment D	269,621,619	4,770.9	295,059,482	537,655,504
Pipeline Segment E-30	7,685,219	136.0	8,410,293	15,325,182
Total	**551,740,514**	**9,763**	**603,795,317**	**1,100,231,969**

Table I-7: Alternative A State - Costs or Expenditures and Statewide Impacts by Major Construction Components – IMPLAN Output

State Alternative A Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Missouri River Intake Pump Station	27,788,275	468.8	29,418,068	53,405,636
Red River Valley Water Treatment Plant	18,544,565	312.9	19,632,211	35,640,366
Main Pump	17,752,586	299.5	18,793,782	34,118,280
Central ND Intake and Pump Station	4,166,441	70.3	4,410,804	8,007,385
Hydraulic Break Tank	7,940,056	134	8,405,743	15,259,808
Control Valve Structure and Discharge Structure	4,792,351	80.8	5,073,424	9,210,307
Pipeline Segment A	64,516,149	1,088.4	68,300,045	123,992,078
Pipeline Segment B	83,367,284	1,406.4	88,256,806	160,221,633
Pipeline Segment C	45,565,969	768.7	48,238,430	87,572,170
Pipeline Segment D	269,621,619	4,548.6	285,435,026	518,179,484
Pipeline Segment E-30	7,685,219	129.7	8,135,960	14,770,043
Total	**551,740,514**	**9,308**	**584,100,299**	**1,060,377,190**

Alternative B – State Red River Valley Water Supply Project

Alternative B would include a raw water intake and pumping station on the Missouri River south of Washburn, North Dakota. The Missouri River intake and pumping station facility would pump 165 cfs of water to a State water treatment plant approximately two miles east of the intake. The peak flow rate of 165 cfs would provide 20 cfs to central North Dakota users in the Missouri River Basin from the pipeline, 5 cfs to users on the pipeline after the continental divide between the MRB and HBB, and 140 cfs would be delivered to the Sheyenne River above Lake Ashtabula. The State water treatment plant is intended to provide basic sedimentation (sand/grit removal) and chlorine disinfection for three-log *Giardia* and four-log virus removal/inactivation. The State water treatment plant would utilize a combination of contact basins and pipeline residence time to obtain the required chlorine disinfection contact time. The main pumping station is adjacent to the State water treatment plant would pump the water to a set of hydraulic break tanks located approximately 60 miles east. Water would then flow by gravity from the hydraulic break tanks to the control valve structure and

discharge structure on the Sheyenne River approximately six miles south of Cooperstown. The pipeline segments of this alternative total 166 miles of pipe and the pipe would be 72 inches in diameter.

Economic Impacts Table I-8 shows aggregated Alternative B construction expenditure impact results which could potentially generate up to about 9,553 jobs and 1.07 billion dollars in the region or approximately 9,108 jobs and 1.03 billion statewide. The first column of the summary table includes the two areas of impact: the nine-county region and the state of North Dakota overall. The second column is the total amount of in-region construction cost estimated for Alternative B. The third column is the number of jobs that would be created given the amount spent in the second column. The fourth column shows the total labor income that would be generated. The fifth column shows the total economic effect (direct, indirect, and induced) for the regional economy and the state economy.

Table I-8: Summary of Regional Alternative B Costs or Expenditures and Impacts – IMPLAN Output

Alternative B Regional and Statewide Impacts	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Regional	539,888,854	9,553	590,825,494	1,076,598,440
State	539,888,854	9,108	571,553,535	1,037,599,762

Tables I-9 and I-10 show the same economic indicators as the summary table in more detail by including the major construction component costs. For example, the pipeline D segment is the single most expensive major construction component, which in turn would generate the most employment, labor income, and economic output in the region or in the state.

Table I-9: Alternative B Costs or Expenditures by Major Construction Components – Nine-County Region - IMPLAN Output

Regional Alternative B Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Missouri River Intake Pump Station	27,788,275	491.7	30,410,002	55,412,912
Red River Valley Water Treatment Plant	18,544,565	328.1	20,294,180	36,979,925
Main Pump	17,752,586	314.1	19,427,482	35,400,635
Hydraulic Break Tank	7,940,056	140.5	8,689,173	15,833,355

Regional Alternative B Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Control Valve Structure and Discharge Structure	4,792,351	84.8	5,244,493	9,556,481
Pipeline Segment A	64,516,149	1,141.6	70,603,024	128,652,378
Pipeline Segment B	83,367,284	1,475.2	91,232,698	166,243,639
Pipeline Segment C	45,565,969	806.3	49,864,960	90,863,611
Pipeline Segment D	269,621,619	4,770.9	295,059,482	537,655,504
Total	**539,888,854**	**9,553**	**590,825,494**	**1,076,598,440**

Table I-10: Alternative B Costs or Expenditures by Major Construction Components – North Dakota – IMPLAN Output

Statewide Alternative B Major Construction Components	In-Region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Missouri River Intake Pump Station	27,788,275	468.8	29,418,068	53,405,636
Red River Valley Water Treatment Plant	18,544,565	312.9	19,632,211	35,640,366
Main Pump	17,752,586	299.5	18,793,782	34,118,280
Hydraulic Break Tank	7,940,056	134	8,405,743	15,259,808
Control Valve Structure and Discharge Structure	4,792,351	80.8	5,073,424	9,210,307
Pipeline Segment A	64,516,149	1,088.4	68,300,045	123,992,078
Pipeline Segment B	83,367,284	1,406.4	88,256,806	160,221,633
Pipeline Segment C	45,565,969	768.7	48,238,430	87,572,170
Pipeline Segment D	269,621,619	4,548.6	285,435,026	518,179,484
Total	**539,888,854**	**9,108**	**571,553,535**	**1,037,599,762**

Alternative C – McClusky Canal Only North

This alternative would provide 165 cfs from the McClusky Canal approximately 1.5 miles northwest of McClusky near mile marker 57 of the McClusky Canal. The McClusky Canal intake and pumping station would pump water from the McClusky Canal to a Biota WTP immediately adjacent to the intake facilities. The McClusky Canal main pumping station downstream of the Biota WTP would pump water approximately 11 miles east to hydraulic break tanks near the intersection of Highway 14 and Highway 200. The treated water would then flow by gravity through 21 miles of pipe terminating at the connection with the State RRVWSP main transmission pipeline. The water would continue to flow through this main transmission pipeline, through the control valve structure and be released through the discharge structure into the Sheyenne River approximately six miles southeast of Cooperstown.

Economic Impacts Table I-11 shows aggregated Alternative C construction expenditure impact results, which could potentially generate up to about 7,296 jobs and 831.2 million dollars in the region or approximately 7,572 jobs and 862.4 million statewide. The first column of the summary table includes the two areas of impact: the nine-county region and the state of North Dakota overall. The second column is the total amount of in-region construction cost estimated for Alternative C. The third column is the number of jobs that would be created given the amount spent in the second column. The fourth column shows the total labor income that would be generated. The fifth column shows the total economic effect (direct, indirect, and induced) for the regional economy and the state economy.

Table I-11: Summary of Regional Alternative C Costs or Expenditures and Impacts – IMPLAN Output

Alternative C Regional and Statewide Impacts	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Regional	432,480,198	7,572	473,283,209	862,413,631
State	432,480,198	7,296	457,845,321	831,173,578

Tables I-12 and I-13 show the same economic indicators as the summary table in more detail by including the major construction component costs. For this analysis, Biota WTP Option 1 was included in the analysis as a conservative approach to evaluating the economic impact of this component in the alternatives that include a Biota WTP. The four Biota WTP options have a wide range of costs as discussed in Chapter 2 and Appendix B. For example, the pipeline D segment is the single most expensive major construction component, which in turn would generate the most employment, labor income, and economic output in the region or in the state.

Table I-12: Alternative C Costs or Expenditures by Major Construction Components – Nine-County Region - IMPLAN Output

Regional Alternative C Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	13,508,464	239.0	14,782,941	26,937,380
Biota WTP - Option 1 Disinfection	25,990,537	459.9	28,442,654	51,828,022
McClusky Canal Pump Station	16,615,644	294.0	18,183,273	33,133,443
Hydro Break Tank	7,917,440	1,40.1	8,664,423	15,788,256
Control Valve Structure and Discharge Structure	4,792,351	84.8	5,244,493	9,556,481
Pipeline Segment D	269,621,619	4,770.9	295,059,482	537,655,504
Pipeline Segment G	94,034,143	1,663.90	102,905,941	187,514,544
Total	**432,480,198**	**7,752**	**473,283,209**	**862,413,631**

Table I-13: Alternative C Costs or Expenditures by Major Construction Components – North Dakota – IMPLAN Output

State Alternative C Construction Costs by Major Construction Components	In-State Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	13,508,464	227.9	14,300,740	25,961,601
Option 1 Disinfection	25,990,537	438.5	27,514,892	49,950,605
McClusky Canal Pump Station	16,615,644	280.3	17,590,158	31,933,218
Hydro Break Tank	7,917,440	133.6	8,381,801	15,216,343
Control Valve Structure and Discharge Structure	4,792,351	80.8	5,073,424	9,210,307
Pipeline Segment D	269,621,619	4,548.6	285,435,026	518,179,484
Pipeline Segment G	94,034,143	1,586.4	99,549,280	180,722,020
Total	**432,480,198**	**7,296**	**457,845,321**	**831,173,578**

Alternative D – McClusky Canal Only South

This alternative would provide 165 cfs from the McClusky Canal approximately six miles southwest of McClusky near mile marker 49 on the McClusky Canal. The McClusky intake and pumping station would pump water from the McClusky Canal to a Biota WTP approximately one mile east of the intake facilities. The McClusky Canal main pumping station adjacent to the Biota WTP would pump water approximately 19 miles where the pipeline would terminate at where it connects to the main transmission pipeline of the State RRVWSP. The water would continue to flow another six miles east through the main transmission pipeline to the hydraulic break tanks. The water would then flow by gravity from the hydraulic break tanks to the control valve structure and be released through the discharge structure into the Sheyenne River approximately six miles south of Cooperstown.

Economic Impacts Table I-14 shows aggregated Alternative D construction expenditure impact results, which could potentially generate up to about 7,743 jobs and 872.6 million dollars in the region or approximately 7,382 jobs and 841.0 million statewide. The first column of the summary table includes the two areas of impact: the nine-county region and the state of North Dakota overall. The second column is the total amount of in-region construction cost estimated for Alternative D. The third column is the number of jobs that would be created given the amount spent in the second column. The fourth column shows the total labor income that would be generated. The fifth column shows the total economic effect (direct, indirect, and induced) for the regional economy and the state economy.

Table I-14: Summary of Regional Alternative D Costs or Expenditures and Impacts – IMPLAN Output

Alternative D Regional and Statewide Impacts	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Regional	437,569,108	7,743	478,852,237	872,561,482
State	437,569,108	7,382	463,232,698	840,953,835

Tables I-15 and I-16 show the same economic indicators as the summary table in more detail by including the major construction component costs. For example, the pipeline D segment is the single most expensive major construction component, which in turn would generate the most employment, labor income, and economic output in the region or in the state.

Table I-15: Alternative D Costs or Expenditures by Major Construction Components – Nine-County Region - IMPLAN Output

Regional Alternative D Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	15,369,550	272.0	16,819,614	30,648,592
Option 1 Disinfection	25,990,537	459.9	28,442,654	51,828,022
McClusky Canal Pump Station	16,959,239	300.1	18,559,284	33,818,609
Hydro Break Tank	8,069,793	142.8	8,831,150	16,092,065
Discharge Structure	4,792,351	84.8	5,244,493	9,556,481
Pipeline Segment C	45,565,969	806.3	49,864,960	90,863,611
Pipeline Segment D	269,621,619	4,770.9	295,059,482	537,655,504
Pipeline Segment I	51,200,050	906.0	56,030,597	102,098,596
Total	**437,569,108**	**7,743**	**478,852,237**	**872,561,482**

Table I-16: Alternative D Costs or Expenditures by Major Construction Components – North Dakota – IMPLAN Output

State Alternative D Construction Costs by Major Construction Components	In-State Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	15,369,550	259.3	16,270,980	29,538,379
Option 1 Disinfection	25,990,537	438.5	27,514,892	49,950,605
McClusky Canal Pump Station	16,959,239	286.1	17,953,905	32,593,565
Hydro Break Tank	8,069,793	136.1	8,543,089	15,509,146
Control Valve Structure and Discharge Structure	4,792,351	80.8	5,073,424	9,210,307
Pipeline Segment C	45,565,969	768.7	48,238,430	87,572,170
Pipeline Segment D	269,621,619	4,548.6	285,435,026	518,179,484
Pipeline Segment I	51,200,050	863.8	54,202,952	98,400,179
Total	**437,569,108**	**7,382**	**463,232,698**	**84,953,835**

Alternative E – McClusky Canal and Missouri River North

This alternative would provide full redundancy by either taking 165 cfs from the McClusky Canal near mile marker 57 (approximately 1.5 miles northwest of McClusky, North Dakota) or taking 165 cfs from the Missouri River south of Washburn or any combination thereof, for a maximum total of 165 cfs. The pipeline diameter of the State RRVWSP main transmission pipeline limits the total capacity of water crossing the continental divide to 165c fs. This alternative is proposed to be constructed and operated in two phases.

Phase 1 would develop the facilities required to utilize the McClusky Canal, and Phase 2 would develop the facilities needed to utilize the Missouri River. For utilization of the McClusky Canal, an intake and pump station near mile marker 57 would pump up to 165 cfs of water from the McClusky Canal to a Biota WTP immediately adjacent to the McClusky Canal. To utilize the Missouri River, the river intake and pump station would pump up to 165 cfs of water to a sediment removal plant approximately two miles east of the intake. The sediment removal plant is intended to provide sand/grit removal only. After grit removal, the main pumping station would pump the water to the Biota WTP which would be located adjacent to the McClusky Canal. The main pump station adjacent to the Biota WTP would pump treated water approximately 11 miles east to the hydraulic break tanks near the intersection of Highway 14 and Highway 200. The treated water would then flow through the pipeline by gravity 21 miles where it would terminate at the connection to the State RRVWSP main transmission pipeline. The water would continue to flow in this pipeline to the control valve structure and through the discharge structure into the Sheyenne River, approximately six miles southeast of Cooperstown.

Economic Impacts Table I-17 shows aggregated Alternative E construction expenditure impact results, which could potentially generate up to about 10,851 jobs and 1.22 billion dollars in the region or approximately 10,346 jobs and 1.18 billion statewide. The first column of the summary table includes the two areas of impact: the nine-county region and the state of North Dakota overall. The second column is the total amount of in-region construction cost estimated for Alternative E. The third column is the number of jobs that would be created given the amount spent in the second column. The fourth column shows the total labor income that would be generated. The fifth column shows the total economic effect (direct, indirect, and induced) for the regional economy and the state economy.

Table I-17: Summary of Local and Statewide Alternative E Construction Expenditure Impacts – IMPLAN Output

Alternative E	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Regional	613,260,468	10,851	650,404,988	1,222,909,601
State	613,260,468	10,346	649,228,422	1,178,610,951

Tables I-18 and I-19 show the same economic indicators as the summary table in more detail by including the major construction component costs. For example, the pipeline D segment is the single most expensive major construction component, which in turn would generate the most employment, labor income, and economic output in the region or in the state.

Table I-18: Alternative E Costs by Major Construction Components – Nine-County Region - IMPLAN Output

Regional Alternative E Construction Costs by Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	13,508,464	239.0	14,782,941	26,937,380
Option 1 Disinfection	25,990,537	459.9	4,428,607	51,828,022
McClusky Canal Pump Station	16,615,644	294.0	18,183,273	33,133,443
Hydro Break Tank	7,917,440	140.1	8,664,423	15,788,256
Control Valve Structure and Discharge Structure	4,792,351	84.8	5,244,493	9,556,481
Pipeline Segment D	269,621,619	4,770.9	295,059,482	537,655,504
Pipeline Segment G	94,034,143	1,663.90	102,905,941	187,514,544
Missouri River Intake Pump Station	27,788,275	491.7	30,410,002	55,412,912
Sediment Removal Plant	6,008,565	106.3	6,575,452	11,981,747
Main Pump	17,370,904	307.4	19,009,789	34,639,515
Pipeline Segment A	64,516,149	1,141.6	70,603,024	128,652,378
Pipeline Segment E	21,791,927	385.6	23,847,920	43,455,527
Pipeline Segment F	17,680,353	312.8	19,348,433	35,256,591
Pipeline Segment H	25,624,097	453.4	28,041,642	51,097,300
Total	**613,260,468**	**10,851**	**650,404,988**	**1,222,909,601**

Table I-19: Alternative E Costs by Major Construction Components – North Dakota – IMPLAN Output

State Alternative E Construction Costs by Major Construction Components	In-State Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	13,508,464	227.9	14,300,740	25,961,601
Option 1 Disinfection	25,990,537	438.5	27,514,892	49,950,605
McClusky Canal Pump Station	16,615,644	280.3	17,590,158	31,933,218
Hydro Break Tank	7,917,440	133.6	8,381,801	15,216,343
Control Valve Structure and Discharge Structure	4,792,351	80.8	5,073,424	9,210,307
Pipeline Segment D	269,621,619	4,548.6	285,435,026	518,179,484
Pipeline Segment G	94,034,143	1,586.4	99,549,280	180,722,020
Missouri River Intake Pump Station	27,788,275	468.8	29,418,068	53,405,636
Sediment Removal Plant	6,008,565	101.4	6,360,970	11,547,720
Main Pump	17,370,904	293.1	18,389,714	33,384,734
Pipeline Segment A	64,516,149	1,088.4	68,300,045	123,992,078
Pipeline Segment E	21,791,927	367.6	23,070,032	41,881,395
Pipeline Segment F	17,680,353	298.3	18,717,312	33,979,457
Pipeline Segment H	25,624,097	432.3	27,126,960	49,246,353
Total	**613,260,468**	**10,346**	**649,228,422**	**1,178,610,951**

Alternative F – McClusky Canal and Missouri River South

This alternative would also provide full redundancy by taking 165-cfs from near mile marker 49 on the McClusky Canal (approximately six miles southwest of McClusky, ND), or taking 165-cfs from the Missouri River south of Washburn, ND, or any combination thereof, for a maximum total of 165 cfs. The pipeline diameter of the State RRVWSP main transmission pipeline limits the total capacity of water crossing the continental divide to 165 cfs. This alternative is proposed to be constructed and operated in two phases.

Phase 1 would develop the facilities required to utilize the McClusky Canal, and Phase 2 would develop the facilities needed to utilize the Missouri River. For utilization of the McClusky Canal, the canal intake and pump station would pump water from the McClusky Canal to a Biota WTP approximately one mile east of the intake. To utilize the Missouri River, the river intake and pump station would pump 165 cfs of water to a sediment removal plant approximately two miles east of the intake. The sediment removal plant is intended to provide sand/grit removal only. After grit removal, the main pump station would pump water to the Biota WTP near mile marker 49 on the McClusky Canal. The McClusky Canal pumping station, adjacent to the Biota WTP would pump treated water approximately 19 miles where the pipeline terminates at the connection with the transmission pipeline of the State RRVWSP. From this juncture the water would continue in the pipeline for six miles east to the hydraulic break tanks. The water would then flow by gravity to the control valve structure and through the discharge structure into the Sheyenne River, approximately six miles south of Cooperstown.

Economic Impacts Table I-20 shows aggregated Alternative F construction expenditure impact results, which could potentially generate up to about 10,488 jobs and 1.18 billion dollars in the region or approximately 10,000 jobs and 1.14 billion statewide. The first column of the summary table includes the two areas of impact: the nine-county region and the state of North Dakota overall. The second column is the total amount of in-region construction cost estimated for Alternative F. The third column is the number of jobs that would be created given the amount spent in the second column. The fourth column shows the total labor income that would be generated. The fifth column shows the total economic effect (direct, indirect, and induced) for the regional economy and the state economy.

Table I-20 — Summary of Local and Statewide Alternative F Construction Expenditure Impacts – IMPLAN Output

Alternative F	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Regional	592,725,281	10,488	648,646,857	1,181,960,152
State	592,725,281	10,000	627,488,839	1,139,144,855

Tables I-21 and I-22 show the same economic indicators as the summary table in more detail by including the major construction component costs. For example, the pipeline D segment is the single most expensive major construction component, which in turn would generate the most employment, labor income, and economic output in the region or in the state.

Table I-21: Alternative F Costs by Major Construction Components – Nine-County Region - IMPLAN Output

Regional Alternative F Construction Costs by Major Construction Components	In-region Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	15,369,550	272.0	16,819,614	30,648,592
Option 1 Disinfection	25,990,537	459.9	28,442,654	51,828,022
McClusky Canal Pump Station	16,959,239	300.1	18,559,284	33,818,609
Hydro Break Tank	8,069,793	142.8	8,831,150	16,092,065
Control Valve Structure and Discharge Structure	4,792,351	84.8	5,244,493	9,556,481
Pipeline Segment C	45,565,969	806.3	49,864,960	90,863,611
Pipeline Segment D	269,621,619	4,770.9	295,059,482	537,655,504
Pipeline Segment I	51,200,050	906.0	56,030,597	102,098,596
Missouri River Intake Pump Station	27,788,275	491.7	30,410,002	55,412,912
Sediment River Plant	6,008,565	106.3	6,575,452	11,981,747
Main Pump	17,370,904	307.4	19,009,789	34,639,515
Pipeline Segment A	64,516,149	1,141.6	70,603,024	128,652,378
Pipeline Segment E	21,791,927	385.6	23,847,920	43,455,527
Pipeline Segment F	17,680,353	312.8	19,348,433	35,256,591
Total	**592,725,281**	**10,488**	**648,646,857**	**1,181,960,152**

Table I-22: Alternative F Costs by Major Construction Components – North Dakota – IMPLAN Output

State Alternative F Construction Costs by Major Construction Components	In-State Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Intake Pump Station	15,369,550	259.3	16,270,980	29,538,379
Option 1 Disinfection	25,990,537	438.5	27,514,892	49,950,605

State Alternative F Construction Costs by Major Construction Components	In-State Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
McClusky Canal Pump Station	16,959,239	286.1	17,953,905	32,593,565
Hydro Break Tank	8,069,793	136.1	8,543,089	15,509,146
Control Valve Structure and Discharge Structure	4,792,351	80.8	5,073,424	9,210,307
Pipeline Segment C	45,565,969	768.7	48,238,430	87,572,170
Pipeline Segment D	269,621,619	4,548.6	285,435,026	518,179,484
Pipeline Segment I	51,200,050	863.8	54,202,952	98,400,179
Missouri River Intake Pump Station	27,788,275	468.8	29,418,068	53,405,636
Sediment River Plant	6,008,565	101.4	6,360,970	11,547,720
Main Pump	17,370,904	293.1	18,389,714	33,384,734
Pipeline Segment A	64,516,149	1,088.4	68,300,045	123,992,078
Pipeline Segment E	21,791,927	367.6	23,070,032	41,881,395
Pipeline Segment F	17,680,353	298.3	18,717,312	33,979,457
Total	**592,725,281**	**10,000**	**627,488,839**	**1,139,144,855**

Summary of Regional Economic Impacts

The short-term regional economic effects are as listed in Table I-23. These effects are considered positive regional effects. These regional impacts are not comparable to economic benefits from a broad national perspective.

Table I-23: Summary of Regional Economic Impacts by Alternative

Total Estimated Construction Costs	Estimated Costs or Expenditures (2019$)	Total Economic Effect Employment (Jobs)	Total Economic Effect Labor Income (2019$)	Total Economic Effect Output (2019$)
Alternative A – No Action				
9-County Region	551,740,514	9,763	603,795,317	1,100,231,969
State	551,740,514	9,308	584,100,299	1,060,377,190
Alternative B – State Red River Valley Water Supply Project				
9-County Region	539,888,854	9,553	590,825,494	1,076,598,440
State	539,888,854	9,108	571,553,535	1,037,599,762
Alternative C – McClusky Canal Only North				
9-County Region	432,480,198	7,572	473,283,209	862,413,631
State	432,480,198	7,296	457,845,321	831,173,578
Alternative D – McClusky Canal Only South				
9-County Region	437,569,108	7,743	478,852,237	872,561,482
State	437,569,108	7,382	463,232,698	840,953,835
Alternative E – McClusky Canal and Missouri River North				
9-County Region	613,260,468	10,851	650,404,988	1,222,909,601
State	613,260,468	10,346	643,228,422	1,178,610,951
Alternative F – McClusky Canal and Missouri River North				
9-County Region	592,725,281	10,488	648,646,857	1,181,960,152
State	592,725,281	10,000	627,488,839	1,139,144,855

A comparison of impacts for each alternative indicate the regional impacts from each alternative are of a very similar magnitude, with the value of output varying by about 42% from lowest to highest impact. The alternate with the smallest regional impact, and lowest cost, is Alternative C and the greatest regional impact are Alternatives E and F.

The regional economic impact results presented in Table I-23 indicate the regional impacts for the smaller 9-county region are actually larger than the impacts for the entire state. This result can occur when the smaller subset region is surrounded by more rural regions. An evaluation of regional economic impacts for a large study area, such as an entire state, would be expected to have larger impacts than for a smaller area, such as a sub-set of counties within the state because larger geographies typically capture more production as local. However, in some cases the economy of a subset of the larger region may reflect greater indirect and induced impacts than that of the larger region.

In this situation there may be a small difference in production between the smaller geography and the larger one, but a significant increase in demand for the larger area. The supply relative to demand is much higher in the smaller region than in the larger region. As a result, the larger region sees a much larger increase in demand for the products produced in the smaller geography but does not substantially increase the supply available to meet that demand. This result applies to labor income as well. The regional impacts for the 9-county region and the state-wide regional impacts can be assumed to be essentially the same.

According to the Bureau of Economic Analysis (BEA), the gross regional product of the 9-county region was about $25.6 billion and the gross state product of North Dakota was about $56.1 billion in 2018. The BEA estimates of gross regional product and gross state product are shown in Table I-24.

Table I-24: Gross regional product of North Dakota and the 9-county economic impact region

County/Region	Gross Regional Product
Burleigh	$5,901,363,000
Cass	$12,547,098,000
Foster	$266,869,000
Grand Forks	$4,237,954,000
Griggs	$135,058,000
McLean	$778,187,000
Sheridan	$38,983,000
Stutsman	$1,434,456,000
Wells	$265,233,000
Regional Total	**$25,605,201,000**
North Dakota	**$56,082,300,000**

The gross regional product of the 9-county economic impact region accounted for about 46% of total gross state product, indicating the region represents a significant part of the North Dakota economy.

The impacts on the value of regional output presented in I-Table 23 can be compared to gross regional and state products in Table I-24 to evaluate the extent of regional impacts. The short-term impact ranged from 3.4% of the value of regional output for Alternative C to 4.8% of the value of output for Alternatives E and F for one year in the 9-county region. The range of impact at the state levels ranged from 1.5% to 2.1% of gross output for a single year.

Appendix J

Scoping Comments

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix J Scoping Comments

Introduction

Scoping is "*an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action*" (40 CFR 1501.7). Thus, the purpose of scoping is to obtain information that will focus the Draft EIS on the significant issues. Information gathered in scoping can be used to identify:

- Significant resource issues
- Study participants
- The potentially affected geographic area
- Resources available for the study
- Study constraints
- Alternatives to be considered

It serves as the public's opportunity to provide input and direction on the EIS throughout its preparation. The purpose of the public scoping process is to inform those persons and agencies who may be interested or affected by the proposed action, as well as to gather input regarding issues and concerns. The public scoping period began with the publication of a Notice of Intent to prepare an EIS in the *Federal Register* on November 13, 2019. Public scoping meetings were held in October 2019, and written comments were received by December 13, 2019.

Reclamation's scoping letter, providing details about this scoping process, and the comment letters received during public scoping are included below.

United States Department of the Interior

BUREAU OF RECLAMATION
Great Plains Region
Dakotas Area Office
P.O. Box 1017
Bismarck, ND 58502-1017

IN REPLY REFER TO:
DK-5000
2.1.4.17

SEP 19 2019

Subject: Bureau of Reclamation's Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project

Dear Interested Party:

The Bureau of Reclamation, authorized under Section 7 of the Dakota Water Resources Act of 2000, is preparing an Environmental Impact Statement (EIS) for the funding and construction of the Eastern North Dakota Alternate Water Supply (ENDAWS) Project. Reclamation is the lead Federal Agency responsible for ensuring compliance with the National Environmental Policy Act.

Garrison Diversion Conservancy District (Garrison Diversion), acting on behalf of the State of North Dakota, requested the Bureau of Reclamation to consider issuing a contract for up to 165 cubic feet per second of water from Garrison Diversion Unit (GDU) facilities as an alternate bulk water source for the Red River Valley Water Supply Project. Reclamation's potential actions include construction of ENDAWS features, issuance of permits to construct and maintain ENDAWS facilities on Reclamation rights-of-way, issuance of a water repayment contract for GDU facilities, and compliance with the Boundary Waters Treaty of 1909.

The purpose of this letter is to inform you of Reclamation's decision to prepare an EIS and invite you to participate in the public scoping process. Reclamation is hosting three scoping meetings as a means of gathering public input early in the planning process, in addition to the formal scoping period which will be initiated by the publication of a Notice of Intent to prepare an EIS in the *Federal Register*. Additional information is also provided in the enclosed scoping notice. Issues and information brought forward in the scoping process will be considered by Reclamation for evaluation in the EIS, as appropriate. Please respond with your comments and information by December 15, 2019. If no reply is received by this date, it will be assumed that you have no comments at this time. Comments can be submitted via email to ENDAWS.EIS@usbr.gov or sent to Eastern North Dakota Alternate Water Supply Project, Bureau of Reclamation, Dakotas Area Office, 304 East Broadway Avenue, Bismarck, North Dakota 58501.

Scoping meetings are planned for October 22 – 24, 2019. Additional details pertaining to these meetings can be found in the enclosed scoping notice or by visiting: https://www.usbr.gov/gp/dkao/. If you have any questions or require further information

regarding the EIS, please contact Damien Reinhart, EIS Team Leader, at 701-221-1275 or email him at ENDAWS.EIS@usbr.gov.

Sincerely,

ARDEN FREITAG

Arden Freitag
Area Manager

Enclosure

cc: Contact List Available From Dakotas Area Office

bc: DK-1000 (Freitag), DK-2000 (Fettig, Waters), DK-4000 (Kraft), DK-5000 (Hettinger, Kenninger, Reinhart)
(via electronic copy)

WBR:Kenninger:Vinchattle:09/18/2019:701-221-1282
T:\ENDAWS\Scoping\Scoping Letter\Draft Scoping Letter ENDAWS 09162019.docx

Comment Sheet for the Eastern North Dakota Alternate Water Supply

(Please Print Clearly)

Name Lance Gaebe ND Water Users

Organization and Address 1609 E Capitol Ave
Bismarck, ND 58501

Phone (701) 223 4615 FAX _____ Email lgaebe@ndwaternet

Comments:
Build this project
Fully support providing water to Eastern & Central North Dakota using the Garrison Diversion Project.

*Attach additional sheets if necessary.
Please mail your comments to the address on the back of this form, or FAX your comments to 701-250-4326, or e-mail your comments to ENDAWS.EIS@usbr.gov. Thank you.
The names and comments of those making written or oral statements on this process will become part of a public record. You may request that your name and/or address be withheld from public release. Those requests will be honored to the extent permissible by law.

U.S. Department of the Interior
Bureau of Reclamation

Consulate General of Canada **Consulat général du Canada**

Robert Pengelly
Consul, Foreign Policy and Diplomacy Service

701 Fourth Avenue South, Suite 900
Minneapolis, MN 55415-1899
(612) 492-2925 FAX (612) 332-4061
robert.pengelly@international.gc.ca www.minneapolis.gc.ca

@CanCGMPLS /CanCGMPLS

Canada

- Requested panel info to be sent.

NORTH Dakota | Parks & Recreation
Be Legendary.™

October 3, 2019

Arden Freitag
US DOI BOR
Great Plains Region Dakotas Areas Office
PO Box 1017
Bismarck, ND 58502-1017

Re: Eastern ND Alternate Water Supply Project

Dear Mr. Freitag

The North Dakota Parks and Recreation Department has reviewed the above referenced proposed Eastern ND Alternate Water Supply Project.

Our agency scope of authority and expertise covers recreation and biological resources (in particular rare plants and ecological communities). The project as defined does not affect state park lands that we manage but may affect Land and Water Conservation Fund recreation projects that we coordinate. A map with LWCF project locations has been attached. All LWCF sites received assistance from the federal LWCF program and are under protection of section 6(f) of the LWCF Act. Any property taken from within the 6f boundary of these sites must be replaced with property of equal market value. Should any public or private utilities need to be added or relocated on the LWCF recreational lands, the NDPRD must be consulted prior to any action taken. Please contact Genny Giese at 701-328-5364 if additional information is needed.

The North Dakota Natural Heritage biological conservation database has reviewed the project to determine if any current or historical plant or animal species of concern or other significant ecological communities are known to occur within an approximate one-mile radius of the project area. Based on this review, we have several rare species or significant ecological community documented within or adjacent to project site. Please see the attached spreadsheet and map for more information on these occurrences. Because this natural heritage information is not based on a comprehensive inventory, there may be species of concern or otherwise significant ecological communities in the area that are not represented in the database. The lack of data for any project area cannot be construed to mean that no significant features are present. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

We appreciate your commitment to rare plant, animal and ecological community conservation, management and inter-agency cooperation to date. For additional information, please contact me at (701-328-5370 or kgduttenhefner@nd.gov Thank you for the opportunity to comment on this proposed project.

Sincerely,

Kathy Duttenhefner

Kathy Duttenhefner
Coordinator/Biologist II, Natural Resources Division

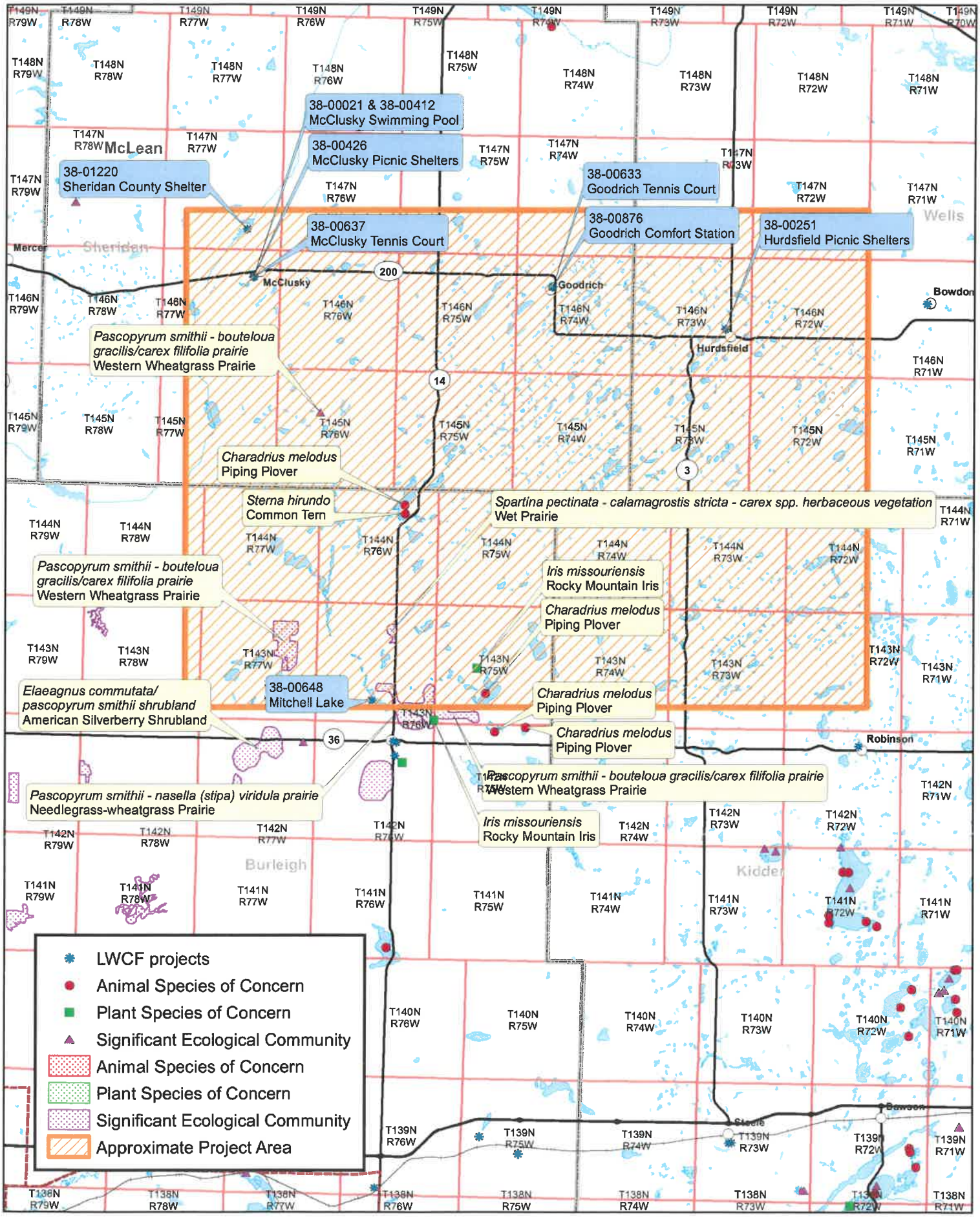
1600 East Century Ave. Ste. 3 | Bismarck, ND 58503

PHONE: 701-328-5357 | FAX: 701-328-5363 | EMAIL: parkrec@nd.gov | WEBSITE: www.parkrec.nd.gov

North Dakota Natural Heritage Inventory
Rare Animal and Plant Species and Significant Ecological Communities

State Scientific Name	State Common Name	State Rank	Global Rank	Federal Status	Township Range Section	County	Last Observation	Estimated Representation Accuracy	Precision
Charadrius melodus	Piping Plover	S1S2	G3	LE,LT	142N075W - 02	Burleigh	1995	Medium	S
Charadrius melodus	Piping Plover	S1S2	G3	LE,LT	142N075W - 03	Burleigh	1996-06-11	Medium	S
Charadrius melodus	Piping Plover	S1S2	G3	LE,LT	143N075W - 28	Burleigh	1994-05-15	Medium	S
Charadrius melodus	Piping Plover	S1S2	G3	LE,LT	144N076W - 02; 144N076W - 11	Burleigh	1992	Medium	S
Elaeagnus commutata / pascopyrum smithii shrubland	American Silverberry Shrubland	SNR	G3?		142N077W - 08; 142N077W - 11; 142N077W - 03; 142N077W - 02; 142N077W - 15; 142N077W - 17; 142N077W - 10; 142N077W - 16; 142N077W - 09	Burleigh	2010-08-16	Low	
Iris missouriensis	Rocky Mountain Iris	S2	G5		143N075W - 21; 143N075W - 28; 143N075W - 15; 143N075W - 09; 143N075W - 19; 143N075W - 22; 143N075W - 16; 143N075W - 20; 143N075W - 08; 143N075W - 29; 143N075W - 17; 143N075W - 27; 143N075W - 18	Burleigh	1997-08-21		M
Iris missouriensis	Rocky Mountain Iris	S2	G5		143N076W - 36; 143N075W - 32; 143N076W - 35; 143N075W - 31; 142N075W - 07; 143N075W - 30; 142N075W - 06; 143N076W - 25; 142N076W - 01; 142N076W - 12; 142N075W - 05; 142N076W - 02	Burleigh	1997-08-21		M
Pascopyrum smithii - bouteloua gracilis/carex filifolia prairie	Western Wheatgrass Prairie	S3S4	GNR		143N076W - 25; 143N076W - 24; 143N075W - 31; 143N076W - 36; 143N075W - 33; 143N075W - 30; 143N076W - 35; 143N076W - 26; 143N075W - 32; 142N076W - 01	Burleigh	2010-08-05	Low	
Pascopyrum smithii - bouteloua gracilis/carex filifolia prairie	Western Wheatgrass Prairie	S3S4	GNR		143N077W - 23; 143N077W - 11; 143N077W - 12; 143N077W - 15; 143N077W - 14; 143N077W - 10; 143N077W - 02	Burleigh	2010-08-10	Low	
Pascopyrum smithii - bouteloua gracilis/carex filifolia prairie	Western Wheatgrass Prairie	S3S4	GNR		145N076W - 16	Sheridan	1985-07-23		S
Pascopyrum smithii - nasella (stipa) viridula prairie	Needlegrass-wheatgrass Prairie	S2	GNR		143N076W - 36; 143N076W - 35; 143N076W - 26; 143N076W - 34; 142N076W - 01; 142N076W - 02; 143N076W - 27	Burleigh	2010-08-09	Low	
Spartina pectinata - calamagrostis stricta - carex spp. herbaceous vegetation	Wet Prairie	S2S3	GNR		143N076W - 10	Burleigh	2010-08-05	Medium	
Sterna hirundo	Common Tern	SU	G5		144N076W - 11; 145N076W - 32; 144N076W - 29; 144N075W - 05; 145N075W - 29; 144N075W - 30; 143N076W - 03; 144N076W - 09; 144N075W - 08; 145N075W - 22; 144N076W - 36; 144N076W - 19; 145N075W - 32; 145N076W - 34; 144N076W - 23; 144N076W - 14; 144N076W - 32;	Burleigh, Sheridan			G

North Dakota Parks and Recreation Department
North Dakota Natural Heritage Inventory



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Charadrius melodus	Piping Plover	S1S2	G3	LE,LT	142N075W - 03	Burleigh	1996-06-11	Medium	S
Charadrius melodus	Piping Plover	S1S2	G3	LE,LT	143N075W - 28	Burleigh	1994-05-15	Medium	S
Charadrius melodus	Piping Plover	S1S2	G3	LE,LT	144N076W - 02; 144N076W - 11	Burleigh	1992	Medium	S
Elaeagnus commutata / pascopyrum smithii shrubland	American Silverberry Shrubland	SNR	G3?		142N077W - 08; 142N077W - 11; 142N077W - 03; 142N077W - 02; 142N077W - 15; 142N077W - 17; 142N077W - 10; 142N077W - 16; 142N077W - 09	Burleigh	2010-08-16	Low	
Iris missouriensis	Rocky Mountain Iris	S2	G5		143N075W - 21; 143N075W - 28; 143N075W - 15; 143N075W - 09; 143N075W - 19; 143N075W - 22; 143N075W - 16; 143N075W - 20; 143N075W - 08; 143N075W - 29; 143N075W - 17; 143N075W - 27; 143N075W - 18	Burleigh	1997-08-21		M
Iris missouriensis	Rocky Mountain Iris	S2	G5		143N076W - 36; 143N075W - 32; 143N076W - 35; 143N075W - 31; 142N075W - 07; 143N075W - 30; 142N075W - 06; 143N076W - 25; 142N076W - 01; 142N076W - 12; 142N075W - 05; 142N076W - 02	Burleigh	1997-08-21		M
Pascopyrum smithii - bouteloua gracilis/carex filifolia prairie	Western Wheatgrass Prairie	S3S4	GNR		143N076W - 25; 143N076W - 24; 143N075W - 31; 143N076W - 36; 143N075W - 33; 143N075W - 30; 143N076W - 35; 143N076W - 26; 143N075W - 32; 142N076W - 01	Burleigh	2010-08-05	Low	
Pascopyrum smithii - bouteloua gracilis/carex filifolia prairie	Western Wheatgrass Prairie	S3S4	GNR		143N077W - 23; 143N077W - 11; 143N077W - 12; 143N077W - 15; 143N077W - 14; 143N077W - 10; 143N077W - 02	Burleigh	2010-08-10	Low	
Pascopyrum smithii - bouteloua gracilis/carex filifolia prairie	Western Wheatgrass Prairie	S3S4	GNR		145N076W - 16	Sheridan	1985-07-23		S
Pascopyrum smithii - nasella (stipa) viridula prairie	Needlegrass-wheatgrass Prairie	S2	GNR		143N076W - 36; 143N076W - 35; 143N076W - 26; 143N076W - 34; 142N076W - 01; 142N076W - 02; 143N076W - 27	Burleigh	2010-08-09	Low	
Spartina pectinata - calamagrostis stricta - carex spp. herbaceous vegetation	Wet Prairie	S2S3	GNR		143N076W - 10	Burleigh	2010-08-05	Medium	
Sterna hirundo	Common Tern	SU	G5		144N076W - 11; 145N076W - 32; 144N076W - 29; 144N075W - 05; 145N075W - 29; 144N075W - 30; 143N076W - 03; 144N076W - 09; 144N075W - 08; 145N075W - 22; 144N076W - 36; 144N076W - 19; 145N075W - 32; 145N076W - 34; 144N076W - 23; 144N076W - 14; 144N076W - 32;	Burleigh, Sheridan			G

Land and Water Conservation Fund Projects

Project Name	Project Number
Goodrich Comfort Station	38-00876
Goodrich Tennis Court	38-00633
Hurdsfield Picnic Shelters	38-00251
McClusky Picnic Shelters	38-00426
McClusky Swimming Pool	38-00021
McClusky Swimming Pool	38-00412
McClusky Tennis Court	38-00637
Mitchell Lake	38-00648
Sheridan County Shelter	38-01220

North Dakota Natural Heritage Inventory Biological and Conservation Data Disclaimer

The quantity and quality of data collected by the North Dakota Natural Heritage Inventory are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in North Dakota have never been thoroughly surveyed, and new species are still being discovered. For these reasons, the Natural Heritage Inventory cannot provide a definite statement on the presence, absence, or condition of biological elements in any part of North Dakota. Natural Heritage data summarize the existing information known at the time of the request. Our data are continually upgraded and information is continually being added to the database. This data should never be regarded as final statements on the elements or areas that are being considered, nor should they be substituted for on-site surveys.

Estimated Representation Accuracy

Value that indicates the approximate percentage of the Element Occurrence Representation (EO Rep) that was observed to be occupied by the species or community (versus buffer area added for locational uncertainty). Use of estimated representation accuracy provides a common index for the consistent comparison of EO reps, thus helping to ensure that aggregated data are correctly analyzed and interpreted.

Very high (>95%)
High (>80%, <= 95%)
Medium (>20%, <= 80%)
Low (>0%, <= 20%)
Unknown
(null) - Not assessed

Precision

A single-letter code for the precision used to map the Element Occurrence (EO) on a U.S. Geological Survey (USGS) 7.5' (or 15') topographic quadrangle map, based on the previous Heritage methodology in which EOs were located on paper maps using dots.

S - Seconds: accuracy of locality mappable within a three-second radius; 100 meters from the centerpoint
M - Minute: accuracy of locality mappable within a one-minute radius; 2 km from the centerpoint
G - General: accuracy of locality mappalbe to map or place name precision only; 8 km from centerpoint
U - Unmappable

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October 24, 2019

Re: DK-5000 2.1.4.17

Comments on the September 19, 2019, Bureau of Reclamation Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project and September 2019 *Managing Water in the West* Eastern North Dakota Alternate Water Supply Project Environmental Impact Statement Scoping Notice

Arden Freitag, Area Manager
Dakotas Area Office
Great Plains Region
Bureau of Reclamation
United States Department of the Interior
P. O. Box 1017
Bismarck, North Dakota 58502-1017

Dear Area Manager Freitag:

The Bureau of Reclamation (Bureau) states in its September 19, 2019, Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply (ENDAWS) that:

> "Garrison Diversion Conservancy District (Garrison Diversion), acting on behalf of the State of North Dakota, requested the Bureau of Reclamation to consider issuing a contract for up to 165 cubic feet of water from Garrison Diversion Unit (GDU) facilities as an alternate bulk water source for the Red River Valley Water Supply Project. Reclamation's potential actions include construction of ENDAWS features, issuance of permits to construct and maintain ENDAWS facilities on Reclamation rights-of-way, issuance of a water repayment contract for GDU facilities, and compliance with the Boundary Waters Treaty of 1909."

The Bureau's September 2019 Scoping Notice for the Eastern North Dakota Alternate Water Supply Environmental Impact Statement further states under "Public Scoping Notice" that:

> "The Bureau of Reclamation (Reclamation) will prepare an Environmental Impact Statement (EIS) for the **funding and construction** of the Eastern North Dakota Alternate Water Supply (ENDAWS) Project. This is a bulk water supply project which would deliver an **alternate water supply to the State of North Dakota's Red River Valley Water Supply Project**. Reclamation is **authorized under Section 7 of the Dakota Water Resources Act of 2000** to work with the State of North Dakota to plan, design and construct municipal water supply projects. Reclamation is the lead federal agency

> and is responsible for ensuring compliance with the National Environmental Policy Act." (Emphasis added)

and under "What is the Proposed Action?":

> "Garrison Diversion Conservancy District (Garrison Diversion), acting on behalf of the State of North Dakota, requested Reclamation consider issuing a contract for **up to 165 cubic feet per second of water from Garrison Diversion Unit facilities. This would include use of Snake Creek Pumping Plant, an intake station and pump located along the McClusky Canal, and a bulk transmission pipeline** to deliver water to the main transmission pipeline of the State's Red River Valley Water Supply Project. Reclamation's potential actions include: **construction of ENDAWS project features**, issuance of a **water repayment contract for Garrison Diversion Unit facilities**, issuance of permits to construct and maintain ENDAWS facilities on Reclamation rights-of-way, and compliance with the Boundary Waters Treaty of 1909." (Emphasis added).

<u>The Bureau of Reclamation Does Not Have Authority to Construct the Eastern North Dakota Alternate Water Supply</u>

The Bureau cites Section 7 of the Dakota Water Resources Act (DWRA) of 2000 as providing authority for it to construct the ENDAWS. However, Section 7 of the DWRA dealing with Municipal, Rural, and Industrial Water Service amends Section 7 of Public Law 89-108 with the specific provision that:

> "The State may use the Federal and non-Federal funds to provide grants or loans for municipal, rural and industrial water systems."

Public Law 89-108 authorizing the Garrison Diversion Unit in 1965 did not include any provisions or features for the delivery of Missouri River water to the Red River Valley for municipal, rural or industrial water service, nor were any such provisions or features included, discussed or evaluated in the Bureau's 1974 *Initial Stage Garrison Diversion Unit Final Environmental Impact Statement*. In fact, construction of features for the delivery of Missouri River water to the Red River Valley for municipal, rural and industrial purposes utilizing Garrison Diversion Unit facilities was not authorized until 1986 when Section 5 of Public Law 99-294, commonly known as the Garrison Diversion Unit Reformulation Act of 1986, amended Section 7 of Public Law 86-108 with language explicitly stating that:

> "The Secretary is authorized and directed to construct, operate, and maintain a Sheyenne River water supply and release feature (including a water treatment plant) capable of delivering 100 cubic feet per second of water for the cities of Fargo and Grand Forks and surrounding communities. . . ."

Section 7 of the DWRA further amends Section 7 of Public Law 86-108 by providing that:

> "The Southwest Pipeline Project, the Northwest Area Water Supply Project, **the Red River Valley Water Supply Project**, and other municipal, industrial, and rural water systems in the State of North Dakota **shall be eligible for funding under the terms of this section. Funding provided under this section for the Red River Valley Water Supply Project shall be in addition to funding for that project under Section 10(a)(1)**." (Emphasis added)

It is important to note that funding for the DWRA Section 7 Municipal, Rural and Industrial Water Supply grant program is covered in Section 10(b)(1) and does not require specific congressional authorization for each project. However, funding for the Red River Valley Water Supply Project under Section 10(a)(1) cited in Section 7 is:

> "RED RIVER VALLEY WATER SUPPLY PROJECT- There is authorized to be appropriated **to carry out section 8(a)(1)** $200,000,000. . ." (Emphasis added)

Thus, the funding for the Red River Valley Water Supply Project provided under the Section 7 Municipal, Rural and Industrial Water Supply grant program of the DWRA is specifically "in addition" to funding authorized to be appropriated for the Red River Valley Water Supply Project described in Section 8. However, neither that project nor the appropriation of funds for it has been authorized by the Congress.

Therefore, Section 7 of the DWRA which the Bureau cites as its authority for "construction of ENDAWS project features" only authorizes the appropriation of funds for features of the Red River Valley Water Supply Project under the Act's Municipal, Rural and Industrial Water Supply grant program after funds have been authorized to be appropriated for the Red River Valley Water Supply Project described in Section 8.

Construction of specific features of a Red River Valley Water Supply Project is addressed separately under Section 8 SPECIFIC FEATURES, Subsection (a) Red River Valley Water Supply Project, Paragraph (3) COMMENCEMENT OF CONSTRUCTION of the DWRA, where Subparagraph (A) provides that:

> "If the Secretary selects a project feature under this section that would provide water from the Missouri River or its tributaries to the Sheyenne River water supply and release facility or from the Missouri River or its tributaries to such other conveyance facility as the Secretary selects under this section, no later than 90 days after the completion of the final environmental impact statement, the Secretary shall transmit to the Congress a comprehensive report which provides--
>
> > (i) a detailed description of the proposed project feature;
> >
> > (ii) a summary of major issues addressed in the environmental impact statement;
> >
> > (iii) likely effects, if any, on other States bordering the Missouri River and on the State of Minnesota; and
> >
> > (iv) a description of how the project feature complies with the requirements of section 1(h)(1) of this Act (relating to the Boundary Waters Treaty of 1909)."

Section 8, Subsection (a), Paragraph (3), Subparagraph (B) then states explicitly that:

> "No project feature or features that would provide water from the Missouri River or its tributaries to the Sheyenne River water supply and release facility or from the Missouri River or its tributaries to such other conveyance facility as the Secretary selects under this section shall be constructed unless such feature is specifically authorized by an Act of Congress approved subsequent to the Secretary's transmittal of the report required in subparagraph (A). . . . The Act of Congress referred to in this subparagraph must be an authorization bill, and shall not be a bill making appropriations."

It should be noted that this requirement for authorization for construction applies not only to a full Red River Valley Water Supply Project utilizing Missouri River water, but to any "project feature or features" that would provide water from the Missouri River to the Sheyenne River or to another conveyance facility.

In December 2007, the Bureau released its *Final Environmental Impact Statement, Red River Valley Water Supply Project* (RRVWSP FEIS) mandated by the DWRA. The RRVWSP FEIS identified one No Action Alternative, two in-basin alternatives (North Dakota In-Basin Alternative and Red River Basin Alternative) and three Missouri River water supply alternatives (GDU Import to Sheyenne River Alternative, GDU Import Pipeline Alternative and Missouri River Import to Red River Valley Alternative). The GDU Import to the Sheyenne River Alternative and the GDU Import Pipeline Alternative both would utilize the Garrison Diversion Unit Principal Supply Works (Lake Audubon, Snake Creek Pumping Plant and McClusky Canal) to supply Missouri River water for the Red River Valley Water Supply Project.

The Bureau's Public Scoping Notice states that the proposed Eastern North Dakota Alternate Water Supply would utilize the Garrison Diversion Unit's Principal Supply Works, including the "Snake Creek Pumping Plant, and intake and pump station located along the McClusky Canal" and "a bulk transmission pipeline to deliver [Missouri River] water to the main transmission pipeline" - i.e., another conveyance facility - to the State's Red River Valley Water Supply Project.

The proposed Eastern North Dakota Alternate Water Supply for the Red River Valley Water Supply Project clearly is not a fundamentally different project from the GDU Import alternatives identified in the Bureau's 2007 RRVWSP FEIS, but rather is simply an alternate feature of the Red River Valley Water Supply Project contemplated in Section 8 of the Dakota Water Resources Act of 2000. However, the Secretary of the Interior has not selected a Red River Water Supply Project alternative that includes a project feature or features that would provide water from the Missouri River to the Sheyenne River or any other conveyance facility, nor has any such project feature or features been authorized by the Congress.

Consequently, the Bureau may not circumvent the congressional authorization clearly required under Section 8 of the Dakota Water Resources Act of 2000 by attempting to construct an integral feature of the Red River Valley Water Supply Project addressed in Section 8 of the Act under the artifice of it somehow being a part of a different State of North Dakota Red River Valley Water Supply Project seeking funding under the DWRA Section 7 Municipal, Rural and Industrial Water Supply grant program.

As noted above, the Garrison Diversion Conservancy District has requested that the Bureau "consider issuing a contract for up to 165 cubic feet per second of [Missouri River] water from Garrison Diversion Unit (GDU) facilities as an alternate bulk water source for the Red River Valley Water Supply Project" and the Scoping Notice goes on to state that:

> "This request for up to 165 cfs includes the previous request of 20 cfs of water from the McClusky Canal for the Central Dakota Water Supply Project."

However, the Bureau's only congressional authorization for constructing a project feature or features for delivering Missouri River water to the Red River Valley is the Garrison Diversion Unit Reformulation Act of 1986 (Public Law 99-294), which provides explicitly under Section 5, Municipal, Rural and Industrial Water Service, that:

> "The Secretary is authorized and directed to construct, operate, and maintain a Sheyenne River water supply and release feature (including a water treatment plant) capable of delivering 100 cubic feet per second of water for the cities of Fargo and Grand Forks and surrounding communities."

In addition, Section 8, Subsection (e) of the Dakota Water Resources Act of 2000 states specifically:

> "SHEYENNE RIVER WATER SUPPLY AND RELEASE OR ALTERNATE FEATURES- The Secretary shall construct, operate, and maintain a Sheyenne River water supply and release feature (including a water treatment plant) capable of delivering 100 cubic feet per second of water or any other amount determined in the reports under this section, for the cities of Fargo and Grand Forks and surrounding communities, or such other feature or features as may be selected under subsection (d)."

It should be noted that the Bureau's Red River Valley Water Supply Project Final Environmental Impact Statement prepared under Section 8, Subsection (c) of the Dakota Water Resources Act includes a GDU Import to Sheyenne River Alternative with a 122 cfs (78,855,920 gallons per day) pipeline from the McClusky Canal to the Sheyenne River and a GDU Import Pipeline Alternative with an 85 cfs (54,940,600 gallons per day) pipeline from the McClusky Canal to the Fargo metropolitan area, but it does not include any alternatives with the capacity to deliver (165 - 20 =) 145 cubic feet per second (93,722,200 gallons per day) of Missouri River water to the Red River Valley.

However, the Secretary has not selected a water supply and release feature, including a water treatment plant, or any other feature or features capable of delivering even 100 cubic feet per second (64,636,000 gallons per day) of water from the Missouri River for the cities of Fargo and Grand Forks and surrounding communities, so the Bureau clearly has no authority to construct a water treatment plant and water supply and release feature capable of delivering more than 100 cubic feet per second of Missouri River water to the Red River Valley.

The Bureau of Reclamation and the State of North Dakota may not build a Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply feature with funding and under the auspices of the Dakota Water Resources Act of 2000 that violates the clear intent and explicit provisions of the Act relating to the Red River Valley Water Supply Project without the formal approval of the Secretary of the Interior and specific authorization by the Congress.

Consequently, without further congressional authorization, the Bureau has no authority to construct a Garrison Diversion Unit or Red River Valley Water Supply Project feature or features (including a water treatment plant) with the capacity to deliver more than 100 cubic feet per of water from the Missouri River for a Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply.

The Bureau's September 19, 2019, Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project also states that:

> "Reclamation's potential actions include . . . compliance with the Boundary Waters Treaty of 1909."

It should be noted that both of the GDU Import options discussed in the Bureau's *Red River Valley Water Supply Project Final Environmental Impact Statement* include biota treatment plants to address compliance with the Boundary Waters Treaty of 1909. However, as noted above, Section 8, Subsection (a), Paragraph (3), Subparagraph (B) of the DWRA states:

> "No project feature or features that would provide water from the Missouri River or its tributaries to the Sheyenne River . . . or such other conveyance facility as the Secretary selects under this section shall be constructed unless such feature is specifically authorized by an Act of Congress. . ."

Therefore as with the Eastern North Dakota Alternate Water Supply, the Bureau also does not have congressional authorization to construct a biota treatment plant or any other feature for compliance with the Boundary Waters Treaty of 1909.

Compliance with the Boundary Waters Treaty of 1909 and the National Environmental Policy Act of 1969

The Bureau's September 19, 2019, Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project states that:

> ". . . Reclamation is the lead Federal Agency responsible for ensuring compliance with the National Environmental Policy Act."
>
> ". . . Reclamation's potential actions include construction of ENDAWS features. . . and compliance with the Boundary Waters Treaty of 1909."

The Bureau's September 2019 Scoping Notice states that:

> "The Bureau of Reclamation (Reclamation) will prepare an Environmental Impact Statement (EIS) for the funding and construction of the Eastern North Dakota Alternate Water Supply (ENDAWS) Project. . . . Reclamation is authorized under Section 7 of the Dakota Water Resources Act of 2000 to work with the State of North Dakota to plan, design and construct municipal, rural and industrial water supply projects. Reclamation is responsible for ensuring compliance with the National Environmental Policy Act (NEPA)."
>
> "Reclamation, as the lead federal agency, will be coordinating with other Federal agencies (e.g., U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service), state agencies, tribal governments, local entities, and the public, throughout the process."

Section 8, Subsection (c), Paragraph (2), Subparagraph (A) of the Dakota Water Resources Act of 2000 provides that:

> "Pursuant to an agreement between the Secretary and State of North Dakota as authorized under Section 1(g), not later than 1 year after the date of enactment of the Dakota Water Resources Act of 2000, **the Secretary and the State of North Dakota** shall jointly prepare and complete a draft environmental impact statement concerning all feasible options to meet the comprehensive water quality and quantity needs of the Red River Valley and the options for meeting those needs, including the delivery of Missouri River water to the Red River Valley." (Emphasis added)

On March 1, 2005, the National Wildlife Federation sent a letter to the Acting Regional Director of the Bureau of Reclamation expressing concern about the legality and propriety of the Garrison Diversion Conservancy District's role in preparing the environment impact statement for the Red River Valley Water Supply Project (Hall, 2005). In its letter, the Federation pointed out that:

> "The NEPA regulations developed by the Council on Environmental Quality (CEQ), make clear that conflicts of interest in the delegation of NEPA responsibilities are to be avoided. Moreover, the delegating authority must participate in the preparation of the EIS, exercise independent oversight authority, and maintain responsibility for the product. In general, any EIS
>
> > prepared pursuant to the requirements of NEPA shall be prepared directly by or by a contractor selected by the lead agency. . . . It is the intent of these regulations that the contractor be chosen solely by the lead agency, or by the lead agency in cooperation with cooperating agencies, or where appropriate by a cooperating agency *to avoid any conflict of interest*. Contractors shall execute a disclosure statement prepared by the lead agency . . . specifying that they have no *financial or other interest in the outcome of the project*. If the document is prepared by contract, the responsible Federal official shall furnish guidance and participate in the preparation and shall independently evaluate the statement prior to its approval and take responsibility for its scope and contents.
>
> 40 C.F.R. § 1506.5(c) (emphasis added). The CEQ has further explained with regard to this regulation that '[i]f a consulting firm has a conflict of interest it should be disqualified from preparing the EIS, to preserve the objectivity and integrity of the NEPA process.' 46 Fed Reg. 18026, 180312 (1981)."

In its comments on the 2007 RRVWSP FEIS, the National Wildlife Federation discussed and documented the ineligibility of the Garrison Diversion Conservancy District to serve as the co-lead with the Bureau in preparing the Environmental Impact Statement for the Red River Valley Water Supply Project and noted that:

> "The Federation/Pearson comments on the Draft EIS included 11 pages documenting the statutory mandate of the Garrison Diversion Conservancy District to promote Missouri River diversion, the absence of statutory authority for the Garrison Diversion Conservancy District to serve as the co-lead in the preparation of the environmental impact statement for the Red River Valley Water Supply Project and the absence of constitutional or statutory authority for the Governor to designate the Conservancy District to represent the State of North Dakota in the preparation of the EIS. The Bureau and the Conservancy District made no attempt what-so-ever to respond to these comments on the Draft EIS (Final EIS Appendix M)." (Pearson, 2008)

In comments on scoping of the Bureau's *Draft Environmental Impact Statement for the Northwest Area Water Supply Project*, which also would involve delivery of Missouri River water to the Hudson Bay Basin for municipal, rural and industrial supplies, the National Wildlife Federation pointed out that:

> "The EA [Environmental Assessment] for the NAWS project was prepared by private contractors for the North Dakota State Water Commission, the Garrison Diversion Conservancy District, and the Bureau of Reclamation. Both the North Dakota State

> Water Commission and the Garrison Diversion Conservancy District have mandates to promote and pursue the diversion of water from the Missouri River into the Hudson Bay Basin of North Dakota. . ." (Pearson, 2006)

It also is important to note that the purpose of an Environmental Impact Statement prepared under the National Environmental Policy Act is not simply to describe the environmental impacts of the proposed action, but also to identify measures that can be taken to avoid or minimize the adverse environmental impacts of the action. For example, in Calvert Cliffs v. Atomic Energy Commission (2 ERC 1779) 449 F.2d 1109 (D.C. Cir. 1971), cert. denied 404 U.S. 942 (1972), the U. S. Court of Appeals for the District of Columbia found, regarding the consideration of alternatives in the EIS, that:

> "This requirement, like the 'detailed statement' requirement, seeks to ensure that each agency decision-maker has before him and takes into proper account all possible approaches to a particular project (including total abandonment of the project) which would alter the environmental impact and the cost-benefit balance. Only in that fashion is it likely that the most intelligent, optimally beneficial decision will ultimately be made."

Similarly, the same U. S. Court of Appeals held in Natural Resources Defense Council v. Morton (3 ERC 1473, 1558, 1623) 337 F.Supp. 165 (D.DC., 1971), 337 F. Supp. 167 (D.DC., 1971), 458 F2d 827 (DC Cir., 1971) 337 F.Supp. 170 (D.Dc., 1972) that;

> "Congress contemplated that the impact statement would constitute the environmental source material for the information of the Congress as well as the Executive, in connection with the making of relevant decisions, and would be available to enhance enlightenment of and by the public. The impact statement provides a basis for (a) evaluation of the benefits of the proposed action in light of its environmental risks, and (b) comparison of the net balance for the proposed project with the environmental risks presented by alternative courses of action."

The necessity for the Bureau to implement active and effective measures to protect the integrity of the NEPA process for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply and to avoid the biases and conflicts of interest of its Environmental Impact Statements for the Red River Valley Water Supply Project (Pearson 2006a, 2007, 2008) and Northwest Area Water Supply Project (Pearson 2006b, 2014, 2015; Pearson and Conrad 2008, 2009) is starkly demonstrated by public statements made by North Dakota officials promoting the diversion of Missouri River water to the Red River Valley. For example:

On September 23, 2016, the Forum News Service reported that:

> "Officials spearheading a decades-old effort to divert Missouri River water to eastern North Dakota . . . said they hope lawmakers will still provide enough money to start construction on the Red River Valley Water Supply Project during the 2017-19 biennium so it can be grandfathered in before new federal regulations that could delay the project take effect.
>
> 'There is great risk here involved with regulation changes,' Ken Vein, chairman of the Garrison Diversion Conservancy District, said Thursday, Sept. 22, during a joint meeting of the State Water Commission and the Legislature's Water Topics Overview Committee."

"Earlier this year, a study identified horizontal collector wells as the best option for taking water from the Missouri River, at an estimated cost of $424 million. Project officials adopted it as the preferred alternative, in large part because it wouldn't require federal permits.

But Vein said the project's legal consultants have since advised that a conventional intake estimated at $187 million - an option that project officials had earlier written off - would likely qualify for a nationwide permit from the U.S. Army Corps of Engineers without having to undergo another extensive environmental review."

"Waiting longer increases the chances that federal regulations such as the Environmental Protection Agency's 'Waters of the U.S.' rule will delay the project, officials said." (Nowatski 2016)

On December 27, 2016, the Forum News Service reported that:

"Project proponents are pushing to start construction in the nest two years because they presume a Trump administration, and a Republican-controlled Congress, will be more likely to grant federal permits for water development projects, [Garrison Diversion Conservancy District general manager Duane] DeKrey said.

'We all know the pendulum swings,' he said, adding that the Obama administration's proposed Waters of the United States regulations, the subject of a legal challenge by states including North Dakota, could have killed the project. Under a Trump administration, the presumption is the rule will be scrapped, DeKrey said." (Springer 2016)

On March 25, 2017, The Jamestown Sun reported that:

"DeKrey and other Garrison Diversion officials were in Washington, D.C., last week to talk with the North Dakota congressional delegation and officials of the U.S. Department of the Interior.

'Their message to us was the Trump administration has put out the word to find a way to get to "yes,"' Dekrey said, referring to discussions with the Interior Department."

". . . Once construction starts, the project would then be governed by the federal regulations in place.

'The ease of doing business with the federal government may not be long lived,' DeKrey said." (Norman 2017)

On July 7, 2017, the Forum News Service reported that:

"North Dakota officials are eager to start construction during the Trump Administration, whose environmental and natural resource policies are supportive of projects like the water supply pipeline.

'We want to have a substantial start now while we're dealing with the current administration,' Vein said.

> Officials fear that a delay could mean adverse policy decisions from a future administration, including a broader definition of wetland, which could make it much more difficult to get an approved pipeline route. Under current wetland conditions, the route can be permitted, officials said." (Springer 2017)

Clearly, Garrison Diversion Conservancy District and other North Dakota officials involved in promoting the State's Red River Valley Water Supply Project are working diligently to minimize and avoid compliance with environmental regulations, including those requiring avoidance or mitigation of impacts on wetlands. However, the environmental impacts of the Red River Valley Water Supply Project are not based on whether they are subject to Federal regulation and the Environmental Impact Statement for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply still must describe those impacts in detail and discuss alternatives for avoiding or mitigating them.

In order to avoid the clear conflicts of interests and institutional and contractual biases of its Environmental Impact Statements for the Red River Valley Water Supply Project and Northwest Area Water Supply Project, the Bureau must (1) prepare the EIS for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply itself or with the State of North Dakota and not the Garrison Diversion Conservancy District, (2) exercise sole authority in selecting any contractors, and (3) assure that any contractors are free of historical or current financial or contractual relationships with the State Water Commission, the Garrison Diversion Conservancy District, or others with a vested interest in the Red River Valley Water Supply Project and/or other Missouri River diversion projects.

Council on Environmental Quality regulations for the implementation of the National Environmental Policy Act require Federal agencies to describe not only the environmental impacts of the proposed action, but also the incremental cumulative impacts of the proposed action and other past, present or reasonably foreseeable future actions, including non-Federal actions (40 CFR § 1508.7).

Consequently, the Bureau's Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply must also identify any ways in which the State's Red River Valley Water Supply Project differs from the GDU Import alternatives described in the Bureau's Final Environmental Impact Statement for the Red River Valley Water Supply Project prepared under Section 8(c) of the Dakota Water Resources Act of 2000 - including its impacts on wetlands. If the State's Red River Valley Water Supply Project differs in any material way from the GDU Import alternatives described in the Bureau's EIS for the Red River Valley Water Supply Project prepared under Section 8(c) of the DWRA, then under CEQ regulations the Bureau's EIS for the Eastern North Dakota Alternate Water Supply must also describe the cumulative impacts of the State's Red River Valley Water Supply Project as a reasonably foreseeable future non-Federal action.

The Bureau's Environmental Impact Statement for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply must also include a discussion of the cumulative impacts of the State's Red River Valley Water Supply Project and the Northwest Area Water Supply project, both of which would transfer Missouri River water into the Hudson Bay Basin. In describing and discussing the cumulative impacts of the Red River Valley Water Supply Project and the Northwest Area Water Supply project, the EIS for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply must also address, substantively and objectively, the numerous technical and legal deficiencies of the Bureau's previous

Environmental Impact Statements for those projects, including the failure to discuss and address the increased cumulative risks of biota transfer from the Missouri River into the Hudson Bay Basin with both projects and the resulting widespread and potentially severe adverse environmental impacts throughout the entire Hudson Bay Basin in the United States and Canada (Pearson 2006a, 2006b, 2007, 2008, 2014, 2015; Pearson and Conrad 2008, 2009). For example:

> "Instead of addressing the potentially catastrophic environmental impacts of low probability-high consequence biota transfers under the Red River Valley Water Supply Project alternatives, the [Red River Valley Water Supply Project] DEIS either assumes that restoration measures that may not be available or feasible (DEIS p. 213) will 'provide replacement ecological services in perpetuity equivalent to those potentially lost from biological invasion' (DEIS, p. 211), or relies on a 'second economic approach, regional economic impact analysis . . . to describe potential consequences for Lake Winnipeg commercial fishing in terms of impacts of risk on the economy' (DEIS p. 213). Consequently, the DEIS interbasin biota transfer risk and consequences assessment clearly is deficient on its face." (Pearson 2006)

and:

> "Consequently, there simply is no discussion anywhere in the [Northwest Area Water Supply project] Draft EIS of the potentially catastrophic consequences of the introduction of invasive species from the Missouri River Basin into either the Canadian or U.S. portions of the Hudson Bay Basin by the NAWS project (including waters and ecosystems in North Dakota such as the Des Lacs, Upper Souris and J. Clark Salyer National Wildlife Refuge and waters of the Red River Basin.)" (Pearson 2008)

The Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply would have the capacity to deliver 93,722,200 gallons per day of Missouri River water into the Hudson Bay Basin, which is 3.6 times the 25,935,676 gallons per day maximum capacity of the Northwest Area Water Supply project, for a combined potential total of 119,657,856 gallons per day. For perspective, at a biota treatment efficacy of 99.9% for *Giardia* (Bureau of Reclamation 2008), that would be equivalent to 70 Olympic-size swimming pools of untreated Missouri River water being transferred into the Hudson Bay Basin by both projects every year during a severe drought.

However, none of the Bureau's Environmental Impact Statements for the Red River Valley Water Supply Project or the Northwest Area Water Supply project discusses the cumulative environmental impacts of the two projects in the Hudson Bay Basin despite the fact that its Dakotas Area Office was preparing the Environmental Impact Statements for both projects simultaneously (Bureau of Reclamation 2006, 2007, 2008; Bureau of Reclamation and Garrison Diversion Conservancy District 2006, 2007a, 2007b).

It is particularly relevant to note here in the context of the discussion of the environmental impacts of the interbasin transfer of Missouri River biota into the Hudson Bay Basin in the Bureau's Environmental Impact Statement for the proposed Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply that the Bureau stated formally and unequivocally in its September 2001 Finding of No Significant Impact for the Northwest Area Water Supply project that:

> "The proposed [Northwest Area Water Supply] Project does not establish a precedent for future actions with significant effects, nor does it represent a decision in principle about

> future considerations. The decisions related to the proposed Project are specific and limited to the Project, as clearly stated in the guiding principle included in the January 19, 2001 determination by the Secretary of the Interior that the Project meets the requirements of the 1909 Boundary Waters Treaty." (Bureau of Reclamation, 2001, p. 25)

Consequently, the Bureau cannot simply assume that the discussion of water treatment options, the environmental impacts of interbasin biota transfer, and compliance with the Boundary Waters Treaty of 1909 contained in its Environmental Impact Statements for the Northwest Area Water Supply project are automatically adequate and transferable to its Environmental Impact Statements for the Red River Valley Water Supply Project and for the proposed Eastern North Dakota Alternate Water Supply.

In order to permit the "evaluation of the benefits of the proposed action in light of its environmental risks" required by the National Environmental Policy Act under Natural Resources Defense Council v. Morton, the Bureau's EIS for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply should also address, substantively and objectively, the highly questionable assumptions upon which its Environmental Impact Statements for the $1 billion Red River Valley Water Supply Project are based[1] (Pearson 2005, 2006a, 2007, 2008), including:

1. The population of the Red River Valley will increase at 3.4 times the rate and be 27% greater in 2050 than U. S. Census Bureau projections.

2. No reduction in per capita water consumption will occur by 2050.

3. If the project is built, the water use rate will increase by10% above the current rate and make the projected shortages during droughts appear even worse.

4. Only minimal water conservation measures (e.g., efficiency, rate structure, plumbing code, leak detection) will be implemented to reduce water consumption.

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[1] On January 30, 2006, the Assistant Regional Administrator, Ecosystems Protection & Remediation, of the U. S. Environmental Protection Agency sent a letter to the Regional Director of the U. S. Bureau of Reclamation regarding the *Draft Environmental Impact Statement for the Red River Valley Water Supply Project* pointing out, "Further, online availability of the documents proved to be cumbersome and difficult to cross-reference, and our subsequent request for distribution of necessary hard copy documents and CD-ROM electronic copies delayed receipt for use by important EPA Reviewers" (Dodson, 2006). In fact, even when hard copies were requested, some of the appendices were not provided. For example the *Appendixes, Draft Environmental Impact Statement, Red River Valley Water Supply Project* did not include Appendix C (Surface Water Quality), Appendix D (Groundwater), Appendix F (Biota of Concern), or Appendix M (Social and Economic Conditions and Environmental Justice), which were "Reserved for Use in the Final EIS" (Pearson, 2006a). Both the Draft and Final *Environmental Impact Statements for the Red River Valley Water Supply Project* cite the Bureau's *Report on Red River Valley Water Needs and Options* as the source for many of these questionable assumptions, but the Environmental Impact Statements do not include the Report in their appendices, thereby withholding from other government agencies, decision-makers and the public the information necessary to evaluate the basis and validity of those hypothetical assumptions. See Pearson (2005) for an analysis of the lack of objective evidence, sound scientific foundation and responsible public policy in the *Report on Red River Valley Water Needs and Options* upon which many of these fundamental assumptions regarding the Red River Valley Water Supply Project are based.

5. No drought contingency plans (e.g., limiting lawn and golf course watering) will be implemented to reduce water shortages during droughts.

6. The estimated peak day of the month water use will occur every day of the month to contribute to the creation of a year 2050 55,000 acre-feet maximum annual water shortage.

7. The estimated 2050 industrial water needs actually will materialize despite the fact that the authors of the report upon which the estimate is based explicitly state that:

   "Forecasts. . . affecting demand and supply of agricultural products rarely are made beyond a 10-year period. Given the complexity of most forecasting methods associated with those studies, it is impossible, given the limitations of this study, to easily extend those forecasts for another 40 years."

   "Given the scope of this study, future predictions out to 2050 for all of the factors that might affect non-food based products associated with agricultural processing is not possible"

   ". . . a precise prediction of how the future will unfold with respect to all the factors influencing agricultural processing activities over a 50-year planning period is impossible."

   "There is inherent risk in accepting past changes as a predictor of future changes." (Bangsund and Leistritz, 2004)

8. A severe drought occurring today would have the same impacts in the Red River Valley as the 1930s Dust Bowl drought, including "nearly five consecutive months of zero flow in the Red River at Fargo" in 1934 (RRVWSP FEIS p. 1-1), despite the fact that the Baldhill Dam was built on the Sheyenne River in 1954, creating the 120,000 acre-feet Lake Ashtabula Reservoir, one of principal authorized purposes of which is to supply water to Fargo and Grand Forks during periods of shortages but has been used only twice for that purpose since it was built.

9. Both a 1930s-level drought will occur AND these artificially inflated water demands will materialize simultaneously (neither alone would be enough) at the end of the 50-year project planning period in 2050 in order to create the fabricated shortages upon which the Red River Valley Water Supply Project is claimed to be justified, but which still could be met by less costly in-basin water supply alternatives (RRVWSP FEIS pp. 2-31 to 2-42, p. 2-67 Table 2.21) with far less potentially severe environmental impacts.

10. The repayment of North Dakota's share of the construction costs (DWRA Section 2(4)(f)(2) REPAYMENT CONTRACT) and payment of the operation and maintenance costs (Section 2(4)(f)(3) OPERATION AND MAINTENANCE COSTS) of the Red River Valley Water Supply Project will be based on the percentage of the total capacity of the project that is in actual use during each payment period, which means that U.S. taxpayers would end up paying for most of the excessive costs of this unnecessary and extravagant project.

The Bureau's September 2019 Scoping Notice states:

> "In the NEPA process, a formal 30-day public scoping period begins with the publication of a Notice of Intent to prepare an EIS in the *Federal Register*. . . . While public participation in this analysis is welcome at any time, comments received by December 15, 2019, will be especially useful in preparation of the EIS. Due to the timeframe established by executive orders, it will be very difficult to extend comment periods. . . ."

The Scoping Notice indicates that the Notice of Intent will be published in the *Federal Register* in November 2019 but it does not give the specific date when the Notice of Intent will be published. Therefore, because many people do not have ready access to the *Federal Register* or time to peruse it every day for notices of intent to prepare EISs, the Bureau should send copies of the Notice of Intent to everyone on the mailing list for its September 19, 2019, Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply so they will know what the deadline actually is for submitting comments.

These comments may be supplemented after review of the Bureau's Notice of Intent to Prepare an Environmental Impact Statement for the Eastern North Dakota Water Supply that is to be published in the *Federal Register* in November 2019.

Sincerely,

Gary L. Pearson

Gary L. Pearson, DVM, MS

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10/28/19	DJR	Damien Scott Arden
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PROJECT		
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FOLDER I.D.		

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
1616 CAPITOL AVENUE
OMAHA NE 68102-4901

OCT 15 2019

Planning, Programs, and Project Management Division

Mr. Arden Freitag
U.S. Department of the Interior
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Ave
Bismarck, North Dakota 58501

Dear Mr. Freitag:

The U.S. Army Corps of Engineers, Omaha District (Corps) has reviewed your letter dated September 19, 2019 (received September 27, 2019) regarding the Bureau of Reclamation's Notice to prepare an Environmental Impact Statement (EIS) for the Eastern North Dakota Alternative Water Supply Project, in North Dakota. It is understood that the EIS will evaluate natural resources within the geographic scope of Reclamation's proposed action area and evaluate depletions of water from the Missouri River Basin and the effect on the availability of water needed to meet the authorized purposes of the Missouri River system. Due to the Corps management responsibilities of the Missouri River Mainstem System, Bureau of Reclamation staff have already began discussions with the Corps regarding assistance in a depletions analysis. The Corps looks forward to working with the Bureau of Reclamation on this evaluation.

The Corps Regulatory Office administers Section 10 of the Rivers and Harbors Act (Section 10) and Section 404 of the Clean Water Act (Section 404). A Section 10 permit would be required for work impacting navigable waters, this includes work over, through, or under Section 10 waters. A Section 404 permit would be required for the discharge of dredge or fill material (temporarily or permanently) in waters of the United States. Waters of the United States may include, but are not limited to, rivers, streams, ditches, coulees, lakes, ponds, and their adjacent wetlands. Fill material includes, but is not limited to, rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mines or other excavation activities and materials used to create any structure or infrastructure in waters of the United States. The activities described in the September 19, 2019 letter may require an authorization from the North Dakota Regulatory Office.

For future correspondence, please coordinate with the following points of contact:

U.S. Army Corps of Engineers, Northwestern Division Water Management Division
Attention: Mr. Mike Swenson, CENWD-PDR
1616 Capitol Ave.
Omaha, Nebraska 68102-4901

U.S. Army Corps of Engineers, Omaha District
Planning Branch
Attention: Mr. Eric Laux, CENWO-PMA-C
1616 Capitol Ave.
Omaha, Nebraska 68102-4901

U.S. Army Corps of Engineers
Bismarck Regulatory Office
Attention: Ms. Patricia McQueary, CENWO-ODR-ND
3319 University Drive
Bismarck, North Dakota 58504-7565

If you have any questions, please contact me at (402) 995-2682 or eric.a.laux@usace.army.mil and reference PD# 8217 in the subject line.

Sincerely,

for:

Eric A. Laux, PMP
Chief, Environmental & Cultural Resources

ENDAWS notice of intent; potential resources to include in EIS

Boswell, Tokey <tokey_boswell@nps.gov>

Wed 12/4/2019 12:49 PM

To: ENDAWS, BOR DKA <bor-sha-DKA-ENDAWS@usbr.gov>

Hello Mr. Reinhart and project team. I received the notice of intent to prepare an EIS for the ENDAWS project in North Dakota. The notice that we received included this statement: *Reclamation anticipates the depletion of Missouri River water to supply ENDAWS will be an issue of concern.*

The NPS administers several sites along the Missouri River downstream of the project area. These include Knife River Indian Villages National Historic Site (ND), Missouri National Recreational River (SD & NE), and the Lewis and Clark National Historic Trail (multiple states along the river). Please also be aware that some segments of the Missouri River downstream of the project area are listed on the Nationwide Rivers Inventory. The impacts of Missouri River depletion on these NPS areas and the NRI segments should be considered; this may well have already been anticipated by your project team.

I would be happy to provide additional detail regarding the downstream NPS areas and NRI segments as you move forward on the project, if requested. Sincerely,

Tokey Boswell
Planning & Compliance Division Program Manager
Omaha, NE
Serving DOI Unified Regions 3, 4, and 5
Office: 402-661-1534

Missouri Department of NATURAL RESOURCES
dnr.mo.gov
Michael L. Parson, Governor
Carol S. Comer, Director

December 9, 2019

Mr. Arden Freitag and Mr. Damien Reinhart
Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation, Dakotas Area Office
304 East Broadway Avenue
Bismarck, ND 58501
ENDAWS.EIS@usbr.gov

Dear Messrs. Freitag and Reinhart:

Thank you for sending a letter notifying us that your office is preparing an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply (ENDAWS) Project, in addition to publishing the Notice of Intent in the Federal Register on November 13, 2019 (84 FR 61638). The ENDAWS Project would allow additional water to be released from Garrison Diversion facilities to serve as an alternate water source for the Red River Valley and Central North Dakota Water Supply projects. This is the third inter-basin water supply transfer project proposed by the United States Bureau of Reclamation (Bureau) diverting water from the Missouri River basin, which would result in a cumulative diversion of 161,588 acre feet annually.

The State of Missouri and the Missouri Department of Natural Resources has long sought advance notification of inter-basin transfer projects from the Bureau. The Missouri Department of Natural Resources greatly appreciates the opportunity to provide scoping comments prior to alternatives identification so that we may provide guidance to avoid impacts to downstream uses of the Missouri and Mississippi rivers.

Historically, the State of Missouri has opposed inter-basin transfers from the Missouri River basin. As a riparian state, we are guided by the principle of reasonable use of water resources so as not to impact downstream beneficial use. The Missouri River is substantially impacted by depletions, which currently affect downstream flow support without these additional exports of water supply out of basin. Transferring from one drought/depletion impacted basin to another merely transfers impact from one region to another, rendering these out-of-basin transfers unsustainable as a reliable source of water supply.

As with most water resources planning efforts, it is essential to first include a comprehensive evaluation of in-basin supply and demand to fully understand the resource and anticipated need. If there is indeed a supply imbalance or shortfall, then in-basin options for providing the desired water supply shortfall should be comprehensively explored. Common options for addressing future municipal and industrial water supply include additional surface water storage, improved conveyance, minimizing system water loss, expanded conservation, conjunctive use, system redundancy, enhanced water treatment, wastewater reuse, and regionalization. Agriculture is

Mr. Freitag and Mr. Reinhart
Page Two

typically the largest water supply user in a basin, and agricultural demands should be considered in addition to options to increase water efficiency, such as irrigation system efficiency, and drainage water recycling.

Inter-basin diversion proposals should be held to a high standard and should demonstrate effective water demand analysis and appropriate implementation or elimination of the water supply measures listed above. If a future shortfall in water supply is projected, even with aggressive application of measures to extend or expand water supply, the State of North Dakota and the Bureau should take a hard look at existing water right allocation and use before considering an inter-basin transfer. Many western states have over allocated or fully allocated their water resources and are transitioning water from agricultural use to the higher valued municipal and industrial water supply to secure their water supply for the future.

If the Bureau and the State of North Dakota are intent on proposing and advancing the ENDAWS project, the Bureau must first fully satisfy the requirements within Section 8(B) of the Dakota Water Resources Act of 2000 (DWRA). Section 8(B) forbids construction of any feature or features that would transfer Missouri River water out of the basin for the Red River Valley water supply needs without a subsequent Act of Congress. Missouri's then Senator Kit Bond included this provision within the DWRA in negotiation with other members of Congress. In March 2001, Senator Bond pointed out this provision to the Bureau when the Bureau was advancing the Federal Red River Valley Water Supply Project. In a letter dated August 17, 2001, Commissioner John Keys re-affirmed this interpretation of DWRA, assuring Senator Bond that no project feature or features specifically authorized by the DWRA or involving the Red River Valley water supply would be designed or constructed without Congressional authorization.

If you have any questions, comments, or need additional clarification, please feel free to contact Mr. Bob Bacon, the State Hydrologist at the Missouri Department of Natural Resources, Water Resources Center at (573) 751-6632 or by email at Bob.Bacon@dnr.mo.gov.

Sincerely,

WATER RESOURCES CENTER

Jennifer Hoggatt
Director

Ecological and Water Resources
2115 Birchmont Beach Rd NE
Bemidji, MN 56601

December 13, 2019

Damien Reinhart
EIS Team Leader
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Ave.
Bismarck, ND 58501

EIS Scoping for the Eastern North Dakota Alternate Water Supply Project

Dear Mr. Reinhart,

Thank you for the opportunity to provide comment on the scoping of the Eastern North Dakota Alternate Water Supply Project (ENDAWS). The Minnesota Department of Natural Resources (MN DNR) has a strong interest in this project because it will transfer water from the Missouri River to the Red River watershed, creating risks for biota and pathogen transfer. In the past, we have been heavily involved and provided lengthy comments on the connected Red River Valley Water Supply Project (RRVSWP). MN DNR recommends the following items be described in the ENDAWS EIS:

Purpose and Need

The purpose and need should include community population projections and associated industrial and domestic water demand along the pipeline. Water use projections should differentiate between domestic, agricultural, and industrial water demand, as well as include trends in water conservation observed in communities throughout the country. Water conservation is becoming easier and more commonplace for communities due to innovations such as water conservation fee structures, rebates for water saving appliances, waterline leak detection, and industrial water recycling and re-use.

The EIS should assess the projected frequency of drought conditions in which users would require supplemental water supply. This assessment should use the latest climate and hydrological/gage data as well as discuss supplemental water supplies already in place from the Devil’s Lake outlet.

Alternatives

- MN DNR recommends the development of a long-term, multi-faceted water conservation program to be invoked when it becomes apparent that a drought is coming. This would also include implementing technologies such as storage and re-use of stormwater as well as laws and regulations requiring or incentivizing water conservation. This water-saving strategy should be included in all proposed alternatives to minimize the use of the project operations and associated impacts to the environment.

- Investigate and describe the use of groundwater aquifers as a project alternative. The assessment should address both groundwater availability and the feasibility of increasing availability with injection using surface water during high water years. The State of Minnesota recently funded a feasibility study led by the University of Minnesota Water Resources Center on using managed aquifer recharge within the Buffalo aquifer area of Fargo and Moorhead. This alternative should also discuss potential impacts associated with groundwater recharge such as changing groundwater quality, aquifer structure, and any changes to the ability of the aquifer to store and transmit water. Visit the University of Minnesota Water Resources Center for more information on the Buffalo Aquifer study.

- All water transfer alternatives should include the following sub-alternatives:

    - Alternatives to discharging within the Sheyenne River such as overland discharge and groundwater injection.

    - Alternative water treatment methods and water treatment facility locations as well as other mitigation measures for prevention of biota transfer. Each potential treatment method and location alternative should disclose the effectiveness of their treatment on aquatic plants, animals, mollusks, cyanobacteria, protozoa, fungi, bacteria, viruses, animal parasites, and other pathogens. The scope of study should include different taxa and life stages such as larvae, fish and fish eggs, and seeds.

Evaluation of Impacts for Each Alternative

MN DNR recommends examination of the following items with all alternatives that include cross-basin transfer of water from the Missouri River watershed into the Red River watershed:

- Updated risk assessment for transport of biota and pathogens. In addition to the biota listed in the scoping announcement (cyanobacteria, protozoa, fungi, bacteria, viruses, animal parasites, & mollusk larvae), please include plants and other animal taxa of various life stages (adult, egg, seed, larvae, etc.) on this list.

- The EIS should specifically investigate fish disease prevention alternatives. Since 1990, MN DNR has invested heavily in population re-stocking, restoration and connection of rivers and

spawning habitat for lake sturgeon throughout the Red River Valley. The EIS should evaluate the potential transfer of sturgeon iridovirus and its potential impact on this species along with other potentially impactful fish pathogens or diseases. Fish diseases as a general rule are not well understood, with a few exceptions. The iridovirus causes death in hatchery settings, and has been detected in wild Shovelnose and Pallid sturgeon in the Missouri downstream of Fort Peck.

- Describe potential operation frequency and operational plan as they relate to current climate projections of drought frequency and other projects (e.g., Devil's Lake outlets, reservoir operations plan). Discuss project operation triggers for each alternative. Discuss agreements or restrictions which would ensure the project follows operational plans and agreements.
- Describe long-range costs of infrastructure maintenance and operations of pipelines, pumps, water treatment plants, as well as costs associated with water treatment chemicals, filters, and waste disposal. The EIS should also describe environmental impacts associated with this maintenance and operation including fossil fuel consumption and wastes generated. Disposal of treatment wastes should be included in the assessment.
- Costs of managing biota should they arrive in the Red River Basin should also be considered.
- The EIS should also discuss financial assurances, risk of failure, associated costs and funding sources.
- Describe potential project operational failures, accidental releases, and secondary containment methods to prevent the release of biota, pathogens, and/or water that does not meet regulatory standards for discharge into a waterbody.

Cumulative Effects

The Red River Valley Water Supply Project will outlet to the Sheyenne River, which is also affected by water releases from the Devil's Lake outlet pumping. The EIS should describe the operation of ENDAWS/RRVWS relative to Devils Lake outflows and what its effects will have on:

- Red River water chemistry during drought conditions with both projects in operation
- Increased potential for biota transfer with the additional connection of the Missouri River watershed to the Red River watershed. Ensure that surveys used to establish baselines/current biota in the two basins are based on up-to-date surveys.
- Potential changes to operations of the Sheyenne and Fargo-Moorhead Diversions
- Changes to geomorphology and hydrology in the Sheyenne River, which can increase sediment loads into the Red River.

Thank you for this opportunity to provide comments on the EIS scope. We hope these recommendations and comments are beneficial as you begin the EIS development process. If you have any questions or concerns, please contact DNR Northwest Regional manager Nathan Kestner at 218-308-26226 or Nathan.kestner@state.mn.us.

Sincerely,

Nathan Kestner, DNR Regional Ecological and Water Resources Manager

CC: Jess Richards, DNR Assistant Commissioner
Theresa Ebbenga, DNR Regional Director Henry Drewes, DNR Regional Fisheries Manager
Jaimé Thibodeaux, DNR Environmental Assessment Ecologist
Jim Zigler, MPCA
Nicole Armstrong, Manitoba Ag. and Resource Development

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Links:
University of Minnesota Water Resources Center
https://www.wrc.umn.edu/banking-groundwater-managed-aquifer-recharge

Lake Agassiz
Water Authority

P.O. Box 140
Carrington, ND 58421

Phone 701-652-3194
Fax 701-652-3195

December 5, 2019

Mr. Arden Freitag
United States Bureau of Reclamation
Dakotas Area Office
304 East Broadway Avenue
Bismarck, ND 58501

Re: Eastern North Dakota Alternate Water Supply Project Environmental Impact Statement Scope

Dear Mr. Freitag:

The Lake Agassiz Water Authority ("LAWA"), on behalf of itself and member communities and water districts, appreciates the opportunity to comment on the scope of the environmental impact statement ("EIS") that the Bureau of Reclamation ("BOR") intends to prepare to evaluate the impacts of the construction of the Eastern North Dakota Alternate Water Supply Project ("ENDAWS"). Based on LAWA's analysis of the available ENDAWS information, LAWA agrees with BOR that the construction of ENDAWS is needed to "improve water reliability standards, given the significant variation in water supplies and high potential for drought on the Red River." Issues of significance that should be adequately analyzed by BOR in preparing its EIS, as well as those issues which should be eliminated from the study are detailed below.

The State of North Dakota created LAWA in order to, among other things, store and distribute water to eastern and central North Dakota through the bulk purchase of water from the Garrison Diversion Conservancy District ("Garrison Diversion"), who requested the study of the ENDAWS option for beneficial and public uses. LAWA requests that BOR consider the comments of LAWA and other North Dakota local governments as their economies and prosperity rely heavily on the development of a safe, secure, and high-quality water supply.

LAWA supports BOR's proposed action: the construction of ENDAWS. This alternative will provide a more affordable water supply option for the State of North Dakota's Red River Valley Water Supply Project ("state RRVWSP"). Regardless of the ENDAWS option, state and local entities will develop a much needed Missouri River water supply for eastern and central North

Dakota communities. Through the state RRVWSP, LAWA's members will prevent catastrophe from occurring in the event of a 1930's style drought in the Red River Valley. By utilizing ENDAWS and other underutilized Garrison Diversion Unit facilities, the state RRVWSP will save approximately $200 million in construction costs and millions of dollars annually in operation and maintenance costs. These savings, in turn, will be passed onto LAWA and our members, the ultimate end users of the water.

As part of its evaluation, BOR identifies compliance with the Boundary Waters Treaty Act of 1909 and "the risk and consequences of transferring aquatic invasive species ("AIS") from the Missouri River Basin to the Hudson Bay Basin, as a result of project operations." BOR should include in its analysis the significant amounts of research and review of treatment options that have been done to date in regards to AIS crossing from the Missouri River Basin to the Hudson Bay Basin. This includes the former federally sponsored RRVWSP, the Northwest Area Water Supply (NAWS), and the Devils Lake Outlet project.

It is noteworthy that Manitoba has regularly been involved with the federal government in negotiating for treatment levels. After consultation in the federally sponsored RRVWSP, BOR determined basic treatment would meet the BWTA, which consists of coagulation, flocculation, sedimentation, UV disinfection, chlorination, and chloramines. A more extensive level of treatment was negotiated in NAWS after 16 years of litigation. Much less treatment was required in the Devils Lake Outlet, which is a state project constructed with a state NDPDES permit issued by the predecessor to the North Dakota Department of Environmental Quality ("NDDEQ"). To the extent NDDEQ agrees with Garrison Diversion on its treatment proposal for the state RRVWSP, there is no reason for BOR to require a heightened standard for the alternative water supply through ENDAWS. The same water, water from the Missouri River, will be crossing the divide with or without ENDAWS. While the federal government needs to meet the BWTA, so long as a NDPDES permit is issued and upheld as adequate, there should be no legal basis on which to raise the bar for BWTA, particularly when there are no standards associated with BWTA, nor is there any enforcement. There would be no legal basis for BOR to require more.

To the extent BOR requires a heightened treatment standard in order to comply with the BWTA, or conditions any water contract on a heightened treatment standard beyond what is required by the NDDEQ, BOR must be prepared to cover those costs and not forward those costs onto Garrison Diversion and the ultimate end users. The cost of compliance with the BWTA is a federal expense under the Dakota Water Resources Act. In fact, since the state RRVWSP could be constructed as a simple water to water transfer without any NDPDES permit, the costs of all treatment could be argued to be a federal responsibility.

Many, if not all, of the issues identified for evaluation have been extensively studied in the Central North Dakota Water Supply Project ("CND"), which resulted in the issuance of a Finding of No Significant Impact ("FONSI") in September 2018. Currently, BOR and Garrison

Diversion are developing a water service contract, which will allow Garrison Diversion to purchase up to 20 cubic feet per second (cfs) out of the McClusky Canal for use within the Missouri River Basin. The utilization of ENDAWS would simply upsize the already-studied 20cfs pipe and allow the additional use of 145 cfs from the McClusky Canal to be conveyed to the state RRVWSP facilities. The geographic scope of the CND and ENDAWS projects are identical, although there is some discussion of changing the route of the 145cfs pipeline slightly. The scope of environmental review is identical. The environmental impacts between the two projects should be identical and the analysis and outcome for ENDAWS should be the same as the CND. Accordingly, the BOR's Environmental Assessment ("EA") for the CND, which includes analysis of the scope of water needs of central North Dakota, and resulting FONSI, should be incorporated by reference in the environmental review documents required for ENDAWS.

LAWA hopes the above comments aid BOR's efforts to identify issues of relevance as it moves forward with an EIS for ENDAWS. Coordination and cooperation between LAWA, its member entities and BOR will provide the context necessary to help BOR make the right decision and doing so with the buy-in of the local communities most affected by that decision. LAWA is prepared to engage constructively with BOR as a partner during this process; and it is our hope that BOR uses this opportunity to recognize the full potential of that partnership. At the same time, it will create hundreds of jobs in the state and will provide significant federal revenue from water sales in an otherwise underutilized federal canal. Moving forward positively with ENDAWS is a win/win for the federal, state and local governmental entities involved.

Sincerely,

Timothy Mahoney
Chair

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
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DEC 1 2 2010

Ref: 8ORA-N

Arden Freitag, Area Manager
c/o Damien Reinhart, EIS Team Leader
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Avenue
Bismark, North Dakota 58501

Dear Mr. Freitag:

The U.S. Environmental Protection Agency Region 8 has reviewed the Bureau of Reclamation's notice to prepare an Environmental Impact Statement (EIS) for the Eastern North Dakota Alternate Water Supply (ENDAWS) Project. In accordance with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA), we are providing scoping comments.

The project proposes to deliver an alternate water supply to the State of North Dakota's Red River Valley Water Supply Project serving the central and eastern part of the state through a contract authorizing up to 165 cubic feet per second (cfs) of water from the Garrison Diversion Unit facilities. Components of the project include the use of the Snake Creek Pumping Plant, an intake and pump station located along the McClusky Canal, and a bulk transmission pipeline to deliver Missouri River water to the main transmission pipeline of the State's Red River Valley Water Supply Project. We understand that Reclamation's scope of analysis will include water quality and water quantity effects in the Missouri River Basin. Reclamation will also focus on the potential effects of transferring aquatic invasive species from the Missouri River Basin to the Hudson Bay Basin. We support that general approach and offer the attached specific comments on the scope of analysis. Because water will be transferred into the Red River Basin, we recommend that water quality and water quantity impacts be assessed in the receiving waters.

We appreciate the opportunity to provide comments at this early stage of the NEPA process. These comments are intended to facilitate the decision-making process and we thank you for considering our input. If we may provide further explanation of our comments, please contact me at (303) 312-6704, or your staff may contact Melanie Wasco at (303) 312-6540 or wasco.melanie@epa.gov.

Sincerely,

Philip S. Strobel
Chief, NEPA Branch
Office of the Regional Administrator

EPA Scoping Comments on the Eastern North Dakota Alternate Water Supply Project

Based on our current understanding of the proposed project and the area, the EPA provides the following scoping comments and recommendations regarding the EIS analysis for your consideration.

Purpose and Need

To comply with both the Clean Water Act (CWA) and National Environmental Policy Act (NEPA), the EPA recommends working with the Corps to develop a purpose and need statement that is broad enough to encompass an appropriate range of both "reasonable" (per NEPA) and "practicable" (per CWA Section 404) alternatives to meet the basic (i.e., underlying) project purpose. The statement should be broad enough to include the proposed action and other available water supply and management options without eliminating less environmentally damaging alternatives that may be considered practicable under the CWA Section 404 implementing regulations. The coordinated purpose and need statement should be developed prior to establishing subsequent screening criteria and identifying alternatives. In our experience, efforts to meet the requirements of both NEPA and CWA Section 404 can provide for a more efficient planning and permitting process, while the use of an overly narrow project purpose has the potential to result in the need to conduct additional analysis to meet NEPA and CWA Section 404 requirements.

When projecting the water need, we recommend that the Draft EIS describe and quantify the gap between supply and demand. Important considerations in the demand analysis include identifying project participants, community growth projections (e.g., per State Demographer information), and existing and projected future use by each entity (municipal, agricultural, industrial) utilizing consistent methodology (e.g., gallons per day *or* gallons per capita). It is informative to describe any available water demand estimates associated with the current community master planning build-out scenarios. If available, it is also helpful to provide similar community-type demand estimates or ranges for comparison purposes.

Range of Alternatives

Clean Water Act Section 404 serves to direct impacts away from waters of the U.S., including wetlands and other aquatic sites, and no activity shall be permitted if there is a practicable alternative which would have less adverse impact on the aquatic ecosystem [40 CFR § 230.10]. For an alternative to be practicable, it must be reasonably available or obtainable and may include options beyond the authority of the lead agency. If any part of the project components would require a CWA Section 404 related permit, it is essential that the Draft EIS include a range of alternatives with the goal of avoiding and minimizing impacts to waters of the U.S. while meeting the underlying purpose of the action. We recommend that the Draft EIS summarize the regulatory criteria and processes utilized to screen potential alternatives and develop the range of reasonable and practicable alternatives, including any environmental, logistical, technological and cost criteria applied. Providing the reasoning used to eliminate alternatives is also helpful in understanding the decision process. As required by regulation, the screening rationale must be consistent with the practicability definition and criteria outlined in the preamble language of the CWA 404(b)(1) Guidelines (40 CFR § 230.10) for applicable projects.

The EPA recommends exploring both structural and non-structural options to meet the underlying project purpose when considering a range of alternatives. Alternatives could include a combination of non-structural and structural components that together may present a practicable alternative that is potentially less damaging than a single larger structural option. For example, for municipal, industrial or irrigation supply, assess the extent to which the need for water could be reduced through available conservation measures. We recommend considering whether remaining need could be partially or fully met through other non-structural measures such as temporary or permanent agreements for use of agricultural water rights, conjunctive use of groundwater and surface water supplies, availability of other water rights that may be less damaging to aquatic resources, blending raw water, or a combination of these or other alternatives. Because non-structural options (e.g., conservation, water rights leasing) may individually contribute less towards meeting the project purpose and need than structural options, we recommend designing screening criteria so that non-structural components are not eliminated solely on the basis of their potentially smaller individual contributions.

Because this project will also likely supply rural water needs, in addition to the considerations mentioned above, we recommend assessing the extent to which the need for supplemental irrigation water could be met through more efficient irrigation practices (e.g., center pivot or linear move irrigation systems, irrigation pipelines, remote-controlled water ditch gates, and irrigation water management). Additional alternatives to consider for agricultural shortages include rotational fallowing, dry year leasing, gravel pit storage, acquiring and utilizing existing storage from reservoir companies, expansion of non-potable supplies, developing wastewater reuse infrastructure, acquisition of additional shares of irrigation company water rights or purchase of additional water rights in ditch companies.

Conservation

For a complete NEPA analysis, the EPA recommends assessing available conservation measures and presenting the results of the assessment in the Draft EIS. We recommend that conservation be used as a tool to reduce demand at the project purpose stage. Another option would be to consider demand management (i.e., an identified level of conservation) in the alternatives analysis, either alone or in combination with other supply management components. Whether as a demand reducer or alternative component, we recommend that the Draft EIS quantify the potential role of conservation in reducing future demand/supply needs and identify how these conservation measures can be implemented. In instances where a project proponent determines that certain conservation measures are not practicable under CWA Section 404(b)(1) Guidelines, we recommend that the EIS document the rationale. Depending on the type and amount of anticipated population growth, EPA's Smart Growth Principles may be useful in considering available measures to reduce demand (see https://www.epa.gov/smartgrowth/smart-growth-and-water).

Baseline Environmental Conditions

When evaluating project effects, we recommend using existing environmental conditions as the baseline for comparing impacts across all alternatives, including the no-action alternative. This provides an important frame of reference for quantifying and/or characterizing magnitudes of

effects and understanding each alternative's impacts and potential benefits. This is particularly important when there are environmental protections in place that are based on current conditions, such as total maximum daily loads (TMDLs) for impaired river segments. It can also be useful, although often less certain, to compare alternatives against a no action baseline that includes reasonably foreseeable future conditions. The EPA recommends that the NEPA analysis compare and present impacts to resources against the existing conditions baseline using a consistent method to measure project impacts for all alternatives. By utilizing existing environmental conditions as a baseline, future changes to environmental resources can be more accurately measured for all alternatives, including the No Action alternative. We recommend that Reclamation consider the following when defining baseline conditions:

- Verifying that historical data (e.g., data 5 years or older) are representative of current conditions.
- Providing a detailed hydrologic analysis to adequately assess the project's potential biological and geomorphic impacts. At a minimum, include wet, average, and dry year analyses at a daily time-step. Also consider potential influences of temperature and precipitation trends on future hydrology.
- Including resources directly impacted by the project footprint within the geographic scope of analysis, as well as the resources indirectly (or secondarily) impacted by the project. These indirectly impacted areas may include downstream segments, source streams where water diversions will occur, and any other resource areas which may be affected by changes in water management or operations.

Impact Analysis/Resource Considerations

Direct, Indirect and Cumulative Effects

Because the proposed action or other alternatives may require a CWA Section 404 permit and NEPA and CWA Section 404 have slightly different definitions for indirect (secondary) and cumulative impacts, we recommend identifying in the Draft EIS which statute is being employed to evaluate the impacts and, if applicable, how the analysis would differ under the other statute's definition.

In analyzing cumulative impacts associated with each alternative, we recommend describing past diversion impacts in the project area including incremental impacts from historical water management operations and their impacts to streams, associated wetlands and aquatic habitat. If there are other reasonably foreseeable water diversion and water management projects that will have a relationship with this project, we recommend that the Draft EIS identify those relationships to aid in the disclosure of any cumulative impacts to the affected environment. We recommend that the Draft EIS consider whether there will be sufficient storage for water delivered by means of this project. If water storage is insufficient, we recommend that anticipated actions to expand storage and any related effects are discussed in the Draft EIS.

Wetlands

In order to illustrate effects to wetlands in the area, we recommend that the Draft EIS specifically include the following analyses or descriptions:

- Description of impacts under individual or nationwide permits authorizing the discharge of fill or dredge materials to waters of the U.S.;
- Maps, identifying wetlands and regional water features;
- Identify the direct, indirect, and cumulative impacts to wetlands in the geographic scope, including impacts from changes in hydrology even if these wetlands are spatially removed from the construction footprint. Include the indirect impacts to wetlands from loss of hydrology from water diversion/transfers, as well as the cumulative impacts to wetlands from future development scenarios based on population and growth estimates.
- For wetlands potentially impacted by project alternatives, include wetland delineations and functional analysis.

Streams

When assessing the project's impacts to streams, we recommend coordinating with state and federal resource agencies to identify critical resources in the project area. Critical resources may include species recovery areas, recreational areas, critical habitat for threatened or endangered species, segments impaired per Section 303(d) of the CWA, segments for which TMDLs have been established, receiving waters for permitted dischargers, and source water protection areas for surface water intakes.

Stream Hydrology

Because this project will alter hydrology in both source and receiving streams, we recommend that the Draft EIS assess the projected pre- and post-project flows. The table below includes recommended flow metrics:

Recommended flow metrics for pre- and post-project comparison		
Flow Type	**Description**	**Hydrologic Parameters**
Low-flow	Baseflow or dominant flow condition	Mean and median values for each month
High-flow Pulses	Flows during rainstorms or brief periods of snowmelt when flows exceed low-flow levels but are less than bankfull	Mean and median values of high flow pulse event: • Duration (days) • Peak flow (maximum flow during event) • Frequency (occurrence throughout water year)
Small Floods	Flows equal to or greater than bankfull flows (2-year flood) but less than the 10-year flood; these floods overtop the main channel but do not include more extreme,	Mean and median values of high flow pulse event: • Duration (days) • Peak flow (maximum flow during event) • Frequency (occurrence throughout water year)

	less frequent floods	
Large Floods	Floods equal to or greater than the 10-year flood	Mean and median values of high flow pulse event: • Duration (days) • Peak flow (maximum flow during event) • Frequency (occurrence throughout water year)

- If the project is projected to exacerbate low flows or high flow events, there are likely to be associated environmental impacts associated with erosion and sediment transport processes. Impacts may include changes to channel complexity, loss of channel maintenance functions, reduced aquatic habitat availability and life history adaptation. If Reclamation determines there is potential for ecologically significant hydrologic impacts, the following information may be useful to identify associated impacts to resident fish species and invertebrate assemblages, including:
    - Any available baseline data regarding functional species composition, diversity, evenness, abundance, and, for macroinvertebrates, % EPT and some characterization of flow preference. The EPA's rapid bioassessment protocol, or a state-specific method, may be used to describe baseline habitat quality;
    - Characterization of predicted shifts in species composition, impacts to less tolerant species, and changes in functional composition between current baseline and post-project environment;
    - Impacts to physical habitat, including availability, heterogeneity, connectivity, and long-term habitat maintenance;
- A description of mitigation measures for potentially adverse impacts to stream resources and aquatic life.

Water Quality

Should the project modify flow through operational changes, increased diversion of water, or introduction of new water sources, we recommend the Draft EIS include an analysis of water quality that evaluates the following areas:

- Compare current water quality, post-project water quality, and the applicable NPDES or North Dakota water quality standards;
- If the EIS identifies the potential for the project to cause or contribute to violations of water quality standards, it will be important to identify alternatives, mitigation or operational controls to avoid such impacts. If it proves difficult to determine the project's potential for impacts to water quality standards, we recommend implementing a water quality monitoring program using the North Dakota Department of Environmental Quality methods for relevant parameters (e.g., DO, pH, conductivity, temperature). In such cases, monitoring should be done before, during and after project implementation to ensure compliance with the North Dakota water quality standards and determine water quality-based effluent limits;Account for changes in background water quality when updating the water quality model and when making determinations of assimilative capacity;

- Identify reaches with existing water quality impairments per State CWA Section 303(d) lists, draft or established total maximum daily loads (TMDLs), and potentially affected dischargers and ensure the project will avoid contributing to existing impairments;
    - To identify impaired waterbody segments within the affected area, the North Dakota 2016 Integrated 305(b) Report and 303(d) List can be found at https://deq.nd.gov/publications/WQ/3_WM/TMDL/1_IntegratedReports/2016_Final_ND_Integrated_Report_20170222.pdf;
    - Source Water Protection areas and explanation of how the project will be consistent with Source Water Protection planning measures; and
- Identify potentially affected drinking water treatment providers with intakes on reaches with predicted water quality changes as well as possible changes to treatment processes.
- Identify waste water treatment plants discharging to reaches with predicted water quality changes. Evaluate current and post-project water quality at a critical flow conditions and expected changes to assimilative capacity or permit limits for any NPDES or North Dakota Department of Environmental Quality discharge permits.

If the irrigation in the project area will increase as a result of this project, we recommend the Draft EIS consider whether there will be water quality effects related to return flows in receiving waters, and any associated impacts to water treatment facilities and discharge permitees.

Stormwater

We recommend considering the following stormwater management and monitoring practices to avoid and minimize impacts to water quality:

- Site-specific stormwater management plans for all stream and wetland crossings to ensure careful consideration is given to uniquely sensitive environments;
- Applicable Best Management Practices during construction, including the use of waterbars, compost filter socks, silt fences and diversion dikes or ditches;
- Timely inspection and maintenance of erosion and sediment control measures following rainstorms to stop sediment releases and repair the controls; and
- For any stream crossings in areas with resources sensitive to sediment loads, water quality monitoring stations should be installed upstream and downstream of those crossings. They should be installed with as much time prior to construction as possible to establish baseline conditions and natural variation in stream conditions.

Groundwater

We would anticipate this project has the potential to both positively and negatively impact groundwater resources. In assessing the potential impacts of each alternative on groundwater systems in the project area, we recommend that the Draft EIS examine the potential for changes in the volume, storage, flow and quality of ground water using available characterization of ground water resources and ground water use. Projected construction, operation or maintenance of a project may have

significant impact on these facets of the natural system mentioned above. If the EIS identifies any adverse impacts to groundwater resources, we recommend considering alternatives, mitigation measures or operational controls that would avoid, reduce or minimize impacts on groundwater.

Air Quality

We recommend evaluating and disclosing current air quality conditions, identify any potential air quality impacts and, if necessary, detail mitigation steps that will be taken to minimize associated adverse impacts. We recommend that consideration be given to opportunities to reduce vehicle emissions by limiting unnecessary vehicle idling, as well as minimizing road and construction-related fugitive dust emissions through the application of best management practices such as dust suppression practices.

Components to be presented in the Draft EIS documentation include the existing air quality conditions in the project vicinity, and an assessment of any impacts on National Ambient Air Quality Standards (NAAQS), Prevention of Significant Deterioration standards, air quality related values (AQRVs), and an assessment of any Class 1 Areas in the vicinity that may be impacted by construction or operation emissions. We understand that this area is currently in attainment for all six ambient air quality NAAQS, and therefore both Transportation Conformity (40 CFR 93, Subpart A) and General Conformity (40 CFR 93, Subpart B) do not apply.

Mitigation

The EPA recommends that each alternative in the Draft EIS identify available mitigation where impacts are expected. Where Reclamation identifies the potential for significant water or air quality impacts, we recommend monitoring and modeling efforts are considered for accurately assessing current conditions, predicting project impacts, and ultimately supporting adequate mitigation planning and implementation of effective mitigation. The higher the uncertainty is surrounding project impacts, the more emphasis there should be on providing mitigation details to assure protection of aquatic resources. Where the EIS commits to mitigation, we recommend specifying the entity responsible for implementing the mitigation and a schedule for when the mitigation will be applied. If the project includes mitigation intended to avoid impacts to *regulatory thresholds*, we recommend including the following additional information in the Draft EIS:

- A defined mitigation monitoring plan to track the effectiveness of the mitigation, including baseline monitoring if data are lacking;
- Specific management decision points based upon protecting the minimum desired environmental conditions (thresholds) in the project area, which would trigger action;
- Management alternatives and mitigation measures that would be implemented should a threshold be exceeded;
- Identification of short and long-term financial assurances;
- Mechanisms for public disclosure of the analysis and management decisions; and
- Specific temporal milestones to meet rehabilitation standards.

We emphasize the importance of the Draft EIS including details on mitigation measures for any impacted resource, especially effects related to water quality, wetlands, stream morphology and aquatic life impacts. Also, ensure that any mitigation details presented are consistent with the 2008 Rule on Compensatory Mitigation for Losses to Aquatic Resources for CWA Section 404 related impacts.

Special-Status and Threatened and Endangered Species

The project area may contain special status species, including Endangered Species Act listed threatened species and endangered species, as well as candidate species. The EPA recommends engaging the U.S. Fish and Wildlife Service (FWS) as early in the analysis as possible to assure that the proposed alternatives account for the following:

- River restoration, flow and channel modifications, wetlands, and habitat fragmentation regarding species' habitat requirements;
- Migratory Bird Treaty Act compliance; and
- Protection from invasive species.

Environmental Justice

If the project area is located in a potential Environmental Justice area, the Draft EIS is required to address whether any minority or economically-disadvantaged communities will be disproportionately and adversely affected by the project. The 2016 Report, *Promising Practices for EJ Methodologies in NEPA Reviews*, may be helpful and can be found at https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

Global Affairs Canada | Affaires mondiales Canada

December 12, 2019

125 Sussex Drive
Ottawa, Ontario
K1A 0G2

Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Avenue
Bismarck, ND 58501
Email: ENDAWS.EIS@usbr.gov

Dear Mr. Freitag:

On behalf of the Government of Canada, I am writing in response to a September 19, 2019, letter from the Bureau of Reclamation (the Bureau) regarding a notice to prepare an Environmental Impact Statement (EIS) for the Eastern North Dakota Alternate Water Supply Project (ENDAWS). The Government of Canada appreciates the opportunity to share comments about the proposed project, and requests clarification about how the project fits into the larger inter-basin water supply projects currently planned, or under development, by the State of North Dakota and/or the Bureau of Reclamation.

Over the last several years, the Government of Canada has expressed its concerns about three water supply projects in North Dakota – the Northwest Area Water Supply Project, the Red River Valley Water Supply Project, and the Central North Dakota Water Supply Project. Canada has, via diplomatic notes to the Department of State and letters to the Bureau, documented our concerns about these projects, which stem from the threat of a transfer of invasive species or harmful biota through an inter-basin transfer of water from the Missouri River to the Hudson Bay basin. The threat of invasive species or other harmful biota moving between the two watersheds could have negative implications on Canadian commercial and recreational fisheries, as well as the ecological health of our lakes and rivers, which could be significant and irreversible, putting Canada's ecosystems and economy at risk.

Canada

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According to the project description in the public scoping notice, the ENDAWS project will be a bulk water supply project that would deliver an alternate water supply to North Dakota's Red River Valley Water Supply Project (RRVWSP). While the state-sponsored RRVWSP may proceed independently of the ENDAWS project, given the stated relation of the ENDAWS to the RRVWSP, Canada's position is that the ENDAWS is an essential component of the RRVWSP as it enables the transfer of water from the Missouri River across the continental divide into the Hudson Bay basin. As such, the environmental and cumulative effects of the ENDAWS project cannot be assessed in isolation from the broader RRVWSP.

The Environmental Impact Statement (EIS) for the Federal RRVWSP and the Northwest Area Water Supply (NAWS) projects, led by the Bureau, demonstrated significant risks posed by inter-basin transfers. Furthermore, for the NAWS project, the U.S. District Court recognized Canada's concerns as valid; noting the risk to water quality and quantity associated with inter-basin transfer should be addressed through strenuous environmental assessments and the implementation of strong mitigation measures. As such, the Government of Canada, which continues to raise concerns about the RRVWSP due to the risks posed to Canadian aquatic ecosystems, believes it is erroneous to assess environmental and cumulative effects of the ENDAWS project in isolation from the broader RRVWSP. The Government of Canada therefore seeks clarification on the following questions related to the ENDAWS project.

1. Court orders from the Northwest Area Water Supply project make clear that the Bureau is required to take a "hard look" at potential transboundary impacts of projects. Canada is seeking clarification as to how the Bureau will undertake this "hard look" as part of this project, which is part of the larger RRVWSP. At what stage of the project will the transboundary impacts to Canada be considered?

2. The public scoping notice makes clear that the ENDAWS project would be part of the RRVWSP. How will the Bureau examine the cumulative effects and broader impacts of the ENDAWS project as a component of the RRVWSP?

3. How will the Bureau of Reclamation and the State of North Dakota coordinate efforts to address the transboundary impacts, and *Boundary Waters Treaty of 1909* implications, of these projects in accordance with the 1977 recommendation of the International Joint Commission related to the water diversion projects associated with the Garrison Diversion?

4. In the event the ENDAWS project proceeds, what type of treatment would be put in place for Missouri River basin water before it enters the Hudson Bay basin?

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The Government of Canada recognizes North Dakota could face future periods of constrained water supplies. Indeed, these threats are mounting across North America. However, meeting those needs must be managed in a way that adequately reduces the risk of spreading harmful biota across the continental divide and into a neighbouring country. Pre-treatment of all inter-basin water transfers, to specific treatment objectives, could ensure a reliable water supply and source for North Dakota. Appropriate treatment is critically important to reduce the risk of spreading harmful biota into the Hudson Bay basin and ensure the protection of Canadian economic and environmental interests.

Decisions made within the water basins of one country can have consequences for the other, placing a premium on effective governance and cooperation of our shared environment. The Government of Canada appreciates the opportunity to provide comments and seek clarification related to the scoping for the referenced project.

Yours sincerely,

Eric Walsh
Director General
North America Strategy Bureau

Manitoba
Agriculture and Resource Development
Water Stewardship and Biodiversity Division
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December 13, 2019

Mr. Damien Reinhart, EIS Team Lead
Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Avenue
Bismarck ND 58501

Eastern North Dakota Alternate Water Supply Project/EIS Scoping Comments

Dear Mr. Reinhart,

In accordance with the Notice of Intent published in the *Federal Register* on November 13, 2019 (84 *Fed. Reg.* 61638), we are writing to comment upon the scope of the proposed environmental impact statement ("EIS") for the Eastern North Dakota Alternate Water Supply Project ("ENDAWS Project" or the "Project").

Manitoba is encouraged by the Bureau of Reclamation's commitments to prepare an environmental impact statement for the ENDAWS Project, to address key issues such the potential risks and consequences of the transfer of aquatic invasive species, and to include the Hudson Bay Basin in the geographical scope of the assessment. We hope you find these comments helpful and constructive as the scope of the draft EIS is identified.

Manitoba's interest in the ENDAWS Project stems from our long-standing concern with proposed projects in North Dakota to move water from the Missouri River Basin to the Hudson Bay Basin. The risks of transferring invasive biota and the need for preventive measures such as effective pre-treatment have been addressed a number of times by Manitoba in various comments and submissions to the Bureau in connection with National Environmental Policy Act ("NEPA") reviews of the Northwest Area Water Supply (NAWS) Project and the previous Bureau-sponsored version of the Red River Valley Water Supply Project ("federal RRVWSP").

To summarize these concerns, the Missouri River and Hudson Bay watersheds are unique, separate, and ecologically distinct, and have different species compositions, including pathogenic species such as bacteria, viruses, fungi, and other microscopic plant and animal parasites. Introducing such species into Hudson Bay Basin waters where they are not now present could cause significant and irreversible damage to Manitoba's aquatic ecosystems, including Lake Winnipeg, the tenth largest freshwater lake in the world. Manitoba has also emphasized that if inter-basin transfers proceed despite the inherent risks they pose, it is critical that Missouri River water be filtered and treated before it enters the Hudson Bay Basin to ensure the removal and deactivation of biota. This includes the need for careful consideration of planned and unplanned pipeline releases, disposal of treatment waste, and other potential biota transfer pathways associated with the projects.

For both the NAWS Project and the federal RRVWSP, Bureau-led Environmental Impact Statement processes found that the risks of transferring invasive biota would constitute a significant impact. For that reason, the Records of Decision issued for NAWS and the final environmental impact statement issued for the federal RRVWSP issued each required pre-treatment and other risk mitigation measures. The validity of these concerns has also been widely recognized by the federal district court in connection with litigation concerning the NAWS Project, by the International Joint Commission during its review of the original Garrison Diversion, and in the Dakota Water Resources Act of 2000, which authorized the NAWS and the federal RRVWS Projects. Moreover, as the federal district court has noted, the Bureau has agreed that invasive biota transfer in the context of inter-basin water transfers from the Missouri River Basin to the Hudson Bay Basin "could have catastrophic consequences" that would be irreversible. These concerns apply equally to the ENDAWS Project.

The greatest concern in these matters arises due to microbiological components (viruses, bacteria, protozoa, myxozoa, etc.) rather than macro flora and fauna (such as plants, fish, invertebrates, etc.). Thus, it is necessary to identify the microbiological components of greatest concern including bacteria, viruses, parasitic protozoa, and fungi. Because identifying invasive species is a dynamic process, and changes in water quality and other characteristics of the Missouri River Basin are likely to occur over time as a result of human activity and climate change, no single species of biota should be considered to be a surrogate for all potential threats. Rather, the soundest way to proceed, assuming that ENDAWS moves forward, is to incorporate the treatability of all *classes* of aquatic pathogens into the analysis of any treatment system's performance.

It is necessary to consider treatment system design based upon known classes of organisms of concern presently found in the Missouri River Basin and their related treatment characteristics. Although not a guarantee, adopting this approach will provide safeguards against further unknown organisms that may be discovered that have characteristics similar to these broad classes. Designs should be developed that provide for achievement of a suitable level of treatment within the Missouri River Basin and for disposal of waste residuals from such a treatment process within that Basin.

Treated water goals have been shared previously with the Bureau of Reclamation, the State of North Dakota, and others and are described below:

Parameter	**Proposed Treated Water Goals Prior to Inter-Basin Transfer**	**Comments**
Turbidity	<0.3 NTU	This is necessary to ensure effectiveness of disinfection agents such as chlorine against viruses.
Disinfection-resistant protozoa such as *Myxobolus cerebralis*	2.5 log (99.9 %) removal	This should be achieved in a minimum of two separate barriers prior

		to transfer across the continental divide from the Missouri River Basin to the Hudson Bay Basin.
Other Protozoa with similar characteristics as *Giardia* and *Cryptosporidium*	4 log (99.99 %) total removal/inactivation with a minimum of 2.5 log by removal	This should be achieved in three separate barriers prior to transfer across the continental divide from the Missouri River Basin to the Hudson Bay Basin.
Viruses	4 log (99.99 %) inactivation	This can be achieved through disinfection.

The regulations of the Council on Environmental Quality (the "CEQ regulations") require the "rigorous" exploration of "all reasonable alternatives." Among other things, this means that BOR should consider the full range of reasonable alternatives including, in the case of an inter-basin transfer, pre-treatment options that would meet the treated water goals described above.

In terms of the scope of the EIS, Manitoba notes that consideration must be given to the effects of climate change on water quantity and need, as well as water quality. Each of those effects could increase the risk of transferring invasive biota through the ENDAWS Project, as well as the efficacy of potential mitigation measures. For example, climate change could impact the turbidity of the Missouri River and impair the efficacy of water treatment technologies in removing invasive biota. The EIS must address these impacts.

There is also a need to consider cumulative impacts of depletions as a result of other inter-basin water transfers currently planned or under development including the NAWS Project. It is appropriate that the scoping document recognizes that the geographic scope of the analysis will extend beyond the proposed action area into the Hudson Bay Basin. Manitoba notes that the environment affected by the ENDAWS Project includes the Hudson Bay Basin as a whole, that is, the portions of the basin in both the United States and Canada. The Bureau must analyze reasonably foreseeable transboundary effects including in Canada.

Finally, Manitoba must also note that any inter-basin water transfer from the Missouri River Basin to the Hudson Bay Basin could have significant environmental impacts on boundary waters within the meaning of the *Boundary Waters Treaty* between Canada and the United States. Article IV of the Treaty provides that "boundary waters and waters flowing across the [US-Canada] boundary shall not be polluted on either side to the injury of health or property on the other side. The Bureau has recognized in the context of other projects that the risk of biota transfer from the Missouri River Basin to the Hudson Bay Basin must be addressed if the United States is to honor its commitments in the Treaty. For the reasons outlined above, Manitoba would contend that those obligations are triggered for the proposed ENDAWS Project.

Manitoba appreciates the opportunity to provide comments as ENDAWS enters environmental review. We hope for a productive outcome, one that addresses eastern North Dakota's long-standing need for additional water sources, while also providing critical protections for the Hudson Bay Basin.

Thank you for your consideration of Manitoba's comments on the scoping document for the ENDAWS Project EIS.

Sincerely,

Elliott J. Brown
Assistant Deputy Minister

cc: Dori Gingera-Beauchemin, Deputy Minister, Agriculture and Resource Development
Michael Richards, Deputy Minister, Intergovernmental Affairs
Nicole Armstrong, Director, Water Science and Watershed Management
International Joint Commission and International Red River Board Co-Chairs

Appendix K

DEIS Distribution List

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix K DEIS Distribution List

Reclamation has maintained and periodically updated a list of individuals and entities with an interest in the Project. This list was used to distribute Project information the Draft EIS.

Federal Agencies

U.S. Army Corps of Engineers
Eric Laux - Omaha District
Patricia McQueary - Bismarck Regulatory Office
Todd Lindquist - Project Engineer, Lake Sakakawea-Garrison Project

Department of the Interior Bureau of Indian Affairs
Marilyn Bercier - Regional Environmental Scientist

Department of the Interior Bureau of Land Management
North Dakota Field Office

Department of Agriculture, Rural Development
Clare Carlson

Department of Agriculture, Rural Utilities Service

Department of Agriculture, Natural Resources Conservation Service
Mark Suchy - Designated Conservationist

U.S. Environmental Protection Agency
Greogory Sopkin - Regional Adminstrator
Philip Strobel - Chief NEPA Branch

Federal Highway Administration
Wendall Meyer - Division Administrator

Department of the Interior Fish and Wildlife Service
Scott Larson

Department of the Interior Geological Survey

Department of the Interior National Park Service
Tokey Boswell - Planning & Compliance Division Program Manager

North Dakota Congressional Delegation

Honorable Douglas Burgum - Governor
Honorable Kelly Armstrong - Representative
Honorable Kevin Cramer - Senator
Honorable John Hoeven - Senator

State Agencies and Local Officials

North Dakota

Burleigh County Auditor
City of Carrington
City of Cooperstown
City of East Grand Forks
City of Fargo
City of Forman
City of Grafton
City of Grand Forks
City of Hannaford
City of Hillsboro
City of Jamestown
City of Langdon
City of Larimore
City of Lisbon
City of Mayville
City of McVille
City of Park River
City of Tuttle
City of Valley City
City of Wahpeton
City of West Fargo
Claudia Berg - ND State Historical Society
David Glatt- Director, ND Department of Environmental Quality
David Hendrickson - District Conservationist, Natural Resource Conservation Service
Design Division - North Department of Transportation
Devils Lake
John Paczowski - Interim State Engineer, ND State Water Commission
Kathy Duttenhefner - Natural Resources Management Coordinator, North Dakota Parks and Recreation Department
Mary Podoll - State Conservationist, Natural Resource Conservation Service
Melissa Baker - Director, ND Parks and Recreation Department
Michelle Kommer - North Dakota Department of Commerce
Mike Humann - North Dakota Land Department
North Dakota Geological Survey
North Dakota Industrial Commission
Ronald Henke - ND Department of Transportation
Sarah Coleman - North Dakota Tourism Division

State Geologist - North Dakota Geological Survey
State Paleontologist - ND Geological Survey
Terry Steinwand - Director, North Dakota Game and Fish

Missouri

Carol Comer - Director, Missouri Department of Natural Resources

Minnesota

Director - Minnesota Department of Natural Resources
Regional Ecological and Water Resources Manager – Minnesota Department of Natural Resources

Tribal Agencies and Officials

Tribal Chair - Three Affiliated Tribes
Tribal Chair - Assiniboine & Sioux Tribes
Tribal Chair - Blackfeet Tribe
Tribal Chair - Cheyenne River Sioux
Tribal Chair - Chippewa Cree Rocky Boy Reservation
Tribal Chair - Crow Creek Sioux Tribe
Tribal Chair - Crow Nations
Tribal Chair - Eastern Shoshone Tribe
Tribal President - Flandreau Santee Sioux
Tribal President - Fort Belknap Indian Community
Indian Affairs Commission
Tribal Chair - Iowa Tribe of Kansas
Tribal Chair - Kickapoo Tribe
Tribal Chair - Lower Brule Sioux Tribe
Tribal Chair - Northern Arapaho Business Council
Tribal President - Northern Cheyenne Tribe
Tribal President - Oglala Sioux Tribe
Tribal Chair - Omaha Tribe of Nebraska
Tribal Chair - Ponca Tribe of Nebraska
Tribal Chair - Prairie Band of the Potawatami Nation
Tribal Chair - Rosebud Sioux Tribe
Tribal Chair - Sac and Fox Nation of Missouri
Tribal Chair - Santee Sioux Nation
Tribal Chair - Sisseton-Wahpeton Oyate of the Lake Traverse Reservation
Tribal Chair - Spirit Lake Tribe
Tribal Historic Preservation Officer - Spirit Lake Tribe
Tribal Chair - Standing Rock Sioux Tribe
Tribal Historic Preservation Officer –Standing Rock Sioux Tribe
Tribal Chair - Three Affiliated Tribes
Tribal Historic Preservation Officer - Three Affiliated Tribes
Tribal Chair - Trenton Indian Service Area
Tribal Chair - Turtle Mountain Band of Chippewa Indians
Tribal Historic Preservation Officer - Turtle Mountain Band of Chippewa
Tribal Chair - Winnebago Tribe of Nebraska

Tribal Chair - Yankton Sioux Tribe

Organizations

Agassiz Water Users District
Audubon Dakota Chapter
Audubon National Wildlife Refuge
Barnes Rural Water District
Burleigh County Water Resource District
Cass Rural Water Users District
Central Plains Water District
Dakota Resource Council
Dakota Rural Water District
Ducks Unlimited
East Central Regional Water District
Garrison Diversion Conservancy District
Greater Ramsey Water District
McLean County Commission
Mclean County Water Resource District
Mclean Sheridan Rural Water
National Wildlife Federation
North Dakota Irrigation Association
North Dakota Rural Water Systems Association
North Dakota Water Users Association
North Dakota Wildlife Society
Northeast Regional Water District
Peterson Coulee Outlet Association
President Dacotah Chapter - Sierra Club
Richland County Job Development Authority
South Central Regional Water District
Southeast Water Users District
Stutsman Rural Water District
The Nature Conservancy, North Dakota Field Office
Tri-County Rural Water District
Turtle Lake Irrigation District
Walsh Rural Water District

Individuals

Gary Pearson

Libraries

North Dakota

Bismarck Public Library
Bureau of Reclamation, Denver Office Library
Natural Resources Library, U.S. Department of the Interior
North Dakota State Library

Canadian Agencies, Officials, Organizations, Individuals, and Libraries

Director - Manitoba Conservation and Water Stewardship
Assistant Deputy Minister – Manitoba Water Stewardship and Biodiversity
Director General - Global Affairs Canada

Appendix L

Responses to Comments on the Draft Environmental Impact Statement

Eastern North Dakota Alternate Water Supply Project
Environmental Impact Statement

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Appendix L Responses to Comments on the Draft Environmental Impact Statement

Introduction

The Draft Environmental Impact Statement (EIS) was distributed to the public on May 22, 2020. The public comment period opened on May 22, 2020 and concluded on July 6, 2020. During the public comment period Reclamation hosted a virtual public meeting on July 18, 2020. A virtual public meeting was held in light of the ongoing Coronavirus pandemic. Notice of the virtual public meeting was provided to local and regional media outlets and a letter inviting interested parties to the meeting was distributed prior to the meeting. The Federal Register notice regarding the availability of the Draft EIS included statements regarding a public meeting and a potential for it to be held virtually. An overview of the Draft EIS analyses and results was presented at the meeting and attendees were invited to provide comment. A recording of the meeting was posted to Reclamation's webpage for the EIS following the meeting so those not able to attend could be informed of the discussion that took place.

All comments received on the Draft EIS were carefully considered and substantive comments were addressed in the Final EIS. Some changes to the EIS text in response to comments were editorial, while other comments resulted in additional information being added to the EIS to clarify the discussion.

How Comments Were Addressed

Some comment letters made a single suggestion, while others expressed multiple suggestions. Reclamation carefully reviewed each comment and considered them individually and collectively. All specific substantive comments were addressed and in some instances the reader is also referred to a section or chapter of the Final EIS or an appendix to the EIS for further information.

Some types of comments are acknowledged but do not require a response. These are:

- Comments expressing a position or a preference regarding one or more of the alternatives or biota water treatment plant options
- Comments offering an opinion or advice not relevant to the scope of the EIS

Some types of comments may require a response, as directed by NEPA regulations (40 CFR Section 1503.4). These are:

- Modify alternatives including the proposed action
- Develop and evaluate alternatives not previously given serious consideration
- Supplement, improve or modify analyses
- Make factual corrections
- Explain why comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position, and if appropriate, indicate those circumstances which would trigger agency reappraisal or further response.
- Acknowledge the comment if it is simply offering an opinion or if it contains advice not pertinent to the EIS.

Members of the public who provided comment during the virtual public meeting were encouraged to send a written comment via email or regular mail. This appendix displays all written comments with a numbered response to each substantive comment identified in each letter. The numbered responses appear at the end of each comment letter.

Each comment letter received has been assigned an identification number. This identification number is printed in the upper right-hand corner of each letter. These identification numbers are used in the numbering of comments and corresponding responses in each letter. For example, if comment letter #5 has three substantive comments requiring a response, the comments and the corresponding responses are numbered 5-1, 5-2, and 5-3. This appendix is organized with the letter with the marked comments, followed by corresponding numbered responses for that particular letter. Then the next comment letter is presented, again followed by the corresponding numbered responses.

Letters and their associated letter numbers are shown in the following table:

Table L-1: Comment letters received in response to the draft environmental impact statement.

Letter Number	Letter From:
1	North Dakota Department of Transportation
2	Mr. Gary Pearson
3	Missouri Department of Natural Resources
4	Minnesota Department of Natural Resources
5	North Dakota State Water Commission
6	Lake Agassiz Water Authority
7	United States Environmental Protection Agency
8	North Dakota Water Users Association

9	Garrison Diversion Conservancy District
10	Mr. Gary Pearson
11	Global Affairs Canada
12	U.S. Senator John Hoeven, U.S. Senator Kevin Cramer, and U.S. Representative Kelley Armstrong
13	Minnesota Department of Natural Resources
14	Missouri Department of Natural Resources
15	Province of Manitoba, Canada, Water Stewardship and Biodiversity Division
16	Coalition to Protect the Missouri River
17	The American Waterways Operators

Letter 1

NORTH Dakota | Transportation
Be Legendary.

OFFICIAL FILE COPY
RECEIVED
JUN 11 2020
REPLY DATE
INFO. COPY TO:
DATE | INITIAL | TO
CLASSIFICATION
PROJECT
CONTROL NO.
FOLDER ID

June 5, 2020

Arden Freitag
Area Manager
Dakotas Area Office
USDI
304 East Broadway Ave.
Bismarck, ND 58501

DRAFT ENVIRONMENTAL IMPACT STUDY (DEIS) FOR EASTERN NORTH DAKOTA ALTERNATE WATER SUPPLY RECLAMATION IDENTIFYING MCCLUSKY CANAL AND MISSOURI RIVER NORTH ALTERNATIVES AS PREFERRED ALTERNATIVE, SHERIDAN COUNTY, MINOT, NORTH DAKOTA

We have reviewed your May 22, 2020, letter.

This project should have no adverse effect on the North Dakota Department of Transportation highways.

However, if because of this project any work needs to be done on highway right of way, management documents will need to be obtained from the Department of Transportation District Engineers, Larry Gangl, Bismarck at 701-328-6951, Jay Praska, Valley City at 701-845-8816, Wyatt Hanson, Devils Lake at 701-665-5114, Jim Redding, Minot at 701-857-6907. 1

CHAD M. ORN, P.E., DIRECTOR – OFFICE OF PROJECT DEVELOPMENT

57\cmo\js

c: Larry Gangl, Bismarck District Engineer
Jay Praska, Valley City District Engineer
Wyatt Hanson, Devils Lake District Engineer
Jim Redding, Minot District Engineer

Response 1-1 Your statement(s) have been included as part of the record. Reclamation will continue to coordinate efforts with state agencies to ensure compliance with state laws and regulations.

Letter #2

GARY L. PEARSON, DVM, MS
1305 Business Loop East
Jamestown, North Dakota 58401
Telephone (701) 252-6036
Facsimile (701) 251-6160
Email: garypearson@esicable.net

OFFICIAL FILE COPY
RECEIVED
JUN 15 2020
REPLY DATE
INFO COPY TO
DATE INITIAL

June 12, 2020

Re: DK-5000
2.1.4.17

Mr. Arden Freitag
Area Manager
Dakotas Area Office
U. S. Bureau of Reclamation
304 East Broadway Avenue
Bismarck, North Dakota 58501

Dear Mr. Freitag:

This is a formal request that the U. S. Bureau of Reclamation extend the 45-day public comment period for the *Draft Environmental Impact Statement, Eastern North Dakota Alternate Water Supply Project.*

It should be noted that your May 22, 2020, letter announcing the availability for the Draft EIS was mailed immediately prior to the 3-day Memorial Day weekend, which meant that I did not receive it until four days later, on May 26th. After checking the Bureau's https://www.usbr.gov/gp/dkao/nepa/endaws/index.html web site, it became apparent that the documents were far too voluminous and complex to be reviewed objectively on-line. Therefore, pursuant to information in your May 22nd letter, the next day, May 27th, I prepared a request for hard copies of the Draft EIS and its appendices, which was mailed the following day, May 28th. I received hard copies of the Draft EIS and its appendices on May 30th, and others probably did not receive hard copies until several days later. But by then at least 10 days of the 45-day public comment period already had elapsed. This meant that with the July 6th deadline for submitting comments, the comment period already had been reduced to less than 35 days for the two inches of documents dealing with a highly controversial State of North Dakota Red River Valley Water Supply Project to deliver Missouri River water to the Hudson Bay Basin involving issues of justification, economic feasibility, compliance with an international treaty and the Bureau's statutory authority to construct the water supply features of the project.

In fact, the Bureau acknowledges in the Draft EIS that the issues are so "controversial for several reasons" that the Secretary of the Interior never signed a Record of Decision on the Bureau's Garrison Diversion Unit Import to Sheyenne River and Missouri River Import to Red River Valley alternatives for a Federal Red River Valley Water Supply Project described in its December 2007 *Final Environmental Impact Statement, Red River Valley Water Supply Project*, which, when the features are combined, are virtually identical to the Bureau's Eastern North Dakota Alternate Water Supply Phase 1 and Phase 2 McClusky Canal and Missouri River North preferred alternative described in the Draft EIS. Indeed, the abbreviated review period for this controversial proposal suggests that it is designed more to accommodate the Garrison Diversion Conservancy District's desire to get the project approved as quickly as possible in order to avoid objective assessment of its environmental impacts[1],

1 On July 7, 2017, the Forum News Service reported that, "North Dakota officials are eager to start construction during the Trump Administration, whose environmental and natural resources policies are supportive of projects like the water supply pipeline." See also Pearson, Gary L., October 24, 2019, Comments on the September 19, Bureau of Reclamation Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project and September 2019 *Managing Water in the West* Eastern North Dakota Alternate Water Supply Project Environmental Impact Statement Scoping Notice.

rather than to provide the full disclosure of those impacts that is mandated by the National Environmental Policy Act.

It should also be noted that restrictions imposed to combat the COVID-19 pandemic further complicate the ability of the public, private organizations and other State and Federal agencies, as well as Canadian agencies, to perform thorough reviews of these voluminous documents.

Therefore, I am requesting that the comment period for the *Draft Environmental Impact Statement, Eastern North Dakota Alternate Water Supply Project* be extended an additional 45 days, until August 19, 2020. 1

Sincerely,

Gary L. Pearson

Gary L. Pearson, DVM, MS

Response 2-1 Response letter provided (June 2020)

Letter #3

Fax

To:	Eastern North Dakota Alternate Water Supply Project	From:	Bureau of Reclamation, Dakotas Area Office
Fax:	2012504590	Fax:	
Company:		Voice:	

Date: June 24, 2020

Subject: FW: Missouri Department of Natural Resources' Extension Request Letter - Eastern North Dakota Alternate Water Supply Project

Comments:

From: Becklenberg, Jessica
Sent: Wednesday, June 24, 2020 12:40 PM
To: 'ENDAWS.EIS@usbr.gov' <ENDAWS.EIS@usbr.gov>
Cc: Hoggatt, Jennifer <jennifer.hoggatt@dnr.mo.gov>; Reschly, Joel <Joel.Reschly@dnr.mo.gov>; Weller, Michael <michael.weller@dnr.mo.gov>; Bacon, Bob <Bob.Bacon@dnr.mo.gov>
Subject: Missouri Department of Natural Resources' Extension Request Letter - Eastern North Dakota Alternate Water Supply Project

Good Afternoon,

Attached is the extension request letter from the Missouri Department of Natural Resources' for the Eastern North Dakota Alternate Water Supply Project comment period. | 1

Thank you,

Jessica Becklenberg
Missouri Geological Survey | Water Resources Center
PO Box 176, Jefferson City, MO 65102-0176
Phone: (573) 751-2867 Fax: (573) 751-8475

JUN 24 2020

This fax originated from a State of Missouri Biscom FAXCOM® Fax Server. If you are not the intended recipient, you are hereby notified that you have received this communication in error and that any review, disclosure, dissemination, distribution or copying of it or its contents is prohibited by federal or state law. If you have received this communication in error, please notify the sender immediately, and destroy all copies of this communication and any attachments.

Missouri Department of NATURAL RESOURCES
dnr.mo.gov
Michael L. Parson, Governor
Carol S. Comer, Director

June 24, 2020

Bureau of Reclamation
Dakota Area Office
304 East Broadway
Bismarck, ND 58501

RE: Eastern North Dakota Alternative Water Supply Project

To Whom it May Concern:

On behalf of the Missouri Department of Natural Resources, I request a minimum 60 day extension of the public comment period for the Draft Environmental Impact Statement (Draft EIS) for the Eastern North Dakota Alternative Water Supply Project. The Draft EIS contains eight volumes (including supporting documents) of highly technical information regarding a large transboundary diversion project with national significance. This comment period extension is particularly important to grant since not all impacted parties from the donor basin (the Missouri River basin) are aware of the project or the availability of the Draft EIS. In addition, our staff, as well as others, need ample time to review that material and consider the technical, legal, and policy issues associated.

Please let me know at your earliest convenience if you intend to grant this request.

Sincerely,

WATER RESOURCES CENTER

Jennifer Hoggatt
Director

JH:bbj

Recycled paper

Response 3-1 Response letter provided (June 2020)

LETTER #4

From: Kestner, Nathan (DNR) <nathan.kestner@state.mn.us>
Sent: Monday, June 29, 2020 2:31:51 PM
To: Reinhart, Damien S <DReinhart@usbr.gov>; ENDAWS, BOR DKA <bor-sha-DKA-ENDAWS@usbr.gov>
Cc: Ebbenga, Theresa (DNR) <theresa.ebbenga@state.mn.us>; Thibodeaux, Jaime (DNR) <jaime.thibodeaux@state.mn.us>
Subject: [EXTERNAL] Request for 15-day extension on ENDAWS DEIS Comment Period

Damien-

This email is to formally request a 15-day extension on the Draft Environmental Impact Statement (DEIS) for the East North Dakota Alternate Water Supply Project. The Minnesota Department of Natural Resources (MNDNR) asked to be included on future notices and to be added to the distribution list in December of 2019 (see attached email requests). Unfortunately, we only recently became aware of the DEIS comment period when we were forwarded an invite to a virtual public meeting notice by the Environmental Protection Agency (EPA) on June 17, 2020 (also attached). This abbreviated time frame is not adequate to provide the needed review and develop agency comments. 1

Thank you

Nathan Kestner
NW Regional Manager | Division of Ecological and Water resources

Minnesota Department of Natural Resources
2115 Birchmont Beach Rd.NE
Bemidji, MN 56601
Phone: 218-308-2626
Fax: 218-755-4066
Email: nathan.kestner@state.mn.us
mndnr.gov

DEPARTMENT OF NATURAL RESOURCES

Response 4-1 Response letter provided (June 2020)

LETTER #5

June 30, 2020

Arden Freitag
US Department of the Interior
Bureau of Reclamation
Dakota Area Office
PO Box 1017
Bismarck, ND 58502-1017

Dear Mr. Freitag:

This is in response to your request for a review of the environmental impacts associated with the Eastern North Dakota Alternate Water Supply Project.

The proposed project has been reviewed by State Water Commission staff, and the following comments are provided:

- There may be floodplains identified and/or mapped where this proposed project is to take place. North Dakota has no formal 'permitting' authority as a state entity in NFIP identified floodplain areas. The permitting is always done by the local entity, which has jurisdiction in the area in question. Please work closely with the local Floodplain Administrator. 1

- If any of the proposed action alternatives impact existing dams or result in the construction or modification of a dam, pond or other device that results in the storage of water, a construction permit may be required. Please contact the OSE Regulatory Division at 701-328-2752 if you have any questions. 2

- The Office of the State Engineer (OSE) Engineering and Permitting Section reviewed the project and determined that the project will be constructed near surface water resources. The OSE requests to be notified regarding the proposed project's impacts, if any, to water resources such as watercourses (i.e. streams or rivers), agricultural drains, and wetlands (i.e. ponds, sloughs, lakes, or any series thereof) as any alterations, modifications, improvements, or impacts to those water resources may require a drainage permit(s) or a construction permit(s) from the OSE. Please contact the OSE Engineering and Permitting Section at 701-328-4288 if you have any questions. 3

- RRVWS project is permitted under Water Permit No. 1416A-02 held by Garrison Diversion Conservancy District (GDCD) authorizing the annual use of 120,000 acre-feet of Missouri River water at an authorized maximum withdrawal rate of 74,057 gallons per minute from an approved point of diversion located at Section 28, Township 148 North, Range 83 West. GDCD has submitted amendment to permit to include NE1/4 of Section 5, Township 143 North, Range 81 West. Diversion facilities must comply with the terms and conditions of Water Permit No. 1416A-02. 4

Thank you for the opportunity to provide review comments. Should you have further questions, please contact me at 701-328-4970 or stevebest@nd.gov.

Sincerely,

Steven Best
Planner III

SB:dm/1570

Response 5-1 Your statement(s) have been included as part of the record. Reclamation and/or the Project Sponsor will coordinate efforts with local agencies to ensure compliance with permitting requirements.

Response 5-2 Your statement(s) have been included as part of the record. Reclamation and/or the Project Sponsor will continue to coordinate efforts with state agencies to ensure compliance with state laws and regulations.

Response 5-3 Your statement(s) have been included as part of the record. Reclamation and/or the Project Sponsor will continue to coordinate efforts with state agencies to ensure compliance with state laws and regulations.

Response 5-4 Your statement(s) have been included as part of the record. Reclamation will continue to coordinate efforts with state agencies to ensure compliance with Water Permit 1416A-02.

LETTER #6

Lake Agassiz
Water Authority

P.O. Box 140, Carrington, ND 58421 Phone 701-652-3194 Fax 701-652-3195

July 1, 2020

Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation, Dakotas Area Office
304 East Broadway Ave
Bismarck, ND 58501

Dear Mr. Reinhart:

The Lake Agassiz Water Authority (LAWA) was created by the State of North Dakota to distribute water to eastern and central North Dakota, and represents the local water users in the state Red River Valley Water Supply Project (RRVWSP). After the voluminous studies of water needs in central and eastern North Dakota, no doubt remains that there will be desperate needs for additional water supplies, not if, but when the region experiences a 1930s-type prolonged drought. North Dakota needs the state RRVWSP.

LAWA's main objectives include selecting an affordable and reliable water supply alternative. LAWA supports the recommendation of the Bureau of Reclamation (BOR) to construct the ENDAWS preferred alternative identified in the Draft EIS, which would deliver an alternate water supply to the state RRVWSP that would initially be much more affordable to the users, with the option to later continue development of a redundant supply as needed. Construction of the preliminary phase to provide a McClusky Canal water supply would save the State and local water users $200 million in construction costs, as well as millions of dollars annually in operating expenses. Utilizing this option provides a necessary economic efficiency, while providing a long term, reliable water supply, thus meeting LAWA's objectives. 1

The state RRVWSP provides a desperately needed water supply for North Dakota communities and rural water systems in central and eastern North Dakota in times of drought, as well as promotes industrial development. The supplemental source of water is crucial to central and eastern North Dakota's ongoing economic vitality.

Thank you for the opportunity to review and comment on the ENDAWS draft Environmental Impact Statement, which the BOR prepared to evaluate the construction and water supply impacts of ENDAWS. LAWA appreciates the BOR's thorough analysis of options and impacts and finds the Preferred Alternative named in the Draft EIS, Alternative E – McClusky Canal and Missouri River North to complete the ENDAWS as a favorable alternative water supply source for the state RRVWSP.

Sincerely,

Dr. Timothy Mahoney
Chair

Response 6-1 Your statement(s) have been included as part of the record.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
Denver, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region08

LETTER #7

July 2, 2020

Ref: 8ORA-N

Joe Hall, Area Manager
c/o Damien Reinhart, EIS Team Leader
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Avenue
Bismarck, North Dakota 58501

Dear Mr. Hall:

The U.S. Environmental Protection Agency Region 8, in coordination with Regions 5 and 7, has reviewed the Bureau of Reclamation's May 2020 Draft Environmental Impact Statement (EIS), CEQ No. 20200106, that analyzes the Eastern North Dakota Alternate Water Supply (ENDAWS) Project. We conducted this review pursuant to Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA). The Draft EIS evaluates the potential impacts associated with a proposal by Garrison Diversion Conservancy District, on behalf of the State of North Dakota, to deliver an alternate water supply to the State's Red River Valley Water Supply Project (RRVWSP) serving the central and eastern communities of the state through a contract authorizing up to 165 cubic feet per second (cfs) of water.

Components of the project include the use of the Snake Creek Pumping Plant, an intake and pump station located along the McClusky Canal, a biota water treatment plant and a bulk transmission pipeline to deliver Missouri River water to the main transmission pipeline of the State RRVWSP eventually into the Hudson Bay Basin (HBB). Reclamation has identified the Preferred Alternative, McClusky Canal and Missouri River North (Alternative E), from among the five action alternatives. The Preferred Alternative provides redundancy in the system for water delivery to the State RRVWSP pipeline through two potential water sources by either using 1) an intake from the McClusky Canal that conveys water from Lake Sakakawea and Lake Audubon, or 2) the State RRVWSP Missouri River intake located south of Washburn, North Dakota. The Preferred Alternative also includes an enhanced disinfection biota water treatment option prior to water entering the HBB.

The EPA understands the importance of this project to North Dakota and that ENDAWS would add a biota water treatment plant, which is not a planned component of the existing State RRVWSP. One of the main considerations in the Draft EIS is preventing the introduction of aquatic invasive species into the HBB from the Missouri River Basin (MRB) due to the interbasin water transfer. The EPA agrees that the primary project concern is the potential for aquatic invasive species transfer to the HBB. Our review identified potential challenges for the proposed treatment plant design to meet biota removal goals and our enclosed Detailed Comments identify a treatment approach that we expect would more reliably meet those goals. Our Detailed Comments also offer

recommendations to improve the impact analyses and identify available measures and best management practices to avoid or reduce potentially significant impacts to water resources.

We also note that the Preferred Alternative will impact approximately 68 acres of wetlands, which is 58% more impactful to the aquatic environment than the alternative with the next highest acreage of wetland impacts under consideration. It is unclear at this stage of the project planning whether a Clean Water Act (CWA) Section 404 individual permit or nationwide permit from the U.S. Army Corps of Engineers (Corps) would be needed. In the event an individual permit is required, our comments provide recommendations for enhancing the Final EIS's ability to support the CWA Section 404 permitting process.

We appreciate the close coordination and communication with Reclamation throughout the NEPA process. Reclamation acknowledged the complexity of this project and provided opportunities for the Cooperating Agencies to discuss ENDAWS and the NEPA process. Additionally, Reclamation was always available to answer the EPA's questions, greatly improving our understanding of the project details, which was helpful in our review and commenting process. Please find enclosed EPA's Detailed Comments, which provide additional information and recommendations for evaluating and addressing the project's environmental impacts. These comments are intended to facilitate the decision-making process and we thank you for considering our input. If further explanation of our comments would be helpful as you prepare the Final EIS, please contact me at (303) 312-6704, or your staff may contact Melanie Wasco at (303) 312-6540 or wasco.melanie@epa.gov.

Sincerely,

Philip S. Strobel
Chief, NEPA Branch
Office of the Regional Administrator

Enclosure

cc: Eric Laux, Acting Regulatory Chief, USACE Omaha District
Drew Becker, Supervisor, USFWS North Dakota Ecological Services

EPA Draft EIS Comments on the Eastern North Dakota Alternate Water Supply Project

The EPA provides the following comments and recommendations regarding the Draft EIS analysis for your consideration.

WATER QUALITY EFFECTS

In EPA's scoping letter dated December 12, 2019, we commented that should the project modify flow through operational changes, increased diversion of water, or introduction of new water sources, the Draft EIS should include an analysis of impacts to water quality. The scoping letter outlined various focus areas for the Draft EIS to evaluate. Although not included in the Draft EIS, we understand through our cooperating agency discussions that Reclamation plans to include an assessment of water quality impacts in the Final EIS. We support that addition and offer our assistance if there are questions regarding our scoping comments. 1

Chlorination and Disinfection Byproducts

The Draft EIS states that the State Red River Valley Water Supply Project (RRVWSP) Alternative, which is a component of the Preferred Alternative, is designed to provide 20 cfs to central North Dakota users in the Missouri River Basin (MRB) from the pipeline, 5 cfs to users on the pipeline after the continental divide between the MRB and Hudson Bay Basin (HBB), and 140 cfs to the Sheyenne River above Lake Ashtabula (p. 2-7). The Draft EIS does not clarify the intended water users for the 25 cfs that is being diverted prior to reaching the Sheyenne River, nor does it address any additional water treatment prior to use. We understand through cooperating agency discussions with Reclamation that the Central North Dakota Water Supply Project (the No Action Alternative) is authorized to use 20 cfs for public water supply (PWS). The chlorine residual from the biota water treatment plant (BWTP) may cause any PWS using water directly from the pipeline to violate the National Primary Drinking Water Regulations (NPDWRs) for disinfection byproducts. Conversely, if there will be other uses than drinking water, it is unclear if any plans are needed for dechlorination. 2

Recommendation: We recommend that the Final EIS clarify the uses for the 25 cfs of water so that potential project effects regarding compliance with the NPDWRs for water recipients or if there are any needed plans for dechlorination can be evaluated. If Reclamation determines that water from the pipeline could go directly to drinking water treatment plants, we recommend including an analysis of the potential for disinfection at the BWTP to result in byproduct formation that could impact the health of those consuming the water. 3

AQUATIC INVASIVE SPECIES (AIS) AND BIOTA WATER TREATMENT

Coordination between Missouri River Management Agencies and Garrison Diversion Conservancy District (Garrison Diversion)

The Draft EIS does not discuss post-project implementation coordination between the Garrison Diversion and any of the state and/or federal agencies that monitor conditions in the Missouri River

related to biota. Because new AIS are likely to be encountered through the life of the project, a coordination agreement would be useful to share new information on AIS presence and on what treatment is needed to prevent inter-basin transfer.

Recommendation: The EPA recommends establishing a long-term coordination agreement between state and federal agencies within the MRB in the Final EIS and Record of Decision (ROD). We also recommend establishing a regular schedule to share post-water treatment monitoring results with this group and with downstream governments in Minnesota and Canada. . Coordination will allow the Garrison Diversion and downstream entities to remain current regarding treatment effectiveness and prevent any new AIS in the Missouri River. 4

Biota Water Treatment Plant Appraisal-Level Design Engineering Report (DEIS Appendix B)

Cryptosporidium

The Draft EIS at Section 2.0 "Regulatory Considerations" discusses the Safe Drinking Water Act (SDWA) sets standards for the reduction of human pathogens for drinking water systems including Giardia, Cryptosporidium, and viruses. Section 2.0 explains that Reclamation is adopting the SDWA and the NPDWRs as a basis of comparison to evaluate treatment efficiency for reducing the risk of transmitting these pathogens. We support Reclamation's adoption of the SDWA AIS treatment guidelines. Upon review, Section 2.0 does not include the SDWA percent reduction for Cryptosporidium although it does include the SDWA percent reduction for Giardia and viruses. Note that the SDWA specifies 2.0 logs of removal for Cryptosporidium (see description in the recommendation below) and, depending on the cyst levels in the raw water, the system may need to add up to 2.5 additional logs of reduction (removal and/or inactivation). Only PWSs meeting the rigorous requirements for filtration avoidance are allowed to use only UV inactivation without any physical removal technologies (i.e., filtration) under the NPDWRs. Unfiltered systems are required to install UV and achieve 3.0 logs of inactivation for Cryptosporidium. If there is an AIS with the potential to be as resistant to chlorine as Cryptosporidium in the 55-year life of this project, it would be important to include the SDWA standards for Cryptosporidium.

Recommendation: We recommend that the SDWA Cryptosporidium removal standards be included in the treatment guidelines in Section 2.0 of Appendix B in the Final EIS. It would be clearest to include the following information on SDWA and NPDWRs reduction standards, including the requirements of the following log removals: 2 logs (99 percent) of removal for Cryptosporidium, and when high cyst levels are present in the raw water, an additional 2.5 logs of reduction (removal and/or inactivation). 5

Turbidity Interference with Efficacy of UV and Chlorine Disinfection

Turbidity interferes with disinfection and, therefore, would reduce the ability of the Enhanced Disinfection BWTP proposed for the ENDAWS project to inactivate AIS. Historic water quality data are included in Appendix B of the Draft EIS. Based on the turbidity data, there were 27 times that the raw water turbidity exceeded 10 nephelometric turbidity units (NTU) in Lake Sakakawea. There were also 27 times that the raw water turbidity exceeded 10 NTU in Lake Audubon. These

sampling events appear to be monthly samples, with the year 1998 reflecting multiple months of high turbidity events for both reservoirs, and 2004 having multiple months of high turbidity in Lake Sakakawea. There were no data available for Lake Audubon in 2004. It is not known from the information presented in the Draft EIS whether sampling occurred during peak turbidity or the length of time that the turbidity remained over 10 NTU. We would also expect the Missouri River intake to regularly have turbidity above 10 NTU. 6

For ENDAWS, the Surface Water Treatment Rule (SWTR) is the most applicable to compare treatment capabilities. As noted above, under the SWTR, all systems that use surface water are required to install filtration unless they can meet the filtration avoidance criteria. One of the key criteria that unfiltered systems must meet is low turbidity requirements and only raw water of a certain quality can meet these criteria. As turbidity increases, the turbidity shields microscopic pathogens, so that disinfectants are not as effective. The higher the turbidity, the less effective the disinfectant treatment is for pathogen inactivation. Accordingly, when there is occurrence of high turbidity, filtration is necessary to prevent the transmission of pathogens. The science behind the mechanisms of turbidity shielding microscopic pathogens for public health protection is similar to the reduction in the efficacy of disinfectants to prevent the transfer of AIS. 7

Interference with the efficacy of UV disinfection inactivation gradually increases with turbidity but becomes demonstratable around 10 NTU. This was researched during the Northwest Area Water Supply (NAWS) EIS. Given the high levels of turbidity detailed in the historic data, when the turbidity exceeds 10 NTU, the ability of UV to inactivate AIS will be reduced. This is important due to the long-term proposal of using UV throughout the life of ENDAWS to inactivate protozoans that may be in the same, or more difficult to inactivate, category as Cryptosporidium. Recommendations related to UV efficacy are outlined at the end of this section.

Regarding chlorine disinfection, the contact time requirements are designed to provide inactivation levels for free-floating bacteria. Turbidity interferes with the efficacy of chlorine disinfection. Turbidity is reduced by physical treatment and the NPDWR requirements for turbidity for conventional treatment is 0.3 NTU in 95% of the samples taken every four hours. Only systems with a certain raw water quality that meet the filtration avoidance criteria requirements are permitted to use chlorine without physical treatment as established in the SWTR. Bacteria attached to particles are more resistant to disinfection due to resistance mechanisms like attachment, agglomeration, and the development of a polysaccharide coating. More importantly, these resistance mechanisms are multiplicative. Given the high levels of turbidity detailed in the historical data, any time the turbidity exceeds 1 NTU (the NPDWR requirement for other filtration technologies), the capability of chlorine to inactivate AIS will be reduced.

Recommendation: Based on our current understanding of the source water quality available to this plant, we recommend considering one of the following options to achieve the treatment guidelines: adding a filtration process to the biota treatment plant in the selected alternative; demonstrating in the Final EIS that influent turbidity would reliably be low enough to achieve the AIS treatment guidelines and including a turbidity monitoring program; or, developing operational controls that would not use the ENDAWS system on days when turbidity is high enough to inhibit treatment effectiveness. For treatment options that do not include filtration, we recommend including in the 8

Final EIS the SDWA language describing the water quality needed to meet SDWA standards without a physical removal treatment step (direct, conventional, membranes). If there is available science to support the benefits of increased disinfectant concentration or contact time in overcoming high turbidity, we recommend citing and summarizing those studies in the Final EIS. 9

Recommendation: We recommend including regularly scheduled AIS monitoring of the influent and effluent and sharing the results with counterparts in the Missouri and Hudson Bay watersheds. 10

Aquatic Invasive Species Risk and Consequence Analysis (DEIS Section 3.2.11 and Appendix F)

System Operations

Conventional treatment including physical removal steps was explored in Appendix F Section 5.4 as a possible option, although not selected for the Preferred Alternative. We found two instances in the EIS indicating that filtration could be bypassed or the BWTP could be shut down under certain circumstances. In Section 5.4.4. "UV and Chlorine Disinfection" it states, "...in the unlikely event that the entire filtration process needs to be bypassed" the UV dose will be increased (pp. 5-6, 5-7). Then, Section 3.2.11 of the Draft EIS, "Summary" states, "In addition, these treatment systems are designed with controls to monitor the effectiveness of the treatment process and automatically adjust the process or shut down the treatment plant if warranted" (p. 3-21). The BWTP is the project feature designed to reduce the risk of irreversible AIS transfer to the HBB; therefore, it will be important to describe the conditions under which BWTP processes could be bypassed or shut down.

Recommendation: The EPA recommends the Final EIS describe the conditions or events that could trigger bypassing or shutting down treatment processes. We also recommend describing how bypassing the BWTP plant or an individual treatment process would be expected to affect the project's ability to prevent AIS transfer to the HBB. If there are operational situations that reduce the effectiveness of the BWTP or cause it to be shut down, the safest approach would be to take the ENDAWS water intakes off-line until the treatment plant returned to full operation. 11

Biota Transfer

Section 6.1.4 "The Risk of Biota Transfer from ENDAWS" states, "*The Transbasin Effects Analysis determined the risk of AIS transfer from the NAWS Project is extremely low compared to non-project related transfers due to the inclusion of such treatment processes (p. 74.) The same conclusion is valid when comparing the risk of the ENDAWS project, with a biota water treatment plant, to the non-project risks*" (p. 6-2). It is not clear that the proposed ENDAWS BWTP would yield the same protection as the NAWS plant because the ENDAWS plant does not include the physical removal processes of conventional filtration that are part of the NAWS plant. Unfiltered systems are considered equivalent to filtered systems only if they meet the filtration avoidance criteria. One of these criteria is meeting low turbidity levels on a consistent basis so as not to shield microscopic AIS from being inactivated.

Recommendation: We recommend that the Final EIS reconsider this biota treatment plant comparison statement in the Final EIS or more thoroughly describe the basis for this statement. 12

Protozoa

Myxobolus cerebralis (the causative agent for Whirling Disease) is the AIS protozoan that the BWTP is targeting for reduction due to its resistance to disinfectants. Whirling Disease has a complex life cycle. Two stages of its life cycle, both myxospore and the actinospore stage (triactinomyxons TAMS from T. tubifex), are both important for inactivation. Appendix F of the Draft EIS documents that research has been conducted on both stages of the protozoan life cycle and inactivation is successful for both at 12 mJ/cm^2 for UV, so Reclamation's proposed dosing at 40 mJ/cm^2 represents a safety factor.

Recommendation: We recommend that this research be summarized in the Final EIS to clarify that much lower dosages of UV are capable of inactivation compared to earlier research. This would provide additional support for the effectiveness of the 40 mJ/cm^2 proposed in the Preferred Alternative. Also, we recommend discussing that 500 mg/L of bleach is needed to inactivate myxospore. This addition would provide additional support for Reclamation's proposed use of different disinfectants to inactivate different microscopic AIS. 13

Cyanobacteria

Cyanobacteria are ubiquitous and are present in both the MRB and the HBB watersheds. There could be a scenario where the cyanobacteria are actively producing toxins in the MRB but not in the HBB, such as in the Sheyenne River. Also, slower moving water favors cyanobacteria growth, such as in a reservoir within the MRB that could potentially transfer to a river within the HBB. In addition, climate trends could cause severe drought and severe rain events that could transport increased nutrients into the Missouri River. These potential events over the 55-year life of the project may increase the severity and duration of harmful algae blooms. Warmer temperatures select for cyanotoxins. Many different types of cyanobacteria can produce multiple toxins and, when lysed, can release their intracellular toxins.

Recommendation: We recommend that these issues and potential scenarios be discussed in the Final EIS. This may further support having an intake on both the Missouri River and on McClusky Canal. 14

WETLANDS AND AQUATIC RESOURCES

The following comments consider the conceptual 30% project design and the possibility that the project may require a Clean Water Act (CWA) Section 404 individual permit from the U.S. Army Corps of Engineers (Corps). We are providing these comments so that the NEPA documentation can further support EPA's CWA Section 404 (b)(1) Guidelines that are relevant to any future CWA Section 404 permitting process. In developing your response to the comments below, we recommend you coordinate with the Corps' Regulatory Program.

Purpose and Need

Chapter 1 of the Draft EIS states, "The purpose of the Project is to respond to Garrison Diversion's request for a contract for up to 165 cfs of water from Reclamation's GDU to provide an alternate

bulk water supply to the State RRVWSP" (p. 1-2). If the purpose of a project is to meet a specific request, then the project proponents' proposal would always be the lead candidate for meeting the purpose and need in the range of alternatives. Defining the project purpose in such a narrow manner can preclude other potentially less environmentally damaging practicable alternatives. The Draft EIS does not describe the need for an alternate bulk water supply. The project need can be described as the problem or the opportunity that the applicant is proposing to address.

Recommendation: The EPA recommends that Chapter 1 of the Final EIS describe the need for an alternate water supply. For example, we recommend the Final EIS include any environmental, cost, water quality, or operational benefits provided by the alternate water supply. Clearly linking the project purpose to the need is critical for CWA 404 permitting and for NEPA as it defines and drives the complexity of the alternatives analysis, including practicability considerations. 15

Recommendation: We recommend the Final EIS clarify what is meant by "alternate bulk water supply" in the project purpose statement. For example, it is not clear whether the project is needed to provide a supplemental water supply source for the State RRVWSP, an entirely new water supply source where the State RRVWSP would only receive water from McClusky Canal, or a water supply source that can be used to alternate between the Missouri River (original source) and the McClusky Canal (newly proposed source). In Alternative B, the sole water supply source for the State RRVWSP remains the Missouri River. In alternatives C and D, the sole water supply source for the State RRVWSP is the McClusky Canal (entirely new source). In alternatives E and F, both the Missouri River and McClusky Canal will be used as water sources. Clarifying the purpose statement may help to better frame the alternatives analysis by defining which alternatives are capable of meeting the need. 15A

Recommendation: In our experience with NEPA and the CWA, we recommend Reclamation consider re-designating the State RRVWSP as a no action alternative in the Final EIS because it does not have the potential to meet the stated purpose and need associated with this EIS. It is our understanding that the State RRVWSP is being pursued independent of ENDAWS, and the State RRVWSP does not appear to provide an "alternate bulk water supply." 16

Recommendation: We recommend that the Final EIS describe alternatives that were analyzed but dismissed from further review (per 40 CFR § 11502.14) and indicate the reason(s) these alternatives were eliminated as well as the criteria used to analyze alternatives. 17

Affected Environment

Wetland impacts were assessed in the Draft EIS using the National Wetlands Inventory (NWI). It appears that neither the NWI data limitations nor the image year were identified in the Draft EIS. Upon review of the NWI metadata provided on the United States Fish and Wildlife (USFWS) NWI mapper, the aquatic impacts were based predominately on photo interpreted color infrared imagery from 1979, using a 1:65,000 scale. The only alternatives that contained a portion of imagery photo interpreted more recently than 1979 were alternatives C and E, though these alternatives still predominately rely on 40-year old data photo interpreted in 1979. The imagery most recently analyzed is for Wells County, North Dakota, and was photo interpreted in 2017 using 1-meter

digital color infrared imagery. It appears the source imagery used in the wetland impacts analysis contains substantially different scales and imagery year.

The NWI mapping used to assess wetland impacts in the DEIS may not accurately reflect current wetland locations and extent in the project area. The underlying aerial photos used to develop the maps have low resolution and are over 40 years old. Thus, the actual amount of wetland impacts could be significantly higher (or lower) that what is estimated in the DEIS. According to the USFWS's webpage on the NWI data limitations, "A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis. The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems. Wetlands or other mapped features may have changed since the date of the imagery and/or field work." [NWI Data Limitations Webpage, https://www.fws.gov/wetlands/data/Limitations.html.]

Recommendation: The EPA recommends that a field assessment be conducted prior to the Final EIS to determine if the NWI data generally reflect on the ground conditions. If field verification is not feasible, the data limitations associated with the impact assessment should be disclosed in the Final EIS, including differences in photo interpretation year and any issues with metadata. We note that a full wetland delineation will be required before a CWA 404 permit (individual or general) can be issued by the Corps. 18

Alternatives Analysis and Project Effects

Although the Draft EIS describes up to 68 acres of wetland impact associated with the Preferred Alternative, those impacts are not well described. The alternatives analysis does not quantitatively catalog the aquatic resources that would be impacted under each alternative. Specifically, Alternative B does not disclose any aquatic impacts. Not disclosing both temporary and permanent aquatic resource impacts for all alternatives may lead to delays in CWA Section 404 permitting due to subsequent NEPA analysis and/or required impact analysis necessary to comply with the CWA.

According to the Wetlands and Riparian Areas Section of Chapter 3, Alternative E has the most impacts to aquatic resources of the alternatives analyzed and is the Preferred Alternative. If the project is expected to require a CWA Section 404 individual permit, the Corps may not be able to issue a permit for Alternative E because the CWA Section 404(b)(1) Guidelines (40 C.F.R. Part 230) require that the Corps cannot issue an individual permit if there "is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." 40 C.F.R. § 230.10(a). As noted on page 3-1 of the Draft EIS, "After an alternative is selected in the ROD and the design is further developed, additional NEPA analysis may be required to ensure any impacts not foreseen in this EIS are disclosed. Any additional NEPA analysis would be tiered to this EIS."

Recommendation: If Alternative B is capable of meeting the alternate water supply need, the EPA recommends that the aquatic resource impacts for that alternative be included as part of the EIS. We also recommend that the Final EIS identify both permanent and temporary wetland and aquatic resource impacts for all alternatives. Table 3.14 may provide an opportunity to efficiently summarize this information. Providing a robust impacts analysis in the Final EIS could reduce subsequent CWA Section 404 permitting delays and may avoid the potential need for subsequent NEPA and Section 404 Guidelines analyses. 19

Wetland and Grassland Easements

The Draft EIS identifies a number of federally owned wetland and grassland easements in the project area that could be impacted. Executive Order 11990 – Protection of Wetlands directs federal agencies to "avoid to the extent possible any long- and short-term adverse impacts associated with the destruction or modification of both jurisdictional and non-jurisdictional wetlands on federal lands and avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative."

Recommendation: The EPA recommends the Final EIS more thoroughly identify the federal easements in the project area and include a prediction of wetland impacts on those easements for each alternative. Any environmental commitments specific to these areas should be included in Table 2.8 Best Management Practices (BMPs), related to avoiding (e.g., through pipeline alignment shifts or directional drilling) or minimizing (e.g., no change in hydrology) impacts consistent with Executive Order 11990. If any jurisdictional or non-jurisdictional wetlands on federal lands will be impacted, we recommend the Final EIS include details on mitigation efforts that will offset unavoidable impacts. 20

BEST MANAGEMENT PRACTICES

The EPA notes the extensive list of BMPs and environmental commitments found in Chapter 2 and Appendix D of the Draft EIS. We provide the following BMP recommendation for your consideration to further safeguard water resources in the project area.

Water Resources

Table 2.19 of the Draft EIS states, "Identified river or stream crossings would be performed by horizontal directional drilling operations whenever practicable, which would not disturb the stream channel or the adjacent wetlands."

Recommendation: We recommend that the Final EIS include a discussion of the potential for inadvertent returns from horizontal directional drilling operations at river crossings to occur. Inadvertent returns are the unintended transfers of drilling mud to the surface during boring machine operations, which if not properly managed, can introduce polluted water into streams and rivers. A description of measures that may be taken to minimize the impact of inadvertent returns could be included in the discussion. 21

Response 7-1 Raw water quality data was included in Appendix B Biota Water Treatment Plant Appraisal Level Design under Section 3 Source Water Quality. The effects on Water quality was evaluated and addressed in the DEIS in terms of biota treatment and depletions. To add clarification, a description of the anticipated water quality effects from the Project for both the receiving water and source waters has been added to Appendix E Other Minor Issues and summarized in the other Minor Issues section of chapter 3 in the FEIS.

Response 7-2 The Need established for the Central North Dakota Water Supply Project is 20 cfs identified for industrial use. The project has established that need to be utilized in basin to specified delivery points. The end user would be responsible for compliance with all regulations. Language has been added to the No Action Alternative in the EIS to clarify.

Response 7-3 See Response 7-2

Response 7-4 For the Biota WTP facility, operational plans will be developed and implemented prior to facility startup including procedures by which chemical dosages for disinfection and other uses are varied to adjust to inlet water quality and will include a process for sharing finished water quality with stakeholders.

Response 7-5 The intent of Section 2.0 is to provide information regarding regulations that are used as guidance due to the lack of Federal rules or regulations regarding the transfer of aquatic invasive species. As stated in Section 2.5, the intent is to use the Safe Drinking Water Act and associated research because it is the best available information to compare treatment capabilities; however, it is important to note the regulations regarding safe drinking water are not directly applicable to this project.

Response 7-6 The Biota Water Treatment Plant appraisal-level design is based on best available water quality information from Lake Audubon and Lake Sakakawea and conservative design assumptions for key parameters such as turbidity and UV transmittance (UVt).

Variations in source water turbidity and UVt will affect UV system performance and the required UV dosage to achieve target inactivation levels. The Enhanced Disinfection treatment option assumes an applied UV dosage of 40 mJ/cm^2 and a 70 percent UVt. The 40 mJ/cm2 dose was established based on previous projects of a similar nature. The 70 percent UVt is a very conservative assumption as typical raw water transmittance ranges between 80 to 90 percent. These key UV system design values are associated with a poorer source water quality with turbidities likely in the 20 to 50 NTU range or similarly total suspended solids in the 9 to 23 mg/L range. Based upon a review of historical water quality information, actual UVt values of 80 percent plus are expected with water withdrawn from the McClusky Canal and the Missouri River. Because of these factors, Reclamation is confident the disinfection system appraisal-level design will achieve the desired disinfection inactivation levels of target AIS.

The Enhanced Disinfection treatment option presented in the Draft EIS provides inactivation of aquatic invasive species (AIS) in excess of target log-removal goals. For example, a greater than 3-log inactivation of *Giardia* will be delivered by the UV system plus a greater than 3-log inactivation of *Giardia* will be provided through chlorine disinfection. Therefore, the disinfection system is fully redundant as it relates to *Giardia* inactivation as a 3-log inactivation is the target for *Giardia.* Similar levels of inactivation are provided for viruses and *Myxobolus cerebralis* (whirling disease). A 3-log inactivation of *Cryptosporidium* is delivered by the UV treatment system; information obtained from literature indicates that chlorine does not readily inactivate *Cryptosporidium.*

Source water quality data for an intake on the Missouri River Mandan, ND was reviewed as part of the State RRVWSP. Turbidity measurements at Mandan over the 6-year period of 2011 to 2018 were consistently below 10 NTU, with an average of 9.7 NTU, a median of 6.8 NTU, a maximum of 320 NTU, and a minimum value of 0.76 NTU.

Reclamation understands the concerns raised by the comments regarding the ability to achieve desired disinfection during events of higher than expected turbidity. An environmental commitment has been added to the appropriate portion of Chapter 2 which will limit the operations of the Biota WTP during those events which includes the monitoring of incoming turbidity (see Table 2.20, Environmental Commitments).

Response 7-7 Comment noted. Although the Surface Water Treatment Rule is the most applicable to compare treatment capabilities, there are no federal rules or regulations regarding the transfer of aquatic species as explained in Chapter 2, Section 2.5; therefore the intent of the Biota WTP is not to meet drinking water requirements. As stated in Response 7-6 an environmental commitment has been added to limit operations of the Biota WTP under certain water quality conditions.

Response 7-8 See Response 7-6 concerning source water turbidity's effect on UV system performance and the ability of the appraisal-level design to achieve target disinfection levels. Missouri River turbidity data for a water plant intake at Mandan, ND was reviewed. The average turbidity measurement for the 6-year period of 2011 to 2018 was 9.7 NTU.

It is customary practice in water plant design and operation to include provisions for continuous monitoring of inlet and outlet turbidities in addition to key process units inside the plant. For this facility operational plans will be developed and implemented prior to facility startup, including procedures by which chemical dosages for disinfection and other uses are varied to adjust to inlet water quality. Online UVt probes commonly used in UV disinfection equipment systems will provide real-time measurement of UVt so the applied UV dose can be adapted to actual water quality measurements. UVt probes are quite common in the industry, and they are deployed in UV systems by all major UV system manufacturers.

In addition to the UV system operational monitoring, the operational plan for the Biota WTP will include procedures to continuously measure applied and residual chlorine concentrations to ensure chlorine levels are being maintained to meet the target contact time (cT). Chlorine system operations will also employ continuous monitoring of temperature, pH, and flow rate so cT can be computed by the plant control system to verify correct system operation.

Response 7-9 The intent of the Biota Water Treatment Plant is to reduce the risk of a project related transfer of aquatic invasive species, not to produce water meeting Safe Drinking Water Act requirements. The biota water treatment plant's purpose, as evaluated in the EIS, is for inactivation and/or removal of aquatic invasive species prior to water being delivered from the Missouri River Basin to the Hudson Bay Basin.

Response 7-10 For this facility operational plans will be developed and implemented prior to facility startup including procedures by which chemical dosages for disinfection and other uses are varied to adjust to inlet water quality. The monitoring of AIS in the influent water is beyond the scope of Reclamation's mission; however, there are other federal agencies and entities that do monitor AIS movement and establishment, and Reclamation and the Project sponsor will review this information during the development and implementation of the operations plan for the Biota WTP.

Response 7-11 Reclamation wishes to clarify that the appraisal-level design does not include provisions to bypass the Biota Water Treatment Plant unit processes. The design does include, however, standard equipment and process unit redundancy to keep the plant functioning while portions are taken offline for maintenance or other activities. If it becomes necessary to take processes offline for an emergency, the plant flow could be reduced to a point where processes function to meet the NDPDES discharge permit. An unplanned flow reduction from the Biota Water Treatment Plant would not have an immediate impact to end users unlike the negative impact to end users of a typical Safe Drinking Water Act water plant.

Reclamation will develop an operations plan that describes situations where it would be necessary and prudent to shut down operation of the pumping and treatment systems. A longer duration high turbidity event in the source water would be one such event or a spill into or other contamination of the source water would be another instance where shutting down system operation would be warranted, however untreated water will be returned to the source, not transferred into the Hudson Bay Basin.

Response 7-12 Reclamation believes the commenter may have interpreted the statements in Appendix F, Section 6.1.4 in a narrower context than intended by Reclamation. Reclamation has reviewed this text in Appendix F, as well as the section referenced from the Transbasin Effects Analysis and offers the following as clarification.

The commenter notes a discussion on page 74 of the Transbasin Effects Analysis which is part of a discussion on the different non-Project pathways through which aquatic invasive species can be transferred and the risks associated with these different pathways. Part of the discussion on the transfer risk states the successful introduction an aquatic invasive species in the Hudson Bay Basin is much more likely to be caused by a high-probability pathway, such as large transfers of untreated water or that occur repeatedly. The discussion concludes with the statement, "…based on a qualitative assessment of the basin linkages and competing pathways, the risk of AIS transfer by the Project (referring to the Northwest Area Water Supply project) is considered extremely low compare to non-Project pathways. One factor in determining the 'extremely low' risk associated with the project was the inclusion of treatment processes within the Biota Water Treatment Plant. Any of the treatment processes, and combination thereof, evaluated in the Transbasin Affects Analysis would reduce the risk of transfer in comparison to interbasin transfers of untreated water. The context of this discussion is a comparison of transfer risk between treated water and untreated water.

As stated in Appendix F, the ENDAWS Risk and Consequence Analysis is based on the Transbasin Effects Analysis. Section 6 of the Risk and Consequence Analysis discusses the risk assessment of biota transfer pathways. The risk of several transfer pathways was evaluated, including the risk posed by the ENDAWS project (Section 6.1.4). The statement quoted by the commenter, from this section, is in reference to the statement above from the Transbasin Affects Analysis regarding the risk of transfer from treated water compared to untreated water. The statement does not include reference to specific treatment processes, as is appears the commenter interpreted it. The concluding statement in Section 6.1.4 is valid in the comparison of the risk posed by the ENDAWS project and the NAWS project. The risks are the same because they both include a biota water treatment plant; treated water versus untreated water. Reclamation recognizes differences between the NAWS and proposed ENDAWS projects; however, Reclamation is confident in the results of the risk analyses completed and the determination that existing non-project pathways pose a greater risk for AIS transfer into the Hudson Bay Basin.

In addition to the text within the referenced documents, understand the timing in which these analyses were prepared may help clarify this as well. The Transbasin Effects Analysis (2013) was prepared in support of the Reclamation's Supplemental Impact Statement. It was completed prior to Reclamation identifying a preferred alternative in the Draft Supplemental Impact Statement (2014). The Transbasin Affects Analysis evaluated all the biota water treatment options which informed Reclamations decision-making. A similar timeline occurred in the evaluation for the ENDAWS project. The Risk and Consequence Analysis was completed to inform Reclamation's decision-making process of identifying a preferred biota water treatment option in the Draft EIS for the ENDAWS project.

Response 7-13 Thank you for the additional information, language has been added to Chapter 2 of the Final EIS.

Response 7-14 The commenter acknowledges that Cyanobacteria are ubiquitous and present in the Missouri River Basin and the Hudson Bay Basin. Then provide several speculative statements regarding Cyanobacteria and recommends Reclamation evaluate these potential scenarios in the Final EIS. Reclamation evaluated the risk and consequences of Cyanobacteria as discussed in Appendix F and summarized this discussion in Chapter 3 (Section 3.2) of the EIS. NEPA does not require an agency to speculate in the absence of information or data and the commenter did not provide specific information or data for Reclamation's consideration. To speculate each of these different scenarios is unreasonable considering the endless number of variables included in each scenario.

Response 7-15 The 2005 CEQ NEPA implementing regulations, at Section 1502.13, and 2008 Department of the Interior NEPA implementing regulation at 43 CFR 46.420, concern purpose and need, requiring that the EIS briefly describe the underlying purpose and need to which the agency is responding. In Section 46.420(a)(2), the Department of the Interior NEPA implementing regulations go on to state, "The needs and goals of the parties involved in the application or permit may be described as background information. However, this description must not be confused with the bureau's purpose and need for action. It is the bureau's purpose and need for action that will determine the range of alternatives and provide a basis for the selection of an alternative in a decision." Consistent with this, Reclamation has defined the purpose and need as stated in the EIS, Chapter 1, Section 1.4. Background information describing the methodology used to determine the project proponents need for 165 cfs to serve central and eastern North Dakota can be found in Appendix A Section 3.0 Major Design Assumptions.

Response 7-15A As stated in Chapter 1 of the EIS, Reclamation is responding to a request by Garrison Diversion, on behalf of the State of North Dakota, who developed the volume of water needed for their project. ENDAWS is being evaluated as an alternate source for bulk delivery to their project. Reclamation was not part of the effort to develop or assess the future water needs or water sources of the State-led Red River Valley Water Supply Project. This is outside the scope of the EIS; however, benefits of the project are noted in letters of support sent to Reclamation during the comment period for the Draft EIS.

Garrison Diversion writes in their July 1, 2020 letter, "Drought modeling and population projections make it abundantly clear that numerous municipalities and some rural systems will be desperately lacking domestic water supplies in times of a 1930s-type drought, validating the need for the state RRVWSP. The state RRVWSP will provide a desperately needed water supply for nearly 50% of North Dakota's population during drought, as well as promote industrial development. Through the utilization of GDU facilities and the ENDAWS option for the full state RRVWSP water needs, the state and local sponsors will save approximately $200 million in the initial phase of construction, along with millions of dollars in

annual operations and maintenance costs. These savings will ultimately be passed on to the end water users, making the project more affordable not only for the state, but also the cities and rural water systems that participate in the project."

Similar benefits were noted in letters of support from the North Dakota Congressional Delegation, Lake Agassiz Water Authority, and North Dakota Water Users Association.

Response 7-16 As noted in Response 7-15 above, it is the bureau's purpose and need for action that determines the range of alternatives and provide a basis for the selection of an alternative in a decision. 'Given that Reclamation's purpose and need is to respond to Garrison Diversion's request for a contract for up to 165 cfs of water from Reclamation's GDU to provide an alternate water supply to the State RRVWSP, the range of alternatives included in the EIS is appropriate. The inclusion of the State RRVWSP as an action alternative is consistent with Reclamation's determination of alternatives and scope because it is most closely aligned with current conditions and reasonably foreseeable actions.

Response 7-17 The Garrison Diversion Conservancy District has been planning the RRVWSP project for many years in which alternative water supplies were considered. The proposed ENDAWS project was established at the request of Garrison Diversion to provide an alternate supply of water from the McClusky Canal to the State's RRVWSP. All the alternatives that were developed and analyzed are included in the EIS.

Response 7-18 Reclamation concludes that the National Wetlands Inventory is the best available data to use in making objective comparisons between the alternatives regarding impacts to wetlands. By evaluating a 150-foot-wide buffer, Reclamation incorporated flexibility in the development of alternatives to allow for avoidance of natural resources during the final design phase of an action alternative. The EIS is not intended to be a substitute for the analysis for the CWA 404 permitting process.

Additional discussion regarding NWI wetland data, including differences in photo interpretation year and the limitations of metadata will be included in the FEIS. Reclamation will continue working closely with the Bismarck Regulatory Office of the Corps, to address Clean Water Act requirements, including 404(b)(1) compliance for the Project. Integration of these guidelines will occur if an action alternative is selected and final design begins. Reclamation will fully comply with application and permit requirements pertaining to CWA 404 permitting, including conducting a field delineation.

Response 7-19 Temporary and permanent wetland impacts for each alternative are disclosed in the Executive Summary, table ES-1.

Response 7-20 Reclamation has committed to avoiding or boring all wetlands and USFWS easements, as stated in Chapter 3 Section 3.5.3.3 and 3.8.1.3. Mitigation for jurisdictional and/or non-jurisdictional wetland impacts is discussed in Chapter 2 and Table 2-20 - Environmental Commitments. Reclamation's commitment is:

"Effects on jurisdictional wetlands and waters of the United States would require authorization from the U.S. Army Corps of Engineers. A compensatory mitigation plan may be required for the loss of any wetlands and would include methods to replace specific functions of affected wetlands.

Lost wetlands would be replaced acre for acre with ecological equivalency or 1/2 acre for acre with ecological equivalency (adversely affected wetlands) as required by the Project's authorizing legislation:

(a) by crediting previously completed wetland restoration for the Garrison Diversion Unit (GDU) and deducting those credits from Reclamation's Mitigation and Enhancement Ledger (MEL)1

or

(b) the Project sponsor may develop separate acceptable mitigation."

Response 7-21 The project sponsor will complete necessary plans and permits required by the NPDES program which will include contingency planning for issues that arise during construction, including how to prevent and mitigate inadvertent releases. See Table 2.19 Best Management Practices.

LETTER #8

NORTH DAKOTA Water Users Association

701-223-4615
701-223-4645 (Fax)

PO Box 2254 • Bismarck, ND 58502-2254

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PROJECT
CONTROL NO.
FOLDER I.D.

July 1, 2020

Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation, Dakotas Area Office
304 East Broadway Ave
Bismarck, North Dakota 58501

Dear Mr. Reinhart:

Regarding the Eastern North Dakota Alternate Water Supply Project, The North Dakota Water Users Association respectfully submits comments in support of the Preferred Alternative named in the Draft EIS. The McClusky Canal and Missouri River North Alternative to complete ENDAWS is a favorable water supply option for the Red River Valley Water Supply Project (RRVWSP). 1

The construction of the RRVWSP will provide an emergency water supply to central and eastern North Dakota. The completion of ENDAWS as a water supply alternative for the RRVWSP will enhance opportunities for economic growth and expansion in the region. In addition, the utilization of existing Garrison Diversion Unit (GDU) facilities reduces annual operations and maintenance costs for project participants.

Thank you for considering our comments in support of the Preferred Alternative, Alternative E – McClusky Canal and Missouri River North, for the construction of ENDAWS.

Sincerely,

Lance D. Gaebe
Executive Vice-president

Dedicated to Protect, Develop, and Manage North Dakota's Water Resources

Response 8-1 Your statement(s) have been included as part of the record.

LETTER #9

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GARRISON DIVERSION
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July 1, 2020

Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation, Dakotas Area Office
304 East Broadway Ave
Bismarck, ND 58501

Dear Mr. Reinhart:

The Garrison Diversion Conservancy District (Garrison Diversion) fully supports the recommendation of the Bureau of Reclamation (BOR) to construct the Eastern North Dakota Alternate Water Supply (ENDAWS) with the Preferred Alternative named in the Draft EIS, Alternative E – McClusky Canal and Missouri River North. This alternative will provide a more affordable water supply option for the State of North Dakota's Red River Valley Water Supply Project (RRVWSP) and will put the underutilized Garrison Diversion Unit (GDU) facilities to beneficial use. Further, end users will pay for the federal water service, so ENDAWS will provide a steady revenue stream for the Federal government. 1

Drought modeling and population projections make it abundantly clear that numerous municipalities and some rural systems will be desperately lacking domestic water supplies in times of a 1930s-type drought, validating the need for the state RRVWSP. The state RRVWSP will provide a desperately needed water supply for nearly 50% of North Dakota's population during drought, as well as promote industrial development.

Through the utilization of GDU facilities and the ENDAWS option for the full state RRVWSP water needs, the state and local sponsors will save approximately $200 million in the initial phase of construction, along with millions of dollars in annual operations and maintenance costs. These savings will ultimately be passed on to the end water users, making the project more affordable not only for the state, but also the cities and rural water systems that participate in the project.

The GDU project was originally designed to divert Missouri River water to central and eastern North Dakota for multiple project purposes, which included municipal and industrial water supply. Components of the GDU project were deauthorized and project purposes and benefits never fully realized. Constructing ENDAWS as an alternate water supply for the state RRVWSP will enable the McClusky Canal to be utilized for one of its intended purposes.

Garrison Diversion appreciates the opportunity to comment on the scope of the environmental impact statement the BOR has prepared to evaluate ENDAWS construction impacts. From our participation in the review process, we appreciate the thorough evaluation and comprehensive efforts undertaken by the BOR on the NEPA environmental review for a federal water supply. The Preferred Alternative named in the Draft EIS, Alternative E – McClusky Canal and Missouri River North to complete the ENDAWS is a favorable water supply option for the state RRVWSP given the affordability to the users and the plan to eventually have a redundant supply.

Sincerely,

Duane DeKrey
General Manager

DD/kac

Response 9-1 Your statement(s) have been included as part of the record.

LETTER #10

GARY L. PEARSON, DVM, MS
1305 Business Loop East
Jamestown, North Dakota 58401
Telephone (701) 252-6036
Facsimile (701) 251-6160
Email: garypearson@csicable.net

July 1, 2020

Mr. Damien Reinhart
U. S. Bureau of Reclamation
Dakotas Area Office
304 East Broadway Avenue
Bismarck, North Dakota 58501

Dear Mr. Reinhart:

I am requesting that the enclosed comments on the U. S. Bureau of Reclamation's May 2020 *Draft Environmental Impact Statement Eastern North Dakota Alternate Supply Project* be included in Reclamation's formal review of the project under the provisions of the National Environmental Policy Act.

Because the adequacy of the *Environmental Impact Statement Eastern North Dakota Alternate Water Supply Project* is certain to be subject to challenge in Federal District Court, I would recommend that Reclamation withdraw the current Draft EIS and start over, rather than proceeding directly to a Final Environmental Impact Statement that would have no prospect of surviving judicial review.

Sincerely,

Gary L. Pearson

Gary L. Pearson, DVM, MS

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COMMENTS ON

U. S. BUREAU OF RECLAMATION
MISSOURI BASIN REGION
DAKOTAS AREA OFFICE
MAY 2020

DRAFT ENVIRONMENTAL IMPACT STATEMENT EASTERN NORTH DAKOTA ALTERNATE WATER SUPPLY PROJECT

Gary L. Pearson
1305 Business Loop East
Jamestown, North Dakota 58401
July 1, 2020

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INTRODUCTION

At the request of the the State of North Dakota and the Garrison Diversion Conservancy District, the U. S. Bureau of Reclamation (Reclamation) is proposing to fund and construct an Eastern North Dakota Alternate Water Supply Project as a bulk water supply project to deliver water from the Missouri River in the Missouri River Basin to supply North Dakota's proposed State River Valley Water Supply Project in the Hudson Bay Basin. Reclamation's May 2020 *Draft Environmental Impact Statement Eastern North Dakota Alternate Water Supply Project* (Draft EIS), which cost $1,740,000 to prepare, states:

> "The Garrison Diversion Unit (GDU) Principal Supply Works was authorized by the 1965 Garrison Diversion Unit Act to deliver Missouri River water throughout North Dakota . . .[1]
>
> The GDU project was reauthorized in 1986, which resulted in a reduced emphasis on irrigation and an increased emphasis on meeting the municipal, rural and industrial (MR&I) water needs throughout North Dakota. The 1986 Reformulation Act, which amended the 1965 Act, authorized a Sheyenne River water supply and release feature, and a water treatment plant capable of delivering 100 cfs [cubic feet per second] of water to eastern North Dakota. The GDU Project was never fully completed, nor delivered water to the HBB [Hudson Bay Basin], limiting intended benefits to North Dakota.
>
> In 2007, Reclamation completed an environmental impact statement (EIS) evaluating the Federal Red River Valley Water Supply Project (Federal RRVWSP), which would have provided Missouri River water to eastern North Dakota communities located in the HBB. **The preferred alternative was controversial for several reasons; therefore, a Record of Decision (ROD) was never signed by the Secretary of the Interior.** The State RRVWSP is being designed to meet the future water needs of central and eastern North Dakota though year 2075." (Emphasis added) (Draft EIS pp. ES-1-2)
>
> "The State RRVWSP is a State and local project developed by the State of North Dakota by and through the Garrison Diversion, designed to meet the future municipal, rural and industrial water needs for participating communities in central and eastern North Dakota. **The State RRVWSP provides 165 cfs of water from the Missouri River to central and eastern North Dakota.** The State RRVWSP intake is near Washburn, North Dakota and discharges the water into the Sheyenne River above Lake Ashtabula. This is not a Federal project, nor does Reclamation have a role in its development." (Emphasis added) (Draft EIS Appendix A, p. 1-3)
>
> "As a potential cost-saving measure, Garrison Diversion requested a 20 cfs [Missouri River] water service contract from the McClusky Canal to provide the portion of the State RRVWSP needs that exist in the Missouri River Basin. This entailed adding an intake into the McClusky Canal and a six-mile pipeline connection between the McClusky Canal and the State RRWSP . . . **This intake and the additional six-mile pipeline segment are referenced in this report as the CNDWSP [Central North Dakota Water Supply Project]. The 20 cfs of water taken from the McClusky Canal can only be supplied to users within the Missouri River Basin.** Reclamation conducted an Environmental Assessment on the CNDWSP to study Garrison Diversion's request for a water service contract for 20 cfs, resulting in a Finding of No Significant Impact (FONSI) in September 2018. For the purposes of this Report, the State RRVWSP supplemented with a water supply option that provides 20 cfs from the

1 Public Law 89-108 enacted on August 5, 1965, authorized a Garrison Diversion Unit (Initial Stage – 250,000 Acres) supplying Missouri River water to seven areas in the Souris River Basin, Devils Lake Basin and James River Basin in central North Dakota located east of the Missouri River to the western edge of the Red River Valley. (Bureau of Reclamation, 1965)

McClusky Canal, through an intake and six-mile pipeline extension to connect the State RRVWSP, will be referred herein as the State RRVWSP/CNDWSP." (Emphasis added) (Draft EIS Appendix A, p. ES-3)

"Garrison Diversion Conservancy District (Garrison Diversion), on behalf of the State of North Dakota, has requested a contract for an additional 145 cubic feet per second (cfs) of water from the Bureau of Reclamation's (Reclamation) McClusky Canal (Canal) as an alternate water source for a State-led municipal rural and industrial water supply project known as the Red River Valley Water Supply Project (State RRVWSP)." (Draft EIS p. ES-1)

This request for an additional 145 cfs of water is in addition to a previous request by Garrison Diversion for 20 cfs of water from the Canal that was to be delivered to the State RRVWSP for use in the Missouri River basin (MRB). The previous request is referred to as the Central North Dakota Water Supply Project (CNDWSP) and was analyzed by Reclamation in an Environmental Assessment. A finding of No Significant Impact was signed in 2018." (Draft EIS p. ES-1)

LACK OF AUTHORITY FOR THE BUREAU OF RECLAMATION TO CONSTRUCT THE EASTERN NORTH DAKOTA ALTERNATE WATER SUPPLY PROJECT

The Draft EIS states that:

"Reclamation is authorized under Section 7 of the Dakota Water Resources Act of 2000 (DWRA) to work with the State of North Dakota to plan, design and construct municipal, rural, and industrial water water supply projects. Reclamation's potential actions include:

- Construction of ENDAWS project features, which may include an intake pump station located along the McClusky Canal, a biota water treatment plant, and a bulk transmission pipeline to deliver water to the main transmission pipeline of the State RRVWSP.
- Issuance of a water repayment contract for GDU facilities, and
- Issuance of permits to construct and maintain ENDAWS facilities on Reclamation rights-of-way." (Draft EIS p. 1-2)

The Draft EIS does not even acknowledge, let along address, the extensive documented discussion of Reclamation's lack of statutory authority to fund and construct the Eastern North Dakota Alternate Water Supply Project that was provided in comments on the scoping of the Eastern North Dakota Alternate Water Supply Project Environmental Impact Statement (Pearson 2019). Therefore, those comments are re-incorporated here as comments on the Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project:

"The Bureau cites Section 7 of the Dakota Water Resources Act (DWRA) of 2000 as providing authority for it to construct the ENDAWS. However, Section 7 of the DWRA dealing with Municipal, Rural, and Industrial Water Service amends Section 7 of Public Law 89-108 with the specific provision that: 1

> "The State may use the Federal and non-Federal funds to provide grants or loans for municipal, rural and industrial water systems."

Public Law 89-108 authorizing the Garrison Diversion Unit in 1965 did not include any provisions or features for the delivery of Missouri River water to the Red River Valley for municipal, rural or

industrial water service, nor were any such provisions or features included, discussed or evaluated in the Bureau's 1974 *Initial Stage Garrison Diversion Unit Final Environmental Impact Statement*. In fact, construction of features for the delivery of Missouri River water to the Red River Valley for municipal, rural and industrial purposes utilizing Garrison Diversion Unit facilities was not authorized until 1986 when Section 5 of Public Law 99-294, commonly known as the Garrison Diversion Unit Reformulation Act of 1986, amended Section 7 of Public Law 86-108 with language explicitly stating that: 1 cont.

> "The Secretary is authorized and directed to construct, operate, and maintain a Sheyenne River water supply and release feature (including a water treatment plant) capable of delivering 100 cubic feet per second of water for the cities of Fargo and Grand Forks and surrounding communities. . . ."

Section 7 of the DWRA further amends Section 7 of Public Law 86-108 by providing that:

> "The Southwest Pipeline Project, the Northwest Area Water Supply Project, **the Red River Valley Water Supply Project**, and other municipal, industrial, and rural water systems in the State of North Dakota **shall be eligible for funding under the terms of this section. Funding provided under this section for the Red River Valley Water Supply Project shall be in addition to funding for that project under Section 10(a)(1)**." (Emphasis added)

It is important to note that funding for the DWRA Section 7 Municipal, Rural and Industrial Water Supply grant program is covered in Section 10(b)(1) and does not require specific congressional authorization for each project. However, funding for the Red River Valley Water Supply Project under Section 10(a)(1) cited in Section 7 is:

> "RED RIVER VALLEY WATER SUPPLY PROJECT- There is authorized to be appropriated **to carry out section 8(a)(1)** $200,000,000. . ." (Emphasis added)

Thus, the funding for the Red River Valley Water Supply Project provided under the Section 7 Municipal, Rural and Industrial Water Supply grant program of the DWRA is specifically "in addition" to funding authorized to be appropriated for the Red River Valley Water Supply Project described in Section 8. However, neither that project nor the appropriation of funds for it has been authorized by the Congress.

Therefore, Section 7 of the DWRA which the Bureau cites as its authority for "construction of ENDAWS project features" only authorizes the appropriation of funds for features of the Red River Valley Water Supply Project under the Act's Municipal, Rural and Industrial Water Supply grant program after funds have been authorized to be appropriated for the Red River Valley Water Supply Project described in Section 8.

Construction of specific features of a Red River Valley Water Supply Project is addressed separately under Section 8 SPECIFIC FEATURES, Subsection (a) Red River Valley Water Supply Project, Paragraph (3) COMMENCEMENT OF CONSTRUCTION of the DWRA, where Subparagraph (A) provides that:

> "If the Secretary selects a project feature under this section that would provide water from the Missouri River or its tributaries to the Sheyenne River water supply and release facility or from the Missouri River or its tributaries to such other conveyance facility as the Secretary selects under this section, no later than 90 days after the completion of the final environmental impact statement, the Secretary shall transmit to the Congress a comprehensive report which provides--

(i) a detailed description of the proposed project feature;

(ii) a summary of major issues addressed in the environmental impact statement;

(iii) likely effects, if any, on other States bordering the Missouri River and on the State of Minnesota; and

(iv) a description of how the project feature complies with the requirements of section 1(h)(1) of this Act (relating to the Boundary Waters Treaty of 1909)."

1 cont.

Section 8, Subsection (a), Paragraph (3), Subparagraph (B) then states explicitly that:

> "**No project feature or features that would provide water from the Missouri River or its tributaries to the Sheyenne River water supply and release facility** or from the Missouri River or its tributaries to such other conveyance facility as the Secretary selects under this section shall be constructed **unless such feature is specifically authorized by an Act of Congress** approved subsequent to the Secretary's transmittal of the report required in subparagraph (A). . . . **The Act of Congress referred to in this subparagraph must be an authorization bill, and shall not be a bill making appropriations**." (Emphasis added)

It should be noted that this requirement for authorization for construction applies not only to a full Red River Valley Water Supply Project utilizing Missouri River water, but to any "project feature or features" that would provide water from the Missouri River to the Sheyenne River or to another conveyance facility.

In December 2007, the Bureau released its *Final Environmental Impact Statement, Red River Valley Water Supply Project* (RRVWSP FEIS) mandated by the DWRA. The RRVWSP FEIS identified one No Action Alternative, two in-basin alternatives (North Dakota In-Basin Alternative and Red River Basin Alternative) and three Missouri River water supply alternatives (GDU Import to Sheyenne River Alternative, GDU Import Pipeline Alternative and Missouri River Import to Red River Valley Alternative). The GDU Import to Sheyenne River Alternative and the GDU Import Pipeline Alternative both would utilize the Garrison Diversion Unit Principal Supply Works (Lake Audubon, Snake Creek Pumping Plant and McClusky Canal) to supply Missouri River water for the Red River Valley Water Supply Project.

The Bureau's Public Scoping Notice states that the proposed Eastern North Dakota Alternate Water Supply would utilize the Garrison Diversion Unit's Principal Supply Works, including the "Snake Creek Pumping Plant, and intake and pump station located along the McClusky Canal" and "a bulk transmission pipeline to deliver [Missouri River] water to the main transmission pipeline" - i.e., another conveyance facility - to the State's Red River Valley Water Supply Project.

The proposed Eastern North Dakota Alternate Water Supply for the Red River Valley Water Supply Project clearly is not a fundamentally different project from the GDU Import alternatives identified in the Bureau's 2007 RRVWSP FEIS, but rather is simply an alternate feature of the Red River Valley Water Supply Project contemplated in Section 8 of the Dakota Water Resources Act of 2000. However, the Secretary of the Interior has not selected a Red River Valley Water Supply Project alternative that includes a project feature or features that would provide water from the Missouri River to the Sheyenne River or any other conveyance facility, nor has any such project feature or features been authorized by the Congress.

Consequently, the Bureau may not circumvent the congressional authorization clearly required under

Section 8 of the Dakota Water Resources Act of 2000 by attempting to construct an integral feature of the Red River Valley Water Supply Project addressed in Section 8 of the Act under the artifice of it somehow being a part of a different State of North Dakota Red River Valley Water Supply Project seeking funding under the DWRA Section 7 Municipal, Rural and Industrial Water Supply grant program.

As noted above, the Garrison Diversion Conservancy District has requested that the Bureau "consider issuing a contract for up to 165 cubic feet per second of [Missouri River] water from Garrison Diversion Unit (GDU) facilities as an alternate bulk water source for the Red River Valley Water Supply Project" and the Scoping Notice goes on to state that:

> "This request for up to 165 cfs includes the previous request of 20 cfs of water from the McClusky Canal for the Central Dakota Water Supply Project."

However, the Bureau's only congressional authorization for constructing a project feature or features for delivering Missouri River water to the Red River Valley is the Garrison Diversion Unit Reformulation Act of 1986 (Public Law 99-294), which provides explicitly under Section 5, Municipal, Rural and Industrial Water Service, that: 2

> "The Secretary is authorized and directed to construct, operate, and maintain a Sheyenne River water supply and release feature (including a water treatment plant) capable of delivering 100 cubic feet per second of water for the cities of Fargo and Grand Forks and surrounding communities."

In addition, Section 8, Subsection (e) of the Dakota Water Resources Act of 2000 states specifically:

> "SHEYENNE RIVER WATER SUPPLY AND RELEASE OR ALTERNATE FEATURES- The Secretary shall construct, operate, and maintain a Sheyenne River water supply and release feature (including a water treatment plant) capable of delivering 100 cubic feet per second of water or any other amount determined in the reports under this section, for the cities of Fargo and Grand Forks and surrounding communities, or such other feature or features as may be selected under subsection (d)."

It should be noted that the Bureau's Red River Valley Water Supply Project Final Environmental Impact Statement prepared under Section 8, Subsection (c) of the Dakota Water Resources Act includes a GDU Import to Sheyenne River Alternative with a 122 cfs (78,855,920 gallons per day) pipeline from the McClusky Canal to the Sheyenne River and a GDU Import Pipeline Alternative with an 85 cfs (54,940,600 gallons per day) pipeline from the McClusky Canal to the Fargo metropolitan area, but it does not include any alternatives with the capacity to deliver (165 - 20 =) 145 cubic feet per second (93,722,200 gallons per day) of Missouri River water to the Red River Valley.

However, the Secretary has not selected a water supply and release feature, including a water treatment plant, or any other feature or features capable of delivering even 100 cubic feet per second (64,636,000 gallons per day) of water from the Missouri River for the cities of Fargo and Grand Forks and surrounding communities, so the Bureau clearly has no authority to construct a water treatment plant and water supply and release feature capable of delivering more than 100 cubic feet per second of Missouri River water to the Red River Valley.

The Bureau of Reclamation and the State of North Dakota may not build a Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply feature with funding and under the auspices of the Dakota Water Resources Act of 2000 that violates the clear intent and explicit provisions

of the Act relating to the Red River Valley Water Supply Project without the formal approval of the Secretary of the Interior and specific authorization by the Congress.

Consequently, without further congressional authorization, the Bureau has no authority to construct a Garrison Diversion Unit or Red River Valley Water Supply Project feature or features (including a water treatment plant) with the capacity to deliver more than 100 cubic feet per of water from the Missouri River for a Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply.

The Bureau's September 19, 2019, Notice to Prepare an Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project also states that:

> "Reclamation's potential actions include . . . compliance with the Boundary Waters Treaty of 1909."

It should be noted that both of the GDU Import options discussed in the Bureau's *Red River Valley Water Supply Project Final Environmental Impact Statement* include biota treatment plants to address compliance with the Boundary Waters Treaty of 1909. However, as noted above, Section 8, Subsection (a), Paragraph (3), Subparagraph (B) of the DWRA states:

> "No project feature or features that would provide water from the Missouri River or its tributaries to the Sheyenne River . . . or such other conveyance facility as the Secretary selects under this section shall be constructed unless such feature is specifically authorized by an Act of Congress. . ."

Therefore, as with the Eastern North Dakota Alternate Water Supply, the Bureau also does not have congressional authorization to construct a biota treatment plant or any other feature for compliance with the Boundary Waters Treaty of 1909." (Pearson 2019)

The Draft EIS states:

> "In compliance with the Dakota Water Resources Act of 2000, the Secretary of the Interior would consult with the Administrator of the Environmental Protection Agency and the Secretary of State to determine that adequate treatment to meet the requirements of the 1909 Boundary Waters Treaty is included in the preferred alternative. A Secretarial Determination **identifying the adequate treatment level** would be signed to document this consultation process." (Emphasis added) (Draft EIS p. 4-3)

Although the requirement of Dakota Water Resource s Act Section 2(4)(h), Paragraph (1) for the Secretary of the Interior to consult with the Secretary of State and the Administrator of the Environmental Protection Agency prior to the construction applies to any water systems authorized under the Act to deliver Missouri River water into the Hudson Bay Basin, only water projects that would provide water from the Missouri River or its tributaries to the Sheyenne River or other such conveyance facility under a Section 8(a)(1) Red River Valley Water Supply Project require the Secretary under Section 8, Subsection (a), Paragraph (3), Subparagraph (3), to prepare a report which provides:

> "(iv) **a description of how the project feature complies with the requirements of section 1(h)(1)** of this Act (relating to the Boundary Waters Treaty of 1909)." (Emphasis added)

The Draft EIS states that:

> "The Dakota Water Resources Act specifies that costs associated with compliance with the Boundary Waters Treaty compliance [*sic*] shall be non-reimbursable which means they are eligible for 100%

federal funding and Reclamation is responsible for operation, maintenance and replacement costs." (Draft EIS p. ES-6)

The Draft EIS does not quote the specific language of the Dakota Water Resources Act for this statement nor does it cite the specific statutory authority upon which it is based. However, Section 2 of the Dakota Water Resources Act states under (4)(h))(2) dealing with the Boundary Waters Treaty of 1909 that:

> "COSTS- All costs of construction, operation, maintenance, and replacement of water treatment and related facilities **authorized by this Act** and attributable to meeting the requirements of the treaty referred in paragraph (1) shall be nonreimbursable." (Emphasis added)

The preceding paragraph (4)(h)(1) states:

> "DELIVERY OF WATER INTO THE HUDSON BAY BASIN- Prior to construction of any water systems **authorized under this Act** to deliver Missouri River water into the Hudson Bay basin, the Secretary, in consultation with the Secretary of State and the Administrator of the Environmental Protection Agency, must determine that adequate treatment can be provided to meet the requirements of the Treaty between the United States and Great Britain relating to Boundary Waters Between the United States and Canada signed at Washington, January 11, 1909 (26 Stat. 2448; TS 548) (commonly known as the Boundary Waters Treaty of 1909)." (Emphasis added)

The only water treatment and related facilities authorized by the Dakota Water Resources Act of 2000 to deliver Missouri River water into the Hudson Bay Basin is the Red River Valley Water Supply Project authorized under Section 8, Specific Features, Subsection (a) Red River Valley Water Supply Project, and Section 8(a)(3)(B) requires additional specific congressional authorization for any "project feature that would provide water from the Missouri River to the Sheyenne River water supply and release facility." But Reclamation is not proposing to construct the Eastern North Dakota Alternate Water Supply Project under Section 8 of the Dakota Water Resources Act, but rather under Section 7 dealing with Municipal, Rural, and Industrial Water Service, commonly known as the Garrison Diversion Municipal, Rural and Industrial Water Supply grant program:

> "Reclamation is authorized under Section 7 of the Dakota Water Resources Act of 2000 (DWRA) to work with the State of North Dakota to plan, design and construct municipal, rural and industrial water supply projects." (Draft EIS p. 1-2)

and:

> "The need for Reclamation's proposed action is established by Reclamation's responsibility under DWRA which authorizes Reclamation to jointly, with the State of North Dakota, construct MR&I water resource development projects to serve areas throughout the State of North Dakota." (Draft EIS p. 1-2)

However, Section 7 of the Dakota Water Resources Act does not **authorize** the construction of any Red River Valley Water Supply water treatment systems or related facilities to deliver Missouri River water into the Hudson Bay Basin, but simply states that ". . . the Red River Valley Water Supply Project . . . shall be **eligible for funding** under the terms of this section" (Emphasis added), and it goes on to state that: 3

> "Funding provided under this section for the Red River Valley Water Supply Project shall **be in addition to** funding for that project under Section 10(a)(1)(B) [i.e., appropriations authorized specifically for the Red River Valley Water Supply Project described in Section 8]." (Emphasis added)

Eligibility for funding does not constitute authorization of construction.

Reclamation cannot have it both ways. It cannot claim to be building the Eastern North Dakota Alternate Water Supply Project under Section 7 of the Dakota Water Resources Act in order to evade the congressional authorization required under Section 8 and then also claim that the costs of the project attributable to meeting the requirements of the Boundary Waters Treaty of 1909 are reimbursable under Section 8. 3 cont.

Unless the Eastern North Dakota Water Alternate Water Supply project is "specifically authorized by an Act of Congress subsequent to the Secretary's transmittal of the report required in subparagraph (A)" as required under Dakota Water Resources Act Section 8(a)((3)(B), the costs of the Biota Water Treatment Plant will not be reimbursable and will be charged to the State Red River Valley Water Supply Project.

Indeed, the only plausible explanation for Reclamation's attempt to construct the Eastern North Dakota Water Supply Project as a Dakota Water Resources Act Section 7 municipal water supply grant project is to evade the scrutiny of a specific congressional authorization that could expose the serious conceptual flaws, economic deficiencies and environmental impacts of the project.

LACK OF NEED FOR THE EASTERN NORTH DAKOTA ALTERNATE WATER SUPPLY PROJECT

In discussing the **Purpose of and Need for Action** for the proposed Eastern North Dakota Alternate Water Supply Project, the Draft EIS states:

> "The **purpose of the Project** is to respond to Garrison Diversion's request for up to 165 cfs of water from Reclamation' GDU to provide an alternate bulk water supply to the State RRVWSP. The **need for Reclamation's proposed action** is established by Reclamation's responsibility under DWRA, which authorizes Reclamation to jointly, with the State of North Dakota, construct MR&I water resource development projects to serve areas throughout the State of North Dakota.
>
> The Project is being proposed and evaluated as an alternate bulk water supply to meet this need. The State of North Dakota is pursuing its own State RRVWSP project with their own Missouri River intake and has requested an alternative water supply from the McClusky Canal, a Reclamation facility." (Emphasis added) (Draft EIS p. 1-2)

The Draft EIS states that:

> "Garrison Diversion completed an analysis of the needs for the State RRVWSP project to determine the amount of water to request from Reclamation. The ENDAWS project components are designed to provide up to 165 cfs to the State RRVWSP pipeline." (Draft EIS p. 2-3)

Of course, neither a request from the Garrison Diversion Conservancy District for an alternate 165 cfs bulk water supply for the State RRVWSP nor the authority for Reclamation to construct MR&I water projects establishes a legitimate need for the Eastern North Dakota Alternate Water Supply Project. 4

Reclamation's Appraisal-Level Design Engineering Report for the Eastern North Dakota Alternate Water Supply Project (Draft EIS Appendix A) was prepared by Black & Veatch, Garrison Diversion and AE_2S, all of whom have long-established historic, financial and/or contractual interests in promoting water development projects in North Dakota involving the diversion of water from the Missouri River. It is instructive to note, therefore, that it was pointed out in comments on the scoping of the Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply project that:

> "On March 1, 2005, the National Wildlife Federation sent a letter to the Acting Regional Director of the

Bureau of Reclamation expressing concern about the legality and propriety of the Garrison Diversion Conservancy District's role in preparing the environment impact statement for the Red River Valley Water Supply Project (Hall, 2005). In its letter, the Federation pointed out that:

> 'The NEPA regulations developed by the Council on Environmental Quality (CEQ), make clear that conflicts of interest in the delegation of NEPA responsibilities are to be avoided. Moreover, the delegating authority must participate in the preparation of the EIS, exercise independent oversight authority, and maintain responsibility for the product. In general, any EIS
>
>> prepared pursuant to the requirements of NEPA shall be prepared directly by or by a contractor selected by the lead agency. . . . It is the intent of these regulations that the contractor be chosen solely by the lead agency, or by the lead agency in cooperation with cooperating agencies, or where appropriate by a cooperating agency *to avoid any conflict of interest*. Contractors shall execute a disclosure statement prepared by the lead agency . . . specifying that they have no *financial or other interest in the outcome of the project*. If the document is prepared by contract, the responsible Federal official shall furnish guidance and participate in the preparation and shall independently evaluate the statement prior to its approval and take responsibility for its scope and contents.
>
> 40 C.F.R. § 1506.5(c) (emphasis added). The CEQ has further explained with regard to this regulation that '[i]f a consulting firm has a conflict of interest it should be disqualified from preparing the EIS, to preserve the objectivity and integrity of the NEPA process.' 46 Fed Reg. 18026, 180312 (1981).'

In its comments on the 2007 RRVWSP FEIS, the National Wildlife Federation discussed and documented the ineligibility of the Garrison Diversion Conservancy District to serve as the co-lead with the Bureau in preparing the Environmental Impact Statement for the Red River Valley Water Supply Project and noted that:

> 'The Federation/Pearson comments on the Draft EIS included 11 pages documenting the statutory mandate of the Garrison Diversion Conservancy District to promote Missouri River diversion, the absence of statutory authority for the Garrison Diversion Conservancy District to serve as the co-lead in the preparation of the environmental impact statement for the Red River Valley Water Supply Project and the absence of constitutional or statutory authority for the Governor to designate the Conservancy District to represent the State of North Dakota in the preparation of the EIS. The Bureau and the Conservancy District made no attempt what-so-ever to respond to these comments on the Draft EIS (Final EIS Appendix M).' (Pearson, 2008)

In comments on scoping of the Bureau's *Draft Environmental Impact Statement for the Northwest Area Water Supply Project*, which also would involve delivery of Missouri River water to the Hudson Bay Basin for municipal, rural and industrial supplies, the National Wildlife Federation pointed out that:

> 'The EA [Environmental Assessment] for the NAWS project was prepared by private contractors for the North Dakota State Water Commission, the Garrison Diversion Conservancy District, and the Bureau of Reclamation. Both the North Dakota State Water Commission and the Garrison Diversion Conservancy District have mandates to promote and pursue the diversion of water from the Missouri River into the Hudson Bay Basin of North Dakota. . .' (Pearson, 2006)

. . .

In order to avoid the clear conflicts of interests and institutional and contractual biases of its Environmental Impact Statements for the Red River Valley Water Supply Project and Northwest Area 5

Water Supply Project, the Bureau must (1) prepare the EIS for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply itself or with the State of North Dakota and not the Garrison Diversion Conservancy District, (2) exercise sole authority in selecting any contractors, and (3) assure that any contractors are free of historical or current financial or contractual relationships with the State Water Commission, the Garrison Diversion Conservancy District, or others with a vested interest in the Red River Valley Water Supply Project and/or other Missouri River diversion projects." Pearson 2019) 5 cont.

However, Reclamation didn't simply disregard these comments; it proceeded to contract with these same vested interests to prepare the Appraisal-Level Engineering Design Report for the Eastern North Dakota Alternate Water Supply project, including the information on "User Demands."

It is not surprising, therefore, that Reclamation also failed to address the highly questionable assumptions upon which the Environmental Impact Statement for its Federal Red River Valley Water Supply Project was based, as noted in comments on the scoping of the Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply project:

"In order to permit the 'evaluation of the benefits of the proposed action in light of its environmental risks' required by the National Environmental Policy Act under Natural Resources Defense Council v. Morton, the Bureau's EIS for the Red River Valley Water Supply Project Eastern North Dakota Alternate Water Supply should also address, substantively and objectively, the highly questionable assumptions upon which its Environmental Impact Statements for the $1 billion Red River Valley Water Supply Project are based' (Pearson 2005, 2006a, 2007, 2008), including:

1. The population of the Red River Valley will increase at 3.4 times the rate and be 27% greater in 2050 than U. S. Census Bureau projections.

2. No reduction in per capita water consumption will occur by 2050.

3. If the project is built, the water use rate will increase by 10% above the current rate and make the projected shortages during droughts appear even worse.

4. Only minimal water conservation measures (e.g., efficiency, rate structure, plumbing code, leak detection) will be implemented to reduce water consumption.

5. No drought contingency plans (e.g., limiting lawn and golf course watering) will be implemented to reduce water shortages during droughts.

6. The estimated peak day of the month water use will occur every day of the month to contribute to the creation of a year 2050 55,000 acre-feet maximum annual water shortage.

7. The estimated 2050 industrial water needs actually will materialize despite the fact that the authors of the report upon which the estimate is based explicitly state that:

   'Forecasts. . . affecting demand and supply of agricultural products rarely are made beyond a 10-year period. Given the complexity of most forecasting methods associated with those studies, it is impossible, given the limitations of this study, to easily extend those forecasts for another 40 years.'

   'Given the scope of this study, future predictions out to 2050 for all of the factors that

might affect non-food based products associated with agricultural processing is not possible.'

'. . . a precise prediction of how the future will unfold with respect to all the factors influencing agricultural processing activities over a 50-year planning period is impossible.'

'There is inherent risk in accepting past changes as a predictor of future changes.' (Bangsund and Leistritz, 2004)

8. A severe drought occurring today would have the same impacts in the Red River Valley as the 1930s Dust Bowl drought, including 'nearly five consecutive months of zero flow in the Red River at Fargo' in 1934 (RRVWSP FEIS p. 1-1), despite the fact that the Baldhill Dam was built on the Sheyenne River in 1954, creating the 120,000 acre-feet Lake Ashtabula Reservoir, one of principal authorized purposes of which is to supply water to Fargo and Grand Forks during periods of shortages but has been used only twice for that purpose since it was built.

9. Both a 1930s-level drought will occur AND these artificially inflated water demands will materialize simultaneously (neither alone would be enough) at the end of the 50-year project planning period in 2050 in order to create the fabricated shortages upon which the Red River Valley Water Supply Project is claimed to be justified, but which still could be met by less costly in-basin water supply alternatives (RRVWSP FEIS pp. 2-31 to 2-42, p. 2-67 Table 2.21) with far less potentially severe environmental impacts.

10. The repayment of North Dakota's share of the construction costs (DWRA Section 2(4)(f)(2) REPAYMENT CONTRACT) and payment of the operation and maintenance costs (Section 2(4)(f)(3) OPERATION AND MAINTENANCE COSTS) of the Red River Valley Water Supply Project will be based on the percentage of the total capacity of the project that is in actual use during each payment period, which means that U.S. taxpayers would end up paying for most of the excessive costs of this unnecessary and extravagant project." (Pearson 2019)

In fact, instead of addressing the serious flaws and deficiencies of Reclamation's 2005 Final Report on Red River Valley Water Needs and Options upon which the Federal Red River Valley Water Supply Project was based Reclamation simply abandoned any pretext of an objective evaluation of the need for the Eastern North Dakota Alternate Water Supply Project and instead allowed the Garrison Diversion Conservancy District, which requested the project (Draft EIS, pp. ES-1, 1-1), to utilized "nominations" to create new "User Demands" to justify the project. For example:

> "The ENDWSP Project is proposed as an alternative source for the State RRVWSP, and therefore is based on the same demands that had been estimated for the State RRVWSP. Approximately 15 years have elapsed since Reclamation projected average day water demands for the Federal RRVWSP in its 2005 report on Red River Valley Water Needs and Options that was part of the final Environmental Impact Statement (FEIS) (Reclamation, December 2007). These demands were based on a 2050 planning horizon.
>
> To update the State RRVWP demand projections, **Garrison Diversion set out to secure nominations** during the summer and fall of 2016 **on behalf of LAWA [Lake Agassiz Water Authority**[2]**) from**

2 The Lake Agassiz Water Authority is the local cooperating agency for the State Red River Water Supply Project. Duane

potential domestic and industrial water users. Garrison Diversion and prospective users changed the planning horizon form 2050 to 2075 to account for the years that had elapsed and the anticipated duration of project development and construction, desiring to maintain a 50-year project life. Over 100 meetings were held with representatives from municipalities and rural water districts, and RRVWSP water nominations were obtained from 35 water users in central and eastern North Dakota. These nominations were obtained from users who were part of the previous Federal RRVWSP, central North Dakota users, and users who were previously independent but could now obtain State RRVWSP [water] as result of a mandate from the North Dakota State Legislature to be as inclusive as possible. (Emphasis added) (Draft EIS Appendix A p, 3-1)

The Draft EIS Appraisal-Level Design Engineering Report then compounded the flaws and deficiencies of Reclamation's Environmental Impact Statements for its Federal Red River Valley Water Supply Project (Pearson, 2006, 2007, 2008) by projecting them another 25 years to 2075:

> "Recent average-day water demands for these users were gathered from North Dakota State Water Commission water permit annual usage reports. The 2005 Final Needs and Options report contained a population projection for 2050. With current Reclamation data, the data from the 2005 study was combined with separate linear and exponential population projections according to each user's historical population trend to develop a range of 2075 population projections. Each of these population projections were multiplied by each user's recent (generally average from 2010 to the present) gallons per capital per day water use to predict a range of 2075 average day water demands. Municipal and rural nominations obtained in 2016 were based on these 2075 projected average day water demands. Future industrial demand estimates were based on existing industrial water use and projected industrial growth within each user's region." (Draft EIS Appendix A p. 3-1)

The deficiencies of this approach and how it further artificially inflates 2075 "User Demands" are obvious. For example:

> "Users currently served with groundwater generally identified their 2075 domestic water needs from a project as the difference between their 2075 average day projected water demand and their current groundwater permit application(s)." (Draft EIS Appendix A p. 3-1)

However, this does not consider the available groundwater supplies and the potential for increasing the volumes of the permitted withdrawals from those sources.

> "Users currently served by surface water (Sheyenne River, Red River of the North or Red Lake River) opted to receive their entire 2075 average day projected water demand from the State RRVWSP because these rivers are highly susceptible to extreme drought conditions." (Draft EIS Appendix A pp. 3-1, 3-2)

However, this does not address the potential for reducing water demand during droughts through water conservation measures and the implementation of drought contingency plans like most other water users across the country do. Nor does it address the fact, noted above in comments on the scoping of the Environmental Impact Statement for the Eastern North Dakota Alternate Supply Project, that since the extreme drought of the 1930s Dust Bowl, the Baldhill Dam was built on the Sheyenne River in 1954, creating the 120,000 acre-feet Lake Ashtabula, one of the principal authorized purposes of which is to supply water to Fargo and Grand Forks during periods of shortages but which has been used only twice for that purpose since it was built. Nor does it address the Draft EIS's own statements that: 6

DeKrey, the Manager of the Garrison Diversion Conservancy District, is secretary-treasurer of the Lake Agassiz Water Authority's Board of Directors. Ken Vein is on the boards of directors of both the Lake Agassiz Water Authority and the Garrison Diversion Conservancy District.

"The Great Plains is projected to generally become warmer and wetter as a result of climate change. Increased temperatures are expected to change the seasonal pattern of runoff and stream flow. Projections showed that warmer winters would result in more precipitation falling as rain and less as snow. Snowpack would also likely decrease, winter stream flow would increase, and spring runoff would occur earlier. For Lake Sakakawea, the results suggest that Lake Sakakawea elevations and reservoir storage were likely to increase in the future as a result of climate change . . . 7

. . . all future projected trends for the Missouri River basin showed a significant increasing streamflow trend." (Draft EIS 3-22)

Eastern North Dakota is included in the Great Plains.

Five of the 14 municipal and rural water users identified in 2005 for receiving water from Reclamation's Red River Valley Water Supply Project (Bureau of Reclamation 2005) have elected not to participate in the State Red River Valley Water Supply Project, including the cities of West Fargo, North Dakota, and Moorhead, Minnesota, and the largest prospective water user of all, the Fargo/West Fargo/Horace/Harwood/ Cass Rural Water District, with 58.9 cfs and accounting for 56% of the total municipal and rural water "demand" claimed for the project. (The City of Fargo was second with 52.04 cfs.) (Draft EIS Appendix A Table 3-2, pp. 3-5 – 3-8). With 36% of the identified municipal and rural water users representing 74% of the municipal and rural water demand identified for the Federal Red River River Valley Water Supply electing 15 years later not to participate in the State Red River Valley Water Supply Project, it is obvious that the Garrison Diversion Conservancy District's "nominations" for municipal and rural water users in 2075 are little more than wild conjecture.

The Draft EIS Appraisal-Level Design Engineering Report states:

"Industrial nominations were generally quantified according to current industrial water use and **the level of anticipated future industrial growth** in each region of the project service area, identification of existing water supplies available, coordination amongst the various water users in each region, and **informed decisions about future water needs** by water users:

Given the projected industrial water uses often dwarfed the entire permitted allocation(s) of many of the rural communities and rural water districts in the project service area, many users served by groundwater **considered their 2075 average day projected domestic demand as a guide and nominated for an industrial flow that matched it** to guard against the **possibility that their current water source would become unavailable.** Therefore, the industrial nomination, although limited, could also be used as a domestic backup.

Many other users also considered a specific industrial demand based on: cropping, livestock production, and **past industrial development**; **historical interest in industry**; and industrial development in **similar regions across the state and country**. These considerations included a wide array of industries, varying ranges of production sizes, and average water usage per production unit. Users were able to **anticipate future industrial water demands** on the basis of **existing industrial development**, industrial growth of industries currently in the region, and **anticipation of specific future industry**." (Emphasis added) (Draft EIS Appendix A p. 3-2)

That's it! That is the entire "analysis" provided in the 2020 Draft EIS of year 2075 industrial water needs for the State's Red River Valley Water Supply Project for which Reclamation is proposing to spend $453,326,000 in U. S. taxpayer revenues to construct a 165 cfs Eastern North Dakota Alternate Water Supply Project. Reclamation simply ignores, and therefore perpetuates and compounds, the admitted deficiencies of the analysis of industrial water needs upon which its own 2007 Environmental Impact Statement for the Federal Red River Valley Water Supply Project was based and that were cited in comments (see above) on the scoping for the

Environmental Impact for its Eastern North Dakota Alternate Water Supply Project:

> "Forecasts . . . affecting demand and supply of agricultural products rarely are made beyond a 10-year period. Given the complexity of most forecasting methods associated with those studies, **it is impossible**, given the limitations of this study, **to easily extend those forecasts for another 40 years.**" (Emphasis added)
>
> "Given the scope of this study, **future predictions out to 2050** for all of the factors that might affect non-food based products associated with agricultural processing **is not possible.**" (Emphasis added)
>
> ". . . **a precise prediction of how the future will unfold** with respect to all of the factors influencing agricultural processing activities over a 50-year planning period **is impossible.**" (Emphasis added)
>
> "**There is an inherent risk in accepting past changes as a predictor of future changes.**" (Emphasis added) (Bangsund and Leistritz, 2004)

Indeed, the irrelevance and unreliability of the patently speculative information on future industrial water needs in the State Red River Valley Water Supply Project area in 2075 presented in Draft EIS Appendix A is unequivocally and embarrassingly demonstrated by Draft EIS Appendix A Table 3-1 (pp. 3-2 – 3-4), which shows that 13 of the 14 industrial water users – 93% - upon which the year 2050 industrial water needs assessment for Reclamation's 2005 Final Report on Red River Valley Water Needs and Options was based have "elected not to participate" in the State Red River Valley Water Supply Project (Draft EIS p. 3-4). If 13 of those 14 industrial water users have already "elected not to participate" 15 years later, what credibility could Reclamation's speculative projections for industrial water use in the Red River Valley in 2075 possibly have?

The Draft EIS does not provide any information regarding (1) what information was provided to the potential water users regarding the costs and feasibility of obtaining water from the project (2) alternatives to obtaining water from the project, or (3) what commitments, if any, were made in the nominations to utilize water from the project if it were to become available. For example, the Stutsman County Rural Water District has the second largest 2075 industrial water "nomination" at 15.00 cfs (Fargo has the highest industrial water "nomination" at 15.40 cfs, Grand Forks is third at 12.2 cfs and Wahpeton is fourth with 3.00 cfs). (Draft EIS Appendix A Table 3-2, pp. 3-5 – 3-8). However, the manager of the Stutsman County Rural Water District told *The Jamestown Sun* in March 2017 that: 8

> "The actual cost of the water has not been determined. **Determining the costs seems to be put off into the future.**" (Emphasis added) (Norman 2017)

Without that information, the "nominations" amount to little more than a Christmas gift list from Uncle Sam that may, or more likely may not, materialize.

The Draft EIS states that Reclamation's Eastern North Dakota Alternate Water Supply Project McClusky Canal and Missouri River North Preferred Alternative:

> ". . . would provide full redundancy by either taking 165 cfs from the McClusky Canal near MM57 (approximately 1.5 miles north of McClusky, North Dakota) or taking 165 cfs from the Missouri River south of Washburn, North Dakota, or any combination thereof, for a maximum total of 165 cfs, the State RRVWSP pipeline diameter limits the total capacity of water crossing the continental divide." (Draft EIS p. 2-12).

One reason for needing redundancy for the McClusky Canal could be:

"McClusky Canal slide repairs are taking place between Canal MM 20-22, upstream of the proposed ENDAWS intake, to **repair portions of the canal which have slumped in**, reducing canal capacity. Slide repair work was initiated the fall of 2017 and **is anticipated to be complete over the next to three to four years.**" (Emphasis added) (Draft EIS p. 3-40)

Another reason could be:

"The Corps identified a dam safety issue with the Snake Creek Embankment. An interim risk reduction measure was implemented in the Corps 2019 *Section 7 Corps Lake Audubon Reservoir Water Control Manuel*. The manual states Lake Audubon water surface elevation will be decreased as necessary through operation of the Snake Creek embankment conduit when Garrison Reservoir is more than 43-feet lower than Lake Audubon. During drought conditions, the performance of the embankment is monitored closely to evaluate the dam's integrity and the 43-foot differential constraint may be adjusted to ensure safety and efficient operation of the Snake Creek embankment. **This means during a long-term drought; Lake Audubon would need to be drawn down to maintain less than 43-feet differential between Lake Audubon and Garrison Reservoir. This impacts the ability of GDU to deliver water down the McClusky Canal to meet all GDU project needs if Garrison's reservoir falls below 1840.0 feet.**" (Emphasis added) (Draft EIS pp 3-40 - 3-41)

The Draft EIS cites no reason for needing redundancy for the Missouri River pumping plant and pipeline components of the McClusky Canal and Missouri River North Preferred Alternative. There are no provisions for redundancy for any of the other pipeline components of the project and the 165 csf Main Pumping Station on the Missouri River South of Washburn, North Dakota, will have multiple pumps so it will designed to have built-in redundancy. As the Draft EIS explains: 9

"The MPS will include four large and four smaller vertical turbine pumps . . . The pumps will operate on a variable frequency drives to accommodate a wide range of head and flow conditions required for the project." (Draft EIS Appendix A p. 6-24)

Reclamation offers no legitimate engineering or operational reason for adding an Alternative C - McClusky Canal Only North to the Alternative B – State Red River Valley Water Supply Project to create the Alternative E - McClusky Canal and Missouri River North Preferred Alternative when the Alternative B - State Red River Valley Water Supply Project with its Missouri River water source at the same location would meet the same purported water supply needs. However, there are three other obvious reasons for adding the McClusky Canal.

First, the McClusky Canal and Missouri River North Preferred Alternative shifts $453,226,000 of the $1,094,088,000 cost of the State Red River Valley Water Supply Project (Draft EIS table 2-2, p. 2-8) to the Federal Government (Draft EIS table 2-18, p. 2-28).

Second, it requires Reclamation to construct a $69,454,000 Biota Water Treatment Plant (Draft EIS Table 2-18, p. 2-28) and it compels Reclamation to continue to operate and maintain the extremely expensive Garrison Diversion Unit Principal Supply Works (Snake Creek Pumping Plant, Lake Audubon and McClusky Canal) and Biota Water Treatment Plant at an annual cost of $7,140,000 (Draft EIS Appendix A Table 7-8, p. 7-18), which would automatically guarantee additional Federal revenues coming into the State every year until at least 2075 and totaling another $357,000,000 (Draft EIS Table 2-17, p. 2-27)

Third, by compelling Reclamation to continue to operate and maintain the Garrison Diversion Unit's Principal Supply Works, it perpetuates North Dakota's and the Garrison Diversion Conservancy District's ultimate goal of reinstating the 250,000-acre irrigation component of the original Garrison Diversion Unit authorized in 1965.

Clearly, the primary purpose of the Eastern North Dakota Alternate Water Supply Project is not to divert

Missouri River water to the Red River Valley, but rather to divert over $1 billion in Federal funds from the U. S. Treasury to North Dakota while perpetuating the Conservancy District's dream of expanding Missouri River diversion even further in the future through the Garrison Diversion Unit's Principal Supply Works.

LACK OF ECONOMIC JUSTIFICATION FOR THE EASTERN NORTH DAKOTA ALTERNATE WATER SUPPLY PROJECT

The State Red River Water Supply Project has an estimated cost of $1,094,099,000 (Draft EIS Table 2.2, p. 2-8) and the State Red River Valley Water Supply Project with Reclamation's Eastern North Dakota Alternate Water Supply Project McClusky Canal and Missouri River North Preferred Alternative E has an estimated total State and Federal cost of $1,260,419,000 (Draft EIS Table 2-18, p. 2-28). Because no legitimate need has been demonstrated for either project, they are manifestly without economic justification and, indeed, neither Reclamation, the State of North Dakota, nor Garrison Diversion Conservancy District has offered a standard economic analysis of the costs and benefits of either project utilizing sound economic principals and procedures. Instead, Draft EIS Appendix I, Socioeconomics, provides a novel Bureau Economic Analysis where:

> "A regional impact analysis is used to evaluate the short-term effects from the construction of the Eastern North Dakota Alternate Water Supply Project alternatives. The regional impacts will occur during the period of construction. The primary purpose of a regional impact analysis is to evaluate the effect of an alternative on income, employment, and the value of output produced in the study area . . .
>
> The economic effects from construction expenditures are based on cost estimates for each type of activity required to build major components of the project . . .
>
> The extent of the impact of each alternative on the regional and state economy is evaluated by comparing the change in the value of output to gross regional product and gross state product. The construction impacts are short-term effects that will occur only during the period of construction." (Draft EIS Appendix I, pp. I-4, I-5)
>
> "The short-term regional economic effects . . . are considered positive regional effects. These regional impacts are not comparable to economic benefit from a broad national perspective." (Draft EIS p. 3-62)
>
> "The regional economic effects from both phases of the [Eastern North Dakota Alternate Water Supply Project McClusky Canal and Missouri River North Preferred Alternative E] Project and construction of the Biota WTP are anticipated to be minor beneficial impacts slightly greater than Alternatives A, B, C, and D on the regional and state economy in terms of employment, income, and value of output. **These minor beneficial impacts are short-term, occurring only during the construction period** and amount to about 2.1% of North Dakota gross state output for a single year or about 4.8% of the gross regional product for one year in the 9-county region. **The impacts of Alternative E are anticipated to be negligible over the long term.**" (Emphasis added) (Draft EIS p. 3-66)

Incredibly, under this bizarre perversion of benefit/cost analysis, the costs of building the project become the benefits of the project. Consequently, with this Twilight Zone denial of economic reality, the higher the costs, the greater the benefits, so virtually any project, no matter how useless or how wasteful, can be justified on the basis of how much it costs taxpayers. 10

The Draft EI states, regarding the State Red River Valley Water Supply Project, that:

> "Under this alternative the State of North Dakota would continue with their plans to construct the State RRVWSP without any federal involvement by Reclamation." (Draft EIS p. ES-5)

and:

> ". . . the State is pursuing its own State RRVWSP project with state and local funding." (Draft EIS p. 1-1-1)

Neither of these statements is true. The State is pursuing the State Red River Valley Water Supply Project under the assumption that most of the costs will be paid by the U. S. Treasury with U. S. taxpayer dollars.

Section 10 of the Dakota Water Resources Act of 2000 authorizes appropriations of $164,000,000 for purposes that include maintenance of the Snake Creek Pumping Plant and McClusky Canal, so those costs would not be charged to the State Red River Valley Water Supply Project even though it theoretically would be the largest user of water from the Snake Creek Pumping Plant and McClusky Canal.

Section 8 of the Dakota Water Resources Act deals specifically with a Federal Red River Valley Water Supply Project and states in Section 8(e):

> "SHEYENNE RIVER WATER SUPPLY AND RELEASE OR ALTERNATE FEATURES – The Secretary shall construct, operate, and maintain a Sheyenne River water supply and release feature (including a water treatment plant) capable of delivering 100 cubic feet per second of water or any other amount determined under this section, for the cities of Fargo and Grand Forks and surrounding communities, or such other feature or features as may be selected under subsection (d)."

Because Reclamation purports to be proposing the Eastern North Dakota Alternate Water Supply Project under Section 7 of the Dakota Water Resources Act this provision for the Secretary to construct, operate and maintain the Sheyenne River water supply, water treatment plant and release features does not appear to apply.

However, Section 10 of the Dakota Water Resources Act also authorizes appropriations of $200,000,000 specifically for a Red River Valley Water Supply Project authorized under section 8(a)(1), and Section 10(e) provides:

> "INDEXING – The $200,000,000 amount under subsection (b(1)(B) [Section 7 Municipal, Rural, and Industrial Water Supply grant program], the $200,000,000 amount under subsection (a)(1)(B) [Red River Valley Water Supply Project], and the funds authorized under subsection (b)(2) [Indian Municipal, Rural, and Industrial and Other Delivery Features] shall be indexed as necessary to allow for ordinary fluctuations of construction costs incurred after the date of enactment of the Dakota Water Resources Act of 2000 as indicated by engineering cost indices applicable for the type of construction involved . . ."

Therefore, an additional amount of Federal funds could be allocated to an Eastern North Dakota Alternate Water Supply for the State Red River Valley Water Supply Project under the Section 7 Municipal, Rural and Industrial Water Supply grant program.

Section 2 of the Dakota Water Resources Act amends Section 1 of Public Law 89-108, the statute authorizing the Garrison Diversion Unit, to provide:

> "REPAYMENT CONTRACT. - **An appropriate repayment contract shall be negotiated** that provides for the making of a payment for each payment period in an **amount that is commensurate with the percentage of the total capacity of the project that is in actual use during the payment period.**" (Emphasis added)

Because water would rarely be needed from the Eastern North Dakota Alternate Water Supply Project and

because it likely would never be needed at full capacity even in the improbable event of a severe drought, little if any of the $200,000,000 authorized specifically for the Red River Valley Water Supply Project can be expected to be repaid to the Federal Government.

Section 10 authorizes an additional $200,000,000 for the Section 7 Statewide Municipal, Rural, and Industrial Water Supply grant program that was established under the Garrison Diversion Unit Reformulation Act of 1986, and Section 7(1)(B) establishes the non-Federal cost share for projects constructed under the Municipal, Rural and Industrial Water Supply grant program at 25 percent.

The State Red River Valley Water Supply Project has an estimated cost of $1,094,088,000 (Draft EIS Table 2.2, p, 2-8). The total estimated cost of the State Red River Valley Water Supply Project with Reclamation's Eastern North Dakota Alternate Water Supply McClusky Canal and Missouri River North Preferred Alternative is $1,260,419,000 (Draft EIS Table 2-18, p. 2-28). However, with Reclamation's Eastern North Dakota Alternate Water Supply, the State's costs for its State Red River Valley Water Supply Project decrease by $286,571,000 to $807,517,000, but the Federal costs increase from zero to $453,226,000 while providing no benefits to U. S. taxpayers. It is not clear what portion of those Federal costs besides the $69,454.000 biota treatment plant might be non-reimbursable and what remaining Federal costs might be allocated under the Section 7 Municipal, Rural and Industrial Water Supply grant program, but even then, only 25 percent of those remaining costs would be reimbursable to the Federal Government. For example, the Draft EIS states, regarding the McClusky Canal and Missouri River North Preferred Alternative for the Eastern North Dakota Alternate Water Supply for the State Red River Valley Water Supply Project, that:

> "Federal Components . . . are eligible for federal cost share under the North Dakota State MR&I program administered by Reclamation authorized under the DWRA. The program could fund these components using federal/non-federal cost share at any ratio (minimum 25% state/local). The federal portion of this cost share is limited by the construction cost ceiling established by the authorization." (Draft EIS p. 2-15)

That the economic feasibility of the State Red River Valley Water Supply Project is in serious question is confirmed by statements in the Draft EIS such as:

> "Garrison Diversion estimates that using the proposed alternate water source could save millions of dollars in costs for construction and annual operations and maintenance; including decreased energy costs for pumping." (Draft EIS p. ES-1)

> "As a potential cost-saving measure, Garrison Diversion requested a 20 cfs water service contract from the McClusky Canal to provide the portion of a State RRVWSP needs that exist in the Missouri River Basin. This entailed adding an intake into the McClusky Canal and a six-mile pipeline connection between the McClusky Canal and the State RRVWSP . . . This intake and the additional six-mile pipeline segment are referenced in this report as the CNDWSP [Central North Dakota Water Supply Project]." (Draft EIS Appendix A p. ES-3)

and:

> "After the CNDWSP FONSI was finalized, Garrison Diversion asked Reclamation to consider another cost-saving option that would allow Garrison Diversion to supplement or replace the full State RRVWSP water supply (165 cfs) from the McClusky Canal. Garrison Diversion requested a water service contract from Reclamation for an additional 145 cfs of water, delivered through an intake on the McClusky Canal and a pipeline connecting the intake to the State RRVWSP transmission pipeline. Reclamation refers to Garrison Diversion's request for this additional 145 cfs from the McClusky Canal as ENDAWS [Eastern North Dakota Alternate Water Supply] or the 'Project.'" (Draft EIS Appendix A p. 1-7)

If the State and the Garrison Diversion Conservancy District were then to decide, as yet another cost-saving option after the Eastern North Dakota Alternate Water Supply Project is approved, to utilize the Section 7 Municipal, Rural and Industrial Water Supply grant program to fund construction of the remaining $807,517,000 costs of the State Red River Valley Water Supply Project, the entire $1,260,419,000 Eastern North Dakota Alternate Water Supply/State River Valley Water Supply Project could end up costing the State only $201,879,250, while U. S. taxpayers would end up paying the over $1,000,000,000 remaining costs. And that is increasingly likely as State revenues from oil production taxes continue to diminish as a result of declining oil prices and as recoverable oil reserves in western North Dakota continue to diminish over the next two decades. 11

In any event, it is abundantly clear that the State of North Dakota will not "continue with their plans to construct the State RRVWSP without any federal involvement by Reclamation" and the State will not pursue "its own State RRVWSP project with state and local funding." Reclamation already has approved the Garrison Diversion Conservancy District's request for the 20 cfs Central North Dakota Water Supply Project and is proposing a 165 cfs Eastern North Dakota Alternate Water Supply Project in response to another request from the Garrison Diversion Conservancy District for Federal involvement by Reclamation. Indeed, it appears that the only reason North Dakota and the Conservancy District have pursued the charade of building a State Red River Valley Water Supply Project without Federal involvement is to circumvent the regulations that would be involved with a Federal project (Nowatzki 2016, Springer 2016), including the National Environmental Policy Act.

FAILURE TO COMPLY WITH THE NATIONAL ENVIRONMENTAL POLICY ACT

Improper No Action Alternative

The Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project is based on a fundamental conceptual flaw that renders the entire analysis of the environmental impacts of the project manifestly invalid. That fundamental conceptual flaw is the selection of an improper No Action Alternative as the baseline for evaluating the relative environmental impacts of all of the other alternatives. 12

The Draft EIS states:

> "The purpose of the No Action Alternative is to provide **the appropriate base against which all other alternatives are compared**. No Action is not the the same as the existing conditions because future actions may occur regardless of whether any of the action alternatives is chosen in the EIS.
>
> **The No Action Alternative was developed based on the environmental analysis and conclusions of the previously completed compliance documents [Environmental Assessment and Finding of No Significant Impact] for CNDWSP [Central North Dakota Water Supply** Project]. As stated in Chapter One, NEPA guidance allows an agency to define No Action as the continuing action of the current management direction; therefore, in this EIS the No Action Alternative is defined as the CNDWS Project which has been previously approved by Reclamation . . ." (Emphasis added) (Draft EIS pp. 2-5 – 2-6)

and in discussing the Affected Environment and Environmental Consequences, the Draft EIS states:

> "The consequences (+ or -) of the No Action Alternative are described and **the potential impacts (+ or -) of each action alternative are evaluated in comparison to the No Action alternative.**" (Emphasis added) (Draft EIS p. 3-1)

Consequently, in discussing the risk of interbasin transfer of Aquatic Invasive Species under the action alternatives for the Eastern North Dakota Water Supply for the State Red River Valley Water Supply Project, the Draft EIS states:

> "These four action alternatives include the McClusky Canal as a water source for the proposed project . . . The risk reduction provided by the water treatment technologies proposed for the Biota WTP, would be equal to, or provide even greater risk reduction than the treatment process included in the No Action Alternative . . . The potential environmental and economic consequences of an AIS transfer into the HHB are the same as the No Action alternative . . ." Draft EIS p. 3-20

A proper No Action Alternative would be the current environment that exists without the proposed Federal action. Reclamation instead chose as the No Action Alternative for the Draft EIS the State Red River Valley Water Supply Project with Reclamation's 20 cfs Central North Dakota Water Supply Project to deliver Missouri River Water from the McClusky Canal for use within the Missouri River Basin. However, Reclamation chose not to prepare a full Environmental Impact Statement for the Central North Dakota Water Supply Project and instead to prepare an Environmental Assessment that limited its discussion of the environmental impacts of the project to those immediately associated with the construction of the project and the delivery of 20 cfs of Missouri River water for use within the Missouri River Basin while ignoring the cumulative environmental impacts of the State Red Red River Valley Water Supply Project, including those resulting from the interbasin transfer of Missouri River water into the Hudson Bay Basin, which is the primary purpose of the State Red River Valley Water Supply Project. As Reclamation explains in the Draft EIS for the Eastern North Dakota Alternate Water Supply Project:

> "The No Action Alternative is based on the environmental analysis and conclusions of the previously completed NEPA documents [Environmental Assessment] for the Central North Dakota Water Supply Project (CNDWSP), and the proposed action selected in the FONSI [construction and operation of the project] (Reclamation 2018). As stated in the Council on Environmental Quality Regulations [Section 1502.14(d)], a no action alternative is to be considered as part of the NEPA process. Additional guidance from the Council [on] Environmental Quality is provided in the document, NEPA's *Forty Most-Asked Questions*, This guidance states that **the no action alternative can be defined as a continuing action of the current management direction**. Therefore, Reclamation has defined the No Action alternative to include the CNDWSP, which would provide 20 cfs of water from the Canal to the State RRVWSP. This alternative includes an intake into the Canal and a six-mile pipeline connection between the Canal and the State RRVWSP. The 20 cfs of water from the Canal can only be supplied to users within the Missouri River Basin." (Emphasis added) (Draft EIS p. ES-5)

However, Reclamation ignores the compelling evidence that the CNDWSP and State Red River Valley Water Supply Project will never be built and do not constitute "a continuing action of the current management direction" but rather, along with the Eastern North Dakota Alternate Water Supply Project, are simply the latest in a series of fanciful proposals promoted by the Garrison Diversion Conservancy District in its 55-year single-minded search for an excuse to divert water from the Missouri River rather than objectively exploring other more responsible and less costly means of meeting North Dakota's legitimate water needs. For example:

1. Although the North Dakota Legislative Assembly has appropriated some funds for the development of a plan for the State Red River Valley Water Supply Project, it has failed to commit to full funding for the construction and operation of the project (Springer 2016), and in 2019 the North Dakota Legislative Assembly approved only $30,000,000 for the project for 2019-2023 (Sixty-sixth Legislative Assembly of North Dakota, Senate Bill No. 2020). The absence of demonstrated need and economic justification for the State Red River Valley Water Supply Project will make State funding for the construction and operation of the project even more tenuous as revenues from oil development decline and other needs increase. Consequently, there is no assurance that the State Red River Valley Water Supply Project will

be built, with or without the Central North Dakota Water Supply Project.

- North Dakota's and the Garrison Diversion Conservancy District's request for the Eastern North Dakota Alternate Water Supply Project to replace the Central North Dakota Water Supply Project eliminates the State Red River Valley Water Supply Project with the Central North Dakota Water Supply Project as "a continuing action of the current management direction."

- The six-mile Central North Dakota Water Supply Project pipeline would be 30 inches in diameter and would deliver Missouri River water south from the McClusky Canal to the State Red River Water Supply Project pipeline from the Missouri River (Draft EIS pp 2-5, 2-6). Under the Eastern North Dakota Alternate Water Supply Project, that same six-mile pipeline segment would be replaced by a 72-inch diameter pipeline from the State Red River Valley Water Supply Project's pipeline from the Missouri River north to additional pipeline segments to deliver 165 cfs of Missouri River water to a biota treatment plant on the McClusky Canal. (Draft EIS pp. 2-13 - 2-15) This 240% increase in diameter and complete reversal of the purpose and operation of the Central North Dakota Water Supply Project pipeline further disqualifies it as "a continuing action of the current management direction." 13

- On February 2, 2020, the State of Missouri filed a lawsuit in Federal District Court requesting that the Central North Dakota Water Supply Project be halted because Reclamation failed to consider the cumulative adverse impacts of combining the Central North Dakota Red River Valley Water Supply Project and other foreseeable Missouri River diversion projects (Springer, 2020). If Missouri should prevail in its lawsuit, there is a significant possibility that the Central North Dakota Water Water Supply would not be built. 14

- Reclamation's Eastern North Dakota Alternate Water Supply Project McClusky Canal and Missouri River Preferred Alternative would included a Biota Water Treatment Plant adjacent to the McClusky Canal to provide the Enhanced Disinfection Option level of treatment (sand/grit removal, UV light irradiation, chlorine disinfection and chloramine formation) (Draft EIS pp. 2-20, 2-27).

> "This option would be designed to provide 3-log inactivation of *Giardia* and viruses (Table 2.9). As described in the Disinfection Option, chemical disinfection alone does not provide protection against organisms such as *Cryptosporidium*, that are resistant to disinfectants like chlorine. This option would also include UV disinfection designed to achieve 3-log inactivation of *Cryptosporidium* and other similar organisms. . ." (Draft EIS p. 2-20)

Enhanced Disinfection is the same level of biota treatment that Reclamation proposed for its Federal Red River Valley Water Supply Project Garrison Diversion Unit Import to the Sheyenne River Preferred Alternative (Bureau of Reclamation 2007a) and for the Northwest Area Water Supply Project (Bureau of Reclamation 2008), both of which would deliver water from the Missouri River into the Hudson Bay Basin.

The State Red River Valley Water Supply Project would include a Water Treatment Plant two miles east of the Missouri River (Draft EIS pp. 2-7, 2-8) that would provide Disinfection Option level treatment (sand/grit removal and chlorination). (Draft EIS p. 3-20).

> "This option would not provide protection against organisms that are resistant to chlorine disinfectants, such as *Crptosporidium* before the water is conveyed into the Hudson Bay basin." (Draft EIS p. 2-19)

Because the State Red River Valley Water Supply Project would employ an inferior level of water treatment that would not provide protection against organisms that are resistant to chlorine disinfectants,

and because it almost certainly would be found not be in compliance with the Boundary Waters Treaty of 1909, there is a high probability that it couldn't be built. If the State Red River Valley Water Supply Project cannot be built because it would violate the Boundary Waters Treaty of 1909, then it cannot be considered to be part of a No Action Alternative. 15

In addition, the Central North Dakota Water Supply Project described in Reclamation's 2018 Environmental Assessment did not include a water treatment plant for the 20 cfs of Missouri River water to be delivered from the McClusky Canal for use within the Missouri River Basin. However, the Central North Dakota Water Supply Project with the State Red River Valley Water Supply Project would use the same pipe to deliver untreated Missouri River water from the McClusky Canal to users in the Missouri River Basin at times of in-basin only use that would be used to supply treated water to the State Red Red Valley Water Supply Project for use in the Red River Basin. As the Draft EIS explains:

> ". . . this represents the No Action alternative. Under this project, 145 cfs or 165 cfs is pumped from the Missouri River near Washburn to the State RRVWSP WTP. The water from the Missouri River is treated to comply with the same requirements of the NDPDES draft permit issued by the NDDEQ for the State RRVWSP. The water is then pumped by the MPS to the HBT, then flows via gravity to the discharge structure on the Sheyenne River southeast of Cooperstown, ND. An additional 20 cfs of untreated water for in-basin use from the CNDWSP is also withdrawn from the McClusky Canal near MM 42.5 and pumped to the main pipeline at the beginning of Segment B [downstream from the water treatment plant for the State Red River Valley Water Supply Project]. **During times of in-basin use only, the water will be pumped directly to the main pipeline without treatment. During periods of full flow, the pipeline will be flushed prior to crossing the continental divide and the water from the Canal will be treated in a similar fashion prior to entering the main pipeline**. . ." (Emphasis added) (Draft EIS Appendix A p. 7-5)

The Draft EIS does not describe what "treated in a similar fashion" means or how it would be accomplished and Reclamation cites no information to demonstrate that using the same pipeline to deliver untreated Missouri River water to users in the Missouri River Basin that is used to deliver treated water to users in the Red River Basin with simply "flushing" the pipeline between would achieve compliance with the Boundary Waters Treaty of 1909 or that the Central North Dakota Water Supply Project with the State Red River Valley Water Supply Project ever could be built as a No Action Alternative. Indeed, the Central North Dakota Water Supply Project appears simply to have been an interim ruse to get from the State Red River Valley Water Supply Project to the Eastern North Dakota Alternate Water Supply for the State Red River Valley Water Supply Project without substantively addressing the environmental impacts of either. 16

The Draft EIS dismisses the risk of transfer of Aquatic Invasive Species from the Missouri River Basin to the Hudson Bay Basin by both the State Red River Valley Water Supply Project and the No Action Central North Dakota Water Supply Project/State Red River Valley Water Supply Project with the blatantly and astonishingly mendacious statement that:

> "This alternative [State Red River Valley Water Supply Project] is very similar to the No Action in that it would be a continuation of the existing transfer pathways in which all or some of these pathways have contributed to the expansion of AIS. In addition, the risk of AIS transfer through this additional interbasin connection, in comparison to existing pathways, would be very low, the same as the No Action alternative . . ." (Draft EIS p. 3- 20)

For the record, and as Reclamation is fully aware, there are not, and have not been for 10,000 years, any interbasin connections and there are no existing pathways between the Missouri River Basin and the Hudson 17

Bay Basin with the potential to transfer 119,460 acre-feet per year – equivalent to 58,963 Olympic-size swimming pools – of Missouri River water to the Hudson Bay Basin.

Reclamation attempts further to dismiss the risk of transfer of Aquatic Invasive Species to the Hudson Bay Basin by the State Red River Valley Water Supply Project, the No Action Central North Dakota Water Supply Project/State Red River Valley Water Supply Project and the Eastern North Dakota Alternate Water Supply/State Red River Valley Water Supply Project with the ludicrous statement that:

> "Most AIS are very small . . . so thousands of cells/single-celled organisms could be contained in a single drop of untreated water or in waste products of birds, fish, and mammals and spread the AIS from one one drainage basin to another . . . **Volume** is one of several important factors when considering the transfer risk however, it **is not as important as other factors because the potential for AIS to be present in an exceptionally small volume of water.**" (Emphasis added) (Draft EIS pp. 3-6-3-7)

Of course, is absurd to suggest that the risk of transfer of Aquatic Invasive Species is as great for one drop of Missouri River water as it is for 119,460 acre-feet of Missouri River water, and it unequivocally demonstrates the incredible lack of objectivity and credibility of the Draft EIS's evaluation of the risks of interbasin transfer of Aquatic Invasive Species by any Red River Water Supply Project alternative. However, it also demonstrates the absurdity of Reclamation's plan under its baseline No Action Alternative simply to flush the pipeline used to deliver untreated Missouri River water to users in the Missouri River Basin before using the same pipeline to deliver treated Missouri River water to the Red River Valley (Draft EIS Appendix A p. 7-5). 18

The Draft EIS acknowledges that:

> "Reclamation's most recent analysis of AIS [the] *Transbasin Effects Analysis Technical Report* [citation omitted] was peer reviewed by technical experts, both within and outside Reclamation, and builds on previous work on this topic. The independent peer review experts found that the analysis was '...based on the best available science and the results and conclusions were supported by that science, **given the uncertainties inherent in the available data and topic knowledge.**" (Emphasis added) (Draft EIS p. 3-3)

> "It is also **difficult to predict which species** will become established and just as challenging to control or eradicate a species once established." (Emphasis added) (Draft EIS p. 3-10)

> "Through the evaluation of the risk associated with these existing pathways, it was determined that human transfer risks are higher than risks from natural pathways." (Draft EIS p. 3-10)

> "It is possible that some of these species could have an impact in a newly encountered aquatic ecosystem; however, others likely would not. **Uncertainty in the context of predicting potential effects is enormous.**" (Emphasis added) (Draft EIS p. 3-11)

> "As stated in Appendix F, historical aquatic invasions were reviewed and these cases indicate that it is **difficult to predict the impacts** of species introductions due to site-specific environmental conditions that directly affect the outcome . . ." (Emphasis added) (Draft EIS p. 3-11)

However, despite the enormous uncertainty in predicting potential effects of interbasin transfer of Aquatic Invasive Species, the Draft EIS confidently concludes that:

> ". . . the risk of AIS transfer through this additional [State Red River Valley Water Supply Project] would be very low; the same as the No Action alternative." (Draft EIS p. 3-20)

and:

> "The potential impacts of an AIS introduction and establishment in the HBB would be the same under the No Action Alternative and all of the action alternatives because numerous pathways for AIS transfer already exist and each alternative evaluated includes an interbasin transfer from the Missouri River to the Hudson Bay Basin. None of these alternatives would create new types of impacts or increase the severity of impacts that could result from AIS transfer under the existing pathways." (Draft EIS p. 3-21)

Under this tortured reasoning, transferring up to 119,460 acre-feet per year for 50 years of inadequately treated Missouri River water into the Hudson Bay Basin under the State Red River Valley Water Supply Project or the No Action Alternative Central North Dakota Water Supply Project/State Red River Water Supply Project poses no greater risk to the Hudson Bay Basin than transferring a single drop of untreated Missouri River water. 19

Using the State Red River Valley Water Supply Project with a Central North Dakota Water Supply Project that includes an inferior water treatment process that increases the risk of an interbasin transfer of Aquatic Invasive Species (Draft EIS pp. 3-3 – 3-21) as the No Action Alternative diminishes the comparative risk of interbasin transfers of Aquatic Invasive Species by the Action Alternatives, including Reclamation's Eastern North Dakota Alternate Water Supply Project McClusky Canal and Missouri River North Preferred Alternative.

By using a project with an inferior biota treatment process in a project designed to transfer up to 165 cfs (= 119,460 acre-feet per year) of Missouri River water into the Hudson Bay Basin as its No Action Alternative baseline instead of current environment with no transfers of Missouri Rifer water into the Hudson Bay Basin, the Draft EIS grossly and artificially diminishes the comparative risk of Aquatic Invasive Species transfer from any Action Alternative employing a more effective biota treatment option. 20

After failing to address the risks and consequences of Aquatic Invasive Species Transfer under the State Red River Valley Water Supply Project in its Environmental Assessment for the Central North Dakota Water Supply Project and using that as the baseline, Reclamation now attempts to avoid addressing the risks and consequences of Aquatic Invasive Species transfers under the Eastern North Dakota Alternate Water Supply for the State Red River Valley Water Supply Project by dismissing them as being no greater than those of the No Action Central North Dakota Water Supply Project/State Red River Valley Water Supply Project that were not evaluated in the Environmental Assessment for that project and are summarily dismissed in the Draft EIS, e.g.: 20A

> "The No Action Alternative would be a continuation of the existing transfer pathways in which all or some of these pathways have contributed to the expansion of AIS. The risk of AIS transfer through this additional interbasin connection, in comparison to existing pathways, would be very low. In addition, the No Action Alternative includes a state water treatment plant located within the Missouri River basin which includes sand/grit removal and chemical disinfection processes for treating the water prior to being delivered through a pipeline and being released into the Sheyenne River . . ." (Draft EIS p. 3-19)
>
> "The risk reduction provided by the water treatment proposed for the [Eastern North Dakota Alternate Water Supply Project Preferred Alternative] Biota WTP [Water Treatment Plant], would be equal to, or provide even greater risk reduction than the treatment process included in the No Action Alternative. The additional biota WTP processes incrementally reduce the Project risk of AIS transfer based on the organism's susceptibility to the different treatment technologies . . . The potential environmental and economic consequences of an AIS transfer into the HBB are the same as the No Action Alternative." (Draft EIS p. 3-20)

The selection of the State Red River Valley Water Supply Project with the Central Dakota Water Supply Project as the No Action Alternative against which the environmental impacts of the Action Alternatives are compared creates a fundamental and pervasive conceptual bias of such profound magnitude and significance as to 21

invalidate the entire Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project.

Failure to Consider Alternatives to the
Eastern North Dakota Alternate Water Supply Project

The Draft EIS states that:

> "On January 31, 2019, Garrison Diversion Conservancy District (Garrison Diversion), on behalf of the State of North Dakota, requested an additional 145 cubic feet per second (cfs) of water from the McClusky Canal as an alternate water source for a State-led Red River Valley Water Supply Project (State RRVWSP) (in the Hudson Bay Basin), which necessitates that Reclamation analyze the request to comply with National Environmental Policy Act (NEPA) and other applicable laws. The additional 145 cfs of water is in addition to a previous request by Garrison Diversion for 20 cfs of water from the McClusky Canal that was to be delivered to the State RRVWSP for use in the Missouri River basin (MRB). The previous request is referred to as the Central North Dakota Water Supply Project (CNDWSP) and was analyzed in an Environmental Assessment (EA). A Finding of No Significant Impact (FONSI) was signed in 2018." (Draft EIS p. 1-1)

Section 102(2)(C)(iii) of the National Environmental Policy Act specifies that Environmental Impact Statements are to address "alternatives to the proposed action," and Council on Environmental Quality Regulations and the courts have made it clear that Federal Agencies are not simply to consider alternatives FOR implementing the proposed action, but they are to explore all reasonable alternatives TO the proposed action. For example, in *NRDC v. Morton*, the U. S. Court of Appeals for the District of Columbia stated:

> "Congress contemplated that the impact statement would constitute the environmental source material for the information of the Congress as well as the Executive, in connection with the making of relevant decisions, and would be available to enhance enlightenment of the public. The impact statement provides for (a) evaluation of the benefits of the proposed action in light of its environmental risks, and (b) **comparison of the net balance for the proposed project with the environmental risks presented by alternative courses of action.**" (Emphasis added)

The Draft Environmental Impact Statement for the Eastern North Dakota Water Supply Project considers one improper No Action Alternative (CNDWSP and State RRVWSP), another no action alternative (State RRVWSP) that does not consider alternatives for meeting the purpose of the Eastern North Dakota Alternate Water Supply Project, and four Action Alternatives FOR building the Eastern North Dakota Alternate Water Supply Project, but it does not consider any alternatives TO building the Eastern North Dakota Alternate Water Supply Project that would meet that same purpose (Draft EIS pp. ES-4 – ES-6, 2-1 – 2-18). This 'all or nothing' approach to the consideration of alternatives fails to provide the comparison of the net balance for the proposed project with the environmental risks presented by alternative courses of action mandated by NEPA and it effectively precludes any actions other than the one being proposed. 22

It is relevant to note that in comments on Reclamation's 2005 *Draft Report on Red River Valley Water Needs and Options*, the National Wildlife Federation pointed out that:

> "All of the options involve various combinations of pipelines, pumping plants and other structural features designed to create large water supply projects ranging in cost from $504,888,000 to $2,518,023,000 . . . Despite being designed to meet speculative water needs projected 45 years in the future, none of the options is designed to be implemented in increments as water needs actually materialize [citation omitted], but the North Dakota In-Basin and the Red River Basin options are based on independent water supply features that could be implemented separately [citation omitted].

> In any event, because the future water needs upon which the *Draft Report* is based are highly speculative, and because the costs of the options identified for meeting those needs are so great, the only options that can realistically be considered are the North Dakota In-Basin and the Red River Valley Basin options that could be implemented in increments as water needs actually materialize." (Pearson, 2005)

In its comments on Reclamation's 2007 *Supplemental Draft Environmental Impact Statement Red River Valley Water Supply Project*, the National Wildlife Federation again noted that:

> "As was pointed out in the appended *Review* of the *Draft Report* (Pearson 2005, p. 62) and the appended *Comments* on the Draft EIS (Pearson 2006, pp. 35-36) all of the Action Alternatives involve various combinations of pipelines, pumping plants and other structural features designed to create large water supply projects now estimated to cost from $415,438,000 to $1,051,996,000. Because each Action Alternative has a large pipeline costing from $214,305,000 to $841,792,000 [citation omitted] as its primary water supply feature, none of the Action Alternatives is very amenable to phased construction. Consequently, despite being designed to meet highly speculative water needs projected 45 years in the future, none of the alternatives is designed to be implemented in increments as water needs actually do – or do not – materialize." (Pearson 2007)

Nevertheless, 13 years later and despite the additional unequivocal documentation of the highly speculative basis for their water needs projections for the Red River Valley in 2075, Reclamation and the Garrison Diversion Conservancy District continue to promote pipelines, pumping plants, biota treatment plants and other structural features designed to create large, costly and highly controversial water supply projects while obdurately refusing to consider responsible and less costly alternatives with far less potentially severe environmental impacts that could be implemented in increments as water needs actually do – or do not – materialize.

Instead of evaluating alternatives for utilizing existing surface water and groundwater sources that were identified in the *Final Environmental Impact Statement Red River Valley Water Supply Project* and found to be available and sufficient to meet future municipal, rural and industrial water needs in the Red River Valley (Bureau of Reclamation 2007b) and that could be implemented on an incremental basis as needs actually materialize, the Draft EIS for the Eastern North Dakota Alternate Water Supply Project ignores those alternatives and again focuses on a $1.26 billion project involving the construction four pumping plants, 169 miles of 72-inch pipelines and a biota treatment plant, plus maintenance and operation of the Snake Creek Pumping Plant, Lake Audubon and 57 miles of the McClusky Canal, none of which is likely to be needed or used for decades, if ever.

Failure to Address Cumulative Environmental Impacts of the Eastern North Dakota Alternate Water Supply Project

Council on Environmental Quality regulations implementing the procedural provisions of the National Environmental Policy Act define cumulative effects as:

> "The impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions."

The proposed State Red River Valley Water Supply Project is devoid of demonstrated need or economic justification and is not likely to be built without Federal funding of the $453,326,000 Eastern North Dakota Alternate Water Supply Project (Draft EIS table 2-18, p. 2-28). Nevertheless, in the context of the Draft EIS, the State Red River Valley Water Supply Project must be considered to be a reasonably foreseeable future action by 23

a non-Federal agency, so the incremental cumulative environmental impacts of the State Red River Valley Water Supply Project must be addressed in addition to the environmental impacts of the Eastern North Dakota Alternate Water Supply Project and not simply be ignored.

The Draft EIS states that:

> "The scope of this EIS focuses on developing and analyzing a course of action and alternatives to it that meet the purpose and need as described previously." (Draft EIS p. 1-2)

The Purpose of and Need for Action described previously are:

> "The purpose of the Project is to respond to Garrison Diversion's request for a contract for up to 165 cfs of water from Reclamation's GDU to provide an alternate bulk water supply to the State RRVWSP. The need for Reclamation's proposed action is established by Reclamation's responsibility under DWRA, which authorizes Reclamation to jointly, with the State of North Dakota, construct MR&I water resource development projects to serve areas throughout the State of North Dakota." (Draft EIS p. 1-2)

Neither the stated purpose nor need is helpful in identifying the actual scope of the EIS.

Reclamation defines the geographic scope of the Eastern North Dakota Alternate Water Supp;y Project as:

> "Reclamation has determined that the geographic scope for the Project includes the following counties in North Dakota: Burleigh, Sheridan and Wells (Figure ES-1). The geographic scope of the resource analysis is limited to areas that could be impacted by the alternatives being evaluated. Some resource analyses such as aquatic invasive species, socioeconomics, and Missouri River depletions extend beyond this geographic scope as described in Chapter 3 for this EIS." (Draft EIS p. ES-2, 1-3)

Figure ES-1 is a map of east central North Dakota east of the Missouri River showing the State Red River Valley Water Supply Project pipeline running from the Missouri River to the Sheyenne River and portions of Burleigh, Sheridan and Wells counties included in a cross-hatched "Project Area." However, this still is not helpful in identifying the actual scope of the Draft EIS's evaluation of the environmental impacts of the Eastern North Dakota Alternate Water Supply Project.

Draft EIS Chapter 3, Affected Environment and Environmental Consequences, states:

> "This chapter summarizes the physical, biological, social and economic resources (affected environment) and the effects of implementing each alternative on those resources." (Draft EIS p 3-1)

So it still is not clear just what the "affected environment" is considered to be for evaluating the environmental impacts of the Eastern North Dakota Alternate Water Supply Project.

In discussing the Affected Environment and Environmental Consequences of the alternatives considered for the Eastern North Dakota Water Supply Project, the Draft EIS states:

> "The consequences of Alternative B – State RRVWSP are described qualitatively for most resources because **it is not known what environmental commitments or BMP's** [Best Management Practices] **Garrison Diversion would implement for the RRVWSP to avoid, minimize, or mitigate any potential effects.**" (Emphasis added) (Draft EIS p. 3-1)

Therefore, it is apparent that Reclamation's Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project, which is designed to provide the entire 165 cfs bulk water supply for the State 24

Red River Valley Water Supply Project, is not considering the cumulative environmental impacts of providing that water to the State Red River Valley Water Supply Project.

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However, just because the measures the State might take, if any, to avoid, minimize or mitigate the environmental impacts of the State Red River Valley Water Supply Project are not known does not relieve Reclamation of its responsibility to describe the cumulative environmental impacts of the State Red River Valley Water Supply that would be added to the environmental impacts of its Eastern North Dakota Alternate Water Supply Action Alternatives and that also need to be addressed.

Threatened and Endangered Species

In the case of Threatened and Endangered Species, the Draft EIS states:

> "The potential consequences associated with the No Action Alternative [Central North Dakota Water Supply Project with State Red River Water Supply Project] are as described in the CNDWSP EA and FONSI and incorporated by reference." (Draft EIS p. 3-50)

But when it comes to the cumulative environmental impacts on Threatened and Endangered Species associated with the State Red River Valley Water Supply Project, the Draft Environmental Assessment for the Issuance of Water Service Contract to Garrison Diversion Conservancy District for the Central North Dakota Water Supply Project, North Dakota simply says:

> "Garrison Diversion is planning to construct the state-sponsored RRVWSP and a small segment of the state-sponsored RRVWSP would occur in the Action Area. Pipeline construction activities would be temporary and Garrison Diversion would reclaim lands as outlined in Land Resources." (Bureau of Reclamation 2018 - CNDWSP Draft EA, pp. 3-21 – 3-22)

There are no indications in the Draft EIS that the cumulative impacts of the State Red River Valley Water Supply Project on threatened and endangered species are considered. 25

Wetlands

In the case of Wetland and Riparian Areas, Reclamation's Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Suppl Project doesn't even make a pretext of evaluating the cumulative environmental impacts associated with the State Red River Valley Water Supply Project and its Missouri River Intake Pump Station, Water Treatment Plant, Hydraulic Break Tank, Control Valve Structure and Discharge Structure on the Sheyenne River (Draft EIS Table 2-2, p. 2-8),165.6 miles of 72-inch pipelines across the Prairie Pothole Region of North Dakota (Draft Appendix A pp. 6-2, 6-4, 6-6, 6-8) and 36 State Red River Valley Water Supply Project 2075 water user "nominations" for up to 159.23 cfs of water from the Missouri River (Draft EIS Appendix A table 3-1, pp. 3-2 – 3-8). Instead, the Draft EIS simply states that:

> "Alternative B would consist of the State RRVWSP, with no federal facilities constructed. **It is reasonable to assume wetlands and riparian areas would be present within the 150-ft ROW** [Right of Way] **for Alternative B** [State red River Valley Water Supply Project]; however, **the wetland acreages were not calculated for this alternative because there is no federal nexus**. The impacts that may occur to wetlands and riparian areas are unknown because environmental commitments or BMP's addressing wetland impacts have not been identified for the State RRVWSP. Garrison Diversion would be responsible for compliance with Corps permitting requirements in addition to any other state or federal agency consultations regarding stream and wetland crossings for the State RRVWSP." (Emphasis added) (Draft EIS p. 3-59)

Of course, the absence of a Federal nexus is not an excuse for Reclamation to ignore the cumulative impacts of the State Red River Valley Water Supply Project on wetlands and riparian areas, not to calculate the acreages and types of wetlands and riparian areas involved in those cumulative impacts and not to describe the specific mitigation measures that will be implemented so their effectiveness can be evaluated objectively. However, the comments by Garrison Diversion Conservancy District officials and other proponents of a Red River Valley Water Supply Project regarding this matter are revealing in Reclamation's discussion in the Draft EIS of the impacts of the Eastern North Dakota Alternate Water Supply Project/State Red River Valley Water Supply Project on wetlands: 26

On September 23, 2016, the Forum News Service reported that:

> "Officials spearheading a decades-old effort to divert Missouri River water to eastern North Dakota . . . said they hope lawmakers will still provide enough money to start construction on the Red River Valley Water Supply Project during the 2017-19 biennium so it can be grandfathered in before new federal regulations that could delay the project take effect.
>
> 'There is great risk here involved with regulation changes,' Ken Vein, chairman of the Garrison Diversion Conservancy District, said Thursday, Sept. 22, during a joint meeting of the State Water Commission and the Legislature's Water Topics Overview Committee."
>
> "Earlier this year, a study identified horizontal collector wells as the best option for taking water from the Missouri River, at an estimated cost of $424 million. Project officials adopted it as the preferred alternative, in large part because it wouldn't require federal permits.
>
> But Vein said the project's legal consultants have since advised that a conventional intake estimated at $187 million - an option that project officials had earlier written off - would likely qualify for a nationwide permit from the U.S. Army Corps of Engineers without having to undergo another extensive environmental review."
>
> "Waiting longer increases the chances that federal regulations such as the Environmental Protection Agency's 'Waters of the U.S.' rule will delay the project, officials said." (Nowatski 2016)

On December 27, 2016, the Forum News Service reported that:

> "Project proponents are pushing to start construction in the nest two years because they presume a Trump administration, and a Republican-controlled Congress, will be more likely to grant federal permits for water development projects, [Garrison Diversion Conservancy District general manager Duane] DeKrey said.
>
> 'We all know the pendulum swings,' he said, adding that the Obama administration's proposed Waters of the United States regulations, the subject of a legal challenge by states including North Dakota, could have killed the project. Under a Trump administration, the presumption is the rule will be scrapped, DeKrey said." (Springer 2016)

On March 25, 2017, The Jamestown Sun reported that:

> "DeKrey and other Garrison Diversion officials were in Washington, D.C., last week to talk with the North Dakota congressional delegation and officials of the U.S. Department of the Interior.
>
> 'Their message to us was the Trump administration has put out the word to find a way to get to

"yes,'" Dekrey said, referring to discussions with the Interior Department."

". . . Once construction starts, the project would then be governed by the federal regulations in place.

'The ease of doing business with the federal government may not be long lived,' DeKrey said." (Norman 2017)

On July 7, 2017, the Forum News Service reported that:

"North Dakota officials are eager to start construction during the Trump Administration, whose environmental and natural resource policies are supportive of projects like the water supply pipeline.

'We want to have a substantial start now while we're dealing with the current administration,' Vein said.

Officials fear that a delay could mean adverse policy decisions from a future administration, including a broader definition of wetland, which could make it much more difficult to get an approved pipeline route. Under current wetland conditions, the route can be permitted, officials said." (Springer 2017)

Clearly, Garrison Diversion Conservancy District and other North Dakota officials involved in promoting the State's Red River Valley Water Supply Project are working diligently to minimize and avoid compliance with environmental regulations, including those requiring avoidance or mitigation of impacts on wetlands. However, the environmental impacts of the Red River Valley Water Supply Project are not based on whether they are subject to Federal regulation and Reclamation's Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply for the State Red River Valley Water Supply Project still must describe those cumulative impacts in detail and discuss alternatives for avoiding or mitigating them.

The discussion in the Draft EIS of the environmental impacts of the Eastern North Dakota Alternate Water Supply Project on Wetland and Riparian Areas is explicitly limited to:

"The affected environment (150-foot ROW, Bitoa WTP with 150-ft buffer, and intake facilities for each alternative) is located within the Prairie Pothole Region, which contains many small depressional wetlands that store surface surface water or groundwater, recharge groundwater with surface water, provide surface water from groundwater, and provide a source of atmospheric water [citation omitted]." (Draft EIS p. 3-57)

The Draft EIS neglects to mention that these small depressional wetlands located within the Prairie Pothole Region of North Dakota also provide nesting habitat for more than 70 species of birds and migration habitat for millions of birds of another 70 species, that those Prairie Pothole wetlands of North Dakota produce more wild ducks than any other state except Alaska, that waterfowl produced on those wetlands have been recovered in 46 states, 10 Canadian provinces, and 23 other countries, and that those wetlands are the primary habit for millions of resident birds and mammals, including pheasants, muskrats, mink, foxes, and deer (Pearson 1985).

And the discussion of the impacts of the Project on wetlands and riparian areas within that limited area is so nebulous, superficial, and dismissive as to be ludicrous:

"Temporary and permanent impacts on wetlands and riparian habitats have the potential to occur as a result of construction of bulk distribution pipelines, a biota water treatment plant, and an intake on the

Canal associated with each alternative C, D, E. and F. Wetland acreages and types differ for the action alternatives C (43 acres), D (13 acres), E (68 acres), and F (32 acres), which would change the amount and types of wetlands and riparian impacts potentially affected for each alternative. However, avoidance, minimization and mitigation strategies results form BMPs and environmental commitments (Appendix D) and the Environmental Commitments Section below) [*sic*] would be implemented for each alternative C, D. E, and F.

BMPs and environmental commitments are fully described in Chapter 2 and Appendix D. Wetland and riparian impacts would be avoided to the extent practical through on-site re-routing around wetland basins or boring underneath. In the event wetlands could not be avoided during construction of any of the action alternatives; construction BMPs, regulatory requirements, and mitigation commitments described in Chapter 2 and Appendix D would be followed.

Given the implementation of the best management practices and environmental commitments, no unavoidable adverse impacts would occur from construction of Project components related to action alternatives C, D, E, and F." (Draft EIS p. 3-59)

It is instructive to note in the context of the comments cited above by Garrison Diversion Conservancy District officials and other proponents of the Red River Valley Water Supply Project related to wetland regulations that the environmental commitments regarding wetlands discussed in Draft EIS Chapter 2 refer only to:

"Effects on **jurisdictional wetlands and waters of the United States** would require authorization from the U. S. Army Corps of Engineers. A compensatory mitigation plan may be required for the loss of any wetlands and would include methods to replace specific functions of affected wetlands." (Emphasis added) (Draft EIS Table 2-20, p. 2-36.)

And the Best Management Practices regarding wetlands discussed in Draft EIS Appendix D relate again only to:

"Long- and short-term effects on wetlands and riparian areas would be avoided to the extent practicable and **in compliance with Section 404 of the Clean Water Act** [which is enforced by the U. S. Army Corps of Engineers]." (Emphasis added) (Draft EIS Appendix D Table D-1, p. D-4)

Exactly as officials of the Garrison Diversion Conservancy District and other proponents of the Red River Valley Water Supply Project wanted, Reclamation's Draft EIS for the Eastern North Dakota Alternate Water Supply Project completely ignores the impacts of the State Red River Valley Water Supply Project on wetlands and it limits its consideration of the impacts of the Eastern North Dakota Alternate Water Supply Project only to wetlands that fit the specific definition of jurisdictional wetlands under the current Trump Administration and then doesn't describe what those impacts actually are or how effective any mitigation measures will be.

The Draft EIS completely ignores the cumulative impacts on wetlands of the State Red River Valley Water Supply Project and it ignores the impacts of the Eastern North Dakota Alternate Water Supply Project on wetlands except for 66 acres of deep wetlands with persistent emergent vegetation and 3 acres of riverine wetlands (Draft EIS Table 3-14, p. 3-58) along the project's 53 miles of pipelines (Draft EIS Appendix A, pp. 6-8 - 6-12) 27

Indian Water Rights

Among "Other Minor Issues" identified in the Draft EIS is "Indian Trust Assets" with the brief notation that:

". . . the federal government recognizes the reserved water rights of tribes within the Missouri River Basin and acknowledges these rights could affect operations of the Missouri River Mainstem Reservoir

System." (Draft EIS Table 3-1, p. 3-3)

In addressing Indian Trust Assets as one of these Other Minor Issues, Draft EIS Appendix E states only that:

> "Another ITA that potentially could be affected by the Project is Indian water rights in the Missouri River. Such water rights in the basin are a matter of federal law. The basis for this stems from the U.S. Supreme Court's decision in *Winters v. United States* (1908), which enunciated the Winters Doctrine. According to the doctrine the establishment of an Indian reservation implied that sufficient water was reserved (or set aside) to fulfill purposes for which the reservation was created, with the priority date being the date the reservation was established. As such, Indian water rights, when quantified, constitute an ITA. In *Arizona v California* (1963) the U.S. Supreme Court held that water allocated should be sufficient to meet both present and future needs of the reservation to assure the viability of the reservation homeland. Case law also supports the premise that Indian reserved water rights are not lost through non-use.
>
> . . . Several tribes within the Missouri River Basin are in various stages of quantifying their water rights. The U.S. Army Corps of Engineers (Corps) is the federal agency responsible for operations of the Missouri River Mainstem Reservoir System. The Corps has recognized that certain Missouri River Basin tribes are entitled to water rights in streams running through and along their reservoirs under the Winters Doctrine. The Corps' operational decisions concerning the Missouri River Mainstem Reservoir System are based on the water that is in the system and demands placed upon it. The Corps recognizes tribal water rights to the mainstem irrespective of whether those rights have been quantified. In doing so, **the Corps recognized that future qualifications of those rights could affect operations.**" (Emphasis added) (Draft EIS Appendix E p. E-6)

The startling inadequacy of the Draft EIS's discussion of the potential cumulative impacts of the reasonably foreseeable future action of Native American Tribes quantifying their rights to Missouri River water is starkly demonstrated by a December 15, 2007, story in the Mitchell, South Dakota, *Daily Republic* reporting that:

> "There are 27 tribes in the Missouri River basin. If all of their water rights are quantified, predicted Dale Frink, one of North Dakota's representatives in this week's MoRAST meeting in Pierre, they could secure rights to an enormous amount of water.
>
> '**If they all would do it, they could tie up a chunk of water, if not all of it,**' said Dale Frink, an Engineer with the North Dakota State Water Commission. 'I don't know if I should say "tie up," but certainly they could quantify a huge amount of water."' (Emphasis added) (Tupper 2007)

What former North Dakota State Engineer Dale Frink's candid admission discloses, of course, is that the State of North Dakota, the Garrison Diversion Conservancy District and the Bureau of Reclamation are deliberately promoting and planning to proceed with an Eastern North Dakota Alternate Water Supply Project for a State Red River Valley Water Supply Project with full knowledge that it (1) ignores Tribal water rights to the Missouri River established under the Winters Doctrine, (2) violates the Secretary of the Interior's responsibility under the Winters Doctrine to protect Tribal water rights, and (3) could cost additional hundreds of millions of dollars in compensation to the Tribes for Missouri River water used by the project over the next 50 years. However, the Bureau of Reclamation does not address these issues substantively, factually or objectively in the Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project. 28

CONCLUSIONS

Reclamation's $1,740,000 *Draft Environmental Impact Statement, Eastern North Dakota Alternate Water Supply*

Project states:

> "In 2007, the Bureau of Reclamation (Reclamation) completed an environmental impact statement (EIS) evaluating the Federal Red River Valley Water Supply Project (Federal RRVWSP), which would have provided water to eastern North Dakota communities located in the HHB [Hudson Bay Basin]. **The preferred alternative was controversial for several reasons and, therefore, the Secretary of the Interior did not sign a Record of Decision (ROD).** As a result, the State RRVWSP is pursuing its own State RRVWSP project with state and local funding. The State RRVWSPis being designed to meet the future water needs of central and eastern North Dakota through the year 2075." (Emphasis added) (Draft EIS pp. ES-2, 1)

Reclamation's Eastern North Dakota Alternate Water Supply for the State Red River Water Supply Project creates a completed project that is virtually identical, both structurally and functionally, to Reclamation's GDU Import to the Sheyenne River Preferred Alternative identified in Reclamation's 2007 *Supplemental Draft Environmental Impact Statement, Red River Valley Water Supply Project* combined with the State Red River Valley Water Supply Project and its water intake from the Missouri River south of Washburn, North Dakota.

The Eastern North Dakota Alternate Water Supply Project meets no valid need, it serves no legitimate purpose, it is devoid of economic rationality or justification, it poses severe but undisclosed adverse environmental impacts, it has the potential to violate the Boundary Waters Treaty of 1909, the National Environmental Policy Act of 1970, the Clean Water Act of 1972, and the Dakota Water Resources Act of 2000, and Reclamation lacks the statutory authority to build it.

In proposing to construct the Eastern North Dakota Alternate Water Supply Project under Section 7 of the Dakota Water Resources Act of 2009, Reclamation is attempting to circumvent the clear language of the Act pertaining to a Red River Valley Water Supply Project with the ultimate result of escalating the very controversies that precluded the Secretary of the Interior from approving Reclamation's 2007 GDU Import to the Sheyenne River Red River Valley Water Supply Project Preferred Alternative in the first place.

The extreme lengths to which the Bureau of Reclamation, the Garrison Diversion Conservancy District and other North Dakota Red River Valley Water Supply Project proponents have to go in circumventing Federal statutes and the clear will of the Congress in order to promote the Eastern North Dakota Water Supply for the State Red River Valley Water Supply Project provides perhaps the most damning confirmation of the project's lack of merit and justification.

It is difficult to believe that Reclamation thinks that the $1.26 billion Eastern North Dakota Alternate Water Supply for the State Red River Valley Water Supply Project is a serious proposal, and there certainly is no reason that anyone else should, either.

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Springer, Patrick. 2020. Missouri sues to block ND water project. Forum News Service. February 14.

Tupper, Seth. 2007. Water fight brewing in SD. The Daily Republic, Mitchell, South Dakota. December 5.

Response 10-1 Reclamation did consider the commenter's perspective on Reclamation's authority provided during the public scoping period. Upon further consideration, Reclamation reaffirmed its initial decision on its authority for the proposed project.

Reclamation respectfully disagrees with the commenter's interpretation of the authorities provided by the Garrison Diversion Unit Act and subsequent modifications to this act including the 1986 Reformulation Act and the Dakota Water Resources Act of 2000. The State RRVWSP is not the Federal RRVWSP noted in Section 8 of DWRA or in previous versions of the act. The commenter's interpretation that ENDAWS is a feature of a Federal RRVWSP is incorrect. The proposed federal actions for ENDAWS do not fall within the purview of Section 8(a)(3)(B), because ENDAWS is not an alternate being selected by the Secretary pursuant to Section 8.

Response 10-2 See Response 10-1. Section 7 of the Garrison legislation is the authorization to provide an alternate bulk water supply to the State RRVWSP. Reclamation's proposed ENDAWS project can be characterized as part of the "multi-purpose water resource development project" authorized under Section 7 of the Garrison legislation and constructed jointly between Reclamation and North Dakota.

Response 10-3 Reclamation respectfully disagrees with the commenter's interpretation of the authorities provided by the Garrison Diversion Unit Act and subsequent modifications to this act including the 1986 Reformulation Act and the Dakota Water Resources Act of 2000. See Response 10-1. Reclamation also points the commenter to Section 1(h)(2) of the Dakota Water Resources Act of 2000, which is consistent with previous legislation relative to the Garrison Diversion Unit, which states "All costs of construction, operation, maintenance, and replacement of water treatment and related facilities authorized by this Act and attributable to meeting the requirements of the treaty referred to in paragraph (1) shall be nonreimbursable."

Response 10-4 See Response 7-15.

Response 10-5 Reclamation has complied with the regulations for implementing NEPA in using information from an applicant (40 CFR 1506.5), in this case the applicant is the Garrison Diversion Conservancy District. The Garrison Diversion Conservancy District is an instrumentality of the state for purposes of matters involving the Garrison Diversion Unit, established under State statute (*North Dakota Century Code* 61-24-08). Reclamation reviewed information and data provided by the applicant, such as the Appraisal Level Engineering Design Report, provided feedback regarding the information prior to accepting it and using it as appropriate in the evaluations conducted for the EIS.

Response 10-6 The comment is outside the scope of the ENDAWS EIS. See Responses 7-15 and 7-16.

Response 10-7 As stated in the EIS (Section 3.3), the objective of the climate change analysis is to evaluate potential impacts of future climate change in the Upper Missouri River Basin on streamflow in the Missouri River which is the source water for the

proposed action. Understanding the potential future effects of climate change on the water source is an important consideration when planning a long-term project. While the commenter is correct in that both the Upper Missouri River Basin and the Red River Basin both lie within the expansive Great Plains region, the focus of the EIS analysis was within the Upper Missouri River Basin.

Response 10-8 See Responses 7-15 and 7-16. The water nomination process and water conservation measures of the State-RRVWSP are outside of the scope of the EIS.

Response 10-9 See Responses 7-15 and 7-16.

Response 10-10 The socioeconomic analysis completed for the EIS follows Reclamation's established approach in assessing economic impacts of water supply projects. This analysis clearly identifies the area of impact being assessed and the methodology used in the assessment. Although the commenter disagrees with the analysis, alternate methods are not suggested for Reclamation to consider.

Response 10-11 The commenter speculates about future actions of the Garrison Diversion Conservancy District and future federal involvement in the State Red River Valley Water Supply Project. Reclamation cannot respond to speculation. Reclamation has and will continue to work within the authorities provided by Congress.

Response 10-12 See Responses 7-15 and 7-15a.

Response 10-13 The 30-inch pipeline described for the CNDWSP remains unchanged under the No Action Alternative of the ENDAWS proposal. The other alternatives which include a pipeline segment in the same location requires a larger diameter pipeline to for the 165 cfs as proposed. The impacts of this change in pipe size is described under each alternative in the EIS. See Chapter 3.

Response 10-14 See Responses 7-15 and 7-15a. Reclamation defined the No Action Alternative at the onset of the EIS process based on NEPA implementing regulations and the best information Reclamation had available at that time. Reclamation continues to work in good faith with Garrison Diversion, project sponsor of the Central North Dakota Water Supply Project to move that project forward. Although a legal challenge regarding the sufficiency of the NEPA analysis completed the Central North Dakota project was filed after the initiation of the ENDAWS EIS process; it is speculative as to how that challenge may or may not change the Central North Dakota project. NEPA does not require agencies to speculate in the NEPA process, but to use the best information available at the time to conduct the necessary analysis.

Response 10-15 Reclamation seeks to clarify this statement by the commenter, in that the State of North Dakota is not bound by the terms of the 1909 Boundary Waters Treaty. This treaty was established between the governments of the United States and Canada; not at the state/provincial levels of government as the commenter implies. In addition, the State Red River Valley Water Supply Project's compliance with this treaty is not a factor in determining the definition of a No Action alternative.

Response 10-16 The current State RRVWSP operational plan prescribes that water from the CNDWSP, which obtains its source water from the McClusky Canal, will be used exclusively within the Missouri River Basin. Therefore, biota treatment for aquatic invasive species is not required because the CNDWSP does not increase the amount of water being transferred into the Hudson Bay Basin.

If the State RRVWSP operational plan changes in the future and McClusky Canal source water is 1) mixed with Missouri River source water and transported across the continental divide or 2) transported separately across the continental divide, the McClusky Canal source water and the Missouri River source water would undergo treatment for AIS meeting permit limits required by a North Dakota Department of Environmental Quality (ND DEQ) North Dakota Pollutant Discharge Elimination System (NDPDES) discharge permit.

State RRVWSP operational procedures and protocol will define the requirements for transitioning pipeline usage from transporting flows exclusively within basin and transporting flows across the basin divide. Those procedures will include flushing all untreated water from the pipeline downstream of the Biota Water Treatment Plant prior to the basin divide, pipeline disinfection of this same pipeline segment, product water treatment to meet NDPDES discharge permit limits before crossing the continental divide, and compliance testing prior to opening isolation valves separating Missouri River Basin pipeline segments from Hudson Basin Bay pipeline segments. Under the State RRVWSP water not having undergone biota treatment and not meeting full treatment requirements (off-spec water) will be flushed from the pipeline and discharged through a secondary outfall at the James River as allowed by the NDPDES discharge permit. Procedures and protocol for off-spec water management will be developed and included in State RRVWSP operational procedures prior to startup of any facilities.

Response 10-17 Waters of the Missouri River Basin and the Hudson Bay Basin have been connected through a constructed interbasin diversion from the St. Mary River to the Milk River in Montana for more than 100 years as noted in Appendix F, Section 4.2.4.

When comparing the basins as a whole there are differences in aquatic communities, but these differences cannot be attributed solely to a lack of past species transfers as the comment suggests. The aquatic community of the Churchill River at Churchill Manitoba is quite different from the aquatic community of the Missouri River at St. Louis, Missouri. This is to be expected, as the tundra and taiga ecosystems in northern Manitoba are very different from anything found in the State of Missouri. Similarly, there are large differences in the aquatic communities within each basin due to climate and geography. The aquatic community of the Madison River in Wyoming (headwaters of the Missouri River) is very different from the community in the lower Missouri River despite the existence of a continuous surface water connection between them. Where the Missouri River Basin and the Hudson Bay Basin are in close proximity to each

other the aquatic communities are marked by their similarities rather than their differences.

Response 10-18 Reclamation respectfully disagrees with the commenter's opinion regarding the objectivity and credibility of the Risk and Consequence Analysis which supports the EIS. The Risk and Consequence Analysis (Appendix F) is an analysis of the ENDAWS project alternatives (not the Red River Valley Water Supply Project as the commenter states) which builds off the robust and independently peer reviewed analysis of interbasin transfer risks & consequences of aquatic invasive species of concern (Reclamation 2013) as identified by agencies/stakeholders within the Missouri River and Hudson Bay basins. The methodology, data and conclusions of Reclamation's 2013 analysis resulted in an overall conclusion of the independent reviewers that the study was based on the best available science, and the results and conclusions were supported by that science, given the uncertainties inherent in the available data and topic knowledge.

As stated in the EIS (section 3.2) the Risk & Consequence Analysis for the EIS use the same methodologies as the 2013 study and researched new data/information available from 2012 through the present to update species distribution information, transfer pathways, assess the risk of transfer, and the consequences of a transfer (project and non-project related). The commenter does not provide alternate methodologies or data for Reclamation's consideration.

Response 10-19 Reclamation does not concur with the commenter's assertions regarding the effectiveness of biota treatment options analyzed in the EIS or the evaluation of risk of an aquatic invasive species transfer. See Response 10-18.

Response 10-20 Contrary to what the commenter asserts, but in accordance with the Regulations for the Implementation of NEPA (40 CFR 1500), Reclamation defined the No Action alternative in the EIS as the continuation of existing management direction as allowed in NEPA (40 CFR 1502.14(d)). Reclamation then assessed the impacts of each proposed alternative in comparison to the No Action alternative as required under NEPA (40-CRFR 1500-1508, Forty Most Asked Questions Concerning CEQ's NEPA Regulations). See Response 10-12.

Response 10-20A Reclamation wishes to clarify the commenter's misstatements regarding the assessment of aquatic invasive species transfer in this current EIS, as well as in and environmental assessment Reclamation completed for the Central North Dakota Water Supply Project. The commenter is incorrect in stating Reclamation did not evaluate the risk of the State Red River Valley Water Supply Project because that is an alternative in the EIS (see Chapter 2). Response 10-18 includes additional information regarding the current evaluation of aquatic invasive species transfer. With regard to the Central North Dakota Project environmental assessment, the federal action analyzed did not include an interbasin transfer.

Response 10-21 See Responses 7-16 and 10-12.

Response 10-22 Reclamation would like to clarify, the commenter's contradictory statements included in the comment provide the needed response. Alternatives C, D, E and F evaluated in the EIS provide alternatives for building ENDAWS, Alternative B

provides a picture of what the impacts associated would be if ENDAWS was not constructed (State RRVWSP) and Alternative A demonstrates an accurate depiction of No Action (CNDWSP and State RRVWSP) – or maintaining the current management direction of the agency.

Response 10-23 Resource categories evaluated in Chapter 3 of the EIS have a defined affected environment for each category and therefore have defined the cumulative impacts analysis based on each affected environment. The State RRVWSP is evaluated in the EIS as Alternative B. To assume the State RRVWSP as a reasonably foreseeable future action, the same impacts to all alternatives, including no action would apply. Reclamation's inclusion of the State RRVWSP as Alternative B provides the benefit to more robustly compare and contrast the alternatives. Recent case law [See e.g. *Sierra Club v. FERC*, 827 F. 3d 36, 47-48 (D.C. Cir. 2016)] states that effects do not include effects that the agency has not authority to prevent or that would happen even without the agency action, because they would not have sufficiently close casual connection to the proposed action.

Response 10-24 See Response 10-23

Response 10-25 As stated in Chapter 3.7 of the DEIS, the affected environment for threatened and endangered species includes a 150ft buffer around the proposed facilities; therefore, Reclamation has evaluated the portion of the State RRVWSP that would be a cumulative impact to the ENDAWS project in the Environmental Consequences Section 3.7.8.

Response 10-26 As stated in Chapter 3.8 of the DEIS, the affected environment for wetlands and riparian areas includes a 150ft buffer around the proposed facilities; therefore, Reclamation has evaluated the portion of the State RRVWSP that would be a cumulative impact to the ENDAWS project in the Environmental Consequences Section 3.8.1.

Response 10-27 See Response 10-26. Reclamation concludes that the National Wetlands Inventory is the best available data for making an objective comparison between the alternatives regarding impacts to wetlands. Impacts to wetlands are stated for each alternative in Section 3.8 and summarized in Table 3.14. Mitigation and avoidance measures are discussed in Section 3.8, as well as being included in Chapter 2, Table 2-19 Best Management Practices and Table 2-20 Environmental Commitments.

Response 10-28 All federal agencies, including Reclamation have trust obligations to federally recognized tribes. The trust responsibility is defined by treaties, statues, Executive Order and other federal law. The procedures for the Department of the Interior agencies to meet their trust responsibilities are described in the Secretarial Order No. 3215, Principles for the Discharge of the Secretary's Trust Responsibility. Reclamation exercised its trust responsibility through consultations with tribes in conjunction with the NEPA process. Reclamation consulted with the Cheyenne River Sioux Tribe, Crow Creek Sioux Tribe, Lower Brule Sioux Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Standing Rock Sioux Tribe, Flandreau Santee Sioux Tribe, Mandan Hidatsa and Arikara Nation, Turtle Mountain Band of

Chippewa, Red Lake Band of Chippewa Indians, White Earth Nation of Minnesota Chippewa, Spirit Lake Tribe, Yankton Sioux Tribe, Sisseton-Wahpeton Oyate Tribe, Crow Nation, Fort Peck Assiniboine & Sioux Tribes, Lower Sioux Indian Community, Upper Sioux Community, and Northern Cheyenne Tribe. All the Tribes were sent scoping information and a Class I file search summary with project description and maps in May 2020.

Through these efforts, Reclamation did not receive feedback from any of the Missouri River Basin tribes expressing concerns regarding their reserved water rights or any other trust assets. Based on Reclamation's firm understanding of its trust responsibility, and in compliance with CEQ's Regulations for Implementing NEPA (40 CFR 1501.1(d), the issue of Indian Trust Assets was evaluated at the onset of the NEPA process and for the reasons stated in Appendix E, it was not evaluated further in the EIS. However, this does not mean that Reclamation is dismissing its trust responsibility as stated in the comment. Reclamation will continue the consultation process with Missouri River Basin tribes regarding future decisions and actions regarding the ENDAWS project in recognition of its trust responsibility.

As the trustee, the United States appreciates the Missouri River Basin tribes' position with respect to water rights pursuant to the Winters Doctrine. The tribes in the western states, where the prior appropriation doctrine's "first in time, first in right" applies, understand the priority date of one's water right is critical. In times of shortage, the junior (most recent) water rights holders must curtail their usage before senior users. Most Indian tribes benefit from this aspect of wester water law given their long histories in their respective territories pre-European settlement and expansion westward. Winters rights are based on what is needed to accomplish the reservation's purposes both for the present and the future, not on initial or event current use of water. Winters rights also cannot be lost for non-use under state-law concepts such as abandonment and forfeiture.

In relation to the proposed action, Reclamation recognizes that at any time in the future when reserved tribal water rights are quantified, or tribes enter into Indian Water Rights Settlements, the volume of water available for other (junior) users in the basin may indeed be affected. This is acknowledged in statements included in Appendix E.

Global Affairs Canada | Affaires mondiales Canada

LETTER #11

125 Sussex Drive
Ottawa, Ontario
K1A 0G2

July 6, 2020

Mr. Damien Reinhart
Project Manager
Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Avenue
Bismarck, ND 58501
Email: ENDAWS.EIS@usbr.gov

Dear Mr. Reinhart,

On behalf of the Government of Canada, I present the following comments on the Draft Environmental Impact Statement (DEIS) for the Eastern North Dakota Alternate Water Supply Project (ENDAWS). Canadian officials have reviewed the draft statement prepared by the Bureau of Reclamation (the "Bureau"), and welcome the opportunity to share our views.

Further to Canada's December 2019 letter in response to the Bureau's notice of intent to prepare an Environmental Impact Statement for the ENDAWS project, Canada considers that the DEIS continues to underestimate the risks associated with non-native biota transfer, and the potential environmental and economic impacts on ecosystems in Canada. 1

Since projects that would transfer Missouri River water to the Hudson Bay drainage basin were first proposed more than 50 years ago, Canada has sought to protect its interests and expressed its concerns in myriad ways, including via diplomatic notes to the Department of State and letters to the Bureau of Reclamation. Government of Canada concerns regarding the threat of a transfer of invasive species or harmful biota through an inter-basin transfer of water remain to this day. There could be serious negative implications on Canadian commercial and recreational fisheries, as well as on the ecological health of our lakes and rivers. These impacts could be significant and irreversible, putting Canada's ecosystems and economy at risk.

As a sovereign nation, Canada will take all appropriate steps to safeguard the natural resources on which its population's welfare depends. Canada has particular interests in cases involving transboundary pollution, and in preserving respect for obligations under the *Boundary Waters Treaty* of 1909 (the "Treaty"). The Treaty establishes rules for the management of waters shared by Canada and the United States, establishing a set of obligations for each country with respect to decisions about those waters.

Of particular relevance to the ENDAWS Project is Article IV of the Treaty which prohibits transboundary pollution, a category that includes invasive species. The DEIS states that concerns over

Canada

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the transfer of invasive species from the Missouri River Basin to the Hudson Bay Basin have led to the development of treatment options to comply adequately with the Treaty. As it is for the Parties – the Government and Canada and the Government of the United States – to interpret and implement the Treaty, it is for the Parties to determine an acceptable level of treatment for this project. 2

In 1975, Canada and the United States jointly referred to the International Joint Commission (IJC) questions regarding the predecessor Red River Valley Water Supply Project. After extensive study, the IJC issued a report, *Transboundary Implications of the Garrison Diversion Unit (1977)*, which recommended that because the safeguards then contemplated "cannot with any certainty prevent biota and disease transfers which would cause severe and irreversible damage to the ecosystem and, in particular, to the commercial and sport fisheries in Canada, those portions of the Garrison Diversion Unit which could affect waters flowing into Canada not be built at this time." The IJC unanimously recommended that such a project proceed only "if and when the Governments of Canada and the United States agree that methods have been proven that will eliminate the risk of biota transfer, or if the question of biota transfer is agreed to be no longer a matter of concern." To date, no such agreement between the two Governments has been reached. 3

In addition, the Environmental Impact Statements (EIS) for both the Federal RRVWSP and the Northwest Area Water Supply (NAWS) projects, led by the Bureau of Reclamation, demonstrated significant risks posed by inter-basin transfers. Furthermore, for the NAWS project, the U.S. District Court recognized Canada's concerns as valid; noting the risks to water quality and quantity associated with inter-basin transfer should be addressed through strenuous environmental assessments and the implementation of strong mitigation measures. 4

The ENDAWS DEIS notes the obligation for a Secretarial Determination to ensure compliance with the Treaty. To fulfill this obligation, which was identified in the *Dakota Water Resource Act* of 2000, the Secretary of the Interior must consult with the Administrator of the Environmental Protection Agency and the Secretary of State to determine that adequate treatment to meet the requirements of the 1909 *Boundary Waters Treaty* is included in the preferred alternative. A Secretarial Determination identifying the adequate level of treatment must be signed to document this consultation process.

The Government of Canada continues to urge North Dakota and the Bureau to put in place in-basin solutions to meet anticipated water supply needs. Canada would welcome an explanation as to why in-basin alternatives were not included in the DEIS. Any inter-basin transfer must be contingent upon the pre-treatment of all inter-basin water transfers, to specific, agreed upon levels. This is a baseline expectation for downstream jurisdictions such as Manitoba and Canada. Appropriate treatment of Missouri River water, to the satisfaction of both Canada and the United States is critically important to reduce the risk of spreading harmful biota into the Hudson Bay Basin, to ensure the protection of Canadian economic and environmental interests, and to ensure compliance and implementation of the *Boundary Waters Treaty*. 5

Notable progress has been made on the NAWS project. The Memorandum of Understanding (MOU) between the Bureau and the Province of Manitoba was made pursuant to the Act of May 12, 1986 (Public Law 89-108), and the Dakota Water Resources Act of 2000 (Public Law 106-554). The MOU included a commitment to the treatment and filtration of Missouri River water to agreed-upon levels that minimize the transfer of invasive biota before they enter the Hudson Bay Basin, as well as an ongoing monitoring role for the Province of Manitoba. 6

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The Government of Canada recognizes North Dakota could face future periods of constrained water supplies. Indeed, these threats are mounting across North America. However, meeting those needs must be managed in a way that adequately reduces the risk of transboundary environmental harm by spreading harmful biota across the continental divide and across an international border into a neighbouring country. 7

Decisions made within the water basins of one country can have consequences for the other, placing a premium on effective governance and cooperation of our shared environment. The Government of Canada looks forward to working with the U.S. to find a mutually acceptable approach to address North Dakota's water supply challenges, while ensuring Canadian waters shared with the U.S. are protected as required under Article IV of the *Boundary Waters Treaty*.

Sincerely,

Eric Walsh
Director General
North America Bureau

Response 11-1 Reclamation respectfully disagrees with the commenter regarding the adequacy of the risk and Consequence Analysis of Aquatic Invasive Species completed in support of the EIS. The commenter does not provide specifics to support their opinion nor do they propose different methodologies and/or data for Reclamation's consideration.

Response 11-2 Reclamation will follow the protocol, established in the authorizing legislation, for compliance with Article IV of the Boundary Waters Treaty. Section 1(h) of the Dakota Water Resources Act, which amended previous legislation relative to the Garrison Diversion Unit, states that the Secretary of the Interior in consultation with the U.S. Environmental Protection Agency and the U.S. Department of State will determine that adequate treatment can be provided to meet the requirements of the Treaty. The commenter's interpretation that 'the Parties' meaning the Government of Canada and the Government of the United States determine an acceptable level of treatment for this project goes beyond the intent of the authorizing legislation.

Response 11-3 The Garrison Diversion Unit project and the safeguards contemplated at the time of the 1977 International Joint Commission report referenced by the commenter were much different than the Project currently proposed. In the 1977 report, the concern about the potential affect on the commercial and sport fisheries in Canada were specifically related to introductions of nonindigenous fish species. The risk of transferring fish through the ENDAWS project is essentially zero. A similar conclusion was reached in 1994 by a joint Canada-United States task group examining invasive species risk associated with the Northwest Area Water Supply Project (Canada/United States Joint Technical Committee Engineering-Biology Task Group, 1994). The aquatic invasive species of concern evaluated in the EIS are microorganisms and the water treatment processes proposed to further reduce the risk of a project-related transfer are much more sophisticated and include tested technology than what was contemplated in the 1977 report.

Reclamation has and will continue to comply with federal laws authorizing the Project. The International Joint Commission's 1977 recommendations regarding construction of the Garrison Diversion Unit were related to the much larger Garrison program and not specific to the Project as the comment infers. The International Joint Commission has the authority to study and recommend solution to transboundary issues when asked to do so by the national governments. However, please note there is a difference between the authority/provisions granted by federal law versus a recommendation made by a committee established under a treaty. As acknowledged by the International Join Committee itself, their recommendations are not binding (http://www.ijc.org).

Response 11-4 Reclamation respectfully disagrees with the commenters statement regarding previous Reclamation projects demonstrating a significant risk of interbasin transfer. The risk and consequence assessments conducted as part of the federal Red River Valley Water Supply Project and the Northwest Area Water Supply project were evaluations that represented the best available science and data at the time of each evaluation. These assessments acknowledge that uncertainty limits

the ability to assign unique transfer risk probabilities to any of the biota transfer pathways; however, based on the qualitative assessment of the basin linkages and competing pathways, the risk of aquatic invasive species transfer by a project such as the Northwest Area Water Supply project is considered to be extremely low compared to non-Project pathways (Reclamation 2013).

Reclamation's 2013 analysis, the Transbasin Effects Analysis Technical Report was reviewed by an independent peer review team which determined that the analysis was a best practice and state of the art evaluation. Overall, the reviewers concluded that the study was based on the best available science, and the results and conclusions were supported by that science, given the uncertainties inherent in the available data and topic knowledge.

Response 11-5 The request for evaluation of in-basin solutions to meet anticipated water supply needs is outside the scope of the EIS. The scope of the EIS is defined by the Purpose and Need as discussed in Chapter 1. Reclamation will follow the protocol, established in the authorizing legislation, for compliance with Article IV of the Boundary Waters Treaty. See Response 11-2, above.

Response 11-6 The MOU developed between Reclamation and the Bureau of Reclamation regarding the NAWS project included a specific type of treatment required for that specific project to meet safe drinking water requirements. The intent of the ENDAWS project is to provide a bulk water supply; not to provide drinking water and therefore the same level of treatment is not warranted. Reclamation will continue to work with our partners to develop operational plans for the biota water treatment facility to ensure it functions as intended.

Response 11-7 Reclamation understands and recognizes the environmental and economic consequences caused by invasive species as noted by the commenter. The robust analysis conducted by Reclamation to evaluate water treatment technologies relative to aquatic invasive species and the exhaustive research conducted as part of the Transbasin Effects Analysis (Reclamation 2013) and the Risk and Consequence Analysis (Reclamation 2019), demonstrate the precautionary approach Reclamation has taken in its efforts to meet the future water needs of North Dakota while reducing the risk of transboundary consequences.

Congress of the United States
Washington, DC 20515

LETTER #12

June 6, 2020

Mr. Damien Reinhardt
Eastern North Dakota Alternate Water Supply Project
Bureau of Reclamation, Dakotas Area Office
304 East Broadway Ave.
Bismarck, ND 58501

Dear Mr. Reinhardt:

We write to express our support for the preferred alternative named in the Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply (ENDAWS). The completion of ENDAWS utilizes federal facilities, makes the supported state Red River Valley Water Supply Project (RRVWSP) more affordable, and generates revenue for the federal government. Thank you for your attention to this matter. 1

Water supply for municipal, rural and industrial (MR&I) water is an originally authorized purpose of the Garrison Diversion Unit (GDU) Project. Utilizing the federal McClusky Canal allows for recouping some of the promised benefits for North Dakota in exchange for the 600,000 acres of prime farmland flooded for the GDU Project. Completing ENDAWS as a water supply source for the state's RRVWSP will allow for MR&I water supply benefits for the region and the McClusky Canal would be utilized for one of its intended purposes. In addition, using the canal as a water supply source reduces operations and maintenance costs to ultimately save the project users millions of dollars annually. Providing a reliable and affordable water supply for municipal and industrial use ensures North Dakota's economic vitality.

By constructing ENDAWS as an alternate water supply for the state, the BOR will see a return on their long-ago federal investment, as the use of the McClusky Canal will generate water sales revenue for the federal government.

We request that BOR support the Preferred Alternative, Alternative E – McClusky Canal and Missouri River North named in the Draft EIS to complete ENDAWS as a bulk water supply to the state RRVWSP. Thank you for your consideration of our views.

Sincerely,

John Hoeven
U.S. Senator

Kevin Cramer
U.S. Senator

Kelly Armstrong
U.S. Representative

Response 12-1 Your statement(s) have been included as part of the record.

DEPARTMENT OF NATURAL RESOURCES

LETTER #13

Ecological and Water Resources
2115 Birchmont Beach Rd NE
Bemidji, MN 56601

July 6, 2020

Damien Reinhart
EIS Team Leader
Bureau of Reclamation
Dakotas Area Office
304 East Broadway Ave.
Bismarck, ND 58501

DEIS for the Eastern North Dakota Alternate Water Supply Project

Dear Mr. Reinhart,

The Minnesota Department of Natural Resources (MN DNR) has a strong interest in this project because it will transfer water from the Missouri River to the Red River watershed, creating risks for biota and pathogen transfer. In the past, we have been heavily involved and provided lengthy comments on the connected Red River Valley Water Supply Project (RRVSWP). MN DNR has reviewed the draft Environmental Impact Statement (DEIS) and has the following comments.

Purpose and Need

The DEIS described purpose and need for the project is too narrowly limited to Reclamation's need to respond to the request for a contract of water supply and doesn't describe the need for the water supply itself relative to downstream users. The purpose and need for a project informs the range of alternatives and subsequent impact assessment. The consequence of narrowly limiting the project purpose and need is an alternatives analysis that does not identify or study the impacts of all feasible alternatives that can meet the need. MN DNR recommends expanding the purpose and need to inlcude all users and operational triggers. Additionally, the final EIS (FEIS) should describe whether periods of drought or limited water supplies are anticipated long-term. Including this information is critical for a robust and informative alternatives analysis that is needed as a source of information by the public and for government decision makers. 1

Pipeline Route Alternatives Reviewed

The no action alternative includes the Central North Dakota water supply project (CNDWSP). The CNDWSP was issued a Finding of No Significant Impact (FONSI) in 2018. The FONSI is being legally challenged, and there is uncertainty about whether the project will occur. Because of this uncertainty, MN DNR recommends removal of the CNDWSP from the no action alternative. 2

Instead, MN DNR believes the no action alternative should be the "status quo" or existing conditions (prior to construction CNDWSP and RRVWSP). This alternative would allow the reader to fully understand the potential impacts of the proposed alternatives. Currently all alternatives included in the DEIS have a cross-basin transfer and discharge into the Sheyenne River. To understand the environmental costs and benefits associated with the proposed action in absence of CNDWSP and RRWSPs, include alternatives with and without cross-basin water transfers.

Water Treatment Alternatives Reviewed

The water biota treatment alternatives analysis should describe turbidity reduction effectiveness in nephelometric turbidity units (NTU) (we understand the project water will be used for potable drinking water and those standards have specific NTU criteria). The FEIS should disclose the effectiveness of reducing turbidity on meeting drinking water standards, on invasive species removal, and prevention of pathogen transfer. 3

Alternatives include detail and reliance on mechanical operational monitoring and automatic shutoffs of the system. The alternatives analysis should describe the effectiveness of proposed post treatment monitoring and measures taken to avoid risk of transfer associated with system failures. During a recent filtration trial of infested water in Minnesota, an automated system designed to shut down filtration if there was a failure did not shut off the system, despite tears in the filtration media. In this case, biological monitoring of the transfer water post-filtration system detected the failure. Thus, all alternatives described should include how the addition of post-treatment biological monitoring can avoid and/or minimize risk of transport due to system failures. 4

Environmental Consequences –Biota Transfer

Generally, the DNR disagrees with the analysis conclusions for the risk of cross-basin transfer of invasive biota. The DEIS analysis downplays the risk of the new water transfer on the potential for increased biota spread. The EIS should acknowledge that additional pathways have the possibility of moving large quantities of water and creating additional risks. The text discussing natural movement by animals such as birds and mammals and how they contribute to the transfer of AIS is distracting from the main point. The concept that natural animal movement could be equivalent or as significant a concern as millions of gallons of water is a false point. Given the potential for significant transfer of biota across watershed boundaries, MN DNR advocates for strict treatment and prevention measures 5

to be put into place along with post-treatment biological monitoring. Below are our specific comments on the potential for biota transfer analysis.

- The biota treatment alternatives do not describe the treatment effectiveness against smaller life-stages of larger plant and animal biota including larvae, fish eggs, and seeds. MN DNR has recommends these classes be added into the analysis of alternatives. 6

- MN DNR aquatic invertebrate invasive species staff reviewed Appendix B containing technical details of treatment alternatives proposed. They concluded that the Enhanced Disinfection alternative provides significant uncertainty of potential transfer of aquatic invertebrates such as the New Zealand Mud Snail (*Potamopyrgus antipodarum*, NZMS). This is due to their likelihood of passage through the grit removal stage and surviving the proposed UV and chlorine treatments. Details on the sizes and dimensions as well as the survivability of the young NZMS is needed to clarify this uncertainty or the need for a finer filtration, and should be disclosed in the EIS. 7

- The DEIS explicitly rejects the inclusion of the Missouri River sturgeon iridovirus MRSIV as a potentially harmful AIS. Appendix G focused on cultured Pallid and Shovelnose sturgeon, and acknowledges the role of stress and hatchery operations on the lethality of the virus. The text fails to acknowledge the potential impacts on wild fish, which remain understudied. The argument fails to consider potential harms to future use of Red River origin fish in hatchery operations for Lake Sturgeon, which is unknown if infected with MRSIV. The analysis also fails in contextualization of MRSIV, outside of the limited knowledge available, into the broader literature of sturgeon disease biology. Finally, the consensus within fisheries science is increasing climatic variability on the Great Plains has the ability to increase stress on riverine species. Given the pathogenic effects of MRSIV are linked to stress and the population of Lake Sturgeon within the Red River in question is in the early stages of reintroduction/recovery, it seems reasonable to include MRSIV as an Aquatic Invasive Species of Concern. Taken with the uncertainty regarding effects on wild populations and the known harm in captive populations, the risks associated with accidental introduction of MRSIV to the Red River must be acknowledged. The Red River Lake Sturgeon population is designated both Endangered (Committee on the Status of Endangered Wildlife in Canada) and Species of Special Concern (MN DNR), and it is both necessary and reasonable to explicitly acknowledge any threat to species recovery. We would also like to emphasize the cultural importance of the Lake Sturgeon to local indigenous peoples, and the need to acknowledge potential impacts of culturally important resources on their cultural identity. 8

- We are encouraged by the progress toward a higher water treatment standard in the DEIS and the analysis of several options within the DEIS. The selection of the Enhanced Disinfection water treatment protocol is a step in the right direction, yet given the extraordinary nature of the proposed project, we strongly advise water treatment to the drinking water standard with 9

membrane filtration, as described in the Advanced Treatment option. The DEIS should recognize the Advanced Treatment option as the alternative providing the highest level of protection.

Environmental Consequences –Water Resources

The DEIS only describes potential impacts to the water resources of the Missouri River basin and Garrison Diversion unit, not the Red River or Hudson Bay basin. Given that water supply may occur during flood as well as drought seasons (it is not specified in the document), the EIS should provide further analysis on the potential effects to downstream infrastructure on the Sheyenne River. Further analysis is also needed on the potential impacts to water temperature, chemistry, geomorphology, and interaction with existing infrastructure such as the Fargo-Moorhead Diversion, which is currently under construction. 10

The EIS should describe potential operation frequency and the operational plan as they relate to current climate projections of drought frequency and other projects (e.g., Devil's Lake outlets, reservoir operations plan). Discuss project operation triggers for each alternative. Discuss agreements or restrictions, which would ensure the project follows operational plans and agreements. 11

The EIS should consider the financial and environmental costs of managing biota should they arrive in the Red River Basin and Hudson Bay watershed as well as financial assurances for maintenance associated costs and funding sources. 12

Cumulative Effects

MN DNR recommends including operational details of each alternative in the FEIS. Operational details of each alternative are needed (timing, duration, and synchronization with other projects) to understand, minimize and avoid impacts to other projects. For example, water supplied into the RRWSP and resulting Sheyenne River (also affected by Devil's Lake pumping and outlets) has the potential to effect the Fargo-Moorhead and Sheyenne River diversions within the Fargo-Metro area.

Given that water supply may occur during flood as well as drought seasons (it is not specified in the document), further analysis is needed on the effect to downstream infrastructure on the Sheyenne River. The EIS should describe the operation of ENDAWS/RRVWS relative to Devils Lake outflows and what its effects will have on: 13

- Red River water chemistry during drought conditions with both projects in operation.
- Potential changes to operations of the Sheyenne and Fargo-Moorhead Diversions.
- Changes to geomorphology and hydrology in the Sheyenne River, which can increase sediment loads into the Red River.

Conclusion

Thank you for this opportunity to provide comments on the DEIS. If you have any questions or concerns, please contact DNR Northwest Regional Manager Nathan Kestner at 218-308-2626 or nathan.kestner@state.mn.us.

Sincerely,

Nathan Kestner, DNR Regional Ecological and Water Resources Manager

CC: Jess Richards, DNR Assistant Commissioner
Theresa Ebbenga, DNR Regional Director
Henry Drewes, DNR Regional Fisheries Manager
Jaimé Thibodeaux, DNR Environmental Assessment Ecologist
Jim Zigler, MPCA
Nicole Armstrong, Manitoba Ag. and Resource Development

Equal Opportunity Employer

Response 13-1 See Responses 7-15 and 7-16.

Response 13-2 See Response 10-14.

Response 13-3 Two biota water treatment options (Disinfection and Enhanced Disinfection) presented in the EIS would provide nominal turbidity reduction below ambient levels measured in the source water. The other two biota water treatment options (Conventional Treatment and Advanced Treatment) would provide more turbidity reduction with product water quality expected to be lower than 1 NTU.

As stated in the Draft EIS, the ENDAWS project is a bulk water supply project. Potable drinking water is not being delivered by the Project to users, so treatment provided by the Biota Water Treatment Plant is not intended to meet SDWA standards. The Project is treating the bulk water supply within the Missouri River Basin to reduce the risk of a project-related transfer of aquatic invasive species. This applies to both direct pipeline users or to users supplied via surface water transport in the Sheyenne River and Red River. Project users who take water directly from the pipeline or indirectly from the Sheyenne River or Red River will still have their own SDWA compliant water plants for treatment prior to delivery to end users.

Response 13-4 For this facility operational plans will be developed and implemented prior to facility startup including procedures by which chemical dosages for disinfection and other uses are varied to adjust to inlet water quality and ensure their effectiveness.

Response 13-5 Reclamation respectfully disagrees with the commenter's statements regarding the adequacy of the risk assessment completed in support of the EIS. As stated in the Risk and Consequence Analysis (Appendix F) and Chapter 3 (section 3.2) there are numerous existing pathways through which aquatic invasive species could be transferred from one basin to another. The EIS and Appendix F provide information about these various transfer pathways. The analysis does not "downplay" the risk of AIS transfer posed by the ENDAWS project.

As stated in the EIS, the risks of a biological invasion vary among species and transfer pathways. Contrary to the commenter's statements, understanding and evaluating the risk of transfer associated with natural and anthropogenic pathways is an essential part of the risk analysis. The EIS discussion regarding transfer pathways (Section 3.2.3) discusses the variables that limit the ability to directly compare the volumes of transferred water or materials to assess transfer risk. Volume is one of several important factors considered when considering the transfer risk.

Response 13-6 Based on a previous study which concluded that the risk of transferring macroscopic organisms to be practically zero, Reclamation chose not to include such things as larvae, fish eggs and seeds as suggested by the commenter.

As stated in the EIS, the list of aquatic invasive species of concern has been developed over the past 20 years with input from federal, state, and provincial stakeholders with interest in interbasin transfers. More specifically, in 2005,

Reclamation cooperated with the United States Geologic Survey (USGS) to complete a risk and consequence analysis for the proposed federal Red River Valley Water Supply Project. The list of species of concern developed for that analysis was developed by an interagency technical team that included representatives from USGS, Reclamation, EPA, U.S. Fish & Wildlife Service, North Dakota Game & Fish Department, Minnesota Department of Natural Resources, Environment Canada, Canada Department of Oceans and Fisheries, and Manitoba Conservation. The species evaluated in that analysis included both microscopic (viruses, bacteria, protozoa, myxozoa, and cyanobacteria) and macroscopic (vascular plants, mollusks, crustaceans, and fishes) organisms. The results of this analysis (USGS 2005) concluded that the risk of transferring macroscopic organisms through a system like the federal Red River Valley Water Supply Project was practically zero. A similar conclusion was reached in 1994 by a joint Canada-United States task group examining invasive species risk associated with the Northwest Area Water Supply Project (Canada/United States Joint Technical Committee Engineering-Biology Task Group, 1994).

These conclusions of a 'practically zero' risk of transfer was the basis for modifying future lists of species of concern to no longer include these organisms. In another analysis conducted by Reclamation in 2013 for the Northwest Area Water Supply Project, additional fish pathogens and parasites and three mollusk species which were added to the list of species of concern based on input from stakeholders.

Response 13-7 Appendix B of the Draft EIS, relying on peer review research, concluded that "The zebra and quagga mussel distribution appears to be a hardy and adaptable invader that would likely establish itself in any suitable waterbody encountered. Currently, the risk of introducing quagga or zebra mussels via a Project interbasin water transfer is considered to be extremely low, given their absence in and near the water supply source area (Lake Sakakawea and Lake Audubon)". The adaptability and rapid spread of the New Zeeland Mud Snail is further shown in Figure 2-5.

Adults snails are small 4 to 6 mm (4,000 to 6000 micron) in size, but the proposed sand and grit removal system is designed for a 100-micron cut off so it would capture a very large portion of the adult New Zealand Mud Snail population.

Response 13-8 Reclamation acknowledged and evaluated the commenter's suggestion received during the public scoping phase of the EIS, to include the Missouri River Sturgeon Iridovirus as a species of concern. Reclamation considered the inclusion of this virus species in previous analyses for other projects, and then directed a consultant to research this specific virus species in order to make an informed decision about adding this as a species of concern to be evaluated in the Risk and Consequence Analysis. This is documented in Section 3.2.1 of the EIS and more detail is provided in Appendix G.

The conclusion of the additional research (see Appendix G) is there is very little known about this virus. This is acknowledged by the commenter's statements that

the potential impacts on wild fish 'remain understudied' and that it is 'unknown' if Lake Sturgeon can be infected with this specific virus.

As stated in the EIS (section 3.2.1), the species of concern evaluated in the Risk and Consequence Analysis (Appendix F) includes a taxonomic group of viruses that encompass a broad range of life histories and characteristics of viruses that is inclusive of the sturgeon iridovirus.

The commenter did not provide additional data for Reclamation to consider further.

Response 13-9 The United States government has not established rules or regulations regarding the transfer of Aquatic Species as discussed in Chapter 2 of the EIS. Although the Advanced Treatment option includes additional water treatment technologies; the costs (construction and operation, maintenance, and replacement) associated with that option are significant to reduce an already low level of risk.

Response 13-10 Reclamation respectfully disagrees with the commenter's statement that the EIS does not describe potential impacts within the Red River or Hudson Bay Basin. The EIS includes a summary discussion of the methods, data and results of the evaluation of the risk and consequences of aquatic invasive species transfer, with the full analysis included as Appendix F of the EIS. As discussed in Chapter 2 of the EIS, the discharge into the Sheyenne River is part of the State RRVWSP and as such, they are responsible for complying with the conditions of their North Dakota Environmental Quality permit conditions to meet.

Response 13-11 ENDAWS would provide water to the main transmission pipeline for the State RRVWSP, which will supply direct pipeline users and strive to maintain the conservation pool in Lake Ashtabula. In the State's project, Lake Ashtabula will serve as a re-regulating reservoir, and water will be released through Baldhill Dam for downstream users of the Sheyenne River and Red River. The project will operate continuously, at a diminished flow rate, for the direct pipeline users, when these users call for water. It is anticipated the direct pipeline users' demands would increase up to a total of 20 to 34 cfs by 2075.

Reclamation reached out the Project Sponsor for assistance in providing information regarding the operations of Lake Ashtabula as referenced by the commenter. This is outside the scope of the EIS; however, Reclamation believes the information will help clarify things for the commenter. According to the project sponsor, Lake Ashtabula is divided into four pools, including: (1) flood storage pool; (2) conservation pool; (3) fish and wildlife pool; and (d) dead pool. Only the conservation pool of Lake Ashtabula will be used for the State RRVWSP. ENDAWS as a bulk water supply to the pipeline for the State RRVWSP is sized to maintain Lake Ashtabula at the bottom of the conservation pool during the critical period of the 1930's design drought, when modeling projected 2075 water demands within a naturalized flow database for the Red River system over the period from 1930 to 2001. ENDAWS and the State RRVWSP will not be operated when the conservation pool within Lake Ashtabula is full. Baldhill Dam is operated by the Corps of Engineers according to Lake

Ashtabula Water Control Manual last updated in 2012. The protocol for water supply releases from Baldhill Dam consists of water users contacting the North Dakota State Water Commission who contacts the Corps of Engineers.

An anticipated range of depletions from the Missouri River System due to operation of the Project was provided to the Corps of Engineers by modeling actual 2015 water demands within the naturalized flow database from 1930 to 2001 and projected 2075 water demands within the naturalized flow database from 1930 to 2001.

Other than to supply the direct pipeline users, it is not anticipated that the Project will be operated in conjunction with the Devils Lake Outlets. The Devils Lake Outlets, when operated, fill Lake Ashtabula, just like the State RRVWSP; so the State RRVWSP water would not be needed. In addition, it is anticipated that the Devils Lake Outlets will only be operated during wet periods with extreme water elevations in Devils Lake. The State RRVWSP is intended to maintain the conservation pool in Lake Ashtabula during drought periods.

Response 13-12 As stated in the EIS (Section 3.2.6) and Appendix F, it is nearly impossible to determine the pathway through which an invasion occurs; therefore, it is not reasonable or feasible for Reclamation to be held financially responsible for impacts from the arrival of a new aquatic invasive species in the Hudson Bay Basin. Given the uncertainty and nearly impossible task of determining where an organism originated, or which transfer pathway facilitated its movement into the Hudson Bay Basin the commenter's suggestion that Reclamation provide financial assurances for maintenance associated costs and a funding sources is unreasonable.

Response 13-13 ENDAWS is supplying an alternate bulk water supply to the State RRVWSP. The downstream infrastructure related to the Sheyenne River including those mentioned are outside the scope of this analysis. See Response 13-11 for additional information regarding the operation of the State RRVWSP.

Missouri Department of NATURAL RESOURCES
dnr.mo.gov
Michael L. Parson, Governor
Carol S. Comer, Director

LETTER #14

July 6, 2020

Damien Reinhart, Project Manager
Bureau of Reclamation, Dakotas Area Office
304 East Broadway Ave
Bismarck, North Dakota 58501

Subject: Comments to the Draft Environmental Impact Statement for the Eastern North Dakota Alternate Water Supply Project

Dear Damien Reinhart:

The Missouri Department of Natural Resources (Department) submits the following attached comments on the Draft Environmental Impact Statement (Draft EIS) for the Eastern North Dakota Alternative Water Supply (ENDAWS) Project. As lead agency for the State of Missouri in matters pertaining to water quantity and water quality issues, the Department is interested in any significant impacts that water transfers have on downstream flow of the Missouri River.

For nearly 20 years, the Department has voiced consistent opposition to proposed inter-basin water transfers out of the Missouri River Basin into the Hudson Bay Basin. As a riparian state, Missouri is guided by the principle of reasonable use of water resources so as not to impact downstream beneficial uses. According to the Bureau's own data, the Missouri River has an average of 7.7 million-acre-feet of present level depletions (including reservoir evaporation) above Garrison Dam. For comparison this is just under half of the average annual volume for the Missouri River at Bismarck, North Dakota. Recent modeling from the U.S. Army Corps of Engineers (Corps) completed for the 2018 update of the Missouri River Master Operational Manual indicates that at current depletions levels, drought operations would be implemented during 70 percent of the years modeled (1931-2012). These drought operations already frequently reduce downstream flow support, thereby impacting downstream beneficial uses.

This inter-basin transfer has national implications, not only impacting downstream beneficial uses in the State of Missouri and on the Missouri River but also affecting the greater inland waterway system. As seen in past Corps' modeling, Missouri River drought operations implemented at inopportune times can have significant economic impacts on the Mississippi River. The many users of the Mississippi River should be notified of the ENDAWS project. Such transparency would meet the intent of NEPA and Executive Order 13807. 1

The State of Missouri recently challenged the Bureau's NEPA analysis of the Central North Dakota Water Supply Project (CNDWSP) in federal court. In that matter, the Bureau failed to prepare an EIS, by instead concluding that the CNDWSP would have no significant impact on

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the human environment. We respectfully disagree with the finding of no significant impact. The Bureau properly decided to prepare an EIS in evaluating the ENDAWS project, but there remain shortcomings in the Bureau's NEPA analysis, as detailed in the attached comments.

We respectfully ask that the Bureau reconsider these inter-basin diversion projects by properly taking into account the impacts to downstream users. We have previously requested a meeting between the Bureau and the Department to discuss these concerns and identify a mutually agreeable solution to long-term water sustainability for our upstream neighbors. I renew that request now, and look forward to a time when we can discuss these topics in the spirit of cooperative problem solving. 2

Thank you for your time and consideration.

Sincerely,

Carol S. Comer
Director

Missouri Department of Natural Resources

Comments to the Draft Environmental Impact Statement

Eastern North Dakota Alternate Water Supply Project

On behalf of the State of Missouri, the Missouri Department of Natural Resources (Department) respectfully submits these comments on the Draft Environmental Impact Statement (Draft EIS) for the Eastern North Dakota Alternate Water Supply Project (ENDAWS). As the lead agency for the State of Missouri on all water quality and quantity issues, the Department is responsible for analyzing the impact the proposed ENDAWS Project will have on the State.

Purpose and Need Unjustified

The National Environmental Policy Act (NEPA) requires a clear, well-justified purpose and need section. The Bureau's two-paragraph purpose and need section lacks sufficient information to justify the project's purpose or need. 3

During scoping the Department provided comments to assist the Bureau with this task. In those comments, the Department sought:

- a comprehensive evaluation of in-basin supply and demand to fully understand the resource and anticipated need;
- an evaluation of in-basin water conservation measures currently employed and implementable in the future;
- an exploration of expanding in-basin supply (increased storage); and
- the evaluation of the potential transition of existing lower valued or inefficient water supply to the higher valued municipal and industrial water supply.

Limited Project Geographic Scope and Red River Valley Implications

The Bureau has limited the geographic scope of the project to just three counties (Burleigh, Sheridan, and Wells counties) in North Dakota. The Bureau's guidance as specified in their NEPA Handbook specifies that '*wherever potentially significant impacts can be identified that are the result of any of the alternatives under consideration, those impacts should be presented, regardless of geographic location*'. Rather than evaluating the impact of the inter-basin transfer project, the Bureau is evaluating a limited six-mile pipeline. Breaking the project into small components to avoid having to conduct a thorough environmental assessment is contrary to foundational NEPA principles. The Department contends the Bureau should broaden the project's geographic scope. 4

The Department would like to re-emphasize a general comment made during the scoping process. If the Bureau and the State of North Dakota are intent on proposing and advancing the ENDAWS project, the Bureau must satisfy the requirements found within Section 8(a)(3)(B) of the Dakota Water Resources Act of 2000, P.L. 106-554, 114 Stat. 2763 (DWRA). It requires specific authorization by an Act of Congress for construction of any feature or features that would transfer Missouri River water out of the basin for water supply for the Red River Valley. 5

Reasonable Alternative Not Considered
The NEPA regulations require the lead agency to "objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated", 40 C.F.R. § 1502.14. The Bureau limited the scope of the project's purpose and need to providing a large volume of water to the Garrison Diversion Conservancy District. In doing so, the suite of reasonable alternatives in the Draft EIS are binary, to supply water or not to supply water, with just subtle location differences as to where in the McCuskey canal the water might originate. The Department recommends that the Bureau consider reasonable in-basin alternatives that avoid the expensive and potentially environmentally harmful aspects impacts of an inter-basin water transfer. 6

Corps Section 404 and 408 Impacts Must Be Considered
The Bureau's Draft EIS does not mention compliance with the requirements of Section 404 (P.L. 92-500, as amended; 33 U.S.C. § 1344; and 40 CFR Part 230) or Section 408 (33 U.S.C. § 408). This project is a major inter-basin water transfer project, which has intakes on two water bodies and approximately 165 miles of 72"-diameter pipe between its intake and outfall.

The U.S. Army Corps of Engineers (Corps) has requirements established in Section 14 of the Rivers and Harbors Act of 1899, as codified at 33 U.S.C. § 408 (Section 408), which were put in place to ensure that its projects continue to provide their intended benefits to the public. Congress mandated that any use or alteration of a civil works project by another party is subject to approval through the Section 408 process. The myriad inter-basin and water development projects recently proposed, including this major inter-basin transfer, will negatively affect downstream flow support. It impacts several project purposes for which Congress authorized the development of the Missouri River reservoir system. Additionally, the Corps is spending millions of dollars of Federal funding to develop habitat to recover the federally endangered pallid sturgeon. Impacts on downstream flow support will increase the frequency of dewatering these fragile habitats, negating the intended benefit of those civil works projects. 7

Projects in the State of Missouri on or adjacent to jurisdictional waters with a much smaller physical and fiscal footprint are required to have a Section 404 permit and some require a Section 408 permit. The Bureau must comply with these requirements or provide documentation and concurrence from the Corps as to why these permits are not needed.

Cumulative Impacts Not Fully Assessed
The Bureau's Draft EIS does not adequately assess cumulative impacts to the Missouri River. "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." 40 C.F.R. § 1508.7.

The Bureau's Draft EIS should consider past actions in the Missouri River basin that have cumulatively impacted downstream flow support. Current Corps' modeling completed for the 2018 update of the Missouri River Master Operational Manual indicates that drought operations would be implemented during 70 percent of the years assessed. These high frequency of drought operations are largely due to past Federal actions, and a large inter-basin transfer of water will further impact the Missouri River basin. The Department recommends that the Bureau assess 8

past actions for a minimum of 20 years to understand the cumulative impacts to Missouri River downstream flow support.

Missouri River Reservoirs Do Not Have a Water Supply Allocation for Municipal and Industrial (M&I) Water Supply

The Missouri River reservoir system does not have a dedicated M&I water supply allocation as required under the Water Supply Act of 1958. The Corps has been allowing temporary M&I water supply (referred to as "Surplus Water") by applying Section 6 of the 1944 Flood Control Act. Section 6 authorizes the Secretary of the Army, "to make contracts with States, municipalities, private concerns or individuals, at such prices and on such terms as they may deem reasonable for domestic and industrial uses for surplus water that may be available at any reservoir under the control of the War Department: ***Provided*, that no contracts for such water shall adversely affect the existing lawful uses of such water**" (emphasis added), 33 U.S.C. § 708.

The Corps' Section 6 authority is not the correct authority for permanent M&I water supply. As defined in Engineering Regulation 1105-2-100, page 3-33: "When the user desires long-term use, a permanent storage reallocation should be performed under the authority of the Water Supply Act of 1958, as amended."

The Draft EIS does not provide a time frame for the water agreement with the Corps. The Draft EIS also does not assess the impact of foreseeable water supply allocations necessary to provide permanent M&I water supply in the Missouri River reservoir system. If this project is for long-term water supply, it should be performed under the authority of the Water Supply Act of 1958. 9

Risk of Invasive Species

With the proposed inter-basin transfer, the Bureau has the responsibility to ensure that the project prevents invasive species transfer. Ensuring the control of invasive species is important to prevent species incursion into a receiving watershed. The proposed system does not fulfill that obligation. The treatment option identified with the preferred alternative lacks the redundant system necessary to prevent transfer of invasive species between watersheds. The Department recommends a "treat and hold" system be analyzed. This approach would allow water to be retained until treatment has been assured through testing. 10

Conclusion

The Environmental Impact Statement analysis is incomplete. The Department respectfully requests that the Bureau revise its analysis, giving due consideration to the aforementioned areas of concern. Thank you for your time and consideration of these important matters. If you have any questions, comments, or need additional clarification, please contact Mr. Bob Bacon, the State Hydrologist at the Missouri Department of Natural Resources, Water Resources Center at (573) 751-6632 or by email at Bob.Bacon@dnr.mo.gov.

Response 14-1 Reclamation's action to notify the public at the onset of the preparation of the EIS, as well as the distribution of the Draft EIS for public review and comment complied with the provisions of NEPA and Executive Order 13807. Reclamation provided multiple press releases in local and regional publications, mailed scoping letters, published required Notices in the *Federal Register*, held three public scoping meetings throughout the State of North Dakota, and hosted a virtual public meeting to gather public input on the Draft EIS. Reclamation also established and updates a webpage for the EIS.

Response 14-2 In response to the commenter's request, Reclamation staff participated in a conference call with Missouri DNR representatives on August 5, 2020. The purpose of this call was to allow Missouri DNR staff to discuss their comments on the draft EIS.

Response 14-3 See Response 7-15.

Response 14-4 The geographic scope of the analysis is described in the EIS (Chapter 1, section 1.5.1) and as noted in this section, the geographic scope for some resources, such as aquatic invasive species, is broader, and discussed further, in Chapter 3. The commenter is incorrect in stating that the EIS does not evaluate the impacts of an interbasin transfer project but limits the EIS evaluation to a "six-mile pipeline". Reclamation would direct the reader to the discussion of alternatives in Chapter 2 and the evaluation of the potential environmental and economic impacts of the alternatives as described in Chapter 3.

Response 14-5 See Response 10-1.

Response 14-6 The scope of the EIS is defined by the Purpose and Need as discussed in Chapter 1. See Response 14-4 above.

Response 14-7 Reclamation will continue working closely with the Bismarck Regulatory Office of the Corps, to address Clean Water Act requirements, including 404(b)(1) compliance for the Project. Integration of these guidelines will occur if an action alternative is selected and final design begins. Section 408 compliance would not be necessary for the ENDAWS project, due to ENDAWS authorizing a water intake and use of the McClusky Canal, not the Missouri River.

Response 14-8 As stated in Chapter 3.6.4 Methods, Reclamation contracted with the Corps to simulate changes in operations of the Missouri River Mainstem System based on the 2018 Master Manual. Reclamation provided the Corps with estimates of historic, existing, reasonably foreseeable depletions and potential ENDAWS Project withdrawals from the Missouri River System for input into the ResSim Model. Reclamation updated its Missouri River Basin Depletions Database with historic and existing depletions from 1922 through 2017 for the entire Missouri River basin. This is 95 years of data which is more than 4 times more than what the commenter suggests. Output values of the depletions database was provided to the Corps for this EIS modeling. This Depletions Database is the most comprehensive analysis available at this time.

Response 14-9 Reclamation disagrees with the commenter's statement. A water supply agreement with the Corps is not required when Reclamation has independent Congressional authority to construct, or direct the construction of, water supply projects and withdraw Reclamation-related project water from the Missouri River. The Missouri River depletions analysis did account of all foreseeable water supply allocations necessary to provide M&I uses in the Missouri River reservoir system, see Chapter 3, Section 3.6.5 and Appendix H.

Response 14-10 Reclamation disagrees with the commenter's statement. The U.S. government has not established rules or regulations regarding the inter-basin transfer of water. The Secretary of Interior in consultation with the EPA and the U.S. State Department determine if the proposed risk reduction is sufficient for treaty compliance. The preferred Biota WTP configuration would ensure a low risk of Project-related transfer and establishment of invasive species, as documented in *Risk and Consequence Analysis (Appendix F).*

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LETTER #15

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Eastern North Dakota Alternate Water Supply Project – Draft Environmental Impact Statement - Comments

Dear Mr. Reinhart,

Thank you for the opportunity to provide comments on the draft Environment Impact Statement (DEIS) for the proposed Eastern North Dakota Alternate Water Supply (ENDAWS) Project prepared by the Bureau of Reclamation (Reclamation).

Manitoba's interest in the ENDAWS Project stems from our long-standing concern with proposed projects to divert water from the Missouri River Basin to the Hudson Bay Basin. The Missouri River and Hudson Bay watersheds are unique, separate, and ecologically distinct from one another with different species compositions, including potentially pathogenic species such as bacteria, viruses, fungi, and other microscopic plant and animal parasites. Introducing such aquatic invasive species (AIS) into Hudson Bay Basin waters where they are not now present could cause significant and irreversible damage to downstream waterways in Manitoba, as well as North Dakota and Minnesota. If an interbasin water transfer proceeds despite the inherent risks, it is critical that Missouri River water be filtered and treated before it enters the Hudson Bay Basin to ensure the removal and deactivation of biota. These measures are essential given the identified risks. 1

Manitoba recognizes the efforts made by Reclamation over the past several decades related to proposed interbasin water transfer projects. For example, water is now proposed to be treated in the Missouri River Basin prior to transfer to the Hudson Bay Basin, key to reducing the risks associated with the transfer of invasive biota. While we welcome Reclamation's work toward mitigating the risks and consequences of the transfer of invasive biota, we do have several significant remaining concerns, which are addressed in these comments on the proposed ENDAWS Project and the DEIS.

Ultimately, our most significant concern relates to the identification of the preferred alternative for the biota treatment plant. The DEIS identifies the "Enhanced Disinfection Option" with UV disinfection and chlorination as the preferred alternative. Table 2.9 indicates, "This option would be designed to provide 3-log inactivation of *Giardia* and 4-log inactivation of viruses (Table 2.9)." The subsequent assessment of the environmental risks and consequences with option 2 are then based on the assumption that these inactivation credits can be met. Manitoba's concern is that

without a filtration step prior to chlorination and UV disinfection, the log inactivation credits in Table 2.9 will not be met, and thus the effectiveness of the biota treatment plant will be greatly reduced. It is widely understood that the effectiveness of UV and chlorine treatment are impacted by turbidity. The DEIS notes that the turbidity in the source water is on average 10 NTU as compared to drinking water standards related to treatment efficacy of 0.3 to 5 NTU (maximum) turbidity. The DEIS alludes to the uncertainty in the effectiveness of option 2 in several places. For example, Appendix F, section 5.7.2, reflects that uncertainty by avoiding use of the affirmative "will" and instead suggesting that "Treatment with chlorine with UV should provide effective disinfection/inactivation..." (underline added for emphasis). Appendix F also notes that bench scale testing is necessary to gauge potential water quality interferences with the UV system and chlorine demand of the source water. 2

As mentioned, Manitoba acknowledges and appreciates Reclamation's intent to treat Missouri River water prior to transfer to the Hudson Bay Basin to reduce the risks and consequences of the transfer of invasive biota. However, the Province is greatly concerned that the intent to treat properly Missouri River water will be negated in the long term due to the lack of filtration prior to chlorination and UV disinfection. Of note, both the Northwest Area Water Supply (NAWS) Project and the preferred alternative for the previous federally-led Red River Valley Water Supply (RRVWS) Project include filtration prior to chlorination and UV treatment, in recognition of the importance of this step to the effectiveness of water treatment. The risks and consequences of the transfer of invasive biota remain and the need for filtration to effectively remove and inactivate invasive biota is well established. 3

Manitoba has previously shared with Reclamation the Province's treated water goals that would provide a multi-barrier approach to the treatment of classes of organisms (Table 1) and we strongly recommend that these goals be incorporated into the preferred alternative for treatment prior to interbasin transfer of water. The DEIS acknowledges that only options 3 and 4 provide a multi-barrier approach (Appendix F) against the transfer of the target AIS. Adequate treatment to meet these goals prior to transfer will protect downstream waterways not only in Manitoba, but also in North Dakota and Minnesota, including the Sheyenne River, Lake Ashtabula, the Red River, and Lake Winnipeg. 4

Table 1. Recommended Treated Water Goals Prior to Interbasin Transfer

Parameter	Recommended Treated Water Goals Prior to Interbasin Transfer	Comments
Turbidity	<0.3 NTU	This is necessary to ensure effectiveness of disinfection agents such as chlorine against viruses.
Disinfection-resistant protozoa such as *Myxobolus cerebralis*	2.5 log (99.68 %) removal	This should be achieved in a minimum of two separate barriers prior

		to transfer across the continental divide from the Missouri River Basin to the Hudson Bay Basin.
Other Protozoa with similar characteristics as *Giardia* and *Cryptosporidium*	4 log (99.99 %) total removal/inactivation with a minimum of 2.5 log by removal	This should be achieved in three separate barriers prior to transfer across the continental divide from the Missouri River Basin to the Hudson Bay Basin.
Viruses	4 log (99.99 %) inactivation	This can be achieved through disinfection.

In addition to the recommended level of biota water treatment, we offer the following comments on the DEIS for the ENDAWS Project.

1. The DEIS Fails to Properly Evaluate the No-action Alternative

Under the National Environmental Policy Act (NEPA), agencies must "rigorously explore and objectively evaluate all reasonable alternatives."[1] Indeed, this alternatives analysis is the "heart" of an environmental impact statement.[2] Critically, this alternatives analysis must include the possibility of taking no action.[3] That is because the no-action alternative provides a baseline to compare the magnitude of other action alternatives' environmental effects.[4] The no-action alternative is therefore necessary to inform the public about action alternatives' effects, and to enable agency decision-makers to consider carefully information about environmental impacts.

A no-action alternative may be defined as either, "no change from a current management direction or level of management intensity," or "'no project' in cases where a new project is proposed for implementation."[5] In either event, the no-action alternative "looks at the effects of not approving the action under consideration."[6] As a result, a no-action alternative is not properly defined as carrying out a new agency action, unless carrying out the action in question is mandatory.[7] Similarly, a no-action alternative is "meaningless" if it assumes the existence of the very plan being proposed.[8] 5

[1] 40 C.F.R. § 1502.14(a); *see also* 43 C.F.R. §§ 46.415(b), 46.420(b), (c)
[2] 40 C.F.R. § 1502.14.
[3] See 42 U.S.C. § 4332(2)(E); 40 C.F.R. § 1502.14(d).
[4] *CEQ Forty Most-Asked Questions*, Question 3, https://www.energy.gov/sites/prod/files/2018/06/f53/G-CEQ-40Questions.pdf.
[5] 43 C.F.R. § 46.30.
[6] 43 C.F.R. § 46.30.
[7] *See Pac. Coast Fed'n of Fishermen's Associations v. United States Dep't of the Interior*, 655 F. App'x 595, 598 (9th Cir. 2016).
[8] *Friends of Yosemite Valley v. Kempthorne*, 520 F.3d 1024, 1038 (9th Cir. 2008).

The ENDAWS DEIS is flawed because the no-action alternative improperly assumes the existence of the Central North Dakota Water Supply Project (CNDWSP) and the State funded RRVWS Project. This is contrary to NEPA because the CNDWSP and the State RRVWS Project have not yet been constructed. Reclamation is not required to implement the proposed action selected in the FONSI for the CNDWSP. Reclamation acknowledges as much in describing Alternative B in the DEIS, stating that "[u]nder this alternative, Reclamation would not construct the features of the CNDWSP as described under No Action and would not issue a repayment contract for 20 cfs from the McClusky Canal."[9] Moreover, the FONSI for the CNDWSP is currently being challenged by the State of Missouri, in a case filed in the Western District of Missouri (Case No. 2:20-cv-04018-NKL). For the State RRVWS Project, a final National Pollutant Discharge Elimination System (NPDES) Permit is still required from the North Dakota Department of Environmental Quality, and it is reported that considerable work remains in terms of finalizing and financing the Project's design and construction. Therefore, defining the no-action alternative to include the CNDWSP and the State RRVWS Project does not provide an adequate baseline for measuring environmental effects. Instead, the DEIS should include a true no-action alternative, so that the full impacts of ENDAWS can be considered and assessed. 5 cont.

Further, Reclamation's failure to include a true no-action alternative was not a harmless error because it caused Reclamation to conflate the risk of AIS transfer posed by its no-action and action alternatives. Specifically, Reclamation appears to recognize that its "no action" alternative introduces an independent risk of AIS transfer: "*In comparison to existing pathways*, the No Action Alternative interbasin transfer risk would be low and is reduced further with the inclusion of the State-proposed water treatment plant."[10] The consequences of an AIS transfer could be catastrophic, and even a small incremental increase in this risk could represent a serious degree of potential harm. Without a true no-action alternative, therefore, it is impossible to accurately isolate and assess the risk of AIS transfer that ENDAWS would present. 6

2. Filtration is essential

Compliance with the 1909 Boundary Waters Treaty between the United States and Canada is required, as stated in Section 1(h) of Dakota Water Resources Act. To address compliance with the Boundary Waters Treaty (as well as other purposes), Reclamation evaluated four biota treatment plant options for the ENDAWS Project with the goal of reducing the risk of a Project-related transfer of AIS into the Hudson Bay Basin. The options were designed to provide a range of treatment methods, starting with disinfection and incrementally adding other water treatment technologies to target different types of pathogens and biota, and increasing the level of protection with each option.

The biota treatment plant options include:

- Option 1 - Disinfection - Sand/grit removal and disinfection using chlorination;
- Option 2 - Enhanced Disinfection - Sand/grit removal and enhanced disinfection consisting of ultraviolet light (UV) and chlorination;

[9] DEIS 2.3.2, p. 2-7; *see also* ES.6.2, p. ES-5.
[10] Table ES-1, p. ES-10 (emphasis added)

- Option 3 - Conventional Treatment - coagulation/flocculation, high rate sedimentation, granular media filtration, UV, and chlorination; and

- Option 4 - Advanced Treatment - Advanced Treatment consisting of sand/grit removal, coagulation/flocculation, membrane filtration, UV disinfection, and chlorination.

Based on the evaluation, the preferred alternative includes Option 2 - Enhanced Disinfection for the biota treatment plant. As summarized above, Manitoba has a number of concerns with option 2 including that without a filtration step prior to chlorination and UV disinfection, the log inactivation credits associated with option 2 will not be met and thus the effectiveness of the biota treatment plant will be greatly reduced.

Unfortunately, the effectiveness of chlorine and UV disinfection is negatively impacted by turbidity and we can expect the effectiveness of the proposed treatment system to be reduced during times of elevated turbidity. Particulate matter that contributes to turbidity can protect viruses, bacteria and protozoa from the effects of disinfection either by reducing the transmittance of the disinfectant or by shielding microorganisms that have become attached to or enmeshed within the particle surface. Health Canada's 2012 Guideline for Canadian Drinking Water Quality on Turbidity[11] provides information on the relationship between turbidity, particles and pathogens. The Environmental Protection Agency has also recognized that turbidity can "render UV disinfection ineffective," with national primary drinking water standards ranging from 0.3 to 5 NTU. [12] While it is acknowledged that water from the proposed ENDAWS Project will be discharged to the Sheyenne River and will not be used directly for drinking, both drinking water treatment and treatment prior to interbasin transfer require similar standards for the removal of pathogens. References providing advice on the effectiveness of pathogen removal should be considered in this environmental impact statement. Health Canada's 2012 advice notes that "Effective removal of microbial pathogens is best achieved when water of low turbidity is produced and effective inactivation of microbial pathogens is best achieved when low-turbidity water is disinfected." Advice from Health Canada varies depending on the source water and treatment system but ranges from maintaining turbidity levels less than 1.0 NTU to less than 0.1 NTU depending on the system. 7

While information on turbidity in the source water for the ENDAWS Project is limited (see below), Appendix B, an appraisal level design report for the biota treatment plant, includes some information on expected water quality in the Missouri River and the McClusky Canal – the two potential sources of water for the ENDAWS Project. The report indicates that turbidity averages around 10 NTU in Lake Audubon, and one of the Appendix B tables suggests an average of 12.6 NTU (range 6.74-22.10). Turbidity in Lake Sakakawea reportedly ranges from 1.13 to 27.36 with an average of 9.4 NTU. A recent application to the North Dakota Department of Environmental Quality for the State RRVWS Project notes that turbidity levels in the Missouri River historically 8

[11] https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-turbidity/page-3-guidelines-canadian-drinking-water-quality-turbidity.html

[12] https://iaspub.epa.gov/tdb/pages/treatment/treatmentOverview.do?treatmentProcessId=-2054608628

range from 2 to 12.4 NTU, with a seasonal high of 500 NTUs in an extreme year. This indicates that turbidity levels in the Missouri River can be much higher (in extreme cases, several orders of magnitude higher) than those recommended in the Health Canada water treatment advice and at levels that could be expected to impair chlorine treatment efficiency. The consequence will be increased risk of AIS transfer.

Further, water quality analyses in Appendix B do not provide additional insight into turbidity in the Missouri River. Section 3.5.2 of the report is captioned "Turbidity" and provides box plots (in Figure 3-2) of turbidity levels for a number of waterbodies. Unfortunately, no information is provided on the number of samples, when they were collected, and what years or seasons are represented. Therefore, it is impossible to determine if these turbidity measurements are representative of the waterbodies included in the figure. In section 3.5.4, total suspended solids measurements from a single sampling date are used to suggest the source of suspended solids, a conclusion that cannot be drawn from a single set of samples. Table A-1 includes historical water quality data with ranges and averages for a number of parameters, but again no information is provided on the number of samples, when they were collected, and what years or seasons are represented. Therefore, it is again impossible to determine if these measurements are representative of the waterbodies included in the table. Notably, there are no turbidity measurements for the McClusky Canal. Tables B-1, B-2 and B-3 provide some individual water quality measurements but most are dated (2011 and earlier) and some suffer from issues such as an "unknown" location. 9

Variability in water quality (including turbidity) in the source water for the ENDAWS Project is expected to increase further with climate change. There is no dispute that climate change will increase flow volumes and surface water levels in the Missouri River as well as other waterways in the Missouri River Basin. The DEIS (Section 3.6.7) notes that "Climate change could have a cumulative effect on system operations by altering the timing and magnitude of runoff. About 75 percent of the climate projections analyzed would result in increased runoff in the Missouri River Basin, which would generally increase streamflow and reservoir levels." However, there is no mention of the potential impacts of climate change on the source water quality for the ENDAWS Project. The assessment of options for the biota treatment plant and the ultimate selection of a preferred alternative must consider the potential impacts of climate change on source water quality. 10

Biota treatment that includes filtration along with chlorination and UV treatment prior to interbasin transfer and discharge to the Sheyenne River is essential to:

- Remove AIS that are not always susceptible to inactivation by UV or chlorine;
- Reduce prevailing levels of turbidity (to 0.3 NTU or less) and dissolved organics to facilitate reliable and effective downstream UV treatment and chlorination; and
- Provide a multiple barrier approach such that should one stage fail or perform less effectively, the other treatment components remain available.

3. More protective treatment will also be cost-effective.

Manitoba's recommendations for more protective treatment technology are by no means indifferent to cost considerations. Water treatment technologies have advanced significantly in the last 20 years, with higher-level treatment more readily available and economically achievable.

In 2006-2007, as part of the environmental review required for the federally proposed RRVWS Project, Manitoba shared information on readily available technology that can cost-effectively achieve the recommended treated water goals. The most promising of this technology appeared to be Dissolved Air Flotation (DAF) combined with filtration in a single tank followed by UV disinfection. While treatment to meet the recommended treated water goals will represent additional costs as compared to the enhanced disinfection option included with the DEIS preferred alternative, implementation of the recommended treatment goals could avoid costs associated with future disputes and delay. Manitoba also notes that the relative difference in capital cost between option 2 (approximately $70M) and option 3 (approximately $222M) seems outsized, with the capital costs for option 3 about three times those for option 2. For comparison, the difference between a chlorine/UV treatment option and a conventional treatment option for the NAWS Project was $30M vs. $67M, respectively, with the capital costs for conventional treatment about 2.2 times the chlorine/UV treatment. NAWS also included an intermediate option with pressure filtration that has not been considered for the ENDAWS Project. Finally, the DEIS also notes that the inclusion of conventional treatment (including the filtration step) reduces the chlorine and UV disinfectant demand, thus providing a more efficient disinfection process and one that is less expensive to operate. It is not clear if the cost estimates provided in the DEIS reflect the reduced need for chlorine and UV treatment with option 3. In short, it appears that there may be other options for biota treatment that would provide more cost effective, multi-barrier treatment. 11

Implementation of effective and protective treatment technology will reduce the risk of transferring AIS and the associated costs downstream in North Dakota, Minnesota and Manitoba, a risk for which economic losses could be staggering. As an example, a US Fish and Wildlife Service fact sheet notes that invasive species cost the United States more than $120 billion in major environmental damages and losses every year, due to negative effects on "property values, agricultural productivity, public utility operations, native fisheries, tourism, outdoor recreation, and the overall health of an ecosystem."[13] 12

4. Aquatic invasive species risks and consequences assessment downplays the risks

Appendix F of the DEIS provides an AIS risks and consequences analysis. Manitoba has a number of concerns with the assessment and notes that overall, it appears to downplay the risks associated with the ENDAWS Project and the environment/economic impacts of invasive species. Of note, under Executive Order 13112, federal agencies such as Reclamation are directed to "prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause" by taking "all feasible and prudent measures to minimize the risk of harm" when their actions "are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere."

Appendix F is heavily based on previous work done for the NAWS Project that failed to quantitatively evaluate AIS transfer risk. Manitoba has provided detailed comments previously on the NAWS Project including on the final Supplemental Environmental Impact Statement and Appendix E, Transbasin Effects Analysis Technical Report. Give Reclamation's reliance on the

[13] https://www.fws.gov/verobeach/PythonPDF/CostofInvasivesFactSheet.pdf

NAWS analyses and Appendix E, many of these comments, including those related to the qualitative assessment continue to apply to the ENDAWS Project assessment.

Appendix F of the ENDAWS DEIS includes a number of key assumptions that could be challenged. For example, Appendix F notes that AIS can be transferred through non-Project pathways. While the transfer of AIS can occur through non-Project pathways, the ENDAWS Project adds a new pathway that did not previously exist and the risks and consequences require assessment independent of existing non-Project pathways. 13

Reclamation also acknowledges that the absence of detection records for a particular organism does not rule out the possibility of its existence thereby opening up the possibility of future transfer of organisms from the Missouri Basin to the Hudson Bay Basin that cannot be identified now. Despite this, Reclamation continues to focus its risks and consequences assessment and its biota treatment plant design on the 39 invasive species first identified in 2005 and 2008, between 12 to 15 years ago. Section 2.1 indicates that the list of invasive species was reviewed in 2019 and determined to be "appropriate" but no information is provided on who reviewed this list and how the list was evaluated. In fact, the presence of AIS can change rapidly and new introductions occur routinely. For example, zebra mussels were not present in the Hudson Bay Basin in 2005 to 2008 when the work was originally completed for the NAWS Project. Similarly, the introduction of whirling disease to the western reaches of the Hudson Bay Basin is a relatively new occurrence. 14

Appendix F also highlights the challenges with maintaining invasive species databases and thus a specific list of invasive species of concern. Funding to maintain the U.S. Fish and Wildlife database expired in 2016, and it is unsurprising that data for Manitoba were not available in a US database (at the University of Georgia). Current staff in Manitoba are not familiar with the Manitoba database housed at the University of Georgia but note that information on AIS distribution in Manitoba is available at any time on request from Manitoba Agriculture and Resource Development's Wildlife and Fisheries Branch. It is unclear if Reclamation contacted Canadian agencies (provincial or federal) to locate up-to-date data. Overall, this is why Manitoba recommends that the biota treatment plant technology focus on treatment for classes of AIS rather than a specific list of species that can quickly become uncertain and outdated. 15

Section 4.2.4 describes interbasin and intrabasin diversions and reports that there are "many" interbasin water diversions located in the region of the proposed ENDAWS Project. The text goes on to describe only a few projects including historical projects such as the Saint Mary River Diversion and the Milk River Diversion projects that were constructed long before our understanding of the impacts of AIS or modern legislation for assessment of environmental impacts. The expression "two wrongs do not make a right" seems to apply if modern interbasin transfer projects are to be authorized based on those constructed more than 100 years ago without an understanding of potential environmental and economic impacts. Other projects included as examples are those that were also challenged (Devils Lake Outlets), those not yet constructed or approved (State RRVWS Project), or those where conventional treatment with filtration is in place (Western Area Water Supply Project) or planned (NAWS). In fact, Appendix F notes specifically that projects such as NAWS and the Western Area Water Supply Project have lower risk of biota transfer precisely because of their water treatment systems. The text seems to suggest that these types of interbasin transfers are routine when in fact they are rare and when proposed in modern times are the subject of significant environmental and legal review. 16

We note that Appendix F includes numerous references to the Souris River and the occasional reference to NAWS. It is expected that these are simply cut and paste errors from previous analyses for the NAWS Project and we are hopeful that the substance of the analyses with respect to topics such as ecological receptors of concern has been updated for the project area associated with the proposed ENDAWS Project. However, it is noted that the focus is on impacts in the Hudson Bay in Canada and while this analysis is appreciated, the assessment does seem to lack consideration of impacts in North Dakota and Minnesota including in the Sheyenne River, Lake Ashtabula and the Red River. For example, it is not clear that potential impacts on recreational fishing in Lake Ashtabula were considered. 17

Finally, Manitoba notes that the analyses of potential economic impacts on the Lake Winnipeg fishery is out of date. In addition to the approximately $50 million commercial fishery on Lake Winnipeg alone, interest in recreational fishing on Lake Winnipeg, especially in the winter, has exploded in recent years. Recent work from the Manitoba Wildlife Federation (https://mwf.mb.ca/archives/674) on the economics of the recreational fishery on Lake Winnipeg indicates that anglers have contributed significantly to the provincial economy with: 18

- $221 million in direct spending by anglers on Lake Winnipeg
- $102 million to the Gross Domestic Product
- $44.5 million in wages
- $52 million in tax revenue to governments

5. Appendix K – DEIS distribution list

Recognizing that changes in agency names and staff can make it difficult to determine lead contacts for review of Reclamation documents, we note that the author of Manitoba's ENDAWS scoping comments was not included on the distribution list for the DEIS. Given the relatively short timeline for review, we were fortunate that we received the notice of publication through colleagues in the Canadian federal government, and I would be grateful if I could be added to the distribution list for future opportunities to review NEPA related documents for the ENDAWS project. 19

* * *

In conclusion, Manitoba appreciates the opportunity to provide comments on the DEIS for the ENDAWS Project. While the DEIS takes into account many of Manitoba's concerns from previous proposed interbasin water transfer projects, I would like to reiterate that our main comment relates to the need for filtration prior to chlorination and UV treatment to ensure the effectiveness of the biota treatment plant for removal and inactivation of invasive biota. We would be pleased to discuss this comment further with Reclamation, particularly if we could be of assistance in exploring cost effective technologies for effective water treatment. We hope for a productive outcome: one that addresses eastern North Dakota's long-standing need for additional water sources, while also providing critical protections for the Hudson Bay Basin in keeping with the obligations of the United States under the Boundary Waters Treaty.

Thank you for your consideration of Manitoba's comments.

Sincerely,

Elliott J. Brown
Assistant Deputy Minister
Water Stewardship and Biodiversity

Cc: Patrick Cherneski, Canadian Co-Chair, International Red River Board
Patrick.Cherneski@canada.ca

Response 15-1 Waters of the Missouri River Basin and the Hudson Bay Basin have been connected through a constructed interbasin diversion from the St. Mary River to the Milk River in Montana for more than 100 years as noted in Appendix F.

When comparing the basins as a whole there are differences in aquatic communities, but these differences cannot be attributed solely to a lack of past species transfers as the comment suggests. The aquatic community of the Churchill River at Churchill Manitoba is quite different from the aquatic community of the Missouri River at St. Louis, Missouri. This is to be expected, as the tundra and taiga ecosystems in northern Manitoba are very different from anything found in the State of Missouri. Similarly, there are large differences in the aquatic communities within each basin due to climate and geography. The aquatic community of the Madison River in Wyoming (headwaters of the Missouri River) is very different from the community in the lower Missouri River despite the existence of a continuous surface water connection between them. Where the Missouri River Basin and the Hudson Bay Basin are in close proximity to each other the aquatic communities are marked by their similarities rather than their differences.

Response 15-2 Reclamation is confident the appraisal-level design will achieve the log-inactivation targets for the respective aquatic invasive species. Conservative assumptions were made relative to UV transmittance and applied UV dosage appropriate for a poorer source water quality than is expected from Lake Sakakawea or Lake Audubon. See the Response7-6 above regarding UV system and chlorine system initial design values. Bench-scale testing would be used in the future to refine disinfection system design parameters and optimize sizing. It would not be used to determine feasibility of the process as the combination of UV and chlorine of Enhanced Treatment will effectively treat for AIS.

Response 15-3 The NAWS project included filtration for the purpose of directly providing drinking water, not to reduce the risk of transferring invasive species, Drinking water regulations do not apply directly to this project as explained in Chapter 2, Section 2.5 and in responses 7-9 and 13-9 above.

Response 15-4 Reclamation is aware of the water treatment goals previously shared by the commenter; however, the United States has not developed water treatment standards/rules or regulations for water treatment to avoid ecological impacts of invasive species related to interbasin water transfers. Reclamation used the best scientific information available to evaluate the potential risks associated with the transfer of invasive species and the most current information regarding water treatment technologies to develop alternatives evaluated in the EIS. As stated in the EIS (Section 2.5), drinking water standards provide an appropriate framework for evaluating the efficacy of the proposed control systems for removal or inactivation of potentially invasive species. There are no accepted or regulatory standards in the United States for control of AIS introduction through interbasin water transfers, but technical analyses like those completed for the EIS can help inform decision makers.

Reclamation disagrees with the commenter's opinion that the Draft EIS and Appendix F acknowledge that only options 3 & 4 provide a multibarrier approach against the aquatic invasive species transfer. While the term 'multibarrier' is used to describe these options in section 5.7.3 and 5.7.4 of Appendix F, this does not infer, nor does it negate other statements throughout Appendix F that describe each of the biota water treatment plant options as combinations of treatment processes designed to further reduce the project-related risk of aquatic invasive species transfer. Figure 5-1 clearly show a combination of treatment processes, or a 'multibarrier' approach, of the four biota water treatment plant options evaluated. The text above this figure states, "As the biota treatment options progress, additional levels of treatment capabilities are added". Then section 5.2 through 5.5 go into detail, describing each treatment process included in the different options and how each process targets different taxonomic groups and/or specific species of concern. Each option is a multibarrier approach. The EIS (Section 2.3.7) describes the biota water treatment plant options as 'incrementally adding water treatment technologies to target different types of pathogens and biota, and increasing the level of protection with each option."

Response 15-5 See Responses 7-16, 10-12, and 10-14.

Response 15-6 Reclamation respectfully disagrees with the commenter's statements regarding the adequacy of the risk and consequence analysis of aquatic invasive species. As stated in the Risk and Consequence Analysis (Appendix F) and Chapter 3 (section 3.2) there are numerous existing pathways through which aquatic invasive species could be transferred from one basin to another. The EIS and Appendix F provide information on these various transfer pathways; existing pathways and the EIS alternatives. As noted by the commenter, the EIS discusses the comparison of the No Action alternative to the existing pathways, along with the evaluation of the action alternatives in comparison to the No Action alternative. The analysis does not 'conflate the risk of AIS transfer posed by its no action and action alternatives' as the commenter asserts.

As stated in the EIS, the risks of a biological invasion vary among species and transfer pathways. The consequences of an invasion vary by species, but not by transfer pathway. An example of this is the invasion of zebra mussels in Lake Winnipeg. This invasion may have occurred through any of several different pathways, but the consequence will be the same regardless of which pathway was responsible.

The commenter's desire for Reclamation to 'accurately isolate and assess the risk of AIS transfer that ENDAWS would present' is very difficult if not impossible due to the uncertainties associated with such an analysis (Section 3.2.6 of the EIS and Appendix F, Section 3.0). The lack of comprehensive species distribution information represents an uncertainty that reduces the ability to identify the most likely sources of introduction, characterize the risk of these transfer mechanisms, and predict the potential impacts of aquatic invasive species establishment.

Response 15-7 The design of each of the Biota WTP options was based on the source water data available. The appraisal-level design of the disinfection system assumes a

relatively poor source water quality (i.e., turbidities of 20-50 NTU and an associated 70-percent UV transmittance level). See Response 7-6 above.

Response 15-8 See Response 15-7 and 7-6 above.

Response 15-9 As stated in the Biota Water Treatment Plant Appraisal-Level Design Engineering Report (Appendix B), the biota water treatment options were designed at the appraisal level using the best available information at the time of the analysis. The appraisal level design process uses the best available information for comparison purposes. Appendix B also informs the reader that additional data gathering, and analysis would be part of a future feasibility level engineering and design effort, pending a decision on this proposed project. Reclamation's reliance on this existing water quality data is appropriate under NEPA and consistent with direction provided within Executive Order 13807. CEQ regulations demand information of "high quality" and professional and scientific integrity (40 CFR 1500.1, 1502.24). Reclamation believes that meaningful evaluation must be carried out on the basis of whatever data is available so long as it meets the intent of 40 CFR 1500.1 and 1502.24. Analyses used for the EIS meet the intent for which they were developed and are in compliance with NEPA.

Response 15-10 See Responses 7-6 and 15-7 above.

Response 15-11 The $220 million estimated capital cost for conventional treatment equates to a per gallon capital cost of $2.06 per treated gallon. This is an appropriate capital cost estimate for a plant of this size (165 cubic feet per second (cfs) or 107 million gallons per day (mgd)) and for the processes included in the appraisal-level design based on historical data and representative water treatment facilities' cost opinions and bid results.

As is the case in every project, there are other treatment approaches that could be employed to deliver the desired water quality and level of disinfection. The Conventional Treatment approach, coupled with UV and chlorine disinfection, is based on proven processes that have been employed successfully for decades. Process unit variations to conventional treatment (e.g., direct gravity filtration, pressure filtration, cloth media filtration, etc.) were discussed in Appendix B as potential process variations; some could present an opportunity for nominal reductions of the initial capital investment (e.g., direct gravity filtration and cloth media filtration) whereas others (e.g., pressure filtration) are expected to have a higher capital cost than the comparable rapid gravity dual media filtration currently included in the Conventional Treatment option.

In the Draft EIS, applied UV dosages were assumed to be higher for the Disinfection and Enhanced Disinfection options (40 mJ/cm^2) versus those of the Conventional and Advanced Treatment options (25 mJ/cm^2). The annual operating and life-cycle costs included in the Draft EIS account for these variations.

The Draft EIS's annual chlorine costs for all four treatment options were computed assuming an applied dosage of 6 mg/L. The assertion chlorine demand should decrease between Disinfection and Enhanced Disinfection options versus

those of the Conventional and Advanced Treatment options is correct with the removal of chlorine-consuming constituents . Realistically, a chlorine dosage reduction from 1 to 2 mg/L could be realized through sedimentation and/or filtration in the Conventional and Advanced Treatment Options. A 2 mg/L reduction in applied chlorine dosage equates to an annual chemical cost reduction of $217,000 or a 20-year net present value reduction of $4,340,000. This cost savings represents a 1 percent net present value reduction for Options 3 and 4 and leaves a separation of $246 million between the net present values of Enhanced Disinfection and Conventional Treatment, with Enhanced Disinfection being much less costly to implement, operate, and maintain.

The pressure filtration option for NAWS was considered but eliminated due to it's its high capital costs with little to no risk reduction when compared to the other options considered.

Response 15-12 Reclamation understands the economic consequences aquatic invasive species can have as described in Table 3-5 of the EIS and discussed further in Appendix F and Reclamation's 2013 Transbasin Effects Analysis. In recognition of this, Reclamation has included a biota water treatment plant within the Missouri River Basin as part of the ENDAWS project to further reduce the risk of a project-related transfer of aquatic invasive species.

Response 15-13 Reclamation respectfully disagrees with the commenter's opinion regarding the Risk and Consequence Analysis which supports the EIS. The Risk and Consequence Analysis (Appendix F) is an analysis of the ENDAWS project alternatives which builds off the robust and independently peer reviewed analysis of interbasin transfer risks & consequences of aquatic invasive species of concern (Reclamation 2013) as identified by agencies/stakeholders within the Missouri River and Hudson Bay basins. The methodology, data, uncertainties, and conclusions of Reclamation's 2013 analysis resulted in an overall conclusion of the independent reviewers that the study was based on the best available science, and the results and conclusions were supported by that science, given the uncertainties inherent in the available data and topic knowledge.

As stated in the EIS (section 3.2) the Risk & Consequence Analysis for the EIS use the same methodologies as the 2013 study and researched new data/information available from 2012 through the present to update species distribution information, transfer pathways, assess the risk of transfer, and the consequences of a transfer (project and non-project related). The commenter does not provide alternate methodologies or data for Reclamation's consideration.

Response 15-14 As discussed and referenced in the EIS (Chapter 3.2) and in Appendix F, the list of 39 species of concern evaluated was developed over time with input from stakeholders, including the Province of Manitoba. The species evaluated represent seven taxonomic groups of organisms exhibiting a range of sizes and susceptibilities to chemical and physical variabilities. The broad range of life histories of these 39 species of concern were evaluated to ensure that the biota water treatment options evaluated would protect against a variety of species including unknown and emerging organisms. At the onset of the NEPAS process,

Reclamation reviewed the list of species of concern and determined the seven taxonomic groups evaluated were representative of numerous organisms and directed the consultant to use this list of species of concern in the analysis. Section 2.2 of Appendix F identifies the data sources used in the analysis.

The commenter asserts that the list of species evaluated is outdated or somehow insufficient; however, the species discussed in the comment were evaluated in the Risk and Consequence Analysis and the commenter does not provide the names or data for additional species recommended for inclusion in the analysis. The commenter notes that zebra mussels were not present in the Hudson Bay Basin in 2005-2008 when Reclamation's previous analysis was conducted. Reclamation is aware of this and the Risk and Consequence Analysis does show the presence of this organism within the HBB (see Figure 2.3 in Appendix F). The commenter also notes "…a relatively new occurrence" of whirling disease in the western portion of the HBB but provides no details or data to support this statement. Reclamation did evaluate whirling disease (Myxobolus cerebralis) in the Risk and Consequence Analysis and specifically addressed its fate in the proposed biota water treatment processes in Chapter 5 of Appendix F. Reclamation included a summary of the analysis in Chapter 3 of the EIS.

Response 15-15 In the development of the Risk and Consequence Analysis, Reclamation focused on data that could be gathered from publicly available databases from the United States and Canada, including the Center for Invasive Species and Ecosystem Health located at the University of Georgia, as discussed in Section 2.2 of Appendix F. The commenter '…recommends that the biota treatment plant technology focus on treatment for classes of AIS rather than a specific list of species..." which is exactly what Reclamation has done. The species evaluated represent seven taxonomic groups of organisms exhibiting a range of sizes and susceptibilities to chemical and physical variabilities. The broad range of life histories of these 39 species of concern were evaluated to ensure that the biota water treatment options evaluated would protect against a variety of species including unknown and emerging organisms.

Response 15-16 Reclamation evaluated natural and anthropogenic transfer pathways as discussed in Section 4.2 of Appendix F. These pathways include Inter and Intrabasin Diversions as discussed in Section 4.2.4 as noted by the commenter. The commenter acknowledges the interbasin diversion called the Saint Mary River Diversion and the Milk River Diversion projects, constructed more than 100 years ago, in direct conflict with their previous comment (Comment 15-1) that the Missouri River Basin and the Hudson Bay Basin are 'unique, separate, and ecologically distinct from one another'. In the discussion of Inter and Intrabasin Diversions, Reclamation presents factual information about such diversions and inferences and opinions of the commenter do not require a response.

Response 15-17 In the Risk and Consequence Analysis, Reclamation explained that it was relying on the economic consequence analysis of the previous Transbasin Effects Analysis to be representative of the types of economic impacts that could be realized from an AIS transfer from any pathway. As stated in Section 7 of

Appendix F, the environmental and economic conditions of the HBB have not appreciably changed since the completion of the Transbasin Effects Analysis and its conclusions are still considered valid. Reclamation's reliance on this previous analysis is appropriate under NEPA and consistent with direction provided within Executive Order 13807. The commenter is correct in noting the focus of the economic consequence analysis was on the Lake Winnipeg area; however, the entire HBB was considered in the analysis and discussed in a more qualitative manner. Section 7.2 of Appendix F states "…the size of the Hudson Bay Basin necessitates a limit to the spatial dimensions of the economic analysis. The estimated impacts on Lake Winnipeg were assumed representative of those water bodies throughout the HBB that could potentially be affected…". The waterbodies of the Hudson Bay Basin would include the Sheyenne River, Lake Ashtabula and the Red River which are waterbodies noted by the commenter.

Response 15-18 In the Risk and Consequence Analysis, Reclamation explained that it was relying on the economic consequence analysis of the previous Transbasin Effects Analysis to be representative of the types of economic impacts that could be realized from an AIS transfer from any pathway. As stated in Section 7 of Appendix F, the environmental and economic conditions of the HBB have not appreciably changed since the completion of the Transbasin Effects Analysis and its conclusions are still considered valid. Reclamation's reliance on this previous analysis is appropriate under NEPA and consistent with direction provided within Executive Order 13807.

Data provided by the commenter on the economic contribution of recreational fishing on Lake Winnipeg appears to confirm the information presented in Reclamation's Transbasin Effects Analysis, in that recreational fishing remains an important contributor to the provincial economy. Data used in the economic assessment of the Transbasin Effects Analysis was obtained from reliable sources such as Statistics Canada and Canada's Department of Fisheries and Oceans. These data were relative to not only recreational fishing at Lake Winnipeg but expanded beyond that to evaluate other economic sectors such as commercial fishing, and other angler-related expenditures for Lake Winnipeg and other water bodies within Manitoba.

The Manitoba Wildlife Federation data presented in the comment is from a phased study completed over a two-year period. The second phase occurred in 2018; however, the article at the link provided is not dated so the timing of this research is unknown. The article also does not provide information or links to the data sources and methodologies used to develop the economic values provided in the comment, so Reclamation is unable to draw further conclusions about these data and how it relates to our previous economic impact analysis.

Response 15-19 Reclamation apologizes for the Draft EIS mailing to the Director of Manitoba Water Stewardship did not arrive as intended. The Distribution List has been updated with the agency's information included on the commenter's letterhead.

COALITION TO PROTECT THE MISSOURI RIVER

LETTER #16

519 W. 9th Street, Hermann, Missouri 65041 (573) 690-2324

July 6, 2020

Mr. Damien Reinhart
Project Manager
Bureau of Reclamation
Dakotas Area Office
304 E. Broadway Avenue
Bismarck, North Dakota 58501

Re: Draft Environmental Impact Statement (DEIS), Eastern North Dakota Alternate Water Supply (ENDAWS) Project

Dear Mr. Reinhart:

The Coalition to Protect the Missouri River (CPMR) appreciates the opportunity to review and comment on the DEIS for the proposed ENDAWS diversion project. CPMR, established in 2001, is made up of 30 members in six states, and supports the responsible management of Missouri River resources, as well as the maintenance and enhancement of congressionally authorized purposes of the river, including flood control, navigation and water supply.

Inter-Basin Transfer of Missouri River Water, Depletions and Aquatic Invasive Species (AIS)

CPMR opposes ENDAWS as it is part of a larger plan to divert Missouri River water through the Red River Valley Water Supply Project (RRVWSP), transferring Missouri River Water to the Hudson Bay Basin, of which we have a long history of opposition to. Simply put, spending taxpayer funds to divert Missouri River water out of the basin and ultimately to Canada is foolish and sets a dangerous precedent. Further, it is troubling that in-basin (and perhaps less costly) water supply alternatives were not considered in the DEIS. 1

Despite attempts in the DEIS to downplay any negative consequences to downstream interests, CPMR knows this to be certain – the Missouri River is substantially depleted already. In a study of 82 years of record as part of the 2018 Missouri River Recovery Program Management Plan & EIS, 70 percent of those years show harm through reduced downstream flow support. During this period of record, reduced downstream flow support already happens 63 percent of years by the March 15th system storage check, 54 percent of years by the July 1st system storage check, and overall calendar days for downstream flow support are reduced 40 percent. If implemented,

ENDAWS will further harm millions of people living in the lower basin who depend on the river for drinking water, cooling for power generation and navigation that moves crop inputs, construction materials and grain more economically and environmentally-friendly than any other mode of transportation. 2

Further, one doesn't have to very far back in history to the drought of the early 2000's to be reminded of the hardships incurred to the upper Missouri River Basin recreation industry during that time. When also taking future tribal water rights into consideration, it's plain to see the Missouri River Basin has already been over-allocated and ENDAWS will further exacerbate this problem. 3

Regarding AIS, page ES-7 describes "potential transfer and consequences of AIS as a primary concern in other interbasin water transfer projects in the past." Yet, page ES-8 states: "The potential impacts of an AIS introduction and establishment in the HBB would be the same under the No Action Alternative and all of the action alternatives because numerous pathways for AIS transfer already exist and each alternative evaluated included an interbasin transfer from the Missouri River Basin to the Hudson Bay Basin. None of these alternatives would create new types of impacts of increase the severity of impacts that could result from AIS transfer under the existing pathways." The Bureau of Reclamation (Reclamation) would be well-served to change this assessment to reflect the long-held concerns of CPMR and others regarding AIS transfer. Obviously, construction and ongoing maintenance costs of ENDAWS are significantly higher due to planned AIS control features. We recommend including those efforts (and costs) in section ES.9.1. 4

Project Purpose and Need

The DEIS fails to demonstrate a strong purpose and need for ENDAWS, similar to the vague nature of Reclamation's proposed Central North Dakota Water Supply Project's (CNDWSP) need statement, which is a concerning trend. For example, page 3-61 projects flat population growth for nine North Dakota counties through 2040. As the case with the CNDWSP documents for public comment, the DEIS needs to demonstrate an actual need for this diversion project. 5

Section 404 and Section 408 Clean Water Act Permitting Must be Considered

The ENDAWS Project Area has two intakes and one outfall located on three waterbodies, plus 165 miles of pipeline. Section 404 and 408 requirements must be considered, or Reclamation should provide documentation in the DEIS as to why such permits are not required. 6

Limited Scope, Impact Assessment and Engagement

CPMR is disappointed to see ENDAWS' geographic scope limited to three counties in North Dakota. Like we recommended with CNDWSP, the geographic scope of this proposed project should include the remainder of the Missouri River to the confluence, as well as the middle-Mississippi River from St. Louis, Missouri to Cairo, Illinois, due to its dependence on Missouri River flow support. 7

Page 4-1 mentions that in preparation of the DEIS, Reclamation consulted with a variety of "interest groups." CPMR is one of the broadest interest groups on the lower Missouri River, but yet we were not consulted with. It is disappointing that in-person scoping meetings were held only in North Dakota, which will benefit from this diversion project. Again, had more meetings been held, Reclamation would have learned that diversion of Missouri River water could harm commercial navigation on the Missouri and middle-Mississippi, reduce cooling and drinking supplies below an acceptable threshold during low-flow periods and harm agriculture through impacts to irrigation, lower crop prices and higher crop inputs because of reduced navigation efficiencies. Until these critical impacts are assessed through extensive economic studies to determine benefits and detrimental impacts of the planned ENDAWS diversion, the DEIS is incomplete and cannot be used toward advancement of the project. 8

Potential Violation of the Dakota Water Resources Act (DRWA) of 2000

If Reclamation is intent on proposing and advancing ENDAWS, it must fully meet the requirements in Section 8(B) of the DWRA, which prohibits construction of any feature or features that would transfer Missouri River water out of the basin for the Red River Valley water supply needs without a subsequent act of Congress. CPMR understands that the congressional sponsor of this language, former Sen. Kit Bond (R-MO), reminded Reclamation of this provision when it was advancing the federal RRVWSP. At that time, Reclamation re-affirmed this interpretation of DRWA, telling Sen. Bond that no project feature or features specifically authorized by the DRWA, or involving the Red River Valley water supply would be designed or constructed without specific congressional authorization. 9

Again, thank you for the opportunity to comment. If you have any questions, please do not hesitate to contact me.

Respectfully,

Dan Engemann
Executive Director

C: The Honorable Charles E. Grassley
The Honorable Joni Ernst
The Honorable Steve King
The Honorable Cindy Axne
The Honorable Pat Roberts
The Honorable Jerry Moran
The Honorable Steve Watkins
The Honorable Sharice Davids
The Honorable Roy Blunt

C: The Honorable Josh Hawley
The Honorable Sam Graves
The Honorable Emanuel Cleaver II
The Honorable Vicky Hartzler
The Honorable Blaine Luetkemeyer
The Honorable Ann Wagner
The Honorable William Lacy Clay
The Honorable Jason Smith
The Honorable Deb Fischer
The Honorable Ben Sasse
The Honorable Jeff Fortenberry
The Honorable Don Bacon
The Honorable Adrian Smith
The Honorable John Thune
The Honorable Mike Rounds
The Honorable Dusty Johnson
The Honorable Richard J. Durbin
The Honorable Tammy Duckworth
The Honorable Mike Bost

Response 16-1 See Responses 14-4 and 14-6 above.

Response 16-2 Reclamation respectfully disagrees with the commenter's conclusion the ENDAWS project would harm people and resources in the lower basin. The commenter does not provide data or suggest alternative methods of analysis for Reclamation's consideration.

As stated in Chapter 3.6.4 Methods, Reclamation contracted with the Corps to simulate changes in operations of the System based on the 2018 Master Manual. Reclamation provided the Corps with estimates of historic, existing, reasonably foreseeable depletions and potential ENDAWS Project withdrawals from the Missouri River System for input into the ResSim Model. The ResSim Model depicted river flow at Sioux City, IA; Omaha, NE; Nebraska City, NE; and Kansas City, MO due to the additional water supply depletions for the No Action, Missouri River intake, and McClusky Canal intake alternatives are nearly identical to each other which is also observed at Gavins Point, the nearest upstream reservoir.

In comparison of the three intake alternatives to No Project Year 2075, 96 percent of the 89-year historic record having changes less than 1,000 cfs. Changes less than -1,000 cfs would occur 2 percent of the time and changes greater than 1,000 cfs would occur 2 percent of the time as caused by different flood evacuation rules being activated at different times or changes to evacuation service levels. 1,000 cfs was chosen by the Corps as modeling threshold do to the accuracy of their daily reservoir forecast modeling and river gaging station flow values and modeling error. See Chapter 3, Section 3.6.6 and Appendix H.

The ResSim Model depicted Gavins Point releases during 1984 when evacuation rules are triggered at different times of the year for each intake alternative. Releases under No Action and Missouri River intake (Alt B) scenarios are made to support navigation until July, when releases are increased to begin evacuating flood waters. Releases under the McClusky Canal intake alternatives and NP2075 begin flood evacuation releases in June. Because releases were higher under the McClusky intake and NP2075 scenarios earlier in the year, the releases return to navigation support during the fall whereas releases under the No Action and Alternative B scenarios are made to evacuate flood waters.

Response 16-3 Reasonably foreseeable tribal water supply and irrigation projects were included as noted in Appendix H, Table H-2. It is impossible to consider how possible depletions of an unknown quantity could affect the future water supply of the Missouri River basin and NEPA does not require agencies to speculate. The commenter does not provide data to support the comment that the Missouri River basin has already been overallocated and ENDAWS will further exacerbate this problem. States along the Missouri River continue to permit water use from the Missouri River with the best interests of the people of the state. The ENDAWS project preferred alternative would utilize Reclamation's existing North Dakota Water Permit no. 1416 obtained for the Garrison Diversion Unit Project for the purpose of irrigation, municipal and industrial, fish and wildlife and recreation.

Response 16-4 The commenter requests Reclamation change the aquatic invasive species assessment to reflect their concerns regarding aquatic invasive species transfer. The commenter does not specify their concerns; therefore, Reclamation cannot respond other than to state that Reclamation has conducted a science-based analysis of the transfer risk of the natural and anthropogenic pathways by which aquatic invasive species can be transferred and has evaluated the potential consequences that could result from a transfer and establishment of aquatic invasive species, regardless of the means by which it was transferred.

The commenter also requests including the costs associated with construction and ongoing maintenance of treating the water to further reduce the risk of transfer of aquatic invasive species in the Executive Summary (ES.9.1). Reclamation decided not to include cost tables for any of the alternatives or biota water treatment plant options in the Executive Summary due to the complexity of the combination of alternatives/options analyzed in the EIS; as well as the limitation of an executive summary to provided the explanation of components and assumptions included in the development of such costs. However, in ES.7 of the Executive Summary, Reclamation does briefly describe the Biota water treatment plant options and directs the reader to Chapter 2 and Appendix B for details and descriptions of the cost estimates for construction costs and operation, maintenance and replacement costs.

Response 16-5 See Response 7-15.

Response 16-6 See Response 14-7.

Response 16-7 Reclamation's scope of the Missouri River depletion analysis included the entire Missouri River basin to the confluence with the Mississippi River. Reclamation updated the historic, existing, reasonably foreseeable depletions for the entire Missouri River basin. The Corp's ResSim Model depicted river flows from the Missouri River headwaters to downstream of the 6 mainstem reservoirs including Sioux City, IA; Omaha, NE; Nebraska City, NE; and Kansas City, MO.

As stated in Chapter 3 Section 3.6.6, Appendix H, and the Corps 2020 Simulation Scenarios Technical Report, the No Action and the action alternatives were nearly identical in the modeling outputs from Gavins Point and flows at the downstream river gages including Sioux City, Iowa; Omaha, Nebraska; Nebraska City, Nebraska; and Kansas City, Missouri. Since the simulation model did not indicate a difference between No Action and the action alternatives, Reclamation determined the impacts of the action alternatives on the Mississippi River were not a substantive issue to address.

Response 16-8 Reclamation's action to notify the public at the onset of the preparation of the EIS, as well as the distribution of the Draft EIS for public review and comment complied with the provisions of NEPA and Executive Order 13807. Reclamation provided multiple press releases in local and regional publications, mailed scoping letters, published required Notices in the *Federal Register*, held three public scoping meetings, and hosted a virtual public meeting to gather public input on the Draft EIS. Reclamation also established and updates a webpage for the EIS.

Reclamation respectfully disagrees with the commenter's statements regarding the ENDAWS diversion could harm commercial navigation and other industries downstream on the Missouri River. Reclamation partnered with the U.S. Army Corps of Engineers on the evaluation of potential impact to the Missouri River and related resources. The results of this analysis are presented in Chapter 3 and a summary of the methods and data used in the analysis are provided in Appendix H. The technical report prepared by the Corps of Engineers (*Missouri River Mainstem HEC-ResSim Modeling for the ENDAWS EIS: Final Mainstem Missouri River Reservoir simulation Scenarios Technical Report*) is included as a supporting document and is available on Reclamation's webpage. Since the No Action and action alternatives are nearly identical in the modeling outputs, specifically from Gavins Point and the downstream river gages including Sioux City, Iowa; Omaha, Nebraska; Nebraska City, Nebraska; and Kansas City, Missouri, there would be no measurable difference to further evaluate relating to impacts to the lower Missouri River flows, navigation service flow and navigation season length.

The commenter does not provide data or suggested methodologies for Reclamation's consideration.

Response 16-9 See Response 10-1.

The American Waterways Operators

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LETTER #17

Justin L. Lampert
Manager – Midcontinent Office

July 6, 2020

Mr. Damien Reinhart
Project Manager
Bureau of Reclamation, Dakotas Area Office
304 East Broadway Ave
Bismarck, North Dakota 58501

RE: Eastern North Dakota Alternate
Water Supply Project DEIS

Dear Mr. Reinhart,

On behalf of the American Waterways Operators (AWO), the national trade association for the tugboat, towboat and barge industry, thank you for the opportunity to comment on the Bureau of Reclamation's Draft Environmental Impact Statement (DEIS) for the Eastern North Dakota Alternate Water Supply (ENDAWS) Project.

The U.S. tugboat, towboat and barge industry is a vital segment of America's transportation system. The industry safely and efficiently moves over 760 million tons of cargo each year, including more than 60 percent of U.S. export grain, energy sources such as coal and petroleum, and other bulk commodities that are the building blocks of the U.S. economy. The fleet consists of nearly 5,500 tugboats and towboats, and over 31,000 barges. These vessels transit 25,000 miles of inland and intracoastal waterways, the Great Lakes, and the Atlantic, Pacific and Gulf coasts. Tugboats also provide essential services including ship docking, tanker escort, and bunkering in ports and harbors around the country.

Since 2001, AWO has been a member of the Coalition to Protect the Missouri River (CPMR), a group of stakeholders that advocate for the responsible management of Missouri River resources to ensure the maintenance of the river's Congressionally-authorized purposes, including navigation. In addition, AWO has been a member of the Congressionally-authorized Missouri River Recovery Implementation Committee since its inception in 2008.

AWO makes the following comments and recommendations on the DEIS:

1) The Missouri River is part of the economically vital 12,000-mile Western Rivers system that efficiently delivers essential commodities throughout the nation. Barge traffic on the Missouri River has been increasing steadily over the past few years due to reliable flows. However, the ENDAWS Project would reduce downstream flow support | 1

and jeopardize the efficient movement of waterborne commerce. AWO opposes the project and strongly opposes any project that would divert Missouri River water through the Red River Valley Water Supply Project, transferring Missouri River water to the Hudson Bay Basin.

Diverting water from the Missouri River would reduce flows that are critical to support commercial navigation on the Lower Missouri River and on the Middle Mississippi River, especially during times of drought. In fact, according to the Missouri Department of Natural Resources, the Missouri River supplies almost 50% of the flows to the Middle Mississippi River during normal conditions and provided more than 70% during the 2012 drought. During severe drought years, such as the late 1980's, more than 80% of the water flowing by the St. Louis Arch originated from the Missouri River. The 2012-13 severe drought in both the Missouri and Upper Mississippi rivers seriously impacted the continuity of waterborne commerce. Because Missouri River flows are critical to support navigation on the Mississippi River, any future flow change would gravely harm navigation and negatively impact our nation's economy.

2) The DEIS fails to demonstrate a strong purpose and need for the ENDAWS Project, similar to the vague nature of the proposed Central North Dakota Water Supply Project's need statement. Page 3-61 projects flat population growth of nine North Dakota counties at just over 1% through 2040. Reclamation must demonstrate in the final EIS an actual need for diverted Missouri River water. 2

3) AWO is disappointed to see the ENDAWS geographic scope limited to just three counties in North Dakota. At the very minimum, the geographic scope of the proposed ENDAWS Project should include the remainder of the Missouri River to the confluence, as well as the Middle Mississippi River from St. Louis, Missouri to Cairo, Illinois, due to its dependence on Missouri River flow support. 3

Additionally, the DEIS notes on page 4-1 that Reclamation consulted with a variety of "interest groups." However, neither AWO nor CPMR were consulted during preparation of the DEIS. We urge Reclamation to conduct much broader outreach to Lower Missouri River and Middle Mississippi stakeholders for an accurate assessment of project impacts. 4

Again, thank you for the opportunity to provide comments on the DEIS. Reclamation's commitment to addressing these comments is greatly appreciated.

Sincerely,

Justin Lampert

Justin Lampert
Manager – Midcontinent Office

Response 17-1 Reclamation respectfully disagrees with the commenter's statement that the ENDAWS project would reduce downstream flow support to industries. Reclamation partnered with the U.S. Army Corps of Engineers on the evaluation of potential impact to the Missouri River and related resources. The results of this analysis are presented in Chapter 3 and a summary of the methods and data used in the analysis are provided in Appendix H. The technical report prepared by the Corps of Engineers (*Missouri River Mainstem HEC-ResSim Modeling for the ENDAWS EIS: Final Mainstem Missouri River Reservoir simulation Scenarios Technical Report*) is included as a supporting document and is available on Reclamation's webpage. Since the No Action and action alternatives are nearly identical in the modeling outputs, specifically from Gavins Point and the downstream river gages including Sioux City, Iowa; Omaha, Nebraska; Nebraska City, Nebraska; and Kansas City, Missouri, there would be no measurable difference to further evaluate relating to impacts to the lower Missouri River flows, navigation service flow and navigation season length

Response 17-2 See Response 7-15.

Response 17-3 Reclamation's scope of the Missouri River depletion analysis included the entire Missouri River basin. Reclamation updated the historic, existing, reasonably foreseeable depletions for the entire Missouri River basin. The Corp's ResSim Model depicted river flows downstream of the 6 mainstem reservoirs including Sioux City, IA; Omaha, NE; Nebraska City, NE; and Kansas City, MO.

As stated in Chapter 3 Section 3.6.6, Appendix H, and the Corps 2020 Simulation Scenarios Technical Report, the No Action and the action alternatives were nearly identical in the modeling outputs from Gavins Point and flows at the downstream river gages including Sioux City, Iowa; Omaha, Nebraska; Nebraska City, Nebraska; and Kansas City, Missouri. Since the simulation model did not indicate a difference between No Action and the action alternatives, Reclamation determined the impacts of the action alternatives on the Mississippi River were not a substantive issue to address.

Response 17-4 Reclamation's action to notify the public at the onset of the preparation of the EIS, as well as the distribution of the Draft EIS for public review and comment complied with the provisions of NEPA and Executive Order 13807. Reclamation provided multiple press releases in local and regional publications, mailed scoping letters, published required Notices in the *Federal Register*, held three public scoping meetings, and hosted a virtual public meeting to gather public input on the Draft EIS. Reclamation also established and updates a webpage for the EIS.