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March 26, 2008

Mr. Dennis Breitzman
Northwest Area Water Supply Project EIS
Bureau of Reclamation
P.O. Box 1017
Bismarck ND 58502-1017

Dear Mr. Breitzman:

COMMENTS:
DRAFT ENVIRONMENTAL IMPACT STATEMENT
NORTHWEST AREA WATER SUPPLY PROJECT
DECEMBER 21, 2007

Thank you for the opportunity to provide comments to the Bureau of Reclamation (Bureau) on the Draft Environmental Impact Statement (Draft EIS) recently released on the Northwest Area Water Supply (NAWS) Project. To review and provide comments on the Draft EIS, Manitoba engaged a team of experts comprised of water and wastewater treatment engineers from the firm of Earth Tech Canada Ltd. who also have affiliates in the United States, environmental scientists from the Winnipeg firm of Tetr*ES* Consultants Inc., legal counsel from the Washington DC firm of Garvey Schubert Barer, and our own departmental experts.

The focus of Manitoba's review was on whether or not the Draft EIS satisfied the legal requirements of the National Environmental Policy Act (NEPA), on estimation of the background or non-Project risks of biota transfer relative to Project risks, on estimation of costs for treatment alternatives within the Missouri River Basin that include filtration to minimize the risk of transfer of disinfection-resistant harmful organisms to the Hudson Bay Basin, and on estimation of risks to Manitoba's environment of the Bureau's "no-action" alterative relative to treatment alternatives that include filtration.

First, having undertaken to prepare a full EIS, the Bureau is obligated under NEPA to produce a comprehensive, inter-disciplinary, finely tuned and systematic balancing analysis to assess the risks and consequences of the proposed project. However, the Draft EIS is simply a truncated analysis of four alternative treatment options, narrow in scope, which falls far short of the legal requirements for an EIS under NEPA.

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Second, scientific experts engaged by Manitoba determined that the Draft EIS over-estimated the non-Project risks of biota transfer. A recurring theme throughout the Draft EIS is that the risk of transfer by non-Project pathways is substantial and dominates the movement of water-borne biota of concern. This is simply not true, has been repeatedly refuted, is contrary to the scientific literature, and is well beyond even the most generous application of what might constitute a reasonable series of events. For example, it would require nearly 10,000 years for the combined effect of water birds migrating north in the Mississippi Flyway to pose the same risk as the Project does in any one year. This is one of the reasons why biotic communities have remained largely distinct between the Missouri River Basin and the Hudson Bay Basin despite annual bird migrations, and the reason that the spread of invasive species has greatly accelerated over the last several decades due to human-induced pathways.

Third, scientific experts engaged by Manitoba found that the Draft EIS under-estimated the risks of Project-related risks of biota transfer and improperly concluded that there is little difference between the "no action" alternative and those involving conventional treatment including filtration. The Draft EIS reaches this conclusion by asserting that the transfer of disinfection-resistant organisms to the Hudson Bay Basin by the "no action" alternative will be contained in a fail-safe system comprised of a closed pipeline coupled with an advanced treatment system at Minot. However, the probability of failure resulting in the transfer of viable organisms of concern from the Missouri River Basin to the Hudson Bay Basin on any day may have been under-estimated by two orders of magnitude. That is, the probability of failure on any day is likely 1/100 rather than 1/10,000 as identified in the Draft EIS. Moreover, the Draft EIS misrepresents these risks when expressed over the expected life-time of the Project. Manitoba's scientific experts have determined that, when correctly expressed as a cumulative distribution function integrating on-going risk from one day to the next over the lifetime of the Project, the risk of failure is greater than 10 % at the end of the first year and rises to 60 % at the end of the Project's expected 30 year lifetime.

Fourth, engineering experts engaged by Manitoba determined that costs for conventional treatment including filtration to satisfy Manitoba's biota removal goals as identified in the Draft EIS have been over-stated by 70 to 75 %. A summary of cost comparisons are shown below:

Biota Treatment Alternative	**Construction Costs Draft EIS Estimate** (21% Contingencies)	**Construction Costs Earth Tech Estimate** (21% Contingencies)
No Action	$8,100,000	$8,720,000
Basic Treatment	$68,000,000	$35,930,000
Conventional Treatment (Coagulation/DAF/Filtration/UV/CL_2)	$73,000,000	$45,365,000
Conventional Treatment (Coagulation/In-filter DAF/UV/CL_2)	Not estimated	$43,216,000
Micro-filtration	$90,000,000	$51,420,000

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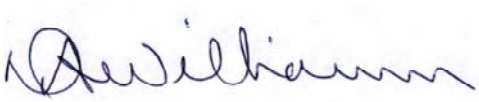
In summary, the Draft EIS is significantly and seriously scientifically flawed, does not satisfy NEPA legal requirements for an EIS and must therefore, be set aside and replaced with a revised Draft EIS which is again circulated for review before finalization.

Manitoba's attached detailed technical comments on the Draft EIS are organized in the following sections:

Section 1: Failure to Satisfy Requirements of the National Environmental Policy Act
Section 2: Potential Biota of Concern
Section 3: Treatability of Potential Biota of Concern
Section 4: Project versus Non-Project Related Biota Transfer Risks
Section 5: Treatment Costs
Section 6: Fundamental Omissions and Detailed Review
Section 7: References
Appendix A1: In Filter DAF Layout Drawings
Appendix A2: DAF-Filtration Layout Drawings
Appendix B1: No Action-Cl_2 Cost Estimate
Appendix B2: Basic DAF-UV-Cl_2 Cost Estimate
Appendix B3: Conventional In-Filter DAF-UV-Cl_2 Cost Estimate
Appendix B4: Conventional DAF-Filtration-UV-Cl_2 Cost Estimate
Appendix B5: Micro Filtration-UV-Cl2 Cost Estimate
Appendix C1: Conventional Treatment Operating Costs

Again, thank you for the opportunity to provide comments. I am hopeful that this information will be helpful as you proceed through the NEPA process. Should you have any questions, please feel free to contact me at the above address, by calling (204) 945-7030, or email at Dwight.Williamson@gov.mb.ca.

Sincerely,



Dwight Williamson
A/Assistant Deputy Minister
Ecological Services Division

c: Don Norquay
David Whorley

Section 1

Failure to Satisfy Requirements of the National Environmental Policy Act

Failure of the Draft EIS to Satisfy NEPA

The Draft EIS is similar to a supplement to an EA rather than a true EIS. Just labeling a document an "EIS" does not make it so. The Bureau suggests that the decision to prepare the Draft EIS related primarily to assuring "maximum public involvement" and had little or nothing to do with the substance of the document (Draft EIS at p. 1-8). However, once the Bureau determined not just to prepare a supplemental EA but instead to prepare a full EIS, it was obligated under NEPA to produce a comprehensive, inter-disciplinary, "finely tuned and 'systematic' balancing analysis" to assess the risks and consequences of agency action (*Calvert Cliffs' Coordinating Committee, Inc. v. AEC*, 449 F.2d 1109, 1113 (D.C. Cir. 1971), *cert. denied*, 404 U.S. 942 (1972)). A truncated analysis of four alternative treatment options simply will not do. From a legal perspective, the Draft EIS is inadequate in at least six fundamental respects:

(1) The Draft EIS Contains an Unduly Narrow Statement of Purpose and Need. Under the regulations of the Council on Environmental Quality (CEQ) and the internal NEPA procedures of the Department of the Interior (Department), the first issue to be addressed in an EIS is the "underlying purpose and need" for the Project (40 C.F.R. § 1502.13; 516 DM 4.9; *see also* proposed 43 C.F.R. § 46.420, 73 *Fed. Reg*. 126, 139 (Jan. 2, 2008)). The Draft EIS states that the proposed action is to "construct a biota water treatment plant (WTP) for the Project to treat source water from Lake Sakakawea before it is brought into the Hudson Bay drainage" (Draft EIS, Executive Summary, at p. 8). It further states that the purpose of the action is to "[a]dequately treat[] the water from the Missouri River Basin," *id*., and the need for the action is just "to comply with the Court's order of February 3, 2005" (*Id*.). The effect of the Bureau's Statement of Purpose and Need is to take the "no Missouri River Project" alternative off the table. In other words, no matter how egregious the consequences of any treatment alternative would be, a Project relying on Missouri River water would still be built.

The Bureau, in support of its approach to the Statement of Purpose and Need, cites Judge Collyer's ruling of February 3, 2005, calling upon the Bureau to prepare "an integrated analysis of the possibility of leakage and the potential consequences of the failure to fully treat the Missouri River water at its source" (Draft EIS at 1-8, quoting *Government of the Province of Manitoba v. Norton*, 398 F. Supp. 2d 41, 65 (D.D.C. 2005)). However, the reference to treatment of Missouri River water in Judge Collyer's opinion was in the context of Judge Collyer's remand to the agency "for completion of a more searching EA" (*Id*.). Once the Bureau decided to prepare a comprehensive EIS, it necessarily undertook broader obligations to meet the requirements of NEPA.

The Bureau's Statement of Purpose and Need is unduly narrow and cannot satisfy NEPA and its implementing regulations. Agencies may not define the objectives of their actions in unreasonably narrow terms, since "[o]ne obvious way for an agency to slip past the strictures of NEPA is to contrive a purpose so slender as to define competing 'reasonable alternatives' out of consideration (and even out of existence)" (*Simmons v. U.S. Army Corps of Engineers*, 120 F.3d 664, 666 (7th Cir. 1997)). Yet, this is precisely what the Bureau has done. Its approach is not sustainable.

The statement in the Draft EIS is notably narrower than the purpose of the Project as stated in the Bureau's Final Environmental Assessment, dated April 2001 (Final EA). The Final EA states (at p. 1) that the purpose of the Project is "to provide a reliable source of high quality water to northwestern North Dakota for municipal, rural and industrial uses." Even though pipeline has been laid from Lake Sakakawea to Minot, this represents only a relatively small percentage of the total Project cost,[1] and thus there is no justification now for the Department to abandon its prior articulation of purpose and need. Similarly, in the Final EIS for the Red River Valley Water Supply Project, dated December 21, 2007 (RRVWSP FEIS), the Bureau stated that the purpose of that project was "to meet the 'comprehensive water quality and quantity needs of the Red River Valley' . . . through year 2050" (RRVWSP Final EIS, Executive Summary, at p. 4). Only such broader statements of purpose and need are consonant with NEPA's requirements.

There is no *a priori* reason to conclude that water sources north of the divide are necessarily inadequate to achieve the Project's purposes. Indeed, it appears that all the communities which will be served by the NAWS Project can be supplied, at least on an interim basis, with water treated at Minot that is derived from in-basin sources (*See* Declaration Michelle Klose, dated February 24, 2006, ¶¶ 5-7, and Declaration of Michelle Klose, dated February 15, 2008, ¶¶ 6-9, in *Government of the Province of Manitoba v. Norton*, No. 1:02CV02057-RMC (D.D.C.)). There seems little question, moreover, that water from in-basin sources treated at Minot could supply the needs of some downline communities for an indefinite period of time (*See* J. Schramm, "NAWS wants Minot water as stopgap measure," *Minot Daily News*, February 23, 2007 (noting the view of Minot Public Works Director that "Minot can easily supply Berthold and Kenmare")). Certainly, given at least this interim ability, it is incumbent on the Bureau to carefully and thoroughly explore whether reliance on in-basin sources is also feasible in the long-term. Finally, it appears from the Final EA that there is sufficient groundwater supply north of the basin divide (Final EA at p. 13).

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[1] Information provided by the Bureau and the State Water Commission to Judge Collyer in March 2005 indicated that the total expenditure for design, construction and inspection on the Project to that point, part of which included construction of pipeline north of the basin divide to Minot, was "[r]oughly $20 million" and that the low bid for the pipeline segment from Lake Sakakawea to the basin divide was $9,578,241 (Declaration of Jaralyn Beek, dated March 22, 2005, ¶¶ 2, 3, in *Government of the Province of Manitoba v. Norton*, No. 1:02CV02057-RMC (D.D.C.)). This compares to a total Project cost estimated at $145 million in 2003 (*Id*., ¶ 2). The remainder of work which has been authorized by the Court since April 2005 basically involves infrastructure north of the basin divide -- the so-called "northern tier" of the Project -- that would be compatible with a Project that relied upon in-basin resources instead of water from Lake Sakakawea (*See* Defendants' Memorandum and Status Report in Support of Joint Motion to Modify Injunction, dated February 3, 2006, pp. 4-6, and Declaration of Michelle Klose, dated February 24, 2006, ¶¶ 5-7; Memorandum in Support of Defendants' Motion to Modify Injunction and Status Report, dated March 3, 2008, pp. 4-5, and Declaration of Michelle Klose, dated February 15, 2008, ¶¶ 5-9).

The Bureau states that "[o]ther surface water and ground water sources were evaluated in the Final EA . . . [and] [t]he Missouri River was identified as the most reliable supply of water for the majority of the Project service area . . . ." (Draft EIS at p. 1-10). That conclusion, however, was based upon a different array of estimated Project costs, which led the Bureau to conclude that reliance upon in-basin sources was far less cost-effective than it appears today. (Compare Final EA at p. 24 with the Draft EIS, Executive Summary, at p. 15). In any event, given the Bureau's decision to prepare a comprehensive EIS, the Final EA's rejection of in-basin alternatives is insufficient to justify a narrow statement of purpose and need.[2] Manitoba submits that the goal of the Project must not be articulated in terms of providing water from any particular source. Rather, the Project's purpose and need must be framed in terms of providing water of sufficient quality and quantity to meet to user needs from whatever appropriate sources may be available.

(2) The Draft EIS Inappropriately Characterizes the "No Action" Alternative. NEPA requires the Bureau to take a full, fair and unbiased look at all reasonable alternatives, specifically including the "no action" alternative (*See* 40 C.F.R. § 1502.14(d); *e.g., Bob Marshall Alliance v. Hodel*, 852 F.2d 1223 (9th Cir. 1988); *Van Abbema v. Fornell*, 807 F.2d 633 (7th Cir. 1986)). The Draft EIS states that the "no action" alternative is simply the treatment process selected by the Bureau in 2001 (Draft EIS at p. 2-5). As a result, the Draft EIS not only does not examine the "no Missouri River project" alternative, but it also does not evaluate in-basin alternatives or the alternative of no project at all. There is thus no valid baseline against which to compare the risks and consequences of various treatment alternatives. Manitoba has consistently taken the position, both before Judge Collyer and in its scoping comments on the Draft EIS, that the approach now taken by the Bureau does not meet the requirements of NEPA. Manitoba recognizes that work undertaken to date and authorized by Judge Collyer to be undertaken in the future essentially involves completion of the entire northern tier of the Project (*see* Declaration of Michelle Klose, dated February 15, 2008, ¶¶ 5-9), and entails expenditure of a substantial percentage of the total cost of the Project. Still, this does not provide a compelling legal reason for the Bureau not to consider an alternative that involves the future without the Project at all.

The Bureau cites the guidance in the CEQ's *NEPA's Forty Most Asked Questions* in support of its position (Draft EIS at p. 2-5). However, it misconstrues the CEQ's guidance. The approach to the "no action" alternative adopted by the Bureau is only appropriate, according to the CEQ, where there are "ongoing *programs* initiated under existing regulations [that] will continue, even as new plans are developed" (*See* www.nepa.gov/nepa/regs/40/1-10.htm (emphasis added)). It has no application in the

[2] Nor, in Manitoba's judgment, can the Bureau narrow its review by "incorporating by reference" all the findings and commitments made in the Final EA, with the exception of "potential impacts and environmental commitments associated with the treatment of Missouri River (Lake Sakakawea) water and operation and maintenance of a biota WTP and related features" (Draft EIS at pp. 1-9). Rather, a fresh analysis is required under NEPA.

context of "federal decisions on *proposals for projects*" (*Id*. (emphasis added)). The NAWS Project plainly falls in this latter category.

Moreover, the courts have stressed that, when there is a failure to analyze fully the consequences of agency action in an earlier environmental assessment, as there has been in the case of the NAWS Project, the agency's prior rejection of a "no action" alternative must be revisited in a new NEPA analysis. As one district court has stressed, "When an agency's initial analysis of alternatives involves a major deficiency . . . , the agency's decision was necessarily undertaken without a proper consideration of relevant alternatives" (*Oregon Natural Resources Council v. U.S. Forest Service*, 445 F. Supp. 2d 1211, 1224 (D. Or. 2006)). In such circumstances, the agency is obligated to consider again "the complete abandonment of the project" (*Id*.). "Fresh consideration of a no action alternative . . . is consistent with the agency's obligation to take a meaningful look at the environmental consequences of the proposed action at a point early enough to contribute to the decisionmaking process, and not simply 'rationalize or justify decisions already made'" (*Id*. at p. 1225).

Similarly, even in the context of plans or programs, the courts have emphasized that it is impermissible for an agency, in formulating the "no action" alternative, to rely upon a prior decision or action that has been held invalid (*See Friends of Yosemite Valley v. Scarlett*, 439 F. Supp. 2d 1074, 1105 (E.D. Cal. 2006)). In the case of NAWS, the basis on which the Bureau had previously proceeded, that is, the Final EA and the Finding of No Significant Impact (FONSI) based thereon, has been declared invalid (*See Government of the Province of Manitoba v. Norton*, *supra*, 398 F. Supp. 2d at p. 65). It is thus equally clear here that the Bureau can not now assume the existence of the Project as its baseline for proceeding forward. As the Court stated in *Scarlett*, "A no action alternative in an EIS is meaningless if it assumes the existence of the very plan that is being proposed" (*Id*. *See also Oregon Natural Resources Council v. U.S. Forest Service*, *supra*, 445 F. Supp. 2d at p. 1223 "[c]consideration of alternatives must include whether a project should be totally abandoned")).

In the broadest sense, if the Project's goal simply is better/higher quality water to users north of the basin divide, as Manitoba has suggested above that it should be, then "no action" here must mean no new project for water supply, whether it relies on in-basin options or the Missouri River option. In fact, this is precisely how the Bureau defined the "no action" alternative in the Final EA. In the Final EA (at p. 24), the Bureau stated that the "no action" alternative would simply "require the ten-county regional area to rely on existing water supplies as well as treatment facilities." Judge Collyer held that the Final EA was inadequate to support the Bureau's decision to proceed with the Project in 2001 (*See Government of the Province of Manitoba v. Norton*, *supra*, 398 F. Supp. 2d at p. 65). Necessarily this means that the Bureau must revisit its decision following completion of the EIS. Among other things, in so doing, the Bureau must consider the validity of its prior determination that only a Missouri River-Minot pipeline would meet the Project goals as then defined.

(3) The Range of Alternatives Discussed in the Draft EIS is Inadequate. It follows from the analysis just set out that that the "range of alternatives" considered in the Draft EIS is inadequate. The Draft EIS only looks at four alternatives: the treatment process adopted by the Bureau in 2001, "basic treatment," "conventional treatment" and "microfiltration" (Draft EIS at p. 2-5). Under NEPA, agencies must "rigorously explore and objectively evaluate all reasonable alternatives" (40 C.F.R. § 1502.14; *see also* 516 DM 4.10A.(1), (2); proposed 43 C.F.R. § 46.415(b), 73 *Fed. Reg*. 126, 139 (Jan. 2, 2008)). The "existence of a viable but unexamined alternative renders an environmental impact statement inadequate" (*Res. Ltd. v. Robertson*, 35 F.3d 1300, 1307 (9th Cir. 1994)).

The Bureau attempts to justify the range of alternatives by claiming the Final EA effectively ruled out in-basin alternatives (Draft EIS at p. 1-10). However, the Final EA itself was an inadequate document (*Government of the Province of Manitoba v. Norton*, *supra*, 398 F. Supp. 2d at p. 65). In such circumstances, its analysis, no matter how thorough or detailed, cannot substitute for that in a comprehensive EIS (*See, e.g.*, *Anderson v. Evans*, 371 F.3d 475, 494 (9th Cir. 2004); *Sierra Club v. Marsh*, 769 F.2d 868, 874-876 (1st Cir. 1985)). For the Bureau to satisfy NEPA's requirements, it needs to look at a minimum at the "no Missouri River project" alternative, in-basin alternatives and the future without any project at all. Only in this way can the risks and benefits of the Project as a whole properly be measured.

(4) The Draft EIS Fails to Consider the Environmental Consequences of Agency Action. Under the CEQ's regulations, an EIS must fully explore the "environmental consequences" of the proposed action and its alternatives (40 C.F.R. § 1502.16). In her opinion of February 3, 2005, Judge Collyer stressed that a signal failure of the Bureau was that there had been "no study of the *consequences* of leakage from the pipeline" (*Government of the Province of Manitoba v. Norton*, *supra*, 398 F. Supp. 2d at p. 59 (emphasis added)). She stated, "Without some reasonable attempt to measure these consequences instead of bypassing the issue out of indifference, fatigue, or through administrative legerdemain, the Court cannot conclude that BOR took a hard look at the problem" (*Id.* at p. 65). She added, "Absent some measurement of the quantum and intensity of any ecological effect . . . , it cannot be said that the risk of environmental impacts is reduced to a minimum" (*Id*.). The Court thus remanded the matter to the Bureau for "an integrated analysis of the possibility of leakage and the potential consequences," (*Id*.), emphasizing, "Manitoba has raised the specter of significant environmental consequences that deserve serious consideration" (*Id*. at p. 68).

The Bureau, in effect, avoids any meaningful analysis of environmental consequences by seeking to limit the geographic scope of the Draft EIS. The Draft EIS states (at p. 3-1), "The geographic scope of this EIS evaluation is limited to the 41 acre construction area of the proposed biota WTP and related features located near Max, North Dakota." Thus, the Draft EIS does not even consider environmental consequences throughout the U.S. portion of the Hudson Bay Basin, let alone consequences north of the U.S.-Canada border. This limited approach to an assessment of environmental consequences is plainly not what Judge Collyer contemplated in her 2005 ruling.

While the Draft EIS contains what it labels a "Risk Analysis" (Draft EIS at p. 4-5 and p. 4-19), the Bureau, contrary to Judge Collyer's ruling, has made no attempt whatsoever to analyze the *consequences* of treatment failure or pipeline leakage. Indeed, notwithstanding Judge Collyer's admonition, the Draft EIS resolutely states, "[N]o Project-related impacts are anticipated under any of the alternatives evaluated" (Draft EIS at p. 4-17). This conclusion may be based upon the assumption that industry standards for low failure rates are met, but the argument is circular, and, in any event, it ignores the fact that standard water treatment plant failure detection systems are not necessarily adequate to detect failure of biota containment. The Bureau's approach to analysis of environmental consequences reflects exactly the problem-avoidance which led to the Court's finding that the Final EA was inadequate.[3]

This omission is particularly egregious, in view of the analyses the Bureau has conducted for other projects. Remarkably, the Bureau notes that the U.S. Geological Survey evaluated both "risks *and consequences* of transferring potentially invasive species" for the RRVWSP, yet, for NAWS, apparently the Bureau only "contracted [the Survey] to evaluate risks of invasive species transfer" (Draft EIS at 3-5 (emphasis added)). Further, even though the RRVWSP Final EIS does not fully assess the environmental consequences of an alien species invasion, for all its faults it does at least discuss *some* consequences of treatment failure or pipeline leakage, even if they are primarily economic rather than environmental (*See* RRVWSP Final EIS at p. 4-125 and p. 4-149 (including both a "Habitat Equivalency Analysis" and a "Regional Economic Impact Analysis")). This shows not only that at least part of the requisite analysis could be done but also that it was readily available. Yet, without explanation or justification, this was ignored by the Bureau.

(5) The Draft EIS Improperly Excludes Discussion of the Canadian Environment. The Draft EIS states that an "evaluation of potential consequences to Canada" is outside the scope of the Draft EIS (Draft EIS, Executive Summary, at p. 10-11). The document thereafter includes no information on Canadian resources that might be affected by the Project or on the nature of the impacts that might occur. The Bureau's decision is insupportable.

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[3] Much of the discussion in the Draft EIS seems designed to downplay the significance of the NAWS Project, *e.g.*, the emphasis on the "higher risks" associated with "non-Project pathways" (Draft EIS at pp. 2-17 and pp. 2-18), or ballast water discharges (Draft EIS at pp. 4-5), and the identification of other inter-basin water transfers in the United States and Canada (Draft EIS at pp. 3-12 and pp. 3-13), all leading to the incorrect conclusion that the Project's risks really do not matter very much. As the Bureau puts it, the strategy of not constructing inter-basin transfer projects "would probably fail within the larger picture, since competing pathways are likely to yield successful species invasions" (Draft EIS at pp. 4-18). However, if invasions are inevitable, one must necessarily ask why have not they already occurred, how is it that the Missouri River Basin and the Hudson Bay Basin are still distinct and vastly different ecological environments and why is control of invasive species a major national environmental priority (*See* www.invasivespeciesinfo.gov/council/main/shtml (National Invasive Species Council homepage))?

Contrary to the approach taken by the Bureau, the best statement of NEPA's obligations is still found in the CEQ's 1997 guidance on this issue. In the July 1, 1997 CEQ "Memorandum to Heads of Agencies on the Application of the National Environmental Policy Act to Proposed Federal Actions in the United States with Transboundary Impacts," the CEQ unequivocally stated, "NEPA requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States" (*See* http://ceq.eh.doe.gov/nepa/regs/transguide.html). The CEQ guidance represents a definitive policy statement concerning agency obligations under NEPA to consider "transboundary impacts" of actions undertaken in the United States. The CEQ guidance offers precisely the sort of "persuasive authority offering interpretive guidance" that courts have relied on from other non-regulatory CEQ issuances (*e.g., Davis v. Mineta*, 302 F.3d 1104, 1125 n. 17 (10th Cir. 2002); *Associations Working for Aurora's Residential Env't v. Colorado Dep't of Transp.*, 153 F.3d 1122, 1127 (10th Cir. 1998)).

Moreover, an analysis of consequences to Canada is dictated by Executive Order 12114, 44 *Fed. Reg*. 1957 (Jan. 9, 1979). Executive Order 12114 obligates federal agencies to undertake an environmental review of agency actions having environmental effects beyond America's borders. While the Executive Order is not judicially enforceable, it does represent binding Executive Branch policy guidance. Further, the Department's own proposed NEPA regulations expressly state that the Department "shall follow" the terms of the Executive Order (*See* proposed 43 C.F.R. § 46.170(a), 73 *Fed. Reg*. 126, 136 (Jan. 2, 2008)). However, the Draft EIS nowhere explains in a meaningful way how it has complied with the directives of the Executive Order (*See* Draft EIS at p. 5-6). In fact, it has not complied with those directives.

The Draft EIS, ignoring the CEQ's guidance and Executive Order 12114, relies upon a 2006 ruling of the District Court of Nevada, *Consejo de Desarrollo Economico de Mexicali v. United States*, 438 F. Supp. 2d 1207 (D. Nev. 2006), in support of its misguided approach (Draft EIS at p. 1-9). This reliance is misplaced. The lower court decision was subsequently vacated by the Ninth Circuit Court of Appeals (*See* 482 F.3d 1157 (9th Cir. 2007)).[4] It thus, has no precedential value.

Leaving aside the law and binding Executive Branch policy, the Bureau's decision to exclude the environment of Manitoba makes no practical sense. The environment affected by the NAWS Project includes the Hudson Bay Basin as a whole, which encompasses both U.S. and Canadian territory, as well as the downstream Missouri River. The Bureau must in such circumstances analyze reasonably foreseeable transboundary effects. Indeed, as a practical matter, impacts within the United States cannot effectively be understood without consideration of correlative impacts in Canada. In this case, in other words, Canada basically provides a mirror into the United States'

[4] Earlier, moreover, in August 2006, the Ninth Circuit had issued an injunction pending appeal, signaling a possible favorable disposition toward the plaintiffs.

own environment which cannot be ignored without fatally undercutting the Bureau's analysis of domestic effects.[5]

Finally, the Bureau, in the RRVWSP FEIS, did consider the environment of Canada to fall within its scope and analyzed at least some consequences of system failure to the Canadian environment (*See, e.g.*, RRVWSP FEIS at p. 4-19, p. 4-21, p. 4-29, p. 4-80, p. 4-81, p. 4-125, p. 4-149, and p. 4-181).[6] The failure to include Manitoba as part of the affected environment in the NAWS Draft EIS is thus, incorrect.

(6) The Draft EIS Fails to Analyze Cumulative Impacts. An EIS must consider "cumulative impacts" (40 C.F.R. § 1508.25(b)(2)) (*See also* proposed 43 C.F.R. § 46.115, 73 *Fed. Reg*. 126, 134 (Jan. 2, 2008)). As defined in the CEQ's regulations, "'Cumulative impact' is 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period time" (40 C.F.R. § 1508.7). The Draft EIS avoids the discussion of cumulative impacts entirely, stating that, because "the additional risk posed by the Project is negligible," in the Department's view, "[N]o cumulative effects are anticipated" (Draft EIS at p. 4-17). This is just another example of the Bureau's failure to acknowledge that system failure is a possibility and, therefore, that significant environmental effects may occur. Yet, if one posits that system failures might occur, it seems clear that there may in fact be cumulative effects, both as a result of the Devils Lake outlet and the RRVWSP. The North Dakota State-financed Devils Lake outlet was completed in the late summer of 2005 and is capable of operating at 100 cubic feet per second, or 72,397 acre feet per year. The RRVWSP, should the Department adopt a Missouri River delivery option, as is its preference (*see* RRVWSP FEIS, Executive Summary at p. 46), could involve the transfer of substantially greater volumes of water (between 113,702 and 142,380 acre feet per year) into the Hudson Bay Basin.

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[5] Ironically, the Bureau does not hesitate to point to inter-basin transfers in Canada (which presumably might impact the Canadian environment), noting, for example, that, "[i]n Canada, more streamflows are diverted out of their basin of origin than any other country in the world," where its intent appears to be to discount the significance of such transfers (*See* Draft EIS at pp. 3-12 and pp. 3-14).

[6] The RRVWSP FEIS states (Executive Summary at p. 15) that the Bureau is undertaking such an analysis for that project as a "voluntary measure." However, the important point is that the analysis can be and has been undertaken for a similar project.

RRVWSP (Final EIS, Executive Summary, at p. 9). Cumulative impacts from these projects could have serious and permanent effects on Manitoba's aquatic environment downstream of the confluence of the Assiniboine River and the Red River, including Lake Winnipeg. The Bureau is obligated under NEPA to assess these effects.

Section 2

Potential Biota of Concern

Consequences of Biota Transfer

Dr. Daniel Simberloff, a current member of the U.S. Invasive Species Advisory Committee, states "*Compared to other threats to biodiversity, invasive introduced species rank second only to habitat destruction…*", and, "*…introduced species are a greater threat to native biodiversity than pollution, harvest, and disease combined*" (Simberloff 2000).

The ecological and economic consequences associated with the expansion of non-indigenous aquatic species are well established and are global in nature. The U.S. Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 -- Title I of Pub. L. No. 101-646 (104 Stat. 4761, 16 U.S.C. § 4701, enacted November 29, 1990) established a broad Federal program to prevent introduction of, and to control the spread of, introduced aquatic nuisance species. By November 29, 1991, the Aquatic Nuisance Species Task Force was directed to identify and evaluate approaches for reducing the risk of adverse consequences from intentional introductions and report to Congress. The Task Force, composed of Federal agencies and representatives of States and regional entities, was to develop and implement an aquatic nuisance species program to prevent their introduction and dispersal in waters of the U.S. The United States Geological Survey Nonindigenous Aquatic Species Database (located on the internet at http://nas.er.usgs.gov) and the Gulf States Marine Fisheries Commission Non-native aquatic species in the Gulf of Mexico and South Atlantic Regions (located on the internet at http://nis.gsmfc.org/) are examples of the attempts to identify and track threatening biota in the U.S. The Nonindigenous Aquatic Nuisance Prevention and Control Act was re-authorized in 1996 and became the National Invasive Species Act (NISA). Internet databases, like the ISSG (2005) Global Invasive Species Database (Managed by the Invasive Species Specialist Group of The World Conservation Union (IUCN) at http://www.invasivespecies.net/database/species), and the National Biological Information Infrastructure (NBII) at http://www.nbii.gov/portal/server.pt, track the expanding nature of this global problem.

The Draft EIS acknowledges the serious nature of the issue of inter-basin transfer of invasive biota and notes (p. 3-7) that "*once established, many diseases may be difficult to control and virtually impossible to eradicate*". This statement contrasts with the stated approach to preventing or mitigating transfer: (p. 4-4) "*Reclamation will develop an adaptive management strategy*" regarding inter-basin biota transfers. To attempt to manage the issue after an inter-basin transfer occurred presents no opportunity to be effective at risk prevention. Prevention of inter-basin biota transfer is the only management option available that can provide effective control.

The Draft EIS notes (p. 1-8) that "*Reclamation was directed by the U.S. District Court … to consider 'an integrated analysis' of the possibility of leakage and the potential consequences of the failure to treat the Missouri River water at its source given the agency's awareness of the treatment-resistant biota.*" Again, the Draft EIS states (p. 1-9): "*…comments suggested Reclamation should take a hard look at consequences … in Canada.*" Notwithstanding the court's prescription, the Bureau concluded in the Draft EIS that "*…this type of evaluation is considered outside the scope of the EIS.*"

This exclusion is particularly important given the stated consequences of a successful invasion, as detailed in Section 5, p. 17 of Linder *et al.* (2005), of up to $655 million in damages to the Lake Winnipeg commercial fishing industry alone. Given additional unspecified damages to the recreational fishery/tourism industry, domestic fishery compensation and other ecosystem costs, it is likely the damages would be in the billions of dollars.

Potential Biota of Concern

In 2001, Manitoba and Canada appealed the Bureau's FONSI issued for the NAWS Project (Manitoba and Canada 2001). To support this administrative appeal, a report was provided to the Bureau which reviewed the findings of an earlier risk assessment of the potential for biota transfer (Tetr*ES* 2001). In addition to whirling disease, fish pathogens of concern were identified as including:

- Infectious hematopoietic septic viral necrosis, enteric redmouth disease (*Yersinia ruckeri*) and *Polypodium hydriforme*.
- Icelanochohaptor microcotyle, Corallataenia minutia, Actheres ambhloptitis and Ergasilus cyprinaceus.

Substantial activity has occurred since 2001 with respect to additional evaluations of the risks associated with inter-basin biotic transfers to the Hudson Bay Basin (USACE 2002; Linder *et al.* 2005). The issue of inter-basin biotic transfers and the associated risks of the spread of invasive species is a growing concern in North America and globally.

The variability in the lists of potential biota of concern (PBOC) for inter-basin transfers compiled for various analyses (as reviewed in Manitoba and Canada 2001, listed in Linder *et al.* 2005, described in various Devils Lake to Red River Basin water transfer studies such as USACE 2002, and derived from personal communications with Dr. Colin Rousseaux of Colin Rousseaux & Associates of Wakefield, Quebec) demonstrates the dynamic nature of this field. These analyses of potential water transfers to the Hudson Bay Basin have identified the following PBOC:

- **Bacteria** – Bacterial Kidney Disease (*Renibacterium salmoninarum*), Furunculosis (*Aeromonas salmonicida*), Streptococcal fish infections (Streptococcus faecalis), Myxobacterial infections (*Flexibacter* spp.), *Pseudomonas* spp., Vibrio infections (*Vibrio* spp.), *Edwardsiella* spp., Mycobacterial fish infections (*Mycobacterium* spp.), Enteric Redmouth Disease (*Yersinia ruckeri*).
- **Viruses** – Infectious Pancreatic Necrosis Virus (*Aquabirnavirus* spp.), Infectious Hematopoietic Septic Viral Necrosis (*Rhabdoviridae*), Viral Haemorrhagic Septicemia (*Novirhabdovirus* spp.), Channel Catfish Virus, Spring Viremia of Carp (*Rhabdovirus carpio*), Infectious Salmon Anemia Virus (*Isavirus* spp.).
- **Parasitic Protozoa** – Flagellates (Phylum *Mastigophora*), Amoebae (Phylum *Rhizopoda*), Coccidia (Phylum *Apicomplexa*), Myxosporidia (Phylum *Myxozoa*, including *Myxobolus cerebralis*), Ciliates (Phylum *Ciliophora*).

- **Fungi** – Branchiomycosis (Branchiomyces sanguinis, Branchiomyces demigrans), Oomycetosis (Achlya spp., Saprolegnia spp.), Ichthyophonosis (Ichthyophonus hoferi), Exophiala spp., Coelomycetosis (Phoma herbarum).

Linder *et al.* (2005) refers to a number of organisms, such as the Missouri River Sturgeon Iridovirus and a "parasitic hydrozoan of acipenserid fishes" (p. 4-38), for which little information exists regarding their biology or treatability. Due to inadequate information, these organisms were not included in the risk analysis and Linder *et al.* 2005 states that "*a qualitative approach may be employed out of necessity*" (p. 4-38).

Given the variables involved and the dynamic nature of invasive species, any prediction with respect to the most likely organisms potentially associated with any water transfer to the Hudson Bay Basin will incorporate a very high degree of uncertainty. The Linder *et al.* 2005 report notes in Section 6.0 "Summary and Conclusions" that *"there is relatively great uncertainty associated with identifying which specific species may be involved in a successful invasion"* and that *"rosters of biota considered to be invasive are continually updated and additional species are being characterized as 'emerging' or 'reemerging' species of concern*." The above list of PBOC is therefore, not comprehensive and is anticipated to evolve as previously identified biota are characterized and as new issues emerge.

Myxobolus cerebralis, a serious fish pathogen found in the Missouri River Basin but not in the Hudson Bay Basin, provides an example of the evolving nature of scientific understanding of non-human related aquatic pathogens. Components of the *Myxobolus cerebralis* life stage were characterized about 100 years ago, and its life cycle components were initially thought to be isolated species until the 1980s (Kent *et al.* 2001). While initially thought to be a disease isolated to the aquaculture industry, it has rapidly spread and has had substantive effects in the natural environment (Linder *et al.* 2005; Gilbert and Granath 2003). The *Myxobolus cerebralis* species is now of primary management concern and is listed in the top one hundred of the world's worst invasive species by the IUCN (The World Conservation Union – ISSG 2005). Gilbert and Granath (2003) also note that the current management effort within aquaculture has shifted from disinfection (primarily due to the disinfection resistant nature of the organism's spores that infect the tubifex worm stages of its life cycle) to one of control of the infestation (by treating for the more vulnerable triactinomyxon or TAM stage that infects the fish host of the life cycle).

Whirling disease also provides an example of the general pattern of management response to emerging aquatic threats. It can be anticipated that new, emerging or re-emerging organisms will appear in the future that will also need to be addressed and, as with whirling disease, it is likely that these threats will not be identified until after their release to the ecosystem. For example, Gilbert and Granath (2003) note since the initial acceptance of *Myxobolus cerebralis* as a separate biotic group, over 1,300 species of Myxozoa have been identified. Nearly all are parasitic on fish and, as a result, are receiving widespread attention (Kent *et al.* 2001).

The causative agent of this critically important fish disease, which is not present in Manitoba waters but is present in upstream American waters, has been an oft-stated pathogen of

concern to Canada and Manitoba. This organism is merely one of thousands of small, spore-forming aquatic pathogens, many of which are robust to typical chemical treatment in water-treatment plants. The Draft EIS states (p. 3-8) that "*susceptible species are generally absent in the Souris River, which is a sub-basin of the Hudson Bay basin. Thus it is highly unlikely that Myxobolus cerebralis could complete its life cycle and cause significant impacts*".

While it is correct to state that the Souris River does not contain susceptible species of fish, the Draft EIS also correctly states "*these spores can withstand freezing and drying and can survive in a stream for 20 to 30 years.*" Because it takes only a little over a week for water to flow downstream from Minot to Lake Winnipeg (which has susceptible fish species and multimillion dollar annual commercial and recreational fisheries), this speculation is refuted by the available scientific information.

The ongoing human influences on the aquatic ecosystems are also a factor altering the nature of invasive species dynamics in the aquatic environment. Galli *et al.* (2001) in "*Water Quality as a determinate of the Composition of Fish Parasite Communities*" found that "*the structure of parasite communities is affected by the water contamination level*." The ongoing modification of water quality by human activity in the Missouri River Basin is therefore, anticipated to result in a change in the fish parasite community and, as a result, an alteration in the type of aquatic threats presented by inter-basin transfer in the future. The identification of the nature of these new threats is complicated by complex interactions of invasive organisms with the environment. For example, the spread of the aquatic plant Eurasian water milfoil to the United States in the 1960s has directly resulted in problems associated with water intakes, but since 1994 has been implicated with Avian Vacuolar Myelinopathy (AVM) affecting herbivorous waterbirds and their avian predators (*i.e.*, eagles, hawks, etc.). Eurasian water milfoil is not the active agent of AVM, but its growth creates an appropriate medium in lakes for concentrated toxic cyanobacterial blooms to occur, resulting in neurotoxin ingestion by waterbirds and bioaccumulation in their predators (Wilde *et al.* 2005) that would not have otherwise occurred. These potential indirect effects of invasive biota are difficult to predict.

Section 3

Treatability of Potential Biota of Concern

Background

The literature concerning the treatment of threatening aquatic biota (other than human pathogens) has been primarily conducted with respect to aquaculture operations. Since many of the threatening aquatic biota have complex life histories, it is important that the treatment system be effective against the forms or stages most likely to be involved in the transmission or distribution of the biota from one water body to the next. Issues of greatest concern will be with respect to microbiological components (*e.g*., viruses, bacteria, protozoa).

The list of PBOC with respect to the transfer of water to the Hudson Bay Basin is likely to expand with each additional review. This dynamic state is driven by growing concerns over invasive species that are currently expanding their range and as new species of concern emerge. The diseases, species and groups listed in Section 2 should therefore, not be considered comprehensive or complete, but should be viewed as a basis for evaluating how effectively the proposed treatment system will address potential invasive biota of concern.

With the objective of understanding how these candidate and example invasive biota would respond to water treatment technologies, a review of the available literature (scientific journals, grey literature reports, and the results of internet searches) was conducted to establish the reported response of relevant invasive biota to a wide range of treatment technologies. The literature review focused on the previously identified candidate lists of invasive biota (PBOC as listed in Section 2), but since this list is not anticipated to represent a comprehensive summary of the actual threat, research, papers and reports detailing the response of invasive biota not yet on the candidate list (including those issues of growing or emerging concern identified by Rousseaux (Rousseaux *pers. comm.* 2005) have also been incorporated into the evaluation of the performance of any treatment technologies (referred to as emerging PBOC).

The most useful sources of information with respect to fish pathogens and parasites were associated with the aquaculture industry. It is indicative of the inherit difficulty to disinfect fish pathogens and parasites that the bulk of the papers and reports are focused on control of disease outbreaks in live fish as opposed to water treatment capabilities to eradicate the causative organisms. In general, control of a disease outbreak in an aquaculture hatchery involves attempts to achieve 1-log to 2-log removals (*i.e.*, 10% - 99%) or inactivation of the causative organism to reduce the frequency of infection in the fish stock to economically acceptable levels. With more aggressive water treatment the eradication of the causative organism is sometimes reported, but more often a 3-log to 5-log removal/inactivation rate is achieved depending on the biota involved. This latter group of research is more relevant to addressing the issues related to treatment system performance, but represents the minority of papers/reports available (Sipple 1983).

This has the practical effect of focusing the discussion of treatability of PBOC to a few core species for which information on the response of the organism to treatment technology is available. While the list of PBOC will continue to evolve (and most likely expand) the paucity of

data on treatment response, particularly on the more obscure organisms, will impair the relative contribution that the addition of species could otherwise have on the practical ability to evaluate the treatment system's capabilities. Although it is important from a risk management perspective to understand the uncertainty these data-gaps create, it is unlikely that the ongoing evolution of the list of PBOC will have a substantive influence on the current ability to evaluate treatment capabilities.

The available information regarding the response of individual PBOC is summarized in Table 1. The table also includes summaries of the response to treatment of a number of species that are not currently listed as a PBOC but serve as useful surrogates for broad classes or groups of organisms or are noted as biota of growing global concern. A number of these surrogates and biota of growing concern were identified by Rousseaux (Rousseaux *pers. comm.* 2005) and have been included in the list as emerging-PBOC of growing status if information on organism response to treatment technologies is available.

Table 2 summarizes the overall performance of filtration, chlorination, ozonation and ultraviolet light on the range of aquatic pathogens listed in Table 1. In general:

(1) Filtration involving sand filters of less than 180 mm particle size achieves less than 2-log removals. Enhanced performance of over 3-log removal is possible if filtration is combined with coagulation, and in particular if electro-coagulation methods are utilized before filtration (Zhu *et al.* 2005).
(2) Residual chlorine concentration of 0.2 - 0.5 mg/L exposure for 10 minute contact time is required to achieve 3-log or better inactivation of vulnerable organisms.
(3) Residual ozone concentration of 0.2 mg/l for a 4-minute contact time is required to achieve a 3-log inactivation of vulnerable organisms.
(4) Ultraviolet dosage of 13,100 mW sec/cm^2 is required to achieve a 4-log or better inactivation of vulnerable organisms. Ultraviolet is relatively ineffective on a number of organisms.

No single treatment technology demonstrated an ability to achieve acceptable removal and inactivation of the overall group of pathogens. Therefore, no one biota can be considered to be a surrogate for all potential threats. The treatability of all classes of aquatic pathogens must be incorporated into the design of a treatment system.

Table 1: Reported Capability of Water Treatment Process to Address the Waterborne Transmission of Invasive Aquatic Biota

Category of Organism	Physical Characteristics	Aquatic Environment Effects	Water Treatment Processes	Reported Removal
BACTERIA				
Aeromonas salmonicida		**PBOC** Fish pathogen causing furunculosis	Ozone for 180 sec at 0.15 to 0.20 mg/l residual ozone for 4-log inactivation**.** UV dose of 2.7 mW sec/cm^2 for 5-log inactivation[2]. 2-7 log inactivation depending on the age of the filter and particle size (sand of 250 μm to 850 μm diameter) [3] In demand free phosphate buffer distilled water ozone residual of 0.01 mg/l resulted in inactivation after 10 minutes exposure. 0.04 mg/l Ozone residual resulted in inactivation in 30 seconds. 0.01 mg/l residual chlorine had no effect after 10 minutes. Increasing chlorine residual to 0.05 mg/l resulted in 2-log inactivation after 10 minutes of exposure. In soft lake water chlorine residual of 0.1 mg/l for 30-60 seconds contact time resulted in inactivation. 0.2 mg/l residual chlorine required to obtain the same result in hard water [24] With filtration (20 μm filter) a UV dose of 13,100 μW sec/cm^2 resulted in 4-log or better inactivation/removal in clear spring water. 2-4 log inactivation/removals occurred at 4,000 to 4,750 μW sec/cm^2 exposure with and without filtration in water containing suspended organic matter [25] 3-log reductions after 4 minutes ozone contact at 0.05 mg/l. 3-log reduction after 1.5 minutes contact at 0.1 mg/l [26]	4-5 log 2-4 log 3-log
Aeromonas hydrophila		**Emerging PBOC** Fish Pathogen	2- to 7-log removal depending on the age of the filter and particle size (sand of 250 μm to 850 μm dia) [3] Maturation of the sand filter important to encourage protozoan grazing of bacteria in filter[3] With filtration (20 μm filter) a UV dose of 13,100 μW sec/cm^2 resulted in 4-log or better inactivation/removal in clear spring water. 2-4 log inactivation/removals occurred at 4,000 to 4,750 μW sec/cm^2 exposure with and without filtration in water containing suspended organic matter [25]	2-7 log 2-4 log
Yersinia ruckeri		**PBOC** Fish pathogen – Enteric Red Mouth Disease	Ozone for 180 sec at 0.15 to 0.20 mg/l residual ozone for 4-log inactivation. UV dose of 2.7 mW sec/cm^2 for 5-log inactivation[2] In demand-free phosphate buffer distilled water, ozone residual of 0.01 mg/l caused inactivation after 30 seconds exposure. 0.01 mg/l residual chlorine had no effect after 10 minutes. Increasing chlorine residual to 0.05 mg/l resulted in inactivation after 30 seconds of exposure [1,24] With filtration (20 μm filter) a UV dose of 13,100 μW sec/cm^2 resulted in 4-log or better inactivation/removal in clear spring water. 2-4 log removals occurred at 4,000 to 4,750 μW sec/cm^2 exposure with and without filtration in water containing suspended organic matter [25] 3-log removal/inactivation after ozone exposure of 4.5 minutes at 0.05 mg/l, 3 minutes at 0.1 mg/l, 2.5 minutes at 0.15 mg/l and 1.5 minutes at 0.2 mg/l [26]	4-5 log 2-4 log 3-log
Pseudomonas fluorescens		**Emerging PBOC** But listed as a fish pathogen of general concern by Rousseaux 2005	2-7 log removal depending on the age of the filter and particle size (sand of 250 μm to 850 μm dia) [3] With filtration (20 μm filter) a UV dose of 13,100 μW sec/cm^2 resulted in 4-log or better inactivation/removal in clear spring water. 2-4 log inactivation/removals occurred at 4,000 to 4,750 μW sec/cm^2 exposure with and without filtration in water containing suspended organic matter [25] 3-log removal/inactivation after ozone exposure of 6 minutes at 0.05 mg/l, 3.5 minutes at 0.1 mg/l and 2 minutes at 0.15 mg/l ozone [26]	2-7 log 2-4 log 3-log

Table 1: Reported Capability of Water Treatment Process to Address the Waterborne Transmission of Invasive Aquatic Biota

Category of Organism	Physical Characteristics	Aquatic Environment Effects	Water Treatment Processes	Reported Removal
Vibrio anguillarum		**Emerging PBOC** Fish Pathogen of growing concern in the aquaculture industry	Ozone for 180 sec at 0.15 to 0.20 mg/l residual ozone for 4-log removal. UV dose of 2.7 mW sec/cm^2 for 5-log removal[2] With filtration (20 μm filter) a UV dose of 13,100 μW sec/cm^2 resulted in 4-log or better inactivation/removal in clear spring water. 2-4 log removals occurred at 4,000 to 4,750 μW sec/cm^2 exposure with and without filtration in water containing suspended organic matter [25]	4- 5 log 2-4 log
Bacillus spp.	Spore size of 1-10 μm	**Emerging PBOC** Wide range of naturally occurring organisms some of which can be fish pathogens	*Bacillus* subtilis spores are resistant to UV light and require 31 mW-sec/cm^2 for a 4-log inactivation[1] Bacillus polymyxa spores resistant to ozone exposure of 1.0 mg/l for over 10 mins [26]	4-log
VIRUSES				
Bacteriohage MS2		**Emerging PBOC** General class of fish pathogens found in natural waters	I. Lime softening[7] within 2 hours achieve more than 4-log inactivation with pH 11-11.5 II. Ultrafiltration achieved 6.5 log removal[1] III. Nanofiltration achieved 5.5 log removal[1, 9 ,10] IV. Granular activated carbon and expanded clay filters, 97-99% hydrophobic and 85-89% hydrophilic particle removal. Noted long term detachment of particles from filter as media ages [4] V. Microfiltration (0.22 μm pore size) achieved less than 0.5 log removal. When used with 6-9 mg/l ferric chloride electocoagulation 4-log removal. Chemical coagulate alone achieved 2-log removal [11]	4-log >6.5-log ~5.5-log 0.8- to 2-log 2-4-log
Infectious Hematopoietic Necrosis Virus (IHNV)		**PBOC** Fish pathogen causing septic viral necrosis	In phosphate-buffer distilled water, 4-5 log inactivation achieved by ozone residual of 0.01 mg/l for 30-60 seconds and in 30 sec by residual chlorine dose of 0.1 mg/l[23]. In natural waters (both hard and soft water sources), a residual ozone dose was difficult to achieve, but the ozone residual of 0.01 mg/l with a contact time of 10 mins yields 4-5 log inactivation. Residual chorine of 0.5 mg/l with a contact time of 5 min in soft water and 10 min in hard water required to achieve inactivation goal.[23]	4-5-log
Infectious Pancreatic Necrosis Virus (IPNV)		**Emerging PBOC** But listed as a fish pathogen of general concern by Rousseaux 2005	In phosphate-buffer distilled water, 4-5 log inactivation achieved by ozone residual of 0.01 mg/l for 10 mins (6 mg s/L) and in 60 sec by residual chlorine dose of 0.1 mg/l.[23] In natural waters (both hard and soft water sources), a residual ozone dose was difficult to achieve, but the residual of 0.01 mg/l with a contact time of 10 mins yielded similar results. Residual chlorine of 0.2 mg/l with a contact time of 10 min in soft water achieved inactivation goal. Inactivation goal was not achieved in hard water.[23] In seawater, a residual ozone dose of 1994 mg s/L yielded a 1-log inactivation[29]. This is considerably higher than for other studies. Complete inactivation (100%) achieved after 25 minutes exposure to 25 mg/l chlorine (fresh water) and 40 mg/l chlorine (salt water) [27] 3-log inactivation after exposure to UV intensity of 246 mJ/cm^2 [29]. 5-log inactivation after exposure to UV intensity of 2,000 μW/cm^2 for 6 minutes (720 mJ/cm^2) and 440 μW/cm^2 for 20 minutes (528 mJ/cm^2) [28].	4-5-log 1-log Complete 3-log 5-log
PROTOZOA AND SIMILAR ORGANISMS				

Table 1: Reported Capability of Water Treatment Process to Address the Waterborne Transmission of Invasive Aquatic Biota

Category of Organism	Physical Characteristics	Aquatic Environment Effects	Water Treatment Processes	Reported Removal
Myxobolus (Myxosoma) *cerebralis*	6-10 μm with 0.25 μm spore wall thickness[13]. TAM stage much larger at about 100 μm[14]. Spore less than 15 μm[24]	**PBOC** Whirling Disease of trout and salmon	180 μm particle size sand filter effective at removing the larger TAM stage. 2-4 log removal in sand filter. Backflushing protocols noted as being very important to prevent remobilization of the TAM from the filter[13,14,15,16,30,31]. TAM infective stage to fish and is fragile[17]. 1-2-log removal using 20 μm mesh flat screens and packed media filters[18]. 1-log inactivation of TAM at 1000 mW sec/cm^2. 1300 – 4000 mW sec/cm^2 needed for TAM inactivation. [12, 17,19,20] 24 μm filter had no affect on reducing incidences of whirling disease in fish. UV treatment of 35,000 and 112,000 microwatt μW sec/cm^2 with and without filtration (20 μm) eliminated the incidences of whirling disease in fish [24]	UV – 1-log Filtration; 2-log
ALGAE-PLANT				
Aphanizomenon spp.		**Emerging PBOC** Ecosystem Disruption	- Dissolved air floatation[21]	1.4-2.0 log
Chodatella spp.		**Emerging PBOC** Ecosystem Disruption	- Test organism used to evaluate treatment system performance. System involved potassium permanganate used in a coagulation process. 1-log removal at pH 4 and improved removals as pH increased. [22]	1-log

Note: (1) Unless specifically stated, filtration is on raw process water without pre-treatment (i.e., coagulation).
(2)"log" removal or inactivation based on percent reduction achieved (i.e., 1-log = 90%, 2-log = 99%, 3-log = 99.9%, 4-log = 99.99% and 5-log = 99.999%.

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Table 2: Summary of Invasive Biotic Response to Treatment Technology

Organism	Filtration*	Chlorination	Ozone	Uv	Comments
Aeromonas salmonicida (Furunculosis)	Sand filter of 250-850 μm particle dia achieved variable removals of 2-7 log Maturation of filter to encourage protozoan grazing important	0.1-0.2 mg/l residual chlorine for 30-60 sec required for 3-4 log inactivation	0.05 mg/l to 0.2 mg/l residual ozone with up to 4 min contact time required to achieve 3-log inactivation	13,100 μW sec/cm^2 for 4-log inactivation and 27,000 μW sec/cm^2 for 5-log inactivation	
Aeromonas hydrophila	Sand filter of 250-850 μm particle dia achieved variable removals of 2-7 log Maturation of filter to encourage protozoan grazing important			Variable 2-4 log inactivation at 4,000-4,750 μW sec/cm^2. 13,100 μW sec/cm^2 resulted in 4-long inactivation.	
Yersini ruckeri		0.05 mg/l residual chlorine required for inactivation (no rate given, but assumed to be better than 3-log)	3-log inactivation achieved with residual ozone of 0.05 mg/l in 4.5 min, to 0.2 mg/l in 1.5 min	13,100 μW sec/cm^2 for 4-log inactivation and 27,000 μW sec/cm^2 for 5-log inactivation	
Pseudomonas fluorescens	Sand filter of 250-850 μm particle dia achieved variable removals of 2-7 log Maturation of filter to encourage protozoan grazing important		3-log inactivation at residual ozone of 0.05 mg/l for 6 min, to 0.2 mg/l for 1.5 min	13,100 μW sec/cm^2 for 4-log inactivation	
Vibrio anguillarum			4-log inactivation at residual ozone of 0.15-0.20 mg/l for 3 mins	13,100 μW sec/cm^2 for 4-log inactivation	
Bacillus spp.			resistant	31,000 μW sec/cm^2 for 4-log inactivation	
Bacteriophage MS2	Poor removal except at nano-filtration (less than 0.22 μm pore size) level.				2-log removed with chemical coagulation 4-log removed with electro-chemical coagulation
Infectious Hematopoietic Necrosis Virus		4-5 log inactivation in residual chlorine of 0.1 mg/l for 0.5 min in distilled water 4-5 log inactivation in natural soft and hard waters required residual of 0.5 mg/l for 5 and 10 mins respectively.	4-5 log inactivation in ozone residual of 0.01 mg/l for 0.5 to 1 min		
Infectious Pancreatic Necrosis Virus		Residual chlorine of 0.2 mg/l for 10 min achieved 4-log inactivation in soft water. Inactivation goals not achieved in hard water	4-5 log inactivation in ozone residual of 0.01 mg/l for 10 min		5-log inactivation achieved at 2,000 μ/W/cm^2 for 6 mins and 440 μ/W/cm^2 for 20 mins
Myxobolus cerebralis	1-2 log removal of larger TAM life stage in 20 μm filter. Backflushing protocols important to prevent remobilization of spores in 180 μm particle size sand filter			35,000 μW sec/cm^2 with 20 μm filtration and 112,000 μW sec/cm^2 without filtration to achieve better than 4-log removal/inactivation	

* Filtration does not include pre-treatment by coagulation unless specifically stated

Beginning on p. 2-13 of the Draft EIS, a comparison is provided of the relative performance and costs of the various treatment options, as indicated in Table 2-6 extracted from the Draft EIS and reproduced below.

Table 3. Summary of Design Capability and Construction Costs by Alternative (Table 2-6 from the Draft EIS).

Biota Treatment Alternative	**Viruses** (SDWA Requirement 4 log)	***Cryptosporidium*** (SDWA Requirement 2 log – bin 1) (SDWA Requirement 5.5 log – bin 4)	***Giardia*** *(SDWA Requirement 3 log)*	**Construction Costs** (0% Contingencies)	**Construction Costs** *(21% Contingencies)*	**Annual OM&R Costs**
No Action	≥4	0	≥3	$6,600,000	$8,100,000	$232,000
Basic Treatment	≥4	≥3.5	≥3	$55,000,000	$68,000,000	$1,781,000
Conventional Treatment	≥4	≥5.5	≥3	$60,000,000	$73,000,000	$1,789,000
Microfiltration	≥4	≥5.5	≥3	$74,000,000	$90,000,000	$2,076,000

The Draft EIS then states:

> *"Table 2.6 shows that the No Action Alternative achieves adequate inactivation credits for viruses and Giardia, while it does not meet the SDWA standard for Cryptosporidium. The Basic Treatment Alternative achieves the log reduction requirements for viruses and Giardia, but only meets the Cryptosporidium inactivation requirements under bin 1 (2.0 credits required) and bin 2 (3.0 credits required). It does not meet the bin 3 and bin 4 requirements for Cryptosporidium which are 4.5 and 5.5 log reduction credits, respectively. The Basic Treatment Alternative does not include filtration so all Cryptosporidium reduction credits are provided through inactivation (disinfection) rather than removal (filtration)."*

The Draft EIS compares the inactivation of viruses and the total removal/inactivation of *Giardi*a and *Cryptosporidium*. However, it does not identify how much of the total is achieved through particle removal or how much is achieved through inactivation by either UV or chlorine disinfection. There is no basis for the supposition that a process that achieves these levels of inactivation/removal of *Giardi*a and *Cryptosporidium* is capable of similar performance against all threatening biota. Indeed, neither chlorine nor UV disinfection is effective against the spore form of *Myxobolus cerebralis*, and protection against this biota can only be afforded through the removal of discrete particles (that is, by filtration).

The following table provides a more detailed comparison of the performance of all treatment options.

Table 4. Earth Tech's Estimated Treatment Performance for Treatment Alternatives.

Unit Process	Option 1 No Action Chlorine	Option 2 Basic Coagulation Settling – UV -chlorine	Option 3 Conventional In Filter DAF-UV-chlorine	Option 4 Membranes Coagulation - Immersed Membrane-UV-Chlorine
Process Performance				
Removal of all organisms including disinfection-resistant pathogens such as *Myxobolus cerebralis*	0 log	0.5 log	3 log	3-4 log
Inactivation by UV of organisms with similar characteristics as *Giardia* and *Cryptosporidium*	Giardia 2-3 log Crypto –0 log	2 to 3 log	2 to 3 log	2 to 3 log
Removal/Inactivation of viruses with characteristics similar to Hepatitis A	4 log	4 log	>4 log	>4 log
Turbidity	>1.0 and < 5.0 NTU	>1.0 and < 5.0 NTU	<0.1 NTU	<0.1 NTU

Thus, it can be seen that the removal of disinfection-resistant organisms such as *Myxobolus cerebralis* is significantly less than indicated in Table 2.6 of the Draft EIS.

Section 4

Project versus Non-Project Related Biota Transfer Risks

Comments on the Logic and Approach Relied-Upon by the Bureau in its Draft EIS

The key components of risk analysis presented within the Draft EIS include the following:

- Baseline risk of biotic transfer without the Project.
- Comparative risk of Project operations leading to biotic transfer.
- Reduction of risk through treatment.
  - No action
  - Basic treatment
  - Conventional treatment
  - Microfiltration

The logic and assertions of the Draft EIS are identical to Bureau's position in 2001, as expressed in both the 2000 Comparative Risk Analysis (CRA) and the Final EA. As stated by Manitoba and Canada (2001) on p. 14:

> "*The underlying logic in the Comparative Risk Analysis (CRA) is that the probability of invasive species being transferred through non-project pathways is high relative to the project, that these risks will remain stable in the future, and therefore, the incremental risk posed by the NAWS project ought to be acceptable.*"

Notwithstanding Manitoba's and Canada's detailed critical analysis of the CRA in August 2001 (Manitoba and Canada 2001) and Judge Collyer's remand of the Final EA to the Bureau for additional assessment, the underlying logic within the Draft EIS remains similar, if not identical, to that espoused in the original CRA, namely that the baseline risk of biotic transfer is greater than the risk of transfer through Project operations (p. 4-17 Draft EIS). The Bureau then mistakenly infers that because "*no Project-related impacts were anticipated under any of the alternatives [water treatment protocols] evaluated*" (p. 4-17 Draft EIS), advanced water treatment within the Missouri River Basin is unnecessary because it would not significantly reduce the incremental risk of NAWS.

The review presented below restates the 2001 review of the CRA (Manitoba and Canada 2001), and outlines arguments that indicate flaws in the current Draft EIS related to deficiencies in methods and logic, misinterpretation and misrepresentation of data and information, and lack of supporting documentation. This review demonstrates that:

- The risk of baseline biotic transfer is currently decreasing;
- The risk of biota-transfer is lower than through Project operations;
- Treatment methodologies differ significantly in effectiveness.

Stability of Non-Project Risks of Biota Transfer into the Future as Mistakenly Identified in the CRA

The underlying logic within the CRA that the risk of species invasion from non-project pathways will remain stable into the future is, "…*significantly flawed because the historical levels of risk posed by non-project pathways have also been identified as being unacceptable and numerous actions are underway by jurisdictions in the project region… to reduce these existing levels of risk*." (p. 14, Manitoba and Canada 2001).

Examples of actions to reduce biotic transfers include the following:

State of Minnesota Actions:

- Enactment of invasive species legislation
- Provision of core funding for relevant programming
- Public education regarding invasive species
- Inspection and enforcement
- Mitigation of invasions

Province of Manitoba Actions:

- Public awareness campaign regarding dangers of invasive species
- Highway billboards for public education
- Enactment of invasive species legislation
- Border inspections
- Establishment of monitoring programs
- Participation on various panels and councils

The effectiveness of these programs has been acknowledged in the State of North Dakota and it has been stated that, "… *knowledge about aquatic nuisance species is increasing and behaviour patterns are changing, thus reducing the risk of transferring unwanted aquatic species through the unknown actions of boaters and anglers*" (Manitoba and Canada 2001, p. 17).

It continues to be egregious therefore, for the Draft EIS to argue that because past practices produced a risk of non-Project inter-basin transfer of biota, no future projects require implementation of system designs and operating practices effective in preventing inter-basin transfer of biota. This argument is especially flawed because past activities have been acknowledged as being harmful, and processes have been implemented to reduce, mitigate and eliminate, wherever possible, the harmful effects of these historical non-Project practices and activities, as the State of North Dakota has recognized.

Over-Estimation of Risk of Non-Project Pathways as Mistakenly Identified in the CRA

The CRA dramatically overstated the risk of inter-basin transfer of invasive species through non-Project pathways (Manitoba and Canada 2001). Overestimated rates of transfer were stated for the following invasive-species vectors:

Bait Bucket Transfer of Organisms:

- The number of anglers who use live bait at any given time;
- The number of live-bait anglers who returned to the Hudson Bay Basin from the Missouri River Basin with bait;
- The quantity of live bait originating from the Missouri River Basin;
- The number of anglers who would empty the bait box into the Hudson Bay Basin.

Boats, Trailers and Tackle:

- The number of boats crossing dividing lines between basins;
- The number of anglers using boats;
- The number of anglers in each boat;
- The amount of water transported by each boat and angler;
- The number of live organisms transported per event.

Birds - Hydraulic and Digestive Tract Transfer:

- The number of organisms that each bird could transport in water;
- The survival rate of transported organisms;
- The distance that passerine birds travel;
- The ability of carnivorous birds to transport organisms in their digestive tract.

The cumulative effect of all of these overestimates was a calculated risk of inter-basin transfer from non-Project pathways that was found to be approximately 100,000 times greater than could reasonably be estimated and justified (Manitoba and Canada 2001).

Under-Estimation of Risk of Project Pathways as Mistakenly Identified in the CRA

The CRA dramatically underestimated the risk of inter-basin transfer of invasive species through Project pathways (Manitoba and Canada 2001). Underestimated rates of transfer were stated for the following invasive-species vectors:

Pipe Failure:

- The CRA underestimated the risk of catastrophic pipeline failure by 10,000 times;
- The probability of at least one failure per year was therefore estimated as 69%, not 0.014%;
- The probability of at least one failure over the life of the Project was therefore estimated as approaching 100%, not 76%.

The CRA considered the risk of low-level pipeline failure as not significant, but in fact, "*… even the best water systems have unaccounted-for-water of at least 5 %*" (p. 23, Manitoba and Canada 2001). Thus, the CRA ignored data on pipeline-breach frequency promulgated by the Bureau itself by failing to use its own data in its own publications in deriving its estimate.

Treatment of Filtration Backwash:

- Unaccountably, the CRA does not consider the handling of filtration backwash in its risk assessment. This is a significant omission because it is expected that the backwash would concentrate any harmful organisms and because the backwash would be created and disposed of in the Hudson Bay Basin.

The cumulative effect of these underestimates was a risk of inter-basin transfer from Project pathways calculated to be 100,000 times less than what could reasonably be justified (Manitoba and Canada 2001).

Manitoba and Canada (2001) concluded that:

- *"the CRA over-estimates the potential for non-project pathway transfer of organisms per year by 100,000 times."*
- *"the CRA under-estimates the potential for the NAWS project pathway transfer of organisms per year also by 100,000 times."*
- *"the NAWS project will exceed the non-project transfer rate by 10,000 times."*

The analysis provided in Manitoba and Canada (2001) and summarized above has not been refuted, addressed, or even cited, in the Draft EIS.

Simply ignoring these failings of the Final EA and the Draft EIS in no way invalidates the criticisms. Further, ignoring these technical challenges and merely asserting repeatedly, without substantiation, that Project risks are exceeded by non-Project risks fails to respond to the carefully phrased language and prescription of the 2005 opinion by Judge Collyer.

Examination of Baseline Risk of Biota Transfer in the Draft EIS

As indicated above, the Draft EIS states that competing non-Project pathways provide for the majority of risk associated with inter-basin transfer (Draft EIS p. 4-17). This position is incorrect as shown below:

Analysis of Draft EIS Claims Regarding the Relative Risk of Non-Project Pathways for Inter-basin Biota Transfer

The Draft EIS makes repeated unreferenced and unsupported statements regarding the risk of biotic transfer between the Missouri and Hudson Bay Drainage Basins, including the following:

- P. 2-17 – "*depending upon the alternative and the species, the risk of transferring microscopic invasive species through non-Project pathways is higher to much higher than the Project-related risk*" – no justification or reference provided.
- P. 2-18 – "*Overall, there is a high risk of biological invasions through non-Project pathways*." – no justification or reference provided.
- P. 4-5 – "*ship ballast water and other pathways related to international commerce will continue to pose a higher risk of biological invasions than existing or proposed interbasin water transfers*" – no justification or reference provided.
- P. 4-13 – "*Additionally, past experience shows that invasion of the Hudson Bay basin through non-Project pathways from the Missouri River basin or from other adjoining basins are almost certain to occur*." – no justification or reference provided.
- P. 4-15 – "*Overall, the risk of transferring invasive species through non-Project pathways would be very high*". – no justification or reference provided.
- P. 4.16 – "*Overall, the risk of transferring invasive species through non-Project pathways would be high, but the risk would vary substantially from species to species, depending on the life history attributes and the number and magnitude of potential invasion pathways*". – no justification or reference provided.
- P. 4-16 – "*Overall, the risk of a biological invasion occurring through non-Project pathways would be much greater than the risk due to Project pathways for most potentially invasive species*" – no justification or reference provided.
- P. 4-17 – "*Overall, the risk of a biological invasion occurring through non-Project pathways would be much greater than the risk due to Project pathways for most potentially invasive species*". – no justification or reference provided.

In each case, the statements are speculative and are unsupported by any logical argument or referenced study. The Draft EIS does note (p. 4-13) that "*because of the number and complexity of competing pathways, it is difficult to quantify the risk of transferring invasive species through non-Project pathways*". This uncertainty is in contrast to, and logically refutes, the Bureau's repeated assignment of "high" or "very high" risk as listed above.

The Draft EIS does refer (p. 4-13) to Linder (2007 which "*developed a simple model to analyze competing pathways (Project and non-Project) as risk factors influencing biological invasions*" and notes (p. 4-6) that this "*is included as a supporting document to this EIS.*" At no time however, does the Draft EIS specifically reference the results of Linder (2007) to support its assessment or any of its findings.

The Draft EIS does not specifically reference the sections on inter-basin transfer contained in Linder (2007) that conclude (p. 89) "*from a competing risk perspective, the sum of these multiple aquatic pathways qualitatively decreases the probability of controlled interbasin water transfers from dominating the overall risk of invasion*". This statement however, says nothing about the quantitative risks of inter-basin transfers. The Draft EIS claims that "*the risk of biological invasion occurring through non-Project pathways would be much greater than the risk due to Project pathways*" (p. 4-17 Draft EIS) is therefore, not supported by the information presented in Linder (2007) and is therefore, speculative and not science based.

The Linder (2007) report documents only direct comparison of the risks of inter-basin biota transfer associated with Project and non-Project pathways in the charts on pp. 93 and 94. In this case, the Project was assumed to incorporate "*a highly managed control system, operating under specified conditions consistent with a 'best management practice' implementing a 'best available technology' to manage risks*", while the non-Project Pathways (#2 to #10) were neither defined, nor described, nor justified by supporting references (pp. 90-91). This stated deficiency was necessary because, as the author states, "… *there are few fully characterized quantitative data needed to develop an empirically-based probabilistic analysis of invasion events*…" (p. 87). The "preliminary evaluation of risk factors" (p. 90) presented in Linder (2007) is therefore, necessarily a speculative, qualitative analysis without rigorous quantitative or technical merit.

The Draft EIS statements regarding non-Project versus Project pathways and risks are therefore, unsupported, speculative, and contrary to the findings of a key Draft EIS supporting documents (that is, the report of Linder 2007).

<u>Non-Project Pathways and Inter-basin Biota Transfer</u>

The Draft EIS (pp. 3-10 to 3-12) lists twenty pathways by which invasive species can be transported to the Hudson Bay Basin. Many of the pathways listed are not relevant to the issue of the potential inter-basin movement potentially associated with this Project. For example:

- Ballast water from international shipping - even though no international shipping historically, currently, or is likely in the future, to occur between the Missouri River Basin and the Hudson Bay Basin, the Draft EIS repeatedly discusses this as a potential pathway:
  - p. 3-3 "*ship ballast water*"
  - p. 3-4 "*current Coast Guard regulations require ships to exchange ballast water at sea*", "*beginning in 2009 ships will be required to treat ballast water*", *and " beginning in 2012 ballast water discharge would have to contain less than one living organism per 10 cubic meters*"
  - p. 3-10 "*Ballast Water*"
  - p. 3-12 "*Researchers suspect they arrived in the Great Lakes via ship ballast water*"
  - p. 4-5 "*there is currently no treatment standards for ballast water*"
  - p. 4-5 "*strictest standards proposed for ballast water*"
  - p. 4-5 "*ship ballast water and other pathways related to international commerce will continue to pose a higher risk of biological invasion than existing or proposed interbasin water transfers*"
- Vehicular Transport – important with respect to terrestrial plants and diseases, but not relevant to aquatic biota.
- Ornamental Plants.
- Domestic Animals Gone Wild.
- Moving and depositing fill in wetland.
- Land/Water Alteration.
- The Draft EIS (p. 3-8) also includes an unlabeled figure apparently taken from an online "wikipedia" site. The figures includes the statement "*Piscivorous birds act as vectors between water bodies*", but this is not referenced and is contrary to available scientific literature that have not identified birds as an established transport vector between

waterbodies (as summarized by the Bozeman, Montana-based Whirling Disease Foundation information and research summarizes (available at: www.whirling-disease.org).

Actual Non-Project Biota Transfer Risk

To examine the Draft EIS' often repeated speculation that "*the risk of biological invasion occurring through non-Project pathways would be much greater than the risk due to Project pathways*" (p. 4-17 Draft EIS), several simple scenarios can be explored quantitatively and compared with the first assumption regarding the Project, namely that:

- Although the Project's maximum daily design capacity is 26 million U.S. gallons per day (Draft EIS, p. 2-3), it could therefore, theoretically transport up to 35.9 million cubic metres per year. However, it is permitted to withdraw only 15,000 acre-ft per year or 18.5 million cubic metres per year (Draft EIS p. 1-1). While the Draft EIS lists many pathways of biota movement (*cf* pp. 3-10 to 3-12), only a few are applicable to the question of inter-basin movement of aquatic biota of concern by aquatic pathways. These are examined logically below using the more conservative estimate of the Project transporting 18.5 million cubic metres per year:

Waterbirds:

The relative risk of waterfowl and other waterbirds transporting water compared with the transfer risk from the NAWS Project can be initially explored using a simple hypothetical scenario, as follows (Note: numbers are based on professional judgment):

- Assuming there are 10 million waterbirds that migrate north into Manitoba;
- Assuming the average mass of each bird is 2 kg;
- Assuming each and every bird stops at the Missouri River and picks up 10 % of its body mass as raw untreated water (although it is unlikely any waterbird would be capable of making any long-distance flights with such a load);
- Assuming each bird then successfully flies to the Hudson Bay drainage without losing any of the water (due to factors such as evaporation or leakage, which is highly unlikely).

It would require nearly 10,000 years, using this simple calculation, for the combined effort of all these water birds migrating north in the Mississippi Flyway to transport the same volume of water from the Missouri River drainage to the Hudson Bay drainage as the Project will transport in one year.

Boats and Bait Buckets:

Regarding the relative risk of movement of water from anglers' live bait buckets, and in the bilge pump/sumps of boats, compared with the transfer risk from the NAWS Project:

- Assuming each bucket or boat transports about 2 US gallons, or 10 litres of water, it would require 1.85 billion boats/buckets per year (all moving north only) to transport the same

volume of water from the Missouri River to the Hudson Bay drainage as the Project will transport in one year.

Weather Systems like Tornadoes:

There is no information available to quantify how much water a tornado could lift, or how far it would carry it. So for discussion purposes:

- Assuming a tornado can lift a 70 tonne truck and therefore, assuming that it can successfully carry this load as water (without any loss) from the Missouri River to the Hudson Bay Basin, it would require over 250,000 tornadoes per year, or on average, nearly 750 per day, or one every two minutes to transport the same volume of untreated water between the basins as the Project does in a single year.

The assertion that non-Project aquatic pathways are substantial and dominant vectors of movement for water-borne potential biota of concern (p. 4-17 Draft EIS) has been repeatedly refuted, is contrary to the scientific literature, and is well beyond even the most generous application is reasonably possible.

Risk of Project Operations Failure

The Draft EIS contains a risk analysis of Project Operations Failures (pp. 4-6 to 4-9, Draft EIS) and suffers from two fundamental problems:

- The formulation of the risk analysis is incorrect;
- The risk analysis is incomplete.

Each of these is discussed below.

Incorrect Risk Formulation

In presenting the formulation, it is not clear which of the four alternatives is being analyzed, and it is therefore implied that each of the biota treatment alternatives is equivalent. This is incorrect because only two of the pre-treatment alternatives ("conventional treatment" and "microfiltration") are capable of preventing passage of spore-forming pathogens (p. 4-14 Draft EIS). The "no action" and "basic biota treatment" options do not have filtration and therefore, will not prevent spore-forming pathogens from passing through the pre-treatment to the conveyance pipeline across the Continental Divide and then to the Minot WTP. This is critical, as the risk analysis defines the failure of *"interruption of the treatment process at the biota WTP **and** a breach in the conveyance pipeline to the Minot WTP"* (p. 4-6 Draft EIS). The risk analysis formulation thus, requires the failure of both parts of the system before a system failure occurs. This is not correct, in that if the "**No Action**" or the "**Basic Treatment**" option is selected, then only a failure of the conveyance pipeline is required in order to transfer spore-forming pathogens across the divide into the Hudson Bay watershed.

This incorrect formulation could therefore, easily underestimate the probability of failure on any given day by the power of two. For example, system failure within the initial year is presented as 1 in 10,000 per day, but is likely due to the probability of failure of two systems, each with the failure of 1 in 100 (*i.e.*, 1/100 x 1/100 = 1/10,000). Therefore, the results currently presented in the Draft EIS as 1 chance in 10,000 are actually risks that will occur in the range of 1 chance in 100 per day.

Incomplete Risk Analysis

The Draft EIS' presentation of the probability distribution function (PDF) is misleading in understanding the true risk of inter-basin biota transfer. The probability distribution function illustrated as the "bathtub curve" (p. 4-8 Draft EIS) presents the risk of failure on any single day during a 30-year period. The risk-analysis results however, should also be presented as a cumulative distribution function (CDF) (NIST 2008) that integrates the failure from one day to the next throughout the entire time period. Such projections of risk over multiple-decade time steps are a now-standard approach to risk-based engineering. In the case of engineering for food-centred projects, which share with the NAWS Project a concern for low-risk, high-consequence events, such projections are required by regulation (USCOE 2006a).

The Draft EIS does not present the daily probability in a tabular format, allowing ready recalculation of the data to ascertain the cumulative probability of risk. However, a graph shown as Figure 4.3 (p. 4-8 Draft EIS) provides sufficient information to develop a CDF. Using a cumulative distribution function approach, the probability of system failure within the first year is greater than 10%, and rises to close to 60% by the end of the 30-year period (Figure 1). The risk of failure for each day is compounded as the time moves from the first to the last day of the period of interest. The presentation of the "bathtub curve" on Figure 4.3 of the Draft EIS is therefore misleading, to the public and decision-makers alike.

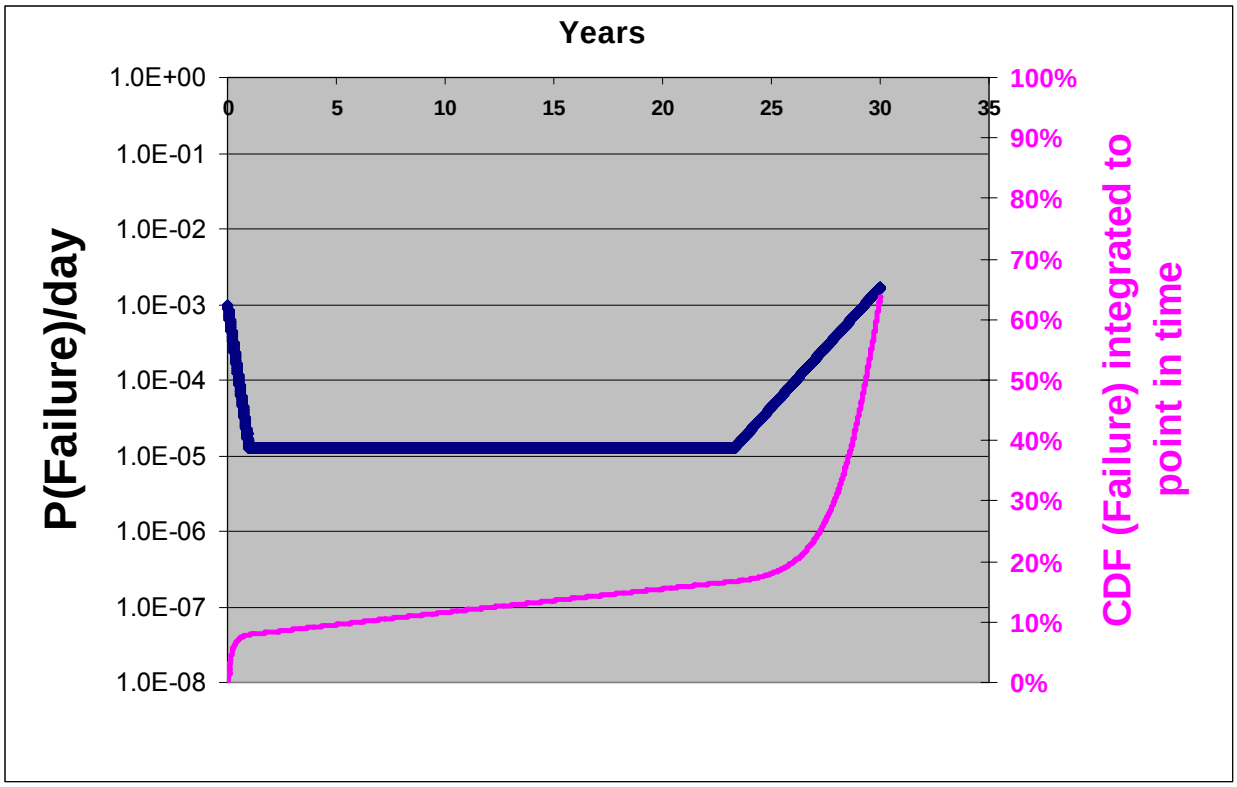

Figure 1. Cumulative distribution function plotted against the Draft EIS' probability distribution function showing expected failure rate over the lifetime of the NAWS Project.

Precedents for Cumulative Risk Analyses

There is a host of literature, and a growing series of databases, documenting the consequences of various catastrophes involving water, particularly national catastrophes. Such events as Hurricane Katrina in 2005 have created greater impetus for the science of risk assessment and the need to ensure the most statistically robust approaches to understanding relative risks, incremental risks, and Project risks as they can relate to the types and magnitudes of various consequences. Statistical analyses and data manipulation to create stochastic and related models for understanding risks from, and the consequences of, major catastrophes are part of a relatively young, but strongly growing science since about 1990 (Muir-Wood 2006). Muir-Wood notes:

> *"As events happen, the sciences within the models becomes improved and, in particular, the vulnerability functions that relate the hazard to the damage and loss are refined."*

Thus, the primary statistical treatments and the science of risk assessment are becoming increasingly important and more sophisticated. Noteworthy in this regard are the forensic findings emerging in the aftermath of Hurricanes Katrina and Rita and accumulating in the litigation of water-management-system failure events where engineering-design standards were ignored, or where the engineering duty of care was insufficient (for a listing of legal cases for

just one consulting hydraulics engineer specializing in forensic analyses of design or system-operations failures, see Mr. R. van Bruggen, P.E., President of Water Resources Consulting Services Inc., available at www.waterengr.com/wrce/litigationsupport.html). Among many other conclusions, these studies, findings and judgments are now calling for more statistically robust estimates of risk (Muir-Wood 2006), more precision in risk analyses, improved incorporation of a broader range of risk analyses in improved public-sector system-design engineering (e.g., van Heerden 2005; Steedman 2006), and better risk communications to the public, decision-makers, water-resource engineers, and a variety of oversight bodies (RMS 2005).

The simplistic approach to risk analyses that underpinned public works designs developed in the 1960s and 1970s, and even the 1980s, are now roundly criticized as risk analysts, forensic accountants, and engineers engaged in forensic understanding of failed projects testify and assert (van Heerden 2005; RMS 2005; USCOE 2006a).

The Draft EIS' reliance on a simple statistical technique, such as the PDF presented in the Draft EIS, is therefore completely inconsistent with the current state of risk-assessment science and risk-based engineering for public water-management systems. In this regard, please see the engineering-decision support available for flood-control engineering which shares with the NAWS Project, a concern for "low probability-high consequence" failure events available from the US Army Corps of Engineers, Hydraulic Centre (HEC). This support includes regulations and policies (e.g., ER 1105-2-101 Risk Analysis for Flood Damage Studies available at: www.usace.army.mil/publications/eng-regs/er1105-2-101/toc.htm, engineering-design manuals (*e.g.*, EM 1110-2-1619 "Risk-Based Analysis for Flood Damage Reduction Studies" available at www.usace.army.mil/publications/eng-regs/manuals/em1110-2-1619/toc.html), engineering software "HEC-FDS Flood Damage Reduction Analysis User's Manual" available at www.usace.army.mil/software/hec/fda/hec-fda-documentation.html, along with other forms of guidance (ETL 110-2-556) "Risk-Based Analysis in Geotechnical Engineering for Support of Planning Studies" available at www.usace.army.mil/publications/eng.

Effectiveness of Alternative Treatment Options

The projected effectiveness of the treatment alternatives are listed in the Draft EIS (p. 4-14) as follows:

- *"… in ascending order, No Action < Basic Treatment < Conventional < Microfiltration"*.

The implication of the statement is that because the various treatment risks are defined as "low to very low," all of the treatment alternatives present a similar risk of biotic transfer, and that a "low to very low" rating is acceptable. The Bureau mistakenly relies upon this assumption to support the Draft EIS conclusions as stated at p. 4-17) that "…*no Project-related impacts are anticipated under any of the alternatives evaluated*." This assumption is inconsistent with the statements and findings of a key document cited by the Draft EIS (Linder 2007) (p. 135):

- *"Technical findings summarized in this report do not recommend one control system over another with respect to specification or configuration, nor do these findings specify whether risks are acceptable or not acceptable"*.

The Linder analysis, cited in and implied as justifying conclusions or findings in the Draft EIS about the relative effectiveness of treatment options, does not, in fact, offer such support. The Draft EIS (p. 4-9) goes on to note that "*Whirling disease myxospores are highly resistant.*" It further acknowledges (p. 4-10) "*…that source water fully treated in the Missouri River basin compliant with LT2 (as in the Conventional Treatment Alternative and the Microfiltration Alternative) would present negligible risks for transmission of whirling disease.*" By its own logic, therefore, the Draft EIS implies that the No-Action and Basic Treatment Option do not satisfy the definition of "effective treatment" required to justify the revised FONSI. Further, Linder *et al.* (2005) did not include the "No Action" and "Basic Alternatives" as within the category of effective treatment options.

Risk of Biota Transfer Following Pipe Failure

In July 2005, the United States Geological Survey (USGS) released a document entitled "*Risk and Consequence Analysis Focused on Biota Transfers Potentially Associated with Surface Water Diversions Between the Missouri River and the Red River Basins*" (Linder *et al.* 2005). A supplemental report was also submitted to the Bureau of Reclamation in September, 2005. Linder *et al.* (2005) notes that:

- "transfers of waterborne disease agents and cyanobacteria (or their toxins) would be associated with greater risks, particularly if control systems were not incorporated into water diversion processes and infrastructure." (Executive Summary)
- "risks were greatest when interbasin water diversions were envisioned as being implemented via open conveyance and only slightly reduced if untreated waters were piped from exporting to importing basin." (Executive Summary)
- "greatest risk reduction was achieved when source waters were treated (*e.g.*, using combined control technologies such as conventional water treatment and pressure-driven membrane filtration) within the exporting basin then transferred via closed conveyance (*e.g,*. piped transfer) to importing basin." (Executive Summary)
- "water treatment alternatives potentially contributing to risk reduction under this general scenario would entail various chemical and physical treatment options such as chlorination or chloramines treatment, ozonation, media filtration (*e.g.*, slow sand filters), and pressure-driven technologies (*e.g.*, Microfiltration or ultrafiltration." (pg 4-79, Section 4.10.3)
- "the control system should reside within Missouri River basin then treated water piped to end-users in the Red River Basin." (pg 4-79, Section 4.10.3)

Linder *et al.* (2005) calculated that a 6-log increase in the risk of adverse effects to downstream watersheds would result should inadequately treated water be piped across the basin divide.

In summary:

- There are numerous speculative and wholly unsupported statements that claim that the risk of non-Project related biotic transfer is ‘very high’, and higher than Project-related risks.
- The preliminary qualitative analysis of the non-Project risk of biotic transfer is misrepresented as a quantitative analysis.
- The inclusion of irrelevant non-Project pathways for biota transfer is misleading to the assessment.
- The underlying logic within the Draft EIS (and the underlying CRA incorporated by reference) that the risk of species invasion from non-Project pathways will remain stable into the future is flawed, because the historic levels of risk posed by non-Project pathways have been identified as being unacceptable, and actions are well underway that are reducing and that will continue to reduce these levels of risk.
- The Draft EIS misrepresents the history of the regulatory process to date and incorrectly cites both 2001 FONSI statements as clear evidence that the risk of biotic transfer from the Project was very low, despite the fact that both the Final EA and FONSI have been challenged and rejected as inadequate through a judicial process.
- The calculation of operation-failure risk contains methodological errors and omissions.
  - The formulation of risk incorrectly assessed risk as the risk of interruption in treatment process and pipe breakage, when in fact the risk should have only considered the probability of pipe breakage for cases where the preliminary water treatment was ineffective.
  - The analysis of risk is fundamentally incomplete because a cumulative distribution curve was not calculated and the cumulative failure risk has not been assessed.
- Omission of chronic leakage from the calculation of operations risk contributes greatly to the serious underestimates of the overall Project risk (as discussed further on page 2-4, Section 2.3, Risk of Project Pathways).
- The Draft EIS concludes that all treatment designs produced ‘low to very low’ risk, but this conclusion is directly contradicted by statements by both the Bureau within the Draft EIS, and by key documents referenced as offering support to the analyses in the Draft EIS and Linder (2007).

The result of these deficiencies is that the risk of non-Project transfer of biota is overstated, the risk of Project transfer of biota is understated, and the stated relative effectiveness of the treatment options is erroneous and misleading.

Section 5

Treatment Costs

No Action Alternative

Table 5 – "No Action" Alternative Cost Estimate (Table 2-1 reproduced from the Draft EIS).

Features	Construction Cost (2007 dollars)	Annual OM&R
WTP Inlet Structure with Valves	$126,000	$0.00
Biota Treatment – Chemical Disinfection	$2,047,000	$104, 000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$5,344,000**	
Contingencies (21%+/-)	$1,156,000	
Field Cost	**$6,500,000**	
Non-Contract Costs (25%+/-)	$1,600,000	
Total Construction / OM&R Costs	**$8,100,000**	**$232,000**

Earth Tech developed an independent cost estimate based on similar rates used to estimate costs for the other process options. A summary of Earth Tech's Project cost estimate for the "No Action" alternative is shown below (Table 6).

Table 6 – Earth Tech's Cost Estimates for the "No Action" Alternative.

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	$0.00
Biota Treatment – Cl_2	$2,468,000	$104,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$5,765,000**	
Contingencies (21%+/-)	$1,211,000	
Field Cost	**$6,976,000**	
Non-Contract Costs (25%+/-)	$1,744,000	
Total Construction / OM&R Costs	**$8,720,000**	**$232,000**

Notes: 1. Costs for Inlet and Booster Pump Station based on Draft EIS estimate

It can be seen that Earth Tech estimates the construction cost of the "No Action" Biota WTP to be $2,468,000, slightly higher than the $2,047,000 estimated within the Draft EIS. Earth Tech's detailed estimate is included as Appendix B-1.

Table 7 – "Basic" Alternative Cost Estimate (Table 2-2 reproduced from the Draft EIS).

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	$0.00
Biota Treatment – Coagulation/Sedimentation Treatment	$41,000,000	$1,653,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$44,297,000**	
Contingencies (21%+/-)	$9,703,000	
Field Cost	**$54,000,000**	
Non-Contract Costs (25%+/-)	$14,000,000	
Total Construction / OM&R Costs	**$68,000,000**	**$1,781,000**

While Earth Tech did not estimate a treatment process using sedimentation, as developed by the Draft EIS, it used the estimate developed for the "Conventional", (DAF-Filtration-UV-Chlorine), option to develop capital cost estimates for a comparable "Basic" approach based on a Coagulation-DAF-UV-Chlorine approach. Based on that approach, Earth Tech estimates the construction cost of the "Basic" biota WTP to be $20,458,000 (Table 8) as opposed to $41,000,000 estimated within the Draft EIS. Based on this reduced cost, the estimate for the Total Project Costs is shown below and detailed estimate is included as Appendix B-2.

Table 8 – Earth Tech's Cost Estimates for the "Basic" Alternative.

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	$0.00
Biota Treatment – Coagulation/DAF/UV/Cl_2	$20,458,000	$1,653,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$23,755,000**	
Contingencies (21%+/-)	$4,989,000	
Field Cost	**$28,744,000**	
Non-Contract Costs (25%+/-)	$7,186,000	
Total Construction / OM&R Costs	**$35,930,000**	**$1,781,000**

Notes: 1. Costs for Inlet and Booster Pump Station based on Draft EIS estimate

2. Biota WTP costs include for low lift PS and residuals treatment and dewatering

Consequently, it is believed that the costs indicated in the Draft EIS for the "Basic" Biota treatment plant (coagulation/sedimentation), are very high and not reflective of current market conditions.

Table 9 – "Conventional" Alternative Cost Estimate (Table 2-3 reproduced from the Draft EIS).

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	$0
Biota Treatment –DAF/Filtration Treatment	$45,000,000	$1,661,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$48,297,000**	
Contingencies (21%+/-)	$9,703,000	
Field Cost	**$58,000,000**	
Non-Contract Costs (25%+/-)	$15,000,000	
Total Construction / OM&R Costs	**$73,000,000**	**$1,789,000**

On p. 2-9 of the Draft EIS, it is stated that:

> *"The pipeline design limits the water surface elevation entering the treatment facility to an elevation of 2107.5 feet, which is approximately two feet below the ground surface at that proposed location. In order for the water to maintain this elevation the treatment facility would have to be built below that elevation (2107.5 feet). For the In-Filter DAF system (DAF on top of a filter in the same tank) the entire process would be underground increasing construction costs."*

Accepting the limitation provided by the pipeline elevation (and the implied restriction that the pipeline is unable to withstand any internal pressure), then as indicated in the Draft EIS the water within the treatment tanks would have to be below the 2107.5 elevation. However, since the headloss through an In-Filter DAF layout is exactly the same as for a separated DAF-Filter configuration, and the depth of an In-Filter DAF unit is virtually identical to that of a conventional filter, the rationale for ignoring In-Filter DAF is flawed. The construction costs for the separated DAF- Filter configuration will still be higher due to its larger footprint.

Whichever option is chosen, if the raw water pipeline cannot withstand internal pressure, then to avoid excessive excavation, it would be preferable to include a small, low lift pump station at the inlet to the plant. This allows the base of the treatment tanks to be located at or close to grade. The costs of the pump station will be more than off-set by the savings incurred through shallower construction. Also, since the treated water has to be pumped into distribution, the additional head provided by the low lift pumps will allow a corresponding reduction in head for the treated water pumps and there will be no net increase in pumping costs.

Earth Tech prepared preliminary layout drawings and estimates for the biota WTP based on similar recent detailed designs for a 55 ML/d In-Filter DAF plant tendered in 2005 and a 150 ML/d DAF plant that is to be tendered in March 2008. For comparison, this biota WTP is rated at 26 mgd or 100 ML/d. The rates used in Earth Tech's estimate reflect both actual 2005 tendered prices that have been inflated to 2007 price levels from the earlier plant, and equipment

pricing recently tendered for the 155 ML/d plant. There is a high degree of confidence that the basis of these estimates closely reflect current market conditions.

Estimates were prepared for the "Conventional" biota WTP using both the "In-Filter DAF-UV-Chlorine" approach and the "Separate DAF-Filtration-UV-Chlorine" approach. Both estimates included costs for a low lift pump station and residuals handling and dewatering facilities. Estimated costs for these two options are shown on the following tables (tables 10 and 11).

Table 10 – Earth Tech's Cost Estimates for the "Conventional" Alternative based upon In-Filter DAF-UV-Chlorine.

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	$0.00
Biota Treatment – Coagulation/In-filter DAF/UV/CL2	$25,276,000	$1,661,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$28,573,000**	
Contingencies (21%+/-)	$6,000,000	
Field Cost	**$34,573,000**	
Non-Contract Costs (25%+/-)	$8,643,000	
Total Construction / OM&R Costs	**$43,216,000**	**$1,789,000**

Notes: 1. Costs for Inlet and Booster Pump Station based on Draft EIS estimate
2. Biota WTP costs include for low lift PS and residuals treatment and dewatering

Table 11 – Earth Tech's Cost Estimates for the "Conventional" Alternative based upon Separate DAF-Filter-UV-Chlorine.

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	$0.00
Biota Treatment – Coagulation/DAF-Filtration-UV-CL_2	$26,696,000	$1,661,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$29,993,000**	
Contingencies (21%+/-)	$6,299,000	
Field Cost	**$36,292,000**	
Non-Contract Costs (25%+/-)	$9,073,000	
Total Construction / OM&R Costs	**$45,365,000**	**$1,789,000**

Notes: 1. Costs for Inlet and Booster Pump Station based on Draft EIS estimate
2. Biota WTP costs include for low lift PS and residuals treatment and dewatering

Details of the assumed plant layouts that formed the basis for the Earth Tech estimates are included in Appendices A1 and A2. Full details of the capital cost estimates are included in Appendices B3 and B4. Identical markups to those used in the Draft EIS were applied to the Contract Costs to determine Field Costs and Total Project Costs.

Earth Tech's detailed cost estimates, which include a low lift pump station, still indicate that the "contract" costs for the In-Filter DAF option will be approximately $1.4 million lower than costs for the Separated DAF-Filter option resulting in Project Cost savings of $2.2 million.

Earth Tech was unable to comment on the basis of the Draft EIS estimate as this information was not available. However, as stated earlier, the Earth Tech estimates are based on:

- Proven, detailed designs with an accurate identification and assessment of quantities.
- Detailed pricing of equipment based on either budget or tendered prices.
- Recently tendered construction rates adjusted to reflect 2007 price levels.
- Two similar DAF plants of comparable capacity and either recently completed or now nearing tender.

Consequently, Earth Tech believes the contract costs of $45,000.000 indicated by the Draft EIS for the Conventional Biota Treatment Plant (DAF/Filtration Treatment) are very high and do not reflect current pricing conditions (Table 12). A competitive approach to design and construction will yield significantly lower costs.

Earth Tech also considers the operating cost estimate in the Draft EIS for the conventional Biota WTP component to be very high. Earth Tech estimates operating costs to be approximately $200-$290 per million gallons produced, depending on the production output of the plant with the cost declining as production increases. A summary of Earth Tech's estimate is included in Appendix C-1. The estimated operating cost quoted in the Draft EIS of $1,661,000 equates to about $450 per million gallons produced, assuming an annual average production rate of 10 mgd. Again, Earth Tech was unable to comment on the basis of the Draft EIS estimate since this information was not available, but note that the estimate in the Draft EIS is high.

Table 12 – "Micro-filtration" Alternative Cost Estimate (Table 2-4 reproduced from the Draft EIS).

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	
Biota Treatment – Micro-filtration Treatment	$56,000,000	$1,948,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$59,297,000**	
Contingencies (21%+/-)	$12,703,000	
Field Cost	**$72,000,000**	
Non-Contract Costs (25%+/-)	$18,000,000	
Total Construction / OM&R Costs	**$90,000,000**	**$2,076,000**

While insufficient time was available to prepare a detailed cost estimate for the micro-filtration option, based on experience elsewhere, this option is expected to be about 15-20%% higher than a "Conventional" DAF-Filtration approach. The Draft EIS costs indicate a 24% increase over the Bureau's "conventional" estimate but this appears high when compared to plant costs that also include low lift pumps, UV and full residual treatment systems. Based on similar rates to those assumed in other estimates, Earth Tech estimates the costs for a Micro-filtration approach to be as below (Table 13).

Table 13 – Earth Tech's Cost Estimates for the "Micro-filtration" Alternative.

Features	Construction Cost (2007 dollars)	Annual OM&R
Inlet	$126,000	$0.00
Biota Treatment – Micro-filtration-UV-CL2	$30,700,400	$1,948,000
Booster Pump Station	$3,171,000	$128,000
Contract Costs	**$33,997,400**	
Contingencies (21%+/-)	$7,139,000	
Field Cost	**$41,136,400**	
Non-Contract Costs (25%+/-)	$10,284,000	
Total Construction / OM&R Costs	**$51,420,400**	**$2,076,000**

Notes: 1. Costs for Inlet and Booster Pump Station based on Draft EIS estimate

2. Biota WTP costs include for low lift PS and residuals treatment and dewatering

As summarized below (Table 14), capital cost estimates contained in the Draft EIS for the Biota WTP are very high and not representative of today's economic climate.

Table 14 - Summary of Earth Tech versus Draft EIS Estimates for all Treatment Alternatives

Biota Treatment Alternative	Construction Costs Draft EIS Estimate	Construction Costs Earth Tech Estimate	Annual OM&R Costs
	(21% Contingencies)	(21% Contingencies)	
No Action	$8,100,000	$8,720,000	$232,000
Basic Treatment	$68,000,000	$35,930,000	$1,781,000
Conventional Treatment (Coagulation/DAF/Filtration/UV/CL_2)	$73,000,000	$45,365,000	$1,789,000
Conventional Treatment (Coagulation/In-filter DAF/UV/CL_2)	Not estimated	$43,216,000	$1,789,000
Micro-filtration	$90,000,000	$51,420,000	$2,076,000

Thus, engineering experts engaged by Manitoba determined that costs for conventional treatment including filtration to satisfy Manitoba's biota removal goals as identified in the Draft EIS have been over-stated by 70 to 75 %.

Section 6

Fundamental Omissions and Detailed Comments

Fundamental Omissions

Before proceeding to comment on specific portions of the Draft EIS, we wish to identify several issues that we believe the Draft EIS fundamentally fails to address. These all have a profound impact on the selection of an acceptable approach to providing adequate protection against potentially invasive species. The failure of the Draft EIS to address them is very significant.

(1) Failure to Establish Specific Minimum Water Treatment Performance Goals

The Draft EIS fails to establish specific water treatment goals that must be met by the biota water treatment process. Manitoba (Letter from Williamson to Breitzman dated May 5, 2006) has previously submitted its views on this issue and recommended water treatment goals based on a review of the biota threats, their potential impact on Canadian watersheds, and the current state of knowledge concerning their treatability by various treatment processes.

Parameter	**Proposed Treated Water Goals Prior to Inter-Basin Transfer for the Comprehensive Biota Pre-Treatment Alternative**	**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*	3 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 C*ryptosporidium*	4 log (99.99%) total removal/inactivation with a minimum of 3 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.
Organic carbon	50% reduction	This is necessary to ensure effectiveness of disinfection agents such as UV, to minimize disinfectant decay, and to minimize disinfection by products.
Viruses	4 log (99.99%) inactivation	This can be achieved through disinfection.
Transmissivity	90-95%	This is necessary to ensure effectiveness of UV disinfection against *Giardia* and *Cryptosporidium*

In subsequent discussions with the Bureau, the goals for Organic Carbon and Transmissivity were removed as these were acknowledged by Manitoba to relate primarily towards achieving an efficient level of operation and were not essential to addressing the threats posed by invasive species. Also, the removal goal for "disinfection-resistant protozoa such as *Myxobolus cerebralis"* was reduced from 3.0 log removal to 2.5 log removal and the goal relating to "Other protozoa with similar characteristics to *Giardia* and *Cryptosporidium"* amended to 4 log (99.99%) total removal/inactivation with a minimum of 2.5 log by removal.

However. the Draft EIS fails to accept these or to identify any other minimum performance goals on which to base the treatment selection. There is a discussion of Manitoba's goals in Chapter 2 of the Draft EIS but misrepresents Manitoba's position as follows:

1. The comment relating to "Disinfection resistant protozoa such as *Myxobolus cerebralis"* has been amended to remove reference to the fact that that this must occur "*prior to transfer across the continental divide from the Missouri River Basin to the Hudson Bay Basin*."
2. The comment relating to "Other protozoa with similar characteristics to *Giardia* and *Cryptosporidium* has been amended to remove reference to the fact that this must occur "*prior to transfer across the continental divide from the Missouri River Basin to the Hudson Bay Basin."*

(2) Failure to Accept the Need for Filtration Prior to Transfer Across the Continental Divide

Certain threatening biota, such as the spores of *Myxobolus cerebralis*, are highly resistant to inactivation by UV or other disinfectants. The only secure means of protecting against these threats is to physically remove the biota rather than attempting to kill or inactivate them with disinfectants. In fact, the Draft EIS comments on this resistance to treatment in Chapter 4, page 4-9, where it states that "*Whirling disease myxospores are highly resistant, and can survive in the environment for 30 years or more"*

For this reason, Manitoba's May 5, 2006 submission to the Bureau strongly recommended that a particle removal process such as filtration or micro-filtration be an essential, not optional, element of the treatment process.

(3) Failure to Discuss and Address Disposal of Plant Wastes

Whichever water treatment process is selected, the removed biota will pass into the waste streams generated by that process and in many cases, remain active. Again, Chapter 4, page 4-9, agrees with this point where it states that "*Whirling disease myxospores are highly resistant, and can survive in the environment for 30 years or more"*

These waste streams containing active biota will pass back into the environment. Usually the wastes are first discharged from the treatment plant through sewer systems to wastewater treatment plants, from which they pass in the wastewater effluent back into

the receiving water courses. Thus, the active biota removed by a biota water treatment plant will eventually return to the watershed.

For this reason Manitoba has expressed the firm commitment that all biota water treatment must occur within the Missouri watershed and that all wastes are returned to that watershed. It is of little practical benefit if raw water is transferred out of the Missouri watershed by pipeline for treatment at the Minot WTP within the Hudson Bay Basin and the treatment wastes containing active biota (particularly wastes from the filtration process) are then disposed within the Hudson Bay Basin.

The Draft EIS consistently fails to recognize this issue, and it likewise does not offer any information as to how these still contaminating waste streams can be safely disposed without presenting a continuing threat to the Hudson Bay Basin.

(4) Essential Elements in Any Approach to Biota Water Treatment

Summarizing Manitoba's position with respect to biota water treatment it is recommended that for any approach to be acceptable, it must as a minimum:

1. Meet the water treatment goals identified in Manitoba's May 5, 2006 submission to the Bureau.
2. The treatment process must contain a filtration or micro-filtration component to physically remove disinfectant resistant biota within the Missouri River Basin and all wastes from that plant must remain within the Missouri River Basin.

Detailed Review

Page 1-5: Purpose and Need

> *"Previous environmental analyses have shown that the risk of this Project transferring invasive species between these two drainage basins is very low (Reclamation 2001)."*

- The use of terms such as "very low" is extremely subjective and misleading and fundamentally untrue, particularly as the "No Action" and "Basic" levels of treatment will be ineffective for invasive biota species that remain active in the waste streams.

> *"Reclamation has conducted additional analyses to address the Court's order regarding fully treating the water at its source",*

- The reference to fully treating the water at source is misleading, highly subjective and very questionable.
- Until pre-defined treatment goals are accepted that include filtration, the water cannot be considered to be "fully" treated at source.

- For the "No Action" and "Basic" approaches, the filtration component is being provided at Minot which is certainly not "at source".

Page 1-6: Project Authorization

> *"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…".*

- The Secretary will not be able to determine the adequacy of treatment unless pre-defined and acceptable treatment goals have been determined.

Page 1-9: Actions and Issues Outside the Scope of the EIS

> *"The statutory provisions of NEPA (and the Council on Environmental Quality's regulations implementing NEPA) do not require assessment of environmental impacts within the territory of a foreign country; therefore this type of evaluation is considered outside the scope of the EIS."*

- The Draft EIS cannot properly assess impacts in the Hudson Bay Basin, the greatest proportion of which lies within Canada, unless it considers impacts occurring north of the U.S.-Canada border. Also, the Draft EIS does not address, or attempt to address, concerns raised under the Boundary Waters Treaty.

Page 1-12: What is Next?

> *"After the final EIS and consultation with the Administrator of the Environmental Protection Agency (EPA) and the Secretary of State are completed, the Regional Director will proceed in making a final decision for the Project. The intent is to meet the purpose and need of the proposed action and comply with the provisions of the Dakota Water Resources Act relative to the Boundary Waters Treaty of 1909."*

- If the study area does not extend into Canada, it would not be possible to address adequately concerns and issues raised under the Boundary Waters Treaty.

Page 2-1: Introduction

> *"This chapter describes a full range of reasonable treatment alternatives developed to meet the purpose and need for the proposed action as identified in chapter one."*

- As discussed earlier, since no definitive treatment goals are set in Chapter 1, it is not possible to describe a full range of alternatives that meet the Project's purpose.

> ***"No Action*** *– The preferred treatment alternative in the Final EA (Houston Engineering Inc. et al 2001) and selected in the FONSI (Reclamation 2001) would include chemical disinfection of raw Missouri River water prior to being delivered into the Hudson Bay basin. Additional safeguards included in the construction of the buried pipeline also reduce the risk of transferring invasive species even further. Ultraviolet (UV) disinfection along with softening and filtration would be provided at the existing Minot WTP."*

- As above, it is not possible for the Draft EIS to discuss treatment options without first discussing biota risks and their characterization and, hence, develop treatment goals. The correct approach is to first identify threats and develop corresponding treatment goals before reviewing treatment processes able to meet those goals.
- Also, the statement that *"additional safeguards….. reduce the risk"* is not correct. Waste streams from treatment processes located within the Souris River watershed are still very capable of infecting the Hudson Bay watershed.

> ***"Basic Treatment –*** *This treatment alternative would include a pre-treatment (Coagulation, Flocculation, Sedimentation) process followed by chemical and UV disinfection prior to the water crossing the drainage divide. The purpose of the pre-treatment process is to reduce raw water turbidity which can influence the effectiveness of the disinfection processes. Softening and filtration would be provided at the existing Minot WTP."*

- This appears to assume that "potable water disinfection" practices will be effective against all threatening biota. There is no justification for this assumption and in fact, past research indicates that disinfection alone will not be effective against many biota in all forms of their life cycle.
- None of the options provide detail what happens to plant wastes that still contain viable invasive species. As mentioned earlier, the Draft EIS consistently ignores this vital issue and it is Manitoba's opinion that these wastes must remain within the Missouri watershed.

<u>Page 2-2: Proposed Biota Water Treatment Plant Location</u>

> *"Each of the alternatives included in this EIS would include a biota WTP designed to further reduce the risk of this Project transferring invasive species from one basin to another."*

- This is misleading since it infers all options include a viable Biota WTP. In fact, the risks of transfer vary dramatically between the options and in our view, the "No Action" and "Basic" approaches cannot justifiably be described as including a "Biota WTP" as the treatment processes proposed are ineffective.

<u>Page 2-5: Alternatives Evaluated in the EIS</u>

Again, none of the descriptions of the processes detail how plant wastes are treated and disposed.

Page 2-5: No Action Alternative

> *"This treatment process, as described in the Final EA (Houston Engineering, Inc. et al. 2001), would provide control of invasive species through 3-log inactivation of Giardia and 4-log inactivation of viruses. A disinfection study was completed to determine the effectiveness of chlorine and chloramines. Details of the study methods and results are presented in the NAWS Chloramine Challenge Study – Final Report (Houston Engineering, Inc. et al. 1995). This alternative would not provide protection against organisms which are resistant to disinfectants like chlorine such as Cryptosporidium before the water crosses the drainage divide."*

- The first sentence is not justifiable and in fact, is contradicted by the second sentence. Effective control of all invasive species cannot be obtained by merely inactivating *Giardia* and viruses.
- This section is lacking in a realistic evaluation on the ability of the "No Action" treatment process to perform. In Manitoba's view, this is an extremely serious omission. In the absence of well defined treatment goals any discussion that is given as to the effectiveness of the treatment process is vague and ill-defined.
- The biota removal performance of this process will be zero since neither sedimentation nor filtration are provided at source.
- The degree to which threatening biota will be inactivated by disinfection is species-specific and for certain threatening species, such as *Myxobolus cerebralis* that are highly resistant to disinfection, the degree of inactivation will be minimal.
- Again, this section omits any discussion on or reference to, plant wastes. While some biota may be inactivated by the disinfection process, all biota will still be transferred along the pipeline to Minot WTP and will be available disperse to the Hudson Bay Basin.

Page 2-8: "Basic" Treatment Alternative

- This section also lacks a realistic evaluation on the ability of the treatment process to perform. For this option, the biota removal performance of the sedimentation process is not detailed and in Manitoba's view, is unlikely to exceed about 0.5 log. The degree to which threatening biota will be inactivated by disinfection is species specific and for certain threatening species such as *Myxobolus cerebralis* that are highly resistant to these disinfectants, the degree of inactivation will be very low or negligible.
- Again, this section omits any discussion on or reference to, plant wastes. For this option, the biota removal performance of the sedimentation process is not detailed and in Manitoba's view, is unlikely to exceed about 0.5 log. With filtration not provided at source, the remaining biota will be transferred along the pipeline to Minot WTP. These biota will then pass through the waste streams into the Hudson Bay Basin and present a threat of invasion.

Page 2-9: Conventional Treatment Alternative

- Again, there is no discussion on the issue of treatment effectiveness.
- A separate DAF-Filter-UV-chlorine configuration as proposed within the Draft EIS will perform with respect to biota removal, identically to the In-Filter DAF-UV-chlorine configuration option. Both would meet the treatment goals identified by Manitoba in its submission of May 5, 2006.

Page 2-13: Summary of Alternatives

> *"The SDWA regulates Giardia lamblia, Cryptosporidium and viruses as human health pathogens for drinking water systems. In the absence of interbasin water transfer treatment standards, the SDWA and the National Primary Drinking Water Regulations (NPDWR) can be utilized as a basis of comparison to evaluate treatment efficiency."*

- This is correct, to a degree, but it must be remembered that the SDWA and NPDWR regulations are focused on human health issues and do not address many of the biota that threaten wild fish stocks and which are important in this Project. These regulations can only be used to compare particle removal efficiency of treatment processes, and the inactivation of viruses, *Giardia* and *Cryptosporidium*. They cannot be used as the basis for calculating the inactivation by disinfection of any other biota.

Page 2-17: Province of Manitoba Biota Treatment Goals

- This section fails to fully detail Manitoba's goals, as discussed earlier.

> *"Reclamation will develop an adaptive management strategy to assess the effectiveness of the biota water treatment alternative selected. This strategy will address the potential for future invasive species concerns independent of modifications to the SDWA. "*

- It is unclear what is meant by the above statement and in particular "*an adaptive management strategy*".

Page 2-17: Summary of Environmental Consequences

> *"The risk of transferring macroscopic organisms (visible to the naked eye) through Project-related pathways is practically zero for all alternatives. Depending upon the alternative and the species, the risk of transferring microscopic invasive species through non-Project pathways is higher to much higher than the Project-related risk."*

- These statements are subjective, unsubstantiated and incorrect. There is no indication as to what is meant by "high" or "higher" risk. It is simply not possible to state that the risk of

transferring microscopic invasive species through non-Project pathways is "higher" and when making such unsubstantiated comparisons, it is not clear to which level of biota treatment the comparison is being made.

- The NAWS scheme will transfer up to 26 million gallons of water a day across the continental divide. Assuming the presence of threatening biota is proportional to the volumes of water transferred, there are no other pathways which approach the level of Project transfer.

> *"Overall, there is a high risk of biological invasions through non-Project pathways. With multiple-barrier control systems, the additional risk posed by the Project is negligible."*

- Similar to the above, this statement is subjective, unsubstantiated and, incorrect. Also, when making such statements, to which level of biota treatment are they comparing?
- In Manitoba's view, this entire section should be rewritten to provide numerically based risk assessments in comparison to each level of biota treatment.
- Also, as discussed above, there is no consideration given in the risk assessment to the threat of contamination from plant wastes.

<u>Page 3-1: Introduction</u>

> *"The environment of the area potentially affected by the alternatives is described in this chapter. The discussion focuses on the resources that could be affected by the Project's proposed alternatives. The geographic scope of this EIS evaluation is limited to the 41 acre construction area of the proposed biota WTP and related features located near Max, North Dakota."*

- The scope of the Draft EIS is mistakenly restricted to the 41 acre construction site with no consideration of impacts on the Hudson Bay Basin as a whole, including Canadian watersheds.

<u>Page 3-3: Invasive species</u>

> *"All of the alternatives considered in this EIS use only closed conveyance (pipelines) and include biota treatment and control systems. "*

- This statement is not correct. Manitoba does not classify the "No Action" approach as a biota treatment and control system as chlorine alone will be ineffective against many of the organisms. Also, this statement fails to consider the treatment and disposal of plant wastes which will presumably be disposed of in the Hudson Bay Basin.

Page 3-8: Protozoan and Metazoan Parasites of Fish

> *"During investigations completed for the Final EA, whirling disease was identified as a species of concern. ……. When an infected fish dies, many thousands to millions of parasite spores are released to the water. These spores can withstand freezing and drying and can survive in a stream for 20 to 30 years. …….. Whirling disease occurs in the upper Missouri River basin in Montana and Wyoming, but has not been detected in North Dakota or Canada."*

- This section acknowledges that Whirling disease is a concern, that it is not detected in North Dakota or Canada, and that the spores have tremendous survivability. This emphasizes the subsequent need to ensure all WTP wastes, including those from filtration which will contain most of these resistant spores, are disposed only within the Missouri River watershed.

Page 3-9: Waterborne Diseases of Terrestrial and Wetland Vertebrates

> *"Protozoa common in open bodies of water are much larger than bacteria and viruses. To survive harsh environmental conditions, some species can secrete a protective covering and form a resting stage called a "cyst." Encystment can protect protozoa from drinking water disinfection efforts and facilitate the spread of disease."*

- This text again indicates the lack of protection afforded by disinfection techniques which are relied upon as treatment barriers proposed in the "No Action" and "Basic" approaches.

Page 3-11: Invasive Species Pathways

> ***"Pathogen Spread by Non-native to Vulnerable Native Species -*** *Non-native species problems include pathogens carried by resistant non-natives to vulnerable native species. Whirling disease, which has decimated rainbow trout in many western rivers, was originally introduced when European brown trout, tolerant of whirling disease, were imported to U.S. waters and hatcheries."*
>
> ***"Disposal of Solid Waste or Wastewater -*** *Seeds, viable roots, or other propagules of invasive plants may be easily spread to receiving waters through wastewater discharge, then spread by water flow to distant areas downstream."*

- Although both of the above are mentioned as potential pathways, they are largely dismissed as insignificant in the Draft EIS. The second paragraph in particular, speaks to Manitoba's concerns over the disposal of WTP waste streams.

Page 3-17: Social and Economic Conditions

- This section only looks at social and economic impacts in North Dakota. There is no discussion surrounding similar impacts within Canada.

Page 4-2: Table 4.1

Fisheries	*Section 3.5*	*Potential impacts identified include the entrainment of fish eggs, larvae, and small aquatic animals through the intake structure; these impacts would be minimized or eliminated through design features and mitigation measures. Potential for accidental spills of pretreated water if a pipeline break were to occur near an intermittent or perennial stream; design features and mitigation measures will be implemented during construction, operation and maintenance of the Project.*

- This table fails to identify or address potential contamination from plant waste streams.

Inter-basin Biota	*Section 3.6*	*The potential transfer of non-native biota from the Missouri River basin to the Hudson Bay basin is the specific concern associated with the proposed Project. Numerous, significant design features and operational measures are included which collectively provided a very low risk of biota transfer.*

- The statement *"Numerous, significant design features and operational measures are included which collectively provided a very low risk of biota transfer"* is both incorrect and subjective. The degree of risk is very dependent on the level of treatment installed at the Biota WTP as previously. The "No Action" and "Basic" approaches do very little to reduce risk, and, in Manitoba's view, only those options that include filtration provide effective control. Also, there is no definition of "low" risk.

Page 4-6: Regulation of Invasive Species

> *"Every Day, Large Quantities of Ballast Water from All Over the World are Discharged into United States Waters (U.S. Department of Homeland Security)"*

- It is unclear what relevance is a discussion on ballast water in this situation since there are no ballast water transfers from the Missouri River Basin to the Hudson Bay Basin. Also, the above statement infers the planned transfers by the NAWS Project are minor compared to the quantities of ballast water. It should be noted that the NAWS Project will transfer up to 26 million gallons per day, a volume which is extremely significant.

> *"All of the alternatives evaluated in this EIS include treatment within the Missouri River basin and conveyance of the treated water in buried pipeline to the Minot WTP. The water would be further treated at the Minot WTP before distribution to communities and rural water systems in the service area. This constitutes a higher level of treatment than the strictest standards proposed for ballast water. Thus, ship ballast water and other pathways related to*

international commerce will continue to pose a higher risk of biological invasions than existing or proposed interbasin water transfers."

- This appears intended to mislead. Ship ballast does not pose a direct threat of transfer of harmful organisms from the Missouri River Basin to the Hudson Bay Basin. Furthermore, all aspects of international commerce are strictly controlled through import statutes to minimize the risk of accidental transfer.

Page 4-6: Risk Analysis

"Each of the proposed alternatives includes a control system to further reduce the risk of transferring invasive species."

- Manitoba does not consider the "No Action" or "Basic" approaches to be "control measures" due to their ineffectiveness against *Myxobolus cerebralis* spores. The statement does not acknowledge that there is a wide range of treatment efficacies or "control" among the treatment alternatives.

Page 4-8: Probability of Control System Failure

"The analysis showed that system failures that result in a biological invasion would be very unlikely. This is not surprising, as the biota treatment processes proposed in the EIS are commonly used for drinking water and have a long history of safe and reliable operation."

- Similarly to the previous comment, Manitoba does not consider the "No Action" or "Basic" approaches to be "control measures" due to their ineffectiveness against *Myxobolus cerebralis* spores. The statement does not acknowledge that there is a wide range of treatment efficacies or "control" among the treatment alternatives.

Page 4-9: Risk Characterization for Species Evaluated

"Risks associated with interbasin transfers of the causative agent of whirling disease would be greatly reduced and have the lowest uncertainty with treated water delivered via buried pipeline (USGS 2005a)."

- This is incorrect since no consideration has been given to disposal of plant wastes. Treatment processes without filtration also transfers *Myxobolus cerebralis* spores through a water pipeline. These are then transferred into plant waste streams at Minot WTP where they then become available for dispersion to the Hudson Bay Basin.

"Risks could be realized if resistant stages of M. cerebralis completed a successful transit from Missouri River waters to receiving waters of the Souris River basin after breaching biota water treatment countermeasures, but the probability of such an event is very low. In particular, source water fully treated in the Missouri River basin compliant with LT2 (as in the Conventional Treatment

> *Alternative and the Micro-filtration Alternative) would present negligible risks for transmission of whirling disease. With treatment, uncertainties associated with risk estimates for whirling disease and other disease agents that could potentially be transferred by the Project would be markedly reduced."*

- This should state that the risk is very low only if filtration is employed at the Biota WTP and all waste streams disposed in the Missouri watershed. This statement is incorrect when referring to the "No Action" or "Basic" treatment options.

Page 4-12: Cyanobacteria

> *"A margin of safety will be achieved with control systems that incorporate sufficient water treatment technology (e.g., DAF, slow sand filtration, membrane filtration with sufficiently low rejection value) to reduce risks associated with cyanobacteria and their associated toxins."*

- This emphasizes that the "No Action" and "Basic" alternatives will not provide adequate protection since they do not employ filtration.

Page 4-12: Comparison of Alternatives

> *"The risk analysis (USGS 2007) demonstrated that, with effective treatment, the risk of transferring invasive species through the Project would be low to very low for all of the alternatives."*

- As previously stated, this is incorrect. The options without filtration and/or those that transfer wastes into Hudson Bay watershed provide no effective treatment.

> *"The Conventional Treatment and Micro-filtration alternatives have the highest risk reduction score, because these have the most redundancy in the treatment regime and are less likely to fail, or to allow a transfer of invasive organisms. The addition of the filtration process in these options provides an additional barrier that the No Action and Basic Treatment alternatives do not provide."*

- Finally, Manitoba's key point is acknowledged. However, the Draft EIS is still misleading in that it does state that for some species such as the spores of *Myxobolus cerebralis*, filtration is not an "additional" barrier but is in fact the only barrier.

Page 4-15: Table 4.2 – Risk Reduction Rank Scores

- The rankings are inherently incorrect due to a failure to consider risks from waste streams generated within the Souris and Hudson Bay Basins.

> *"In summary, the Project-related risk of transferring invasive species from the Missouri River basin to the Souris River basin is low under the No Action Alternative. Overall, the risk of transferring invasive species through non-Project*

> *pathways would be high, but the risk would vary substantially from species to species, depending on life history attributes and the number and magnitude of potential invasion pathways."*

- The first sentence is both incorrect and unsubstantiated. Since the "No Action" approach lacks filtration, it provides minimal removal or inactivation of threatening species so therefore, the risk of transferring invasive species is not "low".
- Also, as discussed earlier, Manitoba does not accept that non-Project pathways present a "high" risk and are therefore, assumed to be more of a risk than the transfer of 26 million gallons per day of water that receives no effective treatment under the "No Action" or "Basic" approaches.

<u>Page 4-16: Basic Treatment</u>

> *"Furthermore, some organisms (e.g., whirling disease myxospores and Cryptosporidium) are resistant to chemical disinfection, but can be inactivated with UV disinfection."*

- This is incorrect since there is a wealth of reputable scientific research that indicates Whirling disease myxospores are very resistant to UV irradiation and can remain active for 20 years or more.

> *"In summary, the Project-related risk of transferring invasive species from the Missouri River basin to the Souris River basin is very low under the Basic Treatment Alternative. Overall, the risk of transferring invasive species through non-Project pathways would be high, but the risk would vary substantially from species to species, depending on life history attributes and the number and magnitude of potential invasion pathways."*

- Again, Manitoba disagrees completely with this statement for the same reasons given above.

<u>Page 4-16: Conventional Treatment</u>

- This section fails to make the point that the "Conventional" option which includes filtration is the only alternative other than Micro-filtration, that would be an effective barrier against *Myxobolus cerebralis* and other disinfection-resistant threatening species.
- The section also suggests the use of DAF is effective against micro-organisms such as protozoa. While this is indeed the case when compared to sedimentation, it should be stressed that this protection is only realized when DAF is used in association with a filtration step.

Micro-filtration Treatment – Page 4-16

> *"Overall, the risk of a biological invasion occurring through non-Project pathways would be much greater than the risk due to Project pathways for most potentially invasive species."*

- It should be noted that this statement is only correct with regard to Micro-filtration treatment alternative with all wastes remaining in the Missouri River Basin.

Page 4-17: Cumulative Effects

> *"The risks of transferring invasive species via the Project's facilities have been carefully estimated and are on the low to very low end of the scale. Among the alternatives evaluated, Conventional Treatment and Microfiltration would provide the greatest risk reduction"*

- This statement is incorrect since the "No Action" and "Basic" treatment approaches provide negligible or minimal protection against the transfer of disinfection-resistant invasive species and cannot therefore, be considered to provide a "low" risk.

Page 4-17: Summary and Conclusions

> *"With the multiple barriers included in all alternatives, the risk of biological invasions through Project pathways would be low to very low for all potentially invasive species identified. Therefore, no Project-related impacts are anticipated under any of the alternatives evaluated.*"

- As previously mentioned, this is incorrect. Unless filtration is provided and all waste streams disposed within the Missouri River watershed, the risk of transfer is very high. To state "*no Project related impacts are anticipated under any of the alternatives evaluated*" is incorrect and unsupportable.

> *"With the control technologies developed in the intervening 30 years and proposed in this EIS, along with the differences in purpose and scope between this Project and the Garrison Diversion Unit as envisioned in the 1970s, those findings are not applicable to this Project."*

- Contrary to the opinion offered on p. 4-17 to 4-18, the International Joint Commission's views on the matter of risks associated with an inter-basin transfer are just as valid today as they were in 1977. While the Garrison Diversion Unit project has evolved considerably since 1977 and new treatment technologies are available now that were not available earlier, the International Joint Commission correctly understood that risks associated with biota transfer should be avoided since impacts arising from the transfer of invasive species are significant and often irreversible, and, in some cases, the full adverse impact does not become apparent for 25 to 50 years. Over the life of the Project, there is a high risk of system failure.

Page 4-18: Environmental Mitigation

- The criteria shown in the section "*Design Criteria for Biota Water Treatment Plant*" are not "design criteria" and, in particular, the list notably omits details of the proposed level of treatment.
- The list of design criteria should include identification of the proposed process and should be based on either the Conventional or Micro-filtration approaches which incorporate a filtration barrier.

Section 7

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Appendix A1

In Filter DAF Layout Drawings

Appendix A2

DAF-Filtration Layout Drawings

Appendix B1

No Action-Cl_2 Cost Estimate

Appendix B2

Basic DAF-UV-Cl_2 Cost Estimate

Appendix B3

Conventional In-Filter DAF-UV-Cl_2 Cost Estimate

Appendix B4

Conventional DAF-Filtration-UV-Cl_2 Cost Estimate

Appendix B5

Micro Filtration-UV-Cl_2 Cost Estimate

Appendix C1

Conventional Treatment Operating Costs