

SUMMARY OF COMMENTS/RECOMMENDATIONS

PROPONENT: Rural Municipality of East St. Paul
PROPOSAL NAME: East St. Paul Sewage Treatment Plant Expansion
CLASS OF DEVELOPMENT: 2
TYPE OF DEVELOPMENT: Sewage Treatment Plant
CLIENT FILE NO.: 2911.30

OVERVIEW:

On December 1, 2006, the Department received an Environment Act Proposal (EAP) from the Rural Municipality of East St. Paul for the expansion and upgrade of its existing sewage treatment plant that is located on Parcels 1 and 2, River Lots 100 and 101, Parish of St. Paul, Rural Municipality of East St. Paul. The original sewage treatment plant was previously licenced under Environment Act Licence No. 2428. The expansion will consist of the addition of a sequencing batch reactor (SBR) sewage treatment plant that will operate in parallel with the existing rotating biological contactor (RBC) sewage treatment plant. A new controls and operations building will be located above the tanks of the SBR and a new aerated sludge holding tank for the SBR will be located near the RBC sewage treatment plant. A new ultraviolet disinfection systems facility will be established while biological phosphorus removal will also be incorporated at the sewage treatment plants. Discharge of treated wastewater from the sewage treatment plants will continue to be via pipeline to the Red River.

The Department, on January 8, 2007, placed copies of the EAP report in the Public Registries located at 123 Main St. (Union Station), the Winnipeg Public Library, the Selkirk-St. Andrews Regional Library, and the Manitoba Eco-Network and provided copies of the EAP report to the Canadian Environmental Assessment Agency (CEAA), the Clean Environment Commission, and TAC members. As well, the Department placed public notifications of the EAP in the Winnipeg Free Press on Saturday, January 13, 2007. The newspaper and TAC notifications invited responses until February 14, 2007.

On February 27, 2007 Manitoba Conservation forwarded requests for additional information from the TAC to the proponent. A subsequent request for additional information was forwarded on March 14, 2007. The proponent's April 12, 2007 response to the requests was then provided to the participating TAC for review and comment on April 17, 2007.

On May 24, 2007 Manitoba Conservation forwarded supplementary requests for additional from the TAC to the proponent. The proponent's June 15, 2007 response to the supplementary requests was then provided to the participating TAC for review and comment on June 19, 2007.

Fisheries and Oceans Canada's requests for additional specific information regarding potential river bed and river bank erosion and related control measures were

forwarded to the proponent on July 26, 2007. The proponent provided a response to the requests on August 15, 2007.

COMMENTS FROM THE PUBLIC:

There were no comments from the public.

COMMENTS FROM THE TECHNICAL ADVISORY COMMITTEE:

Agriculture, Food and Rural Initiatives

- *We note that to handle increased sludge production, additional aerated sludge holding tanks shall be constructed adjacent to the existing sludge holding tanks. The sludge produced from the existing and new systems will be continued to be held in aerated sludge holding tanks and taken to the City of Winnipeg, North End Water Pollution Control Centre.*
- *There appears to be no proposal to spread sludge on land in the Rural Municipality at this time.*
- *I have identified no concerns with this environment act proposal from an agricultural perspective.*

Historic Resources Branch – Culture, Heritage and Tourism

- *No concerns.*

Intergovernmental Affairs and Trade

- *The site of the existing East St. Paul Sewage Treatment Plan is in an area designated as “Recreation/Open Space” in the RM of East St. Paul Development Plan. There are a few generic policies relating to adequate municipal service provision in the plan.*
- *According to Community Planning records, under the RM of East St. Paul Zoning By-law, the area affected by this proposal is within the “PR” Parks and Recreation Zone. “Utility Service” is listed as a conditional use in this zone. It should be noted that the applicant’s information incorrectly shows the location of the proposed expanded treatment plant to be in the “M2” Light Industrial Zoning District. The “M2” zone does not exist under the current RM of East St. Paul Zoning By-law no. 96-22.*
- *Intergovernmental Affairs encourages growing municipalities to plan for sustainable growth and development of their neighbourhoods and communities. Policies in a local development plan should direct the location, capacity and type of future infrastructure investment. Intergovernmental Affairs also encourages the RM of East St. Paul to ensure that current investments are in keeping with plans for future proposes regional water and wastewater systems.*

Proponent Responses – April 12, 2007:

- A drawing showing the current zoning map is attached. The previous drawing submitted with the EAP was dated. The current location of the STP falls under the "Community Services Zone", It should be noted that the existing STP has been operational at the present site for over two decades. The proposed development is related to the plant expansion/upgrade will be restricted to the current site.

Sustainable Resource Management Branch – Manitoba Conservation

- *No concerns.*

Infrastructure and Transportation

- *No concerns.*

Ecological Services Division – Water Stewardship

- *Manitoba Water Quality Standards for the discharge municipal wastewater effluent specify that effluent quality must not exceed 30 mg/L BOD or 30 mg/L TSS. It is recommended that the proponent be required by license to meet at minimum these Water Quality Standards. The concept of a 30-day rolling average is not supported.*
- *Insufficient information was provided by the proponent for evaluation of the Manitoba Water Quality Objectives for ammonia. Additional information required to complete the assessment includes monthly estimated effluent pH and temperature, and monthly estimates of maximum daily and weekly flows. This information should be provided for both the RBC and the SBR so that cumulative impacts can be assessed.*
- *Information in the proposal on proposed monitoring of effluent quality was not found. It is recommended at minimum weekly effluent monitoring for:*
 - *Escherichia coli or fecal coliform*
 - *Total phosphorus*
 - *Total dissolved phosphorus*
 - *Total kjeldahl nitrogen*
 - *Ammonia nitrogen*
 - *Nitrate-nitrite nitrogen*
 - *CBOD*
 - *Total suspended solids*
 - *pH*
 - *temperature*
- *In addition, it is recommended that the proponent be required to collect a bioassay sample of the effluent every three months and test the sample at 100 percent concentration for acute lethality in accordance with Environment Canada's "Biological Test Method: Reference Method for Determining Acute*

Lethality of Effluents to Rainbow Trout: EPS 1/RM/13 Second Edition - December 2000” or any future amendments thereof.

- *The Water Quality Management Section is concerned with any discharges that have the potential to impact the aquatic environment and/or restrict present and future uses of the water. Therefore it is recommended that the license require the proponent to actively participate in any future watershed based management study, plan/or nutrient reduction program, approved by the Director, for the Red River, Lake Winnipeg and associated waterways.*
- *Section 2.5 indicated that the effluent will be discharged to the Red River. It is very important to know whether there is any water supply intake located near the discharge route, especially near the outlet at the river. Please provide a diagram that clearly shows the discharge route from the plant to the outlet.*

Proponent Responses – April 12, 2007:

- First of all, there are two relevant issues related to the effluent criteria. Firstly, the effluent criteria should be based on a Carbonaceous Biochemical Oxygen Demand (cBOD₅) and not total BOD. Carbonaceous Biochemical Oxygen Demand or cBOD₅ refers to organic material that decays in water and reduces dissolved oxygen in the stream. Control of cBOD₅ is required to prevent the dissolved oxygen in the stream from being depleted below values necessary to maintain aquatic life in the rivers. This is also supported by the CCME in the proposed "Canada-wide Strategy for the Management of Municipal Wastewater Effluent".

Secondly, by stating that the BOD and TSS shall "not exceed" 30 mg/L with no reference to an averaging period, the Department will be imposing a very stringent effluent criteria for the facility. For East St. Paul, these "not to exceed" limits are particularly stringent when one considers the dissolved oxygen capacity and the natural suspended solids load of the receiving environment; the Red River. Most jurisdictions in Canada have their effluent permits based on an averaging period such as "monthly average" "annual average" or a "30-day rolling average". Being a biological system, the proposed/existing treatment processes are not as effective during cold- or wet-weather conditions when cold water infiltrates into the collection system and is brought to the plant. During these wet periods (a few days each year) it may be difficult to maintain the effluent cBOD₅ below the target value (generally 5.25 mg/L). A short-term discharge of cBOD₅ above 25 mg/L will not significantly affect dissolved oxygen levels in the rivers nor cause an exceedance of water quality objectives in the Red River. Conventional design practice recognizes that cBOD₅ can vary over the short-term; however, effluent must meet a 25 mg/L limit when averaged over 30 days.

Similarly, the total suspended solid (TSS) is a measure of the solid material in the effluent. A limit of 30 mg/L TSS is very low relative to the Red and Assiniboine Rivers that generally have TSS as low as 10 mg/L in winter and closer to 300 mg/L the remainder of the year, and significantly higher when wet weather events occur. It is conventional practice to set a limit of TSS of 30 mg/L over a thirty-day rolling

average as an indicator of a sewage treatment plant's (STP) performance. Allowing a short-term discharge above 30.mg/L would not cause an exceedence of water quality objectives in the Red River.

As stated above, with the exception of several highly environmentally sensitive receiving bodies of water such as the Okanagan Lake, BC, there are no permits with "not to exceed" 25 mg/L of cBOD₅ and 30 mg/L TSS.

A general summary of licence limits across Canada is provided as follows:

- British Columbia generally applies not to exceed cBOD₅/TSS limits of 45 mg/L unless the receiving body of water is environmentally sensitive.
- Alberta generally applies monthly average values of 20 mg/L for cBOD₅ and TSS.
- Saskatchewan generally applies monthly average values of 25 mg/L for cBOD₅ and TSS.
- Ontario generally applies annual average values of 25 mg/L for cBOD₅ and TSS.
- Maritime Provinces specify not to exceed limits for cBOD₅ and TSS of 40/40 mg/L; however, these are applied as a guideline to trigger discussions with a municipality directed toward upgrading an existing treatment facility.

| Parameter | SBR (Proposed) ¹ | | RBC (Existing) ² | |
|-----------|-----------------------------|-------------------------------------|-----------------------------|---------------------------|
| | Projected Effluent pH | Projected effluent temperature (°C) | Effluent pH ³ | Effluent Temperature (°C) |
| January | 7.8 | 9.0 | 8.08 | 9.0 |
| February | 7.8 | 9.0 | 8.14 | 9.0 |
| March | 7.8 | 10.0 | 8.17 | 10.0 |
| April | 7.8 | 12.0 | 8.14 | 11.8 |
| May | 7.6 | 13.0 | 8.11 | 12.9 |
| June | 7.5 | 15 | 8.08 | 14.3 |
| July | 7.5 | 15 | 8.07 | 15.3 |
| August | 7.4 | 16 | 8.11 | 16.2 |
| September | 7.5 | 16 | 8.20 | 15.6 |
| October | 7.6 | 15 | 8.15 | 15.0 |
| November | 7.8 | 15 | 8.29 | 14.6 |
| December | 7.8 | 14 | 8.38 | 13.7 |

¹ Estimated

² Based on 2006 monthly average (data collected on a daily basis)

³ Note that the addition of alum for P removal (when implemented for the RBC system) will drop the effluent pH for RBC

The projected (20 years) maximum week and maximum day flows for the SBR is as follows:

- Maximum Day = 5500 m³/day
- Maximum Week = 3438 m³/day

It shall be noted that the RM plans to phase out the RBC system in the future and replace them eventually with SBRs, This should be taken into account for developing long-term impacts. Based on the ultimate capacity of the RBC system, the projected flows are as follows.

- Maximum Day = 9067 m³/day
- Maximum Week = 5567 m³/day

- We concur with the proposed monitoring schedule. Generally, monitoring requirements are established by Manitoba Conservation, hence no information was provided in the EAP. It may be noted that a reference is made to tracking effluent cBOD₅ i.e. carbonaceous BOD₅ in the list of effluent parameters. In our previous discussions on effluent limits for BOD, we have stated that measuring cBOD₅ rather than total BOD₅ in the effluent is more appropriate. This is also supported by CCME in the proposed "Canada-wide Strategy for the Management of Municipal Wastewater Effluent" discussions. The proposed limit is based on 25 mg/L. of cBOD₅.
- It should be noted that the CCME proposed document titled "Canada-wide Strategy for the Management of Municipal Wastewater Effluent" suggests quarterly toxicity tests for plants in the "Medium" size category and higher. The "Medium" sized facilities are designated for plants discharging > 2,500 - 17,500 m³/day of treated effluent. The East St. Paul STP does not fit into this category yet.
- We concur with the above comments.
- The effluent outfall to Red River has been in operation for over two decades and has been designed keeping future expansion in mind. A sketch showing the piping route from the plant to the river is attached (see Figure 1.0).

Disposition:

- The draft Environment Act Licence contains clauses that specify discharge criteria for the sewage treatment plant. Averaging has already been included in establishing Ammonia Nitrogen limits for the daily allowable loads for each month as presented in Schedule 1 of the draft Licence. Water Stewardship does not support the concept of using "30-day rolling average" limits regarding BOD and Total Suspended Solids. As proposed, the draft Environment Act Licence includes criteria for Total Phosphorus based on a "30-day rolling average";
- The draft Environment Act Licence requires that the Licencee actively participate in any future watershed based management study, plan or nutrient reduction program,

approved by the Director, for the Red River and Lake Winnipeg and associated waterways and watersheds;

- The draft Environment Act Licence contains a clause requiring that the Licencee, once each week following the commencement of operation of the sewage treatment plant under this Licence, obtain samples of treated effluent from the final discharge point of the sewage treatment plant and have the samples analyzed for:
 - cBOD;
 - fecal coliform;
 - total coliform;
 - Total suspended solids;
 - Total phosphorus;
 - Total dissolved phosphorus;
 - Total kjeldahl nitrogen;
 - Ammonia nitrogen;
 - Nitrate-nitrite nitrogen;
 - total chlorine residual content;
 - pH; and
 - temperature.
- The draft Environment Act Licence contains a clause that makes it not permissible for the proponent to release a quality of effluent from the Development which:
 - on any day, causes, or contributes to, the mixing zone for the effluent in the Red River being acutely lethal to aquatic life passing through the mixing zone; or
 - can be demonstrated to be acutely lethal to fish within the mixing zone for the effluent in the Red River by using a 96-hour static acute lethality test which results in mortality to more than 50 percent of the test fish exposed to 100 percent concentration of effluent, with the test carried out in accordance with the protocol outlined in Environment Canada's "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout: EPS 1/RM/13 Second Edition – December 2000" or any future amendment thereof.
- The draft Environment Act Licence contains a clause requiring that the Licencee report the results of required sampling in accordance with the requirements of Clause 2 c) of the Licence.

COMMENTS FROM FEDERAL REPRESENTATION:

Canadian Environmental Assessment Agency

- *Based on the responses to the CEAA survey, application of The Canadian Environmental Assessment Act with respect to this proposal will not be required. Environment Canada and Health Canada would be able to provide specialist advice if requested. DFO provided an Operational Statement regarding directional drilling directly to the consultant.*

Environmental Protection Operations Division

Initial TAC Review:

- *The proponent stated (s. 2.10 Proposed Environmental Management Practices, page 6) that: "The proposed SBR plant is intended to be expanded and upgraded in the future as treatment and maintenance needs require.*

This includes implementation of total nitrogen removal in the future." It is assumed that this intended to mean reduction of total nitrogen, as the former would not be achievable.

The proponent also stated (page 16), that "...phosphorus removal via chemical precipitation is feasible" [but] "implementing nitrogen removal is impractical due to limit of technology." Yet in the next sentence it is stated that: "... the treatment process for the proposed expansion will be based on a basis that it can be easily modified to achieve this treatment goal.". Disregarding the inconsistency between the two assertions, Environment Canada is not aware of any technology limitation in the SBR technology whereby nitrification/denitrification could not be effectively achieved. There are various technologies available for nutrient removal and the proponent's assertion that "...implementing nitrogen removal is impractical due to limit of technology..." is unsubstantiated.

- *In light of concerns with nutrient discharges to the Lake Winnipeg drainage basin (the final destination of Red River discharge), the province should consider requiring proponents of any new or expanded/upgraded wastewater treatment facilities to provide information on the expected nutrient (phosphorus and nitrogen) discharges and an assessment of their impacts on the environment. .*
- *In pages 4 & 5, under Pollutant release and Fisheries, the report indicates that ammonia-nitrogen will meet Manitoba Surface Water Quality Objectives (page 4) but will result in an incremental increase in unionized ammonia concentrations in the Red River (page 5). The proponent continued under Surface Water Quality and Fisheries section, that this increase is not expected to have a significant impact on fisheries, because as stated "An assessment of mixing zone requirements for the Red River show that, at no time is the 25% limit set by MSWQO will be exceeded...". The proponent is reminded that section 36(3) of Fisheries Act which states that:*

"No person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water"

does not allow for a mixing zone, hence the deposit of free ammonia has a potential to contravene the general prohibition of the Fisheries Act. It is, therefore, expected that, in accordance with 78(6) of the Fisheries Act, the municipality would need to be able to show how it is applying "due diligence" to prevent the deposit of this deleterious substance in Red River, a body of water frequented by fish.

- *It is indicated that the current disinfection practice for the RBC is through the application of "... sodium hypochlorite with a controlled feed rate proportional to the effluent flow rate."*

We are unable to find information in the report on current performance of the disinfection system with regard to Total Residual Chlorine (TRC) and bacteriological indicators. The current facility is projected to not exceed the 5,000 m³ per day threshold of the P2 Notification. However, while it is planned that the proposed expansion/upgrade will use UV disinfection, it is also planned that chlorine disinfection will be retained for the RBC effluent for an unspecified period. Inasmuch as the projected combined flow for the facility will exceed the flow threshold, the municipality may be expected to address the P2 Notification requirements. The link for P2 for chlorine is <http://canadagazette.gc.ca/partI/2004/20041204/html/notice-e.html#i3>

- *Section 2.3 (Design Sewage Flows, p.13), indicated, that "... only the daily total flow is recorded." and that "... the per capita flows ... was calculated to be 282 L/person/day."*

Subsequently, in Table 2-1 (Raw Sewage Constituent Concentrations,) and in section 2.4 (Constituent Loading and Concentrations), a range of values are presented for Total BOD (again, not cBOD), TSS, Ammonia, TKN and TP. It is not clear how the TBOD relates to the cBOD used elsewhere in the document.

Given the typical per capita mass loadings for the cBOD and TSS parameters, the upper values presented in the report appear well in excess of what would be expected from typical domestic sewage, and the lower values as presented, suggest excessive extraneous flows (e.g., at times, less than 5% sewage).

As well, with domestic wastewater BOD and TSS typically "walking together", the difference between them in Table 2-1 is perplexing.

Similarly, it is not clear how the Total Kjeldahl Nitrogen (TKN) concentration was estimated to be only 20% greater than its ammonia content. While such proportions are not inconsistent with ratios reported in warmer environments and with extended collection systems, it is unclear that the organic nitrogen component should not be higher here.

- *It should be emphasized that proper characterization of the wastewater is a fundamental requirement for defining the appropriate solution, it would therefore be necessary to resolve the apparent uncertainties in the data as a prerequisite to facility design.*

Since some of the flow is attributed to wet weather flow "primarily due to clean water from basement sump pumps", implementation of a program to remove this flow from being directed to the STP would reduce some stress on the STP.

In section 4.3.1 (SBR Process Components, page 24), it is indicated that "Provision will be made to install a chemical feed system for adding alum to precipitate phosphorus during the treatment cycle if necessary."

- It is not clear what the rationalization was for selecting alum over ferric chloride (page 20), given that the latter would not entail concerns with aluminum contamination of the sludge generated by the facility. Aluminum content of the sludge would be a factor for consideration in the proposed composting operation.*
- *It is stated (s. 6.2: sludge treatment,) that "... the waste activated sludge (WAS) production is estimated at approximately 240 kg/day (dry weight basis) or 40 m³/day on a clarifier underflow solids concentration of 0.6%." It is not readily clear how sludge is to be wasted from the SBR.*
 - *In general, it is unclear that the proposed Modified SBR would deliver an optimum treatment train, because:*
 - a) *Use of a continuous inflow defeats the benefit of having the settle and decant cycles of the SBR operating in a true quiescent state,*
 - b) *the surface area to volume ratios of the two reactor configuration suggest that heat loss from the SBR reactors would be significant and adversely affect the system performance in general and especially with regard to nitrification/denitrification, and*
 - c) *the larger surface area in the two reactor vs. (say) three smaller reactors configuration would be expected to counter effective development of anaerobic vs. anoxic conditions during the timing sequence and have a detrimental effect on "luxury" phosphorus uptake and its removal in the WAS.*

Proponent Responses – April 12, 2007:

- The reference in the EAP document is directed to implementation of nitrogen removal measured as "total nitrogen" or TN as commonly used in wastewater terminology. It was never meant to imply a virtual elimination of nitrogen constituents from the wastewater. Total Nitrogen in a wastewater sample is a measure of the combined concentrations of ammonia-nitrogen, organic nitrogen, nitrate-nitrogen and nitrite-nitrogen species.
- For clarification, the discussions in EAP document on nitrogen removal potential and limit of technology relates to the existing RBC system and not the proposed SBR system.
- Information on impact of effluent ammonia on Red River in light of Manitoba Surface Water Quality Objectives has been provided. Additional information requested by the Manitoba Water Stewardship – Ecological Services Division on effluent pH and flows are submitted as a part of this response document.
- The pollution prevention planning notice for inorganic chloramines and chlorinated wastewater effluents as published in Canada Gazette on December 4, 2004 is applicable for effluents released to surface water at 5000 m³/day based on an **annual average** basis. The projected 20 years capacity (Year 2027) of the STP is estimated at 4035 Equivalent Residential Unit or ERU which equates to an annual average flow as follows:
 - 4035 ERUs x 3.2 person/ERU x 282 L/person/day + 1000 L/m³ = 3641 m³/day.

- This value is substantially less than the 5000 m³/day threshold stated in the P2 document.
- The chlorine disinfection associated with the existing RBC treatment system has historically performed very well. This is demonstrated by consistently achieving low fecal and total coliform values in the final effluent. The Municipality samples thrice a week and the results are sent to Manitoba Conservation directly from the independent laboratory. Fecal coliforms typically range from 3 - 45 organisms/100 mL and total coliforms range from 4 - 230 organisms/100. The effluent disinfection targets for fecal and total coliforms are 200 and 1500 organisms/100 mi. respectively.
- The design of biological wastewater systems are typically based on mass loadings for various parameters such as BOD₅, TSS, ammonia-nitrogen etc. The mass loading data for various parameters were normalized through statistical analysis to establish key loading factors such as maximum month and maximum day. It should be noted that peaking factors for flows are different from peaking factors for constituent mass loadings, hence "typical" raw sewage characteristics play little role in the process design.
- Generally, *5-day biochemical oxygen demand* or BOD₅ is a key analytical parameter used in the process design and for calculating influent organic loading to the process. For effluent quality, it is more common to use the *carbonaceous biochemical oxygen demand* or cBOD₅ analysis which truly represents the amount of organic matter present in the sample. When performing the cBOD₅ test, a chemical is added to inhibit oxygen depletion effects of the nitrifier population or autotrophic organisms which otherwise interferes with the final results. This is critical for wastewater treatment facilities required to implement nitrification. Effluent permits should therefore be based on cBOD₅ and not BOD₅.
- With respect to comments on the BOD and TSS values, in our experience, the influent TSS values are generally higher than BOD values. Not all communities are the same and the higher TSS value in this case is an indication of the presence of higher inorganic solids in raw sewage.
- On the issue of TKN, further data gathering is ongoing. However, based on limited data so far we are observing the ratio of TKN: ammonia-nitrogen to be higher than 20%.
- We concur with the comments related to reducing extraneous flows to the sewer system, particularly with respect to discharges from any basement sump pumps.
- The rationale for using alum over ferric chloride is that iron absorbs UV light and will compromise the disinfection efficiency of the proposed upgrade. Additionally, iron will coat the UV bulbs inducing chemical fouling.
- It should be noted that for the proposed alum feed system is provided to primarily serve as a back-up to the biological phosphorus removal in the SBR. This is a standard practice in the industry to consistently meet the effluent phosphorus target limits. For the RBC system, it is basically a chemical precipitation of the soluble phosphorus in the wastewater beyond the amounts removed via biological assimilation.

- Sludge is wasted via submersible pumps at the end of the decant cycle. Each basin is equipped with a dedicated sludge pump. Waste activated sludge would be directed to aerated sludge holding tanks,
- The proposed process is a variant of a "true-batch" sequential batch reactor (SBR) system. In this variation of the SBR process, *inflow is continuous, even during the settle and decants phases of the operating cycle*. This is a well established treatment system with over 550 installations worldwide and with 49 plants in Canada. In Manitoba, there are six (6) successfully operating plants with the 7th facility under construction at Gimli.
- Since a portion of the SBR tanks will be exposed (i.e. not covered), heat loss is bound to happen. However, most plants in Western Canada including places such as North Battleford, Saskatchewan; Saskatoon and Edmonton with climate similar to Winnipeg, utilize aeration tanks that are open to air. Lower temperature does impact nitrification, however it should be also noted that the effluent ammonia requirements are also much less stringent during the winter period, Many SBR systems in Manitoba are covered, however, costs are significant.
- A minimum of two bioreactors is always recommended in any SBR installation. The decision to go with a third (3rd) SBR is generally dictated by the influent flow levels. We do not see any co-relation or benefit with a three (3) SBR configuration being advantageous for nutrient removal.

Following Review of April 12, 2007 Proponent Responses – May 11, 2007

- *Comment on total nitrogen removal*
Essentially the consultant provides confirmation of our understanding that what was meant was a reduction in the total nitrogen and not a "total" nitrogen reduction. While we appreciate the clarification, it should be noted that there is no actual measure for total nitrogen. Rather Total Nitrogen is a calculation consisting of the summation of analytical results for the various (reduced and oxidized) species of nitrogen.
In any case, our concern was mainly with the lack of any elucidation of specific and measurable target levels and timelines for achieving those targets which we'd expect to see in an Environmental Management Plan.
Inasmuch as the consultant's response does not redress this concern, it remains outstanding.
- *Comment on "implementing nitrogen removal is impractical due to limit of technology..."*
The clarification that the comments on the lack of feasibility of nitrogen removal related to the RBC and not the SBR is appreciated. However, it continues to beg the question of why nitrogen removal would not be implemented for the SBR or, at least, be specified for implementation with specific and measurable target levels and timelines for achieving those targets which we'd expect to see in an Environmental Management Plan.

As above, inasmuch as the consultant's response does not redress this concern, it remains outstanding.

- *Comment on mixing zone and deposition of deleterious substances.*

As previously indicated, given that the Province does not have the authority to authorize a contravention of the Fisheries Act (FA) and to the extent that this deposit of free ammonia would constitute a contravention of the general prohibition under 36(3) of the FA, I'd expect that, in accordance with 78(6) of the FA, the Municipality would be expected to be able to show how it was applying "due diligence" to prevent the deposit of this deleterious substance.

It is unclear how the consultant's response here addresses the above.

- *Comment on the use of sodium hypochlorite for disinfection of the RBC effluent and the performance of existing chlorine disinfection system.*

a) *As indicated in our comments, we did not expect the current proposal to result in an annual average flow exceeding the initial volume trigger of 5000 cu. m. per day. The consultant's confirmation of this is acknowledged.*

However, given, as described elsewhere in their response maximum daily and maximum weekly flows would exceed the trigger value and that it is expected that the P2 requirements will be phased in to smaller facilities in the future, it would appear prudent to "see the writing on the wall" and, in order to support an argument of "due diligence" to respond appropriately.

b) *The information provided in the consultant's letter on the effectiveness of the current disinfection practice is appreciated, and supports the contention that it has performed well.*

However, as no information is provided on the Total Residual Chlorine (TRC) levels, nor how they will be addressed in an EMS, the response remains deficient.

- *Comments on the sewage characteristics and loadings,*

a) *While we concur with the approach, the point in our earlier comment was that it was unclear how, given the apparently extreme variance, valid values were derived. The assertion here of "statistical analysis" does not resolve the uncertainty engendered by the lack of clarity.*

b) *For domestic wastewater, apart, perhaps, from the contributions of certain household, the products, the major sources of oxygen demanding substances are the wastes from dietary carbohydrates and proteins. The former largely makes up the carbonaceous oxygen demand, while the latter is responsible for most of the nitrogenous oxygen demand. Both need to be satisfied to effectively stabilize wastewater such that its deposit in a receiving environment may be expected to not have adverse environmental effects. As such, the consultant's contention is unsupportable.*

c) *Our allusion to BOD and TSS "walking together" was meant to suggest that (for domestic wastewaters) they correlate - not that they were equal. That is, our experience is like that of the consultant.*

- d) *As expected.*
- e) *While we appreciate the concurrence, it would be more so if the consultant would have indicated how the reduction of extraneous flows would be addressed in an EMS for the development.*
- *Comment on the provision of a chemical feed system for adding alum to precipitate phosphorus.*
 - a) *Presumably, effective precipitation (particularly if undertaken in a truly quiescent state) would substantially limit the amount of iron that might otherwise interfere with UV penetration and fouling of the tubes. In any case, it should be indicated how the addition of the aluminum in the alum does not compromise the potential use of the stabilized sludge for beneficial use.*
 - b) *No comment.*
- *Comment on the proposed sludge wasting from SBR.*

Other than querying the use of the conditional "would" - no comment.
- *Comment on SBR treatment train.*
 - a) *In our earlier comments, we queried the rationale for the use of a "variant" inasmuch as it compromises the potential effectiveness of the oxidation/nitrification and denitrification steps. Allusion to its application at other locations appears to be a fallacious argument. Just because you're not doing anything that others aren't doing, doesn't make it right. Also, it should be noted that many of the installations referred to (presumably including those in the land of Oz) are in location with more moderate climates that occurring at the proposed location, and given the importance of temperature on system performance would invalidate direct comparisons.*
 - b) *As suggested in our earlier comments, heat/energy conservation should be considered of paramount importance - increasing the operating temperature of the facility (through conservation measures) by 5-10 degrees Celsius could be expected to nearly double the reaction rate and thereby half the size of facility required to meet treatment requirements. Whether such an improvement in treatment efficiency would be cost-effective does not appear to have been fully evaluated.*
 - c) *Besides their inherent capacity for flow equalization, the SBR technology offers the opportunity to "hold" the system in the react phase to ascertain that treatment objectives are achieved. In this context, the argument expressed elsewhere in the consultant's report for a higher "rolling 30-day average" limits and against "not to exceed" values appear moot - not only can the uncompromised technology achieve better treatment than current steady-state activated sludge plants, they can do so with greater assurance.*

- *In a true batch system, without an input of partially oxygenated raw wastewater and with sufficient idle time to establish anoxic conditions, the SBR would also effectively achieve denitrification of the nitrates.*

As well, in a true batch system the settle phase would occur under complete quiescent conditions, thereby optimizing clarification and removal of chemical precipitants and thus result in more effective UV disinfection and reduced maintenance.

- *For none of the above does the consultant's response provide realistic cost/benefit analysis. Rather, their suggestion appears to be that because current standard practice allows for pollution, the facility should be designed to pollute to the allowable level. This is a far cry from what should be seen as Best Practicable Technology (BPT).*
- *As a comment on their response to Manitoba Water Stewardship - Ecological Services Division, it might be worthwhile noting that some thirty years ago Environment Canada expected that federal facilities should apply BPT and at a minimum achieve effluent quality levels of 20 mg/L BOD and 25 mg/L TSS. Given that these standards were set before the days of the CPU, it is not surprising that it did allow for "averaging". BPT was defined as: "Involves the use of production processes, activity practices, and control equipment that are technically feasible and economically possible. It is dynamic and will be progressively updated in the light of new developments in technology, social attitudes and pressures of continued growth.". Presumably in the intervening three decades we've learned something whereby our expectations should be for better treatment levels not less. The federal expectations also defined BOD simply as: "The quantity of oxygen used in the biochemical oxidation of organic matter in five days at 20°C under aerobic conditions."*

Proponent Responses – June 15, 2007:

- Prior to the EAP submission in November 2006, Stantec had pre-consulted Manitoba Conservation on the level of nutrient removal requirements for the proposed upgrade as there are no set effluent criteria in Manitoba. Based on these discussions, it was determined that the focus should be on phosphorus removal with a provision for total nitrogen (TN) removal in the future.

As far as measurable target for TN, some of the licences that have been issued by Manitoba Conservation have a target of 15 mg/L (30 day rolling average). This target has been primarily for larger facilities such the City of Winnipeg and to the best of our knowledge, there is presently no existing operating plant in Manitoba meeting the 15 mg/L TN limit.

For the East St. Paul WWTP upgrade, meeting the 15 mg/L target is not possible with the existing RBC component as explained later. However, if required, the proposed SBR system portion of the work can be designed to meet the 15 mg/L TN target following start-up. We will await direction from Manitoba Conservation on this issue.

- A part of this comment was addressed above with respect to targets and timelines for

the SBR component. The municipality recently started monitoring the TN levels from the existing RBC system. A summary of the results are provided below based on a monthly average basis.

| Month/Year | Total Nitrogen (mg N/L) as monthly average |
|----------------|--|
| January, 2007 | 22.4 |
| February, 2007 | 23.9 |
| March, 2007 | 19.4 |
| April, 2007 | 15.1 |
| May, 2007 | 17.5 |

These values should be considered for setting any future targets for total nitrogen from this facility.

- We acknowledge the concern on deposition of deleterious substances.

As stated before, we provided the calculations and supporting documentation on the expected ammonia levels in the effluent (RBC and SBR). This information was reviewed by both Fisheries and Oceans and Manitoba Water Stewardship — Ecological Services Division and no further concerns were noted. In summary, the proposed SBR system will be designed to meet the effluent ammonia-nitrogen levels identified in the upcoming licence.

- As indicated in the EAP document (Section 2.7, page 3, bullet * 3), the municipality intends to phase out the use of sodium hypochlorite in the future (tentatively by 2010-2011).

As a part of the effluent quality monitoring, the total chlorine residual content is measured at the treatment plant prior to discharge to the outfall sewer. The value is typically between 1.5 to 2.5 mg/L as total chlorine. The outfall sewer pipe is approximately 520 m to the point of discharge at the river.

- No further comments
- Point noted. *We* realize in developing the aeration requirement we always consider both the carbonaceous and the nitrogenous demand.
- No further comments.
- No further comments
- The issue of extraneous flows is due to illegal discharges from basement sump pumps to the sewer system. Unfortunately, the locations of these connections are yet to be determined. However, the municipality will be working towards a solution to this problem.
- The municipality does not have a sludge treatment system. Solids are hauled to the

City of Winnipeg's North End Water Pollution Control Centre for further processing. This arrangement will continue in the future. Hence, beneficial use of sludge solids is not applicable here.

- No further comments
- No further comments
- *True batch vs, continuous inflow*, Both technologies are well proven in the industry for wastewater treatment including nutrient removal. However, the concerns/comments from Environment Canada are noted. Stantec intends to select the SBR supplier through a preselection process (prior to initiation of detailed design). Both versions of the SBR technology will be evaluated through proposal calls from SBR suppliers.
- *Heat conservation/tank covers*: Lower mixed liquor temperature will impact nitrification most likely. However, the decision to cover tanks and/or conduct any heat-loss calculations is a design issue which will be made after the targets for ammonia-nitrogen are received from Manitoba Conservation.
- *Quiescent settling*: We agree that a "continuous inflow" type SBR does not simulate quiescent settling during the settle phase of the cycle. The SBR is designed as a plug-flow type system with influent baffle walls. Three stratified layers are formed in each basin at the end of the settle phase and beginning of the decant phase (please see figure). The sludge blanket forms on the bottom of the basin as the mixed liquor suspended solids (MLSS) settle. A buffer zone of approximately three (3) feet acts to buffer the sludge blanket from the volume that will be removed during the decant phase. The drawdown is the top layer of clear liquid that remains after the MLSS settle and is the maximum volume that is drawn off during the decant phase.
- In conventional activated sludge plants, solids settle out in secondary clarifiers under non-quiescent conditions.

Disposition:

- The draft Environment Act Licence contains a clause that limits the effluent total phosphorus concentration;
- The draft Environment Act Licence contains a clause requiring that the Licencee, once each week following the commencement of operation of the sewage treatment plant under this Licence, obtain samples of treated effluent from the final discharge point of the sewage treatment plant and have the samples analyzed for:
 - cBOD;
 - fecal coliform;
 - total coliform;
 - Total suspended solids;
 - Total phosphorus;
 - Total dissolved phosphorus;
 - Total kjeldahl nitrogen;
 - Ammonia nitrogen;

- Nitrate-nitrite nitrogen;
 - total chlorine residual content;
 - pH; and
 - temperature.
- The draft Environment Act Licence contains a clause that makes it not permissible for the proponent to release a quality of effluent from the Development which:
 - on any day, causes, or contributes to, the mixing zone for the effluent in the Red River being acutely lethal to aquatic life passing through the mixing zone; or
 - can be demonstrated to be acutely lethal to fish within the mixing zone for the effluent in the Red River by using a 96-hour static acute lethality test which results in mortality to more than 50 percent of the test fish exposed to 100 percent concentration of effluent, with the test carried out in accordance with the protocol outlined in Environment Canada's "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout: EPS 1/RM/13 Second Edition – December 2000" or any future amendment thereof.
 - The draft Environment Act Licence contains a clause requiring that the Licencee report the results of required sampling in accordance with the requirements of Clause 2 c) of the Licence.

Health Canada – Healthy Environments and Consumer Safety Branch

Initial TAC Review:

- *Emergency Response Plan and Risk Management Plan with defined roles and responsibilities should be implemented prior to the start of the project.*
- *Address the potential health and safety effects that may be experienced during the construction and operation of the project. Potential effects may include noise, dust, fall hazard, working in confined spaces and traffic effects during excavation, trenching, hauling etc.*
- *Will measures (eg. Scheduling, routing of vehicles, limiting idling) be required and implemented to reduce the potential effects from noise during construction activities (pile driving, nailing, excavation).*

Proponent Responses – April 12, 2007:

- We will advise the Owner to prepare this document prior to the start-up of the proposed expansion/upgrade.
- The General Conditions and specific sections of the tender documents to be prepared for this project will direct the General Contractor and its subcontractors to comply with the environmental requirements as well as compliance with respect to the Manitoba Occupational Health and Safety act.

Fisheries and Oceans

Initial TAC Review:

- *Is there any work being done in or near the water, i.e. to the outfall or banks near the outfall?*
- *How close will the construction be to the river?*
- *Will the new treatment process result in increased output to the river that may cause erosion at the outfall?*

Proponent Responses – April 12, 2007:

- No construction work is planned for the outfall. All construction works associated with the proposed expansion/upgrade will be at the existing STP site
- The existing sewage treatment plant site is approximately 520 meters from the river.
- The output to the river will increase every year as the community grows. The present 750 mm diameter outfall to the river has adequate capacity to handle the projected growth.

Following Review of April 12, 2007 Proponent Responses – May 23, 2007

- *What kind of erosion controls are currently in place at the outfall?*
- *Are the existing erosion control measures (if any) adequate to handle the expected increase in output without allowing erosion in or near the river?*

Proponent Responses – June 15, 2007:

- There is a rock rip-rap placed over the pipe.
- The rock rip rap was placed based on a 24 inch i.e. 750 mm outfall pipe discharging to the river. As stated earlier, the 750 pipe has adequate capacity to handle the projected growth.

Disposition:

- The draft Environment Act Licence contains a clause requiring that the Licencee install and maintain rip rap on the river bed and bank at the location of the outfall of the effluent discharge pipeline to prevent erosion of the river bed and bank to the satisfaction of an Environment Officer.

PUBLIC HEARING:

A public hearing was not requested.

RECOMMENDATION:

Issue an Environment Act Licence in accordance with the attached draft. Once the sequencing batch reactor sewage treatment plant and UV disinfection process components are operational, a joint inspection should be completed by Environment Officers from the Environmental Assessment and Licensing Branch and Regional Operations Branch prior to transferring the Licence to the Region for enforcement.

PREPARED BY:

Robert Boswick, P. Eng.
Environmental Engineer
Environmental Assessment and Licensing Branch
Manitoba Conservation
October 18, 2007

Telephone: (204) 945-6030

Fax: (204) 945-5229

E-mail Address: robert.boswick@gov.mb.ca