Township of Red Rock

Red Rock Wastewater Treatment Plant Environmental Study Report

Prepared by:

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AECOM Project No. 60144398

Date:

February 2013

ENL Engineering Northwest Ltd.

AECOM

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ENL Engineering Northwest Ltd.
Consulting Engineers

February 21, 2013 PN 09080

Township of Red Rock
P.O. Box 447
Red Rock, Ontario
P0T 2P0

Attention: Mr. Kal Pristanski, CAO

Dear Sir:

Re: Township of Red Rock
Wastewater Treatment System Upgrades
Final Environmental Study Report

Please find attached five (5) copies, plus one CD, of the Final Environmental Study Report (ESR) dated February 2013 for your records. One (1) additional hard copy and CD has been delivered to OCWA for their records.

Upon receipt of Council's Resolution accepting the report and recommendations, the Notice of Completion will be advertised as required. The report will then be required to be placed on the Public Record for a minimum 30-day review period. One copy of the ESR should be made available at the Township offices and one copy at the Red Rock library for review upon Council's acceptance. We understand that the Township will upload the ESR to the Township's website.

If there are any questions please do not hesitate to contact our office.

Yours very truly,

ENGINEERING NORTHWEST LTD.
A Division of Hatch Mott MacDonald

K. Bemben, P.Eng.
KB:dc
Encl.

cc. J. Casal - OCWA
Meseret Aniye – AECOM

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Distribution List

# of Hard Copies	PDF Required	Association / Company Name
5	1 CD	Township of Red Rock
1	1 CD	Ontario Clean Water Agency

Revision Log

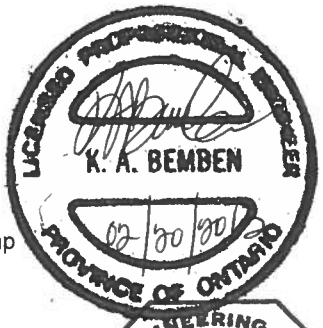
Revision #	Revised By	Date	Issue / Revision Description
1	AECOM/ENL	February 28, 2012	Red Rock WWTP ESR - Draft
2	AECOM/ENL	March 8, 2012	Red Rock WWTP ESR
3	AECOM/ENL	February 22, 2013	Red Rock WWTP ESR

Signatures

Report Prepared By:

Kathy Bemben, P.Eng.
Project Manager, Engineering Northwest Ltd. (a Division of Hatch Mott MacDonald)

Stamp



Report Prepared By:

Dan Currie, C.E.T.
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Report Prepared By:

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Project Engineer, AECOM

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Report Reviewed By:

Bruce McMullan
Senior Project Manager, AECOM

Executive Summary

ES1. Introduction

The Township of Red Rock utilizes primary treatment and disinfection with chlorine to treat wastewater collected from the Community before discharging the effluent into Nipigon Bay of Lake Superior.

Nipigon Bay has been designated as an Area of Concern in Ontario by the Water Quality Board of the International Joint Commission. One of the main stresses is the result of effluent discharge from primary wastewater treatment plants in Nipigon and Red Rock. The full delisting of Nipigon Bay as an Area of Concern will require the Red Rock Wastewater Treatment Plant to implement full secondary treatment.

The Township of Red Rock commissioned a Class Environmental Assessment report to investigate alternative ways to address the need to implement a full secondary treatment process.

ES2. Class Environmental Assessment Process

This project is being planned in accordance with the Municipal Class Environmental Assessment (Class EA) document dated October 2000, as amended in 2007. The Class EA process was developed as an alternative method to individual Environmental Assessments for recurring municipal projects that were similar in nature, usually limited in scale and with a predictable range of environmental effects that were responsive to mitigating measures.

A key component of the Class EA process is to inform and consult with the public and concerned agencies. From a review of the various alternative planning solutions for upgrading and expansion of the Red Rock Wastewater Treatment Plant, it was identified that this project would qualify as either a Schedule ‘B’ or Schedule ‘C’ undertaking under the Municipal Class EA process depending on several factors such as constructing a new facility on a new site or expanding the plant on the existing site.

According to the MEA Class Environmental Assessment planning and design process, the public, review agencies and the MOE will be notified on the completion of the study.

The filing of the ESR and public record marks the conclusion of Phase 3 of the Class EA process for this study. Subject to any comments received during the review period, and assuming that no Part II Order requests are submitted or the matter is not referred to mediation or the project is not abandoned, the project will be considered to be approved under the Class EA as a Schedule ‘C’ activity and the Township of Red Rock may proceed to the detailed design and implementation stages.

ES3. Inventory of the Environment

Part of the study included an inventory of the environment, including:

- defining study area;
- wastewater servicing;
- natural environment;
- inventory of social environment; and
- regulatory environment.

ES4. Problem Statement

The Red Rock Wastewater Treatment Plant was constructed in 1975 and provides primary treatment and chlorine disinfection of the effluent. Upgrades are required to the existing plant for the following reasons:

- the Nipigon Bay has been classified as an Area of Concern (AOC) in Ontario by the Water Quality Board of the International Joint Commission due to water pollution. As one of the requirements to delist the Bay as an AOC, the Red Rock Wastewater Treatment Plant must provide secondary sewage treatment. The existing plant provides only primary treatment; and
- secondary sewage treatment is required in the Province of Ontario.
- high wet weather flows cause sewage backups as a result of the reduction in outfall pipe size through the Mill property (requires replacement);
- much of the existing plant components and equipment are at the end of their serviceable life;

ES5. Review of Alternative Planning Solution

The alternative planning solutions are the larger concept solutions to satisfy the problem/opportunity statement developed for the Red Rock Wastewater Treatment Plant. A list of alternatives was developed based on an initial screening. The following alternatives were developed and evaluated:

- do nothing;
- demand management;
- extraneous flow reduction;
- existing plant process optimization;
- upgrade/expand the existing plant at the existing site; and
- construct a new wastewater treatment plant on an alternative site.

The following wastewater treatment options were reviewed:

- aerated lagoons (on a new site);
- conventional activated sludge process (at the existing site);
- extended aeration process (at the existing site);
- sequencing batch reactor (at the existing site); and
- rotating biological contactors (at the existing site);

Based on the evaluation, the preferred planning solution for this study is to upgrade the existing wastewater treatment plant using Rotational Biological Contactor (RBC) and discharge treated effluent to Nipigon Bay. This alternative is preferred as:

- minimal impact on the natural and social environment;
- sufficient land available on the existing site to construct the new treatment plant. Property acquisition is not required;
- the treatment process (i.e. RBC) will be similar to the treatment process recently installed in the Township of Nipigon, which provides a mutual benefit with respect to operating knowledge and potential economies of scale;
- the existing collection system has been constructed based upon the present location of the Red Rock WWTP, therefore a new forcemain and pumping of sewage to a new location will not be required;
- Proximity to Peregrine Falcon habitat will not be an issue;
- No further studies (i.e. assimilative capacity of North Trout Creek, Archaeological, etc.) with impacts to schedule and cost will be required.

An effort should be made to reduce extraneous flows to the sanitary system (i.e. repairs to manholes and sewers).

It was identified that this project would qualify as a Schedule 'B' undertaking under the Municipal Class EA process as per the following:

"An expansion of a sewage treatment plant, including relocation or replacement of the outfall to a receiving water body, up to an existing rated capacity where new land acquisition is required."

ES6. Review of Alternative Design Solutions

Once the preferred planning solution was selected, various design solutions were then proposed and evaluated to refine the project. After review of the design solutions, a preferred project was developed as noted as follows:

- plant capacity = 900 m^3/d (average day)
- new sewage pumping station having a capacity of 58 L/s (5,000 m3/d)
- septage receiving station.
- headworks –mechanical coarse screen with standby manually cleaned bar screen, horizontal grit tank having a capacity of 58 L/s (5,000 m^3/d)
- secondary process involving Rotating Biological Contactors (with primary & secondary clarifiers) having a process capacity 900 m^3/d and clarifier hydraulic capacity of 5,000 m^3/d.
- disinfection process involving either Chlorination/dechlorination system or UV system having capacity of 58 L/s (5,000 m^3/d)
- sludge stabilization using aerobic digestion
- outfall in Nipigon bay
- new control building
- decommissioning and demolition of the existing plant facilities
- disposal of biosolids at the landfill
- upgrades to collection system to reduce inflow and infiltration

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1. Introduction

1.1 Background of Report

The Township of Red Rock is located on the north shore of Lake Superior, approximately 100 km east of the City of Thunder Bay. The Township owns and operates the municipal wastewater collection and treatment system that serves the Townsite area. The wastewater treatment plant provides primary treatment and disinfection of the domestic wastewater, prior to discharging into Nipigon Bay of Lake Superior.

The Nipigon Bay has been designated as an Area of Concern (AOC) in Ontario by the Water Quality Board of the International Joint Commission. Main stresses on the ecosystem are related to water level and flow fluctuations in Lake Nipigon and Nipigon River. One of the stresses is the result of the effluent discharge from the primary wastewater treatment plants in Nipigon and Red Rock. The full delisting of the Nipigon Bay as an AOC will require the Red Rock Wastewater Treatment Plant (and Nipigon Wastewater Treatment Plant) to implement full secondary treatment.

The Township of Red Rock commissioned a Class Environmental Assessment (EA) report in 2004 to investigate alternative ways to address the need to implement full secondary treatment. Subsequent to the previous Class EA being completed, the Township has expressed concerns regarding the operating costs of a new treatment process, land availability to accommodate a secondary treatment process, and the need to relocate the existing effluent outfall.

Accordingly, the Township initiated this study to consider the Township's concerns, and to update the previous Class EA and preliminary design study as required.

1.2 Previous Studies

The following reports have been completed with respect to upgrading the Red Rock wastewater treatment plant facilities and extent of Infiltration and Inflows in the sanitary collection system as follows:

- "Final Report for the Township of Red Rock WWTP Class EA", March 2004, Hydromantis Inc.;
- "Preliminary Design Study to Address Issues for Proposed Upgrades of the Wastewater Treatment Plant from Primary to Secondary", April 2006, Wardrop and Hydromantis Inc.;
- "Township of Red Rock Sanitary Collection System Inflow and Infiltration Desktop Study", May 2010. Engineering Northwest Ltd.

The 2004 Class Environmental Assessment (EA) evaluated alternative treatment options for upgrading the wastewater treatment facilities to provide secondary treatment. The EA process proceeded as a Schedule B project, see Section 1.3 below for information relating to the Class EA process.

Public consultation was held as part of the EA process. On March 18, 2004 a Public Information Centre (PIC) was convened to invite public input into the process. Two short-listed alternative treatment processes were presented at the PIC:

- rotating biological contactor; and
- conventional activated sludge.

Based on the comments received at the PIC and the Township's preference for a process with minimal operational costs, the recommended alternative was a Rotating Biological Contactor (RBC) to be constructed at the existing plant site. The report also recommended the following additional studies to be completed at the detailed design stage of the RBC process:

- geotechnical analysis of the plant site as excavation will be required for the RBCs and secondary clarifiers.
- plant site hydraulic profiling to determine optimal location of the new process units;
- a study to determine the effectiveness and design dose for UV disinfection of the RBC effluent;
- socio-economical analysis to determine future growth projections and plant loadings, to allow the assessment of the optimal design flow rate for the RBC process; and
- a detailed review of outfall requirements including length and depth of diffuser.

The recommended solution in the 2004 Class EA was an RBC process to be constructed on the existing site. The study did not consider constructing a new facility at an alternative site.

Subsequent to the completion of the 2004 Class EA study discussed above, the Township commissioned a preliminary design for the recommended alternative. The preliminary design report was completed in April 2006. The report generally addressed the recommendations for additional studies identified in the EA study.

Further public consultation was held on February 21, 2006 with respect to the preliminary design.

1.3 Current Study

This study initially proceeded as a Schedule B project. An initial public meeting was held on April 28, 2010 at the Red Rock Community Centre. The following wastewater treatment options were considered:

- aerated lagoons (on a new site);
- Envapocrystallization (EVC©) (on a new site);
- conventional activated sludge process (at the existing site and at the existing Mill Site);
- extended aeration process (at the existing site);
- sequencing batch reactor (at the existing site); and
- rotating biological contractors (at the existing site).

Based on the evaluation, the preferred planning solution was to upgrade/expand the existing plant at the existing site.

Once the preferred planning solution was selected, various design solutions were proposed and evaluated to refine the project. After review of the design solutions the preferred project was proposed as noted below:

- upgrade existing facility on the existing site;
- capacity of the new plant to be 1,272 m^3/d (same as the existing plant capacity);
- headworks involving installation of mechanically cleaned coarse screen and a bypass manually cleaned bar rack;
- horizontal grit channels;
- secondary treatment process involving either SBR or RBC type activated sludge process to be selected during the detailed design stage;
- sludge stabilization involving aerobic digestion;
- a new control building at the wastewater treatment plant;
- a new outfall in Nipigon Bay;

- continued disposal of biosolids at the landfill; and
- decommissioning and demolition of the existing plant process tanks and buildings after the new plant is commissioned.

After the first draft of the ESR was presented to Council in August 2010, the Township of Red Rock requested the project team to investigate the proposal and additional information provided by Northern Watertek Corporation for an EVC© treatment system in more detail, including visiting an existing installation. As well, the potential for utilizing the former Red Rock Mill lagoons was added as a viable option as the mill would not be re-opening. A further refinement of the population and design flows was then undertaken.

Based on this further review, the draft ESR completed in 2010 was updated, and the preferred project was proposed as noted below:

- upgrade the existing lagoons on the Red Rock Mill site for use as Municipal Aerated lagoons;
- capacity of the new facility to be 900 m^3/d;
- treatment of anticipated peak flows resulting from extraneous flow in the collection system;
- removal of screenings to protect downstream equipment;
- removal of suspended solids to achieve anticipated effluent criteria for this parameter;
- removal of organics (referred to as biological oxygen demand or BOD_5) to achieve anticipated effluent criteria for this parameter;
- removal of ammonia to achieve non-toxic effluent;
- removal of phosphorus to meet effluent criteria for this parameter and minimize impacts on Nipigon Bay, and
- provision will be made into the system during design to provide disinfection system should it be required in the future;
- provision will be made into the system during design to provide for future tertiary/enhanced treatment should it be required in the future;
- An effort should be made to reduce extraneous flows to the sanitary system (i.e. repairs to manholes and sewers).

Prior to this alternative being implemented, the land for the lagoons had to be acquired by the Township, and the existing lagoon sludge sampled to ensure that there were no environmental issues with the sludge.

The Notice of Completion was issued in March 2012, and the ESR was placed on the public record for review.

Since filing the ESR in March 2012, the Township has been unable to secure the necessary land to implement the preferred alternative. As a result, the option of utilizing the Red Rock mill lagoon is no longer a viable alternative. The Township has therefore withdrawn the Notice of Completion for the project in order to complete additional documentation of the remaining alternatives.

1.4 Class Environmental Assessment (EA) Process

This project is being planned in accordance with the Municipal Class Environmental Assessment (Class EA) document dated October 2000, as amended in 2007. The Class EA process was developed as an alternative method to individual Environmental Assessments for recurring municipal projects that were similar in nature, usually limited in scale and with a predictable range of environmental effects that were responsive to mitigating measures.

The Class EA procedure does not require application for additional approvals under the Environmental Assessment (EA) Act provided the proponent has complied with the necessary requirements and procedures. These requirements and procedures include a full description of the project, consideration of alternatives, and identification

of the impacts resulting from their implementation and continuance. The Class EA process also requires the proponent to inform and consult with the public and concerned agencies. The planning and design process requirements for a Class EA are detailed in Figure 1.1.

Depending on the Schedule designation, the following phases of the planning process are required for compliance with the Class EA document:

Phase 1 - Identify the problems or deficiencies.

Phase 2 - Identify alternative solutions and establish the preferred solution taking into account public and agency review input.

Phase 3 - Examine alternative methods of implementing preferred solution.

Phase 4 - Document in an Environmental Study Report a summary of the rationale and the planning, design and consultation process.

Phase 5 - Proceed to construction and operation and monitor for adherence to environmental provisions and commitments.

In accordance with the Class EA, an expansion of a sewage treatment plant, including relocation or replacement of outfall to receiving water body, up to existing rated capacity where new land acquisition is required would qualify as a Schedule 'B' project. A new plant on a new site would qualify as a Schedule 'C' project. The Class EA Schedule is to be determined based on the preferred alternative.

1.5 Project Team

The project team for the Red Rock Wastewater Treatment Plant Class EA is as follows:

Proponent:	Township of Red Rock
Main Contact:	Gary Nelson, Mayor Kal Pristanski (CAO) David Pettersen, Public Works Superintendent
Project Management:	Ontario Clean Water Agency
Main Contact:	José A. Casal, M.Sc., (Eng.), P.Eng. Bob Dormer, P.Eng.
Consultant:	Engineering Northwest Ltd. (A Division of Hatch Mott MacDonald)
Main Contact:	Kathy Bemben, P.Eng. Dan Currie, C.E.T.
Sub-consultant:	AECOM Canada Ltd.
Main Contact:	Bruce McMullan Meseret Aniye, P.Eng.

1.6 Project Schedule

The following summarizes the major milestones of this project:

Project Initiation	December 2009
Initial Notice	January 2010
Public Consultation Centre No. 1	April 2010
Environmental Study Report 1st Draft	August 2010
Public Consultation Centre No. 2	October 26, 2011
Notice of Completion	March 28, 2012
Notice of Completion Withdrawn	September 25, 2012
Public Consultation Centre No. 3	December 5, 2012
Notice of Completion	March 2013
Environmental Study Report Filed for Public Review	March 2013

1.7 Consultation with Review Agencies, Special Interest Groups and the Public – Phase One

Initial contact was made with the public and the government review agencies during Phase One of the project, at the commencement of the study. This is a discretionary point of contact under the Class EA. The contact was made by a Notice published in the local publication the Nipigon-Red Rock Gazette on January 19, 2010 and January 26, 2010.

Letters with the Notice were mailed to government review agencies and other interest groups on January 19, 2010. A copy of the Notice as well as a copy of the letter is included in Appendix A.

The following is a list of review agencies and interest groups that were provided written notification of the project:

Provincial Ministries
- Ministry of the Environment
- Ministry of Natural Resources
- Ministry of Culture
- Ministry of Transportation
- Ministry of Northern Development and Mines
- Ministry of Municipal Affairs and Housing

Federal Departments
- Fisheries and Oceans Canada
- Environment Canada
- Parks Canada
- Lake Superior National Marine Conservation Area
- Infrastructure Canada
- Transport Canada - Navigable Waters Coordinator

First Nations and Métis
- Ontario Secretariat for Aboriginal Affairs
- Indian and Northern Affairs Canada
- Red Rock First Nation
- Métis Nation of Ontario
- Nipissing First Nation

Emergency Service Providers
- Ontario Provincial Police
- Red Rock Fire Department
- Superior North Emergency Medical Services

School Boards
- Superior Greenstone District School Board
- Superior North Catholic District School Board

Utilities
- Bell Canada
- TBay Tel
- Shaw Cable
- Union Gas
- Hydro One
- Trans Canada Pipeline

Railways
- Canadian Pacific Railway
- Canadian National Railway

Municipalities
- Township of Red Rock
- Township of Nipigon

Other

- Thunder Bay District Health Unit
- Nor West Community Health Centres – Mobile Unit
- North American Logistics (the Red Rock Mill)
- Remedial Action Plan Coordinator
- Nipigon Bay Public Advisory Committee

A detailed mailing list of the above can be found in Appendix A.

A number of comments/concerns were received from review agencies and residents of the area. A summary of the comments received, and the response to the comments is included in Table 1.1 following, and copies of the comments and responses can be found in Appendix B.

Table 1.1 Summary of Comments Following Initial Notice

Respondent	Date Response Received	Summary of Comments Received	Summary of Response/Action Provided
Department of Fisheries and Oceans (DFO)	January 19, 2010	Acknowledged receipt of Initial Notice of Project. Noted DFO's involvement if there will be in water work with respect to a new outfall.	No response necessary. DFO will be duly consulted as the process moves forward.
Dorion Resident #1	January 21, 2010 February 1, 2010	General request for information about the Municipal Class Environmental Assessment for Red Rock. Comment supporting the Envapocrystallization ("snowfluent") process by Northern Watertek.	An email response (January 22, 2010) provided a link to the Municipal Engineers Association where the Municipal Class Environmental Assessment Document is available for review. No response necessary. This process is being considered in the evaluation process of this project.
Indian and Northern Affairs Canada (Don Boswell)	January 21, 2010	Information provided with respect to First Nation Land Claims.	No response necessary.
Remedial Action Plan (Aaron Nicholson)	January 21, 2010 February 11, 2010	Invited ENL to attend a Public Advisory Committee meeting for the Nipigon Bay Area of Concern. Telephone message indicating interest in meeting once a preferred solution if chosen.	Unable to attend meeting. Remedial Action Plan will be notified of future consultation and preferred solution.
Indian and Northern Affairs Canada (Brian O'Meara)	January 27, 2010	Information provided regarding active litigation with respect to First Nation Land Claims.	No response necessary.
Red Rock Resident #1	February 8, 2010	Telephone response indicating concerns with respect to cost of the project, potential increase in taxes and the necessity of the project. Requested information regarding the date for compliance, watermain bleeders, treated water versus sanitary flows.	Suggested the respondent discuss tax increases with the Township. Information regarding date of compliance and flows etc. was provided to the resident in a letter dated April 8, 2010.
Parks Canada – Lake Superior National Marine Conservation Area (Gail Jackson)	February 8, 2010	Telephone response requesting information regarding outfall location with respect to the Lake Superior National Marine Conservation Area.	Information with respect to outfall location will be provided when known.
Ministry of the Environment (Carrie Hutchison)	February 17, 2010	Requested on update regarding the activities since May 2006.	An update on the project was provided by email February 24, 2010.
Dorion Resident #2	February 21, 2010	Comment supporting the Envapocrystallization ("snowfluent") process by Northern Watertek.	No response necessary. This process is being considered in the evaluation process of this project.

Table 1.1 Summary of Comments Following Initial Notice

Respondent	Date Response Received	Summary of Comments Received	Summary of Response/Action Provided
Hydro One (Lee Alexander)	February 25, 2010 March 2, 2010	Telephone request for information if transmission or rural lines will be affected by the project. Requested more information once more details are available	Provided a drawing showing the proposed sites. Hydro One will be duly consulted as the process moves forward.
Ministry of Culture (Paige Campbell)	March 2, 2010	Telephone request to determine if an archaeological assessment was completed for the previous Environmental Assessment completed in 2004, and/or if one will be completed for this study.	An archaeological assessment was completed as part of this study and a copy of the report was provided to the Ministry of Culture by the author.
Ministry of Environment (Paul Jordan)	March 9, 2010	Confirmation of Effluent Criteria to be met for discharge to Nipigon Bay.	Information received in response to January 11, 2010 letter requesting confirmation of effluent criteria. No further action necessary.

1.8 Consultation with Review Agencies, Special Interest Groups and the Public – Phase Two

The second contact was made near the end of the Phase Two process.

The second contact indicated that a Public Consultation Centre (PCC) was to be held, the date of the PCC, and requested comments.

The contact was made by a Notice of Public Consultation Centre (PCC) published in the local publication the Nipigon-Red Rock Gazette on April 13, 2010 and April 20, 2010.

Letters with the Notice were mailed to government review agencies and other interest groups, and unaddressed flyers of the Notices were delivered to 347 addresses in the P0T 2P0 postal code area on April 8, 2010. A copy of the Notice as well as a copy of the letter is included in Appendix A.

A Public Consultation Centre (PCC) was held April 28, 2010 to present the preliminary problem statement, the proposed alternative solutions, the evaluation criteria proposed to evaluate the alternative solutions, and the preliminary evaluation of the alternatives. Fourteen people attended the PCC. Documentation of the information available at the Public Consultation Centre is included in Appendix C.

Comments received subsequent to the PCC are summarized in Table 1.2, and copies of the comments and responses can be found in Appendix B. Verbal comments received at the PCC are noted, otherwise all communication was in writing.

Table 1.2 Summary of Comments Following Public Consultation Centre

Respondent	Date Response Received	Summary of Comments Received	Summary of Response/Action Provided
Superior Green Consulting	April 28, 2010	Stated that he has documentation showing that MOE has approved the Envapocrystallization process, so it should be considered as an alternative, contrary to the information presented on the displays. He indicated he would forward MOE approval documentation to ENL (Verbal comment at the PCC).	ENL requested the confirmation of MOE documentation and further technical and cost details in writing on May 11, May 19 and June 2, 2010. Superior Green provided further written documentation May 27, June 4, June 8 and July 15, 2010
Ministry of Natural Resources (Phil Couture)	April 28, 2010	Requested information on the proposed outfall location. ENL noted that the exact location hasn't been selected yet and will ultimately depend on final site selection. If the existing site is to be used the outfall would be to Nipigon Bay. He provided a 2009 survey of the water lots in Red Rock, showing the existing water treatment plant intake and the MCA boundary. Requested more information when known. (Verbal comment at the PCC, email delivery of noted survey plan).	ENL contacted Gail Jackson of Parks Canada on April 30, 2010, with respect to the survey provided by MNR. She confirmed the area of the Lake Superior National Marine Conservation Area (LS NMCA) and the Licenses of Occupation not included in the LS NMCA. She requested to be informed of the proposed location of the outfall when known. The MNR and Parks Canada will be notified of the location of the proposed outfall when known.
Consultation Committee of Thunder Bay & Region Métis Nation of Ontario (Cam Burgess)	April 28, 2010	Did not receive notice of the project, and questioned whether the Red Rock Indian Band received notice. (Verbal comment at the PCC).	An email response was sent to Mr. Burgess on April 30, 2010 indicating that the Métis Consultation Unit (Ottawa Office) was included on the distribution list as was the Red Rock Indian Band. Mr. Burgess was added to the distribution list.
Ministry of the Environment (Michelle McChristie)	April 30, 2010	Request for presentation materials presented at the Public Consultation Centre (PCC).	The information displayed at the PCC was emailed to Ms. McChristie April 30, 2010
Ministry of the Environment (Michelle McChristie)	May 20, 2010	Forwarded information with respect to Environment Canada's proposed wastewater regulations.	On May 26, 2010 MOE and Environment Canada were contacted for additional information and clarification on the proposed regulations.
Métis Nation of Ontario	June 7, 2010	Requested to be involved in the consultation process, and requested sufficient information to be able to determine if the project may impact their Aboriginal rights.	The information displayed at the PCC was mailed to the Métis offices in Thunder Bay and Toronto on June 16, 2010, along with copies of previous notifications that were sent.
Ministry of Natural Resources (Lisa Nymen)	July 5, 2010	Information with respect to Species at Risk in the areas identified as potential sites for new treatment facilities. Identifies potential Peregrine Falcon habitat near Area #1 and #2.	No response required.

1.9 Consultation with Review Agencies, Special Interest Groups and the Public – Phase 3

A third point of contact was made near the end of the Phase Three process. The third contact indicated that a second Public Consultation Centre (PCC) was to be held, the date of the PCC, and requested comments.

The contact was made by a Notice of PCC #2 published in the local publication the Nipigon-Red Rock Gazette on October 11, 2011 and October 18, 2011. Letters with the Notice were also mailed to government review agencies and other interest groups. An unaddressed flyer of the Notice was mailed to 347 addresses in the P0T 2PO postal code on October 18, 2011. A copy of the Notice as well as a copy of the letters is included in Appendix A.

The second Public Consultation Centre (PCC) was held October 26, 2011 to provide alternative design recommendations to the public and to receive input and comments from interested persons. 19 people attended the PCC. Documentation of the information presented at the PCC is included in Appendix C.

A number of comments/concerns were received from residents of the area after PCC#2, and are summarized in Table 1.3 along with proposed mitigation measures. A copy of the comment sheets and letters are enclosed in Appendix B.

Table 1.3 Summary of Public Concerns Following Public Consultation Centre #2

Comment	Summary of Comments Received	Summary of Response/Action Provided
1.	Why have costs changed since the first PCC, because of reduced flows?	Costs have changed due to reduced flow rates, and the exclusion of some items to ensure the costs for all alternatives are based on the same parameters.
2.	Are there costs to remove the sediment in the Mill lagoons in the estimates presented?	No costs to remove sediment are included in the estimates presented, as MOE advised no concerns with using the existing Mill lagoons for the municipal WWTP. The site has been dormant for 5 years, and dilution from rainfall and snowmelt may have occurred. Sampling and testing of the sediment will be required during detailed design if the Mill lagoon is to be reused.
3.	Are there costs to remediate the Brownfield Mill site in the estimates presented?	No costs for site remediation are included in the estimates presented as MOE advised no concerns with using the existing Mill lagoons for the municipal WWTP.
4.	Is there toxic sediment in the Mill lagoons that has to be removed, and where would it be disposed?	MOE advised no concerns with using the existing Mill lagoons for the municipal WWTP. The site has been dormant for 5 years, and dilution from rainfall and snowmelt may have occurred. Sampling and testing of the sediment will be required during detailed design if the Mill lagoon is to be reused.
5.	How is treatment of leachate from the old landfill site beside the Mill lagoons mitigated?	The MOE indicated that the former mill owner (Cascades) has money in trust to complete remediation work at the mill site. This would include the closure of the existing wood waste landfill site. Leachate from the existing landfill has been characterized by the MOE as being low strength and low volume. It is anticipated that the leachate from the landfill site would continue to be pumped to the existing lagoon for a period of time. It was noted that the closure of the landfill site will occur even if the Township does not proceed with re-using the mill lagoon. It should be noted that the Township is not contemplating purchase of the landfill area of the Mill site. The Draft Phase 2 Site Assessment (Oct. 17, 2006) indicates additional assessment may be required at the landfill area.
6.	Discharge of effluent to Nipigon Bay will place heavy burdens on lakes and rivers.	Effluent will meet secondary treatment requirements of MOE and Environment. Canada, the assimilative capacity of the lake due to the high flows in the Nipigon

Comment	Summary of Comments Received	Summary of Response/Action Provided
		River is well above that required by MOE.
7.	Will the Mill lagoons provide secondary treatment?	The Mill lagoons will provide secondary treatment.
8.	Will there be a 3rd open house?	A third open house is not planned.
9.	Do the flow rates allow for future growth?	The flow rates allow for a 1% growth rate.
10.	Are the cost estimates guaranteed prices?	The cost estimates are not guaranteed, they are developed at a Class "C" level, which is standard at this phase of a project.
11.	How were the monies for this project obtained and disbursed to date?	The Province of Ontario through Renew Ontario and the OMAFRA has provided $450,000 to the Township for the Class EA and Preliminary Design Study.
12.	Resident supports innovative technology that prevents hormones, cysts, etc. from entering the lake. Angler doesn't want discharge to the lake.	Effluent will meet secondary treatment requirements of MOE and Environment Canada, and the assimilative capacity of lake due to the high flows in the Nipigon River is well above that required by MOE. Provision will be included in the design for future treatment enhancements should they be required by Regulation changes. EVC© process that uses land application of treated effluent was considered as one of the alternative solutions. The effluent from this process enters the ground through snowmelt and rainwater infiltration, and eventually to the lake through groundwater movement, and possibly through surface runoff. Provision for future disinfection is proposed (chlorination and/or UV).

Comments were also received from several review agencies/special interest groups both prior to and following the PCC #2.

Table 1.4 Summary of Agency/Interest Group Concerns Following Public Consultation Centre #2

Agency/Group	Summary of Comments Received	Summary of Response/Action Provided
Lakehead/Nipigon/Michipicoten Consultation Committee **Métis Nation of Ontario**	Requested the Township's review of innovative technologies beyond secondary treatment; wants to see zero discharge to Nipigon Bay to achieve delisting as Area of Concern; requested consultation with the Township.	Additional information was sent to MNO Dec. 1, 2011 and March 1, 2012 A consultation meeting with MNO was held Jan. 5, 2012. MNO requested a deputation to Township Council which took place Feb. 2, 2012.
Nipigon Bay RAP Committee	Requested documentation from PCC #2. Supports the alternative of update	Displays from PCC #2 forwarded to RAP. Parks Canada has been contacted re: possible outfall sewer and NMCA boundaries.

Agency/Group	Summary of Comments Received	Summary of Response/Action Provided
	and/or expand the WWTP at either the existing or an alternative site, and suggests coordination with Parks Canada regarding the NMCA.	
Parks Canada	Sewage discharge to a National Marine Conservation Area (NMCA) is prohibited.	The NMCA boundary has not been legislated, and the areas for proposed outfall have been provided to Parks Canada. Parks Canada will be kept involved as the project moves forward.
Ministry of Environment	Provided effluent criteria to be met for alternative processes and effluent receivers.	No further action necessary.
Ministry of Aboriginal Affairs	Requested a list of First Nations, Métis and Aboriginal groups contacted during the Class EA	Information was provided to MAA, and MAA advised no further recommendations.

Copies of the comments can be found in Appendix B.

1.10 Consultation with Review Agencies, Special Interest Groups and the Public Following 2012 Notice of Completion

Subsequent to the Environmental Study Report (ESR) being placed on public record in March 2012 a number of comments, questions and concerns were received from local residents. The comments are summarized in Table 1.5 below along with the proposed mitigation measures. A copy of the comment sheets and letters are enclosed in Appendix B.

Table 1.5 Summary of Public Concerns Following Publication of the ESR

Comment	Summary of Comments Received	Summary of Response/Action Provided
1.	How much of excess infiltration and inflow can be stopped without restricting weeping tile water and eaves trough water from entering the system?	In the May 2010 Inflow & Infiltration Desktop Study prepared by Engineering Northwest Ltd. (included as Appendix D to the ESR) an estimated 38% of the total sewage flow is a result of inflow and infiltration. The study also found that the inflow (such as from weeping tile and eaves trough) is typically estimated at a significantly higher proportion (2-4 times) of the total inflow and infiltration as compared to infiltration alone.
	Would the small outfall pipe through the mill properly be a problem if there were no excess flows?	The small outfall pipe would continue to be a problem if there were no excess flows due to its location on the mill property (i.e. the Township does not own the land so access may be an issue in the future). However, the pipe is physically large enough to handle the normal daily flows during dry weather.
	Are the increased costs for Mr. White's pipeline a result of excess flows?	With respect to Mr. White's costs, we do not have detailed information to provide further comment.
	Could you speculate what caused the big spike in the treated water use in 2008?	We believe this comment is with respect to the information provided in Table 2.1 of the ESR relating to sewage flows. The historical maximum day flow recorded was 4,876 m3/d in June 2008. This was likely a result of a heavy rainstorm.

Comment	Summary of Comments Received	Summary of Response/Action Provided
	Why were no bore holes drilled on mill property? Or am I mistaken on this?	There were no bore holes drilled on mill property as part of this study. However, some geotechnical information was available for the mill property which was reviewed and used as part of this study.
	How many communities are you aware of that allow rainwater in the sanitary sewers? .	Some sanitary sewer collection systems were initially installed with combined sewers that collected both domestic sewage and rainwater. This practice is no longer allowed today, however, it remains a problem for many communities in Ontario.
2.	I have questions about this whole process - why there was no citizen participation at the meeting of December 7, 2011 where the environmental plan was adopted? I was the only public attendee. Why was this meeting at 6:00 pm and not on our regular council night? Why was this meeting not advertised in a fashion that people in our town are accustomed to? Every garage and bake sale is advertised by posting a notice on some bulletin board in town. Why does the town administration continue its obviously ineffective method of informing its citizens of important meetings?	Concerns you have relating to meeting notifications, public participation at Council meetings etc. should be directed to the Township's administration.
	Also I question administration's actions in refusing to give me a copy of the waste water treatment plan. Even the Freedom of Information request could not pry one out of the administration's hands. Some people in this town don't use computers. As to the plan itself, what am I actually being asked to comment on? At the last meeting I attended, Information released there seemed to contradict the handout the citizens received. I have some issues here. I am being asked to comment on a multimillion dollar construction project in planning for ten years. However, the planners involved don't seem to know where it is being built, or even what the project will look like when it is finished. Why will there be no open meeting? What possible reason can there be to not inform the citizens of this community in this major undertaking?	As per the Notice of Completion advertised in the local newspapers and delivered by mail to yourself and other local residents, paper copies of the Environmental Study Report (ESR) were made available for review at the Municipal Office and at the library, and could also be checked out from the library. Additionally, an electronic version was available for review on the Township's website. The preferred alternative presented in the ESR is to upgrade the existing Red Rock Mill Lagoon. Two public meetings were held to review the project in April 2010 and October 2011 and a 30-day review period was provided to allow the public an opportunity to review and comment on the ESR. Notices of the meetings and the ESR review period were advertised in the local newspaper and also mailed directly to local residents.
	The cleanup costs for this mill site are unknown to me. The Thunder Bay paper has printed cleanup costs for the Terrace Bay and Marathon mill sites. Why would our town want to acquire this mill site and possible cleanup costs of millions of dollars? Whatever system will be built, I am astounded by the weeping tile water and even eaves trough water entering the system. How much extra cost is added to whichever system is chosen to handle all these peak flows? What percentage of total capital costs will be paid by the 20% of the township residents now on their own septic fields?	The Ministry of the Environment (MOE) indicated that the former mill owner (Cascades) has money in trust to complete remediation work at the mill site. Furthermore, the MOE advised that they have no concerns with using the existing Mill lagoons for the municipal wastewater treatment plant. The cost estimates for the reviewed alternatives have been developed as presented in the ESR for an average day flow rate of 900 m3/d and a peak flow rate of 5,000 m^3/d. Questions with respect to costs to be borne by individual property owners should be directed to the Township.
	I did have the privilege of hearing one presentation on Mr. Muloin's and Mr. White's spray system. Some of the information he presented was closed to the public. I think their system proposal has the greatest return potential for our town. They would try to build a showpiece system to sell globally. The town could potentially benefit from future sales, good training, and construction of the storage building, etc.	This system was evaluated as one of the alternatives and detailed information regarding the evaluation can be found in Section 3.2.8 and Table 3.3 of the March 2012 ESR.

Comment	Summary of Comments Received	Summary of Response/Action Provided
	I believe they were the low bidder until extra piping costs were added. Would this increase in pipe diameter be necessary if all the extra flows were not present? I would prefer the site chosen to be south of town, where the water runoff will have less impact on our water intake.	The preferred alternative is to reuse the existing mill lagoons, which are downstream of the water intake. Based on the information provided by Northern Watertek (NWT), we understand changes in pipe diameters in the NWT proposal were due to a change in site from Area 2 to the mill site.
	At the meeting of December 7, 2011 the unanswered question posed was: "How long does it take to build a sewage treatment plant anyway?" Nobody answered. Also it is doubtful to me that the town's citizens understand the current funding commitments. I'm also doubtful the targeted completion date can be met.	There are a number of factors, such as site conditions, contractor availability, availability of material etc. that can have an impact on the implementation and construction schedule.
3.	Requested additional information on the upcoming PCC scheduled on December 5, 2012	Response was provided describing the open house format of the meeting.

A Part II Order request was also received by the Ministry of the Environment (MOE) following the publication of the ESR. The Part II Order Request and a summary of the responses provided to the MOE with respect to the request are included in Appendix B2.

Comments were also received from several review agencies/special interest groups following the publication of the ESR and are summarized in Table 1.6 below. Copies of the comments and responses can be found in Appendix B1.

Table 1.6 Summary of Agency/Interest Group Concerns Following Publication of the ESR

Agency/Group	Date Response Received	Summary of Comments Received	Summary of Response/Action Provided
Ministry of the Environment Great Lakes Advisor (Michelle McChristie)	March 28, 2012	Requested a copy of the ESR	Directions to the Township`s website were provided.
Ministry of the Environment Northern Region (Ellen Cramm)	April 30, 2012	No indication of timing is given as to when works with respect to reduction of extraneous flows in the sanitary sewage collection system will occur. Section 5 of the ESR lacks detail with respect to mitigation measures to be employed to address potential environmental impacts. The ESR provides little information on monitoring activities to be carried out during/post construction of the project. Please provide further details.	It is anticipated that the improvements to the collection system to reduce extraneous flows will occur around the same time as construction of the new treatment facilities, however this date has not been confirmed. Generally, mitigation measures discussed in Appendix 2 of the MCEA document will be incorporated into the construction specifications. Additional measures might include timing restrictions. Detailed information regarding monitoring will not be available until the design and approvals process is underway. A detailed operations and maintenance manual will be prepared for the new facility which will summarize the required regulatory and other monitoring for the facility. Additional details are included in Section 5 of this document and response letter dated May 24, 2012.
Ministry of the Environment	December 5, 2012	Confirmation of Effluent Criteria to be	No further action necessary.

Agency/Group	Date Response Received	Summary of Comments Received	Summary of Response/Action Provided
Northern Region (Jacinth Gilliam-Price)		met for discharge to Nipigon Bay.	

1.11 Project Update

Subsequent to the publication of the ESR in March 2012, the Township attempted to acquire the land required to implement the preferred alternative, however, the Township has been unsuccessful for the reasons stated below:

1) The Red Rock Mill site is in year 5 of tax arrears, and owes the Township over $2.1 million in back taxes. The site has been advertised for tax sale twice in the past year (March & May 2012) with no purchasers. The Township is in the position to vest the property but the Township would take on the associated liability of the entire mill site (not just the lagoons) and the liability of the clean-up would be too much for the Township to bear.

2) Funding is not available to purchase the land required. The Township could expropriate the lagoons and the area to access them. The Township approached Minister Bob Chiarelli (Infrastructure & Transportation) at the Ontario Good Roads Association meeting in Toronto in February 2011 and again in February 2012 requesting that infrastructure funding for the project be used to purchase the lagoons, and the answer at the meeting was that the Township could get a low interest loan to purchase them. The Township finances are in such a state that the Township simply cannot afford to take on any debt.

3) The Township approached Mr. Van Patten (the current owner of Red Rock Mill Inc.) to discuss a 75 year lease of the property and he agreed to proceed with preparation of lease documents. When the Township sent him the lease document he replied that he now has a potential buyer for the mill site and that he forwarded the lease to the potential new owner for consideration. The signed lease has not been returned and the potential new owner has indicated to the Mayor that he would be willing to negotiate a transfer for consideration of back taxes. This cannot be done under the Municipal Act as the taxes must be paid on a property when it is sold.

For these reasons, the utilization of the existing Red Rock Mill lagoons as presented in the March 2012 ESR is no longer a viable alternative. As a result, the Township has decided to withdraw the Notice of Completion and review the remaining alternatives previously evaluated. See Correspondence dated September 14, 2012 and September 25, 2012 enclosed in Appendix B1.

As the ESR has been withdrawn by the Township, the Minister of the Environment has ceased the review of the Part II Order Request and has not made a decision with respect to the Request. See Correspondence from the Ministry of the Environment dated October 5, 2012 enclosed in Appendix B1. Information with respect to the Part II Order Request and related correspondence are enclosed as Appendix B2.

The issues/concerns noted in the Part II Order Request have been addressed throughout this document.

1.12 Correspondence Following Public Consultation Centre #3

A third public consultation centre was held December 5, 2012 to review the proposed changes with the public and the new preferred alternative and receive input and comments from interested parties. Eighteen people attended the PCC. Documentation of the information presented at the PCC is included in Appendix C.

Contact was made by a Notice of PCC #3 published in the local publication the Nipigon-Red Rock Gazette on November 28, 2012 and December 5, 2012. Letters with the Notice were also mailed to government review agencies and other interest groups. An unaddressed flyer of the Notice was mailed to 347 addresses in the P0T 2PO postal code on November 27, 2012. A copy of the Notice as well as a copy of the letters is included in Appendix A.

A number of comments/concerns were received from residents of the area after PCC#3, and are summarized in Table 1.7 along with proposed mitigation measures. A copy of the comment sheets and letters are enclosed in Appendix B.

Table 1.7 Summary of Public Concerns Following Public Consultation Centre #3

Comment	Summary of Comments Received	Summary of Response/Action Provided
1.	I can't believe the town still intends to treat all the groundwater and rain water from peoples roofs.	Remedial work to reduce the amount of ground and rainwater (inflow and infiltration) to the sanitary sewage collection system is planned as part of this project. See Section2.2.1.1 For more information.
	Why at the March 2012 (council meeting) was it stated there would be no scheduled public meetings on this project?	Concerns relating to council meetings etc. should be directed to the Township's administration.
2.	Check water table, i.e. digging down.	Geotechnical work will be completed prior to design and construction to identify soil and ground water conditions.
	Is it possible to separate sanitary sewers from storm sewers.	Remedial work to reduce the amount of ground and rainwater (inflow and infiltration) to the sanitary sewage collection system is planned as part of this project. See Section 2.2.1.1 For more information.
3.	When is the earliest that the project might begin?	The schedule for design and construction of the project has not been determined pending the finalization of the Environmental Assessment process. The project deadline for funding is presently March 31, 2014.
	What other planning or site partners may be involved in the creation of this plant?	The design and construction of the project are subject to the competitive bid process.
4.	The Township withdrew the Notice of Completion of the Class EA to complete additional studies. What additional studies were completed?	The remaining alternatives were re-examined to select a new preferred alternative. Additional review has been conducted on inflow and infiltration reduction. New effluent criteria was provided by the MOE which required further assessment.
	Why was the "lagoon solution" dropped and what additional studies have you conducted to justify the turn of events?	The re-use of the existing mill lagoon option that was recommended as the preferred alternative in the March 2012 ESR was "dropped" as the property acquisition process failed to secure the necessary section of the mill property (i.e. the lagoons). Subsequently, no further study was undertaken on alternatives of reuse of the mill lagoons.
	Are the Métis and First Nations being consulted and have you considered their preferred option and their point of view?	The Métis and First Nations communities have been consulted throughout the process. Comments received have been considered as part of the study process.
	Is this new option better than the technology currently in use with regard to effluent quality/compositi on?	Yes. The existing treatment provided is primary treatment, and effluent quality criteria is not presently imposed on the existing system. The proposed treatment process will provide secondary treatment and will meet the New Federal Wastewater Regulations and the effluent criteria provided by the Ministry of the Environment.
	How come the capital costs for various solutions were cut in half between the initial public meeting and why was the EVC not cut in half? How were these calculations made? What happens if they are wrong? Who is liable for the errors and does Town	There have been changes in the design flow rate (reduction) of the plant since the initial public meeting, thus reducing the size of the plant. The costs were thereby reduced accordingly. The costs of the EVC process were provided by Northern Watertek Corporation based on the design flow rate.

Comment	Summary of Comments Received	Summary of Response/Action Provided
	council know that they are responsible for shortfalls?	The costs presented in the ESR provide a comparative analysis of the alternatives based on the criteria considered. Design and construction of the project is subject to the competitive bid process and are therefore subject to market conditions. Funding is available to design and construct the project. Cost overruns beyond the available funding may or may not be funded.
5.	RAP will have no problem with using the same system as the Township of Nipigon. Using the existing site should speed some parts of the process up.	No response necessary.

Comments were also received from several review agencies/special interest groups following PCC #3 and are summarized in Table 1.8 below. Copies of the comments and responses can be found in Appendix B.

Table 1.8 Summary of Agency/Interest Group Concerns Following Public Consultation Centre #3

Agency/Group	Date Response Received	Summary of Comments Received	Summary of Response/Action Provided
Thunder Bay Nipigon Remedial Action Plan	December 5, 2012	Requested an electronic copy of December 5, 2012 PCC presentation panels.	Email copy provided December 6, 2012 .
Parks Canada	January 11, 2013	Information showing the proposed revision to the NMCA Boundary to accommodate a new outfall	No response necessary at this time.
Ministry of Aboriginal Affairs	January 25, 2013	Information provided with respect to First Nation Land Claims.	No response necessary.
Indian and Northern Affairs Canada	February 4, 2013	Information regarding contact persons.	Revisions made to contact list.

2. Inventory of the Environment

2.1 Study Area

The study area of the project generally comprises the serviced Townsite, although some rural locations have been identified as potential sites for the location of a new treatment facility, primarily for a lagoon process.

Specifically, five potential lagoon sites were identified as discussed in Section 3.2.6. The existing wastewater treatment plant site is also being considered, which appears large enough to accommodate other types of treatment processes. The lagoon process will not fit on the existing site. The existing mill site is not being considered as an alternative lagoon site, as the Township has been unable to secure the necessary land.

It should be noted that the lagoon sites were primarily selected based on the available land to accommodate the size of the lagoon. Further analysis, as outlined in the following sections of this document, will scrutinize the sites to determine if any of the sites will be acceptable for further consideration.

2.2 Wastewater Servicing

According to the Township of Red Rock Preliminary Design Study for Proposed Upgrades at the Wastewater Treatment Plant dated April 2006, 20% of the population in the Township rely on private septic systems. The remaining 80% of the population is serviced by the Red Rock Wastewater Treatment Plant. The current service population of the Red Rock Wastewater Treatment Plant is estimated at 754. A location plan of the plant is indicated as Figure 2.1.

2.2.1 Existing and Future Sewage Flows

Table 2.1 summarizes the wastewater flows at the Red Rock Wastewater Treatment Plant between 2007 and 2011.

Table 2.1. Red Rock Wastewater Treatment Plant Flows 2007 - 2011

Flow	**Year**					**Average**
	2007	**2008**	**2009**	**2010**	**2011**	
Average Day (m^3/d)	592	840	660	386	418	579
Maximum Day (m^3/d)	3,247	4,876 (1)	2,410	1,890	3,686	4,876 (1)
Plant Capacity (m^3/d)	1,272	1,272	1,272	1,272	1,272	1,272
Average usage	46.51%	66.04%	51.9%	30.3%	32.9%	45.53%
Estimated Average Service Population	831	817	807	801	754	802
Gross per Capita contribution (L/c/d)	712	1028	818	482	554	719

(1) Maximum historical flow.

Refer to Figure 2.2 for average daily flows for the years 2007 – 2011.

Based on the plant flows shown in Table 2.1, the plant is currently operating at approximately 33% of its rated capacity of 1,272 m^3/d.

The MOE design guideline average domestic per capita sewage flow, excluding extraneous flows, ranges between 225 L/c/d to 450 L/c/d. The gross per capita sewage flow contribution to the Red Rock Wastewater Treatment Plant over the years 2007-2011 averaged 719 L/c/d. The high per capita sewage contribution is mainly attributed to

weeping tile and roof leaders tied directly into the sanitary sewer and the poor condition of the sanitary sewers and maintenance holes in the system. A recent study revealed that infiltration and inflow was estimated to be 38% of the total flow in 2009. Refer to Section 2.2.1.1 for a detailed description of the extraneous flows contributing to the sanitary sewer system.

2.2.1.1 Extraneous Flows

One of the requirements of the Provincial funding for the wastewater treatment plant upgrade is for the Township to undertake an Inflow and Infiltration Study on the Township's sanitary sewer system.

The *Water and Wastewater Optimization Study* was completed by R.J. Burnside & Associates in October 1996. This study identified that extraneous flows represented a significant problem causing hydraulic overloading of the existing wastewater treatment plant. The 1996 report study's key findings with respect to the sanitary system were as follows:

- the age and condition of the sanitary sewer system varies greatly throughout the Community. Extraneous flows represent a significant problem and cause hydraulic overloading of the plant;
- the extraneous flows were attributed to:
  - foundation drains for houses being connected to the sanitary system;
  - roof leaders being connected to the sanitary system.
  - infiltration into the sanitary sewer due to cracked pipes, misaligned joints, collapsed pipes, manhole leakage etc.
  - overland storm runoff entering the sanitary system through manhole covers;
- the reduction of inflow by means of disconnecting roof leaders and/or foundation drains would result in the most significant flow reductions, however the report stated it is not practical to direct the flows to the surface or to storm water systems;
- by means of mass balance calculation of water flows versus sewage flows, the report estimated that approximately 150,000 m^3/year of inflow/infiltration entered the waste water treatment plant.

The study recommended several areas of sewer line and manhole repairs.

Since 1996 the Township has undertaken a number of corrective actions to improve the sanitary collection system and limit the inflow and infiltration, including the repair of all sewer lines and approximately half of the manholes recommended for repair in the 1996 study.

An updated report, *Township of Red Rock Sanitary Collection System Inflow and Infiltration Desktop Study*, dated May 2010 was completed by Engineering Northwest Ltd. The purpose of the report was to:

- review the 1996 optimization study;
- review available historic flows, noting apparent flow changes;
- identify effect of extreme weather events, if possible;
- review repairs and/or replacements of sanitary sewers or other work undertaken by the Township to reduce flows to the existing plant;
- identify existing and future anticipated flows;
- identify the amount and potentially where the inflow and infiltration is originating (public or private); and
- draw conclusions from the available information and make recommendations for additional flow reduction undertakings.

The 2010 report made the following conclusions and recommendations:

- Some benefit in reducing the inflow and infiltration may have been realized from the repair work to the sanitary system completed between 1997 and 2009, however, infiltration and to a greater extent inflow continue to plague the system.

- Inflow and infiltration to the sanitary sewer system in Red Rock was estimated to be 38% of the total flow in 2009.

- Weeping tile and roof leader connections tied directly into the sanitary system are a likely cause of a significant portion of the extraneous flows.

  There may be no practical way to eliminate the existing weeping tile connections to the sanitary system. The storm water system is at a higher elevation than the sanitary system and would therefore require a pumped connection from each home to discharge into the storm system, an expensive renovation. Disconnecting roof leader connections to the sanitary system might be possible and this should be explored further. New construction should not allow these connections to the sanitary system.

- Watermain bleeders, necessary to maintain chlorine residuals in the potable water supply system, result in a significant inflow of water into the sanitary system.

- Many of the manholes identified in the 1996 Optimization Study remain in sub satisfactory condition. Depending on the condition of the manholes, there may some relatively easy and inexpensive repairs that could be completed to assist in reducing infiltration. These repairs may include raising the manhole to grade, parging the joints between sections of the manhole and installing a manhole infiltration protector (a device which sits below the manhole cover catching any rainwater entering through the cover). Each manhole will need to be individually assessed.

- The practices outlined in the Assessment and Evaluation of Storm and Wastewater Collection Systems Infraguide produced by the Federation of Canadian Municipalities and National Research Council or a similar type of guidance document should be employed to fully assess the condition of the sanitary collection system. This will provide the basis to implement a strategy to reduce and control the infiltration and inflow to the collection system.

The *Township of Red Rock Sanitary Collection System Inflow and Infiltration Desktop Study* completed by ENL in May 2010 is attached as Appendix D.

2.2.2 Existing Red Rock Wastewater Treatment Plant Process Description

The Red Rock Wastewater Treatment Plant (WWTP) is a primary treatment facility with an average nominal dry weather flow capacity of 1,272 m^3/d and design peak capacity is 3,864 m^3/d. The wastewater treatment plant provides screening, grit removal, primary settling, single stage anaerobic sludge digestion and chlorination. The plant started operation in 1975. A process schematic of the Red Rock Wastewater Treatment Plant is shown in Figure 2.3 and the major processes are listed below:

- raw sewage screening;
- raw sewage pumping;
- grit removal;

- primary clarifiers;
- chlorine disinfection; and
- anaerobic digestion.

Residual solids after being anaerobically stabilized are delivered to drying beds at the landfill.

Table 2.2 summarizes the rated capacities of the individual processes in the Red Rock Wastewater Treatment Plant.

Table 2.2. Summary of Capacities of Individual Treatment Processes

Treatment	Capacity
Raw Sewage Pumping Station	3,859 m^3/d @ 5.2 m TDH
Headworks	3,859 m^3/d
Primary Settling Tank	3,859 m^3/d
Chlorine Contact Tank	3,859 m^3/d
Anaerobic Digester	1,272 m^3/d

2.2.3 Raw Sewage and Treated Effluent Characteristics

2.2.3.1 Raw Sewage Characteristics

The raw wastewater quality from 2007 to 2011 is summarized in Table 2.3.

Table 2.3. Historical Raw Sewage Characteristics

Period	Parameter		
	Suspended Solids (mg/L)	**BOD_5 (mg/L)**	**Total Phosphorous (mg/L)**
2007	125.8	95.8	3.1
2008	72.3	75.3	2.3
2009	93.6	103	N/A
2010	128.42	108.42	3.87
2011	212	123.83	4.12
Average	**126.42**	**101.27**	**3.35**

N/A – Not available.

The MOE guidelines typical for raw sewage BOD, total suspended solids and total phosphorus concentrations are 170 mg/L, 200 mg/L and 7 mg/L, respectively. The historical raw sewage BOD, total suspended solids and total phosphorus concentrations for the Red Rock Wastewater Treatment Plant are 126.42, 101.27 and 3.35 mg/L respectively. This further demonstrates that the raw sewage is diluted by extraneous flow.

2.2.3.2 Effluent Characteristics

The treated effluent characteristics from the Red Rock Wastewater Treatment Plant for the period of 2007 to 2011 are summarized in the following Table 2.4.

Table 2.4. Historical Treated Effluent Characteristics (2007 – 2011)

Parameter	2007			2008			2009			2010			2011		
	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum
BOD5 (mg/L)	43.8	84	18	27.3	38	15	37	65	2.3	41.82	64.7	2	58.48	89.5	4.7
Total Suspended Solids (mg/L)	35.4	76	12	30.2	76	13.2	30	37	13.2	30.8	44.4	18	35.73	54.4	20.6
Total Phosphorus (mg/L)	2.1	4.1	0.8	1.4	2.4	0.6	N/A	N/A	N/A	2.15	3	1.33	3.01	4.5	0.92

N/A – Not available.

2.2.3.3 Effluent Discharge Requirements

According to MOE Procedure F-5-1, the effluent quality for primary treatment without phosphorus removal is 30% BOD removal and 50% total suspended solids removal.

A summary of the plant BOD and total suspended solids removal efficiencies are included in the following Table 2.5.

Table 2.5. Red Rock Wastewater Treatment Plant BOD and Total Suspended Solids Removal Efficiencies

	2007	2008	2009	2010	2011
Average Raw BOD (mg/L)	95.8	75.3	103	108.42	123.83
Average Effluent BOD (mg/L)	43.8	27.3	37	41.82	58.48
Average BOD Removal Efficiency (%)	54.3	63.8	64	61.4	52.8
Average Raw Total Suspended Solids (mg/L)	125.8	72.3	94	128.42	212
Average Effluent Total Suspended Solids (mg/L)	35.4	30.2	30	30.8	35.73
Average Total Suspended Solids Removal Efficiency (%)	71.9	58.2	68	76	83.2

In the years 2007-2011 the plant BOD removal efficiency was consistently above 30%, meeting the 30% MOE Procedure F-5-1 requirement for a primary plant without phosphorous removal. The plant total suspended solids removal efficiency was consistently above 50%, meeting the MOE Procedure F-5-1 requirement for a primary plant without a phosphorous removal requirement of 50%.

2.2.4 Existing Plant Deficiencies

AECOM completed a plant condition assessment of the existing Red Rock Wastewater Treatment Plant. The following summarizes the results of this condition assessment. A Technical Memorandum summarizing the results of this condition assessment is included with this report as Appendix E and summarized as follows:

Building Structures

- building structures are in relatively good condition and just need minor upgrades such as painting, replacement of a wood door in the headworks, minor concrete repairs, and some windows in the digester control building need to be replaced with more energy efficient ones;
- bar screen does not provide adequate capture of solids to meet current standards, as well as reducing the potential for beneficial use of the biosolids;
- the current grit channels do not meet current design guidelines based upon the peak flows experienced by the facility;

- ventilation in the basement of the headworks portion of the plant does not meet National Fire Protection Association (NFPA) 820 requirements for fire protection for wastewater facilities;
- the raw sewage pumps are 30 years old and are reaching the end of their useful life; and
- the piping and some of the components of raw sludge pumps need to be replaced in the near future as a result of grit carryover from the grit channels.

Primary Clarifiers

- the existing primary clarifiers have insufficient area to meet current MOE guidelines surface overflow rate.
- the performance of the primary clarifiers is being affected by not using alum for coagulation.

Anaerobic Digester

- the digester gas system does not meet CSA B1O5 M93 requirements for digester gas systems.
- the digester gas is discharged directly to the atmosphere without flaring or being used in other processes.

Disinfection

- there is a small chlorine contact chamber providing approximately 30 minutes of detention time at average flow.

Electrical Systems

- the MCC was constructed in 1977; it does not have spare parts for upgrading and it is difficult to find a replacement for a faulty component.

Control Building

- the lab in the control building is only 3 m x 3 m and it will need to be expanded for monitoring requirements of current wastewater treatment plants.

Outfall Sewer

- high wet weather flows cause sewage backups as a result of the reduction in outfall pipe size through the Mill property.

Instrumentation and Control

- the instrumentation and control at the facility includes a chlorine residual analyzer for potable water entering the plant, paperless chart recorder for residual chlorine and potable water flow entering the plant, effluent flow meter, verbatim auto dialler and chlorine gas leak detector.

Equipment and instruments that could potentially be salvaged and used as a backup from the existing plant include; residual chlorine analysers, chlorine metering pumps and potable water flowmeter.

In summary, the plant currently operates acceptably as a primary plant, mostly due to the fact that the flows are less than the rated capacity. The majority of the equipment is operating successfully; however, the equipment is over 30 years old and is reaching the end of its useful life.

2.3 Natural Environment

As part of the evaluation of the various sites and potential alternatives, the existing environmental conditions and constraints of each site were generally evaluated.

2.3.1 Topography and Geological Conditions

Existing Wastewater Treatment Site

In January 2006, as part of the "Preliminary Design Study to Address Issues for Proposed Upgrades of the Wastewater Treatment Plant from Primary to Secondary", dated April 2006, by Wardrop and Hydromantis Inc., a preliminary geotechnical investigation of the existing site was completed by TBT Engineering. The preliminary geotechnical investigation at the site included the completion of 9 boreholes, the open excavation of 2 pits and laboratory analysis of soil samples. Their findings were generally as follows:

- the findings in the boreholes indicate the presence of till and/or fill materials consisting primarily of a silt matrix with variable proportions of sand, gravel and clay;
- numerous cobbles and boulders were encountered to the depth of investigation. Auger refusal on cobbles and/or boulders was encountered at depths of 0.3 to 3.2 m at all nine of the borehole locations. At borehole locations 3 and 7 an excavator was utilized to advance the depth of excavation to a depth of 6.1 m and similar soil conditions were found with numerous cobbles and boulders;
- the expected glaciolacustrine deposit of potentially loose/soft silts and clays were not encountered within the limited depth of investigation. Rather, a significant deposit predominately silt till and/or fill was identified which would be more indicative of the terrain mapped to the north and the site. The silt till or fill may be underlain by a significant deposit of soft/loose clays and/or silts typical of glaciolacustrine terrain. Through discussions with personnel from the nearby pulp mill, it is understood that a deep deposit of clay has been identified and piled foundations have been utilized at the mill site. Alternatively, the soils encountered may extend to bedrock as would be expected in similar terrain expected to exist within a few kilometres of the site. As such, the site may be an isolated location of till ground moraine overlying bedrock; and
- the source of fill could be excavations at the existing waste water treatment plant, or from the construction of the parking area located to the southwest of the subject site. It is likely that more fill exists within the site.

For the purposes of this report, a desktop review of the general soil conditions within the five selected green field areas for a lagoon process was undertaken by Trow Consulting Engineers. A location map, including environmental and land use constraints, of the five selected areas is indicated as Figure 2.4 and 2.5. The purpose was to determine the general soil conditions that may be encountered, including any potential for encountering bedrock. The general findings are as follows and may vary within the areas of each site:

Area 1 – Peat organic terrain overlying silt and clay glaciolacustrine plain deposits with mainly low local relief and dry surface conditions. However, the site is near (on the north side of) a rubble Talus pile with mainly high local relief, cliffy volcanic rock signature and dry surface conditions.

Area 2 - Peat organic terrain overlying silt and clay glaciolacustrine plain deposits with mainly low local relief and dry surface conditions. A portion of Area 2 is denoted as Hazard Land in the Official Plan.

Area 3 – The site borders two landforms. The first and to the south is peat organic terrain overlying silt and clay glaciolacustrine plain deposits with mainly low local relief and dry surface conditions. The second and to the north is silt till ground moraine overlying bedrock with mainly moderate relief, sloping and dry surface conditions.

Area 4 – The site is located in peat organic terrain overlying silt and clay glaciolacustrine plain deposits with mainly low local relief and dry surface conditions. However, the site is near (on the south side of) silt till ground moraine overlying bedrock with mainly moderate relief, sloping and dry surface conditions.

Area 5 – The silt is located in peat organic terrain overlying silt and clay glaciolacustrine plain deposits with mainly low local relief and dry surface conditions. However, the site is borders (on the south side of) sand glaciolacustrine plain deposits with mainly low local relief and dry surface conditions.

Area 2 was deemed to be favourable over the other areas due to its closer proximity to the existing plant than Areas 3, 4 and 5. It's location within the Town was more favourable than Area 1. As a result, an additional onsite investigation was carried out by Trow on June 15 to further evaluate this area as a potential site for a lagoon process. The following are the general findings of the site investigation:

- several drainage ravines traverse the site and are generally 15-35 m in width and 5-15 m in depth. These ravines drain to North Trout Creek;
- four test holes were advanced using a power hand auger near the area of one of the ravines. Two holes were advanced at the surface level above the ravine and two holes were advanced at the base of the ravine to depths ranging from 3.3 m to 3.8 m from ground level. The following soil types were noted:
  - organic silt – ranging from 0.2 m below surface;
  - silt – ranging from 0.9 m to 1.8 m below surface;
  - clayey silt – ranging from 3.4 to 3.8 m below surface;
- depth to groundwater was noted as 0.0 m and 0.2 m at the test holes advanced in the bottom of the ravines.

Trow's Geotechnical reports are included in Appendix F.

2.3.2 Water Resources and Wildlife Habitat

Areas No. 1-5 are all green field developments, meaning that presently undeveloped land will be utilized for the construction of a new facility. As such, Bio Consulting, a local biological consulting firm, was retained to review the environmental liabilities of these proposed Areas for development.

The following is a summary of the constraints identified in Bio Consulting's report, included as Appendix G. A discussion of the impacts to surface water resources, groundwater resources and wildlife habitat follows.

Table 2.6. Summary of Constraints Identified

Area	Constraints
Area 1	• Potential odour issues with onshore winds; • Potential impingement to peregrine falcon habitat;
Area 2	• Potential impingement to peregrine falcon habitat • Potential impacts to municipal water supply • Potential effluent discharge impacts to North Trout Creek • Potential site drainage impacts to North Trout Creek • Potential odour issues

Area	Constraints
Area 3	• Potential impacts to municipal water supply • Potential effluent discharge impacts to North Trout Creek • Potential odour issues • Extensive forcemain required to access the site. Risk of forcemain breakage/leakage of raw sewage. • Construction impact of forcemain crossing North Trout Creek and potential ongoing impact associated with breakage/leakage
Area 4	• Potential impacts to municipal water supply • Potential effluent discharge impacts to North Trout Creek • Potential odour issues • Extensive forcemain required to access the site. Risk of forcemain breakage/leakage of raw sewage. • Construction impact of forcemain crossing North Trout Creek and potential ongoing impact associated with breakage/leakage
Area 5	• Potential impacts to municipal water supply • Potential effluent discharge impacts to North Trout Creek • Potential odour issues • Extensive forcemain required to access the site. Risk of forcemain breakage/leakage of raw sewage. • Construction impact of forcemain crossing North Trout Creek and potential ongoing impact associated with breakage/leakage

2.3.2.1 Surface Water Resources

There are two major surface water resources within the Township, Lake Superior (Nipigon River, Nipigon Bay) and North Trout Creek.

The existing wastewater treatment plant currently discharges to Nipigon Bay. The effluent discharge location from the proposed new treatment facility will depend on the final site and process selection. Based on the selected potential sites the proposed discharge locations are as follows:

Existing Site – Nipigon Bay;
Area 1 - Nipigon Bay;
Area 2 - North Trout Creek;
Area 3 - Nipigon Bay;
Area 4 - North Trout Creek;
Area 5 - North Trout Creek;

The effluent from Areas 2, 3, 4 and 5 could potentially impact the water treatment plant as the effluent discharge would be to North Trout Creek which discharges just downstream of the water treatment plant in the vicinity of the water treatment plant intake. In addition, North Trout Creek discharges upstream of the marina and treated effluent could impact the marina as well.

The Ministry of the Environment (MOE) sets acceptable effluent criteria that must be met for discharges to a surface water body. Effluent criteria for discharges to Nipigon Bay have been confirmed by the MOE (see section 2.6.5). The existing wastewater treatment plant discharges to Nipigon Bay, but does not meet the required effluent criteria for secondary treatment. Any future wastewater treatment plant process discharging to the Bay will meet the effluent criteria and therefore will have less environmental impact on the Bay than the existing process.

The MOE has also confirmed that the relatively small and improved WWTP discharge will continue to be easily assimilated by the Nipigon Bay of Lake Superior. There are no known drinking water intakes or recreational

beaches within at least 1.5 km. For these reasons, a receiving water assimilative capacity study was not undertaken.

Conversely, any discharge to North Trout Creek, a cold water fishery, will result in some environmental impact as the existing wastewater treatment plant does not currently discharge to the Creek. Additional investigation would be required to determine the impacts and acceptability of an outfall to North Trout Creek. More stringent treatment requirements and effluent criteria may be imposed for an outfall to North Trout Creek.

It should also be noted that Nipigon Bay is listed as an Area of Concern (AOC) as previously discussed. Any further degradation of the aquatic environment would be in conflict with the mandate of the remedial action plan for Nipigon Bay.

On October 25, 2007 Canada and Ontario signed a Memorandum of Agreement respecting the establishment of a National Marine Conservation Area in Lake Superior. The proposed Lake Superior National Marine Conservation Area (LSNMCA) encompasses the north part of Lake Superior, extending from Bottle Point near Terrace Bay in the east to Thunder Cape at the tip of Sibley Peninsula in the west, and from the shoreline in the north to the Canada-United States boarder in the south. The coastline around Township of Red Rock, with the exception of several private water lots, is located within the proposed LSNMCA boundary.

The LSNMCA boundary is of relevance to this project as a new outfall sewer discharging to the lake may be required. The Canada National Marine Conservation Areas Act prohibits the discharge of polluting substances inside the boundary of an NMCA.

The Township has been in contact with Parks Canada with respect to the LSNMCA boundary and the potential requirement for an outfall from the proposed wastewater treatment plant. The LSNMCA boundary has been legislated, and has excluded an area from the LSNMCA boundary that could be a potential outfall location. Parks Canada has not expressed any concerns regarding effluent discharge impacts to the NMCA as long as the discharge does not occur within the NMCA boundary.

2.3.2.2 Groundwater Resources

There are some private wells in the rural areas; however, these have not been considered for further investigation as subsurface disposal is not being considered for discharge of the municipal treated effluent. The treated effluent is proposed to be discharged to surface water, namely Nipigon Bay of Lake Superior either directly or via a tributary stream or ditch.

2.3.2.3 Significant Wildlife Habitat

Areas No. 1, No. 2 and No. 6 are located near potential Peregrine Falcon (a threatened species projected under the Endangered Species Act) habitat on the cliff faces to the south of the sites. The MNR has confirmed that the cliff and one kilometre around it have potential to become regulated Peregrine Falcon habitat in the event that there is confirmed nesting or bird(s) displaying territorial behaviour. A survey in June 2010 did not observe any falcons. It was also noted that an unconfirmed report of a Peregrine nesting site on a man-made structure within the Township had been made. See correspondence from the MNR dated July 5, 2010 in Appendix G.

2.3.3 Archaeological Assessment

A Stage 1 Archaeological Background Study of the five green field candidate sites was completed February 2010 by Ross Archaeological Associates. As outlined in the Archaeological Assessment Technical Guidelines (1993), a Stage 1 background study provides the consulting archaeologist and the Ontario Ministry of Tourism and Culture

(now the Ontario Ministry of Tourism, Culture and Sport) report reviewer with information about the known and potential cultural heritage resources within the study area. It is recommended that the consulting archaeologist:

- examine the Provincial Site Registration Database to determine the presence of known archaeological sites in and around the project area;
- review the land use history and present condition of the study area;
- examine the geomorphological history of the land during the period of human habitation to evaluate the potential for buried cultural deposits.

If a Stage 1 assessment shows that the study area has a medium to high potential for archaeological resources, a Stage 2 assessment must be completed. A Stage 2 assessment provides an inventory of all the archaeological sites in the study area. The assessment consists of a pedestrian (surface) survey of the entire area and test pit surveys of all medium and high potential areas. The archaeologist uses the recommendations of the Stage 1 Report and field observation to determine the moderate and high potential areas.

The report concludes that Areas 1, 4, 5 and the existing treatment plant site have low potential for archaeological resources and would not require further investigation. Site 2 and 3 however, are considered to have medium to high potential for archaeological resources. Should site 2 or 3 be selected for development a Stage 2 Archaeological assessment must be completed.

Notwithstanding, there is always a possibility of deeply buried, undetected archaeological remains existing in the study area. If such materials are encountered during construction activities, the proponent must immediately stop construction and contact the Ministry of Tourism, Culture and Sport. In the event that human remains are encountered during construction, the proponent must immediately stop all work in the area and contact the local Police Department, the Ministry of Tourism, Culture and Sport and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ministry of Consumer and Commercial Relations.

Subsequent to the review of the Archaeologist Study, it was suggested by the Township that a Prisoner of War Camp was established at the existing plant site during World War II. Further investigation by the Archaeologist identified this as an Internment Camp which housed German Jews which were removed from Great Britain during the Second World War. The German Jews were exiled from Great Britain for fear they would assist the German forces attacking Great Britain. The camps in the area were usually temporary in nature (i.e. wood construction without basements).

There is no requirement to complete an archaeological dig of the existing site, unless the Township deems this to be of some historical significance to the history of the Town. It should be noted that a good portion of the site has been disturbed by the construction of the existing wastewater treatment plant; however, it is possible that there may be some areas of the property that have not been disturbed.

The Township indicated that no further archaeological work will be completed at the site.

The Stage 1 Archaeological Background Study and correspondence relating to the internment camp are enclosed as Appendix H.

2.4 Inventory of Social Environment

2.4.1 Community Profile

The Township of Red Rock is located on the north shore of Lake Superior immediately south of the Township of Nipigon and approximately 100 kilometres east of the City of Thunder Bay. The Township encompasses 62.9 square

kilometres of land, and includes portions of the shoreline of the Nipigon River and of Lake Superior. The Township includes a settlement area (referred to as the Townsite) situated at the east end of Highway 628 and abutting the shores of Lake Superior; and a semi-rural/rural area focused upon Highway 11/17, Highway 628, and several municipal roads. The Townsite contains 472 households; 11 businesses; 3 schools; a variety of institutional organizations; industrial lands primarily associated with a former container board plant; an 82 slip marina and waterfront park; and a large area of industrial property. The semi-rural/rural area contains 116 households, mostly on large parcels of land; a former accommodation and meeting centre for senior executives of the container board plant; municipal waste disposal site; and several properties containing aggregate resources. The Township is traversed by CNR and CPR railway lines, hydro and gas transmission lines and by Highway 11/17. Highway 628 intersects with Highway 11/17 and extends easterly into, and terminating at the community of Red Rock. A wilderness hiking trail along the shoreline of Lake Superior links Red Rock and nearby Nipigon.

The wastewater treatment plant serving the Township of Red Rock was constructed in 1975 to provide primary treatment of the domestic wastewater before discharging into Nipigon Bay.

The population of the Township has been in decline for many years. Statistics Canada data indicates the population has declined from 1,542 in 1981 to 942 in 2011, with the largest population decline between 2001 and 2006 at -13.8%, see Table 2.7 – Population Statistics. The major factor contributing to the decline in population has been the uncertainty of the operation of the mill and its subsequent closure in 2006. According to Statistics Canada, the unemployment rate in Red Rock in 2006 was 12.6%, compared to 6.4% for the Province of Ontario.

Table 2.7. Population Statistics

Year	Population	% Change
1981	1,542	
1986	1,509	-2.1%
1991	1,421	-5.8%
1996	1,258	-11.5%
2001	1,233	-2.0%
2006	1,063	-13.8%
2011	942	-11.4%

2.4.2 Land Use

Land uses within the Township are identified in the Township's Official Plan. Mapping outlining the predominant land uses (i.e. residential, industrial, green space etc.). Refer to Appendix I for Official Plan drawings. The Official Plan referenced has not yet been adopted.

2.4.3 Utilities

An 11.4 m hydro transmission line easement exists through the existing treatment plant site and overhead power lines presently extend through the site. A tower exists adjacent to the site on the southeast corner.

The natural gas pipeline enters the community from the west, north of Highway 628. The location of the pipeline is not expected to affect the location of any potential sites, other than Area No. 3. The lagoon will be required to be located north of the pipeline to maintain an adequate separation distance from the homes in the area. This will require crossing the pipeline to access the proposed site.

2.4.4 Recreation

Recreational opportunities in Red Rock include boating, fishing, hiking and other outdoor activities. A recreation complex provides swimming, bowling, curling and similar indoor opportunities for recreation.

Of significant note is the 82 slip full service marina. Further development of the marina is anticipated in conjunction with the promotion of the Lake Superior National Marine Conservation Area.

2.4.5 Economic Environment

The community is responding to major changes in the economic environment of the region which include economic downturns in the forestry industry including the downsizing and the eventual closure of the Township's dominant employer, Norampac's paper mill in 2006. According to Statistics Canada, the unemployment rate in Red Rock in 2006 was 12.6%, compared to 6.4% for the Province of Ontario.

In light of this new reality, and as outlined in the Township's 2009 Sustainability Plan, Red Rock aspires to leave behind the experience of a lengthy and detrimental pattern of economic decline and to:

- initially establish a pattern of stability, and
- in the longer term to experience modest growth sufficient to support existing business, replenish and strengthen a broad range of existing community institutions and organizations, and to support some new basic commercial service.

Generally, the sustainability plan indicates that the Township will accomplish these goals by:

- maintaining the existing employment and population;
- diversification, including forest based activity;
- being investment ready -- to have available lands to deliver immediately to potential future economic initiatives that might visit the community;
- achieving an integration of community and economic function such as occurs with the Blues and Folk festival. Explore additional events that deliver such all encompassing impact and benefit to the community.
- supporting innovation, entrepreneurship and small business activities and initiatives.
- encouraging the attraction and development of "green industries".
- branding Red Rock as a eco-friendly community.

Future economic opportunities are focused on tourism/eco-tourism, small business, community based events and resource based activities.

The recent designation of the Lake Superior National Marine Conservation Area by Parks Canada is of significance to the Township as it includes water of Lake Superior surrounding the Township. The promotion of existing communities as public access and servicing points for the park will provide some benefit to the community in the form of tourism and recreation.

The mill is not expected to re-open.

2.4.6 Agriculture

There is no significant agriculture near the Township that would benefit or suffer from the proposed treatment alternatives or potential locations.

2.5 Regulatory Environment

Regulatory requirements and guidelines must be reviewed in tandem with the planning and design process. Other areas of interest are the Remedial Action Plan, the Lake Superior National Marine Conservation Area, the Nutrient Management Act with respect to biosolids and land application of waste sludge from the treatment process, Ontario Building Code, Ontario Water Resources Act, Environmental Protection Act and Ministry of the Environment F-5 stating that any sewage treatment works discharging to surface water requires secondary treatment or equivalent as well as the Federal guidelines applicable to effluent requirements.

A new Environment Canada Regulation made under the *Fisheries Act*, *Wastewater Systems Effluent Regulations*, (WSER) is now in effect, as of January 1, 2013. The Regulation will apply to wastewater systems nationwide and it is anticipated that a bilateral agreement between the Federal Government and the Provinces will be put in place for the administration of the Regulation.

The Ministry of the Environment has taken the federal WSER into consideration in their recommendation for the effluent objectives for the design of the proposed new treatment facilities for Red Rock. The effluent objectives are discussed further in Section 2.6.5.

2.6 Future Conditions

2.6.1 Population Projection

Available records indicate that the population in the Township of Red Rock has been in continual decline since at least 1981. Table 2.7 indicates the historical population information from the Township's Official Plan as well as Statistics Canada data. Over the 30 year period from 1981 to 2011, the population has declined an average of 1.3% per year. The Red Rock mill ceased operations in October 2006 and has likely significantly contributed to the historical decline in population. Refer to Table 2.7 for historical population.

The following assumption was made to estimate the future service population of the Community of Red Rock:

- Population will grow at 1.0% from 2011 to the end of the 20 year design period in 2034 (assuming the new wastewater treatment plant commences operation in 2014).
- It is assumed that the mill will not re-open.

The future 2034 population is estimated at 1,184 persons. See Appendix J for the detailed projection.

2.6.2 Future Sewage Flow

Future sewage flow estimates are summarized in the following Table 2.8. The assumed sanitary sewer coverage in the urban area is 80%. The remaining 20% of the population in the Township of Red Rock rely on septic tanks.

Table 2.8. Future Sewage Flow Estimates for Red Rock Wastewater Treatment Plant

	Current Plant Service Population	Additional Service Population (2011 – 2034)	2034
Population	754	430	1,184
Per Capita Sewage Flow (L/c/d)	719	647	647
Average Day Flow (m^3/d)	579	278	857
Harmon Peaking Factor	3.9	4.0	
Peak Flow (m^3/d)	3,607	1,213	4,820
Peaking Factor (Peak Hour/Average Day)	6.2	4.4	5.6

The per capita sewage contribution and peaking factors will likely be reduced in the future due to the implementation of best practices for wastewater collection system construction, including not allowing foundation drains to discharge to the sanitary sewer system as well as improvements in gasketing of sewers and sewer connections to the maintenance holes.

If all the existing residences were upgraded such that foundation drains were removed from the sanitary sewer system and the infiltration was reduced, the future 2034 flows could be reduced to as low as 428 m^3/day and a peak flow of 1,849 m^3/day.

2.6.3 Future Plant Size

The future wastewater treatment plant will have a rated capacity of 900 m^3/d to accommodate future growth in the Township. This is less than the existing rated capacity but reflects expected future flows without over design. The peak plant flow capacity will be 5,000 m^3/d to address the existing peak flows that are experienced. The overall plant peak hour to average day flow factor will be 5.6.

2.6.4 Future Raw Sewage Characteristics

The raw sewage characteristics are summarized in the following Table 2.9.

Table 2.9. Raw Sewage Characteristics for Red Rock Wastewater Treatment Plant Design

	Contribution from Current Plant Service Population	Contribution from Additional Population (2011 -2034)	Combined Contributions	Daily Loading (kg/day)
Raw BOD (mg/L)	91	170	122	99.7
Raw Total Suspended Solids	97	200	148	110.5
Total Phosphorus (mg/L)	2.7	7	4	3.4
TKN (mg/L)	40	40	41	36

2.6.5 Future Effluent Requirements

The MOE has indicated that the plant will be required to meet the following effluent limits for discharge to Nipigon Bay, see correspondence dated December 5, 2012 included in Appendix B.

$CBOD_5$ -	25 mg/L
Total Suspended Solids	25 mg/L
Total Phosphorus	1 mg/L
pH	6.0 to 9.5
Total Residual Chlorine	0.02 mg/L
Un-ionized ammonia	1.25 mg/L (at 15^oC)
E.coli	200 counts/100mL
Acute Lethality – rainbow trout	50% mortality

Discharge into North Trout Creek may require a new set of effluent limits based the assimilative capacity of the creek, which would require further study.

Tertiary treatment is not required based on the effluent criteria provided by the MOE.

2.7 Problem Opportunity Statement

The Red Rock Wastewater Treatment Plant was constructed in 1975 and provides primary treatment and chlorine disinfection of the effluent. Upgrades are required to the existing plant for the following reasons:

- the Nipigon Bay has been classified as an Area of Concern (AOC) in Ontario by the Water Quality Board of the International Joint Commission due to water pollution. As one of the requirements to delist the Bay as an AOC, the Red Rock Wastewater Treatment Plant must provide secondary sewage treatment. The existing plant provides only primary treatment;
- secondary sewage treatment is required in the Province of Ontario;
- high wet weather flows cause sewage backups as a result of the reduction in outfall pipe size through the Mill property (requires replacement); and
- much of the existing plant components and equipment are at the end of their serviceable life.

3. Review of Alternative Planning Solutions

In this section of the report the major planning solutions available to address the problem statement in Section 2.7 are reviewed.

3.1 Identification of Alternative Planning Solutions and Initial Screening

The alternative planning solutions are the larger concept solutions for the problem/opportunity statement developed for the Red Rock Wastewater Treatment Plant. A preferred planning solution is chosen and documented in this section.

Based on the review of the Red Rock Wastewater Treatment Plant problem/opportunity statement, the following alternative planning solutions have been developed and evaluated. These alternatives include:

- do nothing;
- reduce extraneous flows;
- demand management (water conservation);
- existing Wastewater Treatment Plant process optimization;
- upgrade existing plant on existing site;
- construct a new plant at a new site. Five potential sites have been identified for an aerated lagoon process.

As noted in Section 1 of the report, the March 2012 ESR evaluated these additional alternatives:

- utilize the existing Red Rock Mill Lagoon with one of the following options:
  (a) Aerated Lagoon with discharge to Nipigon Bay;
  (b) EVC© process with land application of treated effluent as snow and spray irrigation.

Since filing the ESR, the Township has been unable to secure the necessary land to implement either of these two alternatives. As a result, these two alternatives are no longer viable.

Each of the alternatives was evaluated in detail to determine the preferred planning solution to meet the project objective. A description of each alternative and the corresponding evaluation of the alternatives are presented in this section of the report, along with the selection of the preferred alternative.

3.2 Impact Assessment

3.2.1 Do Nothing

This concept considered the effects on the Community if no proactive action is taken to improve the current situation as defined in the problem statement. This alternative does not provide a remedy to the current problems that the plant has such as serviceability, it does not provide for secondary treatment and does not address the size constraint of the outfall structure. The physical and operational issues with the plant described in the Problem Statement will not be addressed; and effluent quality will not be improved, affecting Nipigon Bay.

Therefore, this alternative will not be evaluated further.

3.2.2 Reduce Extraneous Flows

The alternative of reducing extraneous flows as a possible solution is based upon the premise that an upgraded collection system will reduce flows to the wastewater treatment facility. This could potentially provide some

additional capacity in the treatment facility for future growth, but will not address constraints described in the problem statement, specifically the need for secondary treatment.

Reducing extraneous flows is a wastewater system best practice and is recommended as part of the preferred solution. The desktop Inflow and Infiltration study noted that 38% of the 2009 flow was infiltration and inflow (I&I). Reducing this would require sump pumps or other remedial piping work to be installed in every residence that has a foundation drain connection to the sanitary sewer system and improvements to the surface water drainage system. The preliminary cost of these upgrades is estimated as $2,000,000. The removal of the foundation drains from the sewer system would take a number of years and there would be no guarantee of long-term flow reductions.

Other alternatives to reduce I&I flows include:

- installation of rain barrels to help capture storm water and thus reduce runoff to the sanitary and storm sewers;
- installation of inflow basins on the sanitary sewer manholes to retain rainwater and allow it to be released to the sewer system slowly to reduce peak flows to the WWTP;
- public education;
- storm drainage improvements to direct runoff away from residences and thus reduce the volumes of surface runoff from entering the foundation drain and weeping tile systems;
- maintenance of existing storm drainage systems to ensure major storm events are conveyed through the townsite and reach the natural streams, ditches, etc.;
- repairs to manholes;
- repairs to sanitary sewers.

The preferred alternative will include measures to reduce extraneous flow such as repairs to manholes. The concept will not be carried forward as a standalone alternative for further evaluation, but as part of the preferred alternative.

3.2.3 Demand Management (Water Conservation)

The alternative concept of demand management was a possible suggestion based on the premise that the less water used presumably would reduce the demand on the existing systems and provide more capacity with the existing system for future growth without expansion or constructing a new facility.

This alternative does not address the need for secondary sewage treatment and the plant's other deficiencies would not be addressed. The concept of water conservation and demand management, although unsuccessful as an alternative to plant expansion or construction, should be held in the highest regard within the community and implemented as a standard protocol in reducing flows and conserving water resources. The preferred alternative will include water conservation. The concept will not be carried forward as a standalone alternative for further evaluation.

3.2.4 Existing Plant Process Optimization

The existing Red Rock Wastewater Treatment Plant provides a primary sewage treatment process that discharges effluent to Nipigon Bay which is designated as an area of concern in Ontario by the Water Quality Board of the International Joint Commission. Objectives of this study are to improve the quality of treated effluent discharged into the environment by upgrading the level of treatment from primary to secondary treatment in conformance with the regulatory requirements set out in MOE Guideline F-5.

Process optimization will not address the need for secondary treatment. Therefore, the alternative of optimizing the existing wastewater treatment plant will not be carried forward for further evaluation.

3.2.5 Upgrade/Expand Existing Plant on Existing Site

This alternative would involve the upgrading of the existing wastewater treatment plant at the existing site.

3.2.5.1 Description of Alternative

A review of the existing treatment facility and the land availability indicated that the existing wastewater treatment plant could be expanded on the existing site to meet the wastewater treatment requirements.

With the expansion of the existing wastewater treatment plant, the previously noted deficiencies will be addressed and the biological treatment process will be designed to provide improvements to effluent quality. The expanded wastewater treatment plant would also require process tankage, a control building and additional biosolids storage. The existing plant will be decommissioned and demolished once the new facilities are constructed.

This alternative will address the issues noted in the problem/opportunity statement and provide for long-term reliability of the treatment facility.

Treatment processes that are considered under this alternative are described in more detail below:

- rotating biological contactor;
- sequencing batch reactor;
- extended aeration process; and
- conventional activated sludge process.

The existing plant site plan would not accommodate the lagoon treatment processes referred in Section 3.2.6.

Rotating Biological Contactor (RBC)

An RBC consists of a series of closely packed circular discs of polystyrene or polyvinyl chloride material that provide media for biomass to grow. The cylindrical plastic discs are attached to a horizontal shaft that rotates the discs. The RBC unit is partially submerged (typically 40 percent) in the tank containing the wastewater, and the discs rotate slowly at approximately 1 to 6 revolutions per minute. Mechanical drives are normally used to rotate the shaft and units. As the RBC discs rotate out of the wastewater, aeration is accomplished by exposure to the atmosphere. Wastewater flows down through the discs and solid and sloughing occurs. The RBC requires pre-treatment of primary clarification or fine screens and secondary clarification for liquids/solids separation.

Sequencing Batch Reactor (SBR)

The SBR is a fill-and-draw type of reactor technology involving a single complete mix reactor in which all steps of the activated sludge process occur. For municipal wastewater treatment with continuous flow, at least two basins are used so that one basin is in the fill mode while the other goes through react, solids settling and effluent withdrawal. A SBR goes through a number of cycles per day. A typical cycle may consist of 3 hours fill, 2 hours aeration, 0.5 hour settle and 0.5 hour for withdrawal of supernatant. An idle step may also be included to provide flexibility at high flows. Mixed liquor remains in the reactor during all cycles, thereby eliminating the need for separate secondary sedimentation tanks.

Decanting of supernatant is accomplished by either fixed or floating decanter mechanisms. The hydraulic retention time for SBR's generally range from 18 to 30 hours, based on influent flow rate and tank volume used. Aeration may be accomplished by jet aerators or coarse bubble diffusers with submerged mixers.

Extended Aeration Activated Sludge Process

The extended aeration activated sludge process operates in the endogenous respiration phase of the micro-organism growth curve, which requires a low organic loading (F/M ratio) and long aeration time. Because of the long solids retention times (20 to 30 days) and hydraulic retention times (in the order of 24 hours), aeration equipment design is controlled by mixing needs and not usually oxygen demand. The process is used extensively for pre-engineered plants for small communities. Generally, primary clarification is not used. Secondary clarifiers are designed at lower hydraulic loading rates than conventional activated sludge clarifiers to better handle large flow rate variations typical of small communities. The extended aeration technology is extensively used throughout Ontario.

Conventional Activated Sludge Process

In the conventional activated sludge process, pre-settled wastewater and recycled activated sludge are introduced in the aeration tank and continuously mixed by providing air.

Suspended biomass in the aeration tank provides wastewater treatment and is separated from the treated effluent in the secondary clarifier and returned back to the aeration tank. The aeration tank is designed to provide 3 - 5 hour hydraulic retention time and a 3-15 day solids retention time.

A more detailed assessment of the various processes is included in Section 4.4.

Preliminary capital and operating costs for the various sewage treatment processes proposed at the existing plant site are compared in the following Table 3.1. A detailed cost breakdown is attached in Appendix K.

Table 3.1. Capital and Operating Costs for Various Treatment Processes for Red Rock Wastewater Treatment Plant at Existing Plant Site

Treatment Process	Initial Capital Cost	Annual Operation and Maintenance cost	Lifecycle Cost
Rotating Biological Contactor (RBC)	$6,454,000	$141,000	$9,274,000
Sequencing Batch Reactor (SBR)	$6,533,000	$134,000	$9,213,000
Extended Aeration Process (EA)	$6,862,000	$153,000	$9,922,000
Conventional Activated Sludge Process (CAS)	$6,782,000	$151,000	$9,802,000

Cost of property acquisition and inflow/infiltration reductions are not included in any of the treatment process costs. Property costs are not eligible for funding and are borne 100% by the users. Lifecycle costs are based on the annual O&M costs for 20 years plus the initial capital cost.

Based upon Table 3.1, the SBR process provides the most economical O&M cost. The RBC provides the most economical initial capital cost.

3.2.5.2 Impact on Natural Environment

Expanding the Red Rock Wastewater Treatment Plant on the existing site will consume additional land area on the existing plant site.

Much of the existing site is old natural vegetation and grass cover.

A plant expansion at this location would have minimal impact to the existing natural environment setting. The ground cover has by and large been cleared and the local topography is sufficiently altered so that disturbance as a result of an expanded facility at the existing plant site would be negligible. The potential expansion area is level and is located above a high water table. Significant dewatering may be required during construction as the result of the proximity to the Bay. Appropriate permits will be obtained from the local Ministry of Natural Resources or Department of Fisheries and Oceans and rehabilitation plans will be established for the remaining land within the vicinity of the wastewater treatment plant.

A new outfall sewer constructed into Nipigon Bay would be required. This marine construction could have an impact on the aquatic environment, and mitigating measures during construction would be required. A proposed area for the outfall would has been excluded from the National Marine Conservation Area.

Mitigation measures during construction would focus on implementation of erosion and controls to prevent the migration of fines outside of the construction area while soils are exposed.

A mechanical wastewater treatment plant will produce biosolids which will need to be disposed of by dewatering and disposal at the local landfill or on land.

3.2.5.3 Impact on Social Environment

The upgraded facilities would be located within the existing site and as such may have minimum exposure to the passerby.

Odours generated by the upgraded treatment plant can be mitigated through covering of the process tanks and implementation of odour control methods. In addition, good operation and maintenance of the facilities can also result in the reduction and mitigation of odours produced.

Noise produced by the upgraded wastewater treatment plant can be mitigated through the use of:

- mufflers on standby power unit and blowers;
- soundproofing of buildings in which noise reducing devices are installed; and
- soundproofing of noise producing equipment such as blowers located in sound reduction enclosures.

3.2.5.4 Impact on Economic Environment

The Red Rock Wastewater Treatment Plant has a current rated capacity of 1,272 m^3/d. The proposed plant capacity is 900 m^3/d, and based upon secondary treatment objectives would improve the effluent quality of the plant. The estimated capital cost is $6,454,000, including engineering (15%) and contingency (15%), based on a Rotating Biological Contactor.

3.2.6 Construct a New Facility at a New Site

For this alternative, a new wastewater treatment plant would be constructed on a new site and the existing facility abandoned.

3.2.6.1 Description of Alternative

Under this alternative, the treatment processes that were considered were aerated lagoon treatment processes. The other mechanical sewage treatment processes referred to above were not considered under this alternative as the

existing site provides an adequate footprint for these processes and constructing them at a location further away from the current plant would add to the cost of pumping, forcemain and outfall sewers.

Aerated Lagoons

Five alternative sites indicated in Figure 2.4 were considered for construction of aerated lagoons.

The proposed aerated lagoons would include the following components:

- two (2) partial mixed aerated lagoon cells;
- aeration system in the aerated cells;
- positive displacement blowers for both aerated lagoon cells
- chemical feed system for phosphorus removal;
- Disinfection facilities (chlorination or ultraviolet);
- building to house blowers, filter, chemical feed system and other process equipment, instrumentation and controls;
- forcemain and pumping station to pump sewage from the current plant to the proposed sites, and
- outfall to North Trout Creek in the case of lagoon sites 2, 4 and 5. Outfall into Nipigon Bay in the case of lagoon sites 1 and 3.

Land acquisition would be required to develop any of the five sites.

3.2.6.2 Impact on Natural Environment

Construction of a new plant on a new site would result in significant environmental impacts to develop the new site on an area which is currently undeveloped.

In order to construct a new wastewater treatment plant, the existing forcemain from the pumping station will need to be redirected to the new wastewater treatment facility. Due to the prevailing soil conditions, detailed geotechnical and hydrogeological studies would be required.

This option will also generate odour, noise and visual impacts requiring mitigation measures.

A new outfall would be also be required for this facility to discharge the effluent into the Nipigon Bay either directly or via North Trout Creek. The outfall route, construction and location would also have significant impact on natural and social environment. There is a potential impact to the water treatment plant intake from Area 2, 4 and 5 that will be discharging to the North Trout Creek as the creek passes near the treatment plant's intake. Effluent discharged to the creek will also pass by the marina which has recently been upgraded and could have visual aesthetic and recreational effects. Effluent criteria will be required from the Ministry of the Environment for discharge to the creek.

There are several large drainage ravines traversing Area #2. Due to the topography of the area, substantial re-grading and existing surface water drainage modifications would be required to develop this Area.

An aerated lagoon will produce less biosolids that will need to be disposed of as compared to a mechanical wastewater treatment plant. Typically an aerated lagoon will require the biosolids to be removed and disposed of every 10 years.

3.2.6.3 Impact on Social Environment

A new plant constructed at a new location could have a negative impact on the social environment, depending on the proposed plant location. However, on the positive side, the process treatment selection for the new treatment facility will provide significant improvement on the surface water quality of Nipigon Bay. As well, the new site location could be further investigated and developed with a sufficient buffer zone from residential property to meet MOE guidelines and policies.

3.2.6.4 Impact on Economic Environment

The construction of a new wastewater treatment plant with an average design flow of 900 m^3/d would have a construction cost estimate of $6,065,000, including engineering (15%) and contingency (15%), based on the aerated lagoon process at Alternative Area 2 that would discharge to North Trout Creek, see Table 3.2.

Capital and operating cost estimates for the five alternative Areas are summarized in the following Table 3.2. A detailed cost breakdown is included in Appendix K.

Table 3.2. Comparison of Capital and Operating Costs for Aerated Lagoon

Alternative	Aerated Lagoon Process		
	Initial Capital Cost[1]	Annual Operating and Maintenance	Life Cycle Costs[3]
Alternative Area 1	$7,392,000	$109,000	$9,572,000
Alternative Area 2	$6,065,000[2]	$103,000	$8,125,000
Alternative Area 3	$10,785,000	$119,000	$13,165,000
Alternative Area 4	$8,589,000[2]	$122,000	$11,029,000
Alternative Area 5	$9,112,000[2]	$120,000	$11,512,000

[1]Costs of property acquisition and inflow/infiltration reductions are not included in any of the alternatives. Property costs are not eligible for funding and are borne 100% by the users.

[2]Sites not discharging to Nipigon Bay (#2, 4 and 5) may require more stringent effluent criteria and higher operating costs to provide additional treatment. Capital costs for additional treatment could be in the order of $800,000 - $900,000.

[3]Life Cycle costs include initial capital cost plus 20 years annual O&M Costs.

Based on Table 3.2, the most economical alternative is an aerated lagoon at Alternative Area 2. The construction cost estimate is $6,065,000, including engineering (15%) and contingency (15%), based on the aerated lagoon process including a new outfall at Area 2. Additional capital costs in the order of $800,000 to $900,000 for additional treatment may be necessary to meet more stringent effluent requirements at this location.

3.3 Evaluation of Alternative Solutions

The alternatives developed noted previously in this report have been evaluated and the results of this evaluation are summarized in this section of the report.

3.3.1 Evaluation Criteria

The proposed alternative solutions upon implementation will have an impact on various forms of the environment which are generally categorized as technical, environment, social, economic, operations and construction. Under each of these general categories several specific factors were rated, and the alternatives evaluated with respect to these specific factors, to identify whether the alternatives address the problem/opportunity statement.

Factors rated under technical include:

- regulatory requirements;
- ease of implementation;
- performance;
- flexibility to service future growth; and
- energy consumption.

Factors rated under environmental include:

- impact on surface water quality;
- impact on terrestrial habitat;
- impact on aquatic habitat;
- impact on National Marine Conservation Area (NMCA);
- impact on groundwater resources;
- impact on air quality; and
- effluent criteria.

Factors rated under social include:

- visual aesthetic;
- odour;
- noise;
- truck traffic;
- occupational health and safety;
- community growth;
- disruption of existing land use;
- heritage resource; and
- recreation resource.

Factors rated under economic include:

- capital cost; and
- operating and maintenance cost.

Factors rated under operations include:

- relative complexity of operation;
- level of operator training required;
- familiarity (operational experience in the province);
- operator acceptance;
- chemical use;
- ease of obtaining spare parts; and
- expected life.

Factors rated under construction include:

- impact on existing operations;
- community impacts during construction;
- land use requirements;
- geotechnical conditions and constraints;
- site construction constraints;
- potential impact on project implementation schedule.

3.3.2 Evaluation Summary

An impact evaluation matrix comparing each of the alternatives with respect to the technical, environmental, social, economic and construction impacts are included in Table 3.3.

3.3.3 Preferred Solution

The preferred alternative for this study is to:

Upgrade the Existing Waste Water Treatment Plant Using Rotating Biological Contactors

The reasons for selecting this as the preferred alternative include:

- minimal impact on the natural and social environment;
- sufficient land available on the existing site to construct the new treatment plant. Property acquisition is not required;
- the treatment process (i.e. RBC) will be similar to the treatment process recently installed in the Township of Nipigon, which provides a mutual benefit with respect to operating knowledge and potential economies of scale;
- the existing collection system has been constructed based upon the present location of the Red Rock WWTP, therefore a new forcemain and pumping of sewage to a new location will not be required;
- Proximity to Peregrine Falcon habitat will not be an issue;
- No further studies (i.e. assimilative capacity of North Trout Creek, Archaeological, etc.) with impacts to schedule and cost will be required.

The new wastewater treatment capacity will be 900 m^3/d, which is reduced from the existing Certificate of Approval.

The reduction of extraneous flows to the sanitary sewer system should also be incorporated as part of the preferred alternative.

3.3.3.1 Estimated Total Project Costs

Capital Costs	-	$6,454,000
Inflow/Infiltration Reductions	-	Unknown at the time of the report
ESTIMATED TOTAL PROJECT COSTS	**-**	**$6,454,000**

Table 3.3 Comparative Evaluation Matrix

Screening Criteria	Upgrade Existing Plant on Existing Site	Construct a New Lagoon at a New Site
Technical		
Regulatory Requirements	Will meet requirements of MOE Guideline F-5.	Will meet requirements of MOE Guideline F-5.
Ease of Implementation	Requires new plant design.	Requires new plant design.
Performance	Will meet MOE Guideline F-5.	Will meet MOE Guideline F-5.
Flexibility to Service Future Growth	There will be flexibility to service future growth.	There will be flexibility to service future growth.
Energy Consumption	Higher energy consumption as a result of new treatment process.	Lower energy consumption than a mechanical plant
Environmental		
Impact on Surface Water Quality	Surface water improved due to new treatment system with improved reliability.	Outfall to Nipigon Bay - Surface water will improve due to new treatment system with improved reliability. Outfall to North Trout Creek – Alternative Areas 2, 4, & 5 may have a negative impact directly on North Trout Creek (i.e. cold water fishery), the drinking water treatment plant intake and the marina due to outfall into North Trout Creek. Area #3 may have a negative impact on the drinking water treatment plant intake and the marina due to the outfall near intake protection zone and marina. These alternatives may require stricter effluent limits (additional study would be required) and additional treatment to meet stricter effluent limits Area #2 located in hazard land (flood plain) adjacent to North Trout Creek and is traversed by deep drainage ravines.
Impact on Terrestrial Habitat	No terrestrial impact.	Terrestrial impact due to new plant development. Areas 1 and 2 located near potential peregrine Falcon Habitat.
Impact on Aquatic Habitat	Aquatic habitat will be impacted due to new outfall construction, timing restrictions will be implemented during construction	Aquatic habitat will be impacted due to new outfall construction, timing restrictions will be implemented during construction
Impact on National Marine Conservation Area (NMCA)	Outfall will not be located within NMCA boundary	Outfall will not be located within NMCA boundary
Impact on Groundwater Resources	Groundwater may be affected during construction.	Groundwater may be affected during construction.
Impact on Air Quality	No additional impact. It will be improved due to better treatment of sewage.	Additional impact due to emissions from new plant
Effluent Criteria	Will meet criteria: 25 mg/L TSS, 25 mg/L BOD, 1 mg/L Phosphorus. Provision for future tertiary treatment will be made.	Will meet criteria: 25 mg/L TSS, 25 mg/L BOD, 1 mg/L Phosphorus, for discharge to Nipigon Bay. More stringent effluent criteria may be required for discharge to North Trout Creek. Provision for future tertiary treatment will be made.
Social		
Visual Aesthetic	Minor Impact due to new facilities.	Impact due to new construction of treatment facilities.
Odour	Reduced odour due to better treatment.	Potential odour impact due to new plant at a new location, particularly at Area 1 and 2 as they are in closer proximity to the Townsite
Noise	Potential noise impact due to generator set.	Potential noise impact due to blowers and generator set.
Truck Traffic	No additional truck traffic impact.	No additional truck traffic impact.
Occupational Health and Safety	Plant will meet occupational health and safety requirements.	Plant will meet occupational health and safety requirements.
Community Growth	Growth will be accommodated.	Growth will be accommodated.
Disruption of Existing Land Use	No impact	Will impact existing land use.
Heritage Resource	Low potential for archaeological resources.	Potential impact on heritage resources. Area 2 and 3 have medium to high potential for archaeological resources.
Recreation Resource	No impact	Potential impact on recreation resources.
Economic		
Capital Cost	Capital cost $6,454,000 (RBC) Costs for Inflow/Infiltration reductions are not included.	Capital cost $6,065,000 (Area 2) Costs of property acquisition and Inflow/Infiltration reductions are not included. Property acquisition costs are ineligible for funding. 100% of property acquisition costs to be borne by the Municipality.
Annual Operating Cost	Annual O&M cost $141,000	Annual O&M cost $103,000
Operations		
Relative Complexity of Operation	Will be more complicated than existing process.	Aerated lagoon will be less complicated than the existing process.
Level of Operator Training Required	Operators will require knowledge of secondary process for treatment of sewage and process control	Operators will require knowledge of secondary process for treatment of sewage and process control.

Familiarity (Operational Experience in the Province)	Extended aeration & conventional activated sludge processes are familiar processes in the province. The SBR is less familiar. An RBC treatment process was recently commissioned in the Township of Nipigon.	Aerated lagoons are a familiar process in the Province.
Operator Acceptance	The RBC has less process control over biomass, but is relatively easy to operate. SBR is more complex with sophisticated controls. Conventional processes such as extended aeration and conventional activated sludge are easy for an operator to adapt to.	Aerated lagoons are easy for an operator to adapt to.
Chemical Use	Alum will be used for phosphorous removal. Chlorination/De-chlorination or Ultraviolet (UV) will be used for disinfection.	Alum will be used for phosphorous removal. Disinfection not required.
Ease of Obtaining Spare Parts	Easy.	Easy.
Expected Life	25 years.	25 years.
Construction		
Impact On Existing Operations	Potential Impact due to construction activity at the site	Less Impact as the site is away from the existing plant site
Community Impacts during Construction	Potential impact such as traffic, noise, etc.	Potential impacts such as traffic, noise, etc.
Land Use Requirements	No Impact.	Land acquisition required, land use will change.
Geotechnical Conditions and Constraints	Potential impact on schedule and cost due to geotechnical conditions and constraints.	Potential impact on schedule and cost due to geotechnical conditions and constraints.
Site Construction Constraints	Sediment and erosion control, timing restrictions for outfall construction, re-vegetation	Sediment and erosion control, timing restrictions for outfall construction, re-vegetation
Potential Impact on Project Implementation Schedule	Potential impact on schedule as a result of site conditions.	Potential impact on schedule as a result of site conditions. Land acquisition process may cause further delays in the project with no guarantee that the required land will be obtained by the Township.

4. Alternative Design Solutions

4.1 Preliminary Identification of Alternative Design Solution

The preferred planning alternative for this project is to expand and upgrade the existing plant on the existing site. This section provides a review of design alternatives available for a specific wastewater treatment process considered for the Red Rock Wastewater Treatment Plant expansion. The new plant will be designed with a capacity of 900 m^3/d. The plant design will provide:

- treatment of anticipated peak flows resulting from extraneous flow in the collection system;
- treatment for septage received at the plant;
- removal of grit and screenings to protect downstream equipment;
- removal of suspended solids to achieve anticipated effluent criteria for this parameter;
- removal of organics (referred to as biological oxygen demand or BOD_5) to achieve anticipated effluent criteria for this parameter;
- removal of ammonia to achieve non-toxic effluent;
- removal of phosphorus to meet effluent criteria for this parameter and minimize impacts on Nipigon Bay;
- disinfection to eliminate pathogens in the effluent, while achieving a non-toxic effluent with respect to chlorine;
- stabilization of wastewater residuals to reduce pathogens and vector attraction and generate a resulting material, referred to as biosolids, that can be disposed in accordance with Ontario regulations; and
- effluent disposal in Nipigon Bay.

This section presents the preferred treatment operations and process that will be included in the proposed design concept.

4.2 Raw Sewage Pumping Station

The existing raw sewage pumping station at the existing wastewater treatment plant could be re-used with new higher head pumps. However this pumping station is a dry well/wet well pumping station and the wet well is exposed to the building. The existing drywell has experienced severe corrosion and the existing pumps will need to be replaced As well, this pumping station has been incorporated into the existing process buildings which will become redundant when the new plant is constructed.

It is recommended that a new submersible style sewage pumping station be constructed. The sewage pumping station will have 3 submersible sewage pumps installed in a wet well and will be designed to pump the peak flows to the plant headworks. The station capacity will be 58 L/s (5,000 m^3/d).

4.3 Headworks

4.3.1 Septage Handling and Treatment

A septage receiving station will be provided to handle septage delivered to the facility. The septage will be received at a dedicated receiving station and after preliminary treatment will be pumped to the headworks.

The septage receiving station will consist of an inlet chamber with manual bar rack and a holding tank with a submersible chopper type pump. The chopper pump will be equipped with a variable frequency drive and will be controlled by an ultrasonic level device. Septage will be discharged through a 75 mm diameter force main on a periodic basis to avoid organic overloads to the system. The volume of the new septage holding tank will be 25.0 m^3.

4.3.2 Screens

The principal role of screening equipment in a wastewater treatment plant is to remove coarse materials from the flow stream that could:

- damage downstream process equipment; and
- reduce overall treatment process reliability and effectiveness.

Two general types of screens, coarse screens and fine screens, are used in the preliminary treatment of wastewater. Coarse screens have clear openings ranging from 6 to 25 mm and fine screens have clear openings less than 6 mm.

In wastewater treatment, coarse screens are used to protect pumps, valves, pipelines and other appurtenances from damage or clogging by rags and large objects.

The application of fine screens is primarily for treatment (following coarse bar screens) or primary treatment (as a substitute for primary clarifiers).

In order to protect the downstream equipment from clogging by rags and large objects, a coarse bar screen will be adequate. Therefore, a coarse bar screen is proposed for the Red Rock Wastewater Treatment Plant.

Coarse screens are designated as either manually or mechanically cleaned. Manually cleaned coarse screens (or bar racks) are used frequently ahead of pumps in small wastewater pumping stations and sometimes used at the headworks of small to medium sized wastewater treatment plants. Often they are used for standby screening in bypass channels for service during high flow periods when mechanically cleaned screens are not in service (i.e. maintenance or power failure). Normally, mechanically cleaned screens are provided in lieu of manually cleaned screens to minimize manual labour required to clean the screens and to reduce flooding potential resulting from clogging.

The advantages and disadvantages of manually cleaned and mechanical cleaned bar screens are listed below:

Manually Cleaned Coarse Screens

Advantages

- little or no equipment maintenance; and
- a good alternative for smaller plants with few screenings in the raw sewage.

Disadvantages

- require frequent raking (cleanup of screenings) to avoid clogging and thus high backwater water levels upstream of screens;
- increased raking frequency increases labour costs; and
- handling of screenings exposes the operators to health risks.

Mechanically Cleaned Coarse Screens

Advantages

- lower labour costs;
- provides improved flow conditions;

- improved screening capture over manually cleaned screens; and
- screenings will be dewatered mechanically, improving operator health safety.

Disadvantages

- high equipment maintenance costs;
- high initial capital cost compared to manually cleaned screens.

For the Red Rock Wastewater Treatment Plant the preferred alternative is one (1) mechanical coarse bar screen and one (1) backup manually cleaned coarse bar screen (rack) for the following reasons:

- reduces labour costs;
- improved screenings capture; and
- screenings will be dewatered mechanically, improving operator health and safety.

The screens will be designed to handle the plant design peak flow of 5000 m^3/d.

4.3.3 Grit Removal

Grit removal equipment is provided for removal of grit from the wastewater at the headworks of wastewater treatment plants in order to:

- protect moving mechanical equipment from abrasion and accompanying abnormal wear;
- reduce formation of heavy deposits in pipelines, channels and conduits; and
- reduce the frequency of digester cleaning caused by excessive accumulation of grit.

There are three main methods of grit removal, including:

- horizontal grit channels;
- vortex grit removal units; and
- aerated grit channels.

The advantages and disadvantages of each of the above-noted grit removal systems are summarized in the following Table 4.1.

Table 4.1. Grit Removal Systems

Type	Advantage	Disadvantage
Horizontal Grit Channel	• flexible as they allow performance to be altered by adjusting the outlet flow control device; • simple construction; • grit does not require further classification.	• difficult to maintain a 0.3 m/s velocity over a wide range of flows; • excessive headloss (30 - 40% of flow depth); • channels without effective flow control will remove excessive amount of organic material that requires grit washing and classifying.
Vortex Grit Removal	• effective over wide flow variations; • no submerged parts; • space requirement is minimal; • low energy requirements; • minimal headloss.	• proprietary design; • paddles can collect rags; • grit can be clogged in the grit sump; • require deep excavation due to their depth.
Aerated Grit Removal Channel	• effective over wide flow variation; • minimal headloss; • pre-aeration of sewage is provided.	• high power consumption; • additional equipment and maintenance required; • may produce odour and harmful volatile organics.

For the Red Rock Wastewater Treatment Plant, a horizontal grit channel is the preferred alternative for the following reasons:

- the current plant has a horizontal grit channel and operators are familiar with this operation;
- lower capital and operating costs;
- simple construction; and
- flexible.

The horizontal grit channel will be designed to handle the plant design peak flow of 5000 m^3/d.

4.4 Secondary Treatment

Once the raw sewage has been screened and degritted, it will be directed to a secondary biological process for treatment.

The secondary treatment process will provide:

- Removal of dissolved and particulate BOD biologically;
- Oxidizing (conversion) of ammonia into nitrate biologically; and
- Removal of biomass that was created during the biological process from the liquid phase for further digestion.

For the Red Rock Wastewater Treatment Plant, the following secondary treatment technology alternatives are considered:

- rotating biological contactor (RBC);
- sequencing batch reactor (SBR);
- extended aeration; and
- conventional activated sludge process.

All of the above technologies are various forms of activated sludge process.

4.4.1 Rotating Biological Contactor (RBC)

An RBC consists of a series of closely packed circular discs of polystyrene or polyvinyl chloride material that provide media for biomass to grow. The cylindrical plastic discs are attached to a horizontal shaft that rotates the discs. The RBC unit is partially submerged (typically 40 percent) in the tank containing the wastewater, and the discs rotate slowly at approximately 1 to 6 revolutions per minute. Mechanical drives are normally used to rotate the shaft and units. As the RBC discs rotate out of the wastewater, aeration is accomplished by exposure to the atmosphere. Wastewater flows down through the discs and solid and sloughing occurs. The RBC requires pre-treatment of primary clarification or fine screens and secondary clarification for liquids/solids separation. The advantages and disadvantages of the RBC technology are listed below:

Advantages

- ease of operation;
- high process stability;
- modular process;
- good settling characteristics of the biomass;
- low sludge production;
- capable of handling a wide flow range;
- Similar process to that installed in Nipigon, which may provide benefits with respect to operating knowledge.

Disadvantages

- more sensitive to temperature (covered design will be required);
- limited degree of process control; and
- shaft bearings and mechanical units require frequent maintenance.

4.4.2 Sequencing Batch Reactor (SBR)

The SBR is a fill-and-draw type of reactor technology involving a single complete mix reactor in which all steps of the activated sludge process occur. For municipal wastewater treatment with continuous flow, at least two basins are used so that one basin is in the fill mode while the other goes through react, solids settling and effluent withdrawal. A SBR goes through a number of cycles per day. A typical cycle may consist of 3 hours fill, 2 hours aeration, 0.5 hour settle and 0.5 hour for withdrawal of supernatant. An idle step may also be included to provide flexibility at high flows. Mixed liquor remains in the reactor during all cycles, thereby eliminating the need for separate secondary sedimentation tanks.

Decanting of supernatant is accomplished by either fixed or floating decanter mechanisms. The hydraulic retention time for SBR's generally range from 18 to 30 hours, based on influent flow rate and tank volume used. Aeration may be accomplished by jet aerators or coarse bubble diffusers with submerged mixers. Advantages and disadvantages of the SBR technology are listed below:

Advantages

- simple technology;
- separate final clarifier not required;
- return sludge pumping not required;
- compact facility;
- operation is flexible;
- nutrient removal can be accomplished by operational changes;

- can be operated as a selector to minimize sludge bulking potential;
- quiescent settling enhances solids separation (low effluent suspended solids);
- more tolerance for poor settling sludge; and
- applicable for a variety of plant sizes.

Disadvantages

- complicated process control;
- high peak flows can disrupt operation unless accounted for in design;
- higher maintenance skills required for instruments, monitoring devices and automatic valves;
- batch discharge may require equalization of flow for the downstream process following the SBR train; and
- some designs use less efficient aeration devices.

4.4.3 Extended Aeration Activated Sludge Process

The extended aeration activated sludge process operates in the endogenous respiration phase of the micro-organism growth curve, which requires a low organic loading (F/M ratio) and long aeration time. Because of the long solids retention times (20 to 30 days) and hydraulic retention times (in the order of 24 hours), aeration equipment design is controlled by mixing needs and not usually oxygen demand. The process is used extensively for pre-engineered plants for small communities. Generally, primary clarification is not used. Secondary clarifiers are designed at lower hydraulic loading rates than conventional activated sludge clarifiers to better handle large flow rate variations typical of small communities. The extended aeration technology is extensively used throughout Ontario.

The advantages and disadvantages of the extended aeration technology are listed below:

Advantages

- high quality effluent;
- relatively uncomplicated design and operation;
- capable of treating shock/toxic loads;
- well stabilized sludge;
- low biosolids production; and
- proven technology demonstrated across Ontario, with sound understanding of operating requirements.

Disadvantages

- aeration energy use is high;
- relatively large aeration tanks required; and
- adaptable mostly to small plants.

4.4.4 Conventional Activated Sludge Process

In the conventional activated sludge process, pre-settled wastewater and recycled activated sludge are introduced in the aeration tank and continuously mixed by providing air.

Suspended biomass in the aeration tank provides wastewater treatment and is separated from the treated effluent in the secondary clarifier and returned back to the aeration tank. The aeration tank is designed to provide 3 - 5 hour hydraulic retention time and a 3-15 day solids retention time. Advantages and disadvantages of the conventional activated sludge process are listed below:

Advantages

- proven technology/demonstrated across Ontario;
- good understanding of operation requirements; and
- moderate complexity.

Disadvantages

- anaerobic digestion, which is expensive for this scale of plant, is required;
- large land area required compared to other processes; and
- requires primary treatment.

Based upon the lifecycle costs indicated in Table 3.1, the SBR process provides the lowest lifecycle cost option. The RBC provides the lowest capital cost option. The preferred solution is an RBC process for the following reasons:

- ease of operation;
- high process stability;
- modular process;
- good settling characteristics of the biomass;
- low sludge production;
- capable of handling a wide flow range;
- Similar process to that installed in Nipigon, which may provide benefits with respect to operating knowledge.

Layout of RBC process proposed for the plant is indicated as Figure 4.1.

4.5 Phosphorus Removal

Removal of phosphorus in soluble and insoluble forms, with the exception of the biological nutrient removal process, requires chemical precipitation of soluble phosphorus followed by physical removal of precipitated phosphorus either by settling or filtration or both.

The most commonly used mineral salts in a wastewater treatment plant for chemical precipitation of phosphorus are alum (aluminum sulphate), ferric chloride and ferric sulphate. The advantages and disadvantages of these mineral salts are listed below:

Table 4.2. Comparison of Mineral Salts

Chemical Coagulant	Advantages	Disadvantages
Alum	• Easy to handle. • Most commonly used. • Most effective between pH of 6.5 and 7.5. • Produces less sludge. • Relatively low cost.	• Effective over a limited pH range. • Consumes alkalinity.
Ferric Chloride	• Effective in a wide pH range (4 - 11).	• Consumes twice as much alkalinity as alum. • More expensive than alum.
Ferric Sulphate	• Effective between a pH of 4 -6 and 8.8 - 9.2.	• Consumes alkalinity. • More expensive than alum.

For the Red Rock Wastewater Treatment Plant, alum is the preferred mineral salt for phosphorus removal for the following reasons:

- lower cost than ferric sulphate or ferric chloride;
- easy to handle; and
- less sludge production.

The MOE design guideline (2008) states that filtration is necessary where the effluent concentration is less than 10 mg/L of total suspended solids and/or 0.5 mg/L total phosphorus should be achieved. The Red Rock Wastewater Treatment Plant effluent limits for the proposed plant include 25 mg/L of total suspended solids and 1 mg/L of total phosphorus. The use of secondary clarification will be adequate to achieve these limits.

4.5.1 Tertiary Treatment

Tertiary treatment is not required to meet the MOE effluent criteria for secondary treatment for this project. Normally Tertiary filtration is required if the effluent total phosphorous requirement will not be achieved through chemical process such as coagulation. The most economical tertiary filtration process is a cloth media disk filter and will have the following provisions:

- A pre-engineered building of its own;
- Filters assumed to be installed in painted steel tanks above grade; secondary effluent pumps will be required to provide filtration head;
- Stainless steel flow distribution chamber to equally distribute flows to the filters;
- All electrical, controls , heating and ventilation; and
- All piping and valves.

This process will add approximately $1,000,000 to the capital cost of the proposed project. There would be an operating cost to run and maintain the filters as well and filter media replacement that would occur once in every 10 years. The tertiary filter overall operating and maintenance cost will be in the range of $10,000 to $20,000 annually. Tertiary treatment may also increase the Classification of the plant and may require operators with a higher license Class. Should there be a future requirement to use a tertiary or enhanced treatment process it will be selected based on effluent target requirements. Provision will be included in the design for the future inclusion of tertiary or enhanced processes.

4.6 Disinfection

The MOE requires that sewage treatment plant effluent, including all overflows within the plant, should not exceed a monthly geometric mean of 200 E. coli per 100 mL. The Ministry also requires that effluent is non-toxic to aquatic organisms.

Effluent disinfection is generally achieved using chlorination/dechlorination or UV disinfection. The disinfection system will be sized to handle the plant peak flow capacity of 5000 m^3/d.

4.6.1 Chlorination/Dechlorination

Chlorination is one of the most commonly used methods for the destruction of pathogenic or other harmful organisms that may endanger human health. The principal chlorine compounds commonly used at wastewater treatment plants in Ontario are gas chlorine and sodium hypochlorite.

Chlorine gas is supplied as a liquefied gas under high pressure in containers varying in size from 68 kg to 908 kg. Selection of the size of chlorine pressure vessels depends on an analysis of the rate of chlorine usage, cost of chlorine and the facility's requirements for storage.

Many of the safety concerns related to the transport, storage and feeding of liquid gaseous chlorine are eliminated by the use of sodium hypochlorite, which is only available as a liquid and usually contains 12.5 to 17 percent available chlorine at the time it is manufactured. Generally, smaller plants use sodium hypochlorite.

Where effluent toxicity requirements are applicable following chlorination, a dechlorination chemical is added to the chlorinated effluent. Sulphur dioxide is used most commonly for dechlorination. Other chemicals that have been used are sodium sulphite, sodium bisulphite, sodium metabisulphite and sodium thiosulphate. Activated carbon has also been used for dechlorination. Advantages and disadvantages of chlorination/dechlorination are listed below:

Advantages

- well established technology;
- effective disinfectant;
- chlorine residual can be monitored and maintained;
- germicidal chlorine residual can be maintained in long transmission lines;
- relatively inexpensive; and
- oxidizes sulphides.

Disadvantages

- hazardous chemical that can be a threat to plant workers and the public, thus strict safety measures must be employed;
- relatively long contact time required;
- residual toxicity of treated effluent must be reduced through dechlorination;
- formation of trihalomethanes and other disinfection by-products (DBP); and
- chloride content of the wastewater is increased.

4.6.2 UV Disinfection

The germicidal properties of the radiation emitted from ultraviolet (UV) light sources have been used in a wide variety of applications, including wastewater treatment plant effluent. With the proper dosage, UV radiation has proved to be an effective bactericide and virucide agent for wastewater, while not contributing to the formation of toxic by-products. Advantages and disadvantages of a UV system are listed below:

Advantages

- an effective disinfectant;
- no residual toxicity;
- effective on tertiary effluent;
- more effective than chlorine in inactivating most viruses, spores and cysts;
- no formation of disinfection by-products at dosages used for disinfection;
- improved safety compared to the use of chemical disinfectants;
- requires less space than chlorine disinfection; and
- effective in the destruction of resistant organic constituents.

Disadvantages

- no immediate measure of whether disinfection was successful;
- no residual effect;
- less effective in inactivating some viruses, spores and cysts at low dosages used for coliform organisms;
- energy intensive;
- hydraulic design of UV system is critical;
- relatively expensive;
- large number of lamps required where low pressure low intensity systems are used; and
- low pressure, low intensity lamps require acid washing to remove scaling.

In the past, the Township had concerns with the UV disinfection system in their water treatment plant. The preferred option is to undertake a more detailed design to select the preferred process.

4.7 Sludge Stabilization

The sludge produced from the secondary treatment system must be stabilized prior to disposal in accordance with MOE guidelines and the Nutrient Management Act. The sludge stabilization process provides the following benefits:

- reduce pathogens;
- eliminate offensive odours; and
- inhibit, reduce or eliminate the potential for putrification.

There are four main methods of stabilizing biosolids to meet MOE land disposal requirements. These include:

- aerobic digestion;
- aerobic thermophillic phased digestion;
- anaerobic digestion; and
- composting.

Aerobic digestion involves holding the biosolids within an aerobic aerated reactor for a minimum of 45 days solids retention time. The solids retention time can be made up of the solids retention time in the secondary process as well as the solids retention time within the aerobic digester process tankage. A minimum of 45 days solids retention time is required to achieve sufficient pathogen reduction to meet MOE guidelines. In an aerobic digestion facility, the destruction of biological cells will result in a release of water (supernatant) which is decanted from the digestion facilities back to the secondary treatment process.

Aerobic thermophillic phased digestion (ATPD) involves aerobic treatment of the biosolids in an insulated reactor with mechanical mixing and minimal air addition. The natural heating of the biosolids during the stabilization process raises the temperature of the aerobic reactor resulting in a decreased time for pathogen stabilization. This process has the ability to produce a Class A biosolids with a solids retention time of 15 days. Currently, in Ontario there is no requirement for Class A biosolids for land disposal. There are ATPD processes operating in Ontario; one installation in Long Sault is operating successfully while the second installation in Cardinal has had difficulty with odours and equipment failure.

Anaerobic digestion involves stabilizing the biosolids in a closed vessel which operates anaerobically without oxygen. In order to make the anaerobic process operate successfully, a hydraulic retention time of 25 days is required and supplemental heat is added to keep the process at approximately 35°C. The hydraulic retention time of anaerobic and aerobic digesters is similar. The advantage to an anaerobic digester over the aerobic digester is that the energy input is usually less for the anaerobic digester since large volumes of air are not required for mixing of the

biosolids. However, anaerobic digesters have a very high capital cost and require more operator attention to ensure the process remains stable. Anaerobic digesters are typically more cost effective than aerobic digestion when the plant capacity exceeds 20,000 m^3/d and the liquid treatment process has a primary sludge.

Composting is an effective method to reduce pathogens in biosolids. Typically, the compost will produce a temperature of approximately 55°C under heat produced by the biological processes alone. This high temperature results in a Class A biosolids with respect to pathogens being produced with a 15 day retention time. In order to effectively compost biosolids, they must be dewatered to a minimum of 25 percent and mixed with woodchips or other bulking agents. Currently in Ontario, the compost regulations are such that biosolids stabilized by composting will not meet the Ontario regulations for finished compost due to metals in the biosolids.

Each of the four biosolids stabilization processes evaluated is compared in the following Table 4.3.

Table 4.3. Comparison of Digestion Processes

Process	Advantages	Disadvantages
Aerobic Digestion	• low capital cost; • low operator requirements; • stable process; • supernatant low in BOD_5.	• high operating cost due to the air required for mixing; • poor mechanical dewatering characteristics of the biosolids.
ATPD	• less solids retention time required (15 days); • low energy requirements due to minimal air addition and self heating of biosolids; • produces Class A biosolids.	• process may not be as stable as aerobic digestion; • based on proprietary designs, some of which have experienced failures; • high potential for odour production.
Anaerobic Digestion	• lower energy costs than aerobic digestion; • methane is produced which can be used for heating of the biosolids as well as supplemental building heat; • less quantity of sludge produced than aerobic digestion; • biosolids have good dewatering characteristics.	• methane is produced which is explosive; • high capital cost for piping, mixing and heat exchangers; • process requires operator attention to ensure stability; • requires similar solids retention time as aerobic digestion; • can potentially generate objectionable odours.
Composting	• low energy input requirements; • can produce Class A biosolids with respect to pathogens; • very low capital cost.	• feedstock quality does not allow for compost to meet composting regulations in Ontario; • requires biosolids to be dewatered and woodchips added; • requires operator attention for turning of compost piles or loading compost reactors; • potential for odour production.

Aerobic digestion is suitable to treat activated sludge or a mixture of activated sludge and primary sludge. Aerobic digestion is used primarily in plants of a size less than 200 L/s. Red Rock's Proposed new plant will have a process capacity of 900 m^3/d (10 L/s) which is within the recommended range for aerobic digester. For the Red Rock Wastewater Treatment Plant, we recommend aerobic digesters be provided at the plant site based on a minimum of 45 days solids retention time (with the SRT in the aeration system included). The plant will have a two (2) stage aerobic digester.

4.8 Biosolids Storage

The Ministry of the Environment, as part of the new Nutrient Management Act, requires 240 days biosolids storage for wastewater treatment plants.

The following alternatives were considered:

- on-site storage;
- off-site storage; and
- disposal at the landfill.

The advantages and disadvantages of on-site and off-site storage are listed below.

On-site Storage

Advantages

- reduces transportation costs of liquid sludge;
- cost effective to provide now when the plant is being upgraded; and
- easy to handle and treat the supernatant flow.

Disadvantages

- potential odours; and
- cost of construction of biosolids storage tank.

Off-site Storage

Advantages

- less capital and operational costs for the Township.

Disadvantages

- transportation costs of liquid sludge; and
- handling and treatment of supernatant flow.

Disposal at the Landfill

Advantages

- less capital and operational costs for the Township.

Disadvantages

- transportation costs of liquid sludge;
- A Certificate of Approval Amendment may be required.

For the Red Rock Wastewater Treatment Plant, disposal at the landfill site is preferred for the following reasons:

- less capital and operational costs.
- For this size of plant mechanical dewatering equipment is not preferred due to significant capital and operating cost, and a holding tank will be used to concentrate the biosolids.

4.9 Outfall

The proposed outfall location for the proposed plant will be in the Nipigon Bay exact location will be determined during detailed design stage.

4.10 Recommended Project

In this section of the report, we describe the recommended project required to upgrade the Red Rock Wastewater Treatment Plant. The preferred planning solution is to upgrade the existing wastewater treatment plant at the existing site.

The components recommended for this project are as follows:

- plant capacity - 900 m^3/d (average day)
- new sewage pumping station having a capacity of 58 L/s (5,000 m3/d)
- septage receiving station.
- headworks –mechanical coarse screen with standby manually cleaned bar screen, horizontal grit tank having a capacity of 58 L/s (5,000 m^3/d)
- secondary process involving Rotating Biological Contactors (with primary & secondary clarifiers) having a process capacity 900 m^3/d and clarifier hydraulic capacity of 5,000 m^3/d.
- disinfection process involving either Chlorination/dechlorination system or UV system having capacity of 58 L/s (5,000 m^3/d)
- sludge stabilization using aerobic digestion
- outfall in Nipigon bay
- new control building
- decommissioning and demolition of the existing plant facilities
- disposal of biosolids at the landfill
- upgrades to collection system to reduce inflow and infiltration

5. Environmental Impacts and Mitigation Measures

The potential impacts associated with the construction and operation of the Red Rock Wastewater Treatment Plant are summarized below:

5.1 Terrestrial, Aquatic, Vegetation and Wildlife

The effects resulting from municipal wastewater projects including the alteration of composition of the vegetation through the loss of topsoil, removing disturbing significant trees and/or ground flora, and increasing the exposure of forest edge to result in habitat loss for wildlife. Mitigating measures to reduce the potential for adverse environmental effects include replacing topsoil, providing a buffer zone and minimizing tree removal.

Dewatering might be required in some excavated areas at the wastewater treatment plant where the water table is high. Pumping of this water to local drainage ditches or to Nipigon Bay could potentially impact the Bay. These impacts will be effectively mitigated through erosion control and effective silt management strategies.

These efforts will be in addition to any monitoring requirements identified by the regulatory agencies such as the MOE, MNR and DFO.

It is anticipated that the following mitigation measures will be employed, at a minimum:

- Timing restrictions for in water work, in consultation with DFO/MNR/MOE;
- Timing restrictions for peregrine falcon habitat if required, in consultation with MNR;
- Sediment and erosion controls during construction to prevent sedimentation from entering the water. Further details will be obtained from the successful contractor's site specific erosion and sediment control plan.
- Re-vegetation of disturbed areas using indigenous species;
- Provisions for spill control;
- Construction materials used in the project should not be taken from below the high water level of any body of water.

Adherence to the construction specifications that will be provided in the construction document must be accepted by the contractor as part of the contractual agreement. A construction inspector will monitor construction and the mitigating measures to ensure compliance.

5.2 Heritage and Archaeological

During the construction activities should any heritage or archaeological artefacts be identified the work on site will stop immediately and the appropriate authorities will be notified. The site or area of the discovery will be separated and secured until the investigation is complete.

5.3 Noise Impacts

Noise is an effect which must be addressed in the evaluation of wastewater facility design alternatives. In addition to the short term associated with construction, intermittent operation of standby power generators may impact nearby residences and commercial establishments.

Mitigating measures to reduce the potential noise effects include erecting temporary barriers to reduce the noise level during the construction activities and installing a generator that meets the MOE noise emission guidelines at the property boundary. Construction hours may also be limited to minimize impact to surrounding environments.

5.4 Air Quality Impacts

To ensure the protection of public health, effects of construction on air quality must be addressed in the evaluation of all alternatives. All emissions must comply with Ministry of Environment Guidelines during construction activities.

Mitigating measures during construction include utilizing water trucks for dust suppression (as needed only) and limited stockpiling on site. Vehicular traffic may be directed into a certain area that is not impacted by construction activities to limit the amount of road dust.
Air emissions during operation will be mitigated through:

- odour control;
- covering of the tanks to reduce aerosols; and
- emergency process control and multiple units to reduce the possibility of upsets.

5.5 Construction Activities

Construction will involve the following activities:

- striping and stockpiling of topsoil;
- excavation;
- forming and pouring concrete structures;
- backfilling;
- building erection;
- mechanical and electrical equipment installation; and
- landscaping.

The potential effects of construction activities on the environment including fish, aquatic, vegetation and wildlife include the alteration of the existing habitat and water quality during construction. These alterations could result in an ecological imbalance within the aquatic environment by altering species abundance and/or diversity. Appropriate mitigation measures will be implemented to reduce impact.

The existing plant will continue operating until the proposed plant is commissioned. The existing plant will be decommissioned and it will be demolished.

A new treatment facility will be constructed; therefore the impact on the existing treatment operations will be minimal. It is anticipated that the existing monitoring practices will be maintained until the existing plant is fully decommissioned.

5.6 Approvals

The following approvals will be required prior to the construction of the plant expansion:

- Ministry of the Environment, OWRA Section 53 for the sewage works;
- Ministry of the Environment, under EPA for standby power;
- Township of Red Rock building permit;
- Ministry of Natural Resources – Approval for Construction work;
- National Marine Conservation Area (Parks Canada) – outfall
- Transport Canada Navigable Waters Approval for outfall; and
- Department of Fisheries and Oceans – Outfall.

5.7 Project Operation Requirements

The proposed treatment plant expansion must be operated under the terms of the Environmental Compliance Approval issued by the Ministry of the Environment. Appropriate maintenance activities should continue to ensure proper long-term operation of the completed facilities.

A detailed Operations and Maintenance Manual will be prepared to ensure that the facility is operated consistent with good practice and in accordance with the manufacturer's manuals.

An initial plant classification was conducted based on the preferred alternative. The proposed plant was found to border a Class II and Class III facility. The existing plant is a Class II. A Class III facility would require a Class III licensed operator to act the overall responsible operator and will require on going additional training hours required of a Class III facility. The Classification of the plant will need to be confirmed during the design phase.

Post Construction

- Post construction monitoring will be completed, at a minimum, in accordance with the Certificate of Approval for the facility and associated legislation (i.e. OWRA). The quality of raw sewage and treated effluent will be monitored on an ongoing basis. Effluent sampling frequency and methodology must conform with the Certificate of Approval issued by the MOE for the new treatment facility. It is anticipated that the following effluent parameters will be monitored as per the effluent criteria provided by the Ministry:
    - BOD
    - Total Suspended Solids
    - Total Phosphorus
    - Toxicity
- Flow volumes received at and discharged from the new treatment facility will be monitored on an ongoing basis;
- Plant staff will follow-up on any complaints and monitor and nuisance impacts;
- The Township will continue to keep records of all monitoring/sampling results. These records will be made available to the MOE upon request. A summary report will be compiled on an annual basis and available for public review.

To the best of our knowledge, the Remedial Action Plan (RAP) for Nipigon Bay does not require any specific testing or monitoring to be completed during or after construction.

6. Conclusions and Recommendations

6.1 Conclusions

Based on a review of the background of this project, the following project objective was developed:

> **Undertake upgrade and expansion of the existing Red Rock Wastewater Treatment Plant to improve the quality of treated municipal wastewater effluent discharged to the environment by upgrading the level of treatment from primary to secondary treatment in conformance with the regulatory requirements set out in MOE Procedure F-5.**

A list of alternatives was developed based upon an initial screening, the following alternatives were determined to be not feasible and were not evaluated further:

- do nothing/limit community growth;
- demand management (water conservation);
- extraneous flow reduction, and
- existing plant process optimization.

The following alternatives were evaluated in detail:

- upgrade/expand the existing plant at the existing site,
- construct a new wastewater treatment plant on an alternative site.

6.2 Preferred Alternative

The preferred planning alternative for this study is to:

Upgrade the Existing Waste Water Treatment Plant Using Rotating Biological Contactors and Discharge of Treated Effluent to Nipigon Bay

The reasons for selecting this as the preferred alternative include:

- minimal impact on the natural and social environment;
- sufficient land is available on the existing site to construct the new treatment plant. Property acquisition is not required;
- the treatment process (i.e. RBC) will be similar to the treatment process recently installed in the Township of Nipigon, which provides a mutual benefit with respect to operating knowledge and potential economies of scale;
- the existing collection system has been constructed based upon the present location of the Red Rock WWTP, therefore a new forcemain and pumping of sewage to a new location will not be required;
- Proximity to Peregrine Falcon habitat will not be an issue;
- No further studies (i.e. assimilative capacity of North Trout Creek, Archaeological, etc.) with impacts to schedule and cost will be required.

The new wastewater treatment capacity will be 900 m^3/d, which is reduced from the existing Certificate of Approval.

The reduction of extraneous flows to the sanitary sewer system should also be incorporated as part of the preferred alternative.

6.3 Class Environmental Status

This report finalizes Phase 3 of the MEA Class Environmental Assessment. Based upon the analysis summarized in this report, the preferred planning alternative for this project is upgrade the existing wastewater treatment plant using Rotational Biological Contactor (RBC) and discharge treated effluent to Nipigon Bay.

In accordance with the MEA Class EA document, this activity is a Schedule 'B' undertaking as noted below for the following components of this project:

"expansion of a sewage treatment plant, including relocation or replacement of outfall to receiving water body, up to existing rated capacity where new land acquisition is required".

The filing of the ESR and public record marks the conclusion of Phase 3 of the Class EA process for this study. Subject to any comments received during the review period, and assuming that no Part II Order requests are submitted, the project will be considered to be approved under the Class EA as a Schedule 'B' activity and the Township of Red Rock may proceed to the detailed design and implementation stages.

7. Recommendations

Based upon the findings of this Environmental Study Report, the following g recommendation is made:

- Upgrade the Existing Waste Water Treatment Plant Using Rotating Biological Contactors and Discharge of Treated Effluent to Nipigon Bay; and
- reduction of extraneous flows in the sanitary sewer collection system through repairing maintenance holes and piping as well as other means that are feasible.