6.0 Route Alignment and Mitigation Measures

This section describes the physical, natural, and socio-economic features that occur along the Preferred Route. The potential impact of construction and operation of the proposed pipeline on those features and recommended mitigation measures to reduce potential negative effects are also described. Specific construction methods and timing are recommended to minimize potential impacts. The photomosaics, included as **Appendix D**, illustrate the proposed alignment of the pipeline, as well as providing a summary of the outlined mitigation measures.

Constructing within or adjacent to road allowance can significantly reduce potential negative impacts of pipeline construction. There are, however, a number of recommended mitigation measures that will further reduce potentially adverse effects of constructing and operating the proposed pipeline. No significant adverse effects are expected from the construction and operation of the proposed pipeline.

6.1 PHYSICAL FEATURES

6.1.1 Physiography

Potential Impacts

Physiography is a description of physical features. Typically, the greatest impacts to physiographic features occur on slopes adjacent to watercourses. Potential impacts to watercourses may include surface soil erosion, trench slumping, and in extreme cases, sedimentation. Much of the topography along the Preferred Route is virtually flat; however, the Preferred Route involves two watercourse crossings involving Beaver Dams Creek. These two crossings will be horizontal directionally drilled (“HDD”) to minimize effects to the watercourse. However, construction along the Preferred Route alignment could potentially cause the slopes of the watercourses to lose stability.

As stated, the topography along the Preferred Route is generally flat. During construction, soils on flat land are also more prone to soil and wind erosion as a result of the loss of vegetative cover, intensity and duration of rainfall events, antecedent soil moisture, surface soil cover, slope, soil texture, soil structure, and organic matter levels.

Mitigation and Protective Measures

The Preferred Route crosses Beaver Dams Creek at two separate locations. The southerly crossing is within the road allowance of Thorold Townline Road, and the other crossing is within the road allowance of Niagara Falls Road. At this point, grading may be required to accommodate installation of the drill rig and associated equipment. Grading involves the “stripping” of topsoil from the banks and “cutting” into the subsoil to create grades that are practical and safe for construction. To reduce the risk of complications associated with grading the slopes of the waterways, site-specific mitigation measures are required. Preparation for

grading, which includes vegetation clearing, should not be initiated until the date of the actual watercourse crossing is imminent. Retaining trees and grasses on the approach slopes of watercourses will minimize the risk of slope failure and siltation for as long as possible.

Similarly, clearing, topsoil stripping, and grading activities within the crossing area, should be initiated as close as possible to the date of a crossing. Prior to any construction activity, sediment control fence, fronted with a row of straw bales, should be securely installed on both banks of the watercourse parallel to the water edge. The sediment control fence should be set back at least 15 m from the waters edge or as directed by the Environmental Inspector. This barrier will protect the identified watercourse from receiving deleterious sediment.

All soil removed from the slope of the watercourse should be separated by layer and temporarily stockpiled a minimum of 15 m from the edge of the watercourse. The section of bank immediately adjacent to the creek bed (i.e. between the erosion control fences) should not be disturbed during grading activities.

As soon as possible following completion of the crossing, the slopes of the watercourse should be restored to their original grade. Topsoil should be replaced at a depth similar to preconstruction conditions. Seeding should follow immediately. Once sown, seed should be protected with a layer of erosion control straw matting that will assist in stabilizing the slope and propagating the seed mixture. In the event that broadcast seeding is not feasible due to climatic or seasonal restrictions, hydroseeding should be considered. The sediment control fence, fronted with a row of straw bales, should remain securely installed on both banks of the watercourse throughout construction, restoration, and rehabilitation of the slopes. It should remain, in good repair, until stabilizing vegetation has re-established.

Seeding should be completed after the construction phase and prior to September 30th, in order to allow for germination prior to winter. Seeded areas should be protected with appropriate stabilizing techniques. In the event that broadcast seeding is not feasible, hydroseeding should be considered. If installed, sediment control fencing should be maintained throughout construction, restoration, and rehabilitation until vegetative cover is fully established. The requirement for, and location of, sediment control fencing should be determined by Enbridge's Environmental Inspector.

With the effective implementation of the mitigation measures recommended above, construction activities should have no adverse environmental effects on the physiographical features traversed by the Preferred Route.

6.1.2 Bedrock Geology

Potential Impacts

The Study Area consists of Paleozoic bedrock of the Lockport Formation, which is comprised of blue and grey shale with limestone interbeds. Interpretation of water well records within the Study Area report that the depth to bedrock varies from 12 m to 27 m (MOE, 2005); therefore, it is unlikely that bedrock will be encountered. However, bedrock outcrops exist north of the Study

Area (Ontario Division of Mines, 1976). In the event that bedrock is encountered during trench excavation, a hoe-ram will be used to achieve sufficient trench depth and width. Where bedrock material is excavated by hoe-ram, potential effects are limited to increased noise and vibration in the immediate vicinity.

Mitigation and Protective Measures

Since bedrock is not anticipated to be encountered, specific mitigation measures have not been developed.

6.1.3 Climate

Potential Impacts

As the pipeline is proposed to be constructed almost entirely within road allowance, potential impacts associated with inclement weather are not anticipated to be significant. For the most part, impacts to surficial soils have been avoided through careful route planning and aligning the pipeline largely within road allowance. Subsequently, impacts associated with wet soils are not anticipated to occur during construction.

High winds may generate airborne dust, which, if persistent, may become a nuisance to residents adjacent to construction areas. Persistent, uncontrolled airborne dust is an irritant to residential and business properties located in close proximity to the proposed pipeline.

A period of heavy rainfall may cause a significant increase in the surface and ground water levels. High water levels and rapid flows may result in flooding of the trench line and flooding of adjacent lands.

Mitigation and Protective Measures

Erosion associated with high winds, resulting in soil loss and nuisance dust, can be reduced or eliminated by stabilizing temporary soil storage piles with straw mulch. Furthermore, applying a low energy water spray to the work area can temporarily control nuisance dust. In extreme cases, a dust suppressant can be applied to contain soil particles onsite.

During periods of excessive rainfall or saturated soil conditions, construction activities should be monitored to ensure that excavated soils remain on-site and do not migrate off the work area. If excessive amounts of rain continue to fall, excavated soils should be secured by the use of sediment control fencing and straw bales where appropriate.

If the mitigation measures recommended to reduce the impact of inclement weather are followed, there should be no adverse environmental effects from climatic events that occur during construction.

6.1.4 Seismicity

Potential Impacts

The Preferred Route is within the second lowest rated seismic ground motion zones with respect to relative seismic risk (Natural Resources Canada, 2005a; Natural Resources Canada, 2005b). The probability of significant seismic activity in the area traversed by the proposed pipeline is extremely low.

Mitigation and Protective Measures

Since seismicity is not a concern along the Preferred Route, mitigation and protective measures have not been developed.

6.1.5 Hydrology

Surficial Watercourses

Potential Impacts

The Preferred Route crosses Beaver Dams Creek in two locations.

As detailed in **Appendix C**, Beaver Dams Creek serves as a displacement basin for the Welland Canal. It receives water displaced from the canal by ships as they pass. Water levels rise and fall with the passing of ships; however, the creek always contains some water and is known to support a wide variety of fish.

The potential exists for water quality to be affected during construction of the pipeline through the following means:

- Accidental spills from construction vehicles working in or adjacent to the watercourses, and due to inappropriate handling or storage of fuel, dust suppressants, lubricants or other potential contaminants; and,
- Erosion resulting from the unavoidable removal of stabilizing vegetative cover.

Specific issues related to hydrostatic testing are discussed in **Section 7**. Other potential effects related to watercourses are discussed in **Section 6.2.1**.

Mitigation and Protective Measures

General mitigation measures to protect the surficial hydrology of Beaver Dams Creek during pipeline construction are described below and can be seen on the mitigation mosaics (**Appendix D**). Both crossings will be HDD thus avoiding potential impacts on flow rate and fisheries. It is anticipated that this crossing method will eliminate effects to the watercourse.

Horizontal Directional Drill

Potential Impacts

The two Beaver Dams Creek crossings will be completed using HDD technology. Directional control of the drill bit is achieved using pressurized water and bentonite (an inert, non-toxic clay

that eliminates concerns related to toxicity) directed through jets mounted on the drill bit. As the drill bit progresses, a series of sections of drill pipe will be attached to the drill head. Once the pilot hole is successfully drilled, the hole will be shaped and widened to its final diameter using a series of progressively larger 'cutters' and 'reamers', which are run from one end of the hole to the other. The pre-welded pipe will then be attached to a pull head and pulled into position under the river.

The main environmental issues pertaining to surficial water quality associated with the HDD of the Beaver Dams Creek include:

- Sedimentation and contamination of the watercourse through the release of 'inadvertent returns' of drilling mud through the bed of the watercourse. Inadvertent returns occur when a significant amount of drilling fluid returns to the surface via a route other than the entry or exit point due to migration of the pressurized fluid through cracks or fractures in the soil;
- Sedimentation and contamination of the watercourse through the release of 'inadvertent returns' of drilling mud onto the surface and the subsequent flow of this mud into the channel; and,
- Disposal of drilling mud that is collected at the entry and exit points of the HDD.

Mitigation and Protective Measures

In order to minimize the effects of erosion and sediment deposition during the directional drill of the Beaver Dams Creek, standard erosion and sediment control measures must be implemented around the drill and pipe staging areas.

Once vegetative cover is removed and soil is disturbed at the drill exit site the potential for erosion and sediment deposition increases. Topsoil stripped from the drill exit site must be stockpiled in a location designated by the Environmental Inspector. The topsoil stockpile must be located as far as possible from adjacent surface receptors such as bar ditches, municipal drains and culverts, and it must be protected against migration by using sediment control fencing.

Additional supplies should be maintained onsite, in a readily accessible location, for maintenance and contingency purposes. Prior to construction, the contractor must obtain adequate quantities of the materials listed below in order to control erosion and sediment deposition.

- Sediment control fencing;
- Straw bales;
- Wooden stakes;
- Sand bags;

- Water energy dissipater;
- Filter cloth;
- Water pumps (including stand-by pumps and sufficient lengths of hose); and,
- Snow fencing with sufficient quantities of t-bars.

Prior to construction, sediment control fencing must be erected to protect each surface receptor situated in close proximity to the drill exit site.

Sediment control fencing must be properly keyed-in and maintained at all locations in order to work effectively and achieve maximum sediment control. Sediment control fencing must be inspected on a daily basis for wear and tear. Damaged or worn sediment control fencing must be replaced immediately. Additional protection, as required by the Environmental Inspector, can be achieved by placing straw bales against the uphill side of sediment control fencing.

Spill Response

Enbridge's approach to spill response places a strong emphasis on prevention and preparedness and involves many organizations, including federal and provincial agencies, private industry, and volunteer groups. With respect to the HDD, the potential exists for hazardous substance spills to occur, as well as the release of inadvertent drilling fluid returns.

a) Hazardous Substance Spills

Hazardous substances refer to any substance, which, by its chemical, physical, or biological nature represents a hazard to the public, property, or the environment. There are many operations that can involve hazardous substances during pipeline construction. Fuelling and lubrication of construction equipment associated with directional drilling activities must be carried out in a manner that parallels the procedures recommended above.

b) Drill Slurry Release

On land, inadvertent returns of drilling fluids are most likely to occur where the pressure from the drilling fluid shears the soil and allows the fluid to escape to the ground's surface. The following materials should be maintained onsite in an accessible location to assist in the management of a drill slurry release on land:

- Sediment control fencing;
- Straw bales;
- Wooden stakes;
- Sand bags;
- Shovels and squeegees;
- Numerous 5 gallon pails;

- Water pump, spare water pump, and sufficient lengths of hose;
- Rubber tired backhoe with front end loader; and,
- 24-hour access to a local vacuum truck.

During drilling operations, areas in proximity to the exit point must be monitored for indications of above-ground seepage of drilling fluid. If inadvertent drilling fluids are observed above-ground, the following procedures should be followed:

- Evaluate the release to determine if containment structures are warranted and can effectively contain the release;
- Install containment structures (i.e. berms or sediment control fence) around the area affected by the return to prevent drilling fluid from migrating across the ground's surface;
- If significant volumes are released, excavate a small sump pit and remove fluid by vacuum truck to be disposed of at a pre-approved disposal facility; and,
- Terminate drilling operations in the event that returns pose a threat to public health and safety.

Designing the directional drill so that drilling slurry pressure is minimized and the drilling rate is reduced in porous materials will minimize the chance of loss of circulation of the drilling slurry. Other measures to ensure that lost circulation does not occur are as follows:

- Maintain smooth operation of the drilling string and slurry pumping systems to avoid pressure surges;
- Minimize slurry viscosity through appropriate filtering of drilled material to reduce the pressure gradient along the drill path due to frictional effects; and,
- Continually monitor slurry volumes to enable a quick response to any indications of lost circulation.

In the event of a loss of circulation, the drilling slurry pressure should be reduced to a level that will enable the opening, through which slurry is escaping, to seal while ensuring drill cuttings are transported back to the surface at a rate sufficient to prevent accumulation in the drill hole. Increasing the viscosity and density of the drill slurry may also be necessary to seal the opening through which the drilling slurry is escaping.

Any drill slurry that escapes onto land should be immediately contained and transferred into the onsite containment system. If leakage into the channel is suspected, water users within 2 km of the drill location should be notified as soon as possible.

All drilling fluid that returns to the surface following completion of drilling and reaming and during pipeline pull back operations should be contained and disposed of by an approved disposal method. Methods that should be considered for slurry disposal include hauling the slurry to a disposal site. Drill slurry contained within holding tanks or sumps should be analyzed in accordance with MOE regulations and guidelines prior to disposal.

Additional mitigation measures for hydrology are presented in **Section 6.2.1**. No significant adverse effects upon surface water hydrology along the Preferred Route are expected with proper implementation of these measures.

Groundwater

Potential Impacts

As discussed in **Appendix C2**, and as can be seen in **Appendix C1, Figure C1-2**, there are 20 reported water wells within the Study Area. The average depth at which the water was found is 11.7 m ranging from 4.9 m to 23.8 m. There are several reported uses for the wells including domestic, public supply, commercial, industrial and not used. There are four wells situated in close proximity (within 100 m) to the Preferred Route.

Due to the shallow depth of a normal pipeline excavation, approximately 2 m, construction is not anticipated to affect groundwater; however, in wet areas dewatering may be required to lower the near-surface water table to enable excavation of a trench.

Mitigation and Protective Measures

Dewatering has the potential to affect nearby wells. To determine preconstruction quality and quantity conditions, nearby well owners should be given the option to participate in a water well monitoring program prior to construction.

Associated dewatering should be discharged in a vegetated area or into a filter system to eliminate ground scouring. An MOE Permit to Take Water is required if more than 50,000 litres per day is withdrawn as a result of sand pointing activities.

Fuels, chemicals, and lubricants should be stored on level ground in properly contained/sealed storage areas. Refueling activities should be monitored at all times; vehicles should never be left unattended while being refueled and refueling and maintenance of vehicles should occur at a minimum distance of 100 m from the edge of a watercourse. In the unlikely event of a spill, the MOE Spills Action Centre should be contacted and spills containment and clean-up procedures implemented immediately.

The potential for effects to groundwater quality and quantity is low; however, the water-bearing zone may occur within the potential zone of impact for normal pipeline trenching operations. It is possible that water-bearing overburden may be encountered during the two HDDs of Beaver Dams Creek. With proper implementation of these mitigation and protective measures, construction related activities should have no significant adverse effects upon hydrology along the Preferred Route.

6.2 BIOPHYSICAL FEATURES

6.2.1 Watercourses and Fisheries

Potential Impacts

The Beaver Dams Creek is crossed twice by the Preferred Route (see **Appendix C1, Figure 2**). Beaver Dams Creek is known to contain a variety of fish species.

The primary concern regarding potential effects of pipeline construction on fish and fish habitat is species viability and potential impacts to spawning/nursery activities. Construction effects including siltation and sedimentation, erosion of stream banks, and maintenance of downstream flow are addressed in **Section 6.1.5**.

Mitigation and Protective Measures

Both crossings of Beaver Dams Creek will be completed by HDD. This will reduce potential impacts to flow rate, fisheries and navigation. A permit must be obtained from the NPCA prior to the commencement of watercourse crossings.

No work will be conducted in either watercourse and as such, with the implementation of the appropriate mitigation measures, no effects to the watercourse are anticipated resulting from these crossings.

The following mitigation measures should be taken for all watercourse crossing types, including HDD, when constructing in or proximal to fish habitat:

- Watercourse crossings are preferred to be performed during the summer months when fish are not migrating or spawning and water flow is low;
- Prior to removal of the vegetation cover, effective mitigation techniques for erosion and sediment must be in place to protect water quality. Limit disturbance to the area during construction and delay grubbing activities until immediately prior to grading operations;
- Materials removed or stockpiled during construction (e.g. excavated soil, backfill material) must be deposited and contained in a manner to ensure sediment does not enter the watercourse;
- There must be no fording of any flowing stream;
- Enbridge or any subcontractor will not obstruct any watercourse in a way that impedes the free movement of water and fish;
- All exposed mineral soil must be graded to a stable slope and treated as quickly as possible to prevent erosion and sediment from entering the water; and,
- Enbridge is to have additional materials (e.g. rip rap and sediment control fencing) readily available in case there is an urgent need for erosion and sediment control.

6.2.2 Forest and Vegetation Cover

Potential Impacts
Road allowance undergo continual management by municipal and provincial road crews. Grass and brush cutting, pesticide spraying, and salt deposition are also common occurrences. As a result, vegetative cover within road allowance generally consists of common, hardy plant species that are adaptable to disturbed environments.

Most trees situated adjacent to the Preferred Route have been previously cleared for agricultural purposes and for road construction and maintenance. Consequently, minimal tree removal will be required as part of this project.

A review of the NHIC (2005) and National Species at Risk (Environment Canada, 2004) databases identified seven plant species that are of national concern or provincial concern that could possibly exist in the Study Area. The exact locations of these species are kept confidential, but it is not anticipated that any will be affected by the Preferred Route alignment.

Mitigation and Protective Measures

Tree clearing is anticipated to be minimal. To the greatest extent possible, trees have been avoided by selecting a route almost entirely within road allowance. Where trees are adjacent to the Preferred Route, protective measures such as using snow fence to control access and working only outside the tree drip line should reduce impacts. If a significant tree is situated in the path of the pipeline, protective measures such as HDD should be considered.

To minimize the extent of disturbance to forest and vegetative cover, vehicular movement and material/equipment storage should be confined to the right-of-way.

It is anticipated that a quick re-establishment of herbaceous ground cover will result due to natural in-growth from adjacent areas. Seed mixes, fertilizer, and application rates should be determined in consultation with the City of Thorold and highway Superintendent, as appropriate. Should any trees require to be cut, Enbridge will implement their Tree Replacement Program.

Since pipeline construction will occur largely within existing road allowance, the amount of vegetation to be cleared should be minimal and the effects should be short term. In the event that a significant species is encountered during construction, Enbridge should cease work on the effected portion of the right-of-way and consult the MNR regarding appropriate protective measures.

No significant adverse impacts are anticipated to vegetation adjacent to the Preferred Route, provided the measures described above are followed.

6.2.3 Wetlands

Potential Impacts
The Preferred Route does not impact any provincially significant or municipally designated wetland areas.

Mitigation and Protective Measures

Since no provincially significant or municipally designated wetlands are affected along the Preferred Route, no mitigation or protective measures are necessary.

6.2.4 Natural Heritage and Areas of Natural and Scientific Interest ("ANSI"s)

Potential Impacts
The Preferred Route for the proposed pipeline does not affect any provincially recognized natural heritage or environmentally significant areas.

Mitigation and Protective Measures

Since no provincially recognized natural heritage or environmentally significant areas are crossed by the Preferred Route, no mitigation or protective measures are necessary.

6.2.5 Wildlife

Potential Impacts
Due to the urban and industrial surroundings, the limited number of fence lines and watercourse valleys, and a lack of woodlots adjacent to the Preferred Route, minimal opportunities for the habitat of birds, mammals, reptiles or amphibians exist within the Study Area. Species that could possibly be encountered during construction include raccoons, groundhogs, squirrels, skunks and various avian species including wild turkey.

A review of the NHIC (2005) and National Species at Risk (Environment Canada, 2004) databases identified eighteen wildlife species of national concern or provincial concern that could possibly inhibit the Study Area. Lists of these species are provided in **Appendix C2, Tables 3.2 and 3.3**. The exact locations of these species are kept confidential; however, it is not anticipated that any will be affected by the Preferred Route alignment.

Mitigation and Protective Measures

As pipeline construction will occur largely within existing road allowance, the amount of vegetation to be cleared and the impact on wildlife habitat should be minimal and short term. In the event that significant species are encountered during construction, Enbridge should cease construction of the affected portion of pipeline and consult the MNR regarding appropriate protective measures.

6.3 SOCIO-ECONOMIC CHARACTERISTICS

6.3.1 Municipal Structure

Potential Impacts
The Preferred Route traverses road allowance, and industrial lands. As well, it is within close proximity to residential homes and businesses. Locating the proposed pipeline within road allowance is anticipated to minimize any potential impact on these areas.

After short-term disruption and use of municipal roads during the construction phase, it is expected that the overall impact to this area will be positive. The anticipated municipal taxes paid by Enbridge on an annual basis to the City of Thorold will be a significant long-term economic benefit of the pipeline. The amount of these taxes has not yet been determined, but will be based upon provincial assessment standards for the length of the pipeline.

While the increased number of personnel present in the area during pipeline construction will demand some services from the local municipality, the demand is expected to be minimal and short-term. Once the pipeline is in operation, it will require minimal municipal services.

Mitigation and Protective Measures

Prior to commencing construction of the proposed pipeline, Enbridge should consult with municipalities to identify specific concerns and potential mitigation measures to eliminate present and future problems. Concerns expressed during construction and operation of the proposed pipeline by effected municipalities should be addressed in an expeditious and courteous manner.

No significant adverse impacts on municipal structure are anticipated.

6.3.2 Existing Linear Facilities

Linear facilities may be affected along the Preferred Route, including railways, roads, telecommunication and hydroelectric transmission lines.

Potential impacts include access limitations to businesses, emergency vehicle access, and general impedance to traffic. The potential also exists for the temporary disruption of services such as telephone and hydro due to accidental severance of these services during trench excavation or working under overhead lines.

Prior to construction, Enbridge must coordinate with the appropriate agencies to determine the location of all buried utilities, and potential future utilities, in areas of excavation and construction activity. Heavy machinery should cross underground utilities to the least extent possible. All heavy machinery operators should by advised of the location of all buried utilities and the concerns associated with construction in their vicinity.

Roadways

Potential Impacts

Much of the Preferred Route is being constructed within road allowance. Impedance to vehicle transportation is the largest potential impact to residents and vehicles using the roadways. **Table 6-1** lists roads that may be impacted during construction.

Table 6.1 Location of Preferred Route Relative to Roads

Road Name	Road Type	Location of Pipeline Relative to Road
Thorold Townline Road	Municipal	Adjacent and Crossing
Beaverdams Road	Municipal	Adjacent
Davis Road (Highway 58)	Provincial	Crossing
Niagara Falls Road	Municipal	Adjacent and Crossing
Allanburg Road	Municipal	Adjacent

Road crossings represent the construction activity with the most potential to disrupt traffic flow. The potential impact of constructing within a road allowance and road crossings includes the temporary disruption of traffic flow throughout construction. Boring horizontally or directionally drilling under the road surface may be used for road crossings. Open cut road crossings are used for roads without significant traffic volumes. Although bored crossings allow traffic flow to continue across the work area throughout construction, these require additional temporary workspace on either side of the crossing location to accommodate excavation of the bore bays. Construction activities required to excavate bore bays result in additional disturbance at each crossing. Increased movement of construction equipment and materials on paved roads may also result in some deterioration of road surfaces.

Mitigation and Protective Measures

Depending on the frequency of use, road crossings may be directionally drilled, bored, or open cut. Directional drilling and boring are the preferred methods for roadways with high traffic volumes, such as those designated as highways. Should a road be open cut, it should be returned to its original condition or better following construction. The period of time that a road is closed should be reduced to the shortest extent possible. Enbridge should meet with representatives of the Ministry of Transportation (“MTO”) (for a provincial highway) or the City of Thorold Transportation and Works Department (for a municipal road) to address the following issues:

- Deterioration of roadways due to increased traffic;
- Preferred method of road crossings;
- Crossing procedures including resurfacing or grading of roadways, and traffic safety;
- Road restrictions and haul routes; and,
- Road surface and municipal drain restoration.

Equipment should be stored and operated only within the shoulder or curb lane portion of the roadway to the extent possible. To reduce the risk of vehicle accidents or pedestrian injury, warning signs and construction barricades should be erected at all areas of construction activity near road crossings. Appropriate traffic control measures should be used if construction activity occurs before dawn or after dusk.

Although a short-term disruption in traffic will result from construction of the proposed pipeline, no long-term significant adverse impacts on roadways are anticipated with proper implementation of the measures described above.

Railways

Potential Impacts

The Preferred Route under crosses a Canadian National Railway ("CNR") at Niagara Falls Road. During construction there is potential for access or service disruption provided by this railway line as well as potential to encounter contaminated soils adjacent to the railway line. Potential for contaminated soil to exist along the alignment of the Preferred Route should be confirmed prior to construction.

Mitigation and Protective Measures

Enbridge should discuss crossing procedures with CNR to determine if any mitigation measures are required. Typically, railways are bored or directionally drilled rather than open-cut; as a result, no disruption to railway traffic is anticipated.

To determine the potential to encounter contaminated soils during construction an assessment of soil and groundwater conditions along the alignment of the Preferred Route should be completed. The MOE *Guideline for Use at Contaminated Sites in Ontario* (1997) and supporting documentation should be used to determine sampling methods, criteria for contaminate levels, and rehabilitation (if required). If contaminate levels exceed MOE criteria for surface and subsurface soil for industrial/commercial land use for nonpotable groundwater conditions, work on the affected portion of the pipeline should cease immediately. Appropriate rehabilitation measures should be discussed with the MOE and carried prior to resuming construction activities.

Electric Transmission Lines

Potential Impacts

Several portions of the Preferred Route cross under high voltage transmission lines. The presence of these high voltage transmission lines presents a potential safety concern to equipment operators, workers, and the public. Distribution lines may also exist along the municipal and provincial highways adjacent to the Preferred Route.

In some cases, voltage may be induced in ductile iron pipelines and construction equipment when they are located close to high voltage transmission lines. Voltage can be induced through capacitance (electrostatic charge), conductance (direct contact or ground fault), and induction. The potential for capacitance or conductance increases if a steel transmission tower happens to be hit by lightning. Capacitance or conductance is unlikely in coated pipes buried in the earth, because electrical contact with the ground is more likely than contact with the earth. In addition,

current pipe coating technology acts as an insulator. However, coated metal pipes represent the greatest concern for inductance because the contact with the ground is mainly through points where the coating has been damaged (Bonds, 1999).

Mitigation and Protective Measures

During construction, all machine operators should be informed that power lines are present overhead. Lines that may interfere with the operation of construction equipment should be identified with overhead red flags. Signs should be posted along the alignment of the Preferred Route stating “Danger - Overhead Power Lines.” The final alignment of the Preferred Route should consider the location of existing utility poles and their supporting guy wires.

The most effective way to mitigate construction adjacent to a high voltage hydroelectric corridor is by increasing the separation distance between the pipeline and the transmission line. When this is not feasible, special monitoring and grounding procedures must be followed to prevent electrostatic voltage from reaching levels where it presents a shock hazard to workers who may contact any large, insulated metallic objects including coated pipe joints, rubber-tired vehicles, etc.

Pipelines, Sewers and Water Mains

Potential Impacts
The Preferred Route crosses several natural gas distribution pipelines and various buried utilities. Sewer, water, and gas lines may be located along all roadways in proximity to the Preferred Route. Careless trenching or horizontal boring activities during construction may affect the operation of existing buried utilities. Heavy machinery crossing these utilities may potentially impact the integrity of the pipelines and disrupt their operation. The buried utilities traversed by, or in close proximity to, the proposed pipeline provide a vital service to the Thorold area. Severing any of these utilities would result in disruption to a number of industries, businesses, or residents.

Mitigation and Protective Measures

Prior to construction, Enbridge should make every effort to identify the location of all buried utilities, and potential future utilities, in the area of excavation and construction activity. Heavy machinery should cross underground utilities as little as possible. All heavy machinery operators should by advised of the location of all buried utilities and the concerns associated with construction in the vicinity of buried utilities.

6.3.3 Population and Institutional Facilities

Potential Impacts

A portion of the Preferred Route comes in close proximity to a residential area in Thorold. Several residences have been identified to occur within 100 m of the Preferred Route.

During construction, residents may experience a temporary disruption in the use and enjoyment of their property. This disruption may result from noise, dust, or additional traffic volume.

Mitigation and Protective Measures

Enbridge should address concerns expressed by residents, businesses, and institutions in an expeditious and courteous manner. Prior to construction, Enbridge should provide residents and businesses along the Preferred Route with a construction communication procedure and every reasonable effort should be made by Enbridge to address concerns and maintain good landowner relations.

Measures that reduce noise and dust on the effected properties, and requirements to replace or repair driveways and post-construction landscaping, and ornamental trees, should be established.

Should landowners express concerns during construction or operation of the pipeline, every effort should be made by Enbridge to address concerns and maintain landowner relations.

To minimize inconveniences brought on by excessive noise, all engines associated with construction equipment should be equipped with mufflers. Nuisance dust can be minimized by proper maintenance of road surfaces. Traveled surfaces should be kept moist during excessively dry and/or windy conditions by frequently applying a low energy water spray. Road surfaces should be cleared of debris as required by the Chief Inspector. Following standard traffic safety guidelines as recommended by the City of Thorold and the MTO can minimize occasional disruptions.

Public safety is a primary focus of Enbridge. Safety issues, both perceived and real, can be mitigated by implementing proven safety measures during construction, ensuring that the pipeline is constructed and operated in accordance with all applicable codes and regulations, and monitoring pipeline integrity once it is service.

According to the Technical Standards and Safety Authority (TSSA, 1998b) guidelines, a pipeline can be constructed within 20 m of a residence, depending on certain engineering factors. The pipeline will be constructed and operated safely, allowing mitigation of perceived risks by implementation of risk communication strategies during construction and operation.

6.3.4 Land Use

Potential Impacts

The Preferred Route traverses an urban area of the City of Thorold. Urban land use includes road allowance and industrial lands.

Routing of the proposed pipeline has minimized potential impacts to other land uses by locating the proposed pipeline within in road allowance to the greatest extent possible.

Short-term impacts associated with disturbance, disruption, or loss of use may occur during construction due to noise, dust, or additional traffic volumes. Residents and businesses may experience a temporary disruption in the enjoyment and use of their property during pipeline construction.

Temporary disruption of commercial and industrial activities may occur where the Preferred Route crosses entrances and exits to businesses.

Construction activity and construction crews may pose an undesirable presence during pipeline construction. Furthermore, increased traffic along municipal roads may increase potential for vehicle accidents. Residents may experience occasional inconveniences where local purchases and pipeline purchases are from the same retail outlet. A temporary increase in economic activity, particularly at local restaurants, can be expected during pipeline construction.

Mitigation and Protective Measures

While the Preferred Route generally avoids direct impacts on urban areas, it does travel close to residences and businesses. Dust, noise, or disruption related to construction can be expected to dissipate within 100 m of the construction area. Consequently, a 100 m distance was used as the environmental and socio-economic inventory boundary within which most features were identified.

Safety issues, both perceived and real, can be mitigated by implementing proven safety measures during construction, ensuring that the pipeline is constructed and operated in accordance with all applicable codes and regulations, and monitoring pipeline integrity once it is in service.

To minimize disruption, the preferred method of crossing commercial and industrial entrances and exits during pipeline installation is horizontal boring. In cases where this method is not suitable, “plugs” (such as metal plates) capable of supporting a loaded tractor-trailer should be installed over the trench to allow access. Residential laneways may be open cut provided that asphalt driveways are sawed rather than dug. Residential laneways that are excavated should be restored to their pre-construction condition. Access to and from residential homes and businesses must be maintained at all times. During trench excavation, steel plates should be available on-site in the event a homeowner or tenant requires access.

Traffic safety planning, public access barriers to construction sites, and other construction safety measures should be in place and minimized during construction. Signs indicating the presence of a buried pipeline should be placed at all road and watercourse crossings.

An Enbridge Chief Inspector or other designated representative will be available to assist in maintaining good relations throughout construction and operation of the proposed pipeline. Concerns expressed during construction by residents and businesses in the area of the Preferred Route should be addressed in an expeditious and courteous manner.

To minimize inconveniences brought on by excessive noise, all engines associated with construction vehicles should be equipped with mufflers. Where possible, noise levels arising from equipment should be below the maximum acceptable limits at the nearest residence as recognized by the MOE.

Construction activities that could create noise should be restricted to daylight hours and adhere to any local noise by-laws. If construction activities must be carried out which cause excessive noise outside of these time frames, adjacent residents and the appropriate municipality should be notified.

Occasional disruptions at construction access locations can be minimized by providing advance notice to local police (Thorold Police Service), posting construction signs to warn oncoming motorists of construction activity, assigning a traffic control duty officer to assist with truck entry and exit where possible, and providing proper training, safety attire and equipment to the traffic control officer.

Another potential effect on land use is the temporary removal of fences. Fences cut on, or adjacent to, the pipeline alignment should be repaired to their pre-construction condition when access is no longer required.

6.3.5 Waste Disposal and Potentially Contaminated Sites

Potential Impacts

There are no known registered active or inactive waste transfer or landfill sites within the Study Area (MOE, 1991).

Historical land use in the Study Area suggests that some of the lands crossed by the Preferred Route on Abitibi Consolidated Inc.'s property may contain contaminated soils. Potential for contaminated soil to exist along the alignment of the Preferred Route should be confirmed.

Mitigation and Protective Measures

To determine the potential to encounter contaminated soils during construction an assessment of soil and groundwater conditions along the alignment of the Preferred Route should be completed. The MOE *Guideline for Use at Contaminated Sites in Ontario* (1997) and supporting documentation should be used to determine sampling methods, criteria for contaminate levels, and rehabilitation (if required). If contaminate levels exceed MOE criteria for surface and subsurface soil for industrial/commercial land use for nonpotable groundwater conditions, work on the affected portion of the pipeline should cease immediately. Appropriate rehabilitation measures should be discussed with the MOE and carried out prior to resuming construction activities.

6.3.6 Heritage and Archaeological Features

Potential Impacts

D.R. Poulton & Associates Inc. ("DPA") conducted a Stage 1 Archaeological Assessment under Archaeological Consulting License #P053, issued by the Province of Ontario. The Stage 1 assessment consisted of background research to identify known or potential archaeological planning constraints within the Study Area. A variety of sources were consulted in the course of this work. These included a thorough review of published and unpublished reports on past

archaeological surveys and excavations, a review of the history of land-use in the area, and an examination of archaeological site inventories and archival materials.

It was indicated in this report that 60% of the Preferred Route will be placed in previously disturbed areas, and therefore is unlikely to retain potential for extant archaeological remains. The 800 m portion of the route that travels adjacent to the south side of Beaverdams Road is considered to have some potential for archaeological remains. DPA also expressed concern with regards to the lands where the excavated materials from the directional drilling operation will be placed. Recommendations were made by DPA to perform a Stage II Archaeological Assessment.

The full Archaeological Assessment can be found in **Appendix E.**

Mitigation and Protective Measures

Prior to construction, additional archival research and a Stage 2 Archaeological Assessment should be undertaken along the Preferred Route by a licensed archaeologist. The survey should be undertaken in accordance with the Ontario Ministry of Culture ("MOC") guidelines. The survey will serve to confirm the presence of significant archaeological resources subject to potential impact from the proposed pipeline. In addition, the Stage 2 assessment should determine the extent to which the inherent archaeological potential of the alignment has been degraded by previous disturbances. Recommendations for mitigation and protection, outlined in the Stage 2 report, should be implemented during construction.

If deeply buried cultural remains are encountered during construction, all activity should be suspended and the archaeological staff of the MOC should be notified immediately to determine an appropriate course of action. It is similarly recommended that if any human remains are encountered, John MacDonald, Heritage Planner, MOC (519-675-7742) and Michael D'Mello, the Registrar of the Cemeteries Section of the Ministry of Consumer and Business Services (416-326-8404).

6.3.7 Land Claims

Potential Impacts

INAC was contacted on June 12, 2007 to seek information regarding the status of lands within the Study Area. INAC replied to Stantec's letter request on July 11, 2007. The letter notified Stantec that INAC no longer responds to these types of letters by providing contact information for First Nations groups who may have interest in the project. They now ask that potentially interested First Nations groups are identified and notified by the proprietor of the project. Stantec followed up with this request by investigating if there are any First Nations interests in the Study Area.

An email with a map showing the Study Area was sent to INAC's Litigation Management and Resolution Branch on July 12, 2007, INAC's Comprehensive Claims Branch on July 13, 2007, and INAC's Specific Claims Branch on July 17, 2007. A response from INAC's Specific Claims Branch was received on July 19, 2007 indicating that there are no land claims in the Study Area

that they are aware of. A response from INAC's Comprehensive Claims Branch was received on July 23, 2007 indicating that there are no lands claims in the Study Area that they are aware of. A response from INAC's Litigation Management and Resolution Branch was received on July 30, 2007, indicating that their inventory does not include active litigation in the Study Area.

A fax was received from the Association of Iroquois and Allied Indians ("A.I.A.I.") on September 6, 2007 stating that they do not have any information to provide to us regarding site selection or technological alternatives and that the existence of land claims and other First Nation activities should be sought. This information has been collected; therefore no further action is required

Mitigation and Protective Measures

Since there are no known First Nations claims within the Study Area, no specific mitigation or protective measures have been developed.

6.3.8 Conservation Lands

Potential Impacts

The Preferred Route traverses areas under the jurisdiction of the NPCA. There are no Conservation Areas in the Study Area.

Mitigation and Protective Measures

Although the Preferred Route is located largely within road allowance, Enbridge should consult with the NPCA to identify specific concerns and potential mitigation measures to eliminate present and future problems. Concerns expressed during construction and operation of the proposed pipeline by the NPCA should be addressed in an expeditious and courteous manner.

6.4 PERMITS REQUIRED

Permits should be secured prior to construction of the pipeline. Permits may be required from federal and provincial levels of government.