



**ENVIRONMENTAL ASSESSMENT REGISTRATION
GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT**

FINAL REPORT

REPORT TO

**M.S.D. ENTERPRISES LIMITED
GLENHOLME, NS**

Submitted by:

AMEC Earth & Environmental,
A Division of AMEC Americas Limited
32 Troop Avenue
Dartmouth, Nova Scotia
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June 2007

File No. TV61049

FINAL REPORT

EXECUTIVE SUMMARY

M.S.D. Enterprises Ltd. (MSD) is undertaking an environmental assessment of two existing gravel pit operations and expansion developments located on two separate properties (North and South Property) near the community of Glenholme, Colchester County, NS. The proposed developments would supply aggregates, concrete, and manufactured soil to various local markets including residential and commercial construction, municipal infrastructure projects (i.e., water and sewer) and road building. The scope of the future activities is similar to current and past activities and will encompass pit extraction, crushing, washing, stockpiling, and dry batch concrete production.

The North Property is located north of Trunk 2, and northwest of the community of Glenholme. The area of development for the North Property will total approximately 10.2 ha with a gravel pit development of approximately 4.6 ha, and associated process operations within a footprint of 5.6 ha more or less. The South Property is located south of the community of Glenholme adjacent to Little Dyke Road. The area of development for the South Property will total approximately 20.8 ha, with existing gravel pit operations extending over an area of approximately 11.8 ha. and expanded area of approximately 8.8 ha.

The products generated include sand, stone, dry batch concrete, and manufactured soil. Portable crushing equipment will be brought to the site to process the extracted gravel. Gravel is washed by means of constructed on-site wash facilities. Various products (i.e., various aggregate sizes) will be stockpiled at the site until they are trucked to local markets in Nova Scotia, typically within 125 km of Glenholme. The average number of trucks hauling aggregates from the pits will be 20 to 50 per day, depending on market demand. This could increase to as many as 100 to 165 per day, at peak production for short periods during the construction season, if a large aggregate supply contract were awarded. The anticipated average production rate is approximately 155,000 tonnes per year. The operating schedule will be based typically on 12-hrs/day, 5-days/week, year-round, with the potential for short term expansion of operations to 7-days per week, 24-hours per day for short periods during the construction season.

MSD is required to register this project as a Class I Undertaking pursuant to the Nova Scotia Environment Act and Environmental Assessment Regulations. This legislation requires the proponent to undertake an environmental assessment (EA) of the proposed works and activities. Other relevant provincial regulations include the Activities Designation Regulations, which requires an Industrial Approval from the Nova Scotia Department of Environment and Labour for the pit operation.

This environmental assessment evaluated the potential environmental effects of the Project elements and activities, for all Project phases, with regard to each Valued Environmental Component (VEC) and Valued Socio-economic Component (VSC). Components evaluated as part of this study included:

- surface water resources and fish and fish habitat;
- rare and sensitive flora;
- wildlife;
- groundwater resources;
- wetlands;

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- archaeological and heritage resources;
- air quality;
- noise; and
- socio-economic environment.

Based on an analysis of each of the identified VEC and VSC, it is concluded that with the implementation of recommended mitigation, monitoring, and progressive reclamation measures, the Project will not cause a significant adverse effect. Any effects to VECs will be of small magnitude, low frequency, short duration, limited geographical extent, and, in most cases, reversible.

Activities associated with the Project development will be conducted in accordance with terms and conditions of the future Industrial Approval, adherence to the Pit and Quarry Guidelines (NSEL 1999) and specific mitigative measures described in this assessment and all other applicable legislation, policies, and guidelines.

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1.0 PROPONENT AND PROJECT IDENTIFICATION

1.1 PROPONENT INFORMATION

M.S.D. Enterprises Limited (MSD, the Proponent) was incorporated as a Nova Scotia company in 1987 where it carries out its materials-related business. MSD has been in the sand and gravel pit, and concrete production materials related business in Nova Scotia since incorporating. A copy of MSD's Certificate of Incorporation and its Registry of Joint Stocks Corporate Profile are included in Appendix A.

Name of Proponent: M.S.D. Enterprises Limited

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Signature of President



Date

1.2 PROJECT INFORMATION

Name of the Undertaking: Glenholme Gravel Pit Expansion Development (the Project)

Location of the Undertaking: Glenholme, Colchester County, Nova Scotia

2.0 PROJECT INFORMATION

2.1 DESCRIPTION OF THE UNDERTAKING

M.S.D. Enterprises (MSD) wishes to permit two existing gravel pit operations and expansion developments located near the community of Glenholme, Colchester County, NS. The lands for the proposed expansion development are owned by or licensed to MSD and consist of two separate properties identified as the North Property and South Property (refer to Figures 2-1, 2-2, and 2-3). The two properties are separated by a distance of 800 m. The total areas of the North and South Properties owned by or licensed to MSD, including all currently developed and undeveloped lands, are 18.3 ha and 32.6 ha, respectively. The total areas of existing and planned development for the North and South Properties are 10.2 ha and 20.8 ha, respectively. The anticipated average production rate is approximately 155,000 tonnes per year with the potential for short term expansion in the event of a large contract award during the construction season that could double the production rate. As has been the practice at the sites, disturbance of wetlands and forested areas on the two properties will be minimized. Surveyed plans of the North and South Properties showing property boundaries, PIDs, and site infrastructure are provided in Appendix B (Figures B-1 to B-3, incl.). The development currently supplies and historically has supplied gravel, sand, stone, dry batch concrete, and manufactured soil to supply various local markets including residential and commercial construction, municipal infrastructure projects (i.e., water and sewer) and road building.

As a result of field and desktop studies undertaken in support of this environmental registration report, the expansion development area has been carefully considered so as to minimize potential environmental impacts to adjacent wetlands and watercourses.

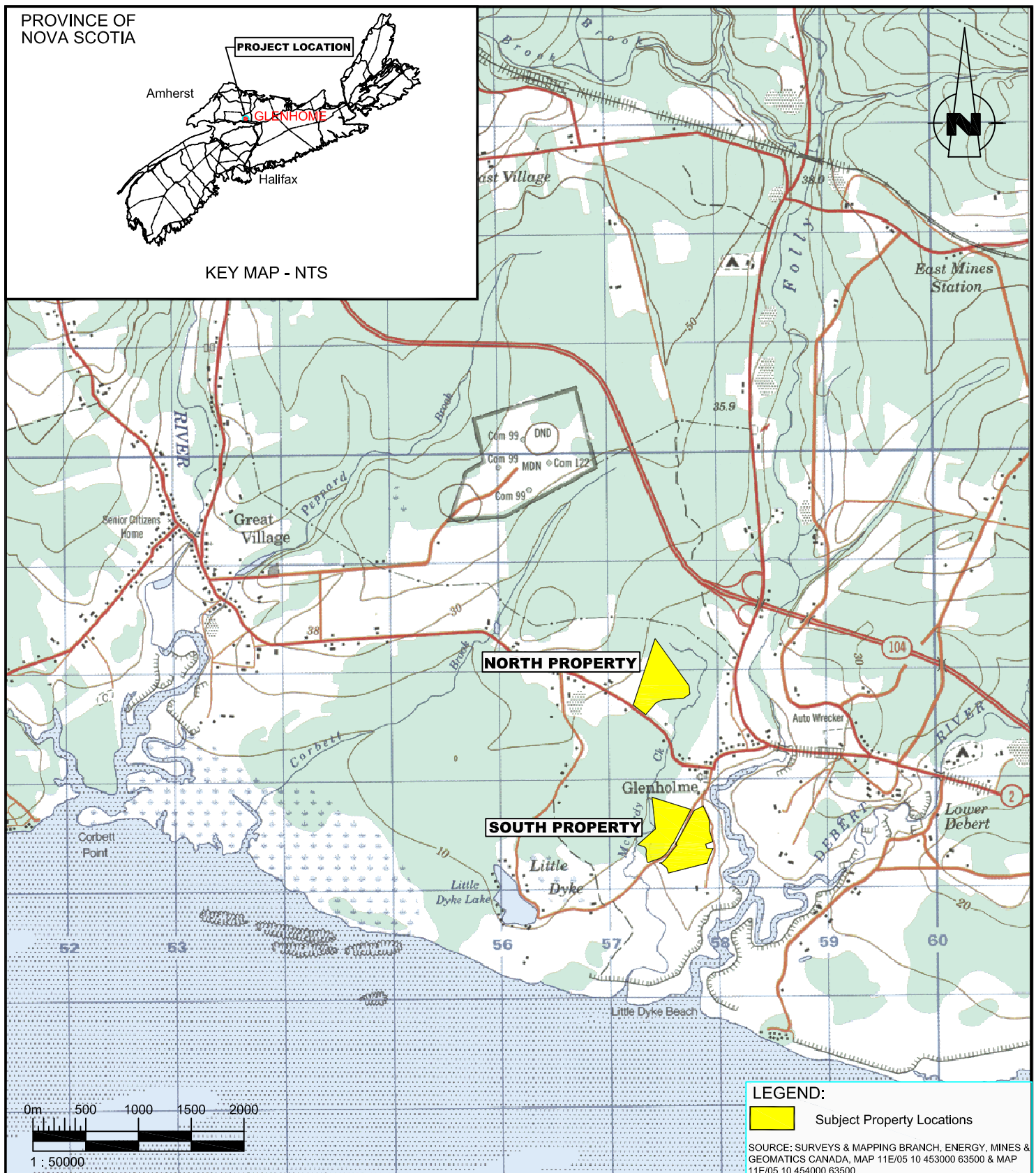
There are numerous former gravel pit operations throughout the Glenholme area within a radius of one to two kilometres from the North and South Properties. The locations of these former operations are shown on Figures 2-2 and 2-3.

2.2 GEOGRAPHICAL LOCATION AND SETTING

2.2.1 North Property

The North Property is located north of Trunk 2 (commonly known as Highway No. 2), and northwest of the community of Glenholme (refer to Figures 2-1 and 2-2) on PID 20134474. This property was developed previously (between 1990 and 1999) as a gravel pit operation and more recently (2006 to 2007) as a gravel pit and processing operation. The nearest residences located from the North Property extend along Trunk 2, with the nearest residential properties located about 80 m and 100 m from the southwest and southeast corners, respectively, of the proposed expansion development area. As shown on the mapping, there are 24 buildings/structures within 500 m radius of the North Property boundary, 126 within 1 km, 185 within 1.5 km and 280 within 2 km.

The area of development for the North Property will total approximately 10.2 ha with a gravel pit development of approximately 4.6 ha, and associated process operations within a footprint of



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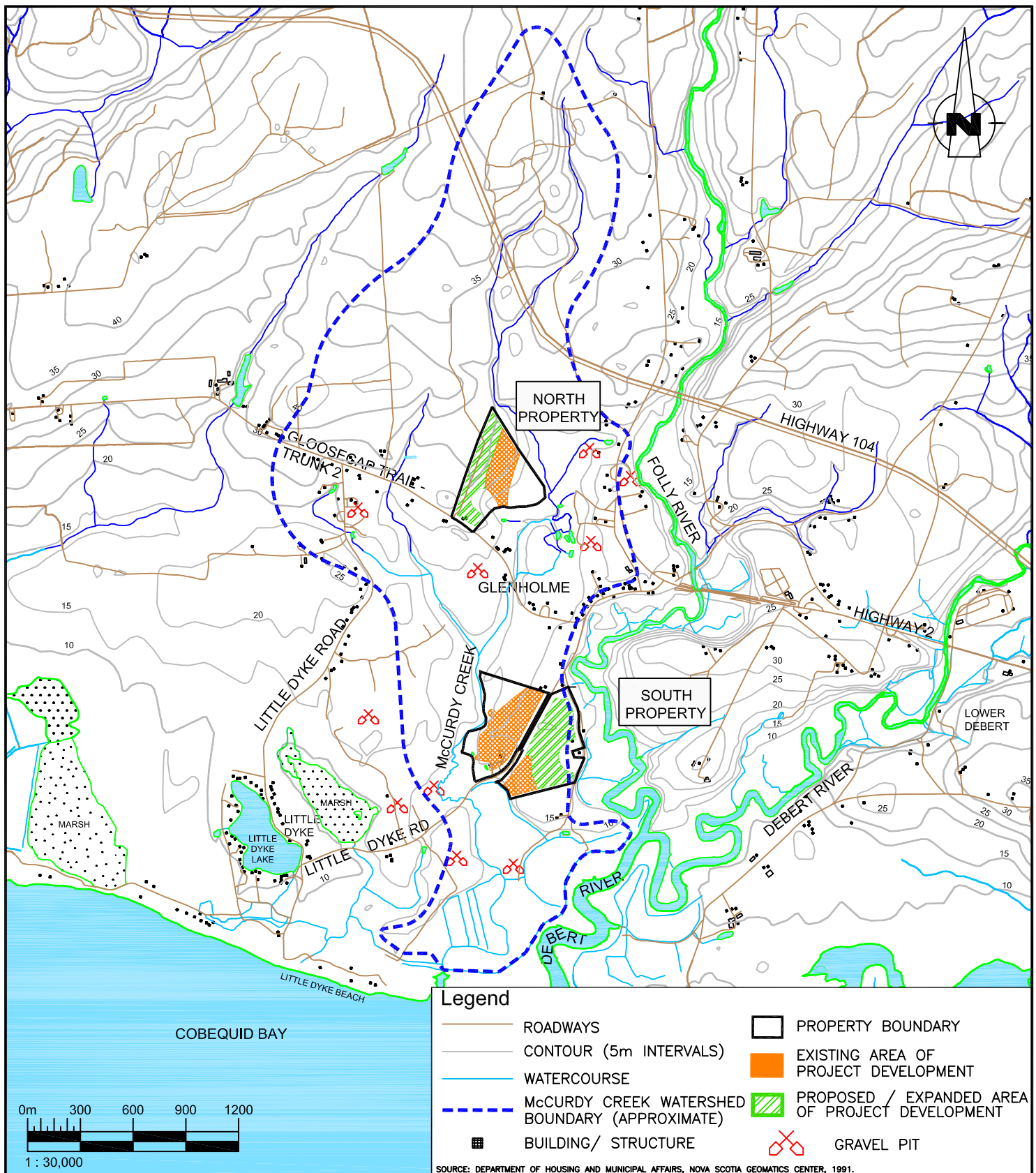
CLIENT

M.S.D. ENTERPRISES LTD.

PROJECT GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT

TITLE PROJECT LOCATION PLAN

DWN BY:	YC	DATUM:	NA	DATE:	June 2007
CHK'D BY:	JM	REV. NO.:	0	PROJECT NO.:	TV61049
PROJECTION:	NA	SCALE:	1:50,000	FIGURE No.	FIGURE 2-1



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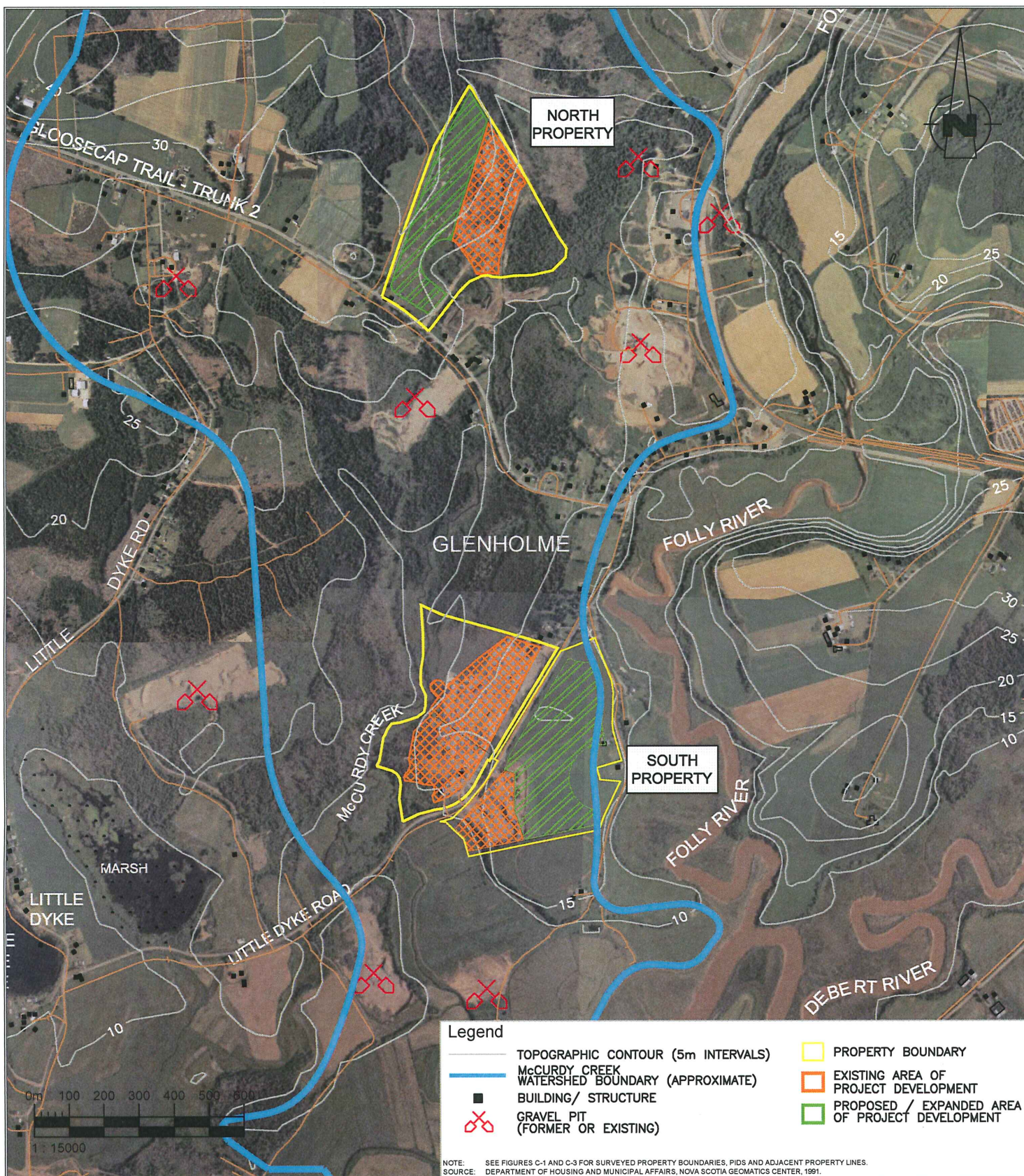
PROJECT GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT

TITLE
SITE AREA PLAN

DWN BY: YC DATUM: NAD83 DATE: june 2007

CHK'D BY: JM REV. NO.: 0 PROJECT NO: TV61049

PROJECTION: UTM Zone 20 SCALE: 1:30,000 FIGURE No. FIGURE 2-2



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PROJECT **GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT**

TITLE
2004 Aerial Photograph

DWN BY: YC DATUM: NAD83 DATE: June 2007

CHK'D BY: JM REV. NO.: 0 PROJECT NO: TV61049

PROJECTION: UTM Zone 20 SCALE: 1:15,000 FIGURE No. **FIGURE 2-3**

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approximately 5.6 ha (refer to Figure 2-4). Preparation and development activities are currently underway at the North Property. The expansion development for the North Property encompasses existing/past gravel pit operations to the east and agricultural lands consisting of cultivated blueberry fields to the west. Gravel has historically and is currently extracted to depths averaging 12 m. Two forested wetland/bog areas located on the eastern portion of the North Property will remain undeveloped and undisturbed. The width of the area to be excavated is 240 m to the north narrowing between 60 m and 120 m in the southern portion of the property (refer to Figure 2-4).

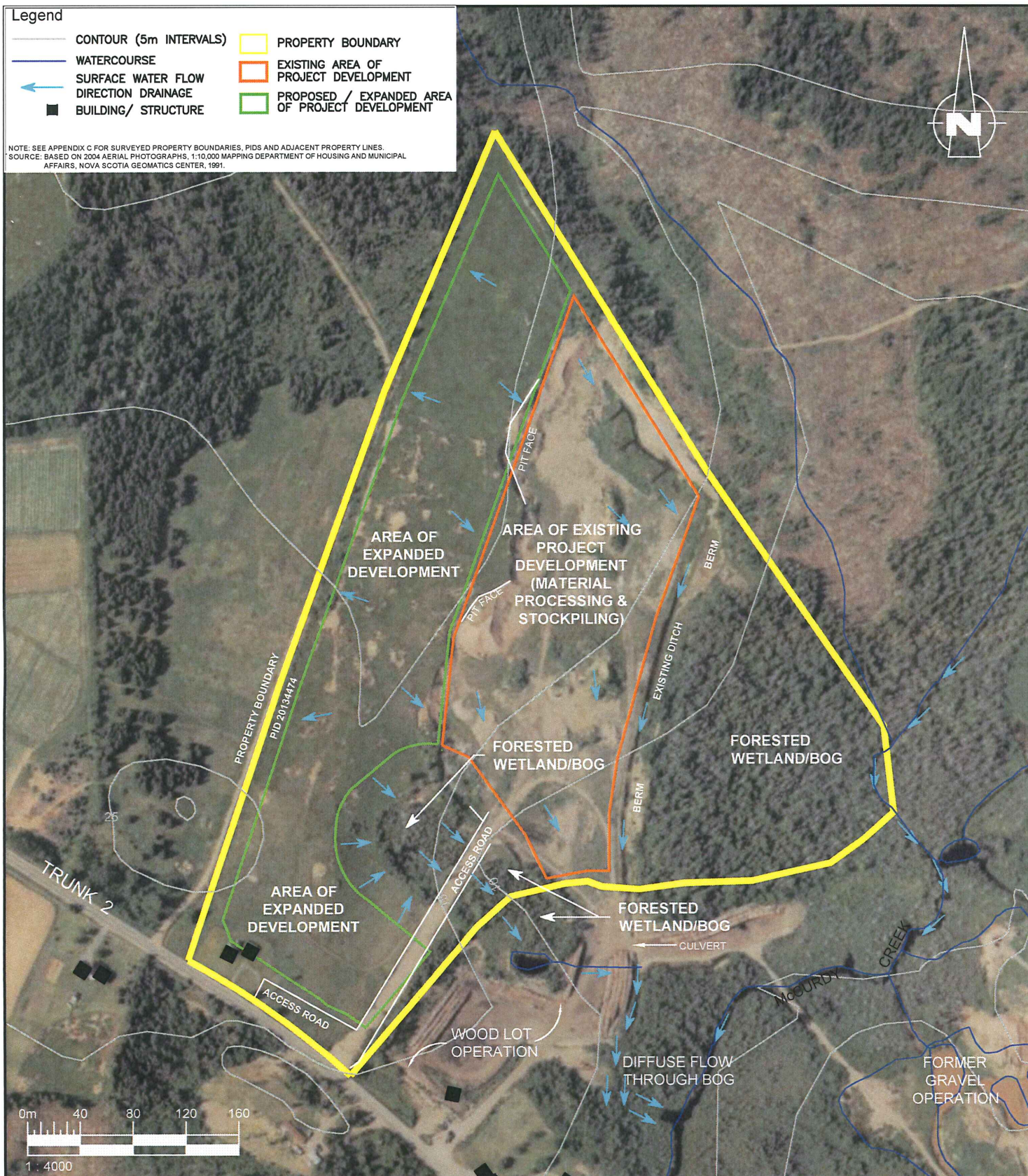
The natural topography of the property is moderate, varying from 25 metres above sea level (masl) near the western property boundary to 15 masl along the eastern portion of the development area. The natural drainage of the North Property is to the east towards a pre-existing drainage system that consists of ditches that discharges to wetland/bog areas to the east and southeast. The forested wetland/bog areas drain indirectly and diffusely to McCurdy Creek, located further to the east. McCurdy Creek intersects the North Property at only one location; a 40 m reach of the creek intersects the northeast corner of the property (refer to Figure 2-4). This location is approximately 180 m east of the eastern boundary of any project development.

Property survey plan for the North Property showing ownership and PIDs is presented in Appendix B, Figure B-1.

2.2.2 South Property

The South Property is located south of the community of Glenholme adjacent to Little Dyke and Folly Point Roads (refer to Figures 2-1, 2-2, and 2-3). This property has been an active gravel pit and process facility since 1987. Currently, gravel extraction and process activities have been minimized with the exception of dry batch concrete production and minor screening and washing associated with proposed reclamation activities that will involve wetland creation (refer to Section 2.7). The nearest residences relative to the South Property extend along Little Dyke Road and Folly Point Road. The nearest residential properties are located about 30 m from the north end of the existing gravel pit (west of Little Dyke Road), and 90 m from the north and east boundaries of the proposed expansion development area (adjacent to Folly Point Road). As shown on the mapping, there are 14 buildings/structures within 500 m radius of the South Property boundary, 88 within 1 km, 222 within 1.5 km and 307 within 2 km.

The area of development for the South Property forms two separate areas, bisected by Little Dyke Road totalling approximately 20.8 ha, with existing gravel pit operations, west of Little Dyke Road, extending over an area of approximately 11.8 ha on PID no. 20134243, Lot 1, and an expanded area of development east of Little Dyke Road and adjacent to Folly Point Road of approximately 8.8 ha on PID nos. 20348462 and 20134219 (refer to Figure 2-5). The activities currently underway at the South Property include a dry batch concrete operation and final pit grading which is part of reclamation activities (refer to Section 2.7). There will be minor screening and washing operations associated with this work. The expansion development for the South Property will encompass existing/past gravel pit operations and agricultural lands consisting of uncultivated hay and grain fields. A wetland area located southwest of the existing gravel pit development (west of Little Dyke Road) will remain undeveloped and undisturbed. The western portion of the South Property where historic gravel pit and associated activities occurred is roughly rectangular in shape varying in width from 100 m to 180 m and 500 m in



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PROJECT GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT

TITLE NORTH PROPERTY
AREA OF PROJECT DEVELOPMENT

DWN BY: YC/EM DATUM: NAD83 DATE: June 2007

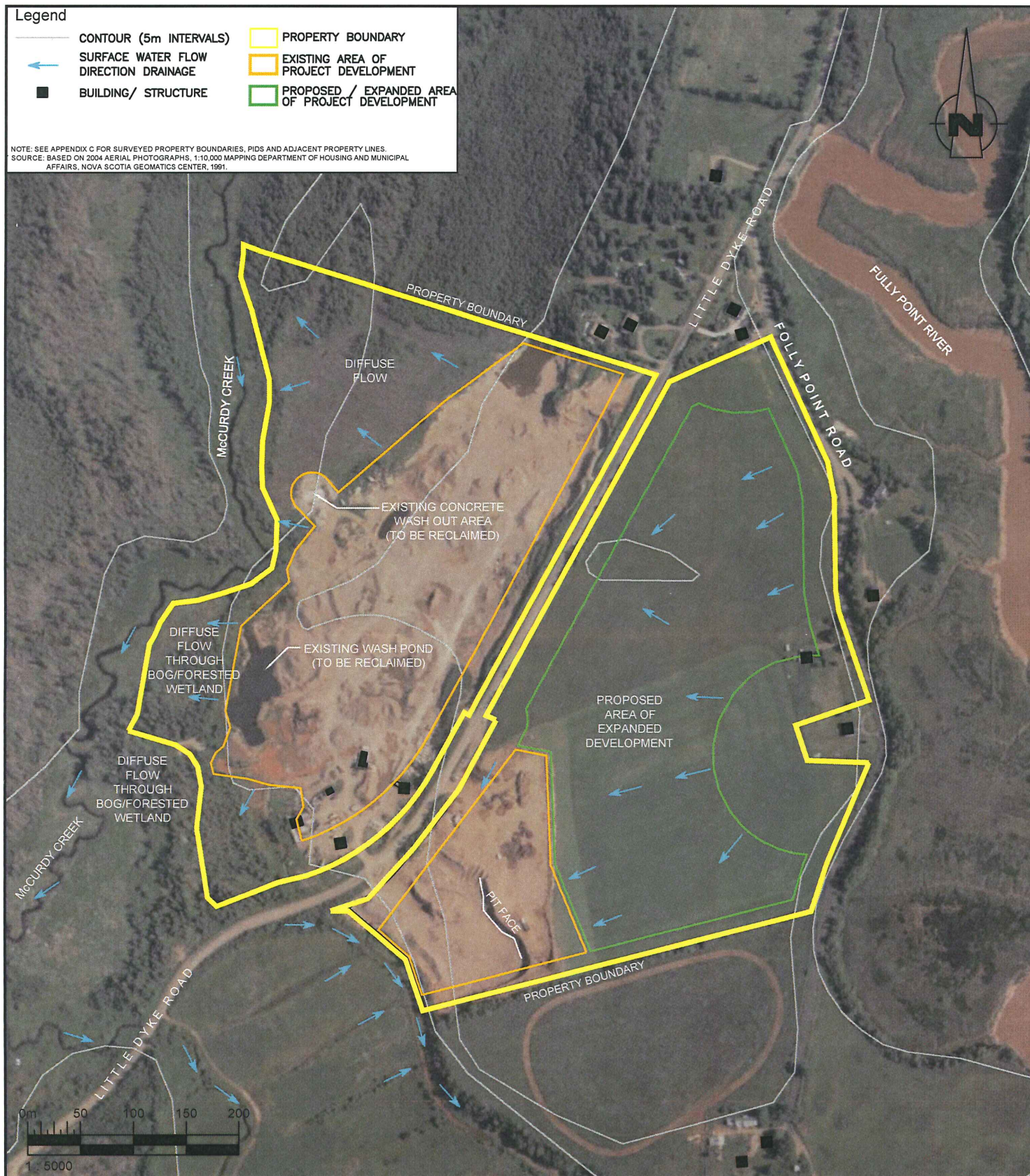
CHK'D BY: JM REV. NO.: 0 PROJECT NO: TV61049

PROJECTION: UTM Zone 20 SCALE: 1:4,000 FIGURE No. FIGURE 2-4

Legend

- CONTOUR (5m INTERVALS)
- ← SURFACE WATER FLOW DIRECTION DRAINAGE
- BUILDING/ STRUCTURE
- PROPERTY BOUNDARY
- EXISTING AREA OF PROJECT DEVELOPMENT
- PROPOSED / EXPANDED AREA OF PROJECT DEVELOPMENT

NOTE: SEE APPENDIX C FOR SURVEYED PROPERTY BOUNDARIES, PIDS AND ADJACENT PROPERTY LINES.
SOURCE: BASED ON 2004 AERIAL PHOTOGRAPHS, 1:10,000 MAPPING DEPARTMENT OF HOUSING AND MUNICIPAL AFFAIRS, NOVA SCOTIA GEOMATICS CENTER, 1991.



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PROJECT GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT

TITLE SOUTH PROPERTY
AREAS OF PROPERTY DEVELOPMENT

DWN BY: EM DATUM: NAD83 DATE: June 2007

CHK'D BY: JM REV. NO.: 0 PROJECT NO: TV61049

PROJECTION: UTM Zone 20 SCALE: 1:5,000 FIGURE No. FIGURE 2-5

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length. The eastern portion of the South Property is also the site of historic gravel pit operations (small area to the south) and proposed/expanded operations (larger area to the north). The gravel pit extraction depths for past operations averaged 12 m in height.

The natural topography of the South Property is flat lying to gently sloping, varying from 10 to 15 masl. Most of the South Property drains in a west or south direction toward a wetland area adjacent to McCurdy Creek and toward agricultural ditches located south of the property. A small eastern portion of the property currently drains in the direction of Folly River, but is separated from Folly River by Folly Point Road. During operations, all potential run-off from the property will be directed in a west, southwest, or southerly direction toward McCurdy Creek so that the Folly Lake watershed will remain unaffected by operations. Similar to the North Property, drainage to McCurdy Creek is indirect and diffuse via agricultural ditches and wetlands located adjacent to the banks of the creek.

Property survey plan for the South Property showing ownership and PIDs is presented in Appendix B, Figure B-3.

2.3 PHYSICAL COMPONENTS

The development consists of two existing gravel pit operations located on two properties (refer to Figures 2-4 and 2-5) and associated equipment and infrastructure to carry out gravel and soil extraction, gravel and soil processing activities and batch concrete production. The existing gravel pit operations consist of laydown areas for the classifier, portable crushing equipment, various stockpiles of processed and unprocessed materials, pit floor and working face, settling ponds, scale and scale house, and access road. From time to time, a crusher is mobilized and operated on site. Currently, the concrete dry batch operation is located in the southwest portion of the South Property, and may be moved to a dedicated location on the North Property. A building with concrete floor is located on the South Property where routine maintenance is performed on mobile equipment.

Once the available gravel has been removed from the North Property, it is anticipated that the classifier /wash plant equipment associated with the North Property operation will be moved back and established at the South Property location. It is possible, however, that if sufficient contracts were awarded to MSD during the initial five year period, that infrastructure could be established on both the North and South Properties for brief periods during the construction season to support simultaneous operations at both properties. Any such temporary infrastructure would be placed within the delineated proposed/existing development area.

There is no storage of dangerous goods, pipelines, port facility or railway associated with the existing facility and none are proposed for the expansion development. The only exceptions are a 2000 L diesel fuel storage tank at a dedicated location on the South Property to provide contingency fuel for site mobile equipment in the event of temporary fuel shortage and a 200 L tank dedicated to the storage of used engine oil (see Section 2.6.7). Used oil filters are stored in sealed properly labeled drums. All waste oil and filters stored on site are picked up regularly by a licensed waste management service and shipped to a licensed waste oil recycling facility in accordance with the Nova Scotia Used Oil Regulations.

Topsoil and overburden that are stripped prior to gravel extraction operations will be temporarily stored in the Project area so that a sufficient quantity will be available for subsequent use during

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site reclamation. The piles will be vegetated if necessary to reduce potential for dust, erosion, and sedimentation.

The proposed/expanded gravel pits will consist of the lands of former gravel pit operations (both properties), abandoned farmland (South Property) and a blueberry field (North Property). The development will avoid encroachment on forested lands or forested wetlands/bogs. There are no natural surface water bodies (ponds or streams) within the footprint of the areas to be developed on the properties.

The North Property (refer to Figure 2-4) is bounded to the south by Trunk 2, to the east by forested wetlands and McCurdy Creek, to the southeast by an operating commercial woodlot, to the southwest by abandoned blueberry fields, to the northwest by a dry forested area, and to the northeast by a cut over area. A ditch located along the eastern extent of project development flows in a southerly direction, across an adjacent commercial woodlot to a forested wetland area. A vegetated (treed) berm three to four metres in height forms the eastern bank of the ditch and separates the adjacent forested wetland to the east from the developed areas.

The South Property (refer to Figure 2-5) is bounded to the west by forested and non-forested wetlands, a wetland area and McCurdy Creek, to the north by two residential properties, to the east by Folly Point Road.

Current practice on the North Property is to obtain clean water for washing from a shallow pond excavated into the groundwater table. Used water from the wash operations is discharged into a series of settling ponds and directed back to the clean water pond by a series of ditches. Water treatment by means of flocculation is introduced into the process when required to remove excess fines that can't be removed by settling. Water from washing operations is not discharged to the receiving environment, but is recirculated. This practice will continue for all future operations at the North and South Properties. The clean water pond will also be used to obtain water for dust suppression as needed during crushing and for road watering during dry conditions. Water will be withdrawn in relatively small quantities on an as needed basis. The current project infrastructure/set up is shown in Appendix B, Figure B-2.

Existing access roads for the North Property will be used with no additional roads planned. Access to the North Property is gained by means of an established access road located at the south end of the site directly from Trunk 2. Access roads for the South Property are established for the portions of the existing gravel pits located east and west of Little Dyke Road.

Project activities will be in accordance with the *Nova Scotia Pit and Quarry Guidelines* (NSEL 1999).

2.4 SITE PREPARATION AND DEVELOPMENT

Standard practice is/will be to strip topsoil and ground vegetation and to stockpile/windrow this material for future use during rehabilitation. To minimize the potential for erosion and sedimentation, removal of topsoil and the vegetative mat will be conducted on an as needed basis to accommodate advancement of the operation. The areas to be developed are an abandoned blueberry field and hay-grain fields; therefore, there is no timber to be harvested. Vegetative organic materials will be left in the soil stockpiles to decay and will act as a source of nutrients for topsoil that will be used later in reclamation activities.

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As has been the practice for past operations in the South and North Properties, the pit floor will be maintained at 0.5 metre above the seasonally high groundwater table. Past experience has shown that surface water runoff originating from rainfall or snowmelt events typically infiltrates rapidly into the subsurface due to highly permeable sands and gravels. However, in the event of extreme precipitation or snowmelt event, it is possible that the infiltration capacity of the sands and gravels could be exceeded and temporary surface flow might occur. Site specific measures adopted for the North and South Properties to deal with this possible scenario are presented in the sections below.

All reasonable efforts will be made to implement the practice of progressive reclamation early in the life of the operations. As soon as areas of development have been exhausted of gravel resource, and the area in question is not required for ongoing operations, progressive reclamation will commence (refer to Section 2.7). Since gravel resources have been extracted in the western portion of the South Property, west of Little Dyke Road, this area is currently being reclaimed and completion of reclamation is scheduled within the next two years.

2.4.1 North Property

The development area on the North Property (Figure 2-4) can be divided into two sections, with a gravel pit of 4.6 ha size in the western portion and an area of 5.6 ha located in the eastern portion of the property where previous commercial gravel operations were conducted. This latter area is the present location for laydown areas for the classifier, portable crushing equipment, and various stockpiles of processed and unprocessed materials, settling ponds, scale and scale house. Preparation and development of the 4.6 ha area of the North Property has been underway since 2006 with the pit working face advancing in a westward direction. It is anticipated that excavation of gravel resources will proceed first for the southwest portion of the property, after which the northwest portion of the property will be developed. As the pit face advances new areas would be opened up providing more efficient locations for infrastructure such as laydown areas for stockpiles and classifiers.

The nearest natural water body located down gradient from areas of development on the site is McCurdy Creek, at a distance of approximately 130 m. A pre-existing south flowing ditch located along the eastern margin of the development drains across an operating commercial woodlot (on adjacent PID no.20295986) and towards McCurdy Creek. The flow paths along this ditch become diffuse and indirect as the ditch enters a forested wetland area southeast of the woodlot. The ditch is primarily groundwater fed from a seepage source identified along the north boundary of the property. The ditch was observed to be fish bearing, therefore it is considered to be fish habitat. Steps have therefore been taken to protect this ditch system from potential surface water impacts originating from pit operations. To this end, MSD has adopted a specific mitigative approach with the objective to protect the existing ditch system, now considered to be fish habitat. This is further discussed in Section 5.2 and involves the following:

- the construction of a new ditch that will act as an interceptor for property drainage;
- a wash water system that is a closed circuit system, where wash water is not discharged to the receiving environment, but is recycled;
- construction of a berm in the intervening area between the existing and new ditch that includes a barrier consisting of a length of filter fabric inserted in a backfilled trench; and,

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- vegetating and mulching the berm to minimize sedimentation to the existing ditch system.

To further enhance drainage flow away from the ditch system, the pit floor will be graded to maintain a slope that will direct drainage away from the ditch towards a small wetland area to the south. This wetland has already been impacted from drainage originating from the operating commercial woodlot (PID no. 20295986). Other measures to minimize erosion and suspended solids from discharging into the wetlands will be taken and are described in Section 2.6.1.

2.4.2 South Property

Once the North Property is exhausted of gravel resources, MSD will move to the South Property (Figure 2-5) for additional gravel extraction. The development area will include the 11.8 ha northeast undeveloped portion of the property east of Little Dyke Road that is currently agricultural land. Site infrastructure including laydown areas, classifier, portable crushing equipment, and various stockpiles of processed and unprocessed materials will be established initially in pre-existing developed areas in the southeast portion of the property. The pit face will advance in a southerly direction as the property is further developed. As pit face advances new areas would be opened up providing more efficient locations for infrastructure such as laydown areas for stockpiles and classifiers.

The existing gravel pit west of Little Dyke Road is exhausted and further excavation and washing activities are planned for this area to support reclamation for the area. Drainage from this portion of the property is directed east and south to a wetland area adjacent to McCurdy Creek. Flow from the wetland to the creek is indirect and diffuse with no direct pathways or channels. Drainage from the proposed area of expanded development east of Little Dyke Road will be controlled by means of maintaining a southwest grade along the pit floor. Any drainage will be directed away from the Folly River watershed to the McCurdy Creek Watershed. Surface water flows will not be allowed to flow in the direction of Folly River. All drainage from this portion of the site will be directed in a southwest direction towards an existing ditching system along Little Dyke Road that discharges to a wetland area adjacent to McCurdy Creek. Other standard mitigative measures described in Section 5.2 will be taken to minimize erosion and the off-site discharge of suspended solids. However, based on historical operating experience and subsurface geological conditions, surface water runoff from rain or snowmelt events typically evaporates or infiltrates rapidly into the subsurface due to highly permeable sands and gravels.

2.5 OPERATION AND MAINTENANCE

2.5.1 Products

The products generated include gravels, sand, stone, dry batch concrete, and manufactured soil. Portable crushing equipment will be brought to the site as required to process the extracted gravel. Gravel is washed by means of constructed on-site wash facilities. Various products (i.e., various aggregate sizes) will be stockpiled at the site until they are trucked to local markets in Nova Scotia, typically within 125 km of Glenholme.

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2.5.2 Transport

The average number of trucks hauling aggregates and concrete from the pits will be 20 to 50 per day, depending on market demand. This could increase to as much as 100 to 165 per day, at peak production for short periods during the construction season, if a large aggregate or concrete supply contract were awarded.

Aggregate products and dry batch concrete will be transported from the properties using trucks. In most instances, the customer will transport the aggregate products. The trucks will use the access road owned by the proponent to access the Project area. The entrance to the access road for the North Property fronts directly on Trunk 2 and for the South Property onto a one kilometre length of Little Dyke Road that accesses Trunk 2. Transportation routes generally will follow Trunk 2 north to Highway 104.

2.5.3 Production Schedule and Rates

The anticipated average production rate is approximately 155,000 tonnes of aggregate and 7000 m³ of concrete per year. The operating schedule will be based typically on 12-hrs/day, 5-days/week, year-round, with the potential for peak season expansion of operations to 7-days per week, 24-hours per day.

Based on the planned production rate of 155,000 tonnes per year and a working face averaging between 6 to 12 m in height, development of the North Property would be complete within approximately seven years (by 2014) after which time the focus change to the South Property for a period of approximately nine years (assuming 6 to 12 m working face) after which all gravel supplies would likely be exhausted for both properties. Note that there is a potential for short term expansion of the production rate (doubling) in the event of a large contract award during the construction season. Also note that actual tonnage for a given year is difficult to predict as it is dependent on market demand. However, assuming the 155,000 tonnes per year average, final reclamation of the North and South Properties is scheduled for 2014 and 2024, respectively.

2.5.4 Excavation, Processing, and Stockpiling

The specific equipment and methods used for current operations at both the North and the South Property does not differ markedly with equipment and methods used for historic operations at other gravel pits within a two kilometre radius. At the pit face, the material is typically excavated using a front-end loader fitted with a 2 or 5 cubic metre bucket. The excavated material is then dumped into a crusher and/or a screener (classifier). Once the excavated material is crushed and/or screened, the end-product is then transported to a stockpiling area. There will be no blasting associated with the project. When required, the stockpiled materials will be trucked to various markets or used in the dry batch concrete process. Some sand and excavated fines from the settling ponds will be used in manufactured soil production.

At any given time, up to 200,000 tonnes of aggregate material may be stockpiled within the stockpile laydown area. Processing and stockpiling areas will be kept within the active area of the proposed / expanded pit.

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2.5.5 Concrete Production

The method used for current dry batch concrete production is similar to all concrete production plants in the province. The plant consists of one split aggregate bin/scale which controls the feed of the aggregate onto a conveyor belt and up into the mixer truck. Silos feed the cementitious materials into another scale which controls the feed of the cement into the mixer truck. Metered water is pumped into the mixer as additives are dispensed pneumatically through a plastic hose into the mixer truck. Once loaded, the mixer truck is washed down and sent to the job site.

2.5.6 Separation Distances

The proposed / expanded active areas of the North and South Properties will adopt the following separation distances as provided in the *Nova Scotia Pit and Quarry Guidelines* (NSEL 1999) and detailed below.

MSD will not locate the Active Area of the pit within:

- i. 30 metres of the boundary of a public or common highway;
- ii. 30 metres of the bank of any watercourse (natural) or ordinary high water mark; and
- iii. 30 metres of the boundary of the pit property.

MSD will not locate the excavation "Working Face" of the pit within:

- i. 30 metres of the boundary of a public or common highway;
- ii. 30 metres of the bank of any watercourse or ordinary high water mark;
- iii. 90 metres of the foundation or base of a structure located off site; and
- iv. 15 metres of the property boundary when a structure on the abutting property is not involved.

MSD will adhere to the following site-specific conditions related to separation distances based on existing conditions:

The inactive pit face along the northwestern boundary of the South Property (PID No.20134243, Lot 1) is located within 90 metres of the foundation of a structure (residential property) located off-site on PID No. 20155578. This was a pre-existing condition based on obtaining the consent of the property holder. The former pit face along this property has been stabilized and revegetated and will be periodically monitored to ensure continued slope stability. The pit face along the west boundary of same PID, adjacent to Little Dyke Road, is less than 30 metres from the boundary of the road at some locations. The pit slope along this boundary has been stabilized and revegetated. Similarly the former pit face along this boundary will be periodically monitored to ensure ongoing slope stability.

Separation distances for proposed/expanded development areas will be in accordance with NSEL (1999).

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2.6 ENVIRONMENTAL MANAGEMENT

A summary of the general environmental management practices to be used in relation to identified environmental risks as identified from the Project development are provided below.

2.6.1 Erosion Control

In accordance with best practices and standard NSEL requirements, erosion and sedimentation controls will be in place to ensure that runoff generated during operations is managed appropriately. This will include diversion of clean surface drainage away from disturbed areas, coordination of activities with seasonal constraints (i.e., to the extent possible, avoid periods of heavy precipitation and snow melt), and minimization of the amount and duration of erodible soil at all times. Additional measures to minimize erosion may be required, such as ditching, sediment fencing, and check dams. In general, the standard guidance to be followed when constructing sedimentation and erosion measures are detailed in the *Nova Scotia Standard Specifications Highway Construction and Maintenance* (NSTPW, 2005), *Nova Scotia Watercourse Alteration Specifications* (NSEL, 1997) and the *Nova Scotia Erosion and Sedimentation Control Handbook* (NSEL, 1988).

2.6.2 Water Management and Discharges

Specific retention structures to prevent off-site discharge of effluent will not be necessary as there will be no groundwater discharge to the pit floor since the pit floor will be positioned above the groundwater table. Surface water will readily infiltrate into the subsurface based on the high permeability of the sands and gravels. Any surface water resulting from major precipitation or snowmelt events will be controlled by means of pit floor grading, berms, and swales. Natural water bodies do not occur on the areas planned for development on the North and South Properties. The North Property ditch identified as fish habitat has been protected from site activities by means of a berm (lined with filter fabric) and an upgradient ditch used to recirculate treated wash water that will also act as an interceptor. There will be no discharge of wash water from the operation because the wash water system is a recirculating design.

It is anticipated that in the event that surface run-off is directed off-property (for example during an extreme precipitation or snowmelt event), the flows will be periodically monitored in accordance with terms and conditions in the future Industrial Approval and the *Nova Scotia Pit and Quarry Guidelines* (1999) to ensure total suspended solids levels do not exceed the approved final effluent discharge limits. In the unlikely event that runoff from the property exceeds final effluent discharge limits as determined through monitoring, contingency measures may include the pumping of sediment laden water away from watercourses and wetlands to temporary holding areas on the pit floor or wash water ponds where the runoff would be treated by means of settling, flocculation, filtering, or some other means. Drainage ditches and swales will be utilized to the greatest extent practicable to divert upgradient surface and shallow water flows around the pit perimeter, thereby minimizing contact of upgradient water with the pit floor and working faces.

2.6.3 Dust and Noise Control

Dust emissions and noise will be controlled by the implementation of site specific measures. For example dust can be controlled by the application of water obtained from existing ponds or the application of environmentally friendly dust suppressants in high traffic areas. Stockpiles/windrows of topsoil and vegetative material may be seeded and/or covered with mulch to minimize erosion and dust generation.

2.6.4 Hazardous Materials Management and Contingency Planning

There is no planned storage of hazardous materials at the site. Typically mobile equipment is fuelled utilizing contracted mobile fuel trucks from off-site. There is a 2000 L diesel fuel storage tank at a dedicated location on the South Property to provide contingency fuel for site mobile equipment in the event of a temporary fuel shortage (i.e., contract service not temporarily available). This storage tank is located far (>100 m) from the nearest surface water body (McCurdy Creek). Preventive maintenance will be performed on site equipment by qualified personnel and contractors. Used oil and filters will be stored for a short time and removed from the site and disposed of in an appropriate manner. Refuelling of equipment will be conducted on a regular basis, under contract by a tanker truck, onsite. Refuelling activities will not be conducted within 30 m of any watercourse, and equipment operators will remain with the equipment at all times during refuelling in accordance with the Petroleum Management Regulations of the Nova Scotia Environment Act.

In the event of a leak or spill during refuelling, maintenance, or general equipment operation, immediate action will be taken to stop and contain the spilled material. Spill kits containing spill response materials and equipment will be available on site at strategic locations in the areas of pit development and material processing to permit immediate clean-up in the event of a spill. All contaminated material will be collected and stored in an appropriate manner so as not to be re-released to the environment until such time as it will be transported to an approved treatment/disposal facility. All spills will be reported to the 24-hour environmental emergencies reporting system (1-800-565-1633) in accordance with the Emergency Spill Regulations of the *Nova Scotia Environment Act*. All equipment operators and those responsible for refuelling and maintaining equipment will undergo mandatory spill response training which will be documented.

MSD will prepare a contingency plan for accidental events which can be submitted to NSEL at their request for review and approval. The Canadian Standards Association publication, *Emergency Planning for Industry (CAN/CSA-Z731-95)*, will be consulted as a reference in the preparation of the contingency plan.

2.7 DECOMMISSIONING AND RECLAMATION

MSD will undertake a progressive rehabilitation program at the development sites. As distinct areas within the pits become inactive, the area will be graded to a stable slope, covered with topsoil that has been stripped and stockpiled/windrowed, and seeded. At the end of the pit operation (within six months of abandonment), rehabilitation will consist of:

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- grading and contouring of all slopes and exposed pit faces in consideration of slope stability, and safety;
- spreading existing stockpiled topsoil; and,
- vegetating.

The laydown area and settling ponds within the footprint of the pit floor will be graded, as required, and leveled to allow for future commercial, industrial, recreational, or residential land use.

Wetland creation during rehabilitation will be considered as an option for the northwest portion of the South Property. This will require some additional excavation in the area. Based on the success achieved from this work, additional wetland creation would be considered for other locations on the North and South Properties.

A reclamation plan will be developed for the site and submitted to NSEL at their request for review. The proponent plans to reclaim part of the existing disturbed area of the former pit on the South Property this year and maintain a progressive schedule of reclaiming every second operational year. Reclaiming the pit slopes (stabilizing and vegetating) is currently well advanced on the South Property. Final grading and installation of permanent vegetation on disturbed areas will be followed up with periodic monitoring and maintenance as required.

3.0 SCOPE

MSD is undertaking an environmental assessment of two existing gravel pit operations and expansion developments located on two separate properties near the community of Glenholme. As the existing gravel pit operations and expansion developments on the properties are greater than 4 ha, the Project must be registered for Environmental Assessment under the Environmental Assessment Regulations of the Nova Scotia Environment Act as a Class I Undertaking. This report fulfills the primary requirements for Project registration under this legislation.

3.1 SCOPE OF THE UNDERTAKING

The scope of the proposed / expanded undertaking as described in Section 2.0 is similar to current and past activities and encompasses all phases/activities associated with construction, operation, and decommissioning phases of the gravel pit and related works, as follows:

- site preparation;
- excavation/extraction;
- processing, including crushing, washing, screening, stockpiling, and dry batch concrete production;
- stockpiling;
- transportation/trucking to local markets;
- reclamation, and,
- final closure.

The Project expansion area covers a total of approximately 13.4 ha, adhering to all setback and other requirements of the *Pit and Quarry Guidelines* (NSEL 1999). The proponent had considered a larger area for development, however, in the interest of protecting wetland habitat and forested areas on the properties, the expansion area was revised to exclude the wetlands and forest. Areas of development that could potentially impact areas of fish habitat were also avoided.

The anticipated average production rate is approximately 155,000 tonnes of aggregate and 7000 m³ of concrete per year. The operating schedule will be based typically on 12-hrs/day, 5-days/week, year-round, with the potential for short term expansion of operations to 7-days per week, 24-hours per day for short periods during the construction season.

Based on the planned production rate of 155,000 tonnes per year and a working face averaging between 6 to 12 m in height, development of the North Property would be complete within approximately seven years (by 2014) after which time the focus would be the South Property change to the South Property for a period of approximately nine years (assuming 6 to 12 m working face) after which all gravel supplies would likely be exhausted for both properties. There is a potential for short term expansion of the production rate (doubling) in the event of a large contract award during the construction season. Actual tonnage for a given year is difficult to predict as it is dependent on market demand. Assuming the 155,000 tonnes per year average, final reclamation of the North and South Properties is scheduled for 2014 and 2024, respectively.

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3.2 PURPOSE AND NEED FOR THE UNDERTAKING

The materials to be produced by the operation are an important requirement in road and highway construction and maintenance projects in the region, as well as municipal and residential construction projects. The Project under consideration, as well as other similar pit developments in Nova Scotia, is an important component of the natural resource sector of the economy and provides essential raw materials to the province's construction industry. The pit development and processing operations also provide direct and indirect employment for its workers and suppliers, as well as for the transportation and construction industries.

3.3 CONSIDERATION OF PROJECT ALTERNATIVES

An alternative facility location is not a feasible alternative. The operation is occurring in an area that has already been heavily exposed to pit development activities over the years. Development of the proposed / expanded Project will not require the construction of any new facilities, as the existing facilities (e.g., access roads and staging area) are sufficient for proposed / expanded operations. Relocation of the Project to another location may likely require development of a new site, construction of new facilities, and would potentially have greater effect on the surrounding biophysical and socio-economic environment. In addition, sourcing aggregate at an alternate location is not a feasible alternative because the proponent would have to lease or buy additional property. The reasons have to do with financial and source constraints. The proposed / expanded pit is on or near to a property that has already undergone considerable disturbance from previous pit activities, farming, and forestry practices.

3.4 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The Project involves the permitting of a pit development greater than 4 ha. The Project must therefore be registered for an Environmental Assessment under the Environmental Assessment Regulations of the Nova Scotia *Environment Act* as a Class I Undertaking. This report fulfils the primary requirements for project registration under this legislation.

Other relevant provincial regulations and guidelines include the Nova Scotia *Pit and Quarry Guidelines* (NSEL 1999). Relevant federal legislation and policies include the *Species at Risk Act*, *Fisheries Act*, *Migratory Birds Convention Act*, *Wildlife Policy for Canada*, the *Federal Water Policy*, the *Toxic Substances Management Policy*, and the federal strategy for pollution prevention. The Nova Scotia *Used Oil Regulations* are relevant to the site since small quantities of used oil and filters are stored temporarily on the South Property. The Nova Scotia *Petroleum Management Regulations* applies to the handling and storage of petroleum hydrocarbons at the site. There is not, however, a requirement to register any tank on the property, since any above-ground petroleum hydrocarbon storage tank is less than 4,000 litres capacity.

The scope of the environmental assessment in relation to the proposed / expanded Project has been determined by the Proponent and their consultant and is based upon: the proposed / expanded Project elements and activities; the professional judgment and expert knowledge of the study team; consultations with the public and regulatory authorities on this and similar projects; and the results of field studies conducted in support of this environmental assessment. The *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (NSEL 2002) was also used to determine/focus the scope of the assessment and organize the environmental assessment document. The Proponent and their consultant met with

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NSEL in May, 2006, to discuss the location of the expansion development, and elements and activities associated with the Project, in an effort to further focus the scope of the assessment. Landowners adjacent to the project were also contacted (see Section 4.0) for the purpose of issues identification. In addition, a draft of the Environmental Assessment Registration document was submitted to the Nova Scotia Environmental Assessment Branch and other government parties for their preliminary review in April 2007. The draft document was checked by the Environmental Assessment Branch for minimum requirements under the Nova Scotia Environmental Assessment Regulations. The review concluded that the minimum requirements for an official registration had been met in the draft document.¹

This environmental assessment evaluates the potential environmental effects of the Project elements and activities, for all Project phases, with regard to each Valued Environmental Component (VEC) and Valued Socio-economic Component (VSC). VECs and VSCs are components of the biophysical and socio-economic environment and are selected in consideration of their value to stakeholders and their potential interactions with the Project. By assessing potential impacts on VECs/VSCs within the study boundaries, a meaningful evaluation of project effects on relevant environmental parameters is achieved.

Components evaluated as part of this study include:

- surface water resources and fish and fish habitat;
- rare and sensitive flora;
- wildlife;
- groundwater resources;
- wetlands;
- archaeological and heritage resources;
- air quality;
- noise, and
- socio-economic environment.

Further, the above components are evaluated for all Project phases. For each component, mitigative measures are recommended, if warranted, to reduce and eliminate potentially significant environmental effects on identified components. Monitoring and follow-up measures are also recommended with the evaluation of the significance of any residual effect following mitigation (i.e., residual effect).

¹ Note that the review by the EA Branch of the draft document represented a preliminary examination of the proposed undertaking and did not preclude further examination and commentary during the final review of the undertaking once officially registered. Minor comments received as part of the May 2007 from various government sources were considered and incorporated into this document where appropriate.

4.0 PUBLIC INVOLVEMENT

4.1 METHODS OF INVOLVEMENT

In December 2006, a Project Information Bulletin (Appendix B) was distributed to landowners and local businesses within approximately two kilometres of the Undertaking. A total of 60 bulletins were hand delivered and some copies were posted in the local convenience store and service station. The purpose of the bulletin was to advise local residents and businesses immediately adjacent to the Project operations (i.e., those who are potentially most affected) of the development expansion, and provide them with an opportunity to comment on the Project. In addition, a letter, dated February 9, 2007, was sent by courier to the Confederacy of Mainland Mi'kmaq, to encourage the submission of comments, concerns and questions regarding the Project. To date there has been no response to this letter. Copies of the information circular and letter to the Confederacy are provided in Appendix B.

This consultation effort assists with issues scoping and development of appropriate mitigation for potential adverse effects.

4.2 STAKEHOLDER COMMENTS AND STEPS TAKEN TO ADDRESS ISSUES

Table 4.2-1 summarizes the comments received and issues raised as a result of comments received from information bulletin that was distributed to residents within the immediate vicinity of the proposed expansion development. (Note that comments received by regulatory agencies during a review of the draft environmental assessment report will also be included.) Six community residents responded to the information bulletin. MSD's local representative met directly with most of the respondents to discuss their concerns and to develop appropriate responses to each issue raised.

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Table 4.2-1: Summary of Comments and Concerns Raised by Stakeholders

Raised by:	Issue/Concern	Response/Proposed Resolution
Local Resident	Noise and dust during Project operations.	<p>Constructed berms and rows of trees are an effective means of controlling dust and noise from the project. There already exists a buffer of trees separating the existing/proposed Project development from sections of the property footprint and along the roads adjacent to the Project. Along sections of the MSD properties that do not abut neighbouring properties, it is proposed that soil berms be constructed and vegetated. Where MSD properties abut residential properties, MSD will follow the residential property owner's preference between a vegetated soil berm or two rows of fast growing trees.</p> <p>Specific dust suppression measures to be employed during dry periods will include application of water by means of watering trucks, and application of environmentally friendly chemical-based dust suppressants in areas of heavy traffic such as access roads and other high-traffic areas.</p>
Local Resident	Noise from earth moving equipment during off-hours, especially back-up horns.	All back-up beepers will be turned off for the night shift (6 pm to 6 am) to minimize potential noise impacts.
Local Resident	Dust from exposed land and stockpiles.	Dust suppression measures as discussed above will be employed when required.
Local Resident	The site should be progressively reclaimed as soon as possible.	Progressive reclamation will be conducted when practicable. Top soil stockpiles to be used for reclamation purposes will be vegetated if needed. When pit faces reach their limits, pit slopes will be stabilized to an appropriate angle and vegetated to minimize erosion.
Local Resident	Loss of property values.	Gravel pit operations are not a new commercial activity for the community. In the short term, measures will be taken to minimize impacts to neighbouring properties from the Project. In the longer term, progressive and longer-term reclamation measures will ensure that the land will be reclaimed and re-vegetated to maintain acceptable aesthetics.
Local Resident	Damage to roads due to increased truck traffic	Ultimately, repair and upkeep of community roads are a government responsibility. Seasonal weight restrictions and speed limits will be observed to minimize damage.

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Table 4.2-1: Summary of Comments and Concerns Raised by Stakeholders (Cont...)

Raised by:	Issue/Concern	Response/Proposed Resolution
Local Resident	Pollution of residential well water from spills of fuel, antifreeze and oil on adjacent pit floor.	<p>The private wells located near the North Property and South Properties are either trans-gradient or up-gradient of proposed/expanded Project development based on inferred groundwater flow direction (see Section 5.5). Furthermore, over the life of the operations in the Project area (since 1987), there have never been recorded complaints about deteriorating well water quality related to Project gravel pit operations. There is also an operational commitment that the gravel pit floor will not extend into the groundwater table. Any surface water resulting from major precipitation or snowmelt events will be controlled by means of pit floor grading, berms, and swales. Based on these factors, it is unlikely that the Project will have an adverse effect on near-by domestic potable well quality or yield.</p> <p>However, to address the perceived concern of nearby residents and as a precautionary measure, MSD will conduct a well survey on domestic water wells on adjacent properties that are less than 200 m from the MSD property boundary. The well survey will consist of completing a questionnaire about the current and past status of their water wells. A water sample will be collected from their well using approved NSEL sampling protocols and submitted to an independent laboratory for analyses of general water quality parameters and metals. A well yield test may be required to verify current well yield capacity. The results of each well survey, water analyses, and test result will be provided to the resident and all the results compiled and submitted to NSEL. Additional testing on an annual basis will be conducted at the request of NSEL.</p> <p>To address the potential for spills during Project operations, a contingency plan will be implemented for rapid spill response and clean-up in the event of a spill. Refuelling and maintenance activities will be restricted where practicable to established dedicated locations that will be based on minimizing potential off-site groundwater issues.</p>
Local Resident	Concerns about distance of site disturbance to property boundary and the disturbance of top-soil near property boundary.	<p>The set-backs as specified in <i>Nova Scotia Pit and Quarry Guidelines</i> (NSDEL 1999) will be followed (refer to Section 2.5). Where MSD properties abut residential properties, MSD will follow the residential property owner's preference between a vegetated soil berm or two rows of fast growing trees. In the event of the treed buffer, top soil will not be disturbed within the specified set-back.</p>

5.0 VALUED ECOSYSTEM COMPONENTS AND EFFECTS MANAGEMENT

5.1 METHODOLOGY

Field studies were conducted by AMEC on April 27, May 8 and 9, June 16, July 17 and 26, and September 28, 2006, to investigate and establish existing conditions and to determine appropriate mitigation, if necessary, to minimize environmental effects from the proposed expansion development project. These surveys consisted of: vegetation surveys and a fish habitat survey undertaken by qualified personnel employed by AMEC and in the case of potential archaeological and heritage resources was undertaken by a qualified archaeologist subcontracted by AMEC. Incidental wildlife observations were made by the biologists conducting the field investigations. Additional information, in support of the field studies and the assessment, was gathered through a review of: air photos; topographic maps; geological maps; survey maps; and other information sources, such as the Nova Scotia Museum, Atlantic Canada Conservation Data Centre (ACCDC), Department of Fisheries and Oceans; Nova Scotia Department of Environment and Labour (NSEL); Nova Scotia Department of Natural Resources (NSDNR), and Statistics Canada.

The study team conducting the various field and office studies were as follows:

Rare Plant Survey – Dr. Marian Sensen, AMEC

Fish and Fish Habitat – Ms. Carys Burgess, M.Sc., AMEC

Geology and Hydrogeology – Mr. James Millard, M.Sc., P. Geo., AMEC

Incidental Wildlife Observations – Dr. Marian Sensen, Ms. Carys Burgess, James Millard, AMEC

Archaeology and Heritage Resources - Davis Archaeological Consultants Limited

Based on professional judgement and existing information, and given the size, nature and location of the proposed expansion development, the Proponent and its consultants are confident that the zones of influence and subsequent boundaries of the assessment for this Project are limited. Temporal and spatial boundaries encompass those periods during, and areas within which, the VECs are likely to interact with, or be influenced by, the Project. Both the temporal and spatial boundaries for the assessment vary according to the VEC, but are generally limited to the duration of, and for a period of time after, the activities and the immediate Project area unless otherwise noted. The physical footprint of the pit activities will be 31 ha in total for both the North and South Properties, a portion of which has been previously disturbed and developed, and the majority of emissions and discharges will likely be confined to the immediate vicinity of the Project area.

To assess the potential environmental effects of a project and determine the significance of an effect, it is important to consider the magnitude, frequency, duration, geographical extent and reversibility of the potential effect. The study team has considered these elements for each VEC/VSC.

5.2 SURFACE WATER AND FISH AND FISH HABITAT

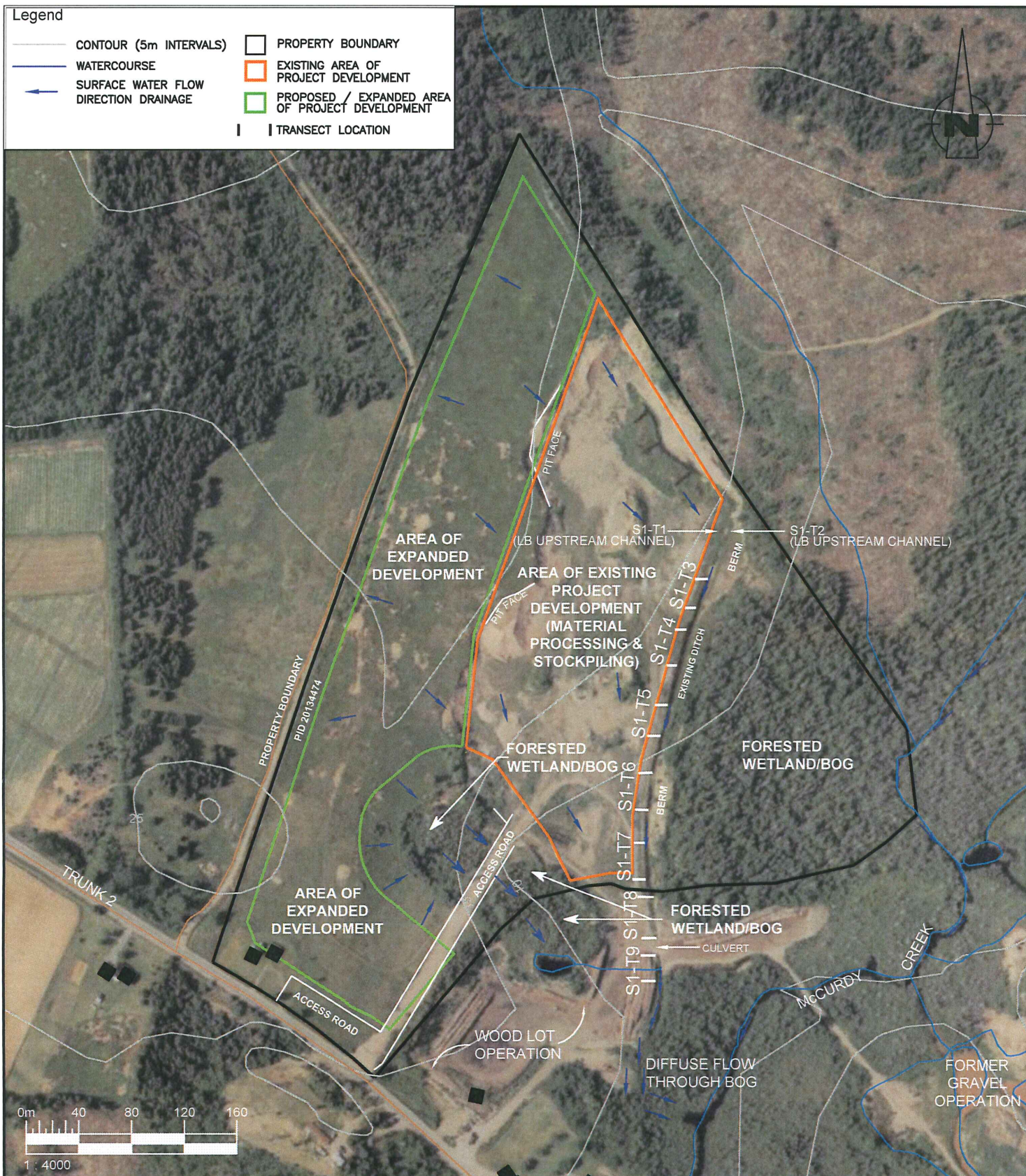
5.2.1 Description of Existing Environment

Based on available 1:10,000 scale NTS mapping, aerial photographs, and field observations, the runoff for the North and South Properties is within the McCurdy Creek drainage area which flows in a southern direction to Cobequid Bay. The headwater for McCurdy Creek is located approximately 1.8 km north of the North Property. McCurdy Creek consists of multiple small tributaries flowing in a southerly direction for a total distance of approximately 5 km to Cobequid Bay. The southern reaches of McCurdy Creek are affected by constructed dykes and ditches that have been long used for agriculture development of the area. McCurdy Creek upstream of the South Property receives runoff from other pit operations in the area, a few residential homes, and a wood lot located adjacent to the North Property on PID no. 20295986. The interpreted drainage divides for the McCurdy Creek drainage area relative to the North and South Properties are shown on Figure 2-2. The drainage area for McCurdy Creek based on the interpreted divides is 600 ha. Based on field observations and aerial photograph interpretation, the eastern boundary of the South Property proposed expanded development is close to the Folly River watershed, but remains almost entirely within the natural drainage of McCurdy Creek.

The natural drainage of the North Property is to the east towards a pre-existing drainage system that consists of ditches that discharges to wetland/bog areas to the east and southeast. The wetland/bog areas drain indirectly and diffusely to McCurdy Creek, located further to the east. McCurdy Creek intersects the North Property at only one location; a 40 m reach of the creek intersects the northeast corner of the property (refer to Figure 2-4). This location is approximately 180 m east of the eastern boundary of any project development.

The natural topography of the South Property is flat lying to gently sloping. Most of the South Property drains in a southwest or south direction towards agricultural ditches and a wetland area adjacent to McCurdy Creek with a small eastern sliver of the property, potentially draining toward Folly River.

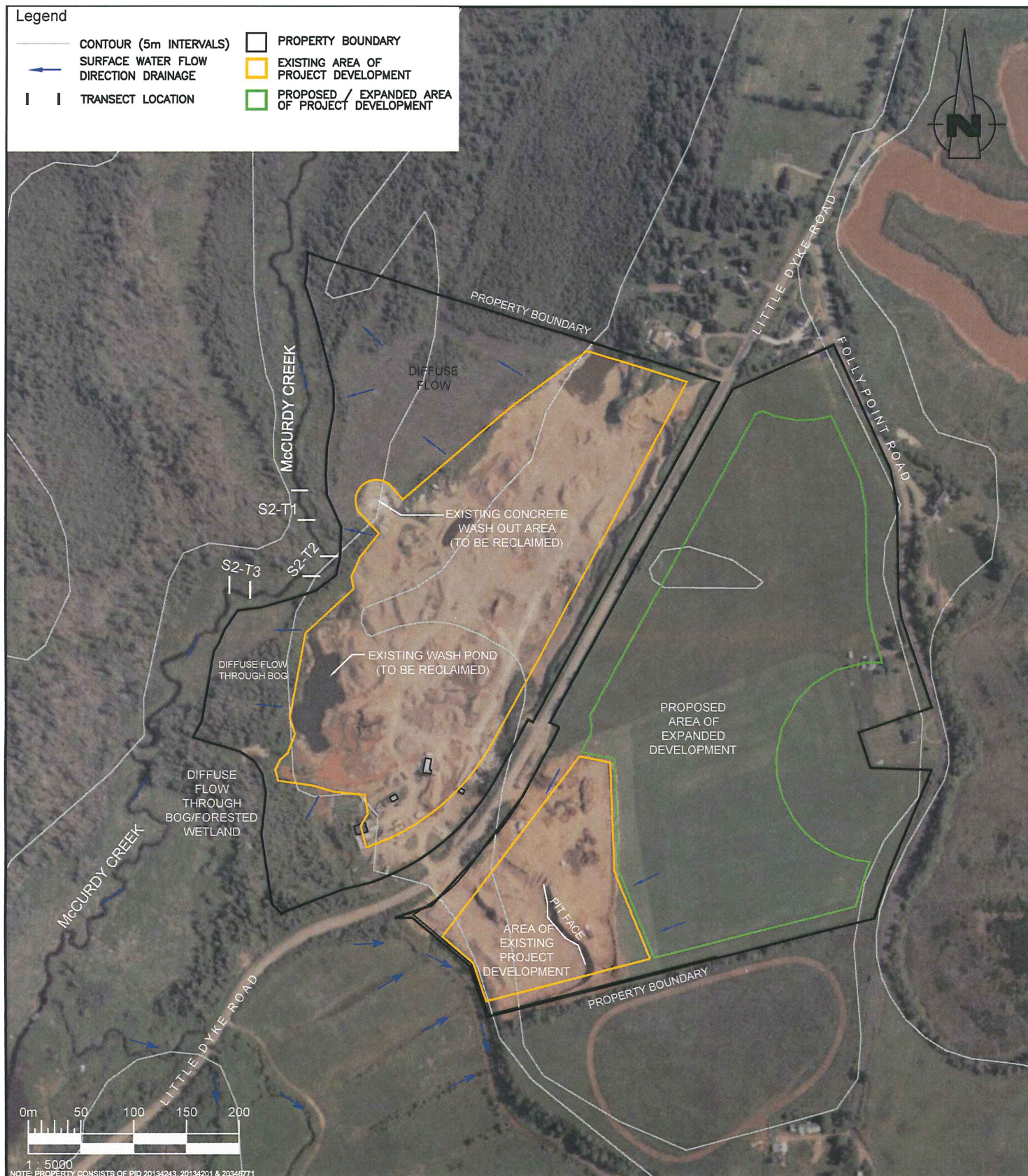
Qualitative fish habitat surveys were conducted on the North and South Properties (refer to Figures 5.2-1 and 5.2-2 for the location of survey transects). On the North Property (Figure 5.2-1), the survey focussed on an existing ditch that flows diffusely toward McCurdy Creek via a wetland and through an adjacent property (commercial woodlot). The wetland would likely provide an effective barrier to the migration of fish via the ditch from McCurdy Creek under all but the most extreme high flow conditions. On the South Property (Figure 5.2-2), the survey focused on McCurdy Creek itself where there were no direct surface drainage pathways to McCurdy Creek from the South Property. The objective of the surveys was to document and classify specific habitat areas and assess habitat types and availability. The collected information has been utilized to provide a functional description for the purposes of environmental planning and reporting and has been used to assist in the development of environmental management measures to address concerns regarding potential impacts to fish and fish habitat via potential sediment laden runoff from the pit operations. Detailed qualitative fish habitat survey results for the North and South Properties are presented in Appendix D.



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PROJECT GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT		DWN BY: YC/EM	DATUM: NAD83	DATE: June 2007	
TITLE TRANSECT LOCATIONS-NORTH PROPERTY FISH HABITAT ASSESSMENT		CHK'D BY: JM	REV. NO.: 0	PROJECT NO: TV61049	
		PROJECTION: UTM Zone 20	SCALE: 1:4,000	FIGURE No. FIGURE 5.2-1	

Legend

- CONTOUR (5m INTERVALS)
- SURFACE WATER FLOW DIRECTION DRAINAGE
- TRANSECT LOCATION
- PROPERTY BOUNDARY
- EXISTING AREA OF PROJECT DEVELOPMENT
- PROPOSED / EXPANDED AREA OF PROJECT DEVELOPMENT



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CLIENT

M.S.D. ENTERPRISES LTD.

PROJECT GLENHOLME GRAVEL PIT EXPANSION DEVELOPMENT

DWN BY: EM DATUM: NAD83 DATE: June 2007

TITLE TRANSECT LOCATIONS-SOUTH PROPERTY
 FISH HABITAT ASSESSMENT

CHK'D BY: JM REV. NO.: 0 PROJECT NO: TV61049

PROJECTION: UTM Zone 20 SCALE: 1:5,000 FIGURE No. **FIGURE 5.2-2**

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There were no concerns identified in the results of the fish habitat surveys for the South Property since the drainage pathways to McCurdy Creek were indirect (wetlands and series of agricultural ditches).

Unexpected results were, however, reported for the North Property associated with an historical drainage ditch system constructed during prior pit operations for draining a portion of the property. During the initial survey of the area in May, minnows were observed in the ditch system prompting the need for more detailed surveys and revision of the original pit development/operational plans to minimize harmful alteration, disruption, or destruction of the newly identified fish habitat (see Section 5.2.2).

There were no rare or endangered species noted during the surveys, however this area is within the range of the Inner Bay of Fundy salmon (*Salmo salar*). This species has been designated as "Endangered" by the COSEWIC (Committee on the Status of Endangered Wildlife in Canada) and spawns in those rivers of Nova Scotia and New Brunswick that drain into the Minas Basin and Chignecto Bay (Species at Risk (SAR) website, 2006). Other anadromous species such as Atlantic sturgeon (*Acipenser oxyrinchus*), American shad (*Alosa sapidissima*), striped bass (*Morone saxatilis*) and rainbow smelt (*Osmerus mordax*) are also common to the region but would not be likely to access the ditch from McCurdy Creek to the North Property, even during flood events, due to the bog barrier. Freshwater fishes common to the region include creek chub (*Semotilus atromaculatus*) and brook trout (*Salvelinus fontinalis*) as well as stickleback (*Gasterosteidae* sp.), killifish (*Fundulus* sp.), common shiner (*Notropis cornutus*), golden shiner (*Notemigonus crysoleucas*), white sucker (*Catostomus commersoni*) and pearl dace (*Margariscus margarita*) (Davis and Browne 1996).

On the North Property, minnows were observed in all transects except T6 and T7 (Figure 5.1), and there were two observations of what was likely a salmonid species, most likely trout. Since an electro-fishing survey was not completed, the positive verification of fish species observed in the ditch and pond cannot be confirmed. Overall the habitats observed on the ditch of the North Property have a sluggish flow with mainly flats and runs, variable depths not exceeding 1m, soft sediment with occasional large and small boulders, and aquatic macrophytes in many locations. Although there are sections with moderately stable and undercut banks, and areas with good cover, the North Property ditch is considered a Classification IV under the habitat classifications for salmonid macro-habitat (Beak 1980 as cited by Sooley et al. 1998). This type of habitat is defined as poor juvenile salmonid rearing habitat with no spawning capability, although there are areas that could (and possibly do) provide shelter and feeding habitat for larger, older and juvenile salmonids such as brook trout. Ideal salmonid spawning habitat is typically characterized by well oxygenated water with riffle sections, deeper pools, and substrate large enough for sufficient water flow with little silt build-up.

During the South Property survey, there were no rare or endangered fish noted however as mentioned previously, Inner Bay of Fundy salmon (*Salmon salar*) are found in this region. It is not known if this species could access McCurdy Creek from Cobequid Bay. Fish were observed feeding in transect T2 but species type was not identified.

5.2.2 Potential Effects, Proposed Mitigation and Monitoring

Potential Effects

The main contaminant of potential concern for both the North and South Properties is suspended sediments and silt in site runoff that could potentially cause adverse effects to environmental components of the existing ditch system, considered to be the aquatic receiving environment. It is also possible that potential impacts to McCurdy Creek could occur via the existing ditch system on the North Property.

On the North Property, the existing ditching system is considered to be the nearest aquatic receiver for the Project and therefore creates a potential for interaction between the Project and the following aquatic environmental components:

- Surface water quality;
- Aquatic habitat; and
- Aquatic species.

Past experience on the properties have shown that surface water runoff originating from rainfall or snowmelt events typically evaporates or infiltrates rapidly into the subsurface due to highly permeable sands and gravels. However, in the event of extreme precipitation or snowmelt event, it is possible that the infiltration capacity of the sands and gravels could be exceeded and temporary surface flow might occur. Site specific measures adopted for the North and South Properties to deal with this possible scenario are presented in the sections below.

Mitigative Measures

North Property

MSD has made significant efforts in protecting the existing ditch system on the North Property from site disturbances and has made the decision to protect the ditch from harmful alteration, disruption, and destruction. To this end, MSD has adopted the following specific mitigative approach at the North Property with the objective to protect the existing ditch system, now considered to be fish habitat:

1. The existing ditching system will not be used to convey drainage and wash water for Project operations in consideration of the identification of fish habitat. A new ditch has been constructed parallel and approximately 10 m from the existing ditch. The constructed ditch will also act as an interceptor for property drainage, protecting the existing ditch during operations (refer to Figure B-2, Appendix B for configuration and location of Project infrastructure).
2. To further enhance drainage flow away from the ditch system, the pit floor will be graded to maintain a slope that will direct drainage away from the ditch towards a small wetland area to the south. In spite of the fact that this wetland has already been impacted from drainage originating from the operating commercial woodlot (PID no. 20295986), steps will be taken to minimize and eliminate further impacts to the wetland from site run-off (refer to General Mitigation Measures, below).

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3. The wash water system is a closed circuit system, where wash water is not discharged to the receiving environment, but is recycled.
4. A berm has been constructed in the intervening area between the existing and new ditch and includes a barrier consisting of a length of filter fabric inserted in a backfilled trench. This will protect the existing ditch from potential discharge of silt laden surface water and shallow groundwater. Based on recent observations made by a DFO representative who visited the Project recently, additional soil material will be added to the southern section of this berm to add extra height at this location.
5. Upon completion of filter installation, the intervening area between the existing and new ditch was hydroseeded and mulched to establish vegetation and further minimize sedimentation to the existing ditch system.
6. Drainage ditches and swales will be utilized to the greatest extent practicable to divert surface water, originating from upgradient of the property, around the pit perimeter, thereby minimizing contact of upgradient water with the pit floor and working faces.

South Property

The natural topography of the South Property is flat lying to gently sloping. Most of the South Property slopes in a south or southwest direction toward a series of agricultural ditches and a wetland area adjacent to McCurdy Creek with a small eastern portion of the property, draining toward Folly River. Drainage to McCurdy Creek is indirect and diffuse via a wetlands located adjacent to the banks of the creek and a series of agricultural ditches located to the south. In addition, past project experience during Project operations has shown that surface water runoff originating from rainfall or snowmelt events typically evaporates or infiltrates rapidly into the subsurface due to highly permeable sands and gravels. Past experience has shown that drainage ditches and swales have been effectively utilized to divert upgradient surface water flows around the pit perimeter, thereby minimizing contact of upgradient water with the pit floor and working faces, particularly during high flow periods.

For the South Property, the following specific mitigative approach will be adopted:

1. During operations, all potential run-off from the property will be directed in a southwest or south direction toward McCurdy Creek so that the Folly Lake watershed will remain unaffected by operations.
2. The wash water system to be used for the South Property will be a closed circuit system similar to the system currently in place on the North Property.
3. Drainage ditches and swales will be utilized to the greatest extent practicable to divert surface water, originating from upgradient of the property, around the pit perimeter, thereby minimizing contact of upgradient water with the pit floor and working faces.

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General Mitigation (North and South Properties)

In addition to the above mitigative measures, the following general measures are to be taken where necessary for both the North and South Properties during construction and ongoing operations by MSD to minimize impact to the existing ditch system and adjacent watercourses:

- Sediment control measures including silt fences and sand bag barriers;
- The use of a flocculent will be involved on occasion to lower suspended solids in process water, reducing the likelihood of siltation issues;
- Erosion control measures including erosion control blankets, mulching, and hydroseeding / re-vegetation (when no further disturbance is anticipated);
- Sedimentation control measures to be inspected regularly, particularly in conjunction with rainfall events;
- Maintenance of sedimentation and erosion control structures to be performed regularly until the site has been stabilized;
- Accidental spills or leaks of petroleum products or other deleterious substances from the vehicles, equipment and storage containers will be immediately contained and cleaned up in accordance with regulatory requirements;
- Equipment refuelling and maintenance will be done at a safe distance (30 m minimum) from wetlands and watercourses;
- Hazardous waste including containers such as petroleum hydrocarbon containers will be collected and disposed off according to current guidelines;
- Hazardous water will be disposed off as soon as possible. Storage of hazardous waste on site will be according to current guidelines and best management practices and will be limited to necessary time periods;
- Solid waste should not be stored on Site for extended periods; and,
- *Nova Scotia Standard Specifications Highway Construction and Maintenance* (NSTPW, 2005), *Nova Scotia Watercourse Alteration Specifications* (NSEL, 1997) and the *Nova Scotia Erosion and Sedimentation Control Handbook* (NSEL, 1988) will be followed when constructing standard sedimentation and erosion control measures.

Monitoring

Ongoing monitoring is also recommended for the North Property as follows:

- Regular weekly visual inspections of the existing ditch from upstream to downstream reaches to the property boundary to ensure that mitigative measures continue to be effective;
- Water quality monitoring for total suspended solids at the property boundary and at downstream end of the stream to coincide with major precipitation and snowmelt events; and,

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- Biannual qualitative fish habitat surveys to ensure that mitigative measures adopted above continue to be successful.

Ongoing monitoring is also recommended for the South Property as follows:

- Visual inspection downstream of operations during major precipitation and snowmelt events to identify any pathways where there is the potential for the transport of suspended sediments toward McCurdy Creek or Folly River.
- If any pathways are identified, water quality monitoring for total suspended solids will be initiated at the property boundary and downstream if appropriate.

5.2.3 Summary

North Property

For the North Property, the existing ditching system is considered to be the nearest aquatic receiver for the Project and therefore creates a potential for interaction between the Project and the aquatic receiving environment. With the recommended mitigative and monitoring measures specific to the North Property (as detailed in Section 5.2.2), there is limited potential for pit activities to negatively interact with surface water or fish and fish habitat. With effective sediment and erosion control measures and compliance with the existing guidelines, and ongoing monitoring, the Project is unlikely to have significant adverse effects on fish habitat in the ditching system as well as downstream in McCurdy Creek.

South Property

For the South Property, McCurdy Creek is the nearest aquatic receiver to the Project, however, the drainage pathways from the Project are diffuse and via a series of agricultural ditches and a wetland area. With the recommended mitigative and monitoring measures specific to the South Property (as detailed in Section 5.2.2), there is limited potential for pit activities to negatively interact with surface water or fish and fish habitat. With effective sediment and erosion control measures and compliance with the existing guidelines, and ongoing monitoring, the Project is unlikely to have significant adverse effects on McCurdy Creek.

5.3 RARE FLORA

5.3.1 Description of Existing Environment

Species-at-Risk Database Review

In response to an information request in 2006, the Atlantic Canada Conservation Data Centre (ACDC) indicated records for 4 rare vascular plant species within a 5 km radius around the North and South Property areas (Project areas), and no records for rare non-vascular plants. Similarly, the Nova Scotia Museum provided records of 12 rare species of vascular plants within the 10 km grid that contains the Project Area. Rare plant species associated with the gypsum area around Maitland, found in an adjacent grid, as well as species associated with estuarine conditions were not included by the NS Museum (2006). Museum staff pointed out that the presence or absence of these plants should be determined during field assessments. The detailed results of the species at risk database review including tabulated lists of species are

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provided in Appendix E. None of the species listed are similarly listed under COSEWIC or SARA (lists updated March 20, 2007) or the Nova Scotia Endangered Species Act (as of 2006).

Based on habitat requirements and habitats available in the Project areas, the following plants listed as rare in Appendix E are unlikely to occur in the North or South Property areas:

Equisetum pratense, *Huperzia selago*, *Asplenium trichomanes- ramosum* and *Dryopteris fragans*. However, *Equisetum pratense*, as well as *Polygonum scandens* may occur in the wetlands adjacent to the Property areas (streamside fen and wooded floodplain).

Based on available habitat in the Project areas (refer to Appendix F), the following plants could potentially occur: *Lobelia spicata* may occur in dry fields, such as the blueberry fields/ abandoned blueberry fields; *Juncus subcaudatus*, *Bidens connata*, *Fraxinus nigra*, *Laportea canadensis*, *Lilium canadense*, *Polygonum arifolium* and *Stellaria longifolia* may occur in the wetlands or floodplains on or adjacent to the Project areas. *Megalodonta beckii*, a submerged aquatic plant, may occur in the ponds and streams on or near the Project areas. *Tiarella cordifolia* occurs in deciduous forests and intervalles and gravelly roadsides. Therefore, it may be found both on and adjacent to the Project areas.

Significant Habitat, Managed, and Special Areas

The results of a database review for significant habitat, managed, and special areas are presented in Appendix E. The ACCDC GIS database identified two areas with some degree of protection within a 5 km radius around the Study Area:

- Lower Debert Beach, protected under the Nova Scotia Beaches Act, is located about 3 – 4 km southeast of the study area at the Bay of Fundy coast.
- Little Dyke, an area owned by Ducks Unlimited, is located about 3- 4 km southwest of the Study Areas at the Bay of Fundy Coast.

Rare flora in the above areas will not be impacted by the Project development due to the distance from the project areas.

In addition, the Nova Scotia Department of Natural Resources (NSDNR) Significant Species and Habitat database was consulted to determine the presence of significant habitats and high priority areas for rare flora within the general area of the Project. A distance of around 10 km from the Project was used as a search radius. The search outlined the following habitats and species of interest:

- Fundy Dykelands that are located south of the Project area
- Salt marshes that are located east and southeast of the Project area along the Folly River basin and coastal areas.
- Sand bars, beaches and shorebirds associated with coastal areas south of the Project.

The Fundy dykeland habitat consists predominantly of agricultural lands developed from rich salt marshes found mainly in the upper Bay of Fundy of Nova Scotia and New Brunswick. Occurring in areas of high tidal range, dykelands owe their existence to dykes constructed to keep out the sea. Dykeland habitat may have the potential for some rare flora and fauna. The Fundy dykeland habitat is unlikely to be impacted by the Project development due to the distance from the Project areas (200 to 500 m from the South Property). Salt marshes were not

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associated with McCurdy Creek. Sandbars and beach habitats are unlikely to be impacted due to distance from the Project.

Rare Plant Assessment for Project

The specific scope of work for the rare plant assessment involved the following activities for the North and South Properties:

- Identify and map general habitat types;
- Survey the study area for rare plant species;
- Assemble vascular plant inventory; and
- Record GPS coordinates of all significant species found within the property, if warranted.

Habitat types were identified during a preliminary field visit on April 27, 2006. Subsequent rare plant surveys were conducted on July 17 and September 28, 2006, at the North and South Properties. The survey dates were chosen to cover early and late flowering times. The study area was surveyed for plant species listed as “endangered”, “threatened” or “vulnerable/special concern” under SARA, COSEWIC or NSESA, as well as plants listed as “Red” or “Yellow” in the NSDNR General Status Ranks of Wild Species in Nova Scotia (NSDNR 2001), and not restricted to the species listed by ACCDC or NS Museum as known to occur within five kilometres.

Both properties were surveyed by walking the perimeters, as well as several meanders across the properties, while ensuring that all habitat types were covered.

There were several distinct habitats identified on the North and South Properties. Habitat maps and descriptions are provided in Appendix F (Section F-1).

Four species of orchids were found, none of them rare. No rare vascular plants or rare lichens were found during the field surveys.

The vegetation on both properties indicates a long history of human use of the area, as there are many introduced plants. These plants were introduced to Canada from Eurasia through early settlers, some for cultivation, others inadvertently. Among the introduced plants found in the study area are Black Medic (*Medicago lupulina*), Cow Vetch (*Vicia cracca*), Purple Loosestrife (*Lythrum salicaria*), Yellow Devil (*Hieracium X floribundum*), Yellow King- Devil (*H. cespitosum*), White Bedstraw (*Galium mollugo*), Sticky Groundsel (*Senecio viscosum*) and sweet clovers (*Melilotus officinalis*), as well as grasses such as Timothy Grass (*Phleum pratense*) and Fine Bent Grass (*Agrostis capillaris*). *Lythrum salicaria* is invasive and the plants should be removed from the wetlands in order to protect the wetlands, particularly since the number of Purple Loosestrife plants is still very small.

The South Property consists largely of disturbed area surrounded by various wetlands and a clearcut. The disturbed areas include three small settling ponds, which are now starting to re-vegetate. Plants found in the settling ponds include Water Horsetail (*Equisetum fluviatile*), Cattail (*Typha latifolia*), Pondweed (*Potamogeton* sp.) and Greater Water Starwort (*Callitriche heterophylla*). Land vegetation in the disturbed areas is very sparse, and includes many introduced species (see above) as well as several native species, such as Field Horsetail (*Equisetum arvense*). None is rare.

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Detailed plant inventory for the North and South Properties correlated with habitat types and areas are provided in Appendix F (Section F-2).

5.3.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Based on the description of the existing environment, there are no rare or endangered flora or sensitive habitat in the Project development areas. The areas of development include a cultivated blueberry field on the North Property and agricultural lands located on the South Property. Wetlands will not be disturbed and a 30 metre buffer will be left between Project development areas and the wetlands. Therefore, with regard to rare flora and habitat, there will be a low potential for adverse effects or interactions predicted for the Project with the environment.

Despite the lack of rare or endangered species observed in the Project areas, it is prudent and environmentally responsible to minimize land and plant disturbance on the North and South Properties and to plan for reclamation and re-establishment of vegetative covers in accordance with the Project reclamation plan. This will be accomplished by adopting the following mitigative measures:

- Minimize the footprint for the operation, access road and the areas used for topsoil and overburden storage;
- Limit vegetation removal to only that required for the extraction and infrastructure;
- Progressive reclamation should be practiced where practicable;
- Remove and store sufficient organic soils to implement the reclamation plan;
- Protect wetlands from disturbance through infilling, access roads and gravel extraction by means of leaving a 30 m buffer.
- Prevent erosion as this may lead to loss of vegetation together with, or through, the loss of soil.
- Prevent sedimentation caused by erosion to enter wetlands or cover terrestrial vegetation outside of the work areas as this may kill or impair plants.
- Sediment control will be installed before construction starts, and erosion control measures will be installed at the end of construction, in order to prevent or minimize sedimentation leaving the work site.

5.3.3 Summary

In consideration of the absence of rare or endangered plants on the North and South Properties, and based on the plan to avoid wetlands, to minimize land and vegetation disturbances, and to reclaim the disturbed areas at the completion of the Project, adverse effects of Project activities on vegetation are unlikely.

5.4 WILDLIFE

5.4.1 Description of Existing Environment

Species-at-Risk Database Review

In response to an information request in 2006, the Atlantic Canada Conservation Data Centre (ACCDC) indicated 7 records of 6 rare vertebrate species, and two records of two rare invertebrate fauna within a 5-km buffer around the Study Area (ACCDC, 2006). ACCDC also notes that Wood Turtles (COSEWIC: Special Concern) are potentially present in the Study Area (i.e. present in adjacent watersheds), and that they utilize both the upper and lower elevations (ACCDC, 2006). In addition, the NS Museum, Heritage Division, assembled a list of 12 species of birds of concern, which were found nesting in the area, as well as four fish species and one shellfish species. While these species have not been found on the specific Project areas, they have however been found in the immediate area around the Project area. Museum Staff also points out that the nature of the wetlands in immediately adjacent areas is such, that there is a high probability for seasonal use of such habitats by a large number of other bird species, particularly during the migration period (NS Museum, 2006). Migratory bird species, which include most of the song birds present in Nova Scotia, are protected under the Migratory Birds Convention Act (MBCA). The protection extends to include nests and young of these species. Raptors such as Northern Goshawk are protected under the Nova Scotia Wildlife Act, as are fish-eating birds.

The detailed results of the species at risk database review including tabulated lists of species are provided in Appendix E.

None of the birds, dragon flies and molluscs is listed under COSEWIC/ SARA (as of March 20, 2007) or the Nova Scotia Endangered Species Act. However, most birds are protected under MBCA, and Northern Goshawk is protected under the NS Wildlife Act. Two of the four fish species are listed under COSEWIC: Striped Bass and Atlantic Salmon. The latter is also protected under the SARA.

Based on the NSDNR Significant Species and Habitat mapping (refer to Appendix E-5), three bald Eagle nests are located in forested areas near the Project Areas. Two of the nests were located 280m and 340m northwest of the west boundary of the South Property, west of McCurdy Creek and a third nest is located 5 km west of the Project areas. Other gravel pits in the area are located a similar or shorter distance to the nests. It is not known whether the nests have recently been occupied. The search 10 km radius search also outlined the following habitats and species of interest: Fundy Dykelands that are located south of the Project area; salt marshes that are located east and southeast of the Project area along the Folly River basin and coastal areas; and, sand bars, beaches and shorebirds associated with coastal areas south of the Project. These habitats have the potential to support rare and sensitive fauna.

Field observations

Incidental wildlife observations were recorded during the field surveys. A total of 13 species were observed (refer to Table 5.4-1). No rare or endangered species were noted. The mixed forests, open land, and intertidal habitats in this region provide various habitat options for

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wildlife. Significant concentrations of shorebirds and waterfowl inhabit the coastal areas, and common mammals include raccoon, red fox, muskrat, and mink (Davis and Browne 1996). Rabbit and coyote scat was noted in several locations in the Project area as well as along the watercourse. Workers on the site reported observing mink on a regular basis. Sightings of Canada geese were also reported.

Table 5.4-1. Incidental Wildlife Observations

Scientific Name	Common Name
<i>Charadrius vociferous</i>	Killdeer
<i>Anas rubripes</i>	American black duck (flying overhead)
<i>Melospiza melodia</i>	Song Sparrow
<i>Turdus migratorius</i>	American Robin
<i>Anas platyrhynchos</i>	Mallard duck (in water)
<i>Corvus brachyrhynchos</i>	American crow
<i>Spizella passerine</i>	Chipping sparrow
<i>Vireo olivaceus</i>	Red-eyed vireo
<i>Zonotrichia albicollis</i>	White-throated sparrow
<i>Castor Canadensis</i>	Beaver
<i>Ondatra zibethica</i>	Muskrat
<i>Rana clamitans</i>	Green frog
<i>Rana catesbeiana</i>	Bull frog (young of year tadpoles)

In the North Property, the area of proposed/expanded development consists of abandoned blueberry fields. It is reported by the former occupants of the North Property that the blueberry fields were heavily treated with herbicides in an effort to reduce the growth of weeds (Shawn Putnam, personal communication, December 2006). This has resulted in a reduction of herbaceous plant growth in the field. In the South Property, the proposed/expanded development consists of former agricultural fields of hay and grains. The Project developments are not encroaching on wetlands or forested areas.

5.4.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Based on the species-at-risk database review, there were five bird species identified as potentially present in the vicinity of the Project areas that were yellow rated (ACDC) and/or S2-rated (NSDNR). None of these birds were identified during the fish and vegetation surveys. The following discussion provides information on the likelihood that these species will utilize the habitat that will be directly disturbed by the Project development (i.e., abandoned blueberry fields, and abandoned hay/grain fields). Wetland and forested habitat will not be directly impacted by the project.

Bobolinks (yellow / S2/S3B rated) nest in dense grasslands, hayfields, and pastures. The South Property development consists of abandoned hay/grain fields that may offer suitable nesting habitat for this species. It is recommended that during the breeding/nesting period (May and August) that there be no surface grubbing of the abandoned hay/grain fields on the South Property development and that in the absence of a breeding bird survey, such activities be conducted outside these months so as to minimize any potential disruption. Alternatively, if ground disturbance is to take place May to August, it will be necessary to perform a breeding bird survey of the area to be disturbed in advance of this work to ensure that Bobolinks or other

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birds are not present as breeders. If Bobolinks are present, all work will be delayed until sets are complete.

The Northern Goshawk (yellow ranked) typically has a large home range that exceeds 2000 ha. The nesting sites typically consist of sizable tracts of tall mature trees with open understory. Considering the lack of appropriate nesting habitat in and immediately adjacent to the Project Areas it is unlikely that Project development will have an adverse effect on the population of the area.

The Sharp Tailed Sparrow and the Nelson Sharp Tailed Sparrow (yellow / S2/S3B ranked) typically inhabit coastal areas with salt/brackish marshes in the vicinity of salt water. The Project area does not provide this required habitat.

Likewise, the Project development area does not provide suitable habitat for the Northern Pintail (S2B ranked) and the Common Loon (yellow ranked). McCurdy Creek and Folly River may provide habitat for these birds. This would be far enough from Project development activities to minimize any adverse interaction.

Nova Scotia has the highest concentration of breeding Bald Eagles in northeastern North America and are not considered endangered. Pit development and operations on the western portion of the South Property, the portion of the property nearest to the eagle nests (280 to 340 m), have been minimized and the area is being reclaimed. Future pit activity for the South Property will be located further to the east, across Little Dyke Road. Project development activities on the North and South Properties will not likely have an adverse effect on the Bald Eagle population of the area. This is in consideration of the likelihood that eagles, if present, have "habituated" to the gravel pit activities in the area.

In 1996 the Wood Turtle was added to the "Vulnerable" section of the official list of species at risk of the Committee on the Status of Endangered Wildlife in Canada. "Vulnerable" means the species is of special concern because of its sensitivity to human activities or natural events - in this case, habitat disturbance by people and livestock along riverbanks, and removal from the natural habitat by people seeking pet turtles. Although no Wood Turtles were observed on the Project property, McCurdy Creek, located immediately adjacent to the property, may provide habitat for this species. Strict adherence to recommended setbacks and minimizing any runoff from the Project will protect the integrity of the potential aquatic habitats required by the Wood Turtle. In the event that a Wood Turtle is found on the Site, the proponent will contact the Department of Natural Resources and comply with any and all recommended procedures for the conservation of Wood Turtles.

The Fundy dykelands, salt marshes, sand bars and beaches in the area have the potential to support rare and sensitive fauna. However, the project area is sufficiently distant from these areas to avoid any negative interactions.

5.4.3 Summary

Based on the species-at-risk database review, there were five bird species identified as potentially present in the vicinity of the Project areas that were yellow rated (ACCD) and/or S2-rated (NSDNR). Only the bobolink and wood turtle were identified as of potential concern since the Wood Turtle could potentially utilize the forested wetland in the vicinity of McCurdy Creek

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and the Bobolink could utilize the abandoned hay and grain fields on the South Property as nesting habitat. Forested wetland will not be disturbed as part of the Project development and 30 m buffers will be established between the disturbed area and the margin of any wetland. Breeding bird surveys are recommended to identify the presence/absence of bobolinks or other nesting birds in the event that surface disturbance/preparation is required during the period May to August. Based on the implementation of the mitigative and monitoring measures outlined in Section 5.4.2, above, significant adverse impacts of the Project on wildlife are unlikely.

5.5 GEOLOGY, HYDROGEOLOGY, AND GROUNDWATER RESOURCES

5.5.1 Description of Existing Environment

The following discussion of the local groundwater resources and hydrogeology is based primarily on field observations of the Project area conditions supplemented by a desktop study. The field observations consisted of a walkover of the North and South Properties and a visual examination of geological characteristics of the pit faces and floors.

Physiography

The North and South Properties are located within the tidal bay region of Nova Scotia and is underlain primarily by Triassic red sandstone beneath glacial outwash deposits. The eroded sandstones resulting from sea level rise can be seen in the Avon and Shubenacadie river estuaries. The coastal portion of the development zone (just south of the south property) is characterized by wide salt marshes. The Folly and Debert Rivers, located east of the Project area flow southward from the Cobequids.

Geology

The surficial geology of the Project area and vicinity are characterized by a variety of glacial deposits including: glacial till deposits of varying thickness, texture, and stoniness; glacial fluvial deposits; organic deposits; or fluvial deposits along river valleys. The upper layers of the Glaciofluvial and outwash deposits (primarily sand and gravel) represent economic sources of aggregate, that underlie the Project area and generally occupy present day river valleys. It is these deposits, lying above the groundwater table, that have been mined as part of gravel pit operations in the area. The deposits can be expected to range from three to 12 metres in thickness, averaging less than seven metres. The areas to the east and west of the Project areas are underlain by glacial till deposits. Figure 5.5-1 illustrates the surficial geology of the Project area and vicinity.

The Project areas are located in a structurally and stratigraphically complex narrow plateau which extends in an east-west direction in a trend along Cobequid Bay. The rocks of this area range from Hadrynian to Middle Devonian age (900 to 374 million years) and are of igneous (plutonic/volcanic), metamorphic and sedimentary origin (Donahoe and Wallace, 1982). The bedrock of the Project area is mapped as being near the contact between the Windsor Group (sandstone, limestone, gypsum, anhydrite, and salt) and Wolfville Formation (sandstone and shale). There is no exposed bedrock outcrop within or near the Project areas, however, based on the lithology and abundance of cobbles and boulders observed in exposed gravel faces on in the development area, the Wolfville Formation red sandstones appear to dominate. Figure 5.5-2 illustrates the bedrock geology of the Project area and vicinity.

Surficial Soils

Salt Marsh, Herbert (South property) and Castley (North property) soils predominate across the area. The Salt Marsh soils are characterized by grayish-brown, silty clay loam marine sediments with very poorly drained soils. These soils are located to the east of both the South and North Properties associated with the Folly River basin. The areas of development on the North and South Properties are characterized by 20 to 50 cm of gravelly loamy sand to gravelly loam over loose glaciofluvial sands and gravels, usually stratified with rapidly- to well-drained soils. The subsoil material contains an abundance of rounded gravels originating predominately from igneous and metamorphic bedrock located in the Cobequid upland (Webb et. al., 1991). The forested wetlands located adjacent to McCurdy Creek are characterized by 40 to 60 cm of poorly decomposed organic material over moderately decomposed peat of mixed origin 50 to 180 cm deep over mineral material with very poorly drained organic soils.

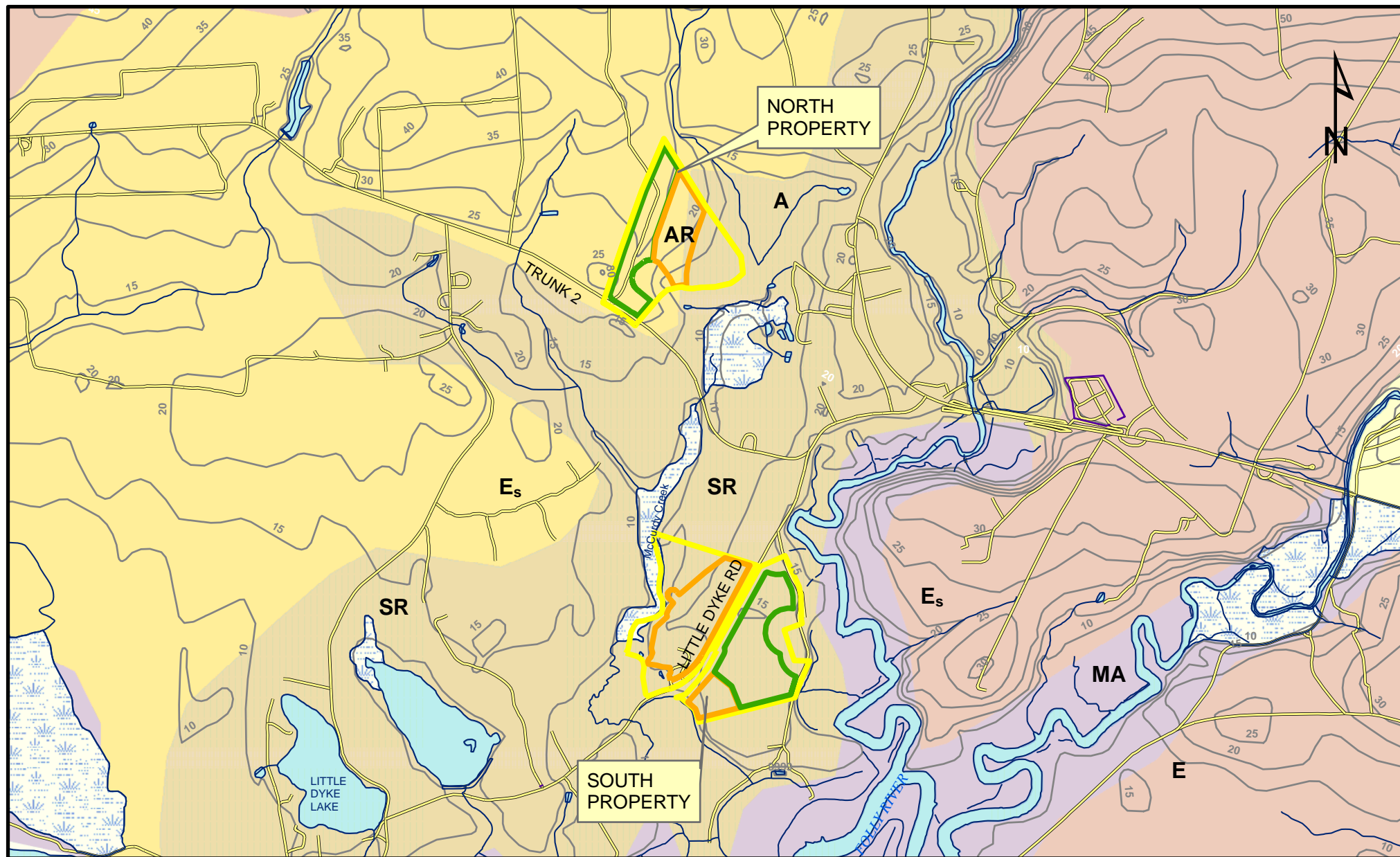
The abandoned blueberry fields on the North Property and hay/grain fields on the property are considered to be Class 3 soils based on the CLI Capability Classification for Agriculture. The soils have moderately severe limitations that restrict the possible range of crops grown. The limitations in the case of the Project Area include topographic considerations in the case of the North Property, and lack of water due to the well drained soils for both the North and South Properties (Webb et. al., 1989).

According to the Water Erosion Risk Mapping produced by Agriculture Canada (1992), soils encountered in the area would have a low to moderate risk of erosion due to water, if left bare and unprotected.

Acid Rock Drainage

Acid generating rocks are a group of mineralized geologic materials that contain various sulphides. When these minerals are disturbed and come into contact with water, oxygen, and iron reducing bacteria, the sulphide minerals, become oxidized and acid is generated in the process. The presence of iron reducing bacteria serves as a catalyst that accelerates acid production and the potential for generation of acid rock drainage (ARD). Carbonate minerals, where present, serve to buffer acid generation. The NSEL and Environment Canada have jointly prepared *Guidelines for Development on Slates in Nova Scotia* (April, 1991). To determine if a particular rock can be considered acid producing the total sulphide content must exceed 0.4 percent and the rock does not contain sufficient minerals such as calcium to neutralize or consume the acid. The guidelines are specifically targeted towards slate bedrock, particularly the Halifax Formation, yet the guidelines are also applicable to other sulphide-containing bedrock.

Based on available regional maps there are no known occurrences of acid generating rocks in the Glenholme area. A visual inspection of the working face at the North Property performed by a geologist did not reveal geological materials that may have originated from rock strata that are potentially acid generating.



Note: Surficial Geology Mapping obtained from
 "NSDNR-Mineria Resources Branch-
 Digital Products" DP ME D92-03 Version 1.
 1:10,000 Mapping provided by Service
 Nova Scotia, Municipal Relations Nova
 Scotia Geomatics Centre.
 UTM NAD83 Zone 20

Legend

- Proposed / Expanded Area of Project Development
- Existing Area of Project Development
- Property Boundary
- River/Stream
- Road
- Contours

Surficial Geology

HOLOCENE

A -Alluvial Deposits: gravel, sand, silt, minor clay and organic material; forms flood plains, channel and bank deposits, 2-15m thick.

MA -Marine Deposits: fine sand, silt, clay; locally overlain by peat and organics (salt marsh), forms intertidal mud flats.

LATE WISCONSINAN

SR -Saints Rest Member: glaciofluvial gravel, sand & minor silt; massive to horizontally stratified, forms outwash plains, 3-30m thick.

AR -Apple River Member: ice contact stratified drift, boulder, gravelly sand, sand & silt; forms hummocky & kettled terrain, 4-30m thick.

Es -Eatonville-Hants Till: (stony, sandy facies) reddish-brown stony sand till: loose to moderately compact, gravelly-sand & sand inclusion, forms hummocky & ribbed moraine generally in topographic depressions, locally with ice contact stratified drift, 3-20m thick.

E -Eatonville-Hants Till: reddish-brown silty sand till: moderately compact to compact.

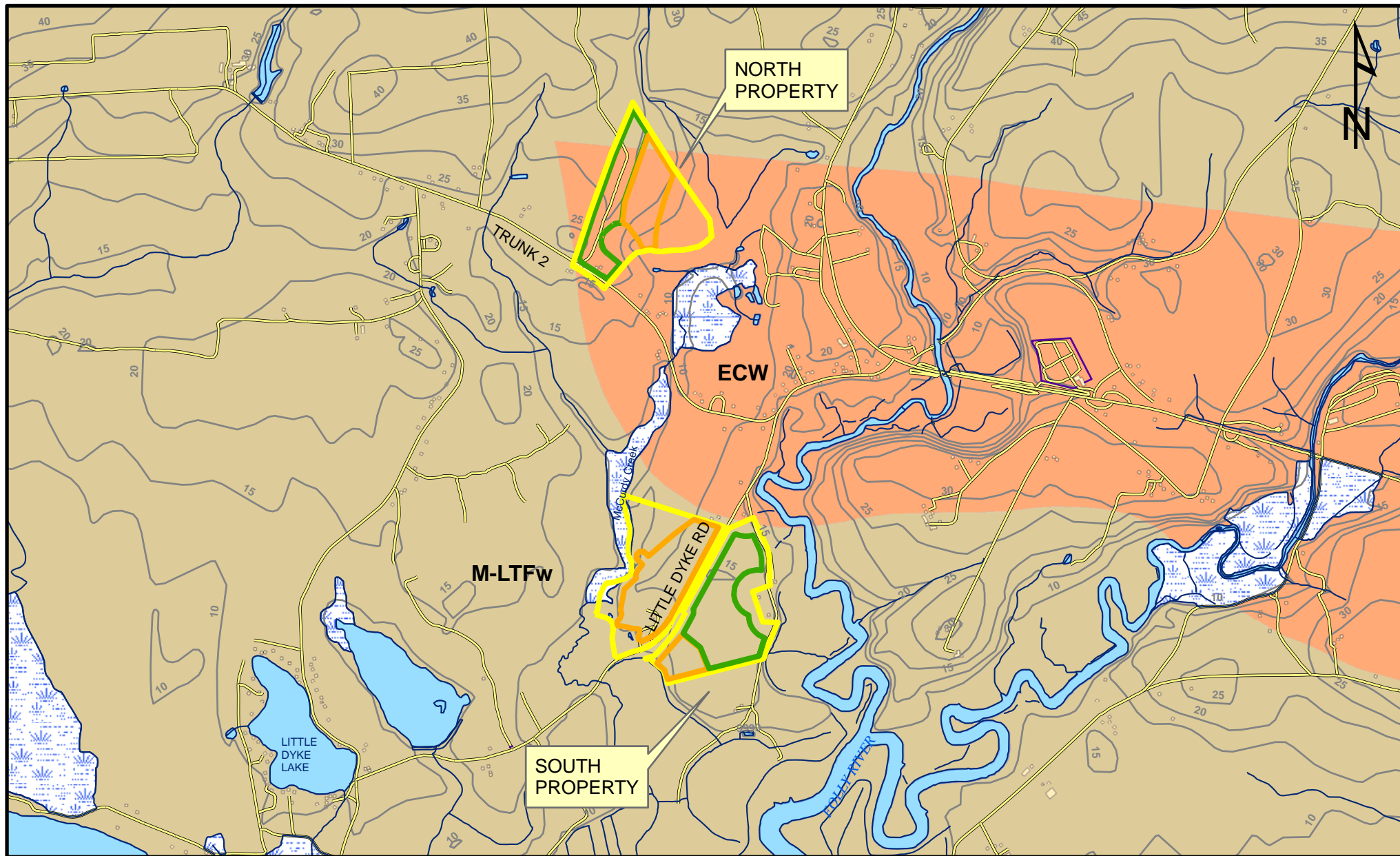
Figure 5.5-1
Surficial Geology
 Glenholme Gravel Pit
 Expansion Development

June 2007
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amec

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0 0.25 0.5 1 Kilometers



Note: Bedrock Geology Mapping obtained from "NSDNR-Mineral Resources Branch-Digital Products"- DP ME D00-01, Geological Map of the Province of Nova Scotia, 1:10,000 Mapping provided by Service Nova Scotia, Municipal Relations Nova Scotia Geomatics Centre, UTM NAD83 Zone 20

Legend

- Proposed / Expanded Area of Project Development
- Existing Area of Project Development
- Property Boundary
- River/Stream
- Road
- Contours

Bedrock Geology

Windsor Group
Early Carboniferous

ECW sandstone, limestone, gypsum, amhydrite, salt

Wolville Formation
Lake Triassic

M-LTFw sandstone, shale

Figure 5.5-2
Bedrock Geology
Glenholme Gravel Pit
Expansion Development
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Groundwater originates from infiltration of precipitation in the form of rain or snowmelt into the underlying soil and bedrock. Once infiltrating groundwater reaches the groundwater table, it flows from areas of high groundwater head (recharge areas) usually associated with higher topographic elevations to areas of lower elevation (discharge areas). An inference of the regional and local groundwater flow directions can be made based on topography.

There are two types of water bearing geologic formations (aquifers), which are typically used as groundwater resources in Nova Scotia: unconsolidated aquifers and fractured bedrock aquifers. Based on the available well records, bedrock aquifers seem to predominate in the Project area and vicinity. The potable water for the Glenholme area and vicinity is supplied by residential water wells. Based on the assumption that most of the wells in the Glenholme vicinity are drilled into Wolfville Formation sandstone, the water quality is expected to be good, with most parameters meeting the Canadian Drinking Water Guidelines (Health Canada 2003).

A review of available NSDEL well records database provides information for 79 drilled well logs that were constructed in or within an approximate five kilometre radius of Project area between 1965 and 2003. The well construction details for these 79 wells are summarized in Table 5.5-1. The wells average 33 m in depth, are typically cased in bedrock with an average 15.7 m of casing, and yield in the range of 1.5 to 350 gpm, with a median value of 8 gpm. Depth to the groundwater table ranges from 0.3 m to 30 m below grade.

Based on operational observations of seasonal standing water in the North and South Project development areas, the depth to the groundwater table typically ranges from 6m to greater than 12 m below original ground surface.

Table 5.5-1: Summary of Water Well Records for Glenholme and Vicinity

	Well Depth (m)	Casing Depth (m)	Estimated Yield (gpm)	Water Depth (m)	Overburden Thickness (m)
Minimum	7	6.66	1.5	0.3	3.3
Maximum	75	59.3	350	30	56.7
Average	33	15.7	11	5.8	13.3
Median	30	13.2	8	2.7	9.3
Number	79	74	74	71	32
Note: Only well logs within a 5km from the two properties radius were used.					

For the North Property, groundwater flow direction is inferred (based on topographic considerations) as being to the east to southeast, controlled by the moderate topography of the land surface and the height of land further to the west. Water rapidly infiltrates vertically into the permeable sands and gravels which underlie the western portion of the property and vicinity (upgradient) and flows as groundwater in an east to southeast direction toward the forested wetlands near McCurdy Creek. Essentially, the development area of the North Property acts as a groundwater recharge zone and the forested wetland area to the east and southeast act as a groundwater discharge zone. Residents located near the property along the south side of Little Dyke Road, likely have water wells on their property.

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For the South Property, groundwater flow direction is inferred (based on topographic considerations) as being to the west and southwest, again following the natural topographic gentle gradient of the area. The height of land separating the Folly River and McCurdy Creek drainage areas is located at the extreme east boundary of the development area. Based on topographic considerations, a small sliver of the extreme eastern portion of the South Property may naturally slope toward Folly River. Similar to the North Property, water rapidly infiltrates vertically into the permeable sands and gravels which underlie the Project area, flowing primarily in a west to southwest direction toward the forested wetlands near McCurdy Creek. The development area of the North Property acts as a groundwater recharge zone and the forested wetland area downgradient in the vicinity of McCurdy Creek acts as a groundwater discharge zone. The potable water for residential properties in the vicinity of the South Property is provided by water wells.

The individual well records for the residential properties in the vicinity of the Project area are not readily identifiable or discernable in the Nova Scotia Well Records Database because of lack of identifiers on many of the well logs such as street addresses or PIDs, however as shown in Table 5.6-1, the wells of the area are typically cased into bedrock and water supply therefore drawn from the fractured bedrock aquifer, likely Wolfville Formation sandstone. This has been confirmed during discussions with local residents who have stated that their wells are cased in the Wolfville Formation sandstone. Some residents have reported low yields for their wells in the Project area, a precondition not contributable to pit operations in the area.

5.5.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Potential impacts to residential water wells from pit operations are generally a function of pit development plans, distance from pit development, location of a well with respect to groundwater flow directions, and individual well construction details. There are residential properties with private wells near to the Project on Little Dyke Road, Folly Road, and Trunk 2. Typical impacts from a gravel pit operation could include possible water quality deterioration of down-gradient wells from surface runoff and/or accidental releases of deleterious substances, such as fuel oil within the quarry area.

Lowering of the groundwater table and decreasing well yield is not expected (either temporary or permanent) because there is an operational commitment that the gravel pit floor will not extend into the groundwater table. Any surface water resulting from major precipitation or snowmelt events will be controlled by means of pit floor grading, berms, and swales. Note that there may be some shallow excavation into the groundwater table during rehabilitation phase of the Project if constructed wetlands option is selected as part of the reclamation plan.

The private wells located near the North Property and South Properties are either trans-gradient or up-gradient of the inferred groundwater flow direction. Furthermore, over the life of the operations in the Project area (since 1987), there have been no complaints about deteriorating well water quality reported to NSEL related to Project gravel pit operations (NSEL, personal communication 2007). Therefore in consideration of the above and the operational commitment that the gravel pit floor will not extend into the groundwater table, it is unlikely that the Project will have a significant adverse effect on near-by domestic potable well water quality.

It is not anticipated that surface water flowing into the gravel pit at the sites would collect or pool in a manner that will require dewatering. Further, due to the granular nature of the shallow

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surficial deposits, perched groundwater conditions are not anticipated to exist and therefore groundwater flow through the pit walls is not expected across the site. These conditions have been confirmed during the operational history of the Project.

To address the potential for spills during Project operations, a contingency plan will be implemented for rapid spill response and clean-up in the event of a spill. Refuelling and maintenance activities for mobile equipment will be restricted where practicable to locations that will be based on minimizing potential off-site groundwater (or surface water) issues. These locations will be established in areas of the Project where there is some level of containment such as concrete pad, or other types of lower permeable covers overlying the sand and gravel base (to restrict infiltration) and at a safe distance (30 m minimum) from wetlands and watercourses. For equipment that must be filled at dedicated locations, the locations below the fuel tank and nozzle will be protected by means of a temporary measure such as absorbent spill pads or a temporary low permeable liner. Accidental spills or leaks of petroleum products or other deleterious substances from the vehicles, equipment and storage containers will be immediately contained and cleaned up in accordance with regulatory requirements. Hazardous waste including containers for petroleum hydrocarbon will be collected and disposed off-site at a licensed facility and in accordance with current guidelines.

It is recommended that as a precautionary measure and to address local concerns, a well survey be conducted on domestic water wells that are located within 200 m of the MSD property boundaries. The residents who reside within 200 m of the MSD property boundaries will be contacted and asked to participate in the well survey. Based on a review of current land use in the area, it is anticipated that the number of residential wells within 200 m of the MSD property boundary are three or four for the North Property and five or six for the South Property. Each individual well survey will consist of completing a questionnaire about the current and past status of the water well. Further, a water sample will be collected from each surveyed well using approved NSEL sampling protocols and submitted to an independent laboratory for analyses of general water quality parameters and metals. A well yield test may be required to verify current well yield capacity. The results of each well survey, water analyses, and test result will be provided to the resident and results from all wells compiled and submitted to NSEL. Additional testing on an annual basis will be conducted at the request of NSEL.

5.5.3 Summary

It is unlikely that the Project will have a significant adverse effect on near-by domestic potable well quality. It is recommended that as a precautionary measure and to address local concerns, a well survey be conducted on domestic water wells within 200 m of the MSD property boundary. The spill prevention/response and associated measures detailed above will ensure that adverse effect of spills on the groundwater environment will be rare events. Should any such spill occur, it would remain a small scale, localized and short term event.

5.6 WETLANDS

5.6.1 Description of Existing Environment

The NSDNR Wetlands and Coastal Habitats Inventory (2000) data for the Glenholme area is presented as Figure 5.6-1. The mapping shows no freshwater wetlands on the North Property

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and "Fen" in the southwest corner and along the western boundary of the South Property associated with McCurdy Creek.

Wetlands in the Project area were identified and characterized based on aerial photograph interpretation and field work consisting of habitat and rare plant surveys (refer to Appendix F). Encroachment on wetlands has been minimized during past operations and no encroachment is planned for the proposed/expanded development areas (refer to Figures 2-4 and 2-5).

From a hydrogeological perspective, it is likely that the Project development areas for both the North and South Properties act as a groundwater recharge zones and the wetland areas adjacent to Project development act as groundwater discharge zones (refer to Section 5.2.2). Water rapidly infiltrates vertically into the permeable sands and gravels which underlie the developed and proposed/expanded areas of the Project and flows as groundwater toward the wetlands near McCurdy Creek. The operational plan for the Project development is to avoid excavation into the groundwater table.

North Property

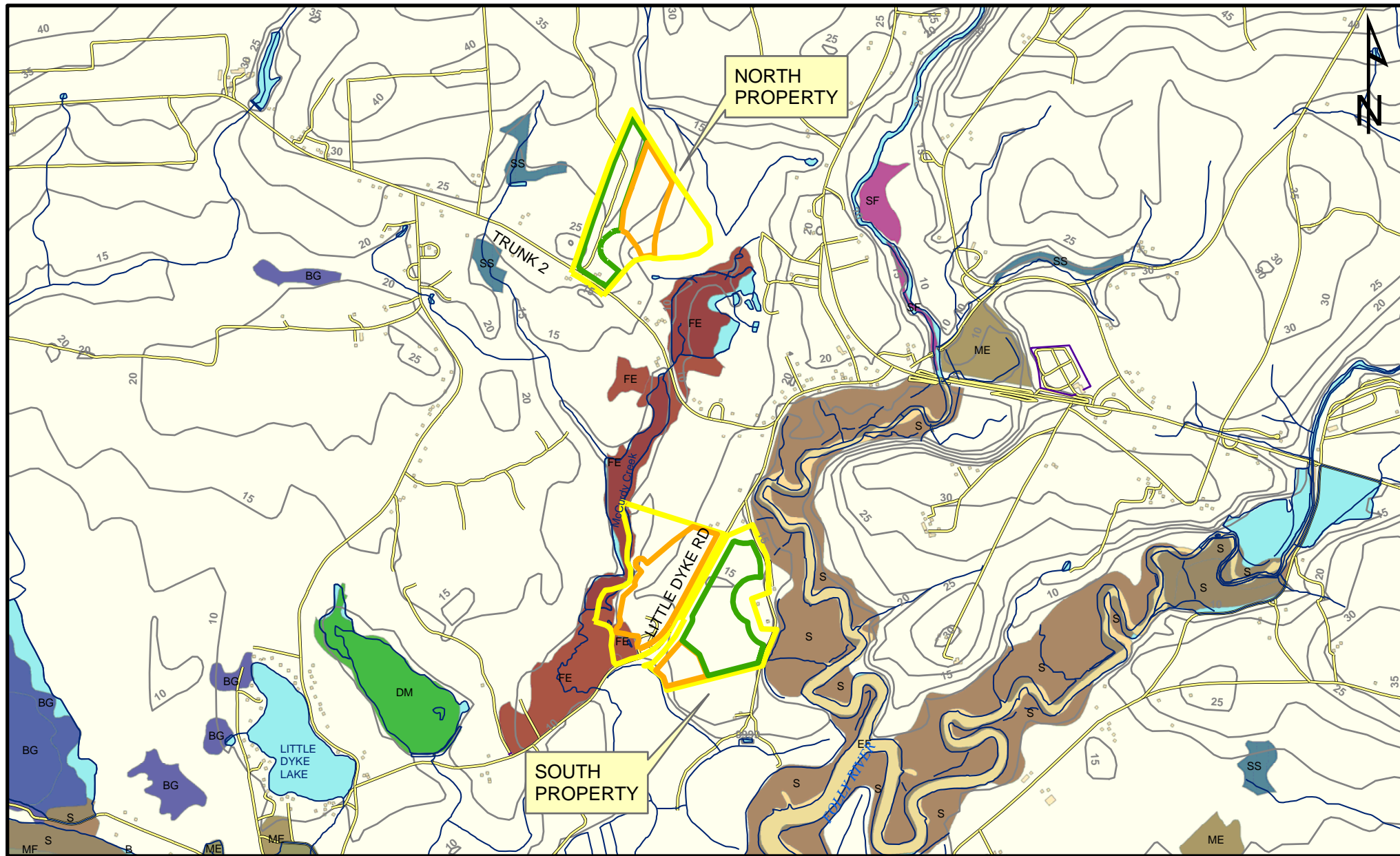
The habitat surveys and aerial photography for the North Property (refer to Figure F-1, Appendix F, and Figure 2-4) identified the presence of two areas of forested wetlands.

The larger forested wetland area (approximately 3.0 ha) is located along the eastern portion of the property, east of a disturbed area that is part of the existing pit operations. This forested wetland is separated from the pit operations by a drainage ditch and berm. This wetland is relatively free of disturbance related to past Project activities. Flow from this wetland is diffuse toward McCurdy Creek.

The smaller area of forested wetland (approximately 1.3 ha) is located in the southeastern portion of the property and is separated from the larger wetland by an existing access road to the lumberyard on the adjoining property. This small wetland flows onto the lumberyard property to a small man-made settling pond with discharge to a ditching system that flows diffusely toward McCurdy Creek. The results of the habitat survey indicated that the forested wetland has a medium to high potential for the presence of rare plant species. The results of the rare plant inventory for the North Property (Appendix F-2) indicated no rare vascular plants or rare lichens were identified during the field surveys. The smaller wetland has already been impacted from drainage originating from the operating commercial woodlot.

South Property

The habitat surveys and aerial photography for the South Property (refer to Figure F-2, Appendix F, and Figure 2-5) identified the presence of a shrub wetland located as a thin strip along the eastern boundary of the property (approximately 1.2 ha) and a forested wetland located in the southeast (approximately 1.6 ha). These wetland areas are contiguous and extend west from the property boundary to McCurdy Creek. Discharge from both of these wetland areas is diffuse and toward McCurdy Creek. The results of the habitat survey indicated that the forested wetland has a medium to high potential for the presence of rare plant species. The results of the rare plant inventory for the North Property (Appendix F-2) indicated no rare vascular plants or rare lichens were identified during the field surveys. The wetlands on the South Property are relatively free of disturbance related to past and current Project development.



Note: Wetland Mapping obtained from "NSDNR-Renewable Resources Branch-Wildlife Division "Nova Scotia Wetlands and Coastal Habitats Inventory (2000); 1:10,000 Mapping provided by Service Nova Scotia, Municipal Relations Nova Scotia Geomatics Centre. UTM NAD83 Zone 20

Legend

- Existing Area of Project Development
- Property Boundary
- Proposed / Expanded Area of Project Development
- River/Stream
- Road
- Contours

FRESHWATER WETLANDS

- (BG) BOG
- (DM) DEEP MARSH
- (FE) FEN
- (ME) MEADOW
- (SF) SEASONALLY FLOODED FLATS
- (SS) SHRUB SWAMP

SALTWATER WETLAND

- (EF) ESTUARINE FLAT
- (MF) MARINE FLAT
- (S) SALT MARSH

Figure 5.6-1

Surface Water and Wetlands Glenholme Gravel Pit Expansion Development

June 2007
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5.6.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Pit development could result in the loss of wetland habitat areas identified in Section 5.6.2 by surface land disturbance or hydrogeological effects. MSD has avoided disturbance of wetlands by ensuring that the existing and planned footprint of the pit development does not encroach on identified wetland areas and that an appropriate buffer is in place where required. For example the forested wetlands identified on the North Property are buffered from Project development by means of setbacks, berms, and ditches. Also, by avoiding excavation into the water table as part of regular operational practice, the hydrogeological regime and water budget for the area should remain essentially constant relative to existing conditions.

Surface water discharge into the wetlands from the Project development areas could result in sedimentation spilling onto the wetland ground surface, damaging plants. Discharge to wetlands will be minimized in consideration that operational practice will involve not excavating into the groundwater table and any surface water resulting from major precipitation or snowmelt events will be controlled by means of pit floor grading, berms, and swales. Silt control measures will be implemented where required as described in Section 5.2.2. Recommended measures and actions to reduce wetland sedimentation include, but are not limited to, the following:

- Silt fences and sand bag barriers;
- Erosion control measures including erosion control blankets, mulching, and vegetating;
- Sedimentation control measures to be inspected regularly, particularly in conjunction with rainfall events; and,
- Maintenance of sedimentation and erosion control structures to be performed regularly until the site has been stabilized.

Damage to wetland habitat could also result from accidental release of petroleum products or other deleterious substances from vehicles, equipment and storage containers. This type of incident will be minimized by the following measures:

- Rapid spill response and effective clean-up measures in accordance with regulatory requirements; and,
- Equipment refuelling and maintenance activities to be conducted at a safe distance (30 m minimum) from wetlands.

Ongoing monitoring related to wetlands is also recommended for the North and South Properties as follows:

- Regular weekly visual inspections of the wetland margins adjacent to Project development areas to ensure that mitigative measures continue to be effective; and,
- Visual inspection downstream of operations during major precipitation and snowmelt events to identify any pathways where there is the potential for the transport of suspended sediments to wetlands.

If any wetland sedimentation or potential for wetland sedimentation is identified from monitoring, mitigative action will immediately be taken.

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5.6.3 Summary

Assuming that the appropriate mitigative and monitoring measures as described above are implemented, it is unlikely that the Project will have a significant adverse effect on the adjacent wetlands. Strict adherence to recommended setbacks and minimizing any runoff and sediment deposition from the Project will protect the integrity of the wetland habitat. Avoiding operational excavation into the groundwater table should maintain the current hydrogeological regime for the wetland areas. No rare flora or fauna were identified during the rare flora survey and fauna observations.

5.7 AIR QUALITY

5.7.1 Description of Existing Environment

The Nova Scotia Department of Environment and Labour (NSEL) and Environment Canada (EC) monitor air quality at a total of 12 locations in Nova Scotia. Generally, air quality in Nova Scotia stays within national standards in most communities. The common air pollutants monitored regularly are sulphur dioxide, suspended particulate, fine particulate matter (PM_{2.5}), carbon monoxide, ground level ozone, nitrogen dioxide and other volatile organic compounds (VOCs). Exceedances for these contaminants are generally small and infrequent in Nova Scotia. The nearest EC air quality monitoring site is located in Jackson (monitoring acid precipitation), approximately 35 km northeast of the Project (NSEL, 2006).

Dust is currently generated from Project operations but is well controlled based on mitigation measures currently in place and outlined below. As shown on Figure 2-2, there are 24 and 14 buildings/structures within 500 m radius of the North Property and South Property boundaries, respectively. Based on discussions with a local NSEL representative, there is no record of complaints regarding offsite dust from Project operations (personal communication, NSEL, April 2007).

5.7.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Project activities can generate dust (i.e., particulate airborne matter) which has the potential to be transported offsite and impact near-by residences. It is anticipated that offsite nuisance dust from these operations will be minimal based on the following measures being implemented. On-site management of potential dust issues will be on a proactive basis. Natural barriers and man-made barriers such as trees and constructed berms will line the property boundaries that adjoin residential properties. Off-site dust emissions will be controlled with the application of water obtained from the sedimentation pond or from small shallow constructed sumps constructed at strategic locations on the pit floor. The application of an environmentally friendly chemical-based dust suppressant in areas of heavy traffic such as access roads and other high-traffic areas will be considered. Stockpiles/windrows of topsoil and vegetative material will be seeded and/or covered with mulch to minimize dust generation if required.

Monitoring of airborne particulate emissions (dust) will be conducted at the request of NSEL and in accordance with the *Nova Scotia Pit and Quarry Guidelines* (1999). The particulate emissions will not exceed the following limits at the site property boundaries:

- Annual Geometric Mean 70 µg/m³

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- Daily Average (24 hrs) 120 µg/m³

Greenhouse Gas emissions will be minimized through proper equipment maintenance and inspection, and reduction of engine idling when equipment is not in use.

5.7.3 Summary

The key concern with respect to air quality relates to potential dust effects of the Project on nearby residents. A series of mitigative measures are available to minimize dust generation and transport. Assuming the implementation of these measures, significant Project-related adverse effects on air quality are unlikely to occur. Monitoring requirements will be implemented at the request of NSEL.

5.8 NOISE

5.8.1 Description of Existing Environment

Currently the Project development activities produce noise originating from trucks traveling to and from the Project area, and equipment working within the footprint of the Project area. As shown on Figure 2-2, there are 24 and 14 buildings/structures within 500 m radius of the North Property and South Property boundaries, respectively. A review of NSEL's records indicated that there were no documented records of complaints from local residents regarding offsite noise levels from existing operations (personal communication, NSEL, April 2007).

5.8.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

There is a potential for off-site noise impacts on near-by residents and wildlife in and adjacent to the Project area from trucks and equipment. Noise connected with this Project is not expected to increase beyond current levels, except in the event of the award of a large aggregate or concrete supply contract. The operating schedule of the Project operation is based typically on 12-hrs/day, 5-days/week, year-round, with the potential for peak season expansion of operations to 7-days per week, 24-hours per day (typically for several week duration during the summer).

As with dust management, on-site management of potential noise issues will be on a proactive basis. Natural barriers and man-made barriers such as trees and constructed berms will line the property boundaries that adjoin residential properties. In addition, should equipment be required to work on 24-hours per day basis for a limited duration (e.g., due to large contract award), low impact back-up horns will be employed between the hours of 6 pm and 6 am to minimize potential noise impacts. Additional measures to reduce noise levels from pit operations will include maintaining access road quality and keeping all Project equipment in good operating order.

The potential for noise from the pit quarry site to have a significant effect on residents is minimal. In accordance with the Pit and Quarry Guidelines, sound levels from the operation in the expansion area will be maintained at a level not to exceed the following sound levels (Leq) from the property boundaries:

- Leq 65dBA 0700-1900 hours (Days)

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- 60dBA 1900-2300 hours (Evenings)
- 55dBA 2300-0700 hours (Nights)

Sound monitoring will be conducted at the request of NSEL.

5.8.3 Summary

The key concern with respect to noise relates to potential effects of the Project on nearby residents. Mitigative measures are available to minimize noise levels from the Project. Assuming the implementation of these measures, significant Project-related adverse effects related to noise are unlikely to occur. Monitoring requirements will be implemented at the request of NSEL.

5.9 ARCHAEOLOGICAL AND HERITAGE RESOURCES

5.9.1 Description of Existing Environment

The Nova Scotia Museum was commissioned to undertake a review their files for the presence of heritage resources (pre- and post contact Sites) in the Project area. In a letter dated May 24th, 2006, the Staff of the NS Museum, Heritage Division, indicated that it had no records of archaeological sites in the Project area. However, archaeological surveys had not been carried out in the area. Therefore, the available information for the area was incomplete and of variable accuracy as to the precise location and condition of heritage resources. Furthermore, the museum staff stated that the potential for presence of First Nations Resources at the Project site is elevated due to the adjacent rivers and streams. They also stated that there is an elevated potential for the presence of Acadian archaeological sites. Based on these facts, the Nova Scotia Museum recommended that an archaeological impact assessment be carried out in the areas affected by the Project.

Davis Archaeological Consultants Limited (Davis) was contracted to conduct an archaeological resource impact assessment of the Project areas in June and July 2006 consisting of the following components:

- Background historical documentary research.
- Archaeological potential modeling to more accurately denote the locations within the study area that have an elevated potential for archaeological resources.
- An archaeological survey designed to locate and assess the significance of archaeological resources within the study area. It is anticipated that sub-surface testing would be part of the survey strategy.

The report completed by Davis is provided in Appendix G.

Historical research of the Project areas was conducted on 08 and 09 June 2006 at Nova Scotia Archives and Records Management, by Davis staff. The purpose of this assessment was to assess the level of archaeological potential within the development area, to determine past land use, and to relate any archaeological resources encountered to their historic/pre-contact context. An archaeological predictive model was developed by in order to determine First Nations potential within the development zone. This was based on climate, terrain, proximity to

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available food resources and transportation routes, previous disturbance, and so on. A field survey was conducted by two Davis archaeologists under Category C Heritage Research Permit A2006NS49.

The historical background study has shown that the study area was inhabited by Acadian settlers in the eighteenth century and by New England settlers throughout the nineteenth century. However, due to a significant amount of disturbance in the development zones owing to agricultural activity in the twentieth century, both properties are believed to be of low potential for historic resources. A field reconnaissance was conducted by two qualified archaeologists, paying particular attention to any potential surface features and to the erosional surface of the Project development areas. Based on the field work, no archaeological resources were encountered within the Project development areas of either property and both properties are believed to be of low archaeological potential for First Nations or historic Euro-Canadian resources.

5.9.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

The Project development areas are of low archaeological significance and therefore there is minimal potential for the Project to cause a significant adverse effect on the archaeological or heritage resources of the area. No further mitigation of potential archaeological or heritage resources is required.

In the unlikely event that any archaeological resources are encountered during development activities, it is recommended that all disturbance activity cease and the manager of Special Places, Nova Scotia Museum (Robert Ogilvie, 902-424-6475), be contacted immediately to assess the find and, if required, determine a strategy for mitigation.

5.9.3 Summary

The results of the archaeological survey indicated that the Project area (both the North and South Properties) is of low archaeological potential and development is unlikely to cause a significant adverse effect on the resource. No further mitigation of potential archaeological or heritage resources is required other than the implementation of a work stoppage policy in case of the unexpected encounter of archaeological finds.

5.10 SOCIOECONOMIC ENVIRONMENT

5.10.1 Description of Existing Environment

Economy

Nova Scotia is a service-based economy, with 78% of employment in services sectors. The service economy provided employment for 340,000 people in over 32,000 businesses. The economy is led by community/business/personal services type businesses, accounting for almost 35% of total employment. Other leaders are retail trade (13% of businesses, 14.6% of employment), public administration (0.6% of businesses, 15% of employment) and manufacturing (6% of businesses, 12% of employment). In the year 2000, Nova Scotia's population was 940,996. The labour force data show a participation rate of 62.6% for the

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province, and an unemployment rate of 8.6% (down 1% from the 1999 average) (Statistics Canada 2001).

The Project area is located near Glenholme, Colchester County. Based on 2001 census data (Statistics Canada 2001), the total population of Colchester County was 49,307. The population of Colchester County west which includes the area west of Folly River (878 km²) to Cumberland County was 3,643. Based on the same census data, the population of Colchester County increased by 0.1% between 1996 and 2001, whereas the population of the western portion of the County declined by 3% during the same period². For Colchester County, the labour force data shows a participation rate of 62.7% and an unemployment rate of 9.9%. The participation and unemployment rates for the western portion of Colchester County, including Glenholme, were 58.1% and 11.6%, respectively (Statistics Canada 2001).

Colchester County, like much of rural Canada, is facing a rapidly aging population, increased out-migration of young people and tremendous competition for new immigrants from urban areas. Currently, the Colchester Regional Development Agency (CoRDA) along with associated municipal units are taking steps to address these trends by developing a regional repopulation strategy for the area with key components aimed at including youth recruitment and immigration (CoRDA 2005) .

Sales and service occupations are at the top of the list of Colchester County's workforce, followed by trades, transport and equipment operators and related occupations. Table 5.10-1 provides a breakdown of occupations by industry for Colchester County (Statistics Canada 2002).

Table 5.10-1: Occupation by Industry Breakdown, Colchester County – 2001 (All Census Subdivisions)

Industry	Number Employed	Percentage
Agriculture and other resource-based industries (primary)	1,780	7.3%
Manufacturing & Construction (secondary)	4,990	20.5%
Wholesale and retail trade	4,580	18.8%
Finance and real estate	690	2.8%
Health and education	4,045	16.6%
Business services	3,300	13.5%
Other services	4,995	20.5%
Total - All Industries	24,380	100.0%

Source: Statistics Canada, 2001 Community Profiles

The CoRDA's Regional Economic Plan (2005) indicates that infrastructure development will play an important role the long term growth of Colchester County. The Project development is well positioned to service any new demand since it currently supplies gravel, sand, stone, dry batch concrete, and manufactured soil to supply various local markets including residential and commercial construction, municipal infrastructure projects (i.e., water and sewer) and road building.

It is anticipated that the Project operation will employ 14 to 20 persons during production to operate heavy equipment, crushing and mobile equipment, dry batch cement production, trucking, and general labour activities. Hauling of materials from the pit involves additional

² The recent 2006 census population data indicates a continued decline of 3% for the western portion of Colchester County for the period 2001 to 2006 (Statistics Canada 2007).

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resources, employing several contractors and numerous truck drivers. The MSD and contract personnel (truck drivers and crushing operation) are locally sourced. The Project expansion will secure continuation of existing MSD employment levels and may require slight increases.

Land Use

MSD has operated in the Project area since 1987. The area in the vicinity of the Project is near several former and existing gravel pit operations as shown on Figures 2-2 and 2-3 (aerial photograph). Residential development in the area of the Project is limited with approximately 280 and 307 building structures within a 2 km radius for the North and South Properties, respectively. The land-use for the area can be considered rural and rural-residential. The lands within and surrounding the Project area have been used extensively for agricultural cultivation of mainly hay and grains. As discussed in Section 5.5.1, the former agricultural lands within the Project footprint are considered to be Class 3 soils having moderately severe limitations that restrict the possible range of crops grown. The agricultural lands associated with the adjacent Dykelands are considered to be of much higher quality and will not be affected by Project activities. The forestry industry is also active with the area as evidenced by the operating woodlot located southeast and adjacent to the North Property. The Glenholme area has been exposed to gravel pit and forestry development for several decades. Based on enquiries made to the Municipality of Colchester Planning Department, no land use zoning has been established for the community of Glenholme and vicinity.

The nearest residence to the North Property is located south-west of the Project area, across Trunk 2. Adjacent (vacant) properties are also owned by local residents. There are several residences adjacent to the South Property and again the area is bordered by several locally-owned vacant properties.

Transportation

Existing roads in the immediate area of the project consist mostly of paved secondary and some tertiary (dirt and paved) roads, used mainly by locals to access residences. Vehicles associated with the pit operations will involve haul trucks (9 to 32 tonnes capacities), concrete mixer trucks (2 to 20 tonnes capacity), and light vehicular traffic. Front end loaders, crushers, wash plant, and dry batch cement plant will operate on-site only, occasionally being moved from one property to the other as needed. Route of transportation will continue as has been the case for the existing operations and involve short distances through residential (country) areas to a provincial highway. Other traffic on the secondary and tertiary roads is typically light to moderate.

Vehicular traffic associated with the Project is not anticipated to increase above that of current levels (considering normal variability of activities). The average number of trucks hauling aggregates and concrete from the pit is 20 to 50 per day, depending on market demand. This could increase to as much as 100 to 165 per day, at peak production for short periods during the construction season, if a significant aggregate or concrete supply contract were awarded (e.g., a large highway construction project).

Visibility from the access road entrances to the North and South Properties are considered to be adequate based on existing speed limits and amount of current vehicular traffic.

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Recreation and Tourism

The recreation and tourism in the area is focused on outdoor activities in the countryside and some cultural and history oriented opportunities. The Canada Land Inventory (CLI) which classifies land capability for recreational purposes, rated the Colchester County area as a six (6) on a scale of one (1) to seven (7)³, considered as land areas or sheltered waters with low capability for outdoor recreation with special recognition of the nearby Cobequid Hills. Recreation is concentrated on localized features but activities are varied and include beaches, parks and recreational fields, bird sanctuaries, golf, hiking and walking tours, boat tours and charters, historical homes and museums, and markets and galleries (Government of Nova Scotia 2005).

There are two protected beaches within a five kilometre radius that have the potential to attract tourists. The project area also supports a recreational fishery (Folly River) and possibly hunting. There is one bed and breakfast establishment identified near the Project area. There are no parks in the vicinity of the Project area.

Human Health

Trends in human health for Colchester County are close to numbers calculated at provincial levels (Government of Nova Scotia, 2005), although the population of people who are obese is much higher in the regional area and there are fewer doctors per 100,000 population compared to provincial statistics: trends indicative of decreased regional health system performance.

5.10.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Economy

Economic benefits from the proposed Project will accrue to the regional and provincial economies. Project development will allow for continued supply of aggregate materials and concrete for municipal, provincial, and private infrastructure construction projects. The Project will continue to generate employment, the majority of which is sourced locally. The western portion of Colchester County had an unemployment rate almost 2% higher than the average Colchester rate and the population continues to decline. The Project will help secure, stabilize, and perhaps boost the local economy.

Land Use and Value

It is not expected that the planned project will have any short-term or long-term impacts on local land use or values since the Project area and vicinity have historically been active in gravel extraction and processing. In the short term, measures will be taken to minimize impacts to neighbouring properties from the Project. In the longer term, progressive and longer-term reclamation measures will ensure that the land will be reclaimed and re-vegetated to maintain acceptable aesthetics. Pit activities will be conducted in accordance with the *Nova Scotia Pit and Quarry Guidelines* (NSEL 1999) and all setback distances specified in the Guidelines will be maintained. There are no municipal land-use policies and zoning regulations for the Glenholme area impacted by the Project.

³ The scale ranges from 1 (very high natural capability to sustain one or more recreational activities of an intensive nature) to 7 (practically no natural capability for any popular types of recreational activity).

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Transportation

Typical vehicular traffic associated with the Project is not anticipated to increase above that of current levels which ranges from 20 to 50 trucks per day. This could increase to as much as 100 to 165 trucks per day, at peak production for short periods (i.e., several weeks) during the construction season, if a large aggregate or concrete supply contract were awarded. Based on current traffic patterns, volumes on approach roads in the Project area are low to moderate. No new access roads are required for the Project.

Since the typical number of loaded trucks per day leaving the property is not anticipated to increase substantially over current volumes (and considering normal variability of activities) and increased traffic levels would occur only over short periods of several weeks per year, the Project should not adversely affect the level of performance or safety of the roads from present conditions. MSD complies with all road restrictions, when/as appropriate.

MSD actively lobbies provincial and municipal government officials to maintain and upgrade the roads of the area in order to ensure safe trucking operations related to the Project. In this way, MSD will continue and to address concerns expressed by local residents regarding the potential for wear and tear on the roads. MSD continues to work with the local truckers to ensure safe trucking practices are implemented and by reminding the truckers to abide by the posted speed limits of the area.

Recreation and Tourism

The proposed Project will not cause a significant adverse effect on the protected beaches (refer to Appendix D) because of distance. The Project area is situated on cleared lands adjacent to roads and rural residences which are not considered suitable conditions for hunting. There is no interaction with the Folly River so therefore the Project will not cause a significant adverse effect on the recreational fishery. It is not expected, therefore, that the Project will have any impacts on local tourism or recreation.

Human Health

Human health related issues are discussed in Section 5.5 (Groundwater Resources), Section 5.8 (Air Quality), Section 5.9 (Noise) and 5.10 (Transportation). There will not be a significant adverse effect to the health and safety of nearby residents caused by the Project.

5.10.3 Summary

In summary, assuming effective application of recommended mitigative measures outlined above, significant adverse Project-related effects on the socio-economic environment are not likely to occur. The Project will likely generate economic benefits for the local community and Municipality, including employment and ongoing business opportunities.

5.11 OTHER UNDERTAKINGS IN THE AREA

As indicated in Section 2.0, the general area within which the Project is located has been historically used as a source of gravel for construction of roads and highways as well as other

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infrastructure. There are approximately seven other gravel pits operating or licensed to operate in the Glenholme and Little Dyke areas. Although these Undertakings add to the traffic flow in the region, MSD does not expect its Project activities to significantly increase the traffic flow.

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6.0 EFFECTS OF THE PROJECT ON THE ENVIRONMENT

The Project is currently an operating gravel pit and development consisting of two existing gravel pit operations located on two properties (refer to Figures 2-4 and 2-5) and associated equipment and infrastructure to carry out gravel and soil extraction, gravel and soil processing activities and batch concrete production. Based on an analyses of each of the identified VECs, it is concluded that with the implementation of recommended mitigation, monitoring, and progressive reclamation measures, the Project will not cause a significant adverse effect. Any effects to VECs will be of small magnitude, low frequency, short duration, limited geographical extent, and, in most cases, reversible.

Activities associated with the Project development will be conducted in accordance with terms and conditions of the future Industrial Approval, adherence to the Pit and Quarry Guidelines (NSEL 1999) and specific mitigative measures described in this assessment and all other applicable legislation, policies, and guidelines.

A summary of potential effects to VECs and requirement to mitigate against the potential for significant adverse effects is provided below:

Surface Water and Fish Habitat. The potential for pit activities to negatively interact with surface water or fish and fish habitat is unlikely so long as the recommended mitigative and monitoring measures as detailed in Section 5.2.2 have been implemented. The mitigation measures are mainly focussed on minimizing suspended solids from entering the aquatic receiving environment and on avoiding any impairment of fish habitat.

Rare Flora. Environmental effects of the quarry expansion will include the loss of terrestrial habitat within the expanded development. This is a non-reversible effect. However, in consideration of the absence of rare or endangered plants on the North and South Properties in the development areas, and based on the mitigation measures outlined in Section 5.3.2 to avoid wetland disturbance, to minimize land and vegetation disturbances, and to reclaim the disturbed areas at the completion of the Project, significant adverse impacts to the terrestrial environment from Project interactions are unlikely.

Wildlife. Based on the species-at-risk database review, only two species were identified as of potential concern (the Bobolink and Wood turtle). Forested wetland habitat protective measures will be implemented for both the North and South Properties and breeding bird surveys are recommended for the South Property if ground will be disturbed between the months of May to August. Based on the implementation of the mitigative and monitoring measures outlined in Section 5.4.2, significant adverse impacts to wildlife from the Project are unlikely.

Groundwater Resources. It is unlikely that the Project will have a significant adverse effect on near-by domestic potable well quality. It is recommended that as a precautionary measure and to address local concerns, that a well survey be conducted on domestic water wells that are located within 200 m of the MSD property boundaries. The spill prevention/response and associated measures detailed in Section 5.5.2 will limit the adverse effect of spills on the groundwater environment.

Wetlands. The mitigative measures detailed in Section 5.6.2 describe how wetland habitat will not be disturbed as part of future Project development and a 30 m buffer and other measures

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will be established between the disturbed area and the margin of any wetland. No rare flora or fauna were identified during the rare flora survey and fauna observations. Strict adherence to recommended setbacks and minimizing any runoff and sediment deposition from the Project will protect the integrity of the wetland habitat and ensure that significant Project-related adverse effects on wetlands are unlikely to occur.

Air Quality and Noise. Assuming appropriate mitigation (refer to Sections 5.7.2 and 5.8.2) to minimize off-site dust and noise effects, as well as the potential monitoring requirements that will be implemented at the request of NSEL, significant Project-related adverse effects on air quality and noise levels are unlikely to occur. These predictions are supported by the operating history of the Project and the absence of any documented complaints to NSEL regarding dust or noise impacts.

Archaeology and Heritage Resources. Based on the results of the archaeological survey that showed the Project area (both the North and South Properties) to be of low archaeological potential and unlikely to cause a significant adverse effect on the resource, no further mitigation is required other than the implementation of a work stoppage policy in case of the unexpected encounter of archaeological finds (refer to Section 5.9.2).

Socioeconomic Environment. Assuming effective implementation of recommended mitigative measures outlined in Section 5.10.2, significant adverse Project-related effects on the socio-economic environment are not likely to occur. The Project will likely generate economic benefits for the local community and Municipality, including employment and ongoing business opportunities.

7.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The environment may affect the Project primarily by way of climatic conditions. Major precipitation events (e.g., precipitation and runoff) may hold up the timely preparation, excavation, and reclamation of land within the active area of the proposed project. Further, wet weather or snow may limit when aggregate can be hauled from the Project. Climatic and associated conditions may not allow for Project activities to proceed safely and may temporarily delay the Project. With respect to precipitation, the Atlantic Region shows an overall increasing trend in precipitation since 1948, with an increasing trend in the number of daily precipitation events above 20 mm and a very slightly increasing trend in the number of daily snowfall events above 15 cm. This was based on a limited analysis of eight climate stations in the Maritime provinces over the period 1944-90 (Lewis 1997).

Based on experience operating in the Project area since 1987 there is seldom surface water flow observed from gravel pit and other disturbed areas. Precipitation and snowmelt tend to rapidly infiltrate into the subsurface. This can be explained by the high overburden permeabilities coupled with the operational plan of not excavating into the groundwater table. There are a number of planning, design and construction strategies to minimize the potential effects of the environment on the Project so that the risk of damage to the Project or interruption of service can be reduced to acceptable levels. Some of these mitigation measures are the design and installation of erosion and sediment control structures as required, and the grading of the pit floor to direct flows away from surface water receivers. Severe weather winter contingency plans need to be considered when planning Project activities.

In summary, climate and meteorological conditions, including climate change, are not anticipated to significantly effect the operation of the pit over its proposed lifetime.

Changing climatic conditions need to be addressed when designing for Project closure and reclamation. For example, if constructed wetlands are being considered, water management plans will need to incorporate the results of predictive climatic modelling for the development of a conservative design basis.

8.0 OTHER APPROVALS REQUIRED

As stated in Section 2.0, the Proponent is required to register this Project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*. In addition to the Environment Assessment Regulations, the Activities Designation Regulations is the other relevant provincial regulation which requires an industrial approval from the NSEL for operation of the Project. Provincial guidelines to be adhered to include the Nova Scotia *Pit and Quarry Guidelines* (NSEL 1999). Other relevant federal legislation includes the SARA, the *Fisheries Act* and the *Migratory Birds Convention Act*. It is not anticipated that any federal permits or approvals will be required for this Project.

9.0 FUNDING

The Project expansion will be 100 percent privately funded.

10.0 ADDITIONAL INFORMATION

No additional information is provided in support of this document.

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