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## **13 LAND USE**

### **13.1 Introduction**

North American's Upgrader site is located in the Alberta Industrial Heartland (AIH), near Bruderheim, Alberta. Other land and resource uses occur on or near the Project lands. Construction and operation of the Project may result in a change to the accessibility and availability of the land and resource uses in the area.

The objectives of the Land Use assessment are to:

- Identify land uses;
- Identify regulatory conditions and policy governing the various land uses; and
- Determine residual impact to land uses resulting from the Project following mitigation.

### **13.2 Study Area**

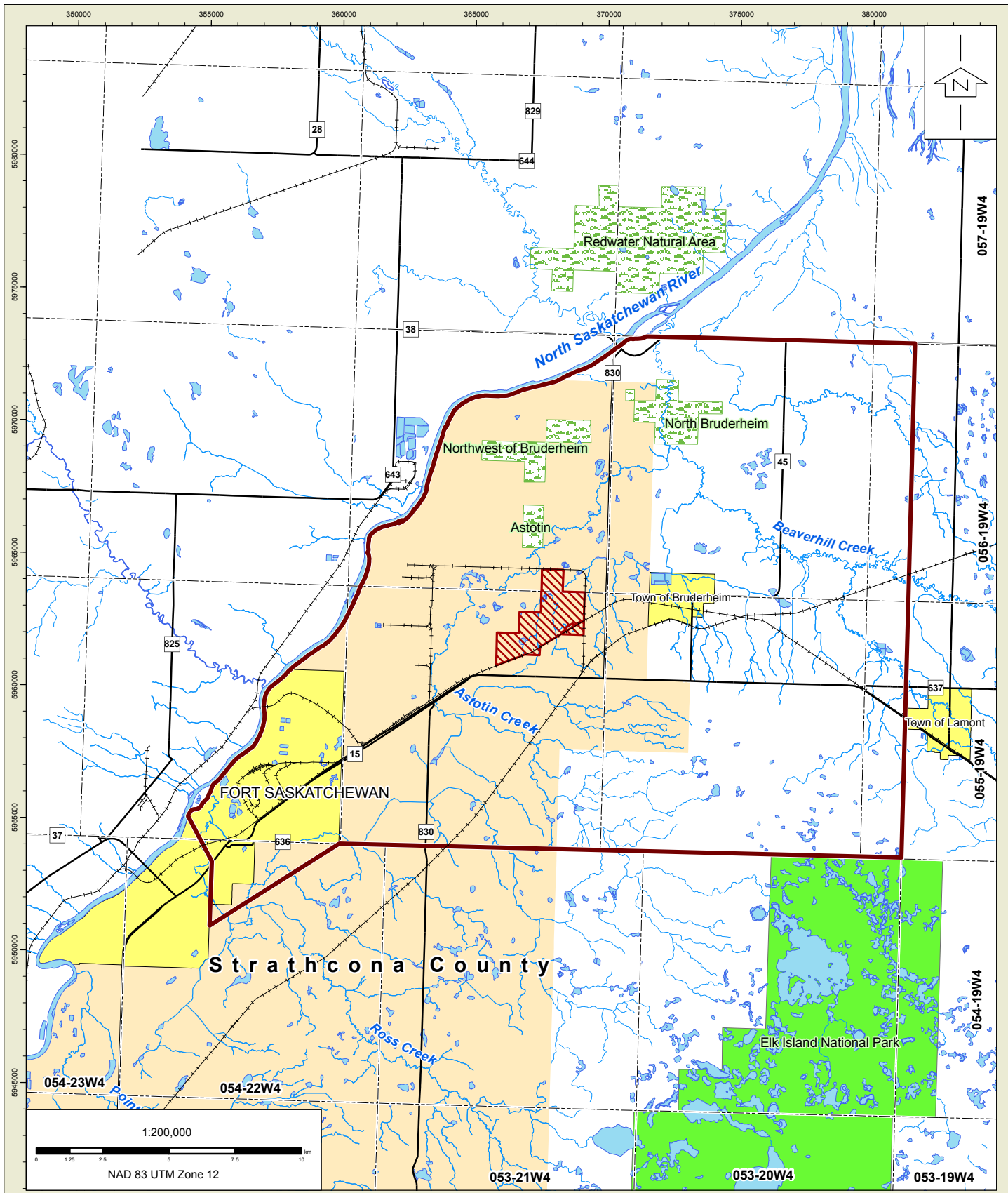
#### **13.2.1 Spatial Boundaries**

The Land Use local study area (LSA) has been designated for the indicators and issues identified for Land Use based on the potential for direct impact. The LSA is defined by the footprint of the Project.

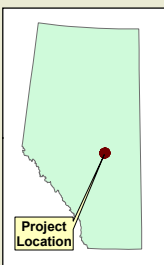
The Land Use regional study area (RSA) is bounded by the North Saskatchewan River (NSR) to the north and west, the City of Fort Saskatchewan to the southwest, a boundary to the south that runs east-west from the City of Fort Saskatchewan to the Hamlet of Josephburg and Elk Island National Park, and a portion of Lamont County to the east and northeast of the LSA that includes the AIH. The RSA includes all areas of the AIH that are located in Strathcona County and Lamont County. In some cases, such as the identification of environmentally important areas, information is presented for an area greater than the RSA. [Figure 13.2-1](#) depicts the LSA and RSA boundaries.

#### **13.2.2 Temporal Boundaries**

The temporal scope of the environmental impact assessment (EIA) reflects the timing and nature of the Project, as well as information available on other proposed projects as described in [Volume 2, Section 1](#). The Project schedule is outlined in [Volume 1, Section 1.4](#).



H:\198\_5\_14\MAPS\FIGURES\013\_RESOURCE\_USE\FIGURE\_13.2-01\_LAND\_USE\_LSA\_RSA\_ENV\_AREA.MXD



**Legend**

- North American Upgrader Land Use RSA
- North American Upgrader Land Use LSA
- Municipality
- Town / City
- Waterbody
- River / Stream
- Major Road
- Railway
- ATS Township/Range
- Alberta Natural Areas
- Elk Island National Park

Title:

**LAND USE LSA, RSA,  
AND ENVIRONMENTALLY  
IMPORTANT AREAS**

**NORTH AMERICAN  
OIL SANDS CORPORATION**

Approved: <b>MU</b>	Revision Date: <b>Oct 26, 2007</b>
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### 13.3 Issues and Assessment Criteria

The key issues and indicators considered in the Land Use baseline and impact assessments are derived from the Terms of Reference (TOR), as well as the key indicators identified in other Land Use assessments in the region. The issues that have been raised include:

- conforming with land use objectives and planning parameters for Strathcona County's AIH Area Structure Plan (2001a), Heavy Industrial Policy Area and the Planning Framework; and
- the Project impact on local and regional land use management.

The indicators of land use included in this assessment are:

- land use objectives, zoning and planning;
- recreational uses;
- environmentally important areas;
- residential areas;
- agricultural activities/development;
- areas with native vegetation;
- wildlife habitat; and
- industrial uses.

Effects of Project activities and mitigative measures were evaluated for these key indicators. Any residual impact remaining following mitigation was rated using the effects criteria as described in [Volume 2, Section 1](#).

### 13.4 Methods

Land use was identified from various sources, including the data collected and presented in other EIAs conducted in the AIH. This information is updated and augmented from a variety of sources. The information sources used to evaluate land use for the Project include the following:

- industry and government management plans relevant to land use, including, but not limited to, the Municipal Development Plans (MDPs) and land use bylaws for Strathcona County and Lamont County and AIH Area Structure Plans;
- personal communication and discussions with selected local land users;
- EIAs submitted for projects in the AIH (e.g., Shell Canada Ltd., 2005; BA Energy Inc., 2004);
- published material describing land use, including government and non-governmental websites; and
- information provided by other Project EIA component leaders following field investigation.

The Land Use investigation included collection of baseline land use information, assessment of the potential for the Project to impact identified land uses, and mitigation proposals for potential impacts, if necessary. It also included a review of the land use objectives and planning parameters for Strathcona County and Lamont County, as well as the planning documents for the AIH.

The information obtained provides a description of specified land uses within the study areas. Quantitative information was used when available. No formal surveys of land users were conducted as part of this study.

## 13.5 Existing Conditions

Existing conditions are described for the key issues that are identified in the TOR and are discussed in the land use assessment.

### 13.5.1 Land Use Zoning and Planning

The Project is located on private property in Strathcona County, approximately 2 km west of the Lamont/Strathcona County line and approximately 3 km west of the Town of Bruderheim. Bruderheim has a population of 1,215 (Statistics Canada Website, 2007). The RSA falls within Strathcona County's and Lamont County's land use and planning zones.

Strathcona County is one of the specialized municipalities in Alberta. This classification provides for the unique needs of a municipality that includes both a large urban centre (Sherwood Park) and a significant rural territory and population (Strathcona County Website, 2007). Strathcona County encompasses approximately 1,179 km<sup>2</sup> and has a population of 82,511 (Statistics Canada Website, 2007). Lamont County is a rich agricultural district (Lamont County Website, 2007) that encompasses approximately 2,400 km<sup>2</sup> and has a population of 3,925 (Statistics Canada Website, 2007).

The Project is located in the AIH, which is a unique planning area that is designated for long-term heavy and medium industrial growth (Lamont County Website, 2007). The AIH consists of four municipalities: Strathcona County, Lamont County, Sturgeon County and the City of Fort Saskatchewan. The AIH is not a municipality, and therefore does not have formal planning documents. Each of the four municipalities that are involved have created Complementary Area Structure Plans (CASP) that specifically plan for the areas of their respective municipalities that fall within the boundaries of the AIH.

There are a number of planning and land management guidelines that are relevant to the Project. These policies are summarized in [Table 13.5-1](#), and their relevance to the Project will be described in more detail in the following sections.

**Table 13.5-1 Summary of Major Planning and Land Management Policies**

Regulating Agency	Land Use Legislation, Policy, Plan or Administration	Brief Description
Alberta Ministry of Municipal Affairs and Housing	Alberta <i>Municipal Government Act</i>	Provincial legislation which gives municipalities the power to govern the development of lands within their boundaries. The planning and development process of these lands is based on a collaborative approach designed to meet both public and private goals and objectives to achieve agreement (Strathcona County, 2005).

Regulating Agency	Land Use Legislation, Policy, Plan or Administration	Brief Description
Strathcona County	MDP	The MDP provides a general framework for the growth and development of Strathcona County for a 20-plus year period. The MDP also provides policies that form the basis for the preparation of Area Concept Plans, Area Structure Plans, Area Redevelopment Plans and the Land Use Bylaw (Strathcona County Website, 2007).
	Land Use Bylaw	The Land Use Bylaw regulates the use, conservation and development of land in the county. The land use bylaw ensures that the quality and the appearance of the county is maintained and it fosters safe, economical and efficient development for all residents by ensuring that development regulations are respected and followed (Strathcona County Website, 2007).
	CASP for the AIH	The Strathcona County CASP for the AIH (Strathcona County, 2001a) outlines the following five objectives: <ul style="list-style-type: none"> <li>• to minimize land use conflicts by ensuring that appropriate land is provided for various types of development through definition of detailed policy;</li> <li>• to identify infrastructure requirements, including utilities and services;</li> <li>• to provide stakeholders and interest groups with opportunities for effective input and ongoing communication through a community consultation program;</li> <li>• to identify strategies to implement the eco-industrial Area Structure Plans; and</li> <li>• to designate planning policy areas within the boundaries of the AIH.</li> </ul>
Lamont County	MDP	The MDP is used by Council, the public and government agencies to ensure that land use and development occurs in an orderly, efficient and consistent manner (Lamont County, 2007a).
	Land Use Bylaw	The Land Use Bylaw regulates and controls the use and development of land and buildings within the municipality (Lamont County, 2007b).
	CASP for the AIH	Provides the basis upon which Lamont County can direct the future planning and development of its lands in the AIH (the AIH Association Website, 2007).
The Town Of Bruderheim	MDP	The MDP “is a tool by which policies are established to aid in making decisions relative to growth and development in a fair and equitable manner” (Town of Bruderheim, 2007) for the area included within the Town’s municipal boundaries.

### 13.5.1.1 Government of Alberta

Alberta's Municipal Government Act states that all municipalities with a population of 3,500 residents or more must adopt an MDP to establish land use and development objectives and policies. Both Strathcona County and Lamont County have adopted their own MDPs.

### 13.5.1.2 Strathcona County

#### Municipal Development Plan

On May 22, 2007, Strathcona County Council approved a new MDP (Bylaw 1-2007). On June 28, 2007, the City of Edmonton appealed the new MDP, and Strathcona County has since reverted to use of the MDP originally passed in 1998 (Bylaw 38-98). The next hearing in regards to the appeal has been scheduled for December 2007; no decision date has been scheduled (Rick Duncan, pers. comm., 2007). This assessment therefore references the MDP that was passed in 1998.

The MDP provides a general framework for the growth and development of Strathcona County for the next 20 years and beyond (Strathcona County Website, 2007). As stated in the MDP, there are three main objectives (Strathcona County, 1998):

- “To maintain and enhance the quality of life of Strathcona’s citizens through opportunities for realization of individual and community needs and aspirations;
- To enhance the environmental management of the County; and
- To provide for planned, efficient, economical and beneficial development which provides for a diversity of choice and lifestyle.”

The Strathcona County MDP (1998) separates the county into different policy areas, and also outlines considerations that must be taken into account when planning for an industrial development. The Upgrader will be built on land located in the Heavy Industrial Policy Area. A portion of the site is located in the Transition Zone: Agricultural Policy Area: approximately 125 ha in the west half of 36-55-21-W4M and approximately 7 ha in NW 26-55-21 W4M (south of the CNR rail line).

The Heavy Industrial Policy Area is “intended to accommodate heavy industrial and supportive uses which may have offsite impacts regarding safety, use, amenity or enjoyment of adjacent or nearby sites. The degree to which a heavy industrial use has a detrimental effect on adjacent or nearby sites and requires mitigation shall be determined through safety, risk and environmental assessment and review processes which are to be completed to the satisfaction of the County, provincial and federal authorities” (Strathcona County, 1998).

The Transition Zone: Agricultural Policy Area is an area that is designed to serve as an appropriate transition between heavy industry and residential and institutional land uses (Strathcona County, 1998). More specifically, “agri-business, agricultural development, light/medium industrial, commercial, recreation or conservation uses shall be encouraged to locate between lands designated for heavy industrial use and lands designated for residential and institutional uses” (Strathcona County, 1998).

#### Land Use Bylaw 8-2001

The Strathcona County Land Use Bylaw 8-2001 was approved on July 10, 2001. The Land Use Bylaw states that its objectives are to:



“regulate the use, conservation, and development of land, habitat, buildings, and signs in pursuit of the objectives of Strathcona County's statutory plans. These objectives are to maintain and enhance the quality of life by providing opportunities to attain individual and community aspirations; to conserve and enhance the environmental quality in Strathcona County; and to foster planned, efficient, economical and beneficial development that provides a diversity of choice, lifestyle, and environment.” (Strathcona County, 2001b).

The Strathcona County Land Use Bylaw includes seven general land use classifications as stated in [Table 13.5-2](#).

**Table 13.5-2 General Land Use Classification for Strathcona County**

Land Use Classification	Description
Agricultural	The purpose of this classification is to foster agriculture and conserve agricultural land by providing for a compatible range of agricultural uses with regulations that maintain large parcel sizes.
Commercial	The purpose of this classification is to provide for a broad range of services needed on a day-to-day basis by residents of urban neighbourhoods, hamlets or rural areas.
Direct Control	The purpose of this classification is to provide a mechanism to create districts with land use regulations for a specific site within Strathcona County when the control by other districts would be inappropriate or inadequate, having regard to existing or future surrounding developments and to the interest of the applicant and the public.
Industrial and Business	The purpose of this classification is to provide for business or industrial development in areas designated by the MDP, other suitable locations along highway corridors, large-scale and major industrial uses, and to avoid conflicts from the development of significant residential or assembly uses. Uses include primary and secondary agricultural processing, and some minor service functions in accessible and serviceable locations. Development should be designed and serviced to minimize the environmental effect. Nuisance factors are also considered.
Parks and Recreation	The purpose of this classification is to provide for the preservation of environmentally sensitive and significant areas, as well as lands which have significant natural capability for conservation, passive recreation and education.
Utilities and Services	The purpose of this classification is to provide for public and private utilities needed to serve Strathcona County and the region.
Residential	The purpose of this broad range of classifications is to foster residential lifestyles on properties of various locations, sizes and descriptions.

Source: Strathcona County, 2001b.

Each general land use classification is further broken down into land use districts. The Project is located in two districts, Heavy Industrial and Agriculture: General.

The purpose of the Heavy Industrial (IH) district is to provide for large-scale and major industrial uses that may have large land requirements and some nuisance effects on adjacent sites (Strathcona County, 2001b). Requirements that are relevant to the Project include:

- When an application is received by the County for a Land Use Bylaw amendment or development permit, and the application is consistent with a license, permit, approval or other authorization granted by a federal or provincial agency or Crown-controlled organization, the County must approve the application to the extent that it complies with the license, permit, approval or other authorization granted.

According to the Land Use Bylaw (Strathcona County, 2001b), the purpose of the Agriculture: General district is to encourage agriculture and protect agricultural land outside of the Urban Service Area. The district provides for a compatible range of agricultural uses, with regulations that maintain large parcel sizes. The district also provides for “a secondary dwelling on large parcels, additional agricultural dwellings, and complementary residential related uses that are compatible with the secondary residential role of an agricultural area” (Strathcona County, 2001b).

### Complementary Area Structure Plan for the AIH

Since the Project is located in the AIH, there are additional policies and land uses described in Strathcona County’s CASP for the AIH area that are applicable to the Project.

Each of the four municipalities that are included in the AIH has developed their own CASP for the area of their municipality that falls within the AIH boundaries. These CASPs work in correlation with each municipality’s MDP, and have been drafted to maximize coordination between the member municipalities so that the following six common goals can be realized (the AIH Association, 2002):

1. *Goal 1* – To diversify and strengthen the regional economy through investment of an additional one billion dollars by industry;
2. *Goal 2* – To diversify and strengthen the regional economy through investment of \$200 million in eco-industrial projects;
3. *Goal 3* – To diversify and strengthen the regional economy through investment by increasing business conducted regionally (i.e., the greater Edmonton area) by 5%;
4. *Goal 4* – To coordinate municipal services;
5. *Goal 5* – To communicate to target audiences; and
6. *Goal 6* – To gain active participation of businesses, industries and other stakeholders in the undertakings of the AIH business plan.”

The Strathcona County CASP for the AIH includes the following three land uses:

1. Environmental Policy Area;
2. Heavy Industrial Policy Area; and
3. Transition Zone.

These land uses are further organized in the following six development cells:

1. NSR: Environmental Policy Area;
2. Scotford: Heavy Industrial Policy Area;
3. Strathcona: Heavy Industrial Policy Area;
4. Astotin: Heavy Industrial Policy Area;
5. Sandhills: Heavy Industrial Policy Area; and
6. Transition: Light/Medium Industrial/Agricultural/Environmental Policy Area.

The LSA is located within the Astotin Heavy Industrial Policy Area, the Strathcona Heavy Industrial Policy Area and the Strathcona Transition Area. The two heavy industrial policy areas have the same intent, objectives and guidelines (Strathcona County, 2001a) and are discussed

together, while the Strathcona Transition Area is discussed separately. The guidelines outlined for these areas are important reference documents for the Project's land use planning.

### **Astotin Heavy Industrial Policy Area and Strathcona Heavy Industrial Policy Area**

The intent of the heavy industrial policy areas is "to accommodate heavy industry, such as petrochemical processing and manufacturing, oil and gas refining, and directly associated support service industries. Extensive agricultural operations may also be permitted to operate in the area" (Strathcona County, 2001a).

The Strathcona County CASP for the AIH (Strathcona County, 2001a) lists five objectives for the heavy industrial policy areas:

- "To accommodate heavy industry in an environmentally sound and economically efficient manner;
- To accommodate heavy industrial uses in areas that are characterized by low population densities;
- To maintain appropriate setbacks between industrial activities and other activities present in the area;
- To encourage maintenance and incorporation of agricultural activities with heavy industrial activities in mutually compatible ways; and
- To discourage the intensification of residential development."

### **Strathcona Transition Area**

As stated in the Strathcona County CASP for the AIH (2001a):

"The intent of the transition zone is to allow for significant spatial separation between heavy industry within [Alberta's Industrial] Heartland Area and those activities that surround it. Incorporating the currently designated land uses, the transition zone in Strathcona County allows for a gradient of land uses from heavy industry within [Alberta's Industrial] Heartland Area to conservation areas, light/medium industrial activities and agri-business to residential acreages and farms outside of [Alberta's Industrial] Heartland [Area]. The continuation of agricultural activities is allowed and encouraged" (Strathcona County, 2001a).

The Strathcona County CASP for the AIH (2001a) lists four objectives for transition areas:

- "To provide a zone of transition between the heavy industrial activities within the Heartland Area and those less densely developed activities located outside of the Area;
- To provide and maintain a diversity of land uses that reflect those types of land uses both within the Heartland Area as well as those adjacent to it;
- To minimize conflict between land uses on either side of the transition zone as well as within it; and
- To recognize the inherent value of the land uses within the transition zone."

### 13.5.1.3 Lamont County

Lamont County has three major planning guidelines, which include:

- the Lamont County MDP;
- the Lamont County Land Use Bylaw; and
- the Lamont County CASP for the AIH.

Each of these planning guidelines will be discussed separately in the following sections. As the LSA is not located in Lamont County, the discussion of the Lamont County planning guidelines will give an overall summary and will not deal specifically with the project. On September 11, 2007, Lamont County passed a new MDP, a new Land Use Bylaw and a new CASP for the AIH. The Town of Bruderheim and the Town of Lamont have recently appealed the new land use planning documents passed by Lamont County on September 11, 2007. The nature of the appeal is considered by Lamont County to be minor and fixable; therefore, Lamont County has continued to use the recently passed land use planning documents (Marie Kurylow, pers. comm., 2007).

#### Municipal Development Plan

The Lamont County MDP (Bylaw 674/07) is based on three fundamental principles (Lamont County, 2007a):

1. "To respect the rights of individual citizens and landowners and to consider the impact of any policy or decision within their overall public interest;
2. To develop planning principles to address the changing needs in agriculture to establish land use patterns which make efficient use of land, infrastructure, public services and facilities; and which contribute to the development of healthy, safe, and viable communities by encouraging appropriate mixes of all land use types, and a wide range of economic opportunities; and
3. Planning activities are to be carried out in a fair, open, consistent, and equitable manner."

The purpose of the MDP is to ensure that land use and development occurs in an orderly, efficient and consistent manner (Lamont County, 2007a).

#### Land Use Bylaw

The purpose of the Land Use Bylaw is to regulate and control the use and development of land and buildings within the municipality (Lamont County, 2007b).

#### Complementary Area Structure Plan for the AIH

There are two land use Policy Areas for the Lamont County CASP for the AIH. They are (Lamont County, 2001 as amended in 2007):

- Heavy/Medium Industrial Policy Area; and
- Agricultural Policy Area.

*Town of Bruderheim*

Because the Town of Bruderheim is not located within the LSA, the discussion of the Town of Bruderheim's MDP will give an overall summary and will not deal specifically with the Project.

The Town of Bruderheim MDP:

- "...is a tool by which policies are established to aid in making decisions relative to growth and development in a fair and equitable manner. The MDP, therefore, presents not only a vision of what the Town will look like in the future, it gives direction to Council on the day-to-day implementation of those policies through their decision making to achieve that long-term vision or goal."
- The Town of Bruderheim MDP has been prepared, taking into consideration the long-term vision established by Council through the creation and endorsement of their 2004 Strategic Plan – Vision 2020 (Town of Bruderheim Website, 2007).
- The goals for the Town over the long-term are to support the continued development of a community which values the existing small town atmosphere, while acknowledging the positive aspects of continued growth in conjunction with increased service levels."

There are four main areas that the local stakeholders have directed Administration to focus on, regarding future growth and development in Bruderheim. These are:

- "Emphasizing community values relative to the "Small Town" feeling – security, comfort, values, quality of life and community spirit. Do not only preserve these attributes, but strengthen them in the future.
- Providing services and supporting development which is of high quality, efficiently developed, and affordable.
- Supporting the development and implementation of community-led initiatives, which create a sense of ownership and true empowerment for stakeholders in the Town of Bruderheim.
- Ensuring that all initiatives in the community, whether residential, commercial or industrial, are sustainable over the long-term, so that this unique community can reach its full potential." (Town of Bruderheim, 2007).

### **13.5.2 Environmentally Important Areas**

Environmentally important areas have been designated or protected because of their environmental features. Environmentally important areas within the LSA and RSA are shown on [Figure 13.2-1](#), and include:

- areas designated as Environmentally Significant Areas by either the province or by an applicable municipality;
- areas protected under legislation; and
- areas designated as historical sites.

Historical resources are addressed in [Volume 5, Section 16](#).

### 13.5.2.1 Environmentally Significant Areas

Environmentally Significant Areas contain unique or representative landforms, rare or endangered vegetation or important wildlife habitat. Environmentally Significant Areas often contribute to biodiversity, as they represent a unique combination of landscape features, vegetation communities, habitats, species populations and genetic resources that are uncommon in the region. In Alberta, Environmentally Significant Areas are identified based on the following criteria (Sweetgrass Consultants, 1997):

- areas that provide an important linking function and permit the movement of wildlife over considerable distances, including migration corridors and migratory stopover points;
- areas that perform a vital environmental, ecological or hydrological function such as aquifer recharge;
- areas that contain rare or unique geological or physiographic features;
- areas that contain significant, rare or endangered plant or animal species;
- areas that are unique habitats with limited representation in the region, or are a small remnant of once-large habitats which have virtually disappeared;
- areas that contain unusual diversity of plant and/or animal communities due to a variety of geomorphological feature and microclimatic effects;
- areas that contain large and relatively undisturbed habitats and provide sheltered habitat for species which are intolerant to human disturbance;
- areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region;
- areas with intrinsic appeal due to widespread community interest or the presence of highly valued features or species such as game species or sportfish; and
- areas with lengthy histories of scientific research.

Unlike parks and protected areas, Environmentally Sensitive Areas are not protected by legislation.

According to a database provided by Alberta Tourism, Parks, Recreation and Culture (TPRC) (TPRC Website, 2007), based on work completed by Sweetgrass Consultants Ltd. (1997), there are no provincially recognized Environmentally Significant Areas located in the RSA.

The NSR and other watercourses (including Astotin Creek) are recognized in Strathcona County's MDP as Environmentally Significant Areas. The MDP states that heavy industrial developments near Environmentally Significant Areas must demonstrate that potential risks are managed and that the municipality's Emergency Services and adjacent industries have been consulted (the AIH Association, 2002). The municipally designated Environmentally Significant Areas within the RSA are described in [Table 13.5-3](#).

**Table 13.5-3 Municipally Recognized Environmentally Significant Areas**

Name	Features
NSR Valley	<ul style="list-style-type: none"> <li>• interprovincially important waterway;</li> <li>• diverse riparian and valley habitats;</li> <li>• key wintering area for white-tailed deer;</li> <li>• supports resident pike, walleye and sauger populations, as well as seasonal goldeye;</li> <li>• many sites of interpretative and educational value relative to geological and palaeontological history, as well as present-day fluvial processes;</li> <li>• possesses scenic and recreational traits not found elsewhere in Central Alberta;</li> <li>• the narrow remnant stands of white spruce are not commonly found in the Edmonton region; and</li> <li>• regionally important resting area for migrating waterfowl, historic peregrine falcon nest sites.</li> </ul>
Astotin Creek	<ul style="list-style-type: none"> <li>• important watercourse in north portion of Strathcona County;</li> <li>• wildlife travel corridor;</li> <li>• diverse valley and riparian habitats;</li> <li>• good beaver habitats;</li> <li>• sinuous creek valley that is relatively non-incised through most of its channel;</li> <li>• the creek flows through small, marshy floodplains and low sand dune areas;</li> <li>• the creek has a character unique in Strathcona County due to its geomorphology and amount of wetland habitat associated with the valley;</li> <li>• provides wetland habitat for the production of waterfowl where few such opportunities exist; and</li> <li>• diverse riparian and valley habitat conducive to many species of water birds and upland wildlife.</li> </ul>

Source: the AIH Association, 2002

### 13.5.2.2 Protected Areas

#### Provincially Protected Areas

There are different types of areas that can be protected by legislation within Alberta (TPRC Website, 2007) and are regulated under the *Wilderness Areas, Ecological Reserves, Natural Areas* and *Heritage Rangelands Act* (Alberta Government Website, 2007a) and the *Provincial Parks Act* (Alberta Government Website, 2007b). Additionally, areas may be protected through agreement between land users. Protected areas within the RSA (TPRC, 2007) are summarized in [Table 13.5-5](#). [Figure 13.2-1](#) shows the location of the provincially protected areas in the RSA.

**Table 13.5-4 Provincially Protected Areas**

Name	Features
Astotin Natural Area	<ul style="list-style-type: none"> <li>• gently rolling landscape;</li> <li>• small creek located in southeast corner that drains into Astotin Lake in Elk Island National Park;</li> <li>• several forest types, including white spruce-aspen and white spruce-paper birch mixedwood, jack pine on sandy knolls, some stands of balsam poplar; and</li> <li>• willow shrub fens rimmed with aspen in wet depressions.</li> </ul>

Name	Features
North Bruderheim Natural Area	<ul style="list-style-type: none"> <li>• rolling stabilized sand dunes;</li> <li>• upland jack pine woodlands; and</li> <li>• a variety of wetlands in dune depressions, including willow/sedge, sedge-reed grass and black spruce muskeg.</li> </ul>
Northwest of Bruderheim Natural Area	<ul style="list-style-type: none"> <li>• upland sand dunes and sandy plateaus interspersed with lowland wetlands;</li> <li>• jack pine-lichen woodlands on uplands;</li> <li>• black spruce-tamarack/Labrador tea and dwarf birch-willow wetlands; and</li> <li>• sedge-cotton grass meadow.</li> </ul>

### Federally Protected Parks

The Government of Canada has established the National Parks System “to protect and present outstanding representative examples of natural landscapes and natural phenomena that occur in Canada’s 39 natural regions” (Parks Canada Website, 2007). National Parks are protected by Canadian federal law for the purpose of “public understanding, appreciation and enjoyment, while being maintained in an unimpaired state for future generations” (Parks Canada Website, 2007).

While there are no national parks within the RSA, Elk Island National Park is adjacent to the southeast boundary of the RSA. Elk Island National Park has many different types of recreational activities, including (Parks Canada Website, 2007):

- hiking and walking;
- canoeing, kayaking and sailing;
- cross-country skiing and snowshoeing;
- wildlife viewing;
- golfing;
- camping;
- picnicking; and
- activities for children, including an organized “Junior Naturalist Program.”

Access to Elk Island National Park is through the well-established highway system, and therefore the Project will not affect access to the park.

### **13.5.3 Residences**

There are a number of residences located within the LSA, all of which are now owned by North American. In some cases the residences have been temporarily leased from North American by the previous owner, while in other cases the residences have been vacated and are uninhabited. Within the RSA there are many residences associated with farms and within the Town of Bruderheim.

Strathcona County’s CASP for the AIH states that no new residences or residential subdivisions are permitted to be built in the Heavy Industrial Policy Areas or the Transition Zone



(Strathcona County, 2001a). North American proposes no heavy industrial development on the lands within the Transition Zone area, as shown on [Figure 3.1-1 in Volume 1](#). The lands in the west half of 36-55-21-W4 may be used for construction parking and laydown. Development of the Project does not conflict with existing land use zoning.

### **13.5.4 Agriculture**

Agricultural activity is currently ongoing throughout the LSA and RSA. Agriculture is a permitted activity within the policy areas in which the Project will be located. Historically, 483 ha (86%) of North American's land has been used for agricultural activities. Approximately 444 ha of land will be displaced from agricultural use in order to construct the Project, leaving approximately 39 ha (approximately 7%) of land which could continue to be used for agricultural activities within the LSA.

A more detailed description of agricultural lands is included in [Volume 4, Section 9 - Soils](#), and [Volume 4, Section 10 - Vegetation and Wetlands](#).

### **13.5.5 Areas with Native Vegetation**

A complete discussion of vegetation is included in [Volume 4, Section 10 - Vegetation and Wetlands](#).

### **13.5.6 Wildlife Habitat**

Wildlife Habitat is discussed in [Volume 4, Section 11 - Wildlife](#).

### **13.5.7 Recreation**

The LSA is located on private land, and therefore access is restricted, including access to the area for recreational purposes. The following recreational indicators were not considered in this assessment because the indicators are not applicable:

- hunting;
- trapping;
- fishing; and
- outfitting.

Berry picking is a popular recreational activity in the Edmonton region and across Alberta, as is evident by the 150 Alberta Farm Fresh Producers Association member farms. There are no farms that offer berry picking in the LSA or RSA (Alberta Farm Fresh Producers Association Website, 2007). Permission to access wild berries, if present, must be obtained from private landowners.

The Project is located on private land; therefore, there are no formal recreational activities available within the LSA. There are no recreational facilities, parks or protected areas in the LSA.

Within the RSA there are five environmentally important areas as described in [Section 13.5.2.1](#). The Bruderheim natural areas give recreational users opportunity to undertake the following recreational activities (Lamont County Website, 2007):

- mushroom and berry picking;
- hiking and nature observation;
- birdwatching and wildlife viewing;
- horseback riding;
- orienteering; and
- nature lab for the local schools.

The NSR Valley offers such recreational activities as biking, hiking, cross-country skiing, birdwatching and wildlife viewing. Recreational snowmobiling is not permitted on the LSA. Snowmobiling is conducted in the RSA; there are over 160 km of trails located throughout the RSA (Fort Saskatchewan and District Snow Angels Website, 2007).

### **13.5.8 Industrial Uses in the Region**

Industrial uses in the LSA are consistent with the AIH planning frameworks. Industrial uses in the RSA are also consistent with land use zoning bylaws for their specific area, and are discussed in more detail in [Volume 5, Section 15 – Socio-Economic Impact Assessment](#).

#### **13.5.8.1 Upstream Oil and Gas Activity in the LSA**

A total of nine oil and gas wells have been drilled in the LSA. Of these nine wells, five have been abandoned and four are active. Auriga Energy Inc. operates the wells.

#### **13.5.8.2 Other Industrial Activity**

The Providence Grain Group's Gaudin facility is located in the LSA. Providence Grain Group is a grain company that handles both Canadian Wheat Board and non-Canadian Wheat Board grain. Providence also supplies seed, fertilizer, pesticides and herbicides (Providence Grain Group Website, 2007).

## **13.6 Impact Assessment and Mitigative Measures**

### **13.6.1 Impact on Land Use Planning Parameters**

The Project conforms to all of the land use objectives and planning parameters outlined in the various documents described in [Section 13.5.1](#) above, and therefore there is no impact predicted on land use planning.

### **13.6.2 Impact on Local and Regional Land Use Management**

The Project conforms to local and regional land use management, and therefore there is no impact predicted on local and regional land use management.

### **13.6.3 Impact on Residential Areas**

North American owns every residence located in the LSA, and will maintain a buffer between the Project facilities and adjacent residential development. As per the Strathcona County CASP, the

buffer will be determined by the County, using the guidelines of the Major Industrial Accidents Council of Canada (MIACC), after a review of the risk assessment of the facility as provided by North American (Strathcona County, 2001a). Therefore, there are no impacts to residential areas from a land use perspective.

#### **13.6.4 Impact on Agricultural Activities and Development**

The Project will displace agricultural land within the LSA. Impacts to soils and vegetation are described in [Volume 4, Section 9 - Soils](#), and [Volume 4, Section 10 - Vegetation and Wetlands](#).

#### **13.6.5 Impact on Areas with Native Vegetation**

Impacts to vegetation are described in [Volume 4, Section 10 - Vegetation and Wetlands](#).

#### **13.6.6 Impact on Wildlife Habitat**

Impacts on wildlife habitat are discussed in [Volume 4, Section 11 - Wildlife](#).

#### **13.6.7 Impact on Recreation Uses**

The Project is located on private land, and access onto the land is only allowed with permission from North American. As access is restricted, there is no predicted impact on recreational uses.

There are five environmentally important areas within the RSA, including:

- NSR Valley;
- North of Bruderheim Natural Area;
- Northwest of Bruderheim Natural Area;
- Astotin Natural Area; and
- Astotin Creek.

The Upgrader is not located adjacent to any of the natural areas listed above; therefore, access to and recreational activities within these areas will not be impacted. All Project activities will be located more than the required 30 m from the bank of Astotin Creek, and therefore the Project will be in compliance with land use guidelines.

Elk Island National Park is located adjacent to the RSA. Most of the park's 200,000 annual visitors are from Alberta, and they visit the park as part of a day trip (Parks Canada Website, 2007), a fact which implies that the majority of visitors are from the greater Edmonton area. No impact on recreational activities at Elk Island National Park is predicted.

#### **13.6.8 Impact on Industrial Uses in the Region**

North American consulted with Auriga Energy Inc. regarding their four active wells within the LSA, and discussed current plans for Upgrader earth work to start in late 2009/early 2010, with major construction starting in 2010. On review of simple production decline analysis, it appears that the current oil wells in the area will be depleted about the same time as construction is scheduled to begin. North American will negotiate with the operator, and may coordinate the surface reclamation of the wells with the construction work for the Project. Future drilling programs within

the LSA will be limited by North American through their rights as surface owners. North American may place a condition on future drilling programs, stating that the activity must be abandoned prior to the construction of the Project, or North American may object entirely to the new drilling program.

The impact on oil and gas activity is therefore negative in direction, the extent is limited to the LSA, the magnitude is low and the effect is both long-term and reversible in the long-term. Overall, the final impact rating on oil and gas activity is low.

The Project will not have an impact on Providence Grain Group's Gaudin facility, as the Project does not have any facilities located adjacent to the Gaudin facility.

The Project will not impact other industrial use in the region.

### **13.6.9 Summary of Impacts**

The Project is in compliance with local land use objectives and planning parameters. The Project will have a low impact on conventional oil and gas, because future activities in the LSA will be limited.

## **13.7 Cumulative Effects Assessment**

The Project will have no impact on land use in the region, and is in compliance with land use objectives and planning parameters. Therefore, there are no cumulative Project-related effects on land use.

## **13.8 Follow-up and Monitoring**

The Project will not have any impact on land use that require follow-up and monitoring.

## **13.9 Summary**

The development of the Project is in compliance with local land use objectives and planning parameters for the area of Strathcona County, in which the Project is located. The Project footprint is located entirely on private land owned by North American, and access is restricted, including access for consumptive and non-consumptive forms of recreation. The Project footprint does not impact the land use of any municipally, provincially or federally protected environmental areas.

The Project will have a low impact on oil and gas activity, as future development on the Project site will be limited by North American.

The Project will have no cumulative impact on land use in the region.

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### **13.10.2 Personal Communications**

Duncan, Rick. Municipal Government Board. Contacted in September 2007

Kurlyow, Marie. Lamont County. Contacted in November 2007

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## 14 LIGHT

### 14.1 Introduction

The North American Upgrader Project is located in Alberta's Industrial Heartland. The closest communities are Fort Saskatchewan, approximately 15 km to the southwest, and Bruderheim, approximately 3 km to the east. The purpose of the light assessment is to evaluate potential effects of lighting associated with the Project on nearby residences.

As part of the Project, exterior lighting will be installed. Lighting is used extensively by industrial facilities for operations, safety and security. The light that escapes the site (known as light trespass) can be regarded as a nuisance by property owners immediately adjacent to these facilities. The following issues were the focus of this assessment:

- Illuminance – the total luminous flux (i.e., the perceived power of light) incident on a surface per unit area. Illuminance is measured in lux and can be thought of as the amount of incident light available to read the text on a piece of paper at a specific location.
- Luminance – the luminous intensity (i.e., the power of light energy emitted) per unit area projected in a given direction. A direct line of sight is required for this issue to be of importance. Luminance is measured in candela per square metre ( $\text{cd}/\text{m}^2$ ). While illuminance levels can be low at a particular location, bright lights in the distance can still be objectionable to people looking at the light. Luminance can be thought of as the "brightness" of such a light. Note that while brightness is subjective and cannot be measured, luminance is a measurable quantity that closely corresponds to brightness, as both parameters are dependent on the area and angle from which the light is emitted.

Several existing and proposed industrial facilities are located in the Fort Saskatchewan area. As some of these facilities are in close proximity to the Project, the potential for overlapping lighting effects exists. Such effects have been considered in this assessment.

Table 14.1-1 shows the key issues for light and their relevance to the Project. The selection of these key issues is based on the TOR for the Project and the professional judgment of the authors.

**Table 14.1-1 Key Issues for Light**

Project Phase	Key Issue	Source	Relevance to Project
Operations	Effects of operation activities on illuminance	TOR	The Project facilities will include night-time lighting which might affect nearby residences.
	Effects of operation activities on luminance	TOR	The Project facilities will include night-time lighting which might affect nearby residences.

### 14.2 Study Area

The Project is located along the north side of Highway 15. Dow Chemical, Keyera Energy, TransAlta Cogeneration LP and Sherritt International all have facilities located along Highway 15 and to the southwest of the Project. The Shell Canada Scotford Complex is located directly to the



west. Total E&P Canada is proposing an upgrader to the southwest, and Shell Canada is proposing an expansion of their complex to include the Shell Canada Scotford Upgrader 2.

Private residences in close proximity are considered to be receptors that are potentially affected by the light emitted from the Project. Because light intensity decreases with increasing distance (the intensity of light diminishes inversely with the square of distance), receptors farther than 2 km from the Project boundary are not considered to be affected. Although lights can be seen at distances greater than this, light impacts beyond 2 km are typically comparable to general lighting in the vicinity of the receptor (e.g., street lights). Consequently, a local study area (LSA) extending 2 km from the Project boundary was selected to assess receptors directly impacted by the Project.

A 5 km regional study area (RSA) was selected to assess overlapping effects (cumulative impacts) on the receptors within the LSA from significant existing and proposed light sources. For example, a receptor at the edge of the LSA can be affected by the Project as well as another light source outside of the LSA. Such light sources include industrial facilities to the west and southwest, and also the community of Bruderheim to the east.

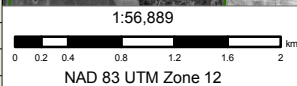
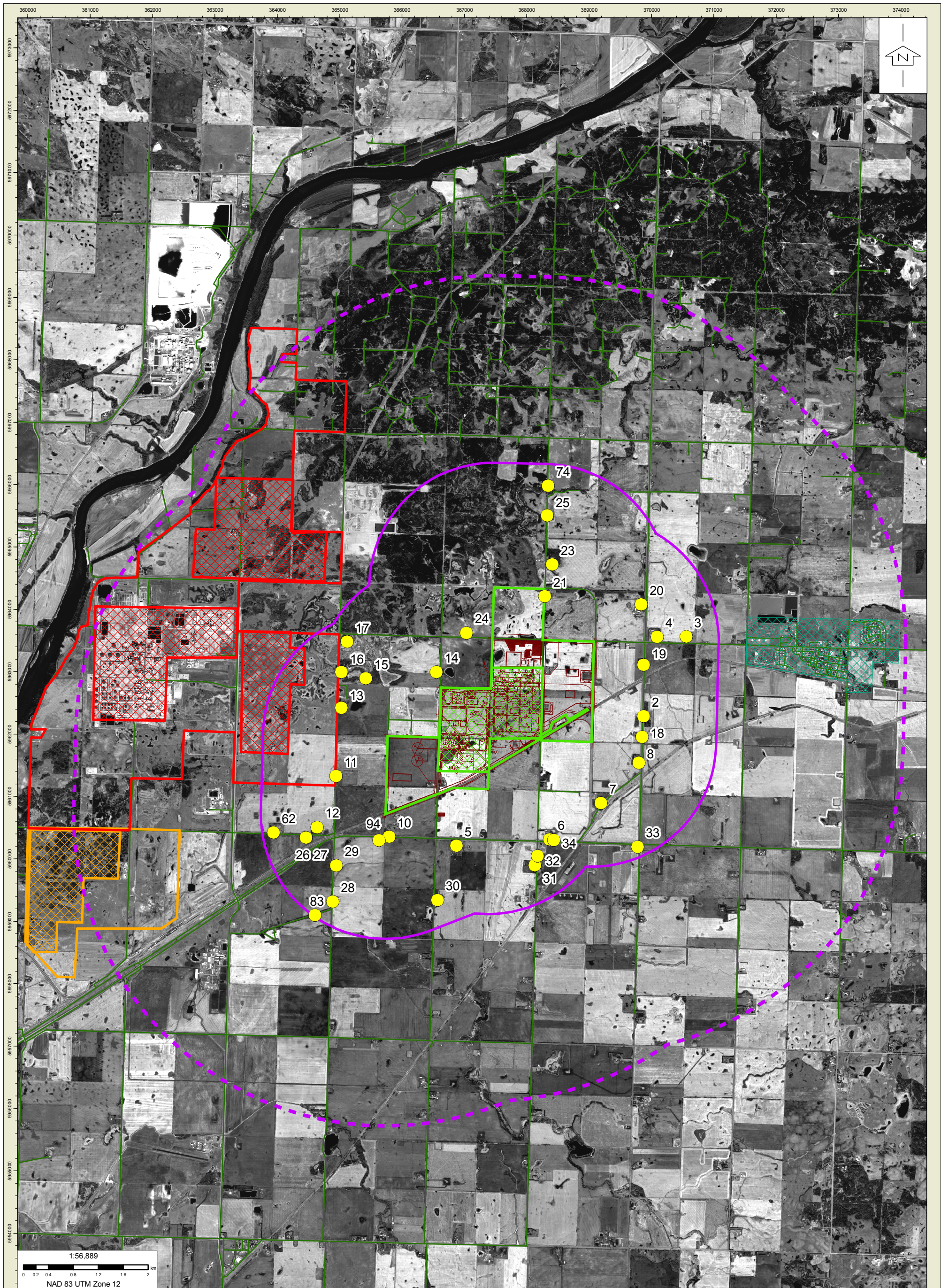
Receptor locations are listed in [Table 14.2-1](#). The LSA, RSA and receptor locations are shown in [Figure 14.2-1](#).

**Table 14.2-1 Light Receptors**

Receptor	UTM Coordinate (m) NAD 83 Zone 12		Comments
	Easting	Northing	
R2	369871	5962288	view of Project through trees
R3	370552	5963564	has a yard light, no view of Project due to trees on road
R4	370087	5963561	has a yard light, partially treed lot
R5	366867	5960212	view of Project, just south of Highway 15
R6	368360	5960315	just north of Highway 15
R7	369188	5960895	treed lot but clear view of Project
R8	369791	5961541	has yard light, treed lot
R10	365790	5960355	just north of Highway 15, treed lot but view of Project
R11	364939	5961328	view of Project
R12	364632	5960507	heavily treed lot, possible view of Project
R13	365024	5962425	heavily treed lot, possible view of Project
R14	366546	5962995	has a yard light, clear view of Project
R15	365417	5962893	heavily treed lot, possible view of Project
R16	365025	5962997	heavily treed lot, possible view of Project
R17	365116	5963482	heavily treed lot, possible view of Project
R18	369846	5961956	heavily treed lot
R19	369872	5963113	treed lot
R20	369832	5964079	heavily treed lot
R21	368287	5964208	thin shelter belt but will still have view of Project
R23	368408	5964719	will have view of Project
R24	367030	5963624	berm to south but will still have view of Project
R25	368326	5965508	heavily treed property, no view of Project
R26	364457	5960341	heavily treed lot, possible view of Project
R27	364457	5960341	heavily treed lot, possible view of Project
R28	364883	5959319	possible view of Project
R29	364943	5959893	treed lot, possible view of Project
R30	366566	5959343	view of Project
R31	368124	5959901	south of Highway 15, yard light, treed lot, view of Project
R32	368169	5960050	south of Highway 15, yard light, treed lot, view of Project
R33	369773	5960194	just south of Highway 15, yard light
R34	368431	5960306	just north of Highway 15
R62	363936	5960424	treed lot
R74	368338	5965982	has yard light, heavily treed lot, no view of Project
R83	364602	5959099	possible view of Project

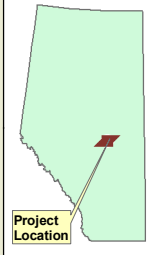
Note: Receptor numbers not on this list are commercial, unoccupied or outside of the 2 km LSA. These receptor numbers are consistent throughout the EIA.

Field data were not collected for R94 and subsequently light intensity analysis was not conducted. R10 has been used as a conservative surrogate in its place. R10 is not only close to R94 (175 m to the NE) but is also closer to the Project than R94. Thus effects of light from the Project at R10 will be greater than those at R94.



**Legend**

- NAOSC Footprint
- NAOSC Site Boundary
- NAOSC Primary Light Area
- Shell Scotford Site Boundary
- Shell Scotford Primary Light Area
- Total Site Boundary
- Total Primary Light Area
- - - 5 km Buffer of Lease (RSA)
- 2 km Buffer of Lease (LSA)
- Road
- Town of Bruderheim



Title:

**Light Assessment  
Receptors**

 <b>NORTH AMERICAN OIL SANDS CORPORATION</b>	
Approved: <b>SBB</b>	Revision Date: <b>July 12, 2007</b>
File: Light Assessment.mxd	
Drawn by: <b>LDB</b>	Checked: <b>SXS</b>
Fig. No.: <b>14.2-1</b>	

## 14.3 Issues and Assessment Criteria

Criteria are typically established by regulatory agencies to specify acceptable levels of a specific parameter (e.g., contaminant levels or lighting levels). In Alberta, there are no regulations governing light trespass. Therefore, this assessment relies on information researched from other sources.

### 14.3.1 Illuminance Criteria

Lighting criteria for illuminance are available from the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Reference Guide Version 2 ([Table 14.3-1](#)). To put these numbers in context, the Illuminating Engineering Society (IES) of North America recommends a minimum lighting level of 5.4 lux for safety. Various other standards recommend 5 lux to 20 lux for pedestrian walkways, and stairways are typically about 50 lux. Interiors of buildings measure in the hundreds of lux.

**Table 14.3-1 Illuminance Criteria**

Item	Description	Maximum Illuminance (lux)
<b>Intrinsically dark landscape</b>	Parks	0.0
<b>Low ambient brightness</b>	Outer urban and rural residential areas	1.1
<b>Medium ambient brightness</b>	Urban residential areas	2.2
<b>High ambient brightness</b>	Urban areas with residential and commercial areas	6.5

### 14.3.2 Luminance Criteria

Although similar regulatory criteria do not exist for luminance, estimated Project lighting levels can be compared with levels familiar from daily experience (e.g., comparing an estimated luminance value to that from a full moon or a street light). [Table 14.3-2](#) presents sample luminance measurements for typical light sources.

**Table 14.3-2 Sample Luminance Measurements**

Item	Luminance (cd/m <sup>2</sup> )
<b>Sun</b>	900,000,000
<b>Street lamp</b>	23,000
<b>Full moon</b>	400
<b>Typical industrial facility at 2 km</b>	<10
<b>Car with high beams at 1 km</b>	60

## 14.4 Methods

### 14.4.1 Existing Conditions

Existing (baseline) conditions represent the current light levels within the LSA. To assess these conditions at the receptors, illuminance and luminance levels were measured at a representative point near receptor properties. Luminance measurements are direction dependent.

## 14.4.2 Impact Assessment

To estimate Project illuminance and luminance levels at the receptors, a database of previously measured lighting levels taken from existing facilities similar to the Project was used. This approach is valid, as it is a practical approach based on real-life measurements. The following are notes on the use of this dataset:

- Illuminance and luminance data were previously collected by taking measurements at roughly 100 m increments along straight lines, starting at an existing facility's perimeter fence and extending outward perpendicularly. These lines were taken along publicly accessible roads but were selected to be representative of the lighting levels at points between the Project and the receptors. Distance outward was dictated by geographical constraints, but was deemed sufficient to represent lighting levels. Several facilities were used to provide a range of data which is expected to be representative of lighting levels from the Project. [Figure 14.4-1](#) presents typical lighting at a facility in the AIH (the Shell Canada Scotford Complex).
- Illuminance data were then tabulated versus straight-line distance from the existing facility, and also used to predict lighting levels at the receptors, based on their distance from the Project. In other words, the distance from the Project to the receptor is cross-referenced with the measurement table to find the corresponding illuminance value for that receptor. The illuminance estimate for a given receptor is thus based on measurements taken at the same distance from similar existing facilities.
- Luminance data were used in the same manner, except data were plotted on a log-log graph, and best-fit lines were superimposed on the highest and lowest measured dataset to provide a high-luminance and low-luminance estimate. In other words, the distance from the Project to the receptor is plotted on the measurement graph to find the corresponding high and low luminance estimates for that receptor. The luminance estimate for a given receptor is thus based on measurements taken at the same distance from similar existing facilities. As luminance measurements vary with the spot selected for measurement (i.e., a typical facility has many spots of light that can be individually selected for measurement), an attempt was made to measure the spot that provided the highest luminance value.

Note that the distance between a receptor and the Project is measured to the Project's primary light area. A primary light area is the area of a facility containing the majority of the lights; this area typically includes the area containing the buildings rather than the total area within the fenceline.

The area surrounding the Project mainly comprises agricultural fields. However, terrain and vegetation features (e.g., small hills, valleys, trees, shrubs and man-made berms) are also common. Although these features block direct lines of sight from some receptors to primary light areas, all receptors were assumed to have a direct line of sight to estimate luminance levels. This assumption is a conservative assessment that allows for obstructions changing over time (i.e., obstructions can be removed). [Figure 14.4-2](#) presents an illustration of the landscape typical of the area.

## 14.4.3 Cumulative Effects Assessment

Cumulative effects encompass overlapping lighting effects associated with existing light sources, the Project light sources and proposed facility light sources. Existing light sources within the 5 km

RSA include the Shell Canada Scotford Complex to the west and the community of Bruderheim to the east. Proposed light sources within the 5 km RSA include the Total upgrader to the southwest and the proposed expansion (Shell Scotford Upgrader 2) of the Shell Canada Scotford Complex. [Figure 14.2-1](#) shows the respective locations of these light sources.

For a receptor to be affected by cumulative impacts it must be within approximately 2 km of the Project and another light source. In other words, all receptors in the LSA are potentially impacted by the Project, but only a subset is impacted by the Project and the Shell Canada Scotford Complex (for example). These receptors are identified along with the source causing the potential cumulative impact (i.e., the cumulative source). For the group of receptors with the same source causing the potential cumulative impact, a range of light levels was estimated based on:

- the distance from the closest receptor in that group to the Project; and
- the distance from the closest receptor in that group to the source causing the potential cumulative impact.

Light levels were estimated using the same methodology as outlined in [Section 14.4.2 Impact Assessment](#).

**Figure 14.4-1 Typical Lighting – Shell Scotford Complex**



**Figure 14.4-2 Typical Landscape in the Area**



## 14.5 Existing Conditions

To provide an indication of existing conditions, illuminance and luminance levels were measured at the selected receptors (Table 14.2-1). Fieldwork in the Fort Saskatchewan area started on June 4, 2007, under a partly cloudy night sky. The temperature was about 10°C. A Sekonic L-558 Cine light meter was used to record lighting levels. This particular light meter was selected because it provides a range of measurements and settings (e.g., illuminance, luminance and aperture settings).

### 14.5.1 Illuminance

Baseline illuminance measurements at the selected receptors (Table 14.2-1) were all below the LEED criteria for rural residential areas (1.1 lux) and also below the lower limit of the light meter (0.63 lux).

Baseline illuminance measurements from existing facilities were required to estimate Project illuminance levels at the receptors. These measurements were previously recorded and form a portion of the light intensity dataset. Relevant measurements from the dataset are shown in Table 14.5-1. Illuminance levels typically decrease to below measurable levels between the facility lights and the facility fenceline. The values in this table typically express the distance from the light source at which there are no lighting effects. In cases where illuminance was measurable at the fenceline (the fractionation facility and one instance of the upgrader/refinery), values diminished with distance from the fenceline. In all cases, illuminance was reduced to below measurable levels at 400 m to 500 m from the light source.

**Table 14.5-1 Selected Illuminance Measurements for Existing Facilities from the Light Intensity Dataset**

Measurement	Approximate Distance from Facility Light Source (m)	Illuminance (lux)
Hydrogen Peroxide Plant <sup>1</sup>	75	Eu <sup>2</sup>
Fractionation Facility <sup>1</sup>	320	2.3
Upgrader/refinery <sup>1</sup>	10	15
Upgrader/refinery	230	0.7
Upgrader/refinery	320	Eu <sup>2</sup>
Upgrader/refinery <sup>1</sup>	600	Eu <sup>2</sup>
Upgrader/refinery <sup>1</sup>	500	Eu <sup>2</sup>

1 Measurement taken at facility fenceline.

2 Eu indicates a reading less than 0.63 lux (lower limit of Sekonic L-558 Cine light meter) – this limit is well below an area of low ambient light levels as defined by LEED.

### 14.5.2 Luminance

Baseline luminance measurements at the selected receptors are shown in Table 14.5-2. The light source for each measurement is also listed. The highest luminance value of 210 cd/m<sup>2</sup> was measured at receptor R33 and is associated with a street light on Highway 15. The highest measurement associated with an industrial facility was 30 cd/m<sup>2</sup>, measured at R14.



**Table 14.5-2 Baseline Maximum Luminance Values at the Receptors**

Receptor	Measured Luminance (cd/m <sup>2</sup> )	Light Source for Measured Luminance
R2	0.4	Scotford Complex
R3	No measurement <sup>1</sup>	–
R4	1.1	Providence Grain
R5	3.5, 25	Scotford Complex, car on Highway 15
R6	1.2	Scotford Complex
R7	2.3	Scotford Complex
R8	2.1	Scotford Complex
R10	0.9	Scotford Complex
R11	14, 8.6	Scotford Complex, ATCO Sour Gas Plant
R12	6.1, 3.7	Scotford Complex, ATCO Sour Gas Plant
R13	2.8	Scotford Complex
R14	21, 30	ATCO Sour Gas Plant, Gulf Canada
R15	2.8	Scotford Complex
R16	2.8	Scotford Complex
R17	2.8	Scotford Complex
R18	No measurement <sup>1</sup>	–
R19	0.3	Scotford Complex
R20	2.8	Scotford Complex
R21	No measurement <sup>1</sup>	–
R23	No measurement <sup>1</sup>	–
R24	1.1	Scotford Complex
R25	No measurement <sup>1</sup>	–
R26	6.1, 3.7	Scotford Complex, ATCO Sour Gas Plant
R27	6.1, 3.7	Scotford Complex, ATCO Sour Gas Plant
R28	3.5, 1.6	Scotford Complex, Gulf Chemical and Metallurgical Spent Catalyst Processing Facility
R29	3.3	Gulf Canada
R30	8.6	Scotford Complex
R31	3.7, 7.5	Scotford Complex, car on Highway 15
R32	3.7, 7.5	Scotford Complex, car on Highway 15
R33	210	Highway light on Highway 15
R34	1.2	Scotford Complex
R62	26, 4.3	Gulf Chemical and Metallurgical Spent Catalyst Processing Facility, Shell Canada Scotford Complex
R74	No measurement <sup>1</sup>	–
R83	3.5, 1.6	Scotford Complex, Gulf Chemical and Metallurgical Spent Catalyst Processing Facility

<sup>1</sup> No measurement because of obstructions blocking the line of sight.

Baseline luminance measurements from existing facilities were required to estimate Project luminance levels at the receptors. These measurements were previously recorded and form a

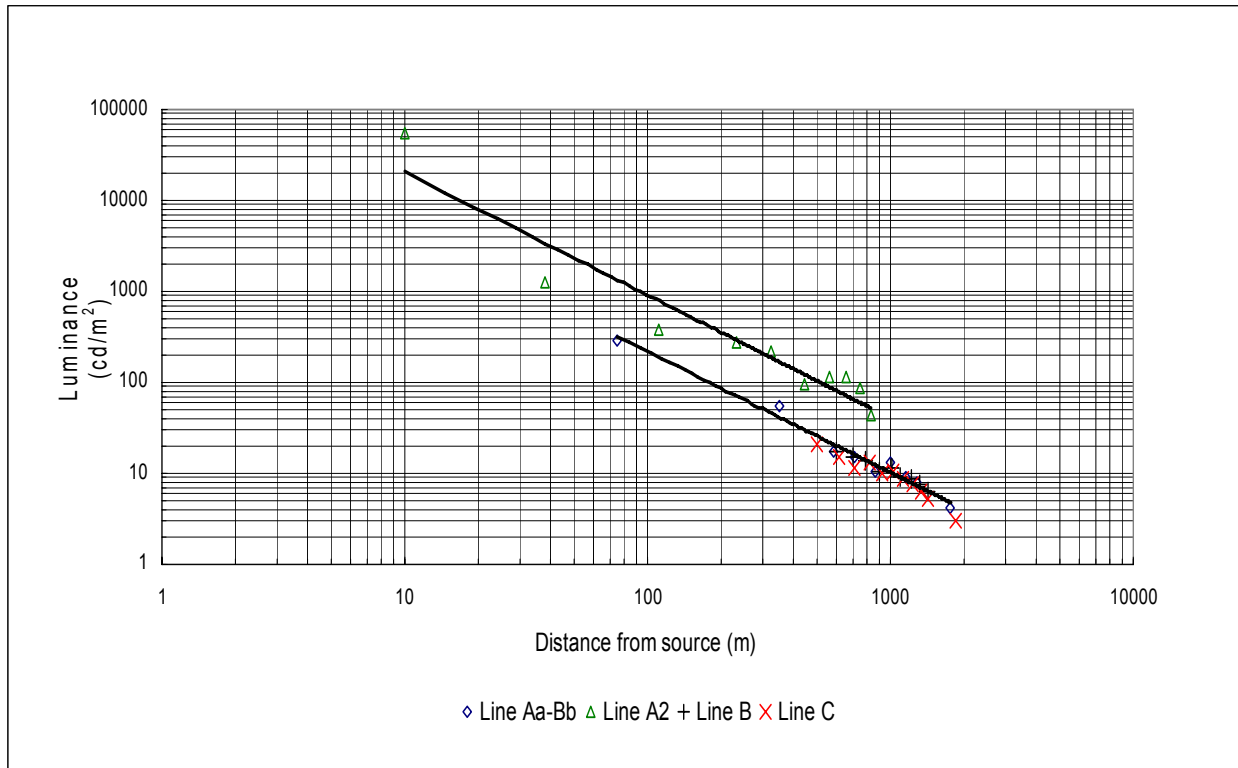
portion of the light intensity dataset. Relevant measurements (taken along luminance measurement profile lines) from the light intensity dataset are plotted and shown in [Figure 14.5-1](#). Measurements generally fall within a range as bounded by the high and low best-fit lines, which provides confidence in the assertion that measurements from existing facilities can be used to estimate luminance levels from the Project.

### **14.5.3 Existing Conditions Summary**

Baseline illuminance measurements at the selected receptors were all below the LEED criteria for rural residential areas (1.1 lux), and also below the lower limit of the light meter (0.63 lux). Illuminance levels from existing facilities similar to the Upgrader typically decrease to below measurable levels at 400 m to 500 m from the light source.

With regard to luminance, measurements at the selected receptors were typically below 10 cd/m<sup>2</sup>. The maximum value of 210 cd/m<sup>2</sup> was associated with a street light on Highway 15, while the highest measurement associated with an industrial facility was 26 cd/m<sup>2</sup>. For comparison purposes, a full moon measures 400 cd/m<sup>2</sup>, and vehicle headlights 1 km away are approximately 60 cd/m<sup>2</sup>.

**Figure 14.5-1 Selected Luminance Measurements for Existing Facilities from the Light Intensity Dataset**



## 14.6 Project Impact Assessment and Mitigative Measures

### 14.6.1 Illuminance

Illuminance levels typically decrease to below measurable levels 400 m to 500 m from the light source ([Section 14.5-1](#)). Because the distance from the primary light areas to the selected receptors is typically greater than 500 m, illuminance levels at the receptors will be below the measurable limits of the light meter (0.63 lux), even after Project construction. The LEED criteria (1.1 lux) for rural residential areas will also be met.

R14 is the only receptor which is closer to the Project's primary light area than 500 m. It is located approximately 300 m away. Based on [Table 14.5-1](#), a receptor this distance from the Project may experience illuminance levels in the range of 0.7 lux to 2.3 lux.

### 14.6.2 Luminance

Previously measured luminance values taken from facilities similar to the Project were used to estimate a high and low luminance level for each receptor ([Table 14.6-1](#)). The distance between the Project and the receptor was plotted on [Figure 14.5-1](#), and the low (from the low best-fit line) and high (from the high best-fit line) estimates were read.

Two assumptions must be noted regarding these predicted values:

- A direct line of sight has been assumed. As this does not always exist, estimated values are conservative.
- As it is not practical to predict luminance values for every location and from every direction on a receptor's property, the maximum predicted value represents a worst-case Project-related luminance value for a given receptor. Actual luminance values may be different when viewed from different points on the property.

The following provides additional detail and context for the estimates in [Table 14.6-1](#). Where trees or other features block the direct line of sight, the luminance values indicated in [Table 14.6-1](#) will not be realized. Other light sources affecting the receptors are also detailed. Note that receptors are grouped together where they share the same general viewscape from a lighting perspective (i.e., they are neighbouring residences which are close together with similar vegetation features).

- R2/R8/R18 are heavily treed lots. While R2 will have a view of the Project through the trees, views from R8 and R18 will be blocked. Estimated luminance values for R2 range from 4.5 cd/m<sup>2</sup> to 10 cd/m<sup>2</sup>. [Figure 14.6-1](#) shows the property associated with R8.
- R3/R4 are on treed lots. R3 will have no view of the Project, as it is located a distance down Township Road 560. R4 will have a view of the Project, and estimated luminance values range from 4.0 cd/m<sup>2</sup> to 16 cd/m<sup>2</sup>.
- R5/R10 have clear views of the Project beyond Highway 15, with estimated luminance values ranging from 6.0 cd/m<sup>2</sup> to 25 cd/m<sup>2</sup>. Luminance levels from vehicles on the highway will typically exceed those from the Project (i.e., a passing vehicle on the highway measured 25 cd/m<sup>2</sup>, and high beams on a car 500 m away can result in approximate luminance values of 400 cd/m<sup>2</sup>). [Figure 14.6-2](#) shows the Project as viewed from across Highway 15 from R10.

- R6/R34 are located just north of Highway 15. They have a potential view of the Project, and estimated luminance values range from 5.0 cd/m<sup>2</sup> to 20 cd/m<sup>2</sup>. As with R5, however, higher luminance values will be associated with Highway 15 (it is closer than the Project).
- R7 is a treed lot. Despite this fact, the residence on this property will likely have a clear view of the Project, and estimated luminance values range from 5.3 cd/m<sup>2</sup> to 21 cd/m<sup>2</sup>.
- R11 has a direct view of the Project immediately east, and currently sees luminance values of approximately 14 cd/m<sup>2</sup> from Shell Canada Scotford Complex immediately west. Estimated luminance values associated with the Project range from 4.5 cd/m<sup>2</sup> to 18 cd/m<sup>2</sup>.
- R12/R26/R27/R62 are heavily treed lots, although there is a potential for a direct view of the Project. Estimated luminance values range from 2.9 cd/m<sup>2</sup> to 14 cd/m<sup>2</sup>. Highway 15 is immediately to the south and also has an impact on these receptors.
- R13/R15/R16/R17 are heavily treed lots, but residences on these properties will have potential views of the Project to the east. Estimated luminance values range from 4.3 cd/m<sup>2</sup> to 25 cd/m<sup>2</sup>. Although the Shell Canada Scotford Complex is a relatively short distance west, trees block direct lines of sight from the actual houses on the respective properties to Shell Canada Scotford.
- R14/R24 will have a clear view of the Project to the south. R14 currently has luminance values of approximately 21 cd/m<sup>2</sup> from the ATCO Sour Gas Plant. It will be the most heavily impacted by the Project, with a maximum estimated luminance value of 200 cd/m<sup>2</sup>. R24 will also be impacted, with a maximum estimated luminance value of 63 cd/m<sup>2</sup>.
- R19/R20 are heavily treed lots. It is not likely that the residences on these properties will have a direct view of the Project.
- R21/R23 will have a clear view of the Project, and estimated luminance values range from 4.3 cd/m<sup>2</sup> to 25 cd/m<sup>2</sup>.
- R25/R74 are heavily treed lots. It is not likely that the residences will have a direct view of the Project.
- R28/R29/R83 will have possible views of the Project beyond Highway 15. Luminance levels from vehicles on Highway 15 will typically exceed those from the Project. Estimated luminance values from the Project range from 2.2 cd/m<sup>2</sup> to 12 cd/m<sup>2</sup>.
- R30 will have a clear view of the Project beyond Highway 15, but luminance levels from vehicles on Highway 15 will typically exceed those from the Project. Estimated luminance values from the Project range from 3.3 cd/m<sup>2</sup> to 14 cd/m<sup>2</sup>.
- R31/R32 are treed lots located to the south of Highway 15. They will have a view of the Project, but luminance levels from vehicles on Highway 15 will typically exceed those from the Project. Estimated luminance values from the Project range from 4.3 cd/m<sup>2</sup> to 18 cd/m<sup>2</sup>.

- R33 is located immediately south of Highway 15. The luminance levels associated with the nearby Highway 15 intersection street light at 210 cd/m<sup>2</sup> are higher than those associated with the Project, which range from 3.0 cd/m<sup>2</sup> to 12 cd/m<sup>2</sup> (Figure 14.6-3).

**Table 14.6-1 Estimated Post-Project Luminance Values at the Receptors**

Receptor	Approximate Distance to Project Primary Light Area (m)	Estimated Luminance for Project	
		Low Estimate <sup>1</sup> (cd/m <sup>2</sup> )	High Estimate <sup>1</sup> (cd/m <sup>2</sup> )
R2	1,600	4.5	18
R3	2,300	3.0	12
R4	1,900	4.0	16
R5	1,200	6.3	25
R6	1,500	5.0	20
R7	1,400	5.3	21
R8	1,600	4.5	18
R10	1,300	6.0	23
R11	1,600	4.5	18
R12	2,100	3.3	14
R13	1,600	4.5	18
R14	300	50	200
R15	1,200	6.3	25
R16	1,600	4.5	18
R17	1,700	4.3	17
R18	1,600	4.5	18
R19	1,600	4.5	18
R20	1,900	4.0	16
R21	1,200	6.3	25
R23	1,700	4.3	17
R24	700	15	63
R25	2,500	2.8	11
R26	2,400	2.9	11.5
R27	2,400	2.9	11.5
R28	2,700	2.5	10
R29	2,200	3.1	12
R30	2,100	3.3	14
R31	1,700	4.3	17
R32	1,600	4.5	18
R33	2,300	3.0	12
R34	1,500	5.0	20
R62	2,800	2.4	9.7
R74	2,900	2.3	9.3
R83	3,000	2.2	9.0

<sup>1</sup> Luminance data extrapolated from field data based on a direct line of sight to the primary light area.

### 14.6.3 Mitigative Measures

Occupational health and safety standards require minimum lighting levels for facility operation and maintenance. Providing that this priority is met, mitigation measures might be implemented to reduce illuminance and luminance levels at receptor locations. These mitigation measures can include the following:

- reduction of the amount of lighting in areas of the facility when these areas are not in use;

- selecting light locations so that they light only the required areas;
- using shielded/directional luminaries to reduce stray lighting;
- using spotlights on the ground that shine no higher than 45° above vertical and are located no farther away than the structure height (LEED, 2001);
- lighting exterior signs from the top;
- use of low reflectance ground cover beneath outdoor lighting;
- installing vegetation or berms to block direct lines of sight; and
- scheduling planned flaring during daylight hours.

North American is committed to implementing the mitigative measures described above.

#### **14.6.4 Prediction Confidence**

The approach taken was practical, involving the measurement of light levels from facilities similar to the Project and the approximation of light levels based on these measurements. There are four sources of uncertainty with this approach:

- Measurement – light levels depend on many factors, including distance and direction from the light source, atmospheric conditions (e.g., clouds and the presence of the moon), ground cover (e.g., snow) and the actual source measured (for luminance). While measurements taken under a specific set of conditions should only be used to provide light level estimates under similar conditions, it is not practical to collect such a wide range of data. Consequently, measurements taken under specific sets of conditions are used to represent all conditions. This uncertainty is reduced as the database grows.
- Scaling – no two facilities are identical and measurements taken from one can only be used to predict light levels at a different facility with a reasonable level of accuracy. This uncertainty is reduced by measuring a range of facilities and providing a low and high estimate in an attempt to capture a range of facility sizes.
- Flaring – upgraders and refineries typically have flares associated with them, but the nature of this flaring is intermittent. In addition, the size of each flare (and the light levels associated with it) is specific to the flare and flaring event. Because flares are not continuous and it is not possible to capture light levels for every size of flare and flaring event, they have not been measured for this assessment.
- Instrumentation – while there is potential error associated with every measuring instrument, these errors are insignificant compared with those mentioned above.

The confidence level for illuminance is moderate to high. The sources of uncertainty can play a significant role in measuring and approximating illuminance levels. Notwithstanding these uncertainties, the approach used in this assessment is a practical one, based on real-world measurements. The approximated range of values will provide an indication of expected illuminance levels.

The confidence level for luminance estimates is high because of the dramatic decrease in luminance levels with distance from the source. Beyond 2 km luminance levels typically decrease to background levels.

### **14.6.5 Project Case Summary**

In summary, illuminance levels decrease rapidly with distance from the light source. As the selected receptors are typically beyond 500 m from the Project, they will not experience a measurable increase in light levels (i.e., they will remain below 1.1 lux). Only R14 is closer than 500 m and, as a result, it may experience illuminance values in the 0.7 lux to 2.3 lux range. The maximum of this range corresponds to a LEED level which is associated with urban residential areas (i.e., medium ambient).

With regard to luminance, the Project will increase the number of lights in the area (i.e., more bright spots in the distance), but luminance levels associated with these lights will typically not be different than the range of baseline measurements. Low luminance estimates are typically less than 10 cd/m<sup>2</sup> and are similar to the baseline measurements.

Maximum luminance estimates are typically less than 20 cd/m<sup>2</sup>, which is a magnitude less than measurements from a full moon (400 cd/m<sup>2</sup>), and less than the high beams of a car at 1 km (60 cd/m<sup>2</sup>). Terrain and vegetation features are also expected to block direct views of the Project from many receptors. Only receptors R14 and R24 will potentially experience higher luminance values.



**Figure 14.6-1 Treed Lot of R8 with Blocked View of the Project**



**Figure 14.6-2 View of Property Across Highway 15 from R10**



**Figure 14.6-3 Shell Scotford and the Highway 15 / RR 210 Intersection Street Light as Viewed from R33**



## 14.7 Cumulative Effects Assessment

Cumulative effects encompass overlapping lighting effects associated with existing facilities, the Project and proposed facilities. For a receptor to be affected by cumulative impacts, it must be within approximately 2 km of the Project and another light source. Such receptors are listed in [Table 14.7-1](#).

**Table 14.7-1 Receptors with Potential Cumulative Effects**

Receptor	Distance to Project <sup>1</sup> (m)	Potential Cumulative Source	Distance to Potential Cumulative Source (m)
R2	1,600	Bruderheim	1,800
R3	2,300	Bruderheim	1,000
R4	1,900	Bruderheim	1,400
R11	1,600	Shell Canada Scotford Complex	850
R12	2,100	Total E&P Canada Upgrader	3,200
R13	1,600	Shell Canada Scotford Complex	700
R15	1,200	Shell Canada Scotford Complex	1,000
R16	1,600	Shell Canada Scotford Complex	600
R17	1,700	Shell Canada Scotford Complex	700
R18	1,600	Bruderheim	2,000
R19	1,600	Bruderheim	1,600
R20	1,900	Bruderheim	1,700
R26	2,400	Total E&P Canada Upgrader	3,000
R27	2,400	Total E&P Canada Upgrader	3,000
R62	2,800	Total E&P Canada Upgrader	2,500

1 Distance to the receptor from the Project's primary light area.

### 14.7.1 Illuminance

Illuminance levels diminish with increasing distance (i.e., illuminance for a typical upgrader drops below measurable limits beyond 500 m). Cumulative effects on illuminance are expected to be negligible, as the selected receptors are all more than 500 m from the Project's primary light areas or a light source causing potential cumulative effects.

### 14.7.2 Luminance

Cumulative effects on luminance are dependent on direction. If a direct line of sight to the Project does not exist at a selected receptor, no cumulative effects will be observed, regardless of what light sources exist or are to be constructed. If a direct line of sight to the Project and any existing or proposed light sources exists, cumulative effects may occur. Referring to [Table 14.7-1](#), the following notes can be made:

- Of the receptors within 2 km of both the Project and the proposed Total E&P Canada Upgrader, R12 is the closest to the Project and R62 is the closest to the Total upgrader. Based on these distances, this group of receptors would experience maximum luminance values in the range of 11 cd/m<sup>2</sup> to 14 cd/m<sup>2</sup>.

- Of the receptors within 2 km of the Project and the Shell Canada Scotford Complex, R15 is the closest to the Project and R16 is the closest to Shell. Based on these distances, this group of receptors would experience maximum luminance values in the range of 25 cd/m<sup>2</sup> to 80 cd/m<sup>2</sup> respectively.
- Of the receptors within 2 km of the Project and Bruderheim, R2 is the closest to the Project and R3 is the closest to Bruderheim. Based on these distances, this group of receptors would experience maximum luminance values in the range of 18 cd/m<sup>2</sup> to 40 cd/m<sup>2</sup>.

These values assume a direct line of sight. In many cases, this line of sight does not exist (i.e., none of R2, R3, R4, R18, R19 or R20 have a view of Bruderheim and, as such, will not experience cumulative luminance effects). It is not possible to see both the Project and the cumulative source in the same viewscape at the same time and, as such; cumulative luminance impacts will typically not occur.

### **14.7.3 Cumulative Effects Summary**

In conclusion, cumulative effects from new or existing light sources in addition to the Project are not expected to occur. Specifically, receptors are far enough from the Project and existing or proposed light sources such that overlapping illuminance impacts will not occur. In regard to luminance, the differing viewscales associated with each light source prevent the occurrence of cumulative impacts (i.e., both light sources can not be seen from a given receptor at the same time).

## **14.8 Follow-up and Monitoring**

Follow-up and monitoring is not required because maximum predicted illuminance levels are below LEED medium ambient brightness criteria (2.2 lux) and luminance levels are typical of large industrial facilities in the area.

## **14.9 Conclusion**

The Project will introduce additional lighting to the area. Illuminance and luminance were assessed for residential receptors located within about 2 km of the North American Project boundaries. A practical approach for estimating light levels from the Project based on measured light levels from similar existing facilities was used. The following impacts from the Project are predicted:

- Current illuminance levels at the selected receptors are below LEED criteria for rural residential areas and the measurable limit of the light meter. Illuminance levels decrease rapidly with distance from the light source and, as the selected receptors are typically beyond 500 m from the Project, they will not experience a measurable increase in illuminance levels. Only one receptor may be affected with a measurable increase in illuminance but, despite this fact, it will remain within the LEED criteria for urban residential areas.
- The Project will increase the number of lights in the area (i.e., more bright spots in the distance), but luminance levels associated with these lights will be similar to baseline measurements. Maximum predicted luminance levels are typically an order of magnitude less than luminance levels from a full moon, and are less than the typical luminance levels of a car's high beams at 1 km. Terrain and vegetation features are also expected

to block direct views of the Project from many receptors. Receptors to the south of Highway 15 will experience their highest luminance values from the highway rather than the Project.

- With regard to cumulative effects, impacts are expected to be minimal. Specifically, receptors are far enough from the Project and new or existing light sources that overlapping illuminance impact will not occur. In addition, it is not possible to see both the Project and existing or proposed facilities at the same time and, as such, cumulative luminance impacts are not predicted to occur.

## **14.10 Literature Cited**

Leadership in Energy and Environmental Design (LEED). 2001. Leadership in Energy and Environmental Design Reference Guide. Version 2: Sustainable Sites, Credit 8.

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### APPENDICES

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## **15 SOCIO-ECONOMIC IMPACT ASSESSMENT**

### **15.1 Introduction**

#### **15.1.1 The Project**

North American plans to develop the Upgrader in several phases to attain the full Project capacity of 1,610 m<sup>3</sup>/h (243,000 barrels per stream day (bpsd)) of bitumen feed. This target capacity is staged largely to match the planned bitumen production from North American's upstream bitumen production facilities.

Assuming favorable regulatory approval and market conditions, construction of the Project is scheduled to begin in 2010, with Phase 1 production of 530 m<sup>3</sup>/h (80,000 bpsd) commencing in 2014. Subsequent phases will bring SCO production of the upgrader to 1,610 m<sup>3</sup>/h (243,000 bpsd) by 2020. Full build-out will be achieved in 2025, with the completion of the second stage of gasification.

The Project definition includes all of the facilities to reach the target capacity of the Upgrader, plus the addition of two stages of petroleum coke (petcoke) gasification to produce hydrogen, electrical power and synthetic natural gas (SNG). Including gasification units, the preliminary estimate of the Project's capital costs falls in the range of \$14 billion to \$18 billion in 2007 dollars. This estimate is based on industry experience, and will be refined as detailed engineering is advanced. For the purposes of this analysis, an overall capital cost of \$16 billion has been used.

Labour force requirements to construct the Project are estimated at 24,000 person-years (py), including on- and off-site construction labour and engineering. The total on-site construction labour force is expected to peak at about 1,500 workers in 2012, during Phase 1, and at 3,000 in 2017, when subsequent phases of the Upgrader and the first gasifier are under construction.

Once fully in production, the average annual operations expenditure for the Project is estimated at \$357 million in 2007 dollars (excluding purchased electricity and natural gas). The Project is expected to create approximately 525 direct operating jobs and 75 full-time equivalent contracted maintenance positions. Operations expenditures will vary year-by-year, depending on plant turnarounds, production levels and variations in the price of inputs.

#### **15.1.2 Location and Access**

The Project is located in Alberta's Industrial Heartland Area (AIH) in Strathcona County, Alberta. The eastern boundary of the development site lies approximately 2.5 km west of the County boundary and 3 km from the Town of Bruderheim. Road access to the Project will be via Highway 15 and Range Road 212.

Changes to the local road network are currently being discussed, and changes might be made to the road network near the Project site in the near future. A recent traffic study completed on behalf of Strathcona County made several recommendations to improve the local road network, including intersection upgrades on Highway 15 and Range Roads 220, 214 and 212 (Stantec, 2007).

The Project is adjacent to the two major rail networks in the region, and plans have been made to link with both the Canadian National (CN) and Canadian Pacific Railway (CPR) rail services.



## 15.2 Methodological Considerations

### 15.2.1 Study Area

The Regional Study Area (RSA) includes the area where most of the population and associated effects will be felt. The definition of the RSA is informed by:

- the likelihood that construction workers for the Project will be recruited from throughout the greater Edmonton area and possibly beyond;
- the expectation that operations workers, like those at industrial facilities near the Project, will likely take up residence in communities within a 50-minute home-to-work commute, including:
  - the Town of Bruderheim, the City of Fort Saskatchewan, the Urban Services Area of Sherwood Park and the Town of Lamont;
  - the City of Edmonton; and
  - the rural services area of Strathcona County, Lamont County and Sturgeon County.
- the Project's construction methodology, which includes fabricating vessels and other components in fabrication yards in east Edmonton, Nisku, Sherwood Park and elsewhere.

The RSA, therefore, includes the Edmonton Census Metropolitan Area (CMA), and Lamont County and the urban municipalities within its boundaries, including:

- the cities of Edmonton, Fort Saskatchewan, St. Albert, Spruce Grove and Leduc;
- Strathcona County, including Sherwood Park, Sturgeon County, Lamont County, Leduc County and Parkland County; and
- the urban municipalities within the boundaries of the rural municipalities, including Bruderheim, Lamont, Beaumont, Stony Plain, Gibbons, Redwater, Bon Accord, Morinville, Devon and Calmar.

For some effects, the study area is expanded beyond the RSA, and for some the study area focuses on the area directly around the plant site. The analysis of the economic impacts, which considers the province of Alberta, is an example of the former; traffic analysis, which emphasizes the roads immediately near the Project, is an example of the latter.

The RSA is shown in [Figure 15.2-1](#).

### 15.2.2 Assessment Cases

The Socio-Economic Impact Assessment (SEIA) broadly addresses the human environment with and without the Project. It also presents estimates of the differences in, for example, population forecasts with and without the Project and other major projects currently planned. The following cases or scenarios have been defined:

- Baseline Case, which includes all economic activity in the RSA, as well as projects that are currently under construction or have regulatory approval. The latter include Petro-Canada's Edmonton Refinery Conversion Project, BA Energy's Heartland Oil

Sands Upgrader, Shell Canada's Scotford Upgrader Expansion 1 Project and North West Upgrading's Bitumen Upgrader;

- Application Case, which includes all the economic activity assumed under the Baseline Case, as well as the North American Upgrader Project; and
- Cumulative Case, which includes all economic activity assumed under the Application Case, plus those large industrial projects disclosed during the time ending six months before submission of the Project application and EIA report, including the Synenco Northern Lights Upgrader, the Petro-Canada Oil Sands Inc. Sturgeon Upgrader, Shell Canada's Scotford Upgrader 2 (SU2) and the Total E&P Canada Bitumen Upgrader Project.

Other projects might come forward and have an effect on population, service providers and other variables discussed in this SEIA.

### 15.2.3 Analytical Approaches

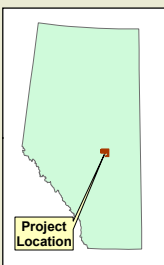
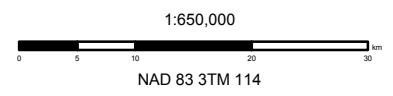
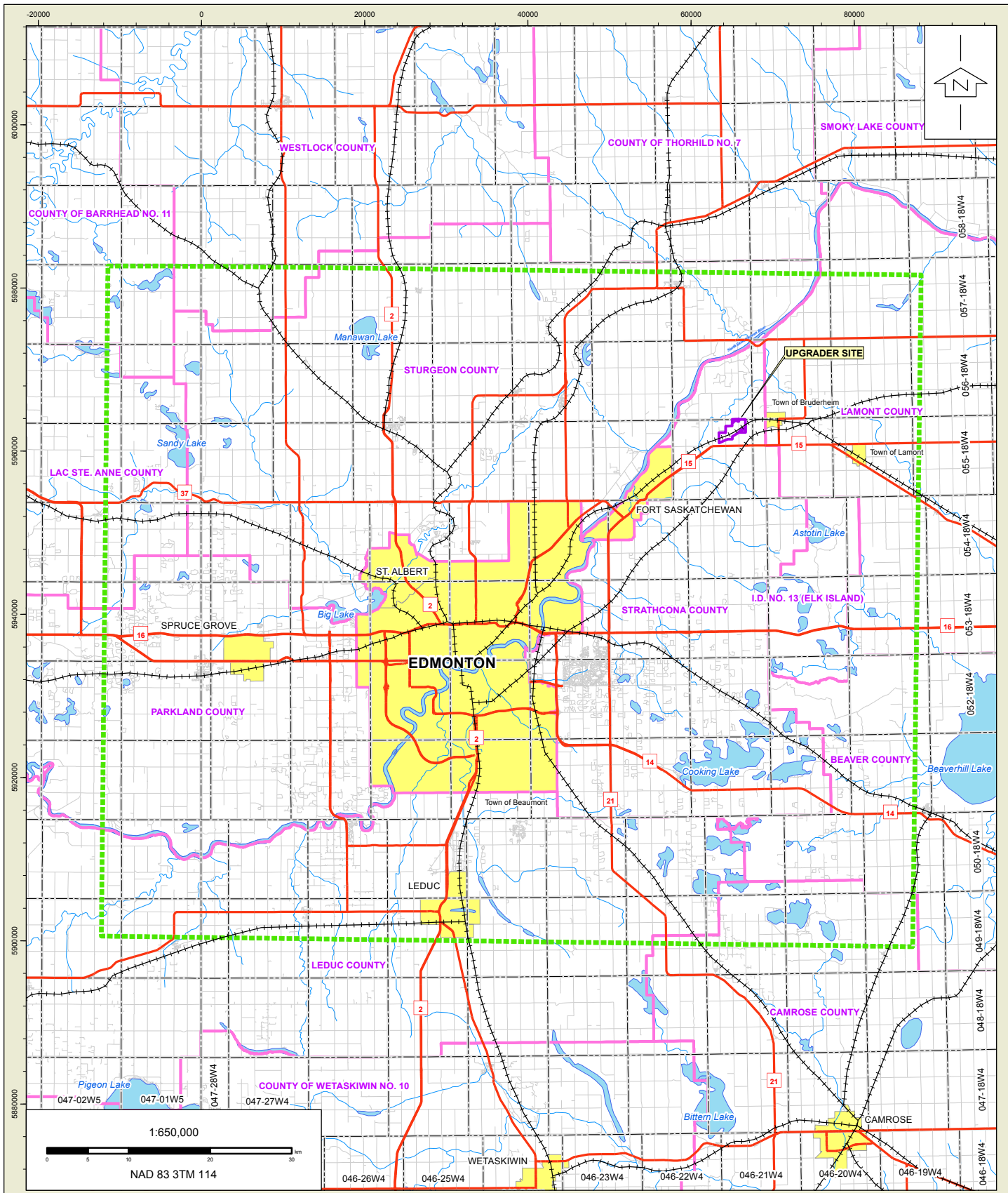
The SEIA employs several analytical approaches, including:

- economic input-output modelling of the Alberta economy to determine effects of the Project on total employment and provincial gross domestic product (GDP);
- labour market analysis to relate the construction workforce demands to the availability of workers (in light of other anticipated heavy industrial construction in the province);
- key respondent interviews and analysis of historical performance to gauge the capacity of education, health, accommodation and other systems to respond to an influx of workers during construction and operations phases; and
- file review and key respondent interviews for construction and operations traffic issues on Highway 15 northeast of Fort Saskatchewan and west of Bruderheim.

### 15.2.4 Assessment Focus

The key socio-economic issues addressed by the SEIA fall into the following categories, and are based on stakeholder consultation and the [Project Terms of Reference \(TOR\)](#) (AENV, 2007):

- regional and provincial economic benefits, including employment and contracting opportunities;
- population impacts and the associated impact on local and regional service providers; and
- impacts on transportation and other infrastructure.



Legend	
	UPGRADER SITE
	MUNICIPAL BOUNDARY
	CITY / TOWN
	RIVER / STREAM
	HIGHWAY
	OTHER ROADS
	WATERBODY
	RAILWAY
	SOCIO-ECONOMIC RSA
	ALBERTA TWP. / RG. GRID

Title:			
<b>BOUNDARY OF THE SOCIO-ECONOMIC REGIONAL STUDY AREA</b>		Approved: <b>BE</b>	Revision Date: <b>Nov. 6, 2007</b>
		File: FIGURE_15_2_1_RSA_SOC_EC.mxd	
Drawn by: <b>LZ</b>	Checked: <b>IG</b>	Fig. No.: <b>15.2-1</b>	

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## **15.3 Existing Conditions**

### **15.3.1 Spatial Aspects of the Regional Economy**

The RSA has a large and diversified economy that gives evidence of a certain level of spatial organization. Most heavy industry, including industries that support oil and gas and other natural resource extraction and processing, tend to be in urban fringe lands, including:

- oil refining and associated industries in the northeastern quadrant of the region;
- metal manufacturing in the southeast of the region;
- oil service industries, which cluster in the southern part of the region (e.g., Nisku); and
- transportation and logistics industries in the western fringe.

As a major urban centre, the region also has well-developed business, wholesale, retail, social, education, health and government services sectors. The majority of these services tend to be located in Edmonton – the urban core of the region. Larger communities closer to the Project site, especially Fort Saskatchewan and Sherwood Park, have been experiencing steady population growth and are expanding their commercial and service bases.

The AIH is a heavy industrial development zone formed by the City of Fort Saskatchewan, Strathcona County, Sturgeon County and the County of Lamont to:

- market itself as a world-class location for petroleum, petrochemical and related heavy industrial facilities;
- coordinate municipal planning to maximize the efficiency of development, for example in area structure plans; and
- develop an eco-industrial master plan to increase synergies of resource usage between facilities, and to develop appropriate plans and responses to manage pressures associated with its activities and the surrounding lands and communities.

There are currently \$87 billion in investment plans for the AIH, including Shell Canada's Scotford Upgrader Expansion 1 and Upgrader 2 projects, BA Energy's Heartland Oil Sands Upgrader, the Total E&P Canada Bitumen Upgrader in Strathcona County and the North West Upgrader, the Petro-Canada Oil Sands Inc. (Fort Hills) Sturgeon Upgrader and the Synenco Northern Lights Upgrader (now on hold) in Sturgeon County. The current oil sands industry plans in the AIH, which have an investment horizon of 19 years, are a key driver for projected growth in the RSA.

### **15.3.2 Growth and Growth Drivers**

The population of the RSA, which covers the Edmonton CMA, the County of Lamont and the urban municipalities within Lamont's boundaries, grew at an average annual rate of 2% in the 2001 to 2006 period and is estimated at 1,041,949 in 2006 (Statistics Canada, 2006).

Between 2001 and 2006, the City of Edmonton has grown at an annual rate of 1.9%, just below the rate for the RSA, while two of the AIH Association member communities – Fort Saskatchewan and Strathcona County – have grown faster than the regional rate, at 2.7% and 2.8%. Sturgeon County has seen modest growth of 0.6% per year in the past five years, whereas

Lamont County experienced a negative growth rate of 1.2%. The Town of Lamont also experienced negative growth in the period.

Table 15.3-1 presents selected population statistics for the AIH municipalities.

**Table 15.3-1 Population – Alberta Industrial Heartland Association Communities**

Community	Population Count	Net Gain or Loss 2001 – 2006	Average Annual Growth Rate (%)
Fort Saskatchewan	14,957	1,836	2.7
Strathcona County	82,511	10,525	2.8
Sturgeon County	18,621	554	0.6
Lamont County	3,925	(242)	-1.2

Source: Statistics Canada 2006 Census.

Census figures capture population counts as of May 2006. Discussions with municipal planners, economic development officers and property developers regarding economic activity and housing starts suggest that population growth remains strong in the AIH communities, and that the Town of Lamont is now showing positive growth. Fort Saskatchewan conducted a municipal census in 2007, indicating a population count of 15,578 (excluding the correctional facility population), which represents a 3% increase over the last municipal census count in 2005.

The GDP of the Edmonton CMA is forecasted to reach \$44 billion in 2007 – 3.6% more than in 2006, and accounting for about 20% of Alberta's total GDP (CBOC, 2007). The growth of the regional economy reflects that of Alberta, which, in turn, is linked to the current and anticipated high world demand and subsequent robust prices for energy and other commodities. Among others, it is the emergence of China and India as major players on the world economic stage that underpins high metal and oil prices. Within Alberta, high oil prices have spurred the level of investment in the oil and gas sector, from \$9.6 billion in 2000 to \$23.7 billion in 2006 (CAPP, 2007), including:

- conventional oil and gas; and
- unconventional oil and gas, including oil sands and coalbed gas.

More recently, government investment in infrastructure is contributing to job growth in the province, with municipalities investing in the expansion and maintenance of road, water, wastewater and solid waste infrastructure. Provincial spending on highways, health and educational facilities has also increased in recent years.

The RSA, and particularly the industrial area around Nisku and Leduc, has traditionally been a focus for oil and gas service and manufacturing companies. The RSA is also becoming a focus for development of oil sands industry facilities, including:

- as a location for upgrading facilities in the AIH;
- as a centre for metal fabrication and construction of modules;
- as a general supply and staging point for remote projects, including:
  - a home base for mobile construction workers who choose to work outside the RSA and live in work camps or in hotels, while their families remain in the RSA; and

- a staging point for air service of supplies, materials and personnel working in remote locations in the North.

Linked to these last two points is the developing opportunity for the RSA to become the marshalling point for oil sands production facilities in the Wood Buffalo region that use fly-in operations, as it already is to other northern operations. Some production facilities planned for the Wood Buffalo region, but which are outside the current commuting distance of Fort McMurray, intend to fly operations workers in on a shift-rotation basis. The RSA is well positioned to capture the economic benefits of becoming the service centre for such flights, as well as the residential community of choice for those personnel and their families.

### **15.3.3 Growth Pressures**

Economic growth in Alberta and the RSA has provided many Albertans with increased job opportunities and incomes. Economic growth has also given rise to related pressures, including:

- skill shortages in many sectors; and
- pressure on housing markets.

Not all Albertans, however, are benefiting from the growth. For example:

- some do not have the ability to take advantage of the increased job opportunities, or have access only to low-paying jobs;
- although incomes have grown on average, they have not all kept up with the increasing cost of living, particularly increases associated with housing; and
- people on fixed incomes, including government financial assistance, are facing increased costs without the offsetting benefits from higher income.

Economic and population growth have also led to structural issues in certain areas becoming more overt. For example, access to health care is the subject of a nation-wide discussion, and shortages of medical personnel would have occurred even without the current high population growth. However, the high population growth in the province makes these shortages more acute. Childcare delivery is another example of a nation-wide debate that is especially poignant in Alberta, where staff recruitment and retention issues in the human services sector have intensified as higher-paying job opportunities become available.

### **15.3.4 Selected Government Responses to Growth Pressures**

#### **15.3.4.1 Labour Force**

Government policy has responded to the current and anticipated tight labour market, as evidenced by the development of the province's 10-year labour force strategy, Building and Educating Tomorrow's Workforce (AEII, 2006a). This workforce development strategy and the associated sector-specific action plans that are being developed and implemented emphasize:

- informing Albertans and employers about labour market trends, and training and education opportunities;
- attracting job seekers to Alberta;

- developing the knowledge and skills of Albertans, and increasing innovation in the workplace; and
- retaining workers in Alberta's labour market.

Building and Educating Tomorrow's Workforce recognizes the Province's need to focus both on increasing the size of its labour force and on making improvements in productivity, through appropriate education and training programs, as well as capital investment. The strategy also recognizes the need to attract workers to the province. Specific initiatives in this area include the expansion of the Provincial Nominee Program (AEII, 2007a), as well as the recently signed Agreement on Canada-Alberta Cooperation on Immigration (AEII, 2007b).

#### 15.3.4.2 Capital Region Integrated Growth Management Plan

In June 2007, the Alberta government announced a process to develop a long-term integrated growth management plan to support the anticipated economic growth in the Capital region, defined as the Edmonton CMA, the County of Lamont and the Town of Lamont. This initiative, entitled the Capital Region Integrated Growth Management Plan (CRIGMP), has three elements:

- core infrastructure and land use planning;
- social infrastructure; and
- regional governance.

As of mid-October 2007, research activities related to this initiative have generated a draft Core Infrastructure Plan (AIT, 2007) and a draft Discussion Paper (AEII, 2007c) on growth pressures and social infrastructure. The draft Core Infrastructure Plan and the draft Discussion Paper on growth pressures and social infrastructure were presented to elected officials of all the municipalities in the region on September 24 and October 24, 2007, respectively.

Whereas the CRIGMP is intended to provide a high-level, long-term view of potential growth and associated pressures in the region, detailed plans exist at sector-specific levels, each with their own timeframe and scope. The plans that address the key socio-economic indicators for the purpose of this SEIA are discussed below.

#### 15.3.4.3 New Funding for Municipalities

The provincial government is also responding to growth and other pressures with province-wide funding programs that will benefit the RSA municipalities. Recent examples include:

- The Municipal Sustainability Initiative announced in September 2007 (AMAH, 2007a). The initiative is expected to provide \$400 million in unconditional grants to municipalities in the 2007/08 fiscal years, increasing to \$1.4 billion in 2010/11. The preliminary estimate of the total commitment under the program is \$11.2 billion over ten years, of which the Strathcona County will receive \$262 million. The corresponding ten-year cumulative funding estimates for Fort Saskatchewan, Bruderheim and Lamont County are \$49 million, \$4 million, and \$21 million, respectively; and
- A ten-year plan to coordinate initiatives that address homelessness in Alberta, through the development of an Alberta Secretariat for Action on Homelessness announced in October 2007 (AMAH, 2007b). This initiative is in very early stages of development, but it

may include \$100 million annually in additional funding for homelessness initiatives for ten years.

#### 15.3.4.4 Health System

The Health Workforce Action Plan (2007-2016) from Alberta Health and Wellness (AHW, 2007) outlines 19 key initiatives that the provincial government will undertake over the next few years. Among those initiatives are:

- expanding health training programs and increasing clinical training capacity;
- attracting health professionals from abroad;
- changing the way health services are delivered; and
- developing a rural health workforce strategy.

With regards to the way health services are delivered, Capital Health has implemented several initiatives in an attempt to reduce wait times in the region, including:

- implementing a new approach regionally to manage hip and knee replacement surgery;
- implementing a system-wide and multi-pronged approach to improve the situation in emergency departments, including:
  - conversion of office space into new treatment areas;
  - addition of triage liaison doctors to various emergency departments; and
  - implementation of the full capacity protocol aimed at moving admitted patients out of emergency and into wards more quickly;
- applying a new chronic disease management model to diabetes services that offers a single point of contact and quick access to educational sessions and clinic appointments; and
- continuing with streamlining and re-engineering current waitlist management systems.

With regard to the situation in the northeastern part of the region, including Strathcona County and Sturgeon County, Capital Health is planning:

- a 38-bed health centre in Fort Saskatchewan to replace the existing facility. The new hospital, located south of Highway 15, will triple the old facility's square footage and outpatient care capacity. It is scheduled to open in 2009; and
- a 72-bed facility in Sherwood Park opening in 2009, providing Strathcona County with its first hospital.

### 15.3.5 Selected Market-Based Responses to Growth Pressures

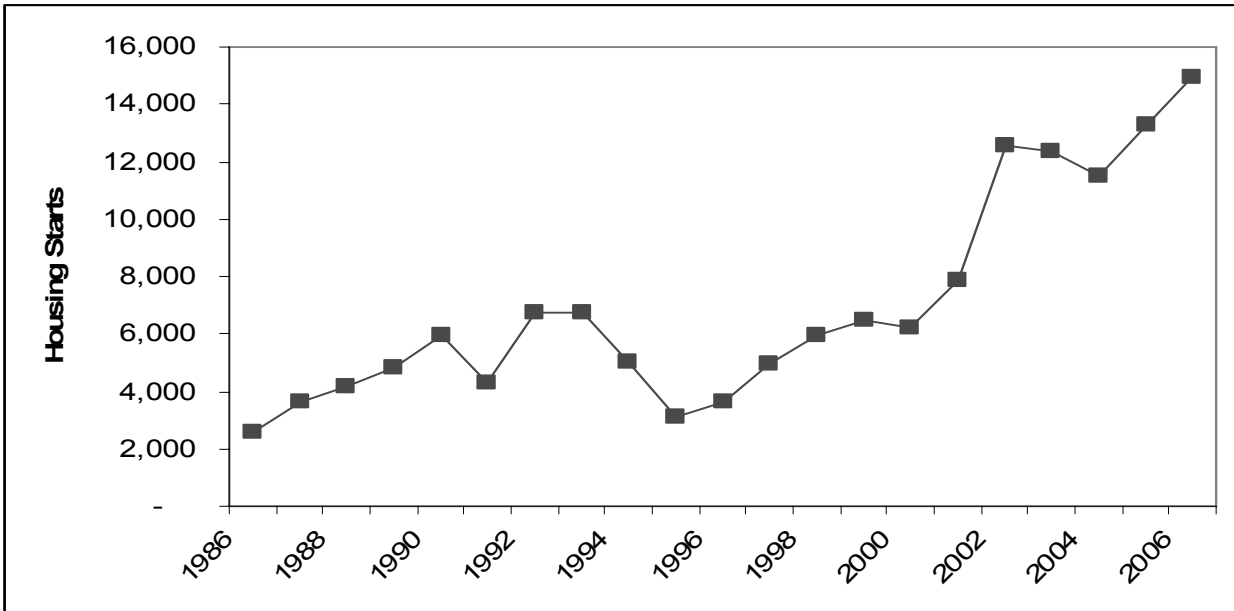
#### 15.3.5.1 Housing

The Edmonton CMA has a large and vibrant housing market, roughly estimated at over 405,000 occupied dwellings in 2006. The stock of housing in the region increased by approximately 49,000 units, or 14%, in the past five years.



The total inventory of housing stock has been increasing for the past two decades, driven primarily by construction of new detached single-family dwellings. Figure 15.3-1 shows the historical trend in annual total housing starts in the Edmonton CMA.

**Figure 15.3-1 Edmonton CMA 20-Year Historical Housing Starts**



Source: City of Edmonton/CMHC.

The housing construction market has shown its ability to respond to recent growth pressures in the Capital Region, posting housing start levels above historical averages. As an example, housing starts in the Edmonton CMA in the past five years (2002-2006) have averaged nearly 13,000 units, and, as shown in Table 15.3-2, reached a record level of nearly 15,000 units in 2006. In comparison, the region averaged 5,100 starts annually in the period of 1987-2001 (COE, 2006). Canada Mortgage and Housing Corporation estimates call for 2007 starts to equal approximately the level reached in 2006 (CMHC, 2007a). The statistics indicate that the Capital Region housing development market has been capable of quickly increasing its output of new housing in response to significant growth demands.

**Table 15.3-2 Annual Housing Starts by Type**

	2005	2006	Change (2005-06)	As % of All Types (2006)
Freehold	8,297	10,157	22%	68
Condominium	4,256	4,540	7%	30
Rental	741	273	-63%	2
Total	13,294	14,970	13%	100

Source: CMHC.

The proportion of new housing constructed in 2006 compared to 2005 has increased in the freehold and condominium housing sectors (CMHC, 2007b). Together, these categories represented 98% of new starts in 2006. The rental market sector, representing 2% of new

housing construction in 2006, experienced a large decrease (63%) in start activity compared to 2005, and is far below the historical level. This statistic provides an indication of a shift in the new construction market away from the construction of rental housing.

### 15.3.5.2 Competition for Labour

Wages in Alberta are also responding to growth pressures. Strong competition for labour is driving up the average earnings of Albertans. The average hourly wage rose by 6.9% in 2006, and Alberta has led the nation in weekly earnings since 2005 (AEII, 2007d). However, not all Albertans have seen an increase in their earnings or disposable incomes.

Various companies and organizations in the civil service and not-for-profit sector are responding to the tight labour market by placing more emphasis on workforce attraction and retention strategies. Human resource policies, such as increases in work-time flexibility and reward-sharing, are becoming more prevalent in organizations. Many companies are actively recruiting across the country and abroad to bring in workers with the necessary skill sets. This practice applies to, among others, heavy industrial tradespeople, of whom there is currently a shortage in the province.

## 15.4 Economic, Fiscal and Employment Effects

### 15.4.1 Project Economic Effects

#### 15.4.1.1 Construction

A preliminary estimate of the Project's capital costs falls in the range of \$14 billion to \$18 billion in 2007 dollars. This estimate is based on industry experience, and will be refined as more detailed engineering takes place. For the purposes of this analysis, an overall capital cost of \$16 billion has been used.

Construction expenditures will provide a stimulus to the provincial economy through wages and salaries paid to workers, as well as direct purchase of goods and services, including equipment modules, structural steel elements and professional engineering and environmental services. Portions of these expenditures will circulate through the provincial economy, multiplying the economic benefits of the Project.

A breakdown of capital expenditures during construction by type and region for the Project is presented in [Table 15.4-1](#). An estimated 21% of capital expenditure will accrue to the RSA, primarily as wages and salaries. Another 42% will accrue to the rest of Alberta. In total, an estimated 63% of capital expenditures to construct the Project will accrue to the Alberta economy.

The capital expenditure associated with constructing the Project constitutes income for contractors, suppliers and workers, who, in turn, spend part of their income on supplies and services, compounding the income effects of the Project. [Table 15.4-2](#) presents the estimates of the direct, indirect and induced GDP, as well as household income effects of the construction phase of the Project, based on published statistics (AF, 2007). The GDP and household income effects are estimated at \$15.3 billion and \$9.9 billion.

**Table 15.4-1 Project Construction Capital Expenditure by Region**

	RSA	Other Alberta	Other Canada	Foreign	Total	Proportion of Total
	\$ million 2007					%
Engineering	400	800	200	100	1,500	9
Construction	1,900	3,400	1,200	400	7,000	44
Materials and Equipment	600	1,300	700	2,900	5,600	35
Other	500	1,100	100	100	1,900	12
Total	3,400	6,700	2,300	3,600	16,000	100
Percentage of Total	21%	42%	14%	23%	100%	

Note: Total may not add due to rounding.

**Table 15.4-2 Project Construction-Related Total Income Effects**

	Direct Effects	Direct, Indirect and Induced Effects	
		GDP	Household Income
	\$ million 2007		
Project Construction	16,000	15,360	9,930

This income effect analysis is based on general procurement patterns, as captured by Alberta Finance's input-output model (AF, 2007). Results should be interpreted with caution, and actual results may differ subject to market adjustments in response to capacity constraints within the Alberta economy. Over the length of the construction phase of the Project, it is likely that the provincial capacity to supply goods and services to upgrader projects will expand.

#### 15.4.1.2 Operations

Table 15.4-3 provides a breakdown of operations expenditures (excluding purchased natural gas and electricity) by type and region for the Project. It shows that an estimated 47% of operations expenditures of \$357 million annually will accrue to the RSA, primarily as wages and salaries. A further 24% of operations expenditures will accrue to the rest of Alberta. As a portion of total operations expenditures for the Project, wages and salaries constitute 43%, while purchased goods and services (excluding purchased natural gas and electricity) accounts for 57%.

Operations expenditures constitute income for contractors, suppliers and workers, who, in turn, spend part of their income on supplies and services, compounding the income effect of the Project. Table 15.4-4 presents the estimated direct, indirect and induced GDP and household income effects of the Project's operational expenditures, based on published statistics (AF, 2007). The GDP and household income effect from operations is estimated at \$340 million and \$93 million.

**Table 15.4-3 Project Operations Expenditure by Region**

	RSA	Other Alberta	Other Canada	Foreign	Total	Proportion of Total
	\$ million 2007					%
Wages and Salaries	132	7	8	8	155	43
Chemicals/Catalysts	17	36	7	16	76	21
Materials and Supplies	7	15	9	39	70	20
Other	12	28	4	12	56	16
Total	168	86	28	75	357	100
As a % of Total	47%	24%	8%	21%	100%	

Note: Total may not add due to rounding.  
Excludes purchased electricity and natural gas.  
Total operating expenditure estimated to be \$600 million annually.

**Table 15.4-4 Project Operations-Related Total Income Effects**

	Direct Effects	Direct, Indirect and Induced Effects	
		GDP	Household Income
	\$ million 2007		
Project Operations	357	340	93

## 15.4.2 Local Procurement

North American is drawing on the corporate social responsibility experience and practices of StatoilHydro, its parent company. Based on these practices, North American aims to make sustainable investments that create and maximize shared value – investments that benefit shareholders and the host communities where they operate. North American will accomplish this by creating local content and generating positive spin-offs from core business in support of the development ambitions of host communities.

North American promotes local sourcing, works with local businesses as suppliers and contractors where they exist, and invests in the development of sustainable and competitive local enterprises. North American believes that suppliers bring significant value to North American, and to partners and customers, and that maintaining a strong relationship with high-quality suppliers will contribute to a sustainable competitive advantage for the company.

North American is committed to:

- engaging suppliers that operate consistently according to their values, and hold high standards in regard to health, safety and environment and ethical and social responsibility;
- securing the best value through the optimal use of in-house and supplier resources to provide products and services with the right quality and which are delivered on time;
- developing long-term local support for the Project by transferring technology and knowledge into Alberta and other parts of Canada, and to share technology on normal commercial terms;

- providing manufacturers, consultants, contractors and service companies in Alberta and other parts of Canada with a full and fair opportunity to participate on a competitive basis in the supply of goods and services used in the Project by:
  - becoming more familiar with Alberta and other Canadian supply capabilities;
  - communicating with Alberta and other Canadian suppliers and manufacturers at the earliest opportunity through information packages that list requirements of goods and services, including general specifications and timing for services, equipment and materials required;
  - holding “supplier meetings” and “pre-bid meetings,” where practical and appropriate, to inform prospective suppliers of the timing and specifications for goods and services required in upcoming segments of the Project; and
  - using electronic bulletin boards for making available to potential suppliers the bidding procedures, names and locations of key procurement personnel (including that of contractors), where appropriate.
- communicating with unsuccessful bidders, when requested and where appropriate, to help them bid more competitively in the future and also with community advisory committees, town councils, appropriate government agencies, business organizations, trade associations and others that form a support network for the supplier community; and
- responding to requests from the communities, business organizations, government and public regarding speaking engagements and general information.

### 15.4.3 Project Fiscal Effects

#### 15.4.3.1 Federal and Provincial Fiscal Effects

During operations, the Project will provide economic benefits to the federal and provincial governments via corporate tax payments. Based on an estimated Project cost of \$16 billion, the annual federal and provincial corporate tax payments are estimated at \$350 million and \$190 million, respectively, once loss-carry forward pools are exhausted. These estimates assume:

- an average Brent benchmark oil price of US \$60;
- an average natural gas price of US \$7 per MMBTU; and
- an exchange rate of Canadian \$0.90 per US dollar.

Federal and provincial corporate tax payments through 2050 total \$17.6 billion and \$9.5 billion, respectively, in 2007 dollars (undiscounted).

#### 15.4.3.2 Municipal Fiscal Effects

The Project will provide significant benefits to Strathcona County by adding to its assessment base and contributing payments to the County in the form of property taxes. Based on 2006 municipal property tax assessments, initial property tax payments associated with the commissioning of Phase 1 of the Project in 2013 or 2014 are estimated at \$14.5 million. Over the following ten years, the Project will provide steadily increasing property tax payments as subsequent phases come online. Once the Project is fully operational, which is assumed, for the

purposes of this assessment, to occur in 2025, total property tax payments for the Project are estimated at \$58 million annually.

The County's total 2006 property tax revenue was \$92.5 million. The Project's initial property tax payments of \$16 million in 2013 or 2014 would represent an increase of 16% over 2006 property tax revenue, and 8% in the County's total 2006 revenue of \$191 million (AMAH, 2007c).

These estimates are subject to uncertainty, as they are based on approximate Project assessment figures and the 2006 non-residential mill rate. As additional projects come on-stream in Strathcona County, the mill rate may change. The Project's property tax payments will come online over an extended time, and assessment standards and tax rates over this period are not yet known.

#### 15.4.4 Project Employment

This section presents the employment impacts of the Project during both the construction and operations phases. It places these impacts in the context of the current situation in the RSA labour market.

##### 15.4.4.1 Current Situation

The Edmonton CMA labour force is estimated to consist of over 571,000 people in 2006, of which 561,300 were employed (StatsCan, 2007). The employment breakdown by industry for the Edmonton CMA and the province is shown in [Table 15.4-5](#). The manufacturing and construction workforce is estimated at 100,900 people, or 18% of the total workforce of the Edmonton CMA, and about one-third of the total Alberta labour force in manufacturing and construction.

**Table 15.4-5 Labour Force by Industry**

Industry Classification	Edmonton CMA	Alberta	Edmonton CMA as % of Alberta
Trade, Transport and Warehousing	125,500	388,600	32
Manufacturing and Construction	100,900	310,100	33
Health and Education	102,100	309,900	33
Information, Accommodation and Other	84,100	271,100	31
Business and Professional Services	55,700	204,900	27
Finance and Real Estate	31,200	96,200	32
Public Administration	38,800	81,100	48
Agriculture, Utilities and Resource-Based	23,000	208,700	11
Total Employment	561,300	1,870,600	30

Source: Statistics Canada.

The upswing in investment in Alberta has led to an expansion of job opportunities, not only in the energy and industrial construction sectors, but also in, for example, the following sectors:

- the retail sector - in response to the increased consumer spending associated with rising incomes and a growing population; and
- the residential construction sector - as more houses are built to accommodate the large number of people moving into the province for work opportunities, as well as Albertans enjoying higher incomes.

From 2002 to 2006, the number of people employed in Alberta grew by almost 200,000, with the largest year-to-year increase being 86,240, occurring between 2005 and 2006 (AEII, 2007d).

Alberta and the Capital Region are experiencing tight labour markets. Unemployment rates for Alberta and the Edmonton CMA in September 2007 are estimated at 3.5% and 4.1%, respectively, below the level that can be considered a balanced labour market (AEII, 2007e). These rates are below the national average of 6.1%. The province has the lowest unemployment rate in the country. While unemployment rates vary among occupational groups, sectors and regions, the labour market is generally tight throughout the province, with an increasing number of employers reporting that they are experiencing difficulty in hiring workers with the necessary skills.

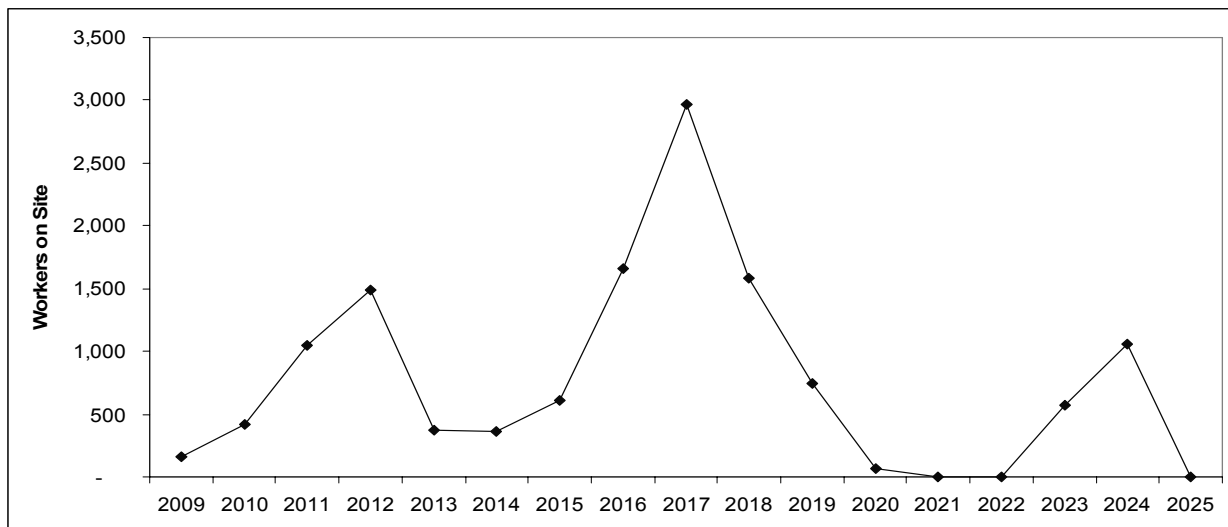
#### 15.4.4.2 Project Construction Workforce

Construction of the Project is estimated to create 24,000 person-years of employment during the 2009 through 2025 construction phase, consisting of:

- 13,000 person-years of on-site construction work;
- 6,700 person-years of employment in construction yards; and
- 4,300 person-years of engineering employment.

Figure 15.4-1 shows the distribution of the approximately 13,000 person-years of on-site employment, consisting of both on-site craft workers and supervisory personnel. The information indicates that the on-site workforce is expected to peak at about 1,500 in 2012, during Phase 1, and at 3,000 workers in 2017, when subsequent phases of the Project and the first gasifier are under construction.

**Figure 15.4-1 On-site Construction Workforce**



The Project will use a wide variety of industrial construction trades on-site over the construction phase. A breakdown of the on-site construction trades and general labour workforce, is presented in [Table 15.4-6](#). Key tradespeople required include pipefitters, electricians, boilermakers and ironworkers.

The percentages shown represent the average over the entire on-site construction period. The makeup of the workforce will vary over time as each phase of the Project goes through the various stages, from site preparation to foundations, and from steel erection to machinery installation.

In addition to the on-site workforce, the Project will create employment in fabrication shops, as its execution methodology includes off-site module fabrication. The off-site workforce may reach 500 workers during Phase 1, and between 750 and 1,000 workers during subsequent phases of the Project. Key tradespeople required for the fabrication shops include pipefitters, boilermakers and welders.

**Table 15.4-6 On-site Construction Workforce by Trade**

Trade	Percent of Total
Pipefitters/Welders	34
Electricians/Instrumentation Personnel	22
Scaffolders/Labourers	13
Operators/Ironworkers/Boilermakers	8
Managers/Supervisors, All Crafts	7
Various Support Personnel	7
Insulators	5
Cement Masons	2
Millwrights	2
Painters	<1
Sheet Metal Workers	<1

Note: Totals may not add due to rounding.

#### 15.4.4.3 Project Operations Workforce

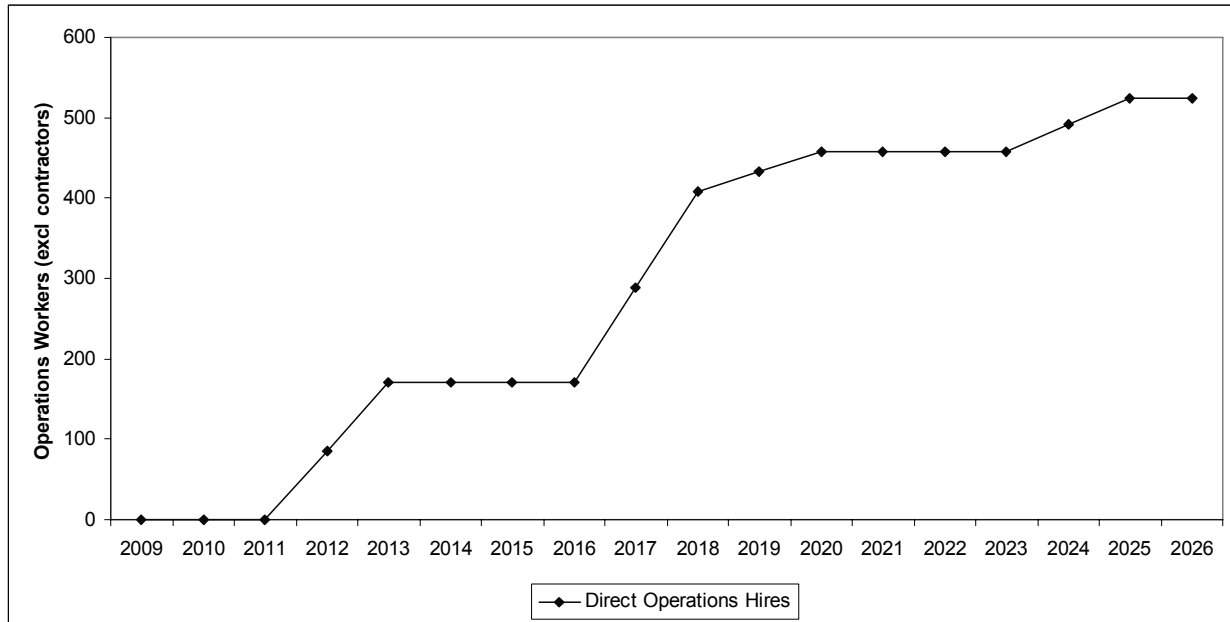
The analysis assumes an operations phase of 35 years for each project component, noting that the experience of other upgraders and refineries indicates that ongoing sustaining capital investment will likely extend the Project's economic lifespan. Operations employment estimates are:

- approximately 170 operations positions, once Phase 1 becomes operational in 2014;
- an increase to 410 operating positions by 2018; and
- 525 direct operations jobs at full build-out, by 2025.

In addition to the full-time operations jobs, the Project will generate contracted maintenance employment, roughly equal to 25% of operations employment.

[Figure 15.4-2](#) shows staged operations hiring for the project over time. An estimated 70% of the total operations workforce, including contractors, is related to process operations and facility maintenance, with the balance related to administration, professional services and management.



**Figure 15.4-2 Direct Operations Workforce**

#### 15.4.4.4 Project Total Employment Effects

Total on-site, off-site and engineering-related direct labour force requirements for Project construction – estimated at 24,000 person-years — will generate employment among Project suppliers (indirect employment) and the general economy (induced employment), which can be estimated using published multipliers (AF, 2007). Total direct, indirect and induced employment is estimated at 56,400 person-years.

Not all the employment creation is incremental to the Alberta economy. Considering the anticipated high level of economic activity in the 2010 to 2015 period, some of this employment creation might displace activity that would have taken place in the absence of the Project.

Project operations will also generate indirect employment and induced employment, which can be estimated using published multipliers (AF, 2007). Total direct, indirect and induced employment related to project operations is estimated at about 1,300 person-years annually. This number includes on-site contractors.

#### 15.4.5 Local Hiring and Workforce Development

North American is drawing on the corporate social responsibility experience and practices of StatoilHydro, its parent company. Based on these practices, North American will:

- actively recruit locally, demonstrating that the company is a good employer by offering a safe working environment and attractive training opportunities, as well as building on local competence; and
- provide full and fair opportunity for Canadians to compete for project employment and training opportunities. All hiring will be completed with due regard for the technical and

safety requirements of the Project when defining qualifications and competencies of the proposed positions.

North American is committed to:

- making available, at the earliest opportunity, information packages which list employment opportunities and skill requirements;
- holding and participating in “Employment Forums,” when practical and appropriate, to inform prospective workers of job opportunities and hiring schedules;
- utilizing electronic bulletin boards/Internet and labour exchanges, with access to potential workers, to post available job positions;
- communicating employment opportunities and related skill requirements with educational institutions, communities, town councils, appropriate government agencies, business organizations and others that form the support network to the workforce;
- responding to requests from the communities, business organizations, government and public for information; and
- communicating information on the employment opportunities widely, and advertising them through the local communication processes.

#### 15.4.5.1 Foreign Workers

Foreign workers may be employed on the Project in specific circumstances. Foreign workers with specialized knowledge or experience would be employed when that specialized knowledge or experience is required, and when qualified Canadian workers are not available, or in other special situations. If foreign workers are engaged, North American is committed to working within the established procedures of Services Canada.

#### 15.4.5.2 Workforce Diversity

North American will extend full and fair opportunity for all stakeholders to share in the economic benefits flowing from the Project. This practice will ensure that individuals from diverse backgrounds will have access to training and employment opportunities associated with the Project.

North American is committed to:

- ensuring that such individuals or groups are represented on North American’s project team and among its suppliers and contractors; and
- working towards removing barriers that prevent individuals or groups from competing for employment opportunities.

### 15.4.5.3 Training

North American will carry out a program to promote, as necessary, education and training. It is expected that the prime supplier of job skills training will be Alberta post-secondary institutions and industry-specific training providers.

North American is committed to:

- participating in discussions with training institutions, school organizations and government agencies to share project- and industry-specific needs to allow these institutions to develop appropriate curricula, if required;
- working with training institutions to deliver many of the training programs at one or more project sites; and
- supporting applicable industry, government and Aboriginal organization collaborative training opportunities.

## 15.4.6 Cumulative Construction and Operations Employment

### 15.4.6.1 Cumulative Construction Employment

Other heavy industrial construction projects are planned in the RSA during the Project's construction timeframe. Four upgrader projects are included in the Cumulative Case, with construction periods overlapping that of North American's construction period. Two of the proposed projects are located within close proximity of the Project in Strathcona County, while the other two are located north of the Project, across the North Saskatchewan River in Sturgeon County. The Cumulative Case projects consist of:

- Shell Canada's Scotford Upgrader 2 (SU2) Project, a 400,000 bpd upgrader expansion with two gasifiers, proposed to be constructed in four phases between 2009-2022;
- Total E&P Canada Bitumen Upgrader Project, a 200,000 bpd facility scheduled to be built in two phases, between 2009-2017;
- Petro-Canada Oil Sands Inc.'s Sturgeon Upgrader, a 340,000 bpd facility, to be constructed in two phases, between 2007-2015; and,
- Synenco Energy Inc.'s Northern Lights Upgrader, a 100,000 bpd facility, which is proposed to be built in two phases, between 2008-2012 (currently on-hold in the regulatory process).

There are also two approved heavy industrial construction projects in Strathcona County that are very close to the Upgrader site, as well as an upgrader project approved for Sturgeon County; these projects have timelines that overlap with that of the Project. These three projects, which are included in the Baseline Case, are:

- BA Energy's 160,000 bpd Heartland Oil Sands Upgrader, which is being built in three phases, with a construction period from 2006-2012;
- Shell Canada's Scotford Upgrader Expansion 1 (SE1), a 90,000 bpd facility, which is being constructed from 2007-2009; and

- North West Upgrading's Bitumen Upgrader, which has received approval to be constructed in three 50,000 bpd stages, between 2007-2015.

Assuming current schedules, the cumulative construction workforce requirements for upgrader projects in Sturgeon County and Strathcona County is estimated to peak at 16,000 on-site workers. This estimate is subject to considerable uncertainty, in that each project included in the Cumulative Case may experience changes in project execution, thus affecting scope and timelines.

No definitive estimate is available of the size of the industrial workforce in the province or the Capital Region, and no such estimate is possible because of:

- a tradition of "working mobile" among those workers who specialize in heavy industrial construction; and
- an ability by some skilled construction workers to work both commercial/institutional and heavy construction (e.g., concrete workers, structural steel workers, carpenters);

That said, the heavy industrial workforce resident in the Capital Region is estimated at between 9,000 to 10,000 workers, based on the following research:

- a May 2007 survey of construction workers in the Wood Buffalo Region which indicated that 29% (or 5,200) of an estimated 18,000 mobile workers in that region were from the Capital Region (Nichols Applied Management, 2007); and
- at that same time, three oil sands projects ongoing in the Capital Region (Petro-Canada's Edmonton Refinery Conversion, BA Energy's Heartland Oil Sands Upgrader and Shell Canada's Scotford Upgrader Expansion 1) were employing an estimated 4,900 workers, most of whom were from the local area.

This estimate does not include workers currently employed in fabrication yards and on large commercial, institutional and maintenance projects. Generally, there is some level of mobility between different parts of the construction industry. Moreover, the decision of individual workers about which sector and location in which to work is dependent on personal choice and project-specific variables, including type of work, financial incentives, work-shift schedules and job stability, work environment and project location.

Taken together, the evidence suggests that the estimated peak demand of 16,000 construction workers in the AIH will be met by:

- the estimated regional supply of 8,500 to 9,000 construction workers with the appropriate skills for heavy industrial construction who are resident in the region, taking into account that at least some of the RSA-based workers will continue to work on projects in the Wood Buffalo region; and
- an estimated 7,000 to 8,000 workers from outside the region.

The extent to which mobile workers will relocate to the RSA in response to long-term construction opportunities is not known at this time. Anecdotal evidence suggests that house price increases in the 2005 to 2007 period have acted as a deterrent to in-migration trends. For the purpose of this analysis, it has been assumed that construction workforce requirements in excess of 8,750 workers will be met by mobile workers non-resident to the region.

### 15.4.6.2 Cumulative Operations

Upgrader operations workforces are estimated to increase as new facilities come on-stream. Cumulative additional upgrader operations employment is estimated to reach 2,000 workers in 2014, 2,900 in 2018 and 3,700 in 2025. The North American Upgrader accounts for 8% of the cumulative new upgrader operations hiring in 2014. The corresponding estimate is 12% for the periods of 2018 and 2025.

Operations-worker hiring in the AIH will take place over a prolonged period, estimated to be 18 years. During this time, AIH upgraders will compete for workers with other planned facilities in the province (e.g., Fort McMurray, Grande Prairie and Cold Lake) and throughout western and northern Canada.

## 15.5 Population Effect

Population growth in the RSA was subject to considerable debate in the fall of 2007. The Capital Region Integrated Growth Management Plan ([Section 15.3.4](#)) has developed a population forecast, based on ongoing work, to support a regional transportation model maintained by the City of Edmonton and Alberta Infrastructure and Transportation. The forecasts developed for the CRIGMP are generally in line with, but lower than, the growth forecasts of individual municipalities, reflecting varying views of the market share of overall RSA growth that individual communities may capture.

The analysis presented in the SEIA focuses on population impacts or the differences in forecasted population, with and without the Project, or with and without all projects assumed in the Cumulative Case. These estimates are presented in [Table 15.5-1](#) through [Table 15.5-4](#), and are not dependent on the absolute level of the forecasted populations. The underlying Cumulative Case forecast is roughly in line with those used for the CRIGMP for the RSA and Strathcona County. The estimates for Fort Saskatchewan and Bruderheim in this study are lower than those adopted by the CRIGMP, and lower than what those municipalities are expecting. The differences in the absolute forecasts reflect different assumptions about the percentage of the overall population impact that will accrue to Fort Saskatchewan and Bruderheim, as compared to other communities nearby, including Edmonton.

**Table 15.5-1 Population Impact, RSA**

	2006	2014	2025
Baseline Case	-	-	-
Application Case	-	760	2,370
Cumulative Case	-	42,110	25,560

**Table 15.5-2 Population Impact, Fort Saskatchewan**

	2006	2014	2025
Baseline Case	-	-	-
Application Case	-	110	360
Cumulative Case	-	3,030	3,720

**Table 15.5-3 Population Impact, Strathcona County**

	2006	2014	2025
Baseline Case	-	-	-
Application Case	-	130	430
Cumulative Case	-	4,570	4,270

**Table 15.5-4 Population Impact, Bruderheim**

	2006	2014	2025
Baseline Case	-	-	-
Application Case	-	20	60
Cumulative Case	-	200	290

Both the RSA and Strathcona County impact estimates show a lower level of impact in 2025 than in 2014. This reflects the completion of upgrader construction activity, with its higher indirect and induced economic activity, and reflects in 2025 operations-based activity, which is less intense than construction.

The population impacts on Fort Saskatchewan and Bruderheim are estimated to increase from 2014 to 2025, reflecting increasing operations hiring and the assumption that, for Fort Saskatchewan, a sizeable portion of new hires will elect to live there.

### 15.5.1 Baseline Case

The population of the RSA and the largest communities in close proximity to the Project are expected to grow under Baseline Case assumptions. The Baseline Case forecast is based on a simple extension of growth rates based on historical evidence for the RSA and the other municipalities.<sup>1</sup>

### 15.5.2 Application Case

The population impact of the Project on the RSA is estimated at about 760 people in 2014 and 2,370 people in 2025. These Project-induced population impacts are approximately 0.1% and 0.2% of the forecasted RSA population in those years, respectively.

The population impact of the Project on Fort Saskatchewan is estimated at about 110 people in 2014 and 360 people in 2025. These Project-induced population impacts are approximately 0.6% and 1.6% of the forecasted population of Fort Saskatchewan in 2014 and 2025, respectively.

The population impact of the Project on Strathcona County is estimated at about 130 people in 2014 and 430 people in 2025. These Project-induced population impacts are approximately 0.1% and 0.3% of the forecasted population of Strathcona County in 2014 and 2025, respectively.

<sup>1</sup> Baseline Case growth rates for the RSA are estimated at 1.8% for the period 2008 to 2015 and 1.5% for the period 2016 to 2126; Baseline Case growth rates for Strathcona County are estimated at 2.5% for the period 2008 to 2015 and 2.5% for the period 2016 to 2126. 2008-15 rates have been based on previous Federal Census ten-year historical growth rates, 2016-2025, based on 20-year historical rates.

Baseline Case growth rates for Fort Saskatchewan are estimated at 3.0% for the period 2008 to 2015 and 1.1% for the period 2016 to 2126; Baseline Case growth rates for Bruderheim are estimated at 0.2% for the period 2008 to 2015 and 0.2% for the period 2016 to 2126. Rates have been based on most recent municipal or federal census, which reflect more current growth trends as opposed to long-term historical rates.

The population impact of the Project on Bruderheim is estimated at about 20 people in 2014 and 60 people in 2025. These Project-induced population impacts are approximately 0.1% and 0.3% of the forecasted population of Strathcona County in 2014 and 2025, respectively.

These impact estimates are critically dependent on how many of the new operations workers will be attracted to the nearby communities. The estimates above are informed by historical dispersion patterns of operations personnel of existing petrochemical facilities in the area. These residence patterns indicate that virtually all communities in the RSA host operations personnel from existing facilities, but that the communities of Fort Saskatchewan and Strathcona County are home to approximately 55% of staff, Edmonton is home to about 25%, and the remainder are dispersed throughout the RSA.

The actual impacts on nearby communities may be higher if housing options, available when the Project starts operational hiring, are attractive relative to competing offerings in other communities. This is particularly true for Bruderheim and Lamont, both of which have seen limited growth in recent years, but which are preparing for growth in the future. If attractive residential development occurs in these centres, it is likely that a portion of new Project operations hires will chose to live there, in view of the proximity to the Project. The population impact of the Project at full build-out for the Town of Lamont is estimated to be in the range of 50 to 60 persons.

### **15.5.3 Cumulative Case**

The population impact of the Cumulative Case projects on the RSA is estimated at about 42,110 people in 2014 and 25,560 people in 2025. These upgrader projects-induced population impacts are estimated at 3.5% and 1.8% of the forecasted RSA population in 2014 and 2025, respectively.

The population impact of the Cumulative Case projects on Fort Saskatchewan is estimated at about 3,030 people in 2014 and 3,720 people in 2025. These upgrader projects-induced population impacts are approximately 15% and 16% of the forecasted population of Fort Saskatchewan in 2014 and 2025, respectively.

The population impact of the Cumulative Case projects on Strathcona County is estimated at about 4,570 people in 2014 and 4,270 people in 2025. These upgrader projects-induced population impacts are approximately 4.5% and 3.0% of the forecasted population of Strathcona County in 2014 and 2025, respectively.

The population impact of the Cumulative Case projects on Bruderheim is estimated at about 200 people in 2014 and 290 people in 2025. These Upgrader Projects-induced population impacts are approximately 16% and 22% of the forecasted population of Bruderheim in 2014 and 2025, respectively.

Discussions with select municipalities in the RSA indicate that some anticipate growth rates to be well in excess of the overall growth rate of the RSA. Fort Saskatchewan, in particular, is forecasting growth rates in the 6% to 8% range annually. This higher rate incorporates a number of other population drivers, such as current trends in new residential development, which, according to municipal reports, is being driven by population growth spillover from Edmonton and Sherwood Park (Laing, pers.comm. 2007).

The analysis used in this study is based on historical settlement patterns, which might change over time as amenities in different communities change relative to each other. In general, there is competition among the various communities near the Project site for new in-migrants, including operations workers for the Cumulative Case upgrader projects. For example, based on historical

settlement patterns, Bruderheim and Lamont could see in the range of 300 to 350 people per community, based on cumulative upgrader activity, but that number will vary depending on how successful these communities are in attracting new growth. The estimates presented here are a plausible scenario of the ways in which the anticipated RSA population growth, including growth associated with the Cumulative Case upgrader projects, might be distributed. Other scenarios are possible.

## **15.6 Transportation Effect**

### **15.6.1 Baseline Case**

The Scotford Expansion 1 project includes a number of improvements to the Range Road 214/Highway 15 intersection, including improvements to the turning lanes on both Highway 15 eastbound and Range Road 214 southbound, as well as the addition of an acceleration lane on Highway 15 westbound. These improvements are designed to accommodate forecasted traffic impacts, as per the Baseline Case.

### **15.6.2 Application Case Effects**

#### **15.6.2.1 Road Traffic**

The Application Case-related traffic impacts are an amalgam of:

- construction traffic, consisting of commuting workers, using a bussing system;
- trucks delivering materials and equipment; and
- operations workers, potentially beginning in 2012.

In 2017, at the peak construction impact, the traffic impact is estimated at 4,700 vehicle movements, most of which will be construction-related traffic. The designated route for the majority of traffic is Highway 15 westbound, to Range Road 212, northbound to Township Road 560 westbound to the Project site.

As part of ongoing operations, the Project will require periodic maintenance work (turnarounds), which typically generate in the range of 1,500 to 3,000 workers for a one-month period. Assuming bussing of the turnaround workforce and standard materials delivery-related traffic, Project turnarounds would generate an additional 100 to 500 average annual daily traffic (AADT), for a brief period of time.

#### **15.6.2.2 Rail Activity**

The Project is sited in proximity to rail spurs operated by CN and CPR, which provide potential options for rail service. Increased rail traffic will impact roadways with spur crossings, namely Range Road 211. The inclusion of gasifiers will reduce the Project's requirements for outbound railcars from an estimated 100 cars down to 10 to 20 cars per day, mainly related to a reduction in petcoke shipments.

### **15.6.3 Cumulative Case**

Assuming current schedules, the cumulative peak on-site construction workforce of BA Energy's Heartland Oil Sands Bitumen Upgrader, Shell Canada's Scotford Upgrader 2, Total E&P Canada's Bitumen Upgrader and North American Upgrader projects is estimated in excess of



8,000 in 2012 and at 6,500 workers in 2017. [Table 15.6-1](#) presents projected AADT volumes associated with cumulative upgrader construction activities (including the Project) on key road segments near the Project site.

**Table 15.6-1 Projected Traffic Near the Project**

	Baseline Condition 2007	Project Effects 2017	Cumulative Effects 2012	Cumulative Effects 2017
	Average Annual Daily Traffic (AADT)			
Township Road 560, West of Highway 830	700	800	1,600	4,200
Range Road 212, North of Highway 15	200	4,700	5,900	11,500
Highway 15, West of Range Road 212	10,800	4,700	13,300	19,900

Source: Appendix 15A, Transportation Technical Brief.

Strathcona County is in the process of completing a transportation study which takes into consideration anticipated industrial activity in the foreseeable future. The Strathcona Area Industrial Heartland (SAIH) Transportation Study (Draft) (Stantec, 2007) recommends several road enhancements in the area, including:

- a new realigned road connection from the Highway 15/Range Road 214 intersection to Range Road 213;
- a major signalized intersection at Highway 15/Range Road 212;
- a minor intersection upgrade (i.e., turning lanes) at Highway 15 and Range Road 211;
- improvements to Township Road 560, Township Road 554 and Range Road 213;
- a two-lane roadway connecting Highway 15 at Range Road 220 to Township Road 562; and
- centralized control of traffic signals in the area, including through the City of Fort Saskatchewan.

In the longer term, as operations-traffic increases, the study recommends:

- a grade separation at the Highway 15/Range Road 214 intersection, particularly in light of a possible extension of the CNR Scotford yard; and
- a grade separation at the Highway 15/Range Road 220 intersection, with a continuous link to Township Road 562.

This study is to be an input to the transportation master plan for Strathcona County, which includes the development of a conceptual major internal road network designed to suit the forecasted needs of industrial activities in the region.

### 15.6.3.1 Regional Road Network Effects

The Capital Region has an extensive roadway network with multiple options of major arterials that traffic can use to move in and around the RSA. Cumulative upgrader activity will have an impact on the regional network, particularly along commuter highways that link the AIH with the rest of

the region. Key arterial roadways, such as Manning Drive, Highway 21 and Highway 15, have been experiencing steady growth in volumes, and will continue to do so as cumulative activity increases. Municipal officials in Fort Saskatchewan have expressed concerns that the segment of Highway 15 within the limits of Fort Saskatchewan is reaching capacity during daily peak travel periods (Polowaniuk, pers. comm., 2007).

Changes in the regional road network will ease some of the traffic pressures. For example, Highway 21 between Highway 16 and Highway 628 is being twinned, including the twinning of the Highway 21 overpass at Highway 16. That said, heavy truck traffic, including dangerous goods loads, combined with upgrader activity, may lead to the need for further upgrades to the road network. This need is being taken into consideration in the development of the Capital Region Integrated Growth Management Plan, as well as in the long-range plans of completing both the inner and outer Capital Region ring roads.

### 15.6.3.2 Bussing Systems

The Shell Canada Scotford Upgrader Expansion 1 and Scotford Upgrader 2 projects, as well as several other projects in the AIH, have brought bussing of construction workers forward as a way to mitigate traffic impacts. Individual company bussing systems will require parking locations around the region that can serve as marshalling points. In 2012, the cumulative demand may exceed 500 buses daily.

### 15.6.4 Mitigation

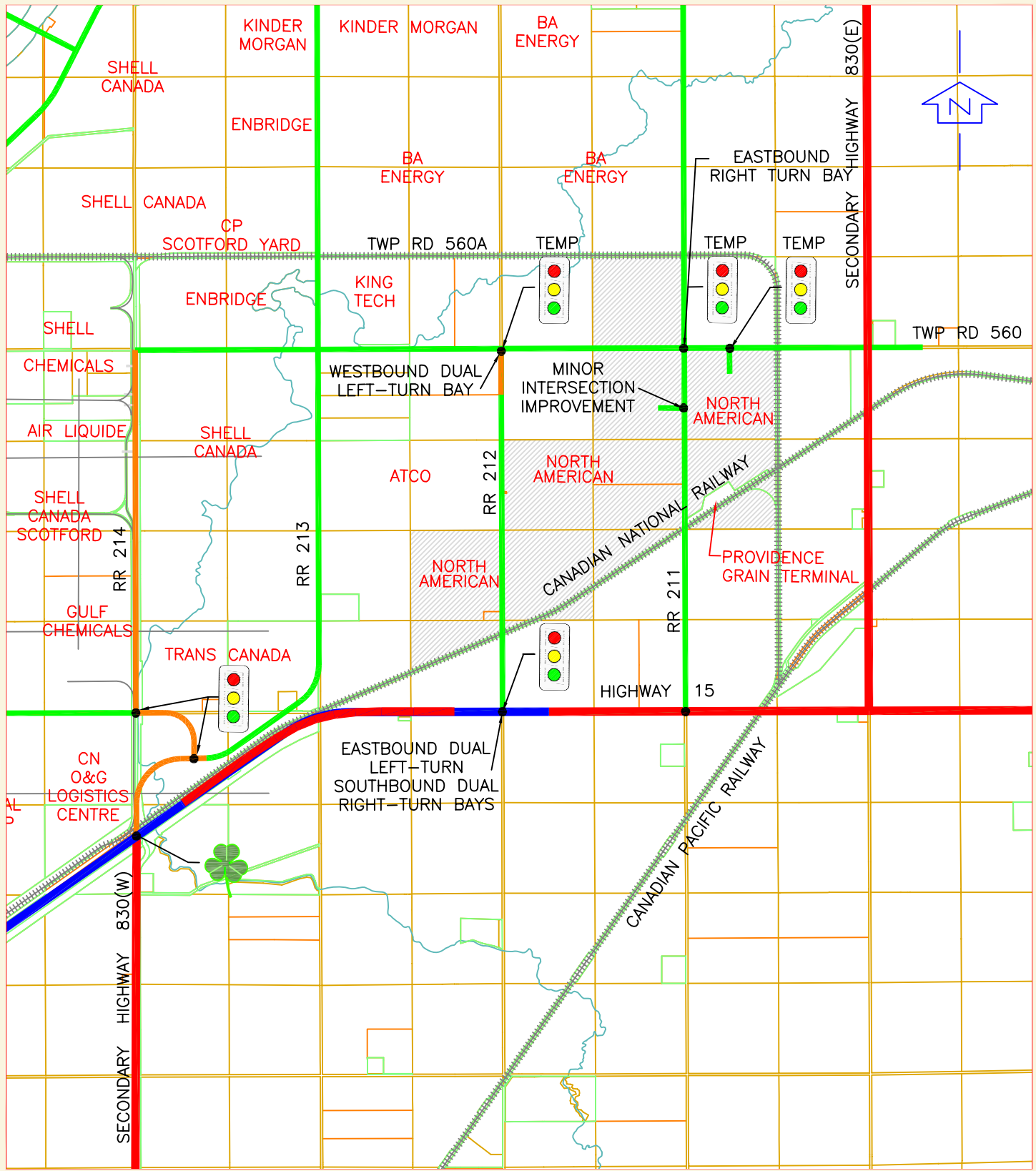
The Transportation Technical Brief completed for the Project and presented in [Appendix 15A](#) suggests the following road improvements to mitigate Project-related traffic impacts:

- eastbound dual left-turn bay and southbound right-turning dual bay at the intersection of Highway 15/Range Road 212;
- westbound dual left-turning bay at the intersection of Township Road 560/Range Road 212; plus single left-turn bays for the other three directions;
- left-turn bays in all four directions, plus an eastbound right-turning bay, at the intersection of Township Road 560/Range Road;
- signalized traffic control for Highway 15/Range Road 212; and
- temporary traffic controls for the intersections of Township Road 560 with Range Roads 212 and 211.

These road improvements are in line with the SAIH transportation study recommendations for the County. [Figure 15.6-1](#) provides an overview of the required improvements.

North American will work with other stakeholders to follow up on possible implementation of recommended road improvements arising out of the 2007 SAIH Transportation Study. The company is committed to:

- exploring opportunities to work with other existing and proposed large facilities in Strathcona County to further coordinate industry-related traffic in the area, particularly as it pertains to scheduled turnarounds;
- providing a bus service for construction workers, supported by a marshalling system; and
- scheduling material and equipment deliveries in off-peak hours, where appropriate.



LEGEND	
	Signals (New / Temporary)
	Highway (Four Lane)
	Highway (Two Lane)
	Class 1A Road (50 m to 60 m ROW)
	Class 1B Road (40 m and 50 m ROW)

Title:

**Roadway Network 2017  
Cumulative Effects**

**NORTH AMERICAN  
OIL SANDS CORPORATION**

Approved: DC	Revision Date: 11/22/07
File: HEARTLAND_PLAN.DWG	
Drawn by: DV	Checked: DC
Fig. No.: <b>15.6-1</b>	

## 15.7 Land Ownership, Housing and Service Provider Effects

The Project and cumulative effects on land use, housing, infrastructure and service providers flows mainly via population effects, discussed in [Section 15.5](#). In the long-term, the upgraders create operations employment, which drives population growth, which, in turn, causes an increase in demand for services and infrastructure over and above what that demand would have been in the absence of the projects.

Although operations-related employment is the long-term population driver, there are effects on service providers and infrastructure during the construction phases. An important factor during the construction phases is the sourcing of on-site construction labour, discussed in [Section 15.4.6](#). As mentioned in that section, the number of construction workers with the appropriate skills for heavy industrial construction available for upgrader projects in the RSA is estimated to be between 8,500 and 9,000.

[Table 15.7-1](#) shows a summary of the need for mobile workers in the RSA under different assessment cases. The table presents workforce and associated population estimates in 2012, which is the year in which cumulative workforce requirements peak. The information in the table shows that:

- any impacts associated with mobile workers occur only in the Cumulative Case, which assumes that all upgrader projects proceed as currently planned; and
- the population impact during the peak construction period, estimated at 3.2% of the RSA population, is muted due to the draw of the upgrader projects on the already resident workforce.

The estimates of mobile worker and overall RSA population impacts underpin the following discussion on land use, housing and service provider impacts. The Application Case impact on most infrastructure and service providers is very small and, in line with the population impact, estimated at less than 1% higher than what they would have been without the Project. In accordance with the finding that the RSA population at peak construction is estimated to be 3.2% higher with the Cumulative Case projects, as compared to without them, the impacts on service providers and infrastructure is small as well, in regards to the Cumulative Case.

This fact is particularly true for those services that are delivered on a regionalized basis, such as health care, post-secondary education and, to a lesser extent, primary and secondary education. For services delivered by local systems, such as policing, emergency and municipal services, the discussion will reflect the relatively higher population impacts on Fort Saskatchewan, Strathcona County, Bruderheim and Lamont, as discussed in [Section 15.5](#).

**Table 15.7-1 Workforce and Associated Population Impacts by Assessment Case**

Impact Assessment Case	AIH Upgraders Workforce (# On-site Workers)		RSA Population Growth 2006-2012	Population Impact relative to Baseline Case	
			# People	# People	% of RSA
Baseline Case (2012)	RSA-Based	2,680	4,770	-	-
	Mobile	minimal			
	Total	2,680			
Application Case (2012) (includes Baseline Case)	RSA-Based	4,360	5,150	380	<1%
	Mobile	minimal			
	Total	4,360			

Impact Assessment Case	AIH Upgraders Workforce (# On-site Workers)		RSA Population Growth 2006-2012	Population Impact relative to Baseline Case	
			# People	# People	% of RSA
Cumulative Case (2012) (includes Baseline & Application Case)	RSA-Based	8,700	42,800	38,030	3.2%
	Mobile	7,300			
	Total	16,000			

Assumptions:

The heavy industrial workforce that is resident in the RSA (and that may work mobile outside of the region) is estimated to be 10,000.

Population impacts are as follows:

- Baseline and Application Cases: driven by operations hires, and resultant indirect/induced positions.
- Cumulative Case: driven by indirect and induced construction workforce impacts above the current baseline level, plus operations hires and resultant indirect/induced positions. Maximum drawback of RSA workforce from out-of-region assumed to be 75%.

All positions filled by people new to the region, with an associated population impact equivalent to the current population/employment ratio (1.9).

Responsibility for addressing socio-economic issues in the region falls largely under the mandate of various public sector bodies, including local and provincial government agencies, as well as private sector agencies, including industry, businesses and non-profit service providers. In many areas, including health, education, emergency services and transportation, public sector agencies play a lead role in both planning and delivering services. For other services, such as housing and some social and recreational services, businesses and not-for-profit sector agencies take the lead.

### 15.7.1 Land Ownership

Several country residences remain near the Project site. Over time, the industrial developments in the AIH will further emphasize the heavy industrial nature of the area, which is ultimately not compatible with residential use.

One initiative that addresses this incompatibility is the Voluntary Property Purchase Program (VPPP). The VPPP, administered under the AIH Land Trust Society, is a collaborative effort of residents, industry and municipal representatives to provide area residents with another option of selling their residential property at a fair price, so that they receive reasonable compensation for expenses they would incur in moving out of the policy area.

The VPPP was initiated by the AIH Association and several local companies in 2004 to find fair and practical ways to address resident concerns about the cumulative impact of industrial activity and development in the AIH policy area. Briefly, the VPPP process works as follows:

- residents who want to relocate outside the AIH are encouraged to sell their property in the open market first, and if not satisfied by the market response, to apply to the VPPP;
- the VPPP uses application rounds, with each round lasting approximately one year;
- the VPPP checks applicants' eligibility, and then lists applicants in order of priority, using a volunteer advisory panel comprised of local community members, councillors and business representatives;

- the VPPP Board is then presented with the rankings, based on proximity to existing or proposed industrial facilities, and makes a decision as to how many properties to accept into the program, based on its yearly budget;
- the approved properties then receive notification of status, and are asked to confirm participation;
- if accepted, participants then select an appraiser from an approved list, and the VPPP Board hires its own appraiser. If the appraisals come within 20% of each other, the average is used. If there is a higher discrepancy, a third appraiser is brought in and the average of all three is used; and
- once the value is established, the society issues an offer to purchase, and the landowner has two weeks to accept or reject the offer. If accepted, the AIH Land Trust Society purchases the property; the landowner has up to one year to complete the transaction.

As of November 2007, six families have either relocated or are in the process of doing so under the terms of the VPPP (Nizioł, pers. comm., 2007). Funding of the VPPP remains a concern, with the contributions to date being limited to the participating municipalities and industrial developers with approved projects. Until now, the Province has not contributed to the funding of the VPPP.

Further information regarding land use impacts is described in detail in [Volume 5, Section 13](#).

#### 15.7.1.1 Mitigation

North American is drawing on the corporate social responsibility experience and practices of StatoilHydro, its parent company. Based on these practices, North American aims to be a good neighbour and is committed to:

- facilitating and participating in joint industry and community meetings to discuss issues; and
- supporting and helping to fund the VPPP, which provides another option for selected affected landowners who wish to sell their property.

#### 15.7.2 Municipal Effects

The expected effects of the Project on the host and closest surrounding municipalities, in terms of municipal services and how they relate to existing growth plans, are detailed below.

##### 15.7.2.1 Strathcona County

Strathcona County released its new Municipal Development Plan (MDP) in 2007. As of October 2007, there is some uncertainty regarding the MDP, as it is under appeal by the City of Edmonton. That said, the MDP sets out the growth strategy and plans to manage impacts in a planning horizon extending to 2025. Some of the highlights of MDP policies that affect growth include:

- consideration for future upgrades to Highway 21 to serve as a future regional ring road around the region;
- cooperative wastewater system planning with the Capital Region Sewage Commission and the City of Edmonton; and

- advocacy for a setback policy of 1.5 km to 3.2 km for residential from heavy industrial lands.

The County has announced its intentions of developing a new urban node, separate from Sherwood Park, to be located north of Highway 16 and east of Highway 21. This centre, with a planned size of 200,000, will have higher density design standards, and will allow for the accommodation of growth that the County is projected to receive. A major driver behind the development of this new urban centre was the physical limitation of the existing underground infrastructure (water and wastewater systems) of Sherwood Park, which is reaching the limits of its design capacity (Turner, pers. comm., 2007). Other planning initiatives ongoing in Strathcona County include:

- the Strathcona Area Industrial Heartland (SAIH) Transportation Study;
- a housing needs assessment; and
- a community facilities study.

Strathcona County has a strong assessment base, which grew by 11% between 2005 and 2006. The assessment growth was strongest in the residential and machinery and equipment categories. The County's municipal capital budget for 2007 is \$111 million, of which \$84 million is allocated to new infrastructure, including the new "Centre in the Park" development project. The 2007 capital budget reflects a 100% increase over the previous year's level of capital investment. The municipal operations budget is \$147 million in 2007. Property taxes collected this year are expected to contribute \$100 million in revenue to the County, based on the following breakdown:

- \$24 million levied on residential and farm assessment base; and
- \$76 million levied on commercial, linear and industrial assessment base.

From an overall municipal management perspective, Strathcona County is well-positioned to manage growth pressures and continue to deliver services that meet resident expectations, as determined by:

- a strong fiscal position, with a large existing tax base, which is poised to grow from both residential and particularly industrial development;
- a large land base upon which to draw for expansion – as Sherwood Park reaches full build-out, the new urban node can be developed in close proximity on available parcels; and
- a well-staffed and funded corporate body, with appropriate internal resources to address management, planning, engineering and public works, economic development and social services needs.

County administration has expressed confidence in the ability of the municipality to manage forecasted growth pressures (Turner, pers. comm., 2007). From their perspective, the main issue to be resolved is that of regional cooperation and potential governance issues being addressed in the Capital Region Growth Management Plan process currently underway.

Strathcona County is expected to continue to be home to many commuting workers employed throughout the region, as well as for part of the new operations workers of projects in the Baseline Case. The forecasted increase in the tax base, both from residential and industrial

growth, is expected to cover the additional demands on municipal services and infrastructure that accompany the development of the new centre, as well as growth throughout the County.

### 15.7.2.2 Bruderheim

The Town of Bruderheim is planning for growth relative to its current size of 1,215 inhabitants. It has prepared itself for growth by contracting the planning and engineering functions for the Town to Strathcona County through a fee-for-service arrangement. This arrangement gives the Town, which has had a relatively stable population, and hence little experience in dealing with growth issues, access to sophisticated systems and processes. Bruderheim updated its MDP in 2007, but further planning is required to accommodate growth projections.

Bruderheim has a small assessment base relative to Strathcona County and Fort Saskatchewan. Its assessment base is also mostly residential, and grew at 7% between 2005 and 2006, mostly based on increasing house prices.

The Town has plans to expand by four quarter sections, with approximately half to be used for new residential development and the remainder for future industrial and commercial development. In the fall of 2007, developer interest appeared high; if developed, Bruderheim may attract more of the regional population growth than currently forecasted in this study.

The water supply and sewage treatment system has a capacity to serve a population of 5,000. The underground services will require upgrading. A conditions review of Town facilities is currently underway. Growth in population would lead to an increase in the residential tax base, which would allow the Town to increase its services.

The anticipated growth is in line with its 2004 strategic growth plan, entitled Vision 2020 (Town of Bruderheim, 2004). That plan highlights the factors that indicate a high quality of life for residents, such as affordable housing, small town values and community life. The vision also sets out aspirations to attract and manage growth, such as positioning the town as an ideal community for young families with members who are employed by nearby industry.

This growth will allow for more services to be provided, and will also cause an increase in school population. Town administration feels prepared to handle forecasted growth, assisted by the management and planning relationship provided by the County of Strathcona (Dubauskas, pers. comm., 2007). As population growth occurs, increased investment in town facilities and infrastructure can take place.

Bruderheim is expected to see some growth under the Baseline Case, especially if commercial developers expand the residential base of the community.

### 15.7.2.3 Fort Saskatchewan

Fort Saskatchewan's MDP is currently under review, as the version produced in 2000 has become outdated in light of the recent strong population growth. The City has recently opened up an additional 500 ha for residential development. If the estimated 6% growth rate seen in the 2006 to 2007 period holds, these lands are expected to be absorbed by 2012 or 2013.

The City's assessment base is roughly one-third of Strathcona County's base. Its assessment base is also more relatively composed of machinery and equipment, and has experienced less growth in the 2005-2006 period than the County. Fort Saskatchewan does not have its own water or wastewater treatment facilities, as the City is a member of the regional water customer group, serviced by EPCOR. The current system can supply a population of 40,000; however, reservoir capacity may need expanding. Fort Saskatchewan is also part of the Capital Region



Wastewater Commission, which provides wastewater processing. The system has capacity to accommodate regional growth.

Fort Saskatchewan is likely to continue to see rapid growth as the nearest residential community to two of the three upgrader projects in the Baseline Case. Its share of the overall growth will depend upon the availability of affordable housing and, generally, the amenities of the community relative to alternative jurisdictions.

#### 15.7.2.4 Lamont County and the Town of Lamont

The Town of Lamont is presently updating its MDP. There is currently interest shown by a number of land and housing developers that suggests the potential for growth in house construction, as well as related population gains. The Town is engaged in annexing property from the County of Lamont. The Town's water treatment facility is at capacity and is currently being expanded. Potable water supply is provided by the regional water system and has excess capacity. The Town has little debt and some reserves built up.

The County of Lamont has recently expanded the amount of land that is part of the AIH. The County has adopted a new MDP which focuses on providing a balanced approach to agricultural, industrial and residential development. The County will be developing a detailed Area Structure Plan, corresponding to their portion of the AIH.

#### **Baseline Case and Project Effects**

Strathcona County plays a lead role in planning and developing various essential services, including roads, sewers, emergency services and general land use. The County has a well-developed road network and emergency services infrastructure to support the heavy industrial facilities already operating near the Upgrader site.

Project effects on services and infrastructure provided by the municipality include:

- increased pressures on the local and regional road network;
- potential upgrades to municipal emergency services; and
- increased demand for municipal planning and development services.

Property tax payments resulting from the Project can be used by the County to provide additional infrastructure and services or lower tax rates for its residents.

The effect of the Project on Fort Saskatchewan, Bruderheim and the Town of Lamont will depend upon the percentage of the direct and indirect employment effects these communities can attract. These centres have opened up additional residential development lands and are expecting to grow as a result of the Project and other industrial development in the area.

#### **Cumulative Effects**

Further industrial development is planned for Strathcona County with construction of BA Energy's Bitumen Upgrader, Shell Canada's Scotford Upgrader Expansion 1 and Scotford Upgrader 2 expansions and the proposed Total E&P Canada's Bitumen Upgrader. These heavy industrial projects, along with other industrial and non-industrial projects planned for Strathcona County, will further increase the County's property tax revenue.

For many heavy industrial projects, effects on municipal infrastructure and services occur in advance of receipt of a project's property tax payments. However, for Strathcona County, the construction and phasing-in of multiple heavy industrial projects, many with multiple phases or components over an extended time, means the County will receive some additional property tax payments during the majority of the on-site construction period and well in advance of full operation of all projects.

Strathcona County is a municipality experienced in addressing local challenges associated with construction and operation of large heavy industrial projects. The County is home to many existing heavy industrial facilities, including the Shell Canada Scotford Complex (Refinery and Upgrader) and the Petro-Canada and Imperial Oil refineries, as well as plants for Shell Chemicals Canada, Air Liquide Canada and Gulf Chemical and Metallurgical.

While Strathcona County is the recipient of property tax payments from various industrial and non-industrial projects planned or underway in the County, neighbouring municipalities will also be affected by demand for municipal infrastructure and services as a result of construction and operation of these projects. Expected population increases associated with the various projects will bring municipal fiscal benefits and costs associated mostly with residential growth.

### Mitigation

North American sees the success of its project as determined in part by how the company manages itself within the local communities. North American recognizes that preparatory work within the local communities is essential. The company is committed to:

- explaining the scope and impact of the work activities to local and regional communities;
- making allowance for local and/or regional participation in addressing issues related to project planning and construction;
- establishing a dialogue with local officials and community leaders to ensure that the needs and expectations of the local communities are understood and dealt with openly and responsively;
- consulting with responsible local and regional authorities in a proactive effort to avoid or mitigate any potential conflicts over socio-cultural issues; and
- providing the schedule and staffing requirements associated with construction activities to local officials and community leaders.

North American is a supporter of community initiatives, has sponsored community projects and is constantly seeking new ways to engage the community.

### **15.7.3 Housing Effects**

As discussed in the introduction to [Section 15.7](#), the Application Case impact on regionally delivered infrastructure is very small. In line with the finding that the RSA population at peak construction is estimated to be 3.2% higher with the Cumulative Case projects as compared to without them, the impacts on housing is small. For this reason, the discussion provides a background on the housing market in the region in 2007 and focuses on the issue of housing for mobile workers under the Cumulative Case assumptions.

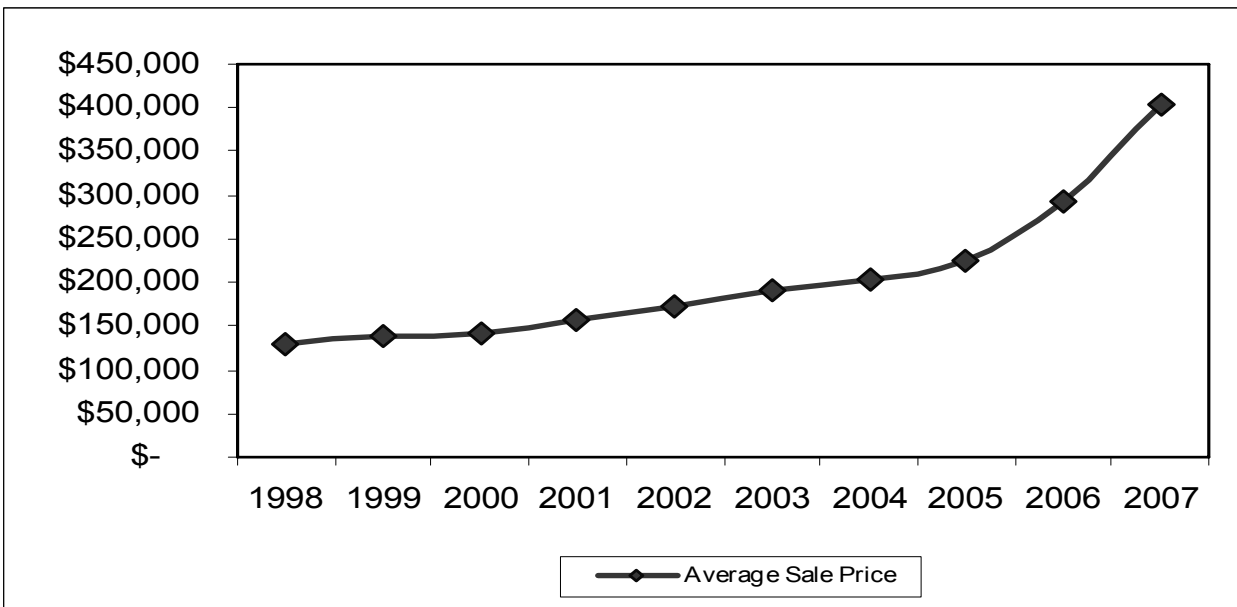
The housing situation in the RSA is characterized by high house and rental prices. In the summer of 2007, the real estate market has shown some weakness, with an increase in the

supply of houses for sale and some decline in house prices. Rental vacancies remain very low and rents high.

House price inflation in the RSA is being driven primarily by population growth, which outstripped the capacity of the real estate development industry to develop new housing in the 2005 to 2007 period. Increases in rents are similarly driven by demand exceeding supply. The rental market is also influenced by loss of rental stock through condominium conversions. Vacancy rates are at historical lows.

Prices have reacted to the supply imbalance, showing increases in property values and rental rates over the past five years. Price increases have also been influenced by increases in construction and maintenance-related costs, driven by increases in energy, land servicing and labour input costs. As shown in Figure 15.7-1, house prices experienced a gradual but steady increase from 1998 to 2005. From 2005 to 2007, the rate of price increases grew substantially, with the average sale price of single-detached homes in August of this year reaching just over \$400,000 (EREB, 2007).

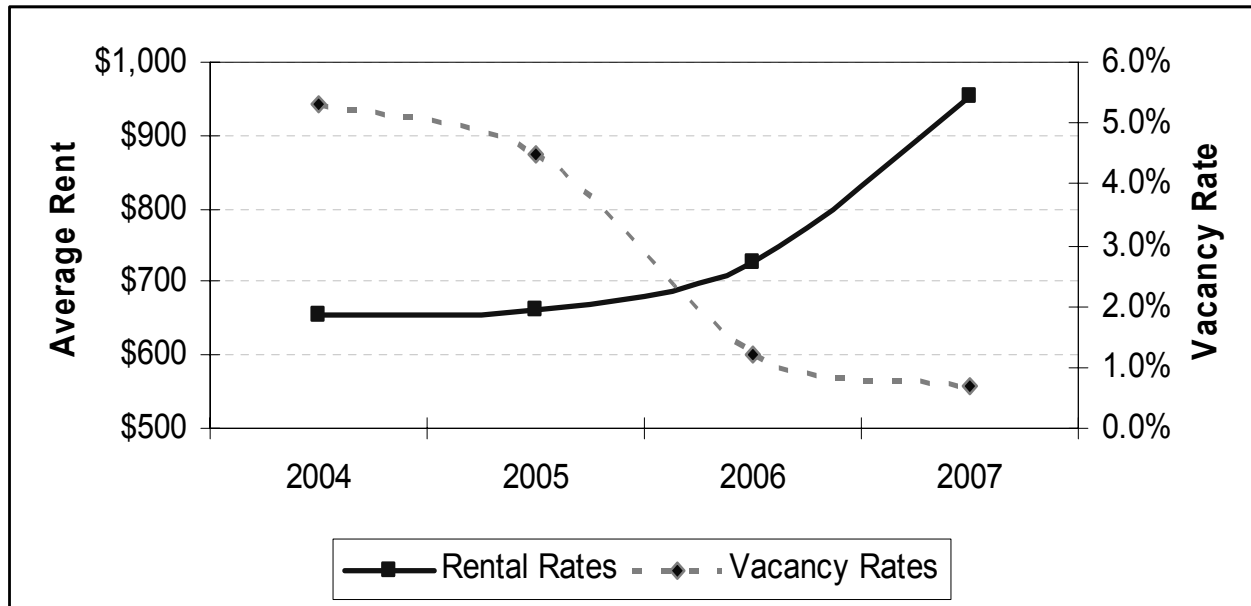
**Figure 15.7-1 Average Price, Single Detached Homes - Edmonton (1998-2007)**



2007 price based on average sale price in August 2007.

Source: Edmonton Real Estate Board / MLS.

Apartment rental rates have followed a similar path as house prices, also seeing a rapid increase in the 2005 to 2007 period. Figure 15.7-2 presents a picture of the trends in vacancy rental rates for all apartment types in the Edmonton CMA.

**Figure 15.7-2 Regional Rental Cost and Vacancy Rate Trends**

CMHC Annual Rental Market Survey (October data annually).

2007 data are estimates to October, based on CMHC 2<sup>nd</sup> Quarter Outlook report.

As discussed in [Section 15.3.5](#), the market has responded to the price movements, producing housing units well above the long-term average output of the industry. This supply response has been limited to ownership units and has not extended to rental accommodation. In the second half of 2007, the real estate market in the RSA has seen house listings increase, sales numbers decline and some downward pressures on house prices. These recent developments suggest that both the demand and supply side of the real estate market are responding to the price increases of the 2005 to 2007 period.

However, recent experience suggests that the market may not deliver an adequate supply of affordable housing accessible to lower-earning households. In early 2007, the Alberta Affordable Housing Task Force (AAHTF) released its report consisting of recommendations on how the Provincial Government should respond to the challenges presented in the current housing market (AAHTF, 2007). A number, but not all, of the recommendations were accepted, and the Province announced \$285 million in additional funding in 2007-2008. When combined with existing programming, the announced funds result in 11,000 new affordable housing spaces to be developed in the province in the next three to five years, of which approximately 3,000 to 4,000 units could be expected to be developed in the RSA.

### Baseline Case and Application Case

The Baseline Case population forecast implies a need for an estimated 8,400 housing units per year to accommodate the population growth in the overall region, assuming an average of 2.5 persons per dwelling. Total new house starts in the region numbered approximately 15,000 units in 2006, with the total for 2007 estimated to be slightly lower, but still exceeding 14,000 (CMHC, 2007a). The Baseline Case housing demand is thus well within the annual regional supply capability of the housing market.

Taking the current operations settlement patterns of industrial facilities as a guide, the estimated housing demand associated with Phase 1 hiring accrues primarily to Fort Saskatchewan, Strathcona County and the City of Edmonton. This distribution pattern may change depending on the relative attractiveness of housing options in the various communities. Phase 1 housing impacts represent 125% of the level of starts recorded in Bruderheim in 2006, and less than 10% of the housing starts in Fort Saskatchewan in 2006. Housing demand will not occur in one single year, but rather over a number of years as staged operations hiring takes place.

Housing effects associated with additional development are expected to be marginally bigger than estimated housing effects from Phase 1, but phased over the remaining twelve years of staged hiring. The total Project housing effect is estimated at about 950 housing units by the time full operation is reached in 2025.

### Cumulative Case

Table 15.7-2 presents a summary of the housing demand generated by Phase 1 operations hiring in the context of other upgrader hiring expected in the region. It shows the requirement for 13,450 dwellings. The Cumulative Case housing demand is thus well within the annual regional supply capability of the housing market, noting that the demand will likely materialize over a four-year period.

**Table 15.7-2 Cumulative Case Operations Housing Demand**

Community or Region	Forecasted Housing Demand 2014	Annual Average Housing Starts (2002 - 2006)	Impact versus 5-Year Annual Average (%) (2002 - 2006)
<b>Cumulative Case</b>			
Fort Saskatchewan	510	275	185
Strathcona County	800	1,100	73
Total RSA	13,450	12,940	105

Note: Assumes that settlement pattern of future hires will follow historical patterns of existing operations staff.

Sources: CMHC, Nichols Applied Management.

The information presented in Table 15.7-2 is a maximum-impact estimate, in that it assumes all operations positions will:

- be new to the region and require housing; and
- occur in one year.

Neither assumption is expected to hold true. Some operations workers will be recruited from the RSA and will not require housing. Industry experience suggests that operations hiring starts at least one year before start-up to ensure operations staff are properly trained and familiarized with equipment by the time project commissioning is completed.

The information in Table 15.7-2 takes the current distribution of residences of operations workforces of industrial facilities as a guide, and shows most of the estimated housing demand associated with upgrader operations hiring accruing to Fort Saskatchewan, Strathcona County and the City of Edmonton. This distribution pattern may change, depending on the relative attractiveness of housing options and other amenities available in the various communities.

The demand for housing in Fort Saskatchewan will accumulate over a number of years, up to and including 2014, as various operations begin staged hiring. Based on the current brisk pace of development in Fort Saskatchewan, including land already released to developers, the City is expected to be able to accommodate the forecasted housing demand.

With its larger base and current strong growth in housing inventory, the housing market in Strathcona County provides evidence of the ability to handle future housing demands, both from the Project and cumulatively. The remainder of the housing demand will be distributed throughout the RSA, which will be able to absorb the forecasted demand.

Cumulative housing demand in 2025 is expected to be 5,300 units, which is driven by operations hires, as all construction activity will be completed by then. This reflects approximately one-third of the number of annual starts in the RSA at present time. The ability of the region to provide sufficient housing for the Project and cumulative activity is ample, taking into account the long timeframe and staged hiring that will take place.

### Construction Accommodation

As shown in [Table 15.7-1](#), an estimated 7,300 construction workers from outside the region may be needed in 2012, the peak of the cumulative construction phase. Current industry plans are to provide out-of-region workers with living-out allowances and lodge them in rental accommodation, including hotels and motels in the region.

Based on current trends of hotel construction and operation, there will be approximately 1,000 hotel and motel rooms available in 2012 within a 30-km radius of the Project, which includes Fort Saskatchewan, Sherwood Park, Edmonton northeast, St. Albert, Redwater, Gibbons, Morinville and Lamont. The corresponding estimate for the RSA is 5,200. This estimate reflects the available supply of rooms, excluding those counted in an average occupancy rate of 65%.

[Table 15.7-3](#) presents the forecasted lodging requirements of out-of-region workers in 2012. As shown, the cumulative demand would require more than 75% of the estimated available rooms in the Edmonton CMA. This analysis is based on average, not peak, demand and an average hotel occupancy rate of 65%. During busy periods, hotels experience occupancy levels well above the average rate, and the cumulative demand for construction worker housing is expected to:

- result in high levels of occupancy in hotels and motels, especially from 2008 to 2015; and
- constrain the tourism industry in servicing higher-than-average demands during peak travel seasons and major city events that typically attract out-of-town visitors.

Demand for accommodation is expected to lessen in 2018, when all but two upgrader projects have completed construction.

Demand will present a challenge to the fixed-roof accommodation market, and will likely spill over into the housing rental markets. If demand for hotel and motel rooms exceed supply, room prices are likely to increase. New supply above the current hotel building rate might come forward, although even the relatively long construction period of most projects in the Cumulative Case might not be enough to encourage significant expansion of the hotel room numbers.

**Table 15.7-3 Cumulative Construction Housing Effects**

Location of Lodging	Average Available Lodging Supply (# Rooms) <sup>2</sup>	Peak Cumulative Demand (# Rooms) <sup>3</sup>	Peak Cumulative Demand (as % of supply)	Range of Effects (as % of Supply) <sup>4</sup>
Near the Project <sup>1</sup>	730	3,650	500	330 to 770
Edmonton CMA	4,900	3,650	75	65 to 150

## NOTES:

- 1 Within 30 km of the Project, including Fort Saskatchewan, Sherwood Park, Edmonton northeast, St. Albert, Redwater, Gibbons, Morinville and Lamont. Hotels in the northeast end of the RSA will be the first choice of accommodation, followed by hotels throughout the rest of the RSA. Some workers might rent apartments if they plan to work in the region for an extended period.
- 2 Based on room availability above an average occupancy rate of 65%, double occupancy, supply and demand estimates in 2012 and lodging inventory increases based on historical rate of growth in the region.
- 3 Assumes 50% of required construction workers are from out of the region.
- 4 Assumes 30% to 70% of the required construction workers are from out of the region.

Sources: Economic Development Edmonton, Nichols Applied Management.

**Mitigation**

North American is drawing on the corporate social responsibility experience and practices of StatoilHydro, its parent company. With regards to housing issues, North American notes that the residential housing, apartment, motel and hotel industry has experienced growth in Alberta and the RSA in response to increasing demands for accommodation. Indeed, North American has chosen to locate the Upgrader in the RSA, in part to be in a region in which market forces and existing communities are likely to meet accommodation needs associated with the Project in an effective manner. That said, North American is committed to working with the accommodation industry and local government to find optimal solutions.

North American's base plan is to find accommodation in existing and new developing communities under municipal development plans, and providing bus transportation for workers to and from the Project site. In November 2007, North American also commissioned a study on the Conceptual Analysis of Personnel Accommodation and Transportation, in order to evaluate alternatives regarding workforce accommodation and transportation management strategies.

One option North American is investigating is the possibility of developing a worker village in close proximity to the Project site, with the intention of accommodating a certain percentage of its out-of-region workforce. Presently no other major project is using a worker lodging facility in the AIH, but this is a common execution strategy in other regions, such as Fort McMurray. The concept of dedicated worker lodging in the AIH is being discussed by various proponents, third-party developers and local municipal representatives. The proposed concept of such a facility would be a worker village that will blend in with existing communities, and which will go beyond a simple trailer complex.

Advantages related to employing a worker village include:

- reduced traffic on the regional network, as workers are bussed to and from site on short, direct routes, as opposed to a region-wide system that requires bus routes to a host of hotels and marshalling lots;
- the presence of on-site security, which will help to offset policing requirements;

- reduction of the impact on lodging available to visitors to the region; and
- possible benefits to a local community - North American is open to creative ways that the worker village facility could have long-term benefits in a local community through, for example, the use of the village facilities for student, retirement or affordable housing after the construction phases are complete.

North American will continue discussions with local municipalities to further explore the potential of developing a worker village of its own, or to participate in a development owned and operated by a third party.

Barring any such approvals, the company will follow the traditional workforce accommodation model of housing workers in hotels and motels throughout the region. This is the model assumed in this regulatory application.

#### 15.7.4 Emergency Services Effects

As discussed in the introduction to [Section 15.7](#), the impact of the Application Case on regionally delivered infrastructure is very small. In line with the finding that the RSA population at peak construction is estimated to be 3.2% higher with the Cumulative Case projects as compared to without them, the impacts are small in the Cumulative Case. For this reason, the discussion provides a background on the emergency services in the region in 2007, and focuses on the issues associated with the Cumulative Case. The section pays special attention to emergency services in the communities near the Project, which, by and large, are municipally delivered.

Generally, the RSA has a well-developed system of emergency services. Strathcona County utilizes a fully integrated Fire, Rescue and Emergency Medical Service, where all staff are cross-trained in fire and emergency medical response. The service currently has a staffing component of 70 full-time and 65 part-time emergency response workers. The integrated system allows for consistent training and adaptability to growth in the region. The Heartland Hall Fire Station, located on Highway 830 immediately south of Highway 15, was constructed and located specifically to address the needs of heavy industrial operations in the northern part of Strathcona County. Station staff are trained to handle industrial emergencies such as fires, accidents and spills, and to coordinate first-response efforts with industry in the area. The County has mutual aid agreements in place with industry and neighbouring municipalities.

The Emergency Services department has identified a change in requirements over time, from smaller-scale fires to larger-scale and resource-intensive calls (Reid, pers. comm., 2007). The department will need to continue investing in infrastructure and staff to maintain service levels for the projected new growth, both in terms of industrial operations and general population growth in the County.

Fort Saskatchewan's fire department is predominantly staffed by part-time firefighters. In light of forecasted population growth, as well as the number of industrial operations planned or under construction in the AIH, two needs have been identified (Parker, pers. comm., 2007):

- the need to make the transition to a full-time staffing system; and
- the need to construct a new fire station.

Fort Saskatchewan participates in an All Inclusive Mutual Aid Agreement with surrounding municipalities, and according to municipal representatives, invests a large amount of resources in protective services and emergency preparedness, due to its industrial-focused economic base.



Ambulance service in Fort Saskatchewan is provided by a third-party contractor. Reports from municipal staff indicate that this contractor is experiencing difficulty in maintaining its level of service and retaining staff, who have been leaving to fill positions in other municipalities or in private industry. The service contract had to be renegotiated mid-term, resulting in an increased cost of service to the City. Fort Saskatchewan is planning to conduct a full review of its protective services in 2008 (Parker, pers. comm., 2007).

The Town of Bruderheim operates a volunteer fire department. Town management has identified a need for constructing a new fire hall and acquiring updated equipment, which will be more important as the town's population increases (Dubauskas, pers. comm., 2007). Retention of current volunteers is proving to be a challenge. Ambulance service is provided by the County of Lamont, which faces the same cost challenges regarding ambulance contract services as does Fort Saskatchewan.

Some issues relative to emergency services include:

- a mixed level of coordination of service delivery among municipalities;
- challenges in some jurisdictions, including Fort Saskatchewan and the County of Lamont, in meeting the rising cost of ambulance services; and
- Challenges facing part-time volunteer fire and ambulance services, including:
  - difficulty in recruiting and retaining volunteers; and
  - adequacy of coverage, particularly in the daytime, as work commitments make it difficult for volunteers to fulfill their responsibilities.

There is a general discussion suggesting that the growth in the region is hastening the conversion of part-time fire-fighting services to a system involving full-time staff.

#### 15.7.4.1 Baseline Case and Application Case

Similar to other industrial construction projects in the County, the Project will rely on the County's emergency response department to provide first response to any potential fire emergencies. Once operational, North American will have first-responder capability, to be complemented by mutual aid agreements involving the County and other industrial facilities in the region.

Strathcona County Emergency Services is aware of the Project and has, in Heartland Hall, the facilities and trained personnel to deal with emergency response issues under the Baseline and Application Case assumptions.

#### 15.7.4.2 Cumulative Case

According to the department (Reid, pers. comm., 2007), the Strathcona County Emergency Services:

- is aware of the Project and other potential projects nearby;
- has, in Heartland Hall, the necessary physical infrastructure to accommodate the anticipated increase in demand; and
- is submitting plans to increase resources and staffing as the need arises.

The projects in the Cumulative Case represent large-scale industrial facilities that require specialized emergency responder capabilities. A concentration of industry in the AIH also signifies a need for a well-developed emergency preparedness plan. In response to these needs, industry, municipalities and government have formed the Northeast Region Community Awareness and Emergency Response (NR CAER) initiative, of which Strathcona County Emergency Services is a member. NR CAER brings these various groups together to assist in response planning and sharing of resources.

NR CAER is continuing to evolve its assistance to local residents, through preventive planning initiatives, such as:

- call-out system tests for members, to verify that their automated resident warning system is meeting requirements;
- shelter-in-place training sessions, to assist emergency responders in following appropriate decision-making steps; and
- facilitating mutual aid response planning.

All proponents that comprise the Cumulative Case (including North American) are, or are planning to become, signatories to the NR CAER partnership.

#### 15.7.4.3 Mitigation

North American is drawing on the corporate social responsibility experience and practices of StatoilHydro, its parent company. With regards to emergency services, North American is committed to:

- meeting or exceeding standard industrial health and emergency preparedness practices during construction and operations, including coordination with Strathcona County Emergency Services;
- ensuring that medical treatment facilities are available on-site to provide first-response treatment for any incidents;
- coordinating with Capital Health to ensure that, in the case of an industrial accident, the routing of patients who require follow-up treatment at a health facility takes place in an efficient manner. This is particularly important for the Fort Saskatchewan Health Centre, which is the closest primary care facility to the Project; and
- working with the NR CAER initiative.

#### 15.7.5 Policing Effects

As discussed in the introduction to [Section 15.7](#), the impact of the Application Case impact on regionally delivered infrastructure is very small. In line with the finding that the RSA population at peak construction is estimated to be 3.2% higher with the Cumulative Case projects as compared to without them, the impacts are small in the Cumulative Case. For this reason, the discussion in this section provides a background on policing services in the region in 2007, and focuses on the issues associated with the Cumulative Case. The section pays special attention to policing, which is, by and large, municipally delivered, in the communities near the Project.

Policing service for the County of Strathcona is provided by the Royal Canadian Mounted Police (RCMP) under a municipal services contract. The RCMP has two detachments in the County: the primary detachment located in Sherwood Park and a satellite office located at Heartland Hall. The County's force is currently comprised of 76 regular members. According to leadership stationed in Strathcona County, the RCMP is seeing increasingly sophisticated criminal activity, including drug usage and gangs, and is cooperating actively with the Edmonton Police Service in joint initiatives (Steinke, pers. comm., 2007). Strathcona County RCMP are responsible for policing activities required in the County's portion of the AIH, with the Fort Saskatchewan detachment providing secondary support.

Fort Saskatchewan's policing services are provided by the RCMP under a municipal service agreement. Municipal representatives suggest there is an increase in the level of criminal activity taking place in the city. A recent resource review indicated a requirement for two to three more members above the current staffing level of 23, which will require additional funding from the municipal budget.

Policing services for the Town of Bruderheim are covered by the RCMP detachment in Fort Saskatchewan. Increasing levels of vandalism and break-ins are motivating the formation of a citizen patrol group. In addition, the Town is currently evaluating a video surveillance program for local businesses (Dubauskas, pers. comm., 2007).

In general, the RCMP has identified a current country-wide shortage of officers available for active street duty. They are developing a national-level staffing plan to address the shortfall.

#### 15.7.5.1 Baseline Case and Application Case

Were the Project the only one to proceed, population effects on the RSA and the nearby communities are expected to be small. Consequently, the impacts on policing are also expected to remain small in both the Baseline Case and Application Case. As discussed above, under the Baseline Case and Application Case, most construction workers are expected to come from the RSA, with minimal out-of-region mobile workers. With most workers already resident in the RSA, and through the use of workforce bussing, the construction impact associated with the Application Case is not expected to have additional effects on police services.

#### 15.7.5.2 Cumulative Case

In the Cumulative Case, the estimated mobile workforce of up to 7,300 people is expected to have an effect on policing demands. Most effects related to the mobile workers will be diffused over the RSA, with the majority expected to be lodged in the city of Edmonton, based on existing lodging facilities. Fort Saskatchewan and other communities are also expected to house a portion of workers, but housing will be limited by the relatively small inventory of hotel rooms and available apartments.

If dedicated construction lodging were to be located in the region, the effects of the mobile workers would be more concentrated, posing additional policing demands on the RCMP—specifically the Strathcona detachment, which would require additional resources (Herchek, pers. comm., 2007). Experience from the Wood Buffalo region indicates that camp and site security augments police resources in the area, both on-site and on public highways near project sites. Examples include securing accident sites and assisting with traffic management.

### 15.7.5.3 Mitigation

North American is committed to:

- working and consulting with local police services, where appropriate;
- engaging security services, where appropriate, to help protect and serve the Project workforce and members of the communities in which North American works and lives; and
- addressing policing issues during safety meetings.

The bussing model employed will be designed to minimize traffic along Highway 15. Generally, and following the example set by StatoilHydro, the company will promote a culture of high ethical standards in order to reduce policing impacts generated by its employees. Examples from StatoilHydro's approach to ethical business conduct as a necessary condition for a sustainable business include:

- treating ethics as an integral part of business activities;
- complying with applicable laws and regulations in all markets in which they operate;
- dealing openly with ethical issues and taking up ethical dilemmas with line management immediately;
- establishing ethical committees to ensure discussions and transfer experience;
- creating ethical awareness by regular training;
- working in a systematic manner to ensure compliance;
- continuously mapping risks relating to North American's ethical values;
- reducing risk through in-depth knowledge of the Project's suppliers, partners and markets; and
- working with government organizations, industry associations, civil society and business associates to develop best practices.

### 15.7.6 Medical Services Effects

As discussed in the introduction to [Section 15.7](#), the impact of the Application Case on regionally delivered infrastructure is very small. In line with the finding that the RSA population at peak construction is estimated to be 3.2% higher with the Cumulative Case projects as compared to without them, the impacts are small in the Cumulative Case. For this reason, the discussion in this section provides a background on medical services in the region in 2007, and focuses on the issues associated with the Cumulative Case.

While residents of the Capital region are generally satisfied with the quality of service provided by the health system, access to those services remains a concern. Reducing wait times and improving access not only to emergency and acute care services, but also to diagnostic, mental health and long-term care services remains a priority for both the Alberta Government and the Capital Health region.

Capital Health is planning on constructing two new hospital facilities in relative proximity to the AIH:

- a 38-bed health centre in Fort Saskatchewan, which will replace the existing facility. The new hospital, scheduled to open in 2009, will triple the area of the old facility and outpatient care capacity; and
- a 72-bed facility, being built in Sherwood Park and set to open in 2009, will provide Strathcona County with its first hospital.

The presence of these two new facilities will increase the capacity of the health region to accommodate future growth in these communities.

#### 15.7.6.1 Baseline Case and Application Case

Were the Project the only one to proceed, most construction workers are expected to come from the RSA, with minimal out-of-region mobile workers accommodated in local area hotels. With most of the workers already resident in the RSA, the Project is expected to have limited effects on medical services in the region.

#### 15.7.6.2 Cumulative Case

In the Cumulative Case, the estimated out-of-town workforce of up to 7,300 is expected to increase demands for medical services in the RSA. As in the past, a number of visits to emergency rooms, such as the Fort Saskatchewan Health Centre, would be generated by mobile construction workers needing general medical care. The magnitude of those effects on individual facilities near the Project site will depend largely on where on-site construction workers seek medical treatment. The expansion of the Fort Saskatchewan health centre and addition of a new hospital in Sherwood Park, combined with the large number of walk-in medical clinics available in the region, will help to diffuse pressure on medical services throughout the RSA.

If dedicated construction worker lodging were to be located in the region, this would pose additional demands on the medical services system in Fort Saskatchewan and Strathcona County. The degree of such an impact would depend on the level of in-house basic medical treatment capabilities available in the lodging facility.

#### 15.7.6.3 Mitigation

North American understands the importance of medical services to the existing communities, its workers and their families. It is committed to:

- cooperating with medical service providers to ensure sufficient medical services are in place to meet the incremental needs associated with the Project; and
- where practical, helping to recruit medical professionals to provide on-site services for North American workers.

As discussed above, North American is committed to coordinating emergency response protocols with the Strathcona County Emergency Services and the Fort Saskatchewan, Strathcona County and Lamont health centres.

### 15.7.7 School System Effect

As discussed in the introduction to [Section 15.7](#), the impact of the Application Case on regionally delivered infrastructure is very small. In line with the finding that the RSA population at peak construction is estimated to be 3.2% higher with the Cumulative Case projects as compared to without them, the impacts are small in the Cumulative Case. For this reason, the discussion in this section provides a background on school systems in the region in 2007, and focuses on the issues associated with the Cumulative Case.

Schooling in the region is provided by a number of school divisions, with the Elk Island Public School Division and the Elk Island Catholic School Divisions operating facilities in Strathcona County, Bruderheim and Fort Saskatchewan, as well as the County of Lamont. The two Elk Island divisions have a combined enrolment of 22,000, and the combined enrolment of all divisions in the RSA amount to 165,000 (AE, 2007). Challenges faced by the primary (kindergarten to Grade 12) education system include increasing facility capital and operating and maintenance costs, as well as recruitment and retention of staff, including issues related to increased levels of retirement of teachers, administrators and non-teaching staff. These challenges are not unique to the region, nor limited to the education field.

Current capacity in the RSA—measured at the school division level—ranges from 69% to 82%, with 85% capacity level being a trigger for additional school development (AIT, 2006).

#### 15.7.7.1 Baseline Case and Application Case

A maximum impact scenario predicts that the population implied by the Project would generate:

- 125 new students in the RSA in 2014, when Phase 1 becomes operational; and
- 385 students in 2025, when the Project reaches full operation.

Based on estimated population distribution of new operations hires, the Elk Island Public and Catholic school divisions would receive 38% of the Project's effects on school systems. The estimated 45 students enrolling in these two divisions in 2014 reflect an impact of 0.2% of current enrolment numbers. The effect felt in 2025 is 145 new students, comprising 0.7% of current enrolment.

There is spare capacity available at the division level to accommodate this relatively small increase. In addition, 39 out of 44 facilities in the Elk Island School Public and Catholic School Divisions have spare capacity. One exception is the Fort Saskatchewan Junior High School. This public school is operating at full capacity, and is predicted to remain so in this upcoming year. There is excess capacity in the two other junior high schools in Fort Saskatchewan. Growth in the school population in Bruderheim would be much welcomed, as the community lost its junior high school and nearly lost its elementary school a number of years ago.

#### 15.7.7.2 Cumulative Case

Using the same settlement pattern assumptions, the Cumulative Case impact on the Elk Island public and Catholic School Divisions is estimated at:

- 1,300 new students (a 6.0% increase over current enrollment) in 2014, when Phase 1 becomes operational and a number of other projects in the Cumulative Case are hiring operations workers; and

- 1,400 new students (a 6.3% increase over current enrollment) by 2025, when the Project is fully operational.

These impacts reflect a maximum impact scenario in that all operations employees are assumed to be new to the region. The effects might be higher or lower, depending on the extent to which future employees reflect the residence pattern of the current ones.

The remainder of new students generated by the Project and the Cumulative Case will be distributed over the other school divisions in the RSA, with the majority likely to enrol in the public and separate school systems in Edmonton.

### 15.7.7.3 Mitigation

North American supports education and skills development in the local community and amongst its suppliers and contractors, to build lasting capacity and to help them develop the skill standards and certifications required for them to work in the oil and gas industry. North American is committed to working with the school boards and informing them, subject to privacy regulations, of the potential demographics of the workforce with school-aged children.

## 15.7.8 Social and Community Services Effects

As discussed in the introduction to [Section 15.7](#), the impact of the Project and Cumulative Case on regionally delivered services is small. For this reason, the discussion in this section provides a brief background on the social setting in the region in 2007, and focuses on the issues associated with the Cumulative Case.

Economic growth and associated increases with population are resulting in increased demands placed on a range of social service providers. Social services agencies have observed that:

- young people moving to the region in search of employment are faced with challenges in finding affordable accommodation, and turn to service providers for assistance;
- some families new to the region experience a sense of isolation that is reinforced in those cases where one of the partners works mobile in the Wood Buffalo region or elsewhere;
- in-migration increases the number of people with English as a second language who require language services and cultural adaptation support; and
- high levels of economic activity generally increase levels of stress as people tend to work longer hours associated with increased work demands.

Strathcona County is examining the concept of making social sustainability a key concept of municipal decision-making, and has developed an in-depth set of indicators to track the degree of social well-being in the community. It is also developing a new "Centre in the Park" in Sherwood Park to serve as a new community hub. The County's Family and Community Social Services (FCSS) department is presently providing home visitation coverage to east Edmonton and Fort Saskatchewan (Gunn-Graham, pers. comm., 2007).

Fort Saskatchewan's FCSS department identifies a number of services that are currently under stress, based on the current high level of population growth (Antoniuk, pers. comm., 2007). This department is open to working with industry to address issues related to industrial growth, demonstrated, for example, by its organization of a panel discussion regarding potential social impacts and mitigation strategies associated with mobile workforces.

Fort Saskatchewan has experienced a rapid growth in its commercial base, which offers more shopping amenities to its citizens. The creation of the Dow Centennial Centre and the associated Landrex Recreational Pavilion provides residents with a new gathering place for the arts, recreation and community events. The City is also in the process of realizing a new downtown revitalization initiative.

Bruderheim has limited social services available within the town itself, but its citizens draw on services offered by FCSS in Lamont County and Fort Saskatchewan.

One issue of particular concern in the region is that of the availability of childcare. Licenced childcare providers are finding it increasingly challenging to attract and retain staff and afford commercial rent. A lack of affordable childcare can place strain on working households, and can remove the choice from a parent who would like to return to the workforce. The issue is an area of focus for the provincial government, as well as for some municipalities and companies in private industry.

The AIH has formed a new subcommittee to coordinate planning efforts for social impacts of development, with representation from Fort Saskatchewan and Strathcona County staff.

#### 15.7.8.1 Baseline Case and Application Case

Were the Project the only one to proceed, most construction workers are expected to come from the RSA. With most of the workers already resident in the RSA, the Project is not expected to have additional social and community services effects. The overall population effect of the Operations phases of the Application Case projects is also estimated to be small.

Some of the Project's operations workers are expected to become residents of the nearby communities. The Project employment is typically permanent, well-paying and requires relatively high levels of education. The required operations workforce is in line with the type of employment in Fort Saskatchewan and Strathcona County.

#### 15.7.8.2 Cumulative Case

The greater Edmonton region is host to an array of social support organizations and programs. The presence of up to an estimated 7,300 mobile members of the workforce in the region will likely increase participation in some of these support programs. Programs and services offered in centres near to where workers are housed (e.g., northeast Edmonton and Fort Saskatchewan) might experience increased usage.

More generally, upgrader operations workers and their families are likely to fit in well with the resident population, due to the fact that their employment is typically permanent, well-paying and requires relatively high levels of education. This fact is in line with similar operations-based employment already present in Fort Saskatchewan and Strathcona County.

#### 15.7.8.3 Mitigation

The management of social and community effects is a shared responsibility between the proponent, governments, affected communities and individuals. North American is committed to:

- extending its employee assistance program to the new operations workers; and
- continuing ongoing engagement with affected stakeholders, as well as continued support to specific local community initiatives.



## 15.8 Summary and Conclusion

North American is proposing to build and operate a bitumen upgrading facility in the Strathcona County portion of the AIH. Including gasification units, the preliminary estimate of the Project's capital costs falls in the range of \$14 billion to \$18 billion in 2007 dollars. The Project is expected to overlap construction phases of other upgrader projects in the region, and extend the oil sands industry expansion in the AIH to 2025. It is located in an area that is zoned heavy industrial, in proximity to a large metropolitan area.

From a government fiscal perspective, the Project is a net contributor. Over its lifespan, it is estimated to contribute over \$27 billion in provincial and federal taxes. It also will contribute to the need for some government infrastructure spending, such as improvements to Highway 15, which will benefit the economic development in the region in general. In terms of municipal property taxes and assuming current mill rates, the Project will add an estimated \$58 million to the Strathcona County property tax income at full build-out, without substantially contributing to the municipal costs directly.

From a provincial economic perspective, the Project is a net economic driver. Phase 1 of the Project is likely to overlap with other projects, and will thus contribute to continued high demand for construction labour. Later phases are planned for a period when most currently discussed oil sands project in the AIH are completed. Thus it extends the construction phase of the industry, and uses resources that otherwise would have to find uses outside the oil sands industry and perhaps outside Alberta. The operations phase will create stable employment and contracting opportunities over the Project life.

From a regional perspective, the Project will have a positive impact in terms of employment and economic development opportunities. This impact holds especially true for the smaller communities near the Project site. The Project will also have some social impact, mostly by way of an increased urban population and the ensuing demands on regional infrastructure and service providers. However, based on current experience, the population impact is likely to be dispersed relatively widely throughout the RSA, limiting its impact on any particular municipality.

As part of ongoing community engagement by North American, the Project is expected to undertake community investment and initiatives to address some of the challenges in the social sphere. The taxes it pays contribute to the ability of Strathcona County and the Province to respond to the growth challenges, and both levels of government have put in place mechanisms to respond. These government initiatives, together with North American's community engagement, will mean that the impact of the Project on the social fabric of the region is likely to be minimal.

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## 16 HISTORICAL RESOURCES

### 16.1 Introduction

Historical resources provide valuable data on the peoples and artifacts comprising Alberta's heritage. Defined by Alberta's *Historical Resources Act* as any work of nature or of humans that is primarily of value for its palaeontological, archaeological, prehistoric, historic, cultural, natural, scientific or esthetic interest, historical resources are both fragile and non-renewable. Once an historically valuable site is disturbed, context cannot be replaced, recreated or restored.

In order to preserve the site integrity of any such potentially historically valuable areas, North American conducted an Historical Resources Impact Assessment (HRIA) as per the guidelines set out by Alberta Tourism, Parks, Recreation and Culture (TPRC) (formerly Alberta Community Development). The HRIA included a baseline data study of the historical resources regional study area, as well as a detailed assessment of ten quarter sections comprising the local study area of the Project. An Archaeological Research Permit (2006-582) was obtained to perform the assessment.

This section of the EIA has been prepared in accordance with [Section 7](#) of the TOR ([Volume 1, Appendix A](#)). A more detailed report was submitted to TPRC as per Permit 2006-582 requirements (Stoddart, 2007).

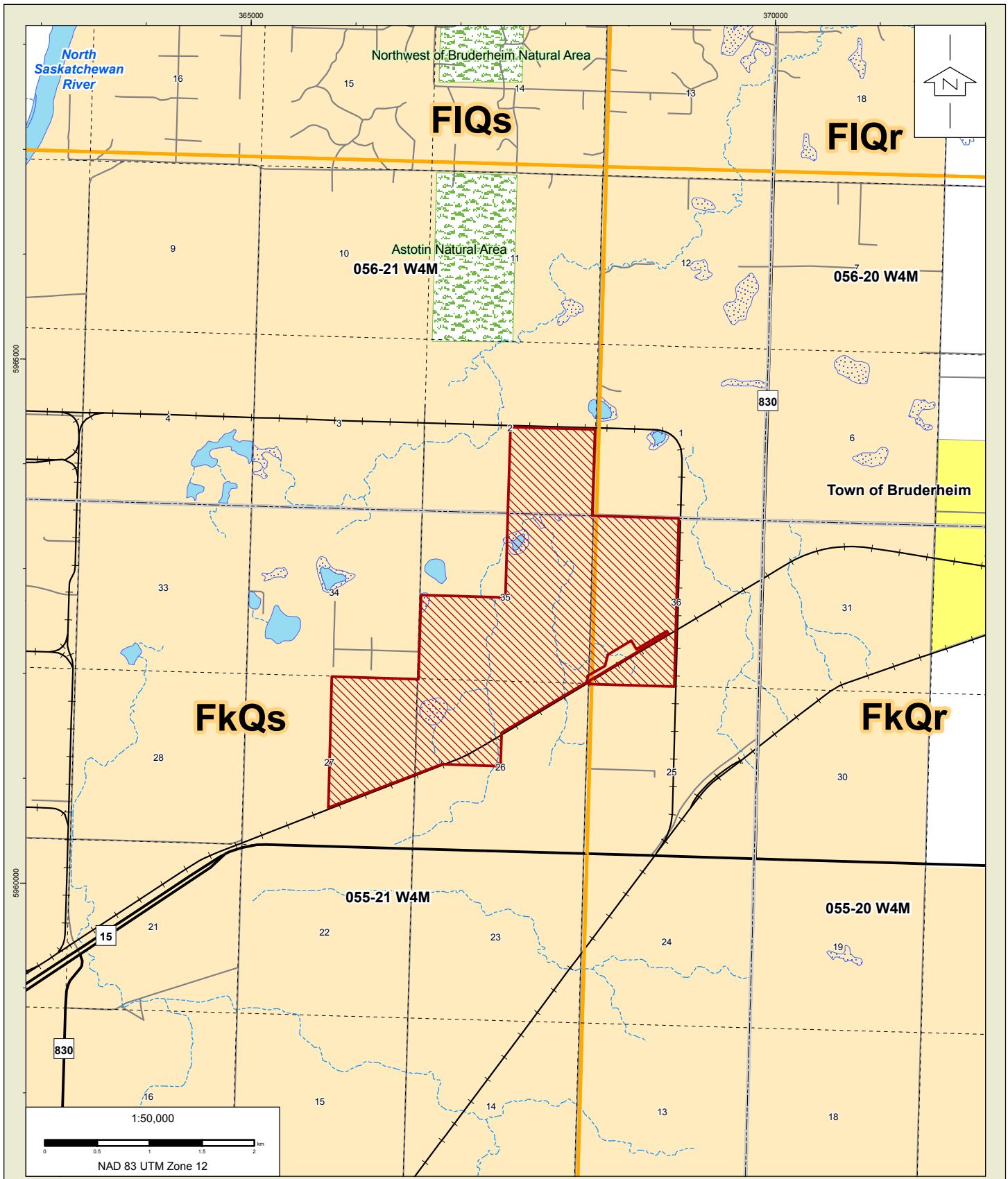
### 16.2 Study Area

#### 16.2.1 Local Study Area

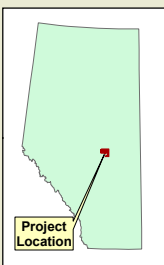
The historical resources Local Study Area (LSA) was established to evaluate the local effects of the Upgrader Project on these resources. The limits of the LSA are North American's property boundaries. The LSA includes approximately ten quarter sections that could be disturbed by Project development ([Figure 16.2-1](#)).

#### 16.2.2 Regional Study Area

The Regional Study Area (RSA) was delineated to assess the possibility of Project-related impacts on historical resources outside the boundaries of the LSA at a regional scale. The RSA encompasses an approximate 10-km radius beyond the site, south of the North Saskatchewan River. The site is within two Borden Blocks, FkQr and FkQs ([Figure 16.2-2](#)). Borden Blocks are the standard Canadian archaeological geographic units used to delineate the historical resources database (Borden, 1954). Archaeological sites (both pre-contact and historic) are referred to by a Borden number, which consists of a four-letter symbol accompanied by a number (e.g., FaPq 11).



H:\198\_5\14\MAPS\FIGURES\14\_HISTORICAL\_RESOURCES\FIGURE\_16.2-1\_HISTORICAL\_RESOURCES\_LSA.mxd

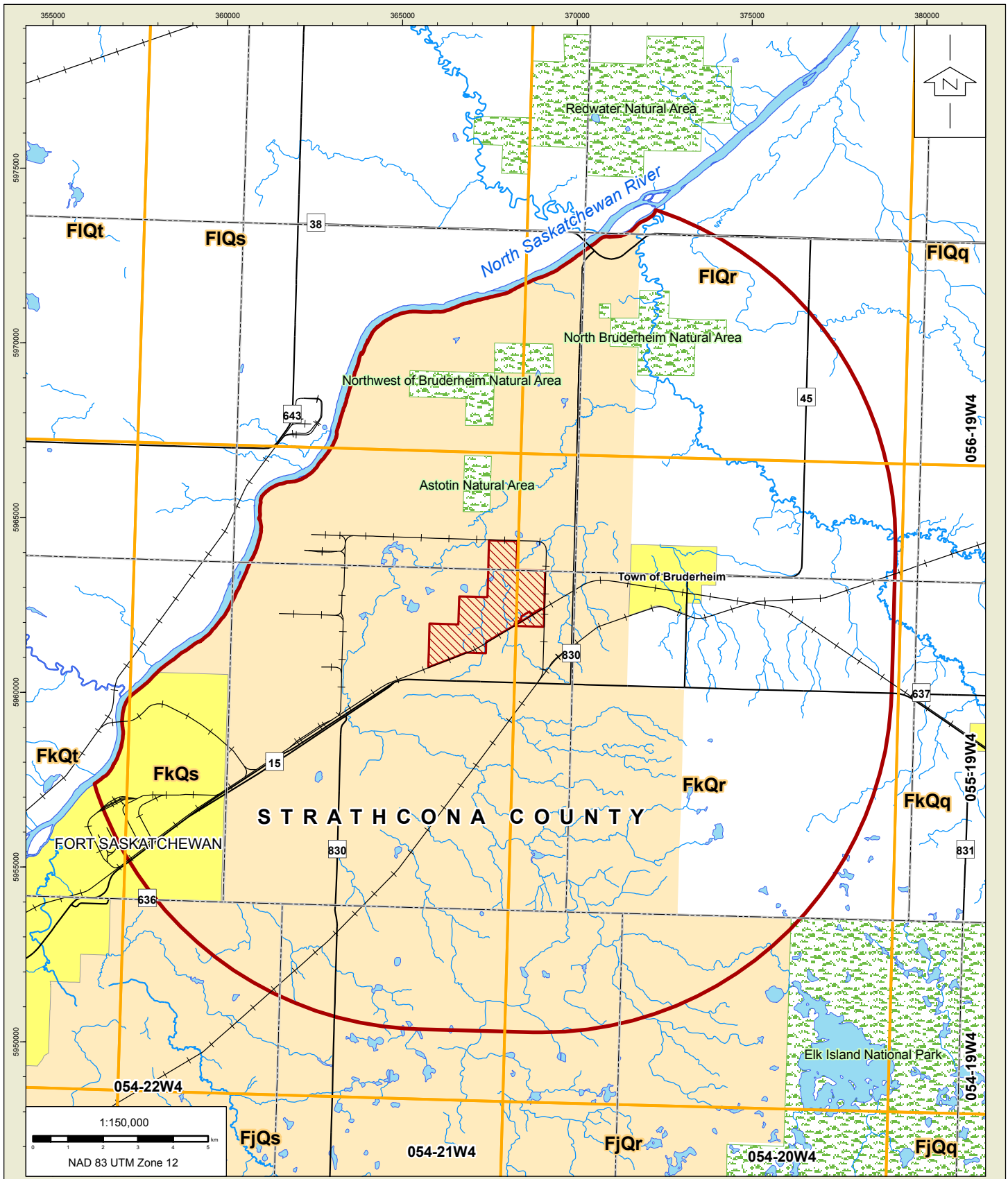


Legend	
North American Upgrader Historical Resources - LSA	Alberta Township / Range
Strathcona County	ATS Section Line
City/Town	Road
<b>Waterbody</b>	Road - Other
Permanent	Railway
Recurring	Borden Block
Stream - Permanent	Alberta Natural Area
Stream - Intermittent	

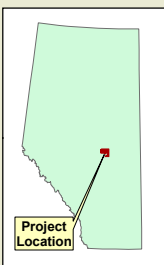
Title:

**HISTORICAL RESOURCES LOCAL STUDY AREA**

Approved: <b>BE</b>	Revision Date: <b>Nov 09, 2007</b>
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**Legend**

North American Upgrader Historical Resources RSA	Waterbody
North American Upgrader Historical Resources LSA	Watercourse
Strathcona County	Major Road
Town / City	Railway
Borden Block	Alberta Township / Range
Natural Area	

Title:

**HISTORICAL RESOURCES REGIONAL STUDY AREA**

Approved: <b>BE</b>	Revision Date: <b>Nov 08, 2007</b>
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Fig. No.: <b>16.2-2</b>	

## 16.3 Methods

HRIA requirements are defined by TPRC (2007).

### 16.3.1 Previous Historical Resource Studies

The first stage of the HRIA for the Upgrader involved a review of previous historical resource studies in the area. The Fort Saskatchewan area has received considerable archaeological inspection in the past two decades, mainly as a result of industrial development. Several large-scale projects in the vicinity that have required EIAs have resulted in the discovery of large numbers of archaeological and historic sites. Most sites have been found further west of the proposed development, nearer the North Saskatchewan River or along Astotin Creek.

According to the Listing of Significant Historical Sites and Areas (Alberta Community Development, 2006), the proposed Upgrader development is not projected to impact areas with Historic Resources Value ratings. No historical or palaeontological sites have been recorded previously within the study boundaries. It was determined that no previously recorded archaeological sites would be impacted by Project development.

### 16.3.2 Mapping and Field Surveys

Prior to the start of fieldwork, a map review of aerial photographs of the area was undertaken. Areas located on what appeared to be undisturbed land or at higher elevations (such as the sand dunes in SE 2-56-21 W4M) were flagged for more intensive ground assessment.

Detailed assessment of the Upgrader LSA followed standard methods undertaken in an HRIA. These methods included a combination of pedestrian surface inspection and judgmental subsurface shovel testing, which occurred from September 28 to November 2, 2006. The inspection was comprised of an evaluation of the terrain surface coupled with a subsurface shovel test to verify the initial visual evaluation. The goals of the inspections were both to determine if intact subsurface cultural remains were present, and to identify other archaeological evidence.

The majority of the Upgrader LSA is located in relatively level, broken ground, allowing high-potential terrain to be accessed quickly during the pedestrian traverse. Hand-held GPS units were used to track all pedestrian walking routes over individual quarter sections. Survey transects were spaced approximately 5 m to 10 m apart. During the pedestrian surveys, waypoints and significant accompanying observations within the Upgrader site were recorded.

Shovel testing operations were conducted in those areas judged to have high heritage potential, though lower potential areas were also tested in an effort to ensure the accuracy of the archaeological model. Because it was anticipated that not all areas would exhibit suitable habitation characteristics, this professional judgmental approach was considered the preferred method of subsurface testing. Shovel tests were approximately 40 cm square, and were excavated to depths beyond the existence of soil parent material (C horizon). In the majority of the LSA located away from the sand dune complex, this depth was often less than 30 cm below the surface. All soil from shovel tests was screened, unless the matrix was unusually wet or had content that was high in clay. The stratigraphy at each location was documented. The general location of each cluster of tests was recorded.

Legal locations were used to divide the site into ten study zones.



### 16.3.3 Impact Assessment Criteria

The criteria used for the assessment of impacts on historical resources have been modified from those provided in [Volume 2, Section 1](#). These modifications reflect the fact that historical resources are non-renewable. Criteria typically used to determine impacts to historical resources are described in the following sections and are summarized in [Table 16.3-1](#).

**Table 16.3-1 Summary of Residual Impact Classifications**

Nature of impact	Direction	Magnitude	Extent	Reversibility
Direct	negative	negligible	local	irreversible
Direct	positive	moderate	regional	irreversible
Indirect	negative	negligible	regional	irreversible

#### 16.3.3.1 Direction

The direction of impacts on historical resources can be negative or positive. Negative impacts can occur with the disturbance or destruction of the resources. Positive effects result from conducting HRIAs, through the addition of information to the historical resource database. The identification of an historical resource would be considered a positive impact.

#### 16.3.3.2 Magnitude

The magnitude of impacts on historical resources varies according to the scientific value of the resource and the extent of any physical impact. High-magnitude impacts occur when resources of high scientific value are physically impacted. Moderate-magnitude impacts occur when resources of high to moderate scientific value are partially impacted. Low-magnitude impacts would occur in areas of low physical impact or when physical impacts occur to resources of low scientific value.

Sites that are unique to an area would be considered to have high scientific value. Their identification would be considered to be a high-magnitude positive effect. The identification of sites similar to other sites in an area would be considered to be a moderately positive effect. A low-magnitude positive effect would result from the identification of sites with low scientific value, or if no historical resources are encountered.

#### 16.3.3.3 Extent

The geographic extent of an impact can occur at both the local and regional levels. Local impacts would occur at sites within the LSA that are directly impacted by the Project and are limited to physical disturbance within the LSA. Regional impacts extend beyond the LSA but are limited to the RSA. In addition to direct impacts from the Project, indirect regional impacts on historical resources may result from increased access to, or awareness of, the study area. These indirect potential impacts are difficult to predict accurately.

#### 16.3.3.4 Frequency, Duration and Reversibility

Impact frequency and duration were not assessed because they are not applicable to historical resources. Because historical resources are non-renewable, negative impacts are always irreversible.

## 16.4 Baseline Conditions

The baseline scenario provides a description of the physical environment of the study area, general field reconnaissance from the ten quarter sections of land surveyed during field work, and also both existing and newly discovered historical resources in both the LSA and RSA.

### 16.4.1 Physical Environment

Prior to field surveys, analysis of the landscape determined that both as-yet undiscovered and intact archaeological sites, as well as the remains of historic homesteads had the potential to exist in less-disturbed areas of the LSA. Once ground truthing was underway, however, it became clear that almost all of the development terrain had been broken in the early part of the last century and was currently under cultivation. As a consequence, most of the potential historical resources, especially rock rings and other stone features, would have been disturbed long ago.

### 16.4.2 Homesteads

Five homesteads were observed in the LSA. All buildings in each of the five homesteads have been thoroughly measured, photographed and documented. Historic site forms have been prepared as part of the permit reporting process, and also have been submitted to the Alberta Heritage Survey Program.

### 16.4.3 Existing Archaeological Sites

Six archaeological and historic sites were recorded in the LSA in previous historical resources studies, or within 1 km of the development boundaries. A summary listing and description of these sites appears in [Table 16.4-1](#). The sites include isolated finds, a kill site, a campsite, a homestead and a lithic scatter. None of these sites have an Historic Resources Value rating higher than 0, meaning that they are considered to be of minimal importance.

**Table 16.4-1 Existing Archaeological Sites in the LSA and RSA**

Borden	Site Type	Feature	HRV	Permit
FkPg-28	isolated find		0	ASA 79-024
FkPg-53	kill site	butchering	0	ASA 81-022; ASA 81-074
FkPg-54	isolated find		0	ASA 81-022
FkPg-55	isolated find		0	ASA 81-022
FkPg-102	campsite		0	ASA 96-063; ASA 99-002
FkPf-46	scatter <10; homestead		0	ASA 81-022; ASA03-211

#### 16.4.3.1 Site FkPg-28

Site FkPg-28 is an isolated find of a retouched flake of chert, found within the RSA on a small knoll south of Astotin Creek. No additional artifacts could be found on the ground surface, and no shovel tests were dug. No further work was recommended for the site.

#### 16.4.3.2 Site FkPg-46

Site FkPf-46 consists of the remains of an historic homestead (log and plank barn) with an associated historic artifact scatter strewn across a cultivated field. FkPg-46 is located

approximately 1 km southeast of the Project boundaries. The site form from 1981 listed a collection of eight ceramic fragments and two glass fragments, as well as several hundred artifacts visibly noted on the ground surface across the site. A revisit to the site in 2003 resulted in the discovery of a single quartzite flake collected from the surface of a proposed right-of-way. A visual inspection of the surface of the cultivated field failed to identify further artifacts or features. No further assessment was recommended for this site.

#### 16.4.3.3 Site FkPg-53

Site FkPg-53 is a kill/butchering site, consisting of a quartzite biface, a quartzite biface chopper and a unifacial chopper, found to the south of the Upgrader site. The artifacts were found approximately 20 m north of Highway 15, in a cultivated field. The site is located at the east edge of an ephemeral wetland. The site was scheduled to be further disturbed by the installation of a water pipeline in 1981, and no further work was recommended by the initial site investigator.

#### 16.4.3.4 Site FkPg-54

Site FkPg-54 is an isolated find of a single quartzite flake, recovered from the surface of a small rise in a cultivated field. Site FkPg-54 is located in the southern portion of SE-27-55-21 W4M along the north margin of Highway 15, approximately 500 m south of the boundaries of the LSA.

As the site was currently cultivated, and was also disturbed by the same water pipeline mentioned above ([Section 16.4.2.3](#)), no further work was recommended.

#### 16.4.3.5 Site FkPg-55

Site FkPg-55 is also an isolated find, recovered from the surface of a small rise in a cultivated field, outside of the study boundaries to the west. The site was not adjacent to any source of water, and had been heavily disturbed by cultivation. This site was scheduled to be disturbed by the installation of the same water pipeline in 1981, and no additional work was recommended.

#### 16.4.3.6 Site FkPg-102

Site FkPg-102 consists of a prehistoric campsite, found on level, cultivated terrain, outside of the study boundaries to the southwest. The site consists of a small scatter of lithics, bone and fire-broken rock scattered over a 40 m<sup>2</sup> area. Four shovel tests were excavated, with negative results. In 1996, no further work was recommended for this site. The site was monitored during construction of a pipeline in 1999, and a quartzite biface fragment, a flake, four bone fragments and a piece of porcelain were also collected from the ground surface.

### 16.4.4 Field Reconnaissance

The results of the field reconnaissance and shovel testing program are shown in [Table 16.4-2](#), and summarized in more detail below.

**Table 16.4-2 Summary of Field Testing Methods, Results, and Recommendations**

<b>Legal</b>	<b>Inspection Methodology</b>	<b>Test Intensity</b>	<b>Results</b>	<b>Recommendations</b>
SE 27-55-21 W4M	Pedestrian traverse, Shovel testing	4 shovel tests placed in high potential areas	No cultural resources found.	No further concerns
NE 27-55-21 W4M	Pedestrian traverse, Shovel testing	5 shovel tests placed in high potential areas	1) Site FkPg-147, a single flake on the surface of a cultivated field; 2) Homestead, occupied during assessment, consisting of 12 buildings. Exterior of buildings and yard recorded.	1) Site FkPg-147, no further concerns 2) Heinrichs Homestead, no historical significance, no further concerns
NW 26-55-21 W4M	Pedestrian traverse, Shovel testing	8 shovel tests placed in high potential areas	Homestead, occupied during assessment, consisting of 15 buildings. Exterior of buildings and yard recorded.	No historical significance, no further concerns
NE 26-55-21 W4M	Pedestrian traverse, Shovel testing	2 shovel tests placed in high potential areas	No cultural resources found.	No further concerns
SW 35-55-21 W4M	Pedestrian traverse, Shovel testing	8 shovel tests placed in high potential areas	Homestead, unoccupied during assessment, consisting of 12 buildings. Exterior and interior of buildings and yard recorded.	No historical significance, no further concerns
SE 35-55-21 W4M	Pedestrian traverse, Shovel testing	8 shovel tests placed in high potential areas	No cultural resources found.	No further concerns
SW 36-55-21 W4M	Pedestrian traverse, Shovel testing	9 shovel tests placed in high potential areas	Site FkPg-50, a biface fragment found on the ground surface.	Site FkPg-50, no further concerns
NE 35-55-21 W4M	Pedestrian traverse, Shovel testing	9 shovel tests placed in high potential areas	Homestead, unoccupied during assessment, consisting of 22 buildings. Exterior and interior of buildings and yard recorded.	Homestead, no historical significance, no further concerns
NW 36-55-21 W4M	Pedestrian traverse, Shovel testing	6 shovel tests placed in high potential areas	Homestead, unoccupied during assessment, consisting of 24 buildings. Exterior and interior of buildings and yard recorded.	Homestead, no historical significance, no further concerns
SE 2-56-21 W4M	Pedestrian traverse, Shovel testing	4 shovel tests placed in high potential areas on cultivated land, 47 tests placed on undisturbed sand dunes containing archaeological deposits	Site FkPg-146, a variety of precontact artifacts including flakes, projectile points, scrapers and pieces of pottery, and historic glass, metal and ceramics in apparent undisturbed context spread over several hundred metres on dunes.	Site FkPg-146, deep testing and stratigraphic analysis were completed in October 2007, no further recommendations

#### 16.4.4.1 SE 27-55-21 W4M

No historic resources were discovered on the ground surface during the visual assessment. A total of four shovel tests were excavated in two areas across the northern part of the quarter section, all with negative results. The shovel tests were excavated to a maximum depth of 15 cm below surface. Two shovel tests were dug in the northwestern portion of the field to a depth of 8 cm to 12 cm before a thick layer of light brown clay was noted. Two additional tests were dug on a low ridge running north-south in the central part of the field, also with negative results, and with light brown clay noted at a depth of 12 cm below surface.

The nearest previously recorded archaeological site (FkPg-54) is approximately 250 m south of any proposed development and will not be affected. No surface features of interest were observed within the quarter section, nor did subsurface testing reveal any subsurface deposits.

#### 16.4.4.2 NE 27-55-21 W4M

One new archaeological site was discovered in this quarter section during the assessment, and one homestead was recorded. Site FkPg-147 was discovered as part of the pedestrian assessment, and consists of a single quartzite flake, found on the ground surface in cultivation. Five shovel tests were excavated in the immediate area of the surface find, with negative results.

Similar to the fields in SE 27-55-21 W4M, the soil consisted of a relatively thin layer (12 cm to 15 cm) of silty loam over top of a thick clay layer. Two shovel tests were dug on the crest of a low hill in the northwestern corner of the quarter section, with negative results. Two additional shovel tests were dug in the southwestern corner of the quarter section, on a small knoll, also with negative results. A single shovel test was excavated in the south-central region of the field, on flat land northwest of the homestead, also with negative results.

There is a homestead in the southeast corner of the quarter section. The homestead consists of 12 buildings (houses and grain bins) the majority of which appear to have been recently built. None of the buildings were entered during the assessment, as they were still occupied.

#### 16.4.4.3 NW 26-55-21 W4M

In NW-26-55-21 W4M, the entire quarter section was visually inspected by pedestrian traverse. The quarter is bisected by the Canadian National Railway (CNR) line. A homestead was noted north of the railway tracks, in the southwest corner of the quarter section.

This area appeared to exhibit low habitation potential other than the historic homestead, owing to its distance from permanent water sources and lack of topographic variation.

The ground surface of the entire quarter section was visually inspected for evidence of prehistoric artifacts, with negative results. Historic structures within the homestead were recorded.

In an effort to get an idea of what the deposits beneath the plow-zone looked like, a total of eight shovel tests were dug in various areas of the quarter. Similar to the other fields surveyed and tested, the soil consisted of a relatively thin layer (approximately 15 cm) of silty loam over top of a thick clay layer. All shovel tests yielded negative results.

#### 16.4.4.4 NE 26-55-21 W4M

A large amount of disturbance has taken place in this quarter, including cultivation and the construction of three gas wells and three pipelines. The CNR line runs through the quarter. Several access roads have been built to the existing gas wells, and an additional well in 15-26-

55-21 W4M is planned. The southern edge of the proposed well site 1-35-55-21 W4M intrudes onto the northern margin of this quarter.

Assessment of this quarter was confined to areas that had not been affected by oil and gas development, and concentrated on the northwest portion of the quarter. The area north of the railway tracks was visually inspected by pedestrian traverse, and two shovel tests were excavated in the northwestern part of the quarter.

The majority of the lands around the oil and gas developments have been cultivated at some point in the past and were covered in stubble at the time of assessment. The quarter is generally flat, with some low knolls north of the railway tracks.

The ground surface of the northwestern portion of this quarter section was visually inspected for evidence of prehistoric artifacts, with negative results. Two shovel tests were dug in the northwestern part of the quarter in an effort to see if any undisturbed cultural deposits were present beneath the plow-zone. Each shovel test was dug to a maximum depth of 14 cm below the surface, as a thick layer of clay was encountered immediately below the plow-zone. Each shovel test produced negative results.

No cultural features or artifacts were found on any of the areas visually inspected. The nearest known archaeological site is over 1 km away. On the whole, the locality appeared to exhibit moderate to low habitation potential, and has been heavily disturbed through past industrial activities.

#### 16.4.4.5 SW 35-55-21 W4M

In SW 35-55-21 W4M, the entire quarter section was visually inspected by pedestrian traverse. The quarter is bisected by an ATCO gas pipeline which runs northwest-southeast in the southwestern corner of the quarter. A homestead consisting of 12 buildings (houses, barns, sheds and outbuildings) was recorded in the southwest corner of the quarter section.

The quarter section is generally flat, and slopes gently up towards the north. A well site (6-35-55-21 W4M) and associated pipeline were abandoned in the 1970s in the northern portion of the quarter, and no sign of them remains on the surface. The quarter is bounded to the north, south and east by fences, and to the west by Range Road 212. The land has been cultivated in the past, and was covered with stubble during the time of assessment. An ephemeral wetland is present in the northwest corner of the quarter. This area appeared to exhibit low habitation potential other than the historic homestead.

The ground surface of the entire quarter section was visually inspected by pedestrian traverse for evidence of prehistoric artifacts, with negative results. Eleven historic structures making up the homestead found in the southwest corner of the quarter were recorded and additional information appears below.

Eight shovel tests were dug in various areas of the quarter. Similar to the other fields inspected, the soil consisted of a relatively thin layer (12 cm to 13 cm) of silty loam over top of a thick clay layer. Each shovel test produced negative results, and no archaeological remains were found during the pedestrian walkover.

#### 16.4.4.6 SE 35-55-21 W4M

In SE 35-55-21 W4M, the entire quarter section was visually inspected by pedestrian traverse. The area is generally flat, and rises gently to the west. Several low ridges running north-south are present on the western side of this quarter.

Some oil and gas activity is present in the eastern and southern parts of this quarter. An existing well site (8-35-55-21 W4M) is present on the east side of the quarter, and an access road runs to it from the northeastern corner. A proposed well site (1-35-55-21 W4M) may be located in the southeastern corner of the quarter, and the well pad will be partially located in NE 26-55-21 W4M. The quarter is bounded on all sides by a fence, and Range Road 211 is present to the east. The land has been cultivated in the past, and at the time of assessment was covered in stubble.

This area appeared to exhibit low habitation potential, owing to its distance from permanent water sources and lack of distinctive topographic variation.

The ground surface of this quarter section was visually inspected for evidence of prehistoric or historic artifacts, with negative results. The entire quarter was examined by pedestrian traverse. A total of eight shovel tests were dug in the western part of the quarter, concentrating along the ridges in the western portion of the quarter. Similar to the other fields surveyed and tested, the soil consisted of a fairly thin layer (approximately 12 cm to 15 cm) of silty loam over top of a thick clay layer. All shovel tests yielded negative results. No cultural features or artifacts were found on any of the areas visually inspected. The nearest known archaeological site is over 1 km away. On the whole, the locality appeared to exhibit moderate to low habitation potential, and has been heavily disturbed through past cultivation and industrial activities.

#### 16.4.4.7 SW-36-55-21 W4M

A large amount of disturbance has taken place in this quarter, including cultivation, and also the construction of two gas wells, several pipelines and a grain elevator. The CNR line and access roads cross the quarter section. Assessment of this quarter was confined to areas that had not been affected by previous industrial or oil and gas development, concentrating in areas which had been cultivated. The ground surface was covered in stubble during the assessment.

This area was visually inspected by pedestrian traverse, and 11 shovel tests were excavated. The quarter is generally flat, with a few low knolls present in the northeastern portion of the quarter. Generally, the area exhibited low habitation potential, as it was far from any permanent water source and had little topographic variation.

The ground surface of the northwestern portion of this quarter section was visually inspected for evidence of prehistoric artifacts. A fragment of a quartzite biface was found east of well site 5-36-55-21 W4M, on the ground surface. This site was designated FkPf-50. Five shovel tests were excavated around the surface find, with negative results.

An additional four shovel tests were excavated around the quarter, concentrating on the low knolls present in the northeastern corner. Each shovel test yielded negative results. Two shovel tests were excavated south of the railway tracks, in a cultivated field, also with negative results. Each shovel test except one was dug to a maximum depth of 12 cm below the surface, as a thick layer of clay was encountered immediately below the plow-zone. No cultural features were found on any of the areas visually inspected. On the whole, the locality appeared to exhibit moderate to low habitation potential, and has been heavily disturbed through past industrial and agricultural activities.

#### 16.4.4.8 NE 35-55-21 W4M

In NE 35-55-21 W4M, the entire quarter section was visually inspected by pedestrian traverse. The quarter contains a low-lying, seasonally wet area in the centre of the quarter, and a homestead is located in the northeast corner. Two small wetland areas are present in the northwest corner of the quarter.

The quarter section is generally flat, and slopes gently up towards the west. Several small knolls and ridges are present in the southwest corner of the quarter. The quarter is fenced in on all sides, and is directly west of Range Road 211 and south of Township Road 560. No oil and gas developments are present on this quarter. The quarter has been cultivated in the past, and was covered in stubble at the time of assessment.

The ground surface of the entire quarter section was visually inspected by pedestrian traverse for evidence of prehistoric artifacts, with negative results. A total of 22 historic structures making up the homestead found in the northeast corner of the quarter were recorded.

Nine shovel tests were dug in various areas of the quarter. Each shovel test was dug to a maximum depth of 10 cm to 15 cm below surface, as a thick layer of clay was encountered immediately below the plow-zone. Each shovel test yielded negative results. Shovel tests were concentrated around the small knolls in the southwestern corner of the quarter, as well as the northwestern corner, near the wetland areas which had not been previously cultivated.

#### 16.4.4.9 NW 36-55-21 W4M

In NW 36-55-21 W4M, the entire quarter section was visually inspected by pedestrian traverse. The quarter contains both oil and gas development, and also a homestead. An abandoned gas well (11-36-55-21 W4M) is located in the southeastern portion of the quarter; no trace of it is visible on the ground surface. An operating gas well is located immediately north of the abandoned well in 12-36-55-21 W4M.

The land in this quarter is generally flat, with little to no topographic variation. A small wetland area is present in the northwest corner of the quarter. The quarter is fenced in on all sides, and is directly east of Range Road 211 and south of Township Road 560. The quarter has been cultivated in the past, and was covered in stubble at the time of assessment. A homestead is located in the southwestern portion of the quarter. Twenty-four historic structures making up the homestead were recorded.

The locality is characterized by generally low-lying terrain that has been cultivated in the past. Little topographic variation and the distance to a permanent water source indicate a low potential for prehistoric archaeological sites. The ground surface of the entire quarter section was visually inspected by pedestrian traverse for evidence of prehistoric artifacts, with negative results. Six shovel tests were dug in various areas of the quarter. Each shovel test was dug to a maximum depth of 10 cm to 15 cm below surface. Each shovel test yielded negative results.

#### 16.4.4.10 SE 2-56-21 W4M

In SE 2-56-21 W4M, the entire quarter section was visually inspected by pedestrian traverse. The area is generally flat, and rises gently to the west. The majority of the area has been cultivated in the past, and was covered in stubble at the time of assessment. The ground surface of this quarter section was visually inspected for evidence of prehistoric artifacts by pedestrian traverse. A total of four shovel tests were dug in the southeastern part of the quarter. Each shovel test was dug to a maximum depth of 15 cm to 20 cm below the surface, as a thick layer of sand and then clay was encountered immediately below the plow-zone. Each shovel test in the previously cultivated area proved to be negative.

The quarter is bounded to the north by a Canadian Pacific Railway (CPR) line, to the east by Range Road 211, to the south by Township Road 560, and to the west by a fence. There is an abandoned well site (7-2-56-21 W4M) in the centre of the quarter. No trace of this development or the previous access road is visible on the ground surface.



A large dune complex is present in the northwestern corner of the quarter, and takes up approximately a quarter of the land. The dune area does not appear to have been cultivated, and was covered with long grasses at the time of assessment. The main portion of the dune complex runs east-west, and extends to the north on the east side. The area northwest of the dunes is flatter and more low-lying, and is covered with bushes and small shrubs. At the west end of the sand dunes there is a raised ring of earth with a depression in the middle. A stand of large trees is growing from the centre of the ring.

The surface inspection of the sand dunes resulted in the discovery of a variety of pre-contact artifacts, including flakes (quartzite, obsidian and chert), projectile points, scrapers and pieces of pottery found lying directly on the ground surface. Some historic glass, metal and ceramics were also recovered. Artifacts were also found beside the dunes, in cultivated areas immediately next to the dunes. These finds were designated FkPg-146.

In an effort to determine site extent, content and condition, forty-seven shovel tests were dug across the site. Shovel tests were dug to a depth of 30 cm below surface. Soil excavated from these relatively shallow shovel tests consisted of uniform brown sand, with no variation. Artifacts were found up to a depth of 30 cm below surface. The majority of artifacts were found on the ground surface, likely owing to erosion of the sand over time, thereby exposing the artifacts.

The site appears to have been used over thousands of years, and at least three different occupations are represented by the artifacts collected. The earliest occupation during the Middle Pre-contact Period (approximately 7,800 years to 2,000 years before present) is represented by a Pelican Lake projectile point (dated to 3,300 years to 1,800 years before present) composed of Knife River flint. Pre-contact pottery first appears during the Late Period (approximately 2,450 years to 250 years before present), and was not made during the Pelican Lake Phase. Moreover, the side-notched projectile points indicate a late period occupation of the site. The historic glass, metal and European ceramics indicate use of the site by Euro-Canadian settlers in the area over the last 140 years.

In addition, evidence of a wide variety of lithic materials used by occupants of the site was noted. The main source of Knife River flint is in west-central North Dakota, but it was widely traded and artifacts of this material have been found throughout the Plains, including most of Alberta. Obsidian does not naturally occur in Alberta, but can be found in British Columbia, Oregon, Wyoming, California and Alaska. The stone was highly valued for stone tool manufacture, and was traded into Alberta.

Pre-contact pottery is still a relatively rare artifact to find in north-central Alberta, and its presence suggests that the site was used by aboriginal people up until relatively recent times. The site appears to have been used as a campsite or as a lookout area for hunting.

#### **16.4.5 Details of New Archaeological Sites**

As described in 16.4.4, three new archaeological sites were discovered during this HRIA: FkPg-146, FkPg-147 and FkPf-50. FkPg-146 was the largest of the three archaeological sites found, and consists of a widespread surface scatter of artifacts on an elongated sand dunes context in SE 2-56-21 W4M, including projectile points, obsidian, prehistoric pottery and a variety of flakes and lithic debitage. Additional artifacts were found in subsurface contexts. FkPg-147 consists of a single quartzite flake, found on the ground surface of a cultivated field, in NE 27-55-21 W4M. Site FkPf-50 also consists of an isolated surface find of part of a quartzite biface found in the middle of a cultivated field in SW 36-55-21 W4M. No palaeontological material was noted during the survey.

A summary of findings is provided in the following sections.

#### 16.4.5.1 Archaeological Site FkPg-146

Site FkPg-146 consists of a collection of artifacts found directly on the ground surface and in shovel tests of large sand dunes in the northwestern corner of SE 2-56-21 W4M. Artifacts include bone fragments, pieces of fire-cracked rocks, lithic debitage made of quartz, petrified wood, chert and obsidian. Two complete chert projectile points were found on the ground surface, along with a chert side-notched projectile point base found in a shovel test. Additionally, three pieces of prehistoric pottery were recovered.

It appears that the site is confined to the sand dunes and does not extend far into the northwestern corner of the quarter. Construction of the Project as currently planned will not affect this site. Shovel testing in the area did not extend deeper than 30 cm below surface.

Deep testing was conducted in October 2007 in order to see if buried palaeosols were present. Further shovel testing was also carried out in the northern portion of the site in order to determine its limits and extent. These deep shovel tests revealed that palaeosols are not present and that black soil horizons do occur in some parts of the northern portion of the site. However, no significant archaeological deposits are present.

#### 16.4.5.2 Archaeological Site FkPg-147

The site consists of a single quartzite flake found lying on the surface amid heavily disturbed cultivation. Five shovel tests were excavated in the immediate area, with negative results. As there is no evidence of an intact subsurface component, and any surface features that existed have long since been disturbed, there are no further concerns with this site area.

#### 16.4.5.3 Archaeological Site FkPf-50

The site consists of a single quartzite biface fragment found lying on the surface amid heavily disturbed cultivation. Five shovel tests were excavated in the immediate area, with negative results. As any surface features that existed have long since been disturbed, thereby leaving no evidence of an intact subsurface component, no further concerns exist regarding this site area.

### 16.5 Impact Assessment and Mitigative Measures

The three new archaeological sites discovered in the HRIA augmented information in the historical resources database. These new sites are located in a portion of the site that will not be disturbed by construction of the Upgrader. Using the criteria outlined in [Section 16.3.3](#), the direction of the impact is considered positive and irreversible. The sites that were discovered, however, are similar to others in the area, thereby rendering the magnitude of this positive impact moderate. Indirect regional impacts on historical resources may result from increased access to and use of the RSA. These indirect potential impacts, however, would likely exist for the long-term due to ongoing development in the RSA.

The HRIA specifically assessed the impact of the Project on the three newly discovered historical sites located within the LSA. Recommendations made with regard to these sites are listed in [Table 16.5-1](#). Through consultation with and review by TPRC, no additional historical resources site investigations are required.

**Table 16.5-1 Recommendations for Newly Discovered Historical Sites**

<b>Borden Number</b>	<b>Site Type</b>	<b>Recommendations</b>
FkPg-146	Artifact scatter	No further work
FkPg-147	Isolated find	No further work
FkPf-50	Isolated find	No further work

## 16.6 Follow-up and Monitoring

No further historical resources investigation or monitoring is recommended.

## 16.7 Cumulative Effects Assessment

These new archaeological sites are located in a portion of the site that will not be disturbed by construction of the Upgrader, and as such no negative cumulative impacts will result. The HRIA contributed to the historical resource database, resulting in a positive cumulative impact.

## 16.8 Literature Cited

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## **15A TRANSPORTATION TECHNICAL BRIEF**

### **15A1 Introduction**

Matrix Solutions Inc. retained Stantec Consulting Ltd. (Stantec) to assist with the transportation impact assessment for North American's Upgrader Project in Strathcona County, Alberta. Stantec's transportation assessment is summarized and integrated as part of the project's Socio-Economic Impact Assessment (SEIA).

This technical brief provides additional detail on the background and assumptions corresponding to the summarized transportation assessment.

### **15A2 Study Area**

The Upgrader Project's location and boundaries are described in the main body of the Environmental Impact Assessment and shown on the figures in this assessment.

The transportation impact assessment includes consideration of the following roads in the vicinity of the Upgrader site:

- Highway 830 (East);
- Range Road 211;
- Range Road 212;
- Range Road 213;
- Range Road 214;
- Highway 15; and
- Township Road 560.
- The study area for the transportation assessment was the area bounded on the south by Highway 15, bounded on the east by Highway 830, bounded on the north by Township Road 560 and bounded on the west by Range Road 214.

### **15A3 Issues and Assessment Criteria**

The transportation impact issues requiring assessment are defined in [Section 3.4](#) of the EIA Terms of Reference (TOR) issued by Alberta Environment (AENV) ([Volume 1, Appendix A](#)). This report includes assessment of the impacts of the Project on transportation planning and traffic, during both the construction and operations phases.

### **15A4 Methods**

Methods employed for the transportation impact assessment include the following:

- reviewing available data from industry and government websites and databases;

- obtaining traffic counts and roadway characteristics for the study area from Alberta Infrastructure and Transportation (AIT), Strathcona County and a report previously completed by Stantec titled Strathcona County 2005/2006 Transportation Model Update (Stantec, 2007);
- obtaining information on overall road planning for the study area from a report completed concurrently titled Strathcona Area Industrial Heartland Transportation Study (Stantec, 2007). The roadway improvements recommended in that study are shown in [Figure 15A-1](#);
- estimating the magnitude and characteristics of traffic activity generated by the proposed development, including trip generation, trip distribution and trip assignment;
- evaluating the impacts of vehicular traffic generated by the Upgrader on adjacent roads and intersections;
- evaluating the impacts of rail traffic generated by the Upgrader;
- identifying potential improvements to affected roadway facilities to mitigate unacceptable development-related traffic impacts; and
- results of consultation with transportation authorities.

Consultation with transportation authorities at Strathcona County and AIT has been completed indirectly through Stantec's concurrent preparation of the Strathcona Area Industrial Heartland Transportation Study (Stantec, 2007). Both stakeholders are in the process of developing procedures and approaches to managing the transportation impacts of all the major projects in the AIH, including revisions to construction programs and timing, as well as development of levies and other funding arrangements to facilitate transportation impacts in partnership with the industrial proponents.

## 15A5 Existing Conditions

[Figure 15A-2](#) shows the Upgrader site and regional road system, as well as existing roadway rail crossings in the vicinity.

### 15A5.1 Road Network

Range Road 211, Range Road 212 and Highway 830 are the north-south routes of the roadway network in the immediate vicinity of the Upgrader site, while Highway 15 and Township Road 560 are the east-west routes. Range Road 212 and Township Road 560 are two-lane, paved (cold-mix asphalt) rural roadways, each with an 80 km/h posted speed limit. Range Road 211 is a two-lane, unpaved (dust-controlled gravel) rural roadway with an 80 km/h posted speed limit. Range Road 211 provides access to a private business (Providence Grain Group Inc.) and several private residences. Highway 15 and Highway 830 are two-lane, paved provincial highways. Highway 15 has a posted speed limit of 100 km/h, and is part of the high load corridor system (all utility lines have been raised to accommodate loads of up to 9.0 m). Highway 830 has a posted speed limit of 80 km/h.

## 15A5.2 Railway Network

There are six active railway crossings in the immediate vicinity of the Upgrader site. The Canadian National Railway (CN) line runs across the study area from the southwest corner to the northeast corner, and crosses Highway 830, Range Road 212 and Range Road 211 between Highway 15 and Township Road 560. The Canadian Pacific Railway (CPR) has two lines in close proximity to the Upgrader location. One line runs north-south between Range Road 212 and Highway 830, crosses Township Road 560 on the north side of the study area and meets the second CPR line on the south. This second line crosses the southeast corner of the study area, resulting in crossings at both Highway 830 and Highway 15.

Traffic on CN's Vegreville line averages ten trains per day. Four of the daily trains are scheduled, and they vary in length from 100 to 200+ cars. They can also block crossings on the range roads for up to ten minutes at a time. A smaller train is on the line in the evenings, and crosses each crossing twice (inbound and outbound). While these trains are scheduled, their actual times can vary. In addition to the scheduled trains, up to four unscheduled trains can be on the line each day.

Existing traffic on CP Rail's Scotford Subdivision east of RR 212 averages four trains per day.

## 15A5.3 Existing Traffic Volumes

Traffic counts at the intersections of Highway 15-Range Road 212, Highway 15-Range Road 211 and Highway 15-Highway 830 (for the AM peak period and the PM peak period) were obtained from AIT (2002). The available traffic counts are four to five years old: Highway 15-Range Road 212 and Highway 15-Range Road 211 were last counted in August 2002 (AIT, 2002), while Highway 15-Highway 830 was last counted in May 2003 (AIT, 2003). Therefore, to ensure that the available volumes were relevant to this impact assessment, the amount of simple growth for each measurement was calculated using the Alberta annual provincial growth rate (2.5%). Each measurement was then increased to reflect 2007 volumes.

Link volumes (measured in average vehicles per weekday) for Township Road 560, Range Road 211, Range Road 212 and Highway 830 were obtained from Strathcona County (Strathcona County, 2006). The link volumes at Township Road 560-Range Road 212 and Township Road 560-Range Road 211 were last measured in 2002, while Township Road 560-Highway 830 was last measured in 2000. Following the same procedure as with the traffic counts from AIT, each measurement was increased at the provincial growth rate to reflect 2007 volumes. AM and PM peak period volumes were then calculated from the growth-corrected measurements of average vehicles per weekday, by using a factor of 0.09 for the AM peak period and 0.10 for the PM peak period. Directional link volumes were calculated by analyzing the traffic counts from AIT and assuming similar proportions. They were then converted to turning movement volumes by assuming 80% of the traffic travelled through the intersection, 10% turned left and 10% turned right (for the intersections of Range Road 212-Township Road 560 and Range Road 211-Township Road 560), or by proportionally distributing the traffic based on the growth-corrected link volumes from Strathcona County (for the intersection of Township Road 560-Highway 830.)

After being increased to reflect 2007 conditions, the volumes from AIT and Strathcona County were then "balanced." This was accomplished by reviewing all volumes across the study area and proportionally increasing them to match the intersection of Highway 15-Highway 830. The results of this process are shown in [Figure 15A-3](#) and [Figure 15A-4](#) for AM and PM peak hours, respectively.

## 15A6 Impact Assessment and Mitigative Measures

The impact assessment and mitigative measures described below are closely linked to the Strathcona Area Industrial Heartland Transportation Study Update (Stantec, 2007).

### 15A6.1 Project-related Traffic

As part of the impact assessment, a key assumption is that none of the construction or operations workers will be accommodated in camps or other housing on or immediately adjacent to the Project.

#### 15A6.1.1 Construction-Related Traffic

Approximately 3,200 full-time equivalent workers are forecast at the peak of construction, which is expected to occur in 2017. A smaller peak of approximately 1,700 workers is expected to occur in 2012. These peak workforce estimates were the most current available when the traffic impact analysis was conducted, and are slightly higher, and therefore more conservative, than the peaks used in the socio-economic impact assessment. The following assumptions have been made regarding the trip pattern of the workers and associated trips:

- of the 3,200 full-time equivalent workers, 70% are projected to travel to or from site in the peak hours;
- a trip-rate of 1.1 vehicles per worker has been estimated to account for all peak-hour trips associated with the Upgrader construction;
- an auto occupancy of 1.0 person/vehicle has been used for analysis purposes. This is a conservative assumption, as other EUB submissions have quoted auto occupancy assumptions of 1.2 persons/vehicle;
- 80% of the workers will arrive by bus, with approximately 30 workers per bus; and
- 90% of the site-generated traffic is oriented in the peak direction (e.g., into the site in AM), and 10% is oriented in the off-peak direction (e.g., out from the site in AM).

The site-generated construction traffic has been distributed external to the study area as following:

- 70% to west of the study area using Highway 15;
- 15% to south of the study area using Highway 830 South;
- 10% to east of the study area using Highway 15; and,
- 5% to north of the study area using Highway 830 North.

The designated route for the majority of the traffic from west of the study area on Highway 15 is to use the Range Road 212 to Township Road 560.



### 15A6.1.2 Operations-related Traffic

At the same time as the peak of construction in 2017, 350 operations dayshift workers are expected to be on-site as well, with the same external distribution as the construction traffic. The majority of operations workers would also be designated to use Range Road 212 to Township Road 560 to access the North American site.

Background traffic for this analysis assumes that there is 3% simple annual growth on Highway 15, as well as traffic from all the currently built and currently approved industrial facilities in the area. With the projected operations traffic, peak construction traffic and background traffic, the roadway network will require some upgrades.

### 15A6.1.3 Rail Traffic

The Project could require over 100 outbound railcars daily prior to gasification when both sulphur and petcoke are being shipped from the site. With gasification, rail traffic would be reduced significantly because petcoke would not be shipped. Increased rail traffic will impact roadways with spur crossings, namely Range Road 211.

## 15A6.2 Travel Routes During Construction and Operation Phases

### 15A6.2.1 Desired Traffic Routing

Based on traffic capacity analysis for the Cumulative Case, and incorporating the results of the overall Strathcona Area Industrial Heartland Transportation Study (Stantec, 2007), the recommended primary traffic routing during all construction and operation phases of the North American Upgrader is to/from Highway 15 via Range Road 212, and Township Road 560 to site operation/construction gates near the intersection of Township Road 560-Range Road 211. The recommended secondary traffic routing is to/from Highway 15 via Highway 830 North and Township Road 560.

In the event that Range Road 212 is realigned (e.g., combined with Range Road 211 at a new intersection on Highway 15), the new alignment should still function acceptably as a primary traffic routing.

All of the roads within the Strathcona County portion of the AIH are subject to substantial amounts of increased industrial traffic due to the approved implementation of industrial area development plans. In terms of minimizing immediate impacts on area residents, it is understood that there are currently more residents on Range Road 211 than on Range Road 212. This is one of the contributing factors in the recommendation that primary and secondary access routings avoid Range Road 211, and use Range Road 212 or Highway 830 North instead.

### 15A6.2.2 Control Methods

Transportation impacts in the immediate vicinity of the Upgrader can be addressed using standard accepted traffic and roadway engineering control methods, such as stop-sign controlled intersections and traffic signals. Short-term traffic controls using manual police traffic controls are also an option. Projected operations of the immediately adjacent roadways are adequate within standard accepted configurations such as two-lane or four-lane divided or undivided road cross-sections, including channelization using single or multiple right-turn and/or left-turn bays. Grade-separated intersections (e.g., interchanges) are also an option that may be appropriate on Highway 15 at intersections more remote from the Upgrader toward Fort Saskatchewan.

### 15A6.2.3 Road Use Agreements

There are no identified locations where agreements are necessary to access private roads or other transportation facilities beyond the public right-of-ways owned and controlled by Strathcona County or AIT.

### 15A6.3 Impacts on Average Annual Daily Traffic

Projected Average Annual Daily Traffic (AADT) volumes for relevant analysis horizons at various locations near the project site are tabulated below in [Table 15A-1](#). Current ratios of AM peak and PM peak volumes to daily volumes in the area average 5.3; therefore, projected AADT volumes were calculated by adding AM peak and PM peak projected volumes and multiplying by 5.3. This method is conservative because of the change in land use of the area, and expected highly peaked traffic volumes in the AM peak and PM peak once construction of the Upgrader begins.

Existing traffic counts show that the Average Summer Daily Traffic (ASDT) is approximately ten percent higher than the AADT. As the traffic in this area becomes dominated by commuters travelling to the area's industrial sites, this difference in traffic volumes by season will become less pronounced. The traffic volumes are expected to vary as the levels of staffing in the area vary.

### 15A6.4 Cumulative Impacts

The Strathcona Area Industrial Heartland (SAIH) Transportation Study addresses the cumulative impacts of numerous planned developments in the portion of the AIH located in Strathcona County. The intent of the SAIH Transportation Study was to develop a master plan to accommodate long-term traffic needs in the area. Its major objectives that pertain to this assessment include developing a conceptual major internal road network, establishing the characteristics of the roadway network elements (number of lanes, major intersection configurations, right-of-way, etc.) and developing a construction staging program.

#### 15A6.4.1 Construction-Related Traffic

Of disclosed projects within the study area whose transportation requirements will cumulatively affect the project, BA Energy, Shell Scotford Expansion 1 and Shell Scotford Upgrader 2 and Total E&P have made public their plans to construct large industrial facilities within the study area. Shell's construction workforce will peak twice, in 2012 and 2018 with approximately 3,800 workers. BA Energy is expected to have a small peak of approximately 800 workers in 2012 and finish construction in 2013. Total E&P's proposed project is expected to have a peak construction workforce of approximately 4,000 in 2012 and be operational by 2017.

For all the proposed projects, the same external distribution and trip-generation rate as the North American construction traffic has been assumed. All are assumed to have 70% of their workforce travel within a highly peaked period, with 33% of the traffic travelling within the same 15 minutes.

- At the Shell site, 90% of the workers are projected to be bussed, with the majority of workers accessing the site via Range Road 214.
- At the Total E&P site, 70% of the workers are projected to be bussed, with the majority of workers accessing the site via Range Road 220.

- At the BA Energy site, 70% of the workers are projected to be bussed, with the majority of workers accessing the site via Range Road 213 and Range Road 212.

With the highest cumulative workforce occurring in the 2012 timeframe, analysis of the 2012 horizon was undertaken in addition to the 2017 horizon. With other projects' traffic projected to use all of the available roadway vehicular capacity at the intersections of Range Road 220-Highway 15 and Range Road 214-Highway 15, all of the project-related traffic must be routed towards the intersection of Highway 15-Range Road 212.

**Table 15A-1 Projected AADT Near the Project for Relevant Analysis Horizons (vehicles/day)**

Location	Baseline Condition	2017 Project Only	2012 Cumulative Effects	2017 Cumulative Effects
Range Road 212, North of Highway 15	200	4,700	5,900	11,500
Township Road 560, West of Highway 830	700	800	1,600	4,200
Highway 15, West of Range Road 212	10,800	4,700	13,300	19,900

#### 15A6.4.2 Regional Mitigation Measures

Figure 15A-6 provides an overview of the recommended roadway upgrades required for the 2012 cumulative effects analysis, and Figure 15A-7 addresses the 2017 cumulative effects analysis.

The 2012 cumulative effects analysis indicates that minor intersection improvements, in the form of standard left-turn bays, are required at the access points to the project site. Similarly, at the intersection of Highway 15-Range Road 212, eastbound and westbound left-turn bays are required, as well as a signal.

The 2017 cumulative effects analysis indicates that a four-lane cross-section of Highway 15 is necessary near the intersection of Highway 15-Range Road 212. If four lanes are built near Range Road 212, it may be practical to continue the four-lane cross-section from Range Road 213 to Range Road 212 for continuity. The intersection also requires eastbound dual left-turn and southbound dual right-turn bays. Temporary traffic controls, such as police control or temporary traffic signals, are necessary at the intersections of Township Road 560-Range Road 212 and Township Road 560-Range Road 211, as well as at the project construction site access. Single left-turn bays are required at all of the intersections along Township Road 560, with the exception of the intersection of Township Road 560-Range Road 212, where dual westbound left-turn bays are required to maintain reasonable levels of service to the North American and BA Energy site workers who will be mainly accessing this intersection. In addition to dual left-turn bays, two southbound lanes leading away from the intersection are required to receive the traffic from the dual left-turn bays. Since BA Energy is assumed to take some access off Range Road 212 north of Township Road 560, the associated projected traffic requires a left-turn and right-turn bay at the intersection of Township Road 560-Range Road 212.

#### 15A6.4.3 Railway Crossings

Cross-buck signs are recommended to mark rail crossings on low-volume two-lane roadways.

Where roadway vehicle and train traffic volumes (cross-product), sight lines and train speeds warrant, the crossing protection is typically upgraded to flashing lights and, in most cases, gates. It is recommended that flashing lights with gates be provided at all crossings where railyards or multiple tracks crossing roadways may create sight line constraints due to stationary railcars.

Provision of grade-separated crossings is typically recommended at new crossings when the cross-product of the Average Annual Daily Traffic (AADT) and the number of trains exceeds 200,000. Using the projected AADT volumes from [Table 15A-1](#), and recognizing that the values are conservative, consideration for grade-separated railway crossings should be considered when there are 20 trains per day on any line. At this point, the actual AADT volumes should be confirmed, and consideration should be given to the length of time the high traffic and rail volumes are expected to continue.

### **15A6.5 Project Mitigation Measures**

Recommended roadway upgrades for the North American project are shown on [Figure 15A-5](#), Roadway Network Project Related Changes.

Of note, minor intersection improvements, in the form of left-turn bays, are required at the following intersections: Highway 15-Range Road 212, Township Road 560-Range Road 212 and an assumed bus/parking access to the project on Township Road 560. The intersection of Township Road 560-Range Road 211 requires left-turn bays, as well as an eastbound right-turn bay and temporary traffic control, such as police direction or a temporary signal. Temporary traffic-control devices are also required at the intersection of Highway 15-Range Road 212.

Oversize loads and slow-moving loads should be scheduled outside of peak travel times.

#### **15A6.5.1 Design and Construction Standards**

Current best practice guides and government guidelines, such as AIT and/or Strathcona County design and construction guidelines, will be followed where applicable.

### **15A7 Follow-up and Monitoring**

Monitoring of road and rail-traffic volumes and operating conditions in a regular traffic-monitoring program would show if a major departure from the predicted traffic flow is occurring. Steps can then be taken to mitigate those effects (or save costs by not implementing measures where they are demonstrably not required). Informal traffic monitoring is recommended. If the results of informal monitoring show that traffic delays and queues are growing at a particular location, it can signal the need for a more formal data collection and analysis program.

Period tracking of railway volumes is recommended using information available from the railways.

### **15A8 Conclusions and Recommendations**

The transportation network within the study area operates efficiently at its current level of activity. The traffic study area is the site of a number of proposed large-scale industrial projects, and past experience has indicated that construction traffic impacts are noticeable. Proper mitigation, including bussing of the workforce, scheduling of deliveries at off-peak times and roadway improvements made at key intersections can help to mitigate increased volumes. Traffic impacts associated with cumulative upgrader activity are being addressed through the SAIH study.

Construction of the Upgrader will require that the surrounding road network be improved. Due to the number of rail crossings present within the study area and the potential for construction of an additional spur line to service the Upgrader, changes to the methods of rail-crossing protection used may need to be considered.

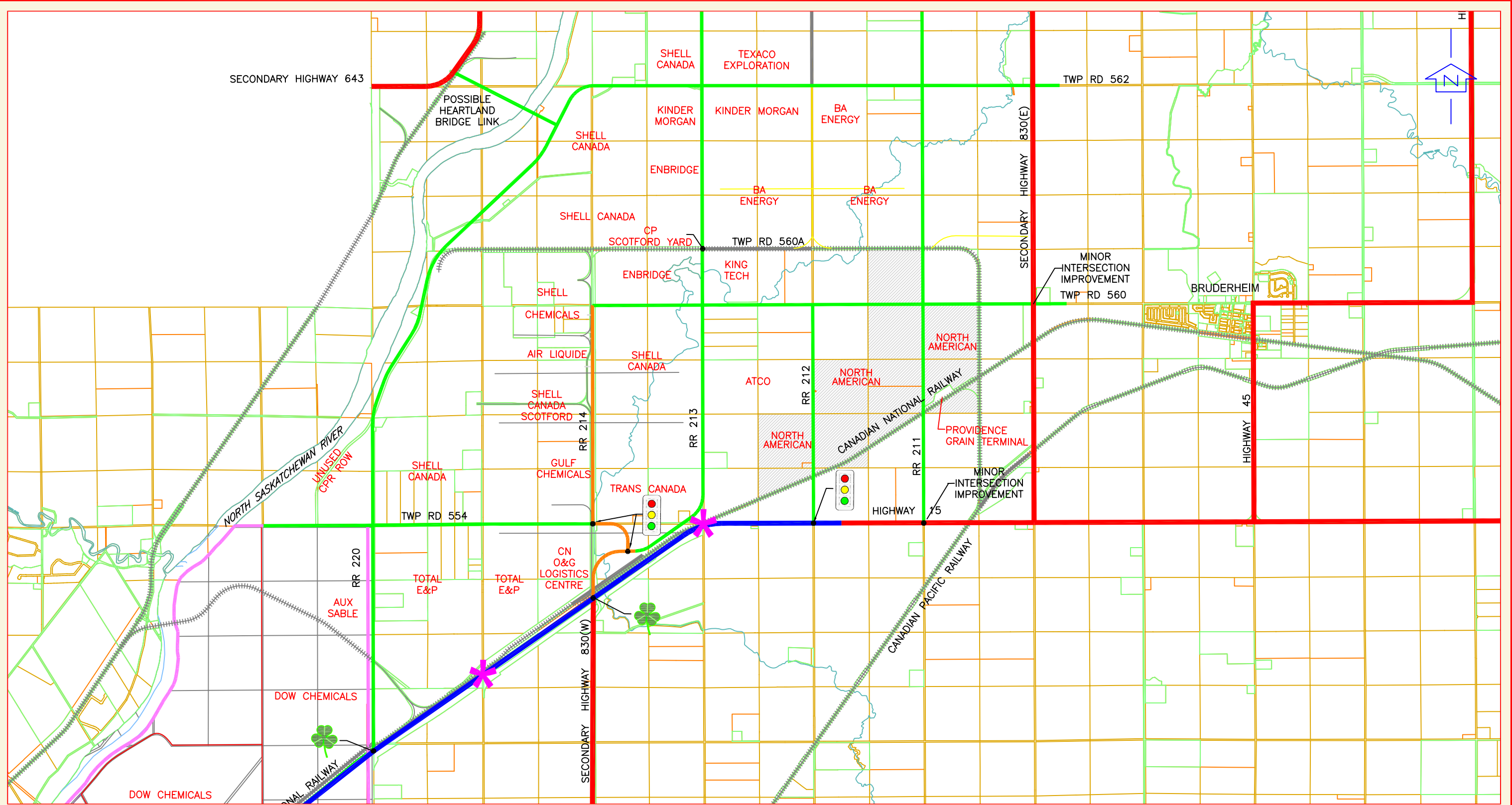
The transportation assessment indicates that the North American project can be developed as planned on the basis of including mitigations, including:

- the use of temporary traffic-control devices;
- the construction of some of the ultimately planned roadway network before construction of the project site is complete;
- bussing the majority of workers to site;
- monitoring of traffic volumes to respond to unexpected changes in traffic patterns; and
- scheduling material deliveries outside of the peak traffic times.

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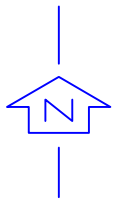
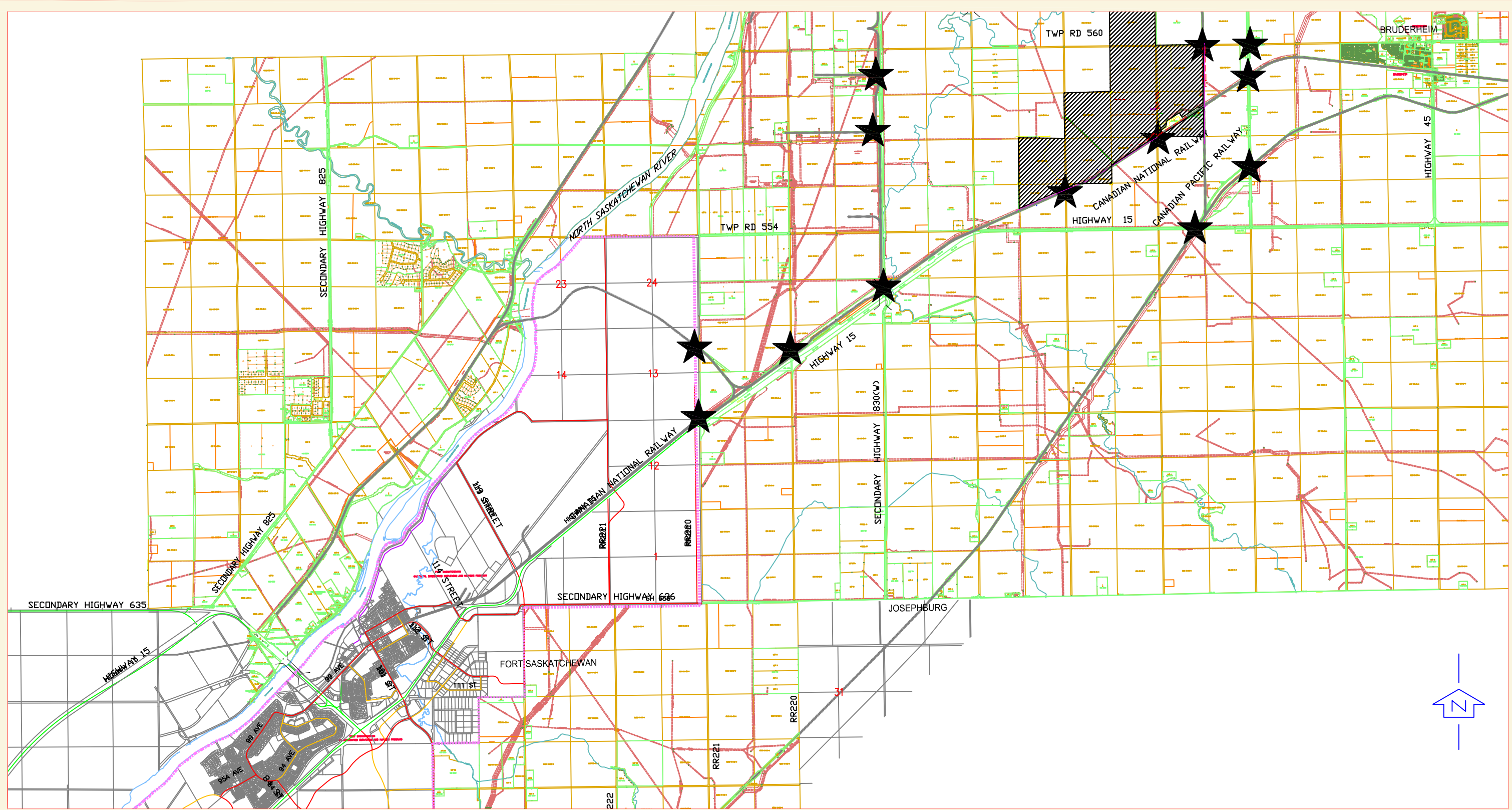
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LEGEND	
	Study Area
	City of Fort Saskatchewan Boundary
	Highway (Four Lane)
	Highway (Two Lane)
	Class 1A Road (50 to 60m Right-of-Way)
	Class 1B Road (40m and 50m Rights-of-Way)
	Railways
	Intersection Closure
	Signals (Existing / New)
	Overpass / Interchange
	Existing Speed Limit

Title:		 <b>Draft</b> <b>Strathcona Area Industrial Heartland</b> <b>Transportation Study Update</b> <b>Overview</b>	
Approved:	DC	Revision Date:	11/22/07
File:	HEARTLAND_PLAN.DWG		
Drawn by:	SB	Checked:	DV
Fig. No.:	15A-1		

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**LEGEND**

★ Rail Crossings

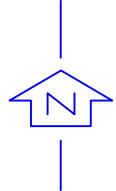
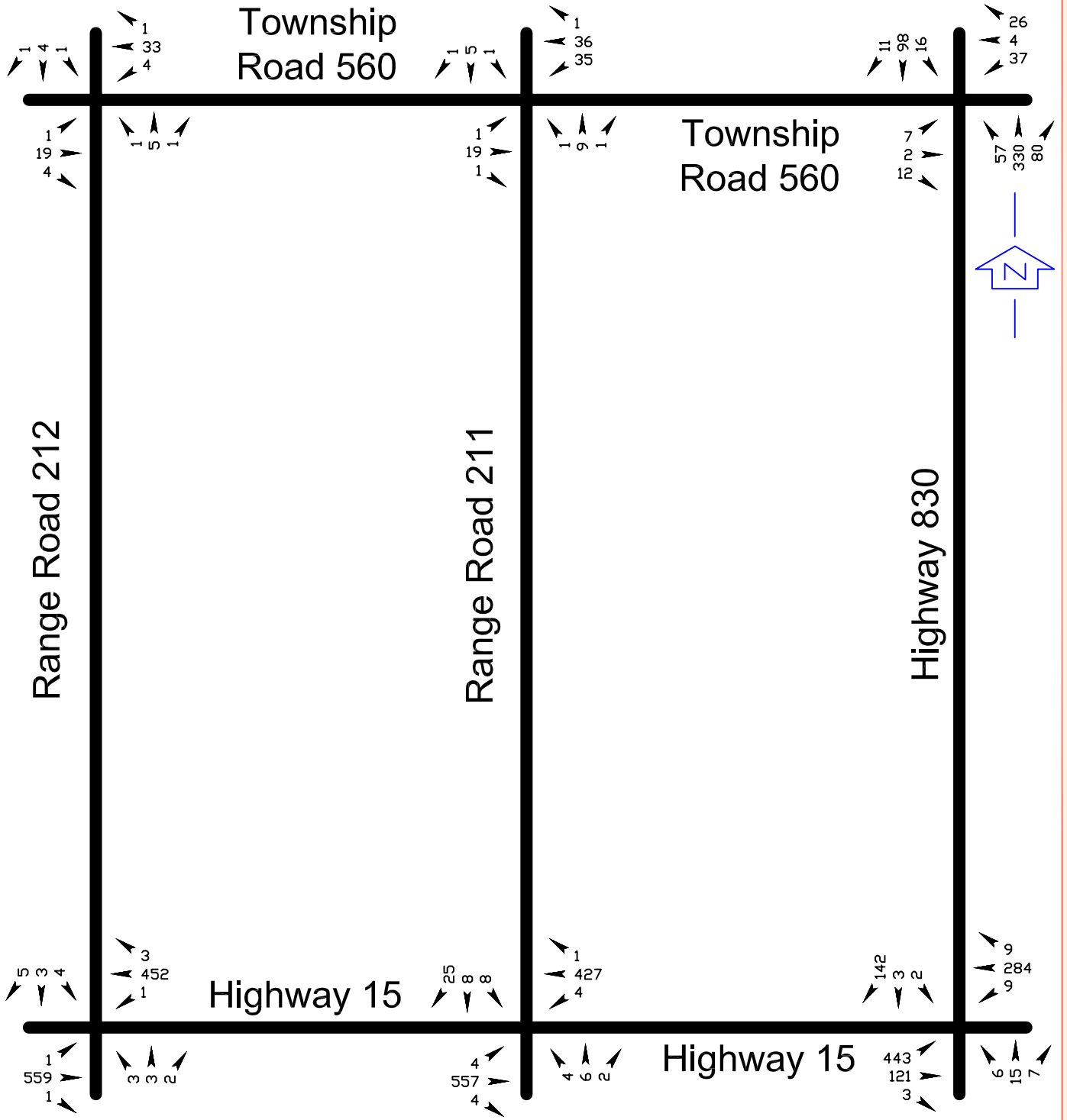
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**LOCATION CONTEXT & RAIL CROSSINGS**

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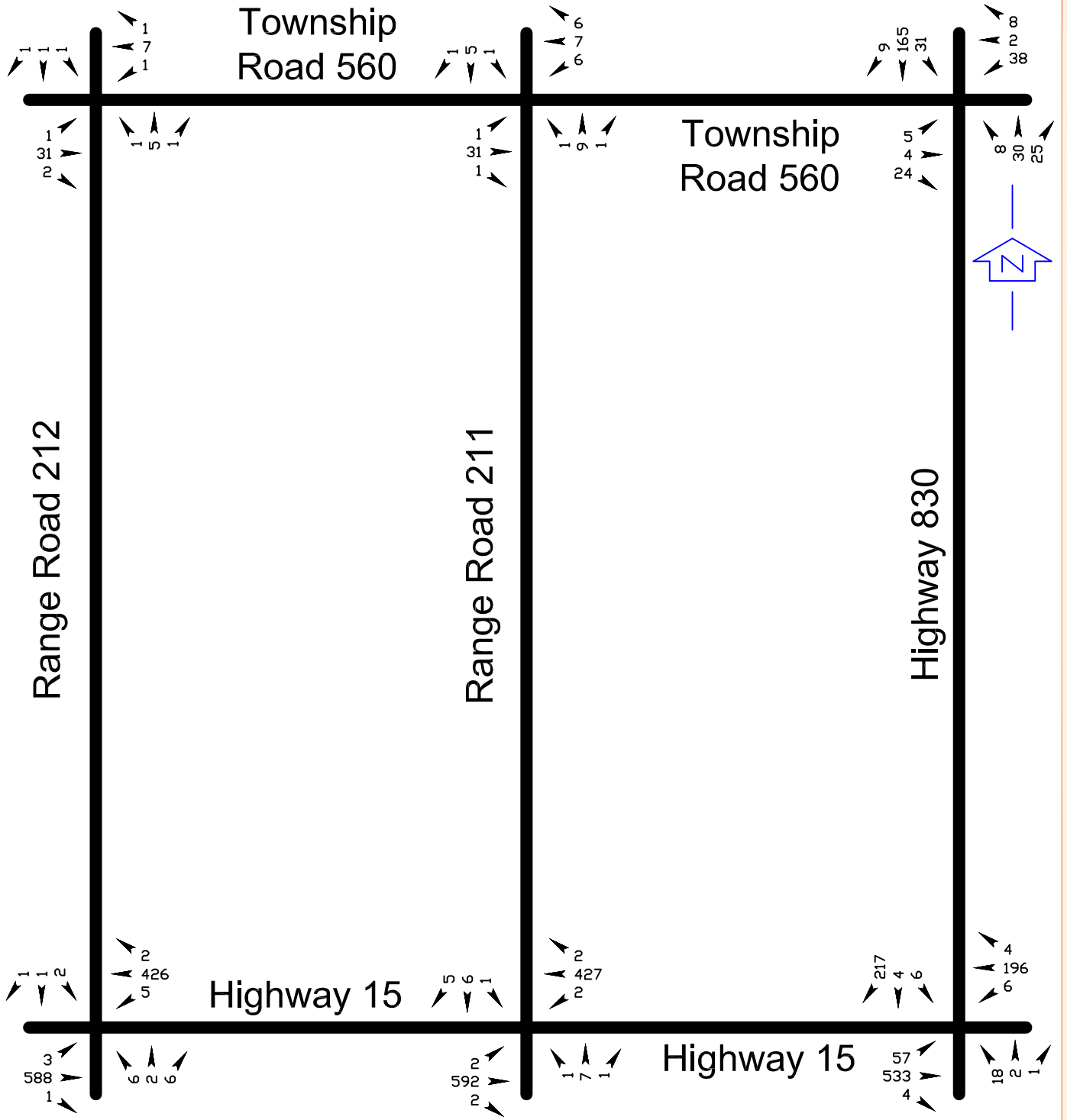
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**ESTIMATED BACKGROUND VOLUMES AM PEAK HOUR EXISTING CONDITIONS**



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Title:

**ESTIMATED BACKGROUND  
VOLUMES  
PM PEAK HOUR  
EXISTING CONDITIONS**



Approved:  
DC

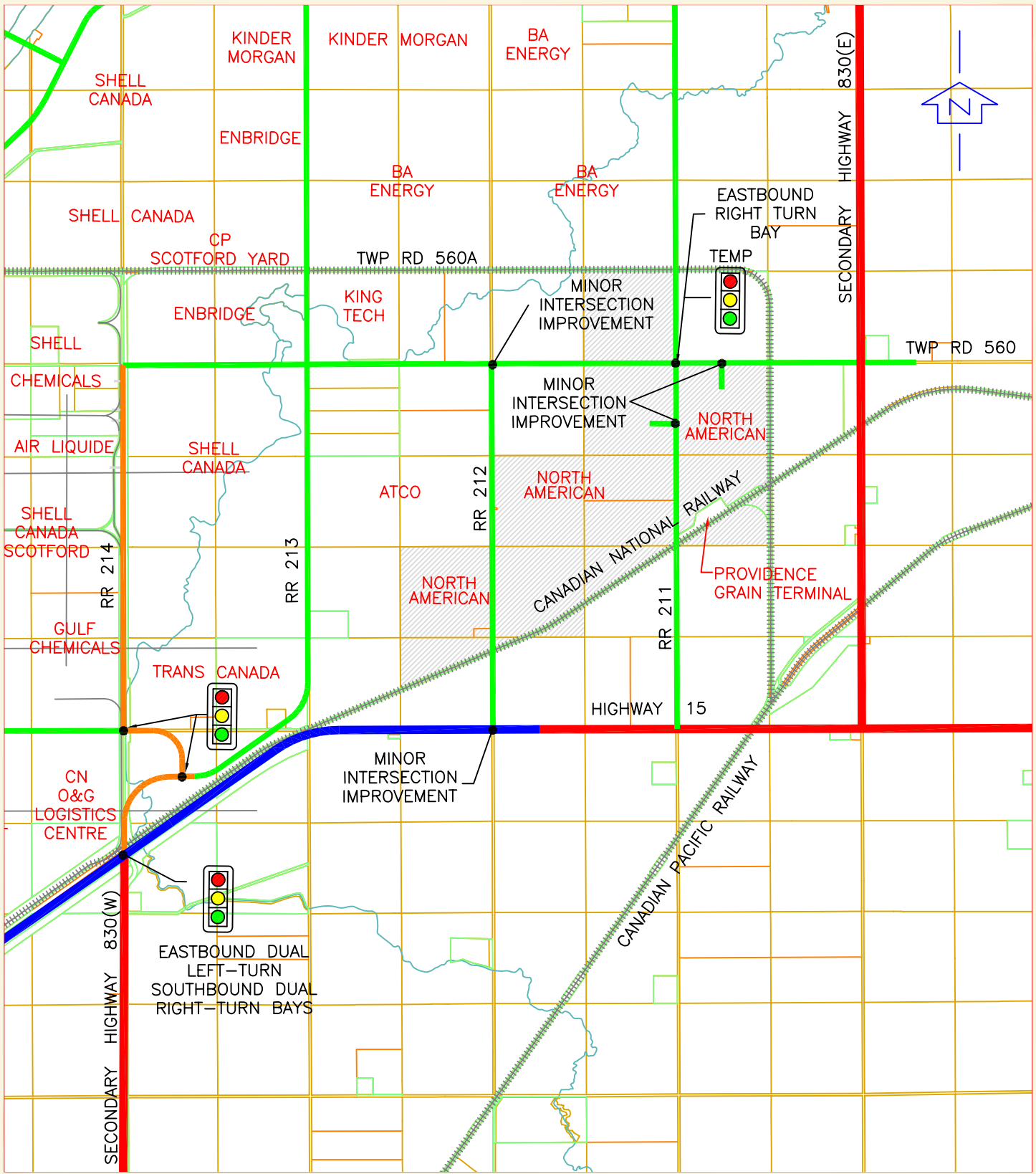
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Fig. No.:  
**15A-4**



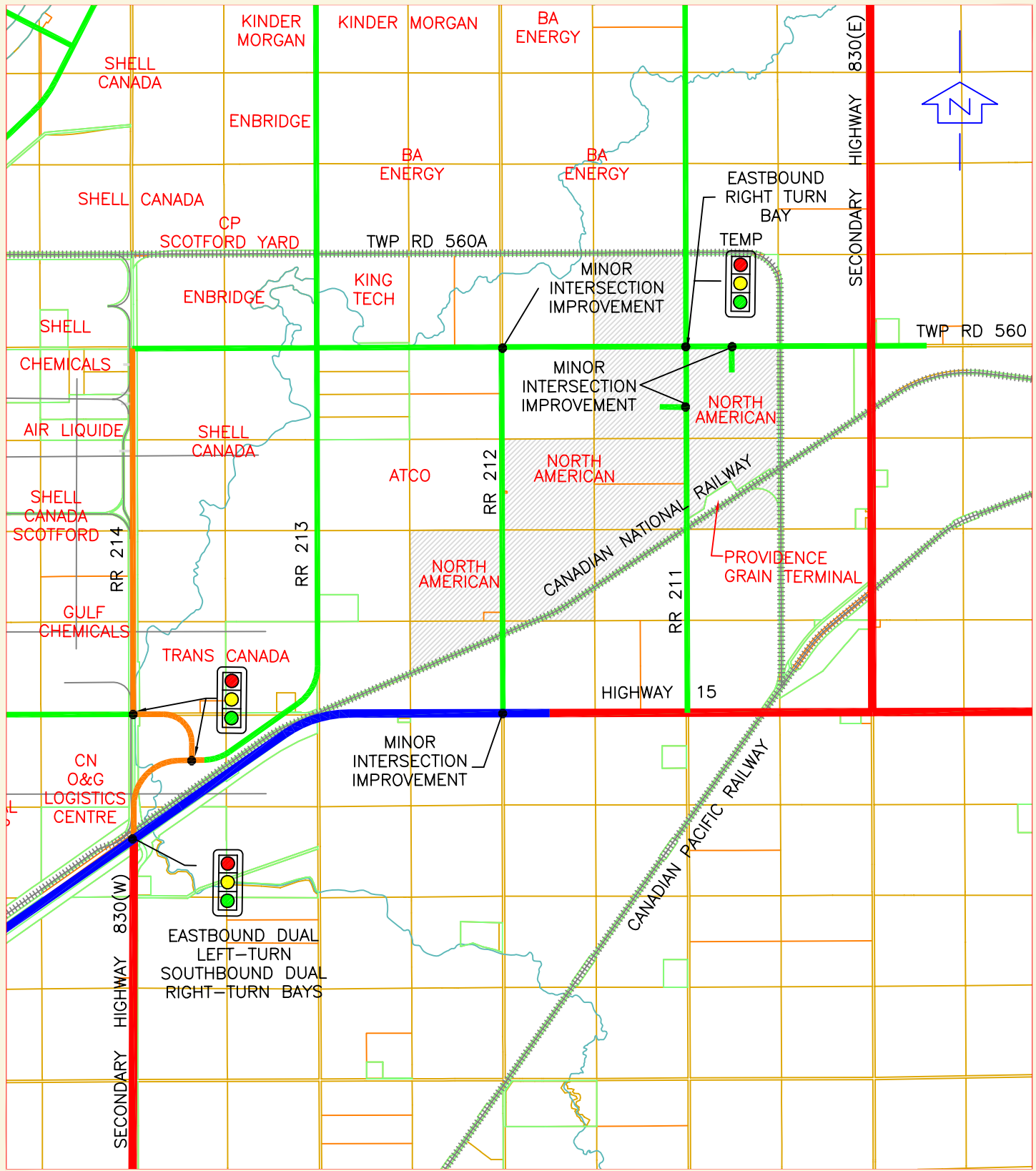
LEGEND	
	Signals (New / Temporary)
	Highway (Four Lane)
	Highway (Two Lane)
	Class 1A Road (50 m to 60 m ROW)
	Class 1B Road (40 m and 50 m ROW)

Title:

**ROADWAY NETWORK  
PROJECT RELATED  
CHANGES**

**NORTH AMERICAN  
OIL SANDS CORPORATION**

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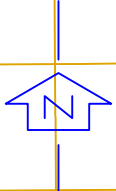
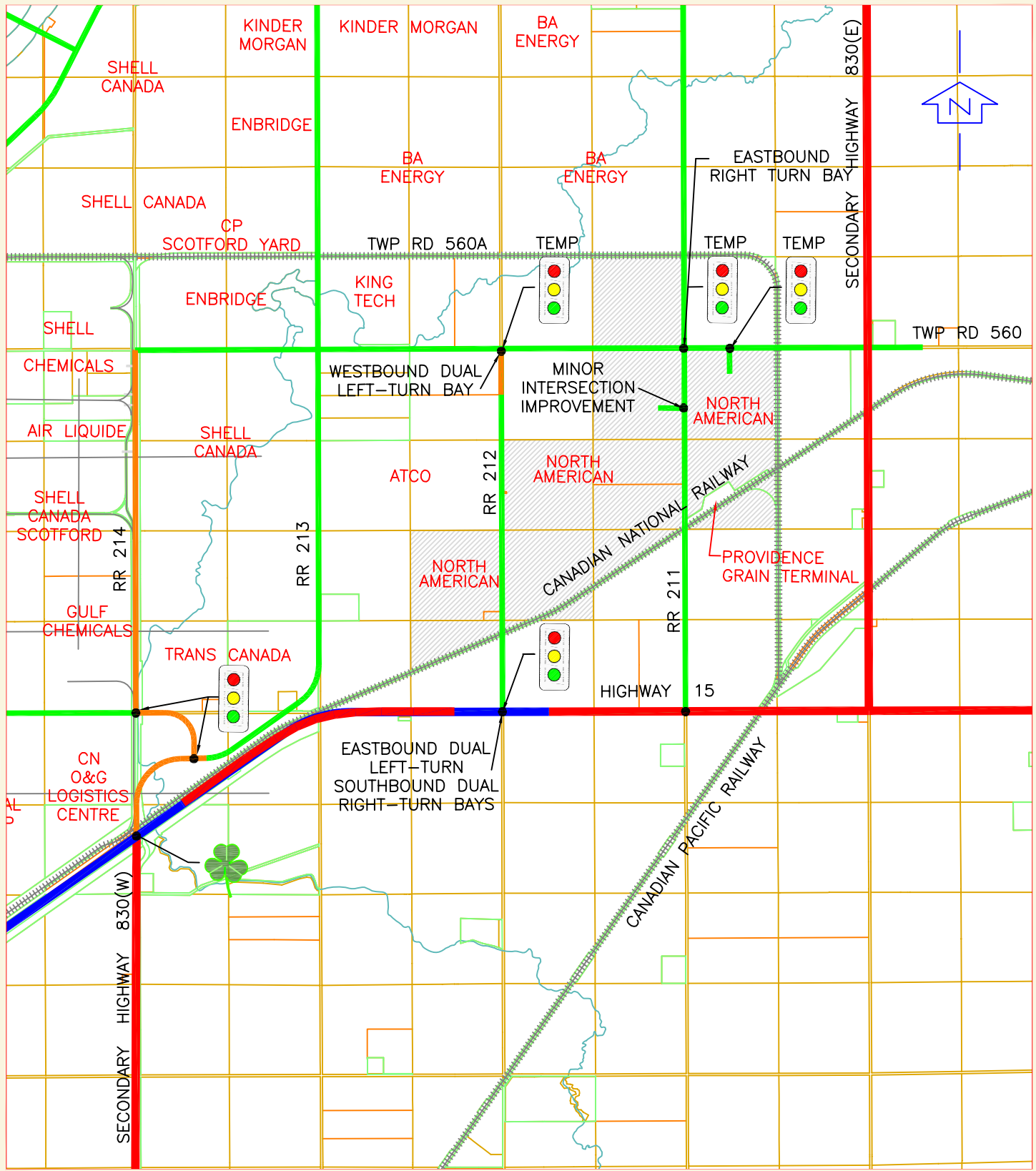
LEGEND	
	Signals (New / Temporary)
	Highway (Four Lane)
	Highway (Two Lane)
	Class 1A Road (50 m to 60 m ROW)
	Class 1B Road (40 m and 50 m ROW)

Title:

**Roadway Network 2012  
Cumulative Effects**

**NORTH AMERICAN  
OIL SANDS CORPORATION**

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Fig. No.: <b>15A-6</b>	



LEGEND	
	Signals (New / Temporary)
	Highway (Four Lane)
	Highway (Two Lane)
	Class 1A Road (50 m to 60 m ROW)
	Class 1B Road (40 m and 50 m ROW)

Title:

**Roadway Network 2017  
Cumulative Effects**

**NORTH AMERICAN  
OIL SANDS CORPORATION**

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