Application for Approval of the
Carmon Creek Project

Volume IID:

- **Socio-Economic Impact Assessment**
- **Historical Resources Impact Assessment**
- **Traditional Ecological Knowledge and Land Use**
- **Land and Resource Use**

Submitted by: Shell Canada Limited
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Executive Summary

Shell Canada Limited (Shell) is applying to the Alberta Energy and Utilities Board (EUB) and Alberta Environment (AENV) for approval to construct, operate, and reclaim a proposed oil sands development, known as the Peace River Oil Sands Carmon Creek Project (the Project). The proposed development is an expansion of the previously approved Peace River enhanced recovery in situ bitumen production plant (the Peace River Complex). The Project is located about 40 km northeast of the Town of Peace River, Alberta within Townships 84–86, Ranges 16–19, W5M, in Northern Sunrise County. Shell's Peace River Oil Sands Leases are estimated to contain about 1.3 billion m^3 (8 billion bbl) of bitumen. This resource is capable of supporting 16,000 m^3/d (100,000 bbl/d) of peak production with a project life of about 40 years. The bituminous resources are contained within the Bluesky Formation, in a reservoir about 600 m deep, and are recoverable using both primary and thermal recovery methods.

The development of the Project will be phased, and is planned to consist of both primary (Primary Development) and thermal (Thermal Development) recovery. Primary Development is proposed in areas throughout the PDA where it is commercially feasible. Thermal Development, using horizontal cyclic steam (HCS), is proposed to occur in two major phases of 8,000 m^3/d (50,000 bbl/d) each, initially in those areas that are not producible with primary methods, and as a follow-up method in those areas where primary production has been completed.

The environmental impact assessment (EIA) will assist regulators and the public in understanding and evaluating the potential effects and benefits of Thermal Development during construction, operation, decommissioning, abandonment and reclamation. The EIA identified and assessed peak disturbance, residual and cumulative impacts associated with Thermal Development. The EIA evaluated potential impacts to physical, biophysical and historical resources, in addition to potential socio-economic impacts. The EIA also identified mitigative measures and adaptive management is planned to reduce or eliminate potential adverse effects.

For each individual impact assessment, a qualitative, final evaluation rating was used where specific guidelines did not exist. This rating was a combination of quantitative analysis and professional judgment that takes into account the various descriptors for each attribute (direction, magnitude, geographic extent, duration, confidence and reversibility) and the potential effects of the specific impact. This rating was applied to residual impacts and cumulative effects. The following table lists the ratings applied and level of action required for each.

Rating	Level of Action
Class 1	The predicted trend in an indicator under projected land use development could threaten the long-term sustainability of the quantity or quality of the indicator in the local and regional study areas. An action plan, developed jointly by regional stakeholders, could be developed to monitor the affected indicator, identify and implement further mitigation measures to reduce any impact, and promote recovery of the indicator, where appropriate. This class of impact might also be applicable to an exceedance of a regulatory guideline, or where the impact is expected to have long-term effects.
Class 2	The predicted trend in an indicator under projected land use development will likely result in a decline in the quantity or quality of the indicator. The decline could be to lower-than-baseline but stable levels in the local and regional study areas after closure and into the foreseeable future. In addition to responsible industrial operational practices, monitoring and recovery initiatives could be required if additional land use activities occur in the study area before closure of the projected land use development. This class of impact might also be applicable to an exceedance of a regulatory guideline, or where the impact is expected to have mid-term effects, but where recovery will take place shortly after closure of the projected land use development.

Rating	Level of Action
Class 3	The predicted trend in an indicator under projected land use development could result in a slight decline in the quantity or quality of the indicator in the local and regional study areas during the life of the projected land use development, but resource levels should recover to baseline after closure. In some cases, a short-term, low to moderate magnitude impact could occur, but recovery will take place within five years. No new resource management initiatives are necessary. Responsible industrial operational practices should continue. This class of impact could also be applicable where regulatory guidelines are not exceeded, but where a relative change in magnitude of an indicator occurs.
Class 4	The projected land use development results in no change and no contribution toward affecting the quantity or quality of the indicator in the local and regional study areas during the life of the projected land use development. Responsible industrial operational practices should continue. Therefore, no cumulative effects result from Thermal Development.

Volume IID – SOCIO-ECONOMIC, CULTURAL RESOURCES, AND LAND USE

Socio-Economics

The Socio-Economic Impact Assessment analyzed the potential effects of the Project on economic activities in Alberta as a whole and in the regional study area specifically. The regional study area includes the communities most likely to supply the goods and services required for Project within an approximate 50–km radius. The economic effects were then used to identify potential effects on social services and infrastructure in the regional study area. The study considers the socio-economic impacts over the first 20 years of the Project.

For the purpose of this assessment, Phase 2 thermal production is assumed to start in 2017.

The Project will have a positive effect on economic activity during both the construction and operations phases because money will be spent in both the provincial and regional study area economies. The economic benefits will be generated through a variety of processes, including purchases of goods (materials) and services (labour) as well as through taxes and royalties paid once the Project is operating.

Employment opportunities will be created during both construction and operations. Based on total spending, an estimated 8,510 person-years of employment will be required for constructing the CPFs (using 2001 Alberta economic multipliers). About 4,490 person-years will be required for Phase 1 and 4,020 person-years for Phase 2. In total, construction of the Project will create about 22,425 person-years of employment between 2008 and 2029.

During Project construction, about 860 person-years of the predicted 22,425 person-years employment will be filled by residents in the regional study area. The remaining jobs created during the construction phase will be filled by workers from outside of the regional study area as the unemployment rate in the regional study area is currently less than 4%. Peak regional employment will occur in 2009 and 2016 with about 120 person-years of employment in each year.

Operational jobs will be generated with Phase 1 thermal operations in 2010, assuming a 2008 construction start. This will expand when Phase 2 thermal operations start between 2013 and 2017. The Project will generate about 250 person-years of employment in the regional study area when operating at full capacity, which is assumed to be in 2017. This includes:

- 170 direct jobs
- 80 person-years of indirect and induced employment

Jobs created during the operational phase are expected to be filled by workers who relocate to the regional study area.

As the Peace River Complex already generates 100 direct jobs and 50 indirect and induced person-years of employment, the incremental jobs created by the Project will be 70 direct jobs and 30 indirect and induced person-years of employment. The 30 person-years of indirect and induced work are expected to be accommodated through the natural expansion of the regional workforce.

The population increase as a result of the Project operations could be as high as 300 for the regional study area. This number reflects the fact that the current Peace River Complex is already generating a considerable amount of indirect and induced employment in the regional study area. Therefore, the population effects of the Project will be somewhat reduced. It also emphasizes the importance of the continued employment of the 100 workers at the Peace River Complex to the regional study area population base because many of the goods and services that will be needed for the Project are already being purchased in the regional study area for the operations of the Peace River Complex.

As a result of the economic activities, social infrastructure and services in the regional study area will have additional demands placed on them. Generally, most of the impacts will be assimilated into expected growth in the region. Therefore, they are considered Class 3. The potential exceptions include effects on health services and protection services during construction, which are classified as Class 2 impacts. The presence of construction camps within the PDA with about 1,500 to 2,000 workers during peak construction has the potential to place additional demands on social services and resources, and is a concern for stakeholders in the regional study area. Shell is committed to addressing potential negative effects that the construction activities might cause in the regional study area by implementing mitigation measures and consulting with stakeholders to determine the effectiveness of the mitigation implemented. Examples include transporting workers to site once the workforce reaches an appropriate size that warrants these services, sharing information with RCMP, local communities and county officials to help identify policing requirements and providing medical services for construction workers at the site.

In keeping with the principles of adaptive management, mitigation strategies will be continually updated throughout the life of the Project.

The Project will generate income and property taxes as well as royalty payments. Over the first 20 years of the Project, income taxes will be about $75 million:

- $50 million payable to the federal government
- $25 million payable to the provincial government

During this timeframe, royalties will amount to about $800 million and estimates of annual taxes payable to Northern Sunrise County are between $6.5 and $7 million (this will increase to about $10 million per year in 2017 when Phase 2 thermal operations are anticipated to start).

Historical Resources Impact Assessment

A historical resources impact assessment was conducted to evaluate potential impacts to historical resources within the local and regional study areas for Thermal Development. Seven new historic sites were identified within the local study area. As no facilities are currently proposed for the areas where these sites are located, no effects on historical resources from Thermal Development are expected.

Traditional Ecological Knowledge and Land Use

A traditional ecological knowledge and land use study near the Thermal Development area was conducted. To date, the leaders of the Woodland Cree First Nation have not elected to participate in this study. Shell and Woodland Cree First Nation are currently involved in discussions

regarding their involvement in a traditional ecological knowledge and land use study. Shell is committed to working with the Woodland Cree First nation on future traditional ecological knowledge and land use studies and integrating the information from those studies into the Thermal Development.

The assessment contains Métis perspectives on the specific effects and cumulative effects of Thermal Development, based on the results of the Cadotte Lake Métis Ecological Knowledge and Land Use Study and on information collected through interviews and fieldwork with Métis participants. Shell has taken the feedback received from participants into consideration in designing the Thermal Development. Feedback from participants was also considered in developing the mitigation and monitoring strategies to be implemented.

Many Cadotte Lake Métis participants continue to practice traditional lifestyles, and have rich ecological knowledge. However, participants had limited concerns within the local study area, which resulted in few issues specific to Thermal Development. Participants looked forward to the possibility of employment representing a positive impact from Thermal Development. Participants outlined a number of cumulative effects that they felt could be mitigated through the support of Métis programs focused on improving community well-being.

Land and Resource Use

This assessment evaluated the effects of Thermal Development on land and resource use within the regional study area. The land and resource uses considered include:

- linear development and access
- existing or leased, but not developed, surface mineral extraction, including aggregate resources, oil, gas and minerals
- commercial and non-commercial forestry
- agriculture, including dry land crops
- livestock and grazing operations
- commercial and recreational hunting
- trapping
- fishing
- parks
- protected areas
- environmentally significant areas, including natural areas and heritage rivers
- recreational use
- visual aesthetics

The effects of Thermal Development, including cumulative effects, are expected to be low to moderate (Class 3) on land and resource use.

Shell will continue to consult with land and resource stakeholders throughout the life of Thermal Development.

Monitoring Summary

Monitoring programs will be developed after regulatory review of the environmental impact assessment and in consultation with the appropriate regulators for each discipline. The following summary provides information on ongoing monitoring programs and considerations for Thermal Development related monitoring programs.

Socio-Economic

Shell will continue engagement with stakeholders to determine the effectiveness of mitigation implemented. In keeping with the principles of adaptive management, mitigation strategies will be continually updated throughout the life of the Thermal Development.

Historical Resources

Shell will continue to avoid known historical sites throughout the construction, operations and decommissioning, and reclamation phases of the Thermal Development. If, any historical resources are encountered, during construction or operations, Shell will advise Alberta Community Development.

As all disturbances will occur at depth, there is no opportunity for monitoring or other mitigation measures relative to any palaeontological resources that might be affected.

Relative to historical resources within the Regional Study Area, the effect of the Thermal Development is positive in that seven new historic sites, including one outside of the Local Study Area boundaries, were recorded and added to the provincial database. Scientific data concerning these historical resources were retrieved during the Historical Resource Impact Assessment.

Traditional Ecological Knowledge and Land Use

Monitoring is discussed in the Historical Resources (Volume IID, Section 3), Wildlife and Vegetation (Volume IIC, Sections 3 & 4), Aquatic Ecology and Surface Water Quality (Volume IIB, Sections 4 & 5), and Air Quality (Volume IIA, Section 2) sections of this EIA

Land and Resource Use

Shell will continue engagement with stakeholders to determine the effectiveness of mitigation implemented. In keeping with the principles of adaptive management, mitigation strategies will be continually updated throughout the life of the Thermal Development.

Summary of Thermal Development Effects

Table 1.1-1 provides a summary of the impacts of the Thermal Development at application on each of the indicators assessed for each environmental impact assessment component. Impacts range from Class 4 to Class 2. There are no Class 1 impacts predicted from the Thermal Development.

Table 1.1-1: Volume IID Final Impact Summary Table for the Application Scenario of the Thermal Development

	Geographic Extent	Magnitude	Direction[1]	Duration	Confidence	Rating
Socio-Economic Impact Assessment						
Economic Impacts - construction						
Regional employment	Regional	Negligible	Positive	Short term	High	Class 4
Provincial employment	Provincial	Negligible	Positive	Short term	High	Class 4
Economic impacts - operations						
Regional employment	Regional	Negligible	Positive	Mid term	High	Class 4
Provincial employment	Provincial	Negligible	Positive	Mid term	High	Class 4
Government revenues	Provincial	Negligible	Positive	Mid term	High	Class 4
Social impacts - construction						
Housing and accommodation	Regional	Negligible	Negative	Short term	Moderate	Class 3
Education	Regional	Negligible	Positive	Short term	High	Class 4
Health services	Regional	Low-moderate	Negative	Short term	Moderate	Class 2
Protection services	Regional	Low-moderate	Negative	Short term	Moderate	Class 2
Family and community services	Regional	Negligible	Negative	Short term	Moderate	Class 3
Transportation	Regional	Negligible	Negative	Short term	Moderate	Class 3
Utilities	Regional	Negligible	Negative	Short term	Moderate	Class 4
Social Impacts - operation						
Housing and accommodation	Regional	Negligible	Negative	Mid term	Moderate	Class 3
Education	Regional	Negligible	Negative	Mid term	High	Class 3
Health services	Regional	Negligible	Negative	Mid term	Moderate	Class 3
Protection services	Regional	Negligible	Negative	Mid term	Moderate	Class 3
Family and community services	Regional	Negligible	Negative	Mid term	Moderate	Class 3

Notes:

[1] Measures of impact direction (positive, negative, neutral) are based on population effect.

[2] Seven sites were recorded in the LSA; however, none are currently in a position to be impacted.

n/a – not applicable.

Table 1.1-1: Volume IID Final Impact Summary Table for the Application Scenario of the Thermal Development (Cont'd)

	Geographic Extent	Magnitude	Direction[1]	Duration	Confidence	Rating
Transportation	Regional	Negligible	Negative	Mid term	Moderate	Class 3
Utilities	Regional	Low	Negative	Mid term	Moderate	Class 3
Historical Resources Impact Assessment						
No impacts predicted[2]	Neutral	n/a	n/a	n/a	High	Class 4
Land and Resource Use						
Linear access						
Increased access	Regional	Low to moderate	Negative	Mid term	High	Class 3
Surface dispositions						
Limit of activity	n/a	n/a	Neutral	n/a	High	Class 4
Forestry						
Reduction of productive forest land	Local	Low to moderate	Negative	Mid term	Moderate	Class 3
Agriculture						
Reduction of productive land base	Local	Negligible	Negative	Mid term	High	Class 3
Hunting						
Decreased success versus effort	Local	Negligible	Negative	Mid term	High	Class 3
Trapping						
Reduction of productive land base; decreased success versus effort	Local	Low to moderate	Negative	Long term	High	Class 3

Notes:

[1] Measures of impact direction (positive, negative, neutral) are based on population effect.

[2] Seven sites were recorded in the LSA; however, none are currently in a position to be impacted.

n/a – not applicable.

Acronyms, Abbreviations, and Defined Terms

°C	degrees Celsius
µg	microgram
µm	micrometre
µS	microSiemen
7Q10	one-in-ten year, 7-day low flow
AAAQO	Alberta Ambient Air Quality Objectives
AAC	annual allowable cut
AADAC	Alberta Alcohol and Drug Abuse Commission
AADT	annual average daily traffic
AAQC	Ambient Air Quality Criterion
AAQO	Ambient Air Quality Objective
ABMP	Alberta Biodiversity Monitoring Program
ACD	Alberta Community Development
ACGIH	American Conference of Governmental Hygienists Inc.
AENV	Alberta Environment
AENVIARC	Alberta Environment International Association for Research on Cancer
AEP	Alberta Environmental Protection
Ag	silver
AGCC	Alberta Ground Cover Classification
AGRASID	Agricultural Region of Alberta Soil Inventory Database
Ah	topsoil
AHRD	Alberta Human Resources and Development
AHW	Alberta Health and Wellness
AIC	Akaike's Information Criterion
AIHA	American Industrial Hygiene Association
AIT	Alberta Infrastructure and Transportation
Al	aluminum
ALCRC	Alberta Land Conservation and Reclamation Council
ALG	Algar soils
ANC	acid neutralizing capacity
ANHIC	Alberta Natural Heritage Information Centre
ANPC	Alberta Native Plant Council
AO	aesthetic objective
ARC	Alberta Research Council
As	arsenic
ASIC	Alberta Soil Information Centre
ASL	ambient sound level
ASRD	Alberta Sustainable Resource Development
ASWQ	Alberta surface water quality
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	all terrain vehicle
AVI	Alberta Vegetation Inventory
AWI	Alberta Wetland Inventory
B	boron
Ba	barium
bbl	barrel
bbl/d	barrel per day
BC	British Columbia

BC MWLAP	British Columbia Ministry of Water, Land and Air Protection
BCF	bioconcentration factor
BCM	bank cubic meters
Be	beryllium
BMC	benchmark concentration
BMCL	benchmark concentration level
BMDC	benchmark derived concentration
BP	before present
BSL	basic sound level
BTEX	benzene, toluene, ethylbenzene, and xylene
BTF	biotransfer factor
BTU	British thermal unit (imperial unit of power)
BW	body weight
C	clay
C&R	conservation and reclamation
Ca	calcium
CAC	criteria air contaminants
$CaCO_3$	calcium carbonate
CAESA	Canada – Alberta Environmentally Sustainable Agriculture
CARB	California Air Resources Board
CASA	Clean Air Strategic Alliance
CCME	Canadian Council of Ministers of the Environment
CCS	CCS Energy Trust Ltd.
Cd	cadmium
CDWQ	Canadian Drinking Water Quality
CEA	cumulative effects assessment
CEC	cation exchange capacity
CEMA	Canadian Environmental Management Association
CEPA	Canadian Environmental Protection Agency
CEQ	Canadian Environmental Quality
CH_4	methane
CICS	Canadian Institute for Climate Studies
Cl	chlorine
CL	clay loam
CL	critical load
cm	centimetre
CMHC	Canada Mortgage and Housing Corporation
CNIT	core need income threshold
CNS	central nervous system
CNT	consultative notation
CO	carbon monoxide
Co	cobalt
CO_2	carbon dioxide
CO_3	carbonate
COHb	carboxyhemoglobin
COPC	chemicals of potential concern
COPD	chronic obstructive pulmonary disease
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPF	central processing facility
Cr	chromium
CR	concentration ratio

CSA	core security area
CSL	comprehensive sound level
CTL	coniferous timber licence
Cu	copper
CWD	course woody debris
CWS	Canada-wide Standards
d	day
dam^3	cubic dekameter
DAR	Decommissioned, Abandoned and Reclaimed
dBA	A-weighted decibel
DBH	diameter at breast height
dBZ	un-weighted or linear decibel
DEQ	Department of Environmental Quality
Devon	Devon Canada Corporation
DFO	Fisheries and Oceans Canada
DMI	Daishowa-Marubeni International Ltd.
DO	dissolved oxygen
DRS	disposition reserve
DTA	deciduous timber allocation
DW	dry weight
DWD	drilling waste disposal
EC	electrical conductivity
EDI	estimated daily intake
EEM	environmental effects monitoring
EEMBMCL	environmental effects monitoring benchmark concentration level
EIA	environmental impact assessment
ELC	ecological land classification
EMS	environmental management system
EMT	emergency medical technician
ENSO	El Niño Southern Oscillation
EPT	ephemoptera, plecoptera, and trichoptera
ER	exposure ratio
ERA	ecological risk assessment
ERMS	emergency response management system
ERPG	emergency response planning guideline
ESA	environmentally significant area
ESH	Esher soils
ESL	effects screening level
EUB	Alberta Energy and Utilities Board
EZE	easement
F	fluorine
FAP	Fort Air Partnership
Fe	iron
FMA	forest management agreement
FMU	forestry management units
FPAC	Federal-Provincial Advisory Committees
FS	fine sand
FSL	fine sandy loam
g	gram
GHG	greenhouse gas
GIS	geographic information system

GLM	generalized linear model
GMP	general municipal plan
GPS	global positioning system
GRR	grazing licence
H_2S	hydrogen sulphide
ha	hectare
HC	heavy clay
HCDWG	Health Canada Drinking Water Guideline
HCO_3^-	bicarbonate
HCS	horizontal cyclic steam
HDPE	high-density polyethylene
HEC	human equivalent concentration
HECLSA	local study area human equivalent concentration
HEI	Health Effects Institute
HEP	habitat evaluation procedure
HFCRD	Holy Family Catholic Regional Division
Hg	mercury
HHRA	Human Health Risk Assessment
HLY	Hartley soils
HNO_3	nitric acid
HQ	hazard quotient
HRIA	Historical Resource Impact Assessment
HRV	historical resources value
HSDB	hazardous substances data bank
HSI	habitat suitability index
HU	habitat unit
Husky	Husky Energy Inc.
HV	hospital visit
I	iodine
i/d	immature or damaged specimen
IARC	International Association for Research on Cancer
ID	identification
ILCR	incremental lifetime cancer risk
Imperial	Imperial Oil Limited
IPCC	Intergovernmental Panel on Climate Change
IPM	individual PAH method
IRf	ingestion rate food
IRs	ingestion rate soil
ISP	industrial sample plot
K	Kelvin
K	local hydraulic conductivity
K	potassium
keq H^+/(ha·y)	kiloequivalents per hectare per year
k_H	horizontal hydraulic conductivity
KIR	key indicator resource
KIRbw	body weight key indicator resource
km	kilometre
km^2	square kilometre
Komex	Komex International Ltd.
K_{ow}	octanol water partition coefficient
kPa	kilopascal

kt/y	kilotonne per year
KTH	Kathleen soils
k_V	vertical hydraulic conductivity
L	loam
LAI	leaf area index
LCC	land capability class
L_{eq}	energy equivalent sound level
Li	lithium
LIS	low impact seismic lines
LOAEL	lowest-observed-adverse-effect level
LOC	licence of occupation
LRU	land and resource use
LS	loamy sand
LSA	Local Study Area
LSAS	land status automated system
LST	local standard time
m	metre
m^3	cubic metre
MA DEP	Massachusetts Department of Environmental Protection
MAC	maximum acceptable concentration
masl	metres above sea level
mbgs	metres below ground surface
MCV	mean cell volume
MD	Municipal District
MF	metabolism factor
Mg	magnesium
mg	milligram
Mg^{2+}	magnesium cation
MIL	Mildred Lake soils
mL	millilitre
MLD	McLelland soils
MLL	miscellaneous lease
MLP	miscellaneous permit
mm	millimetre
mm Hg	millimetres of mercury
MMBTU	million British thermal units
Mn	manganese
MNA	Métis Nation of Alberta
Mo	molybdenum
MP	McElroy-Pooler coefficient
MPa	megapascal
MPOI	maximum point of impingement
MRL	minimal risk level
MRN	Mariana bog soils
mS/cm	milliSiemens per centimetre
MSL	mineral surface lease
MUS	Muskeg bog soils
N	nitrogen
n/a	not applicable
N/A	not available
N/D	no default

N/R	not reported
Na	sodium
NAAQO	National Ambient Air Quality Objectives
NAIT	Northern Alberta Institute of Technology
NB3	Northern Boreal Fish Management Zone 3
ND	no data
ND	not detectable
NDHS	Nampa and District Historical Society
NH^{4+}	ammonium ion
Ni	nickel
NIA	Noise Impact Assessment
NIOSH	National Institute for Occupational Safety and Health
NO	nitric oxide
NO_2	nitrogen dioxide
NO_3^-	nitrate ion
NOAEL	no observed adverse effects level
NOAELHEC	no observed adverse effects level human equivalent
NO_x	nitrogen oxides
NPRI	National Pollutant Release Inventory
NRBSERA	Northern River Basin Study Ecological Risk Assessment
NRCB	Natural Resources Conservation Board (Alberta)
NS	not specified
NSERC	Natural Sciences and Engineering Research Council (Canada)
NTP	National Toxicology Program
NTU	nephelometric turbidity unit
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment (California)
OMOE	Ontario Ministry of the Environment
OSRVC	Oil Sands Reclamation Vegetation Committee
OSWWG	Oil Sands Wetlands Working Group
P	phosphorus
PAH	polycyclic aromatic hydrocarbon
PAI	potential acid input
PASZA	Peace Air Shed Zone Association
Pb	lead
PBPK	physiologically based pharmaco kinetic
PCTB	Peace Country Tender Beef Cooperative
PDA	Principal Development Area
PDO	pacific decadal oscillation
PEL	permissible exposure limits
PG	Pasquill-Gifford coefficient
pH	potency of hydrogen
PHC	primary hepatocellular carcinoma
PHPA	partially hydrogenated polyacrylamided
PIL	project inclusion list
PLA	pipeline agreement
PM	particulate matter
PM_{10}	particulate matter with mean aerodynamical diameter less than 10 µm
$PM_{2.5}$	particulate matter with mean aerodynamical diameter less than 2.5 µm
PMT	particulate matter (total)
PNT	protective notation

PO_4^{3-}	Phosphate ion
ppb	parts per billion
ppm	parts per million
PREMS	Peace Regional Emergency Medical Services
PRSD	Peace River School Division No. 10
PSL	permissible sound level
PV	physician visit
PVC	polyvinyl chloride
RAF	relative absorption factor
RAIS	risk assessment information system
RCMP	Royal Canadian Mounted Police
REC	recreation lease
REL	reference exposure level
RELAD	regional lagrangian acid deposition
RfC	reference concentration
RfD	reference dose
RFMA	Registered Fur Management Area
RGDR	regional gas dose ratio
RIVM	Netherlands National Institute for Public Health and the Environment
ROE	right-of-entry agreement
ROW	right-of-way
RRD	registered roadway
RSA	Regional Study Area
RsC	risk-specific concentration
RsD	risk-specific dose
RTI	Research Triangle Institute
RUT	Ruth Lake soils
S	sand
SAGD	steam-assisted gravity drainage
SARA	Species at Risk Act
Sb	antimony
scf	standard cubic feet
SCL	sandy clay loam
sd	standard deviation
Se	selenium
SE	standard error
SEIA	Socio-Economic Impact Assessment
SEWG	Sustainable Ecosystem Working Group
Shell	Shell Canada Limited
Si	silicon
SI	suitability index
SiC	silty clay
SiCL	silty clay loam
SiL	silty loam
SIL	soil intensity level
SL	sandy loam
SLWRA	screening-level wildlife risk assessment
Sn	tin
SO_2	sulphur dioxide
SO_4^{2-}	sulphate ion
SO_x	sulphur oxides

SPL	sound pressure level
spp.	species
SQG	soil quality guideline
SR	shrubby riparian
Sr	strontium
STEL	short-term exposure limit
$t_{1/2}$	half-life
TC	tolerable concentration
TCEQ	Texas Commission on Environmental Quality
TDI	tolerable daily intake
TDS	total dissolved solids
TEEL	temporary emergency exposure limit
TEF	toxic equivalency factor
TEKLU	Traditional Ecological Knowledge and Land Use
Th	thorium
THC	total hydrocarbons
Ti	titanium
TKN	total Kjeldahl nitrogen
Tl	thallium
TLU	Traditional Land Use
TLV-TWA	threshold limit value – time weighted average
TOR	Terms of Reference
TP	total phosphorus
TPHCWG	Total Petroleum Hydrocarbon Criteria Working Group
TPR	timber productivity rating
TRD	Treatment Recovery Disposal
TRV	toxicological reference values
TSS	total suspended solids
TSSMPOI	total suspended solids maximum point of impingement
TWA	time-weighted average
U	uranium
USDOE SCAPA	United States Department of Energy, Subcommittee on Consequence Assessment and Protective Actions
USEPA	United States Environmental Protection Agency
USEPA OSW	United States Environmental Protection Agency Office of Solid Waste
USNRC	United States National Research Council
UTM	Universal Transverse Mercator
V	vanadium
VCE	vegetation control easement
VFSL	very fine sandy loam
VOC	volatile organic compound
VP	visual plume
W	watt
WBB	Weber soils
WC	watercourse
WGN	Wagon soils
WHO	World Health Organization
WMA	Wildlife Management Area
WMM	whole mixture model
WMU	Wildlife Management Unit
WRS	Western Resource Solutions

WSC	Water Survey of Canada
ww	wet weight
y	year
Zn	zinc
ZOI	zone of influence
Zr	zirconium

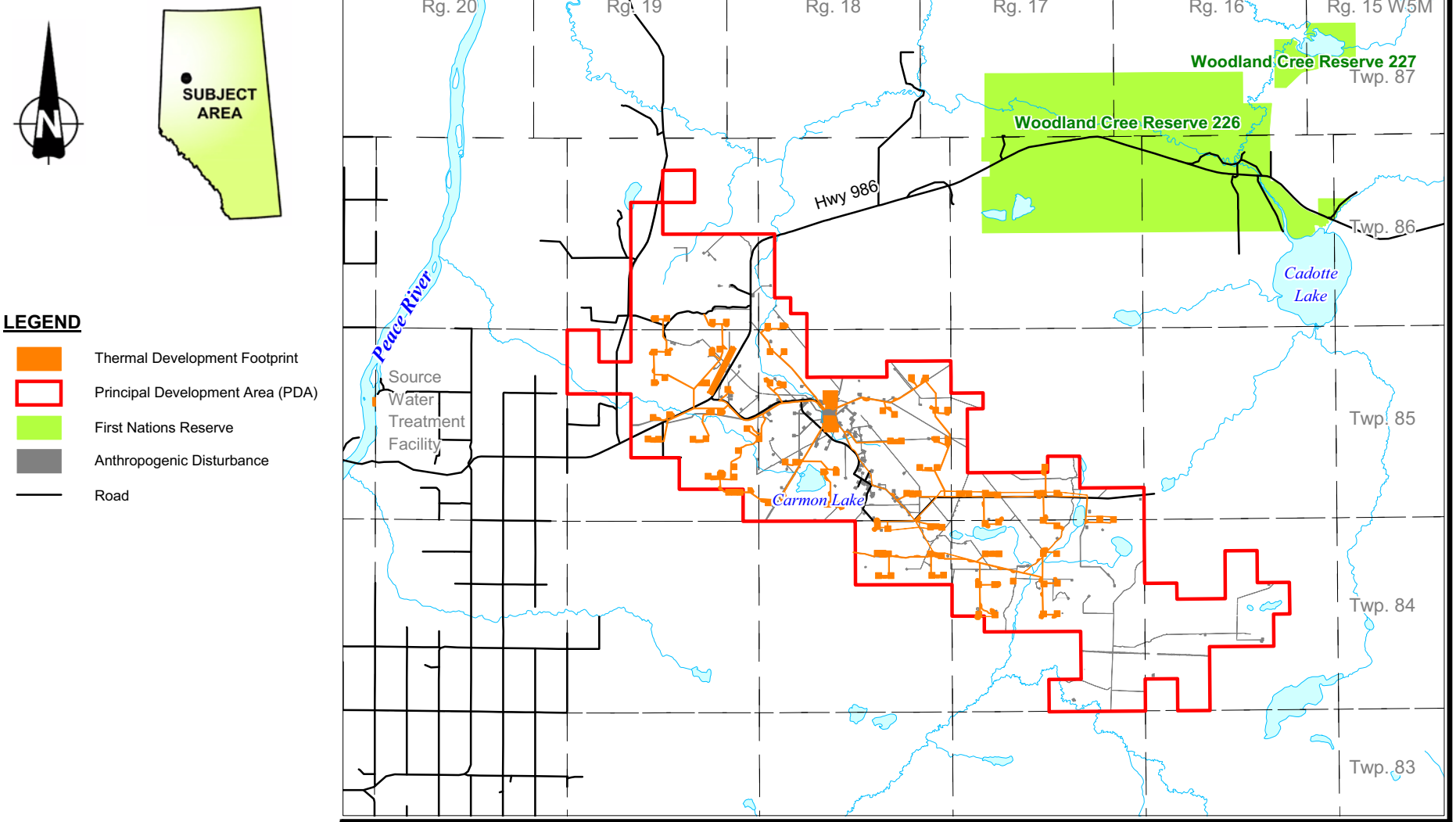
1. Introduction

Shell Canada Limited (Shell) is applying to the Alberta Energy and Utilities Board (EUB) and Alberta Environment (AENV) for approval to construct, operate, and reclaim a proposed oil sands development, known as the Peace River Oil Sands Carmon Creek Project (the Project). The proposed Project is an expansion of the previously approved Peace River enhanced recovery in situ heavy oil processing plant (the Peace River Complex). The Project is located about 40 km northeast of the Town of Peace River, Alberta within Townships 84–86, Ranges 16–19, W5M, in Northern Sunrise County (see Figure 1.1-1). Shell's Peace River Oil Sands Resource Leases are estimated to contain about 1.3 billion m^3 (8 billion bbl) of bitumen. This resource is capable of supporting 16,000 m^3/d (100,000 bbl/d) of peak production with project life of about 40 years. The bituminous resources are contained within the Bluesky Formation, in a reservoir about 600 m deep, and are recoverable using both primary (Primary Development) and thermal recovery (Thermal Development) techniques.

The Peace River Complex is located within Township 85, Range 18, W5M (see Figure 1.1-1). This facility is licensed to produce 2,000 m^3/d (12,500 bbl/d) of bitumen.

The purpose of this environmental impact assessment (EIA) is to assess and report the potential environmental and socio-economic impacts of the Thermal Development. The EIA portion of this application has been organized into four sub-volumes with a common introduction:

- Volume IIA –Air , Noise, and Human Health:
  - Air Quality
  - Climate Change
  - Noise
  - Human Health Risk Assessment
- Volume IIB –Aquatic Resources:
  - Hydrogeology
  - Hydrology
  - Surface Water Quality
  - Aquatic Ecology
- Volume IIC – Terrestrial Resources:
  - Soils and Terrain
  - Vegetation
  - Wildlife
  - Biodiversity
  - Conceptual Conservation and Reclamation Plan
- Volume IID – Socio-Economic, Cultural Resources, and Land Use:
  - Socio-Economic Impact Assessment
  - Historical Resources Impact Assessment
  - Traditional Ecological Knowledge and Land Use
  - Land and Resource Use



SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Regional Setting

DRAWN BY:	EDITED BY:	DATE
HW	SC	2 Nov 2006

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This EIA forms part of the application for the Thermal Development submitted by Shell and has been prepared according to the following requirements:

- Alberta Environment (AENV): *Environmental Protection and Enhancement Act* (EPEA)
- AENV: Final Terms of Reference (TOR: AENV 2006)
- Energy and Utilities Board (EUB) Directive 023: Guidelines Respecting an Application for a Commercial Crude Bitumen Recovery and Upgrading Project, dated September 1991

The concordance table that correlates the various clauses of the TOR to the application and EIA can be found in Volume I.

1.1 Project Description

The Peace River Complex is licensed to produce 2,000 m^3/d (12,500 bbl/d) of bitumen. Shell intends to increase this to a peak production of about 16,000 m^3/d (100,000 bbl/d) of bitumen through a phased expansion including both primary and thermal recovery techniques. Primary Development is proposed in areas of the Principal Development Area (PDA) where it is commercially feasible. The PDA is the part of the Shell lease within which project activities are planned for withdrawal of the bituminous resource (see Figure 1.1-1).

The development of the Project will be phased, and is planned to consist of both primary (Primary Development) and thermal (Thermal Development) recovery. Primary Development is proposed in areas throughout the PDA where it is commercially feasible. Thermal Development, using horizontal cyclic steam (HCS), is proposed to occur in two major phases of 8,000 m^3/d (50,000 bbl/d) each, initially in those areas that are not producible with primary methods, and as a follow-up method in those areas where primary production has been completed.

Phase 1 of the thermal development is expected to require about 160–300 wells to be drilled from 8–15 production pads at start-up. The exact number of pads and locations has yet to be determined. The construction of the initial pads will be completed in conjunction with the Phase 1 thermal central processing facility (CPF). Phase 2 of the Thermal Development will be similar to Phase 1 in size, facilities, and number of initial wells and production pads. After the initial thermal wellpads have been developed, future wellpads will be developed progressively over the life of the Thermal Development to make up for declining production of these earlier pads. A total of 80 wellpads might be required over the life of the Thermal Development. For the purpose of conceptual engineering and the EIA, 92 wellpads have been identified and assessed within the PDA. One cogeneration unit will be provided for each of the two Thermal Development phases. Phase 2 thermal production is expected to start about three to seven years after the initial production from Phase 1 begins. A full description of the project design and facilities is provided in Volume I.

Both Phase 1 and Phase 2 CPFs are planned to be located near the existing Peace River plant site. Processing of existing production will continue through the existing plant site while the Phase 1 CPF is being constructed. Portions of the existing Peace River Complex will be integrated into the Phase 1 CPF. Other portions of the existing Peace River Complex will be decommissioned and abandoned.

A network of pipelines (above- and below-ground), electrical distribution lines, and roads will be constructed to interconnect the wells and wellpads to the CPFs and other infrastructure. These rights-of-way have been configured to reduce:

- the number of road and above-ground pipeline crossings
- the need for large equipment to pass under electrical distribution lines

- surface disturbance

Additional infrastructure in support of the Thermal Development might include (see Volume 1):

- upgrading the existing source water treatment facility and pipeline
- upgrading the existing private airstrip
- building new access roads within the PDA
- upgrading the intersection between the existing plant road and Highway 986, if necessary
- building temporary camps for construction and drilling
- upgrading the existing product (diluted bitumen) pipeline and tankage at the Haig Lake oil product terminal
- constructing a new diluent supply pipeline and rail siding for unloading and storing diluent
- upgrading the existing natural gas supply pipeline
- upgrading the electrical power transmission lines

The development plan is designed so that production will take place sequentially over the approximate 40-year project life. A progressive wellpad layout maximizing the use of pre-disturbed sites and existing infrastructure, where practicable, has been designed to reduce surface disturbance. As new pads are developed and pre-existing pads cease production, reclamation will be executed, where practicable, on an ongoing basis over the life of the Thermal Development, subject to the approved Conceptual Conservation and Reclamation Plan.

1.2 Spatial Boundaries

1.2.1 Principal Development Area

The PDA is the portion of the Shell lease within which project activities are planned for production of the bituminous resource. The PDA is identified by a boundary (see Figure 1.1-1), and most of the surface disturbances are to be confined within the PDA.

1.2.2 Local Study Area

The Local Study Area (LSA) includes the Thermal Development facilities in the PDA, as well as an additional area where the effects of the Thermal Development impacts can reasonably be expected to occur. This area often includes the PDA and a buffer zone around it. For each component or section of the EIA, the LSA boundaries were determined according to the indicators used. Therefore, the LSA varies according to the geographic extent of the resources assessed. A description of the LSAs can be found in each discipline section. Where possible, identical LSAs have been selected by related disciplines.

1.2.3 Regional Study Area

The Regional Study Area (RSA) incorporates the LSA into a larger geographical area where potential regional effects could occur. As with the LSA, for every EIA component, the extent of the RSA was determined according to the indicators used. Where no impact (Class 4) is predicted within the LSA, no analysis of regional effects was undertaken.

1.2.3.1 Cumulative Effects Study Areas

Cumulative effects assessments (CEA) are only applicable when other announced, but yet-to-be approved, projects exist that would affect the same area. Cumulative effects were generally assessed within the regional study for the specific EIA component. Where no impact is predicted within the LSA, no analysis of cumulative effects was undertaken (see Section 1.4.7).

1.3 Temporal Boundaries

The project schedule is preliminary and subject to modification in response to the receipt of regulatory approvals, business considerations, and other weather factors. Assuming favourable regulatory approval and market conditions, construction of the Thermal Development is scheduled to begin in 2008 with initial thermal production starting as early as 2010. The Thermal Development is expected to operate for about 40 years. A detailed project schedule is provided in Volume I.

Temporal boundaries used in this assessment vary depending on the disciplines and the resource assessed. Temporal boundaries extend from the 1950's for the Traditional Ecological Knowledge and Land Use assessment to 75 years after decommissioning of the Thermal Development for the Land and Resource Use assessment.

1.4 Assessment Criteria

The purpose of the EIA is to assess the potential impacts associated with the construction, operation, and reclamation of the Thermal Development. This includes impacts to the biophysical landscape as well as socio-economic and cultural impacts to local communities and historical sites. The EIA also includes preventative actions, mitigation, and adaptive management to reduce impacts of the Thermal Development. The impacts that remain after mitigation measures have been implemented are residual impacts.

Impact assessments are based upon measured, predicted, or reasonably expected changes in some attributes of a selected indicator. The indicators were chosen after reviewing other relevant EIAs, which had been evaluated for applicability to this region, through input from stakeholders, and the professional judgment of the EIA scientists.

For each identified indicator, a description of the potential residual impact was made, using the attributes of:

- direction
- geographic extent
- magnitude
- duration
- confidence
- confidence
- reversibility

1.4.1 Direction

The direction of impact can be described as positive (beneficial), negative (detrimental), or neutral.

- positive – measured or estimated impact represents a real or potential increase in abundance, quality, or other attribute of the indicator

- negative – measured or estimated impact represents a real or potential decrease in abundance, quality, or other attribute of the indicator
- neutral – indicates there is no impact to quantify. Therefore, no quantitative assessment (e.g., extent, magnitude, duration) is possible.

1.4.2 Geographic Extent

Impacts can be confined to small local areas or can occur over a large geographic extent. Generally, impacts were local or regional:

- local – measured or estimated impact occurs only within the boundaries of the LSA
- regional – measured or estimated impact occurs beyond the boundaries of the LSA and mainly within the boundaries of the RSA

1.4.3 Magnitude

Four levels of magnitude were selected:

- zero – the Thermal Development does not impact the indicator; there is no measured or estimated change from baseline conditions
- negligible – measured or estimated impact represents a 1% or less change in the indicator (quality, quantity, or other attribute) from baseline conditions
- low to moderate – measured or estimated impact represents a 1–10% change in the indicator (quality, quantity, or other attribute) from baseline conditions
- moderate to high – measured or estimated impact represents a greater than 10% change in the indicator (quality, quantity, or other attribute) from baseline conditions

Some disciplines have specific threshold values (e.g., Alberta Ambient Air Quality Objectives (AAAQOs) (AENV 2005, Internet site)) that determine the magnitude of the impact, rather than a combination of quantitative analysis and professional judgment that is used where specific guidelines and regulations do not exist.

1.4.4 Duration

Some impacts might persist for short periods, whereas others might be virtually permanent. The following designations for duration were used:

- short term – measured or estimated impact persists for no longer than five years
- mid term – measured or estimated impact persists to the end of the operational life of the Thermal Development
- long term – measured or estimated impact is measurable beyond the end of the operational life of the Thermal Development

1.4.5 Confidence

All measurements or predictions of direction, magnitude, geographic extent, and duration of an impact are made on the basis of available data and understanding of the Thermal Development.

The confidence ratings used are:

- low – no clear understanding of cause and effect is evident because of the lack of a relevant information base or directly relevant data. This generally applies to conditions relevant to the RSA where no data were collected or available, and no details are available regarding other planned developments

- moderate – a good understanding of cause and effect is evident from the existing knowledge base. However, limited data or a lack of directly applicable data exists. This generally applies to conditions within the LSA where larger scale data were collected, but the resource in question is site-specific and could not be surveyed within this year's time frame, or models were used but could not be validated
- high – a good understanding of cause and effect is available from the existing knowledge base and good, directly applicable data available. This generally applies to conditions within the LSA where data were collected and information about the Thermal Development was available (e.g., footprint).

1.4.6 Reversibility

All disciplines provide a basic explanation about whether or not the impact is reversible.

1.4.7 Final Impact Rating

The evaluation of significance is based on the following impact rating classification. For each individual impact assessment, a qualitative, final evaluation rating was applied. This classification rating is a combination of quantitative analysis and professional judgment that takes into account the various descriptors for each attribute (direction, magnitude, geographic extent, duration, confidence, and reversibility), and the potential effects of the specific impact. For some indicators, specific threshold values determine an indicator's impact rating (e.g., for air quality, human health). Other indicators have no such threshold value and a combination of objective analysis and subjective professional judgment is used.

Final impact classification does not always relate directly to the various descriptors used to explain the impact. This is often seen where a relative change of high magnitude is occurring, yet the impact is classified as Class 3 because the overall effect (e.g., impacts to one small stream within a watershed) might be so small that it cannot be measured. The final impact rating guidelines are put forward to provide the consistency and rigour so the assessment in a final determination can be made as to whether an action is required or not. Deviations from these guidelines are explained. The final impact rating is an aggregated, relative, numerical rating determined by both the impact analysis and the level of action the author recommends, as a professional, as necessary to address the impact. This rating is applied to both the Thermal Development-specific residual impacts and cumulative effects impacts (see Table 1.4-1).

Table 1.4-1: Final Impact Rating

Rating	Level of Action
Class 1	The predicted trend in an indicator under projected land use development could threaten the long-term sustainability of the quantity or quality of the indicator in the local and regional study areas. An action plan, developed jointly by regional stakeholders, could be developed to monitor the affected indicator, identify, and implement further mitigation measures to reduce any impact, and promote recovery of the indicator, where appropriate. This class of impact might also be applicable to an exceedance of a regulatory guideline, or where the impact will have long-term effects.
Class 2	The predicted trend in an indicator under projected land use development will likely result in decline in the quantity or quality of the indicator. The decline could be to lower-than-baseline but stable levels in the local and regional study areas after closure and into the foreseeable future. In addition to responsible industrial operational practices, monitoring and recovery initiatives could be required if additional land use activities occur in the study area before closure of the projected land use development. This class of impact might also be applicable to an exceedance of a regulatory guideline, or where the impact is expected to have mid-term effects, but where recovery will take place shortly after closure of the projected land use development.

Table 1.4-1: Final Impact Rating (Cont'd)

Rating	Level of Action
Class 3	The predicted trend in an indicator under projected land use development could result in a slight decline in the quantity or quality of the indicator in the local and regional study areas during the life of the projected land use development, but resource levels should recover to baseline after closure. In some cases, a short-term, low to moderate magnitude impact could occur, but recovery will take place within five years. No new resource management initiatives are necessary. Responsible industrial operational practices should continue. This class of impact could also be applicable where regulatory guidelines are not exceeded, but where a relative change in magnitude of an indicator occurs.
Class 4	The projected land use development results in no change, and no contribution toward affecting the quantity or quality of the indicator in the local and regional study areas during the life of the projected land use development. Responsible industrial operational practices should continue. Therefore, no cumulative effects result from Thermal Development

1.4.8 Assessment Scenarios

The assessment was based on three scenarios – baseline, application, and cumulative effects as required by the TOR (AENV 2006). Impacts of the Thermal Development were evaluated from a project-specific and cumulative perspective by undertaking comparisons of change within these scenarios. These generally included comparisons of the environmental characteristics occurring in the baseline scenario with environmental conditions predicted to occur in the application scenario and in the cumulative effects scenario (see Figure 1.4-1). For the cumulative effects scenario, impacts were not evaluated at closure because of uncertainties about closure planning from other activities in the region.

1.4.9 Baseline Scenario

The baseline scenario includes the existing environmental and socio-economic conditions and existing and approved projects and activities as of June, 2006.

1.4.10 Application Scenario

The application scenario includes the baseline scenario plus the Thermal Development within the LSA. Construction and operation of the Thermal Development will occur sequentially, although Phase 2 construction will overlap with Phase 1 operations. A maximum worst-case disturbance scenario was assessed for the application scenario in which all construction and operation components of the Thermal Development were assumed to occur concurrently. This conservative, worst-case approach over-predicted Thermal Development impacts. In some cases, impacts were evaluated at closure (decommissioning and reclamation) to determine residual effects at that time.

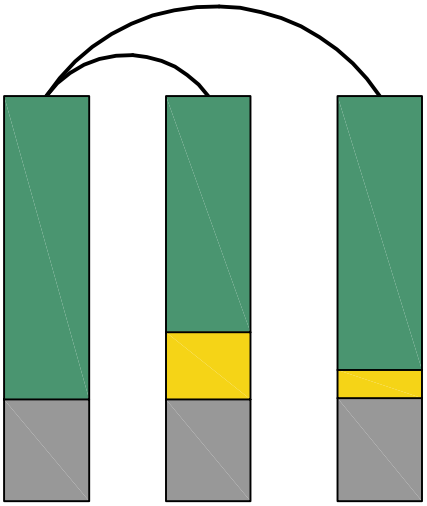
1.4.11 Cumulative Effects Scenario

The cumulative effects scenario includes baseline, application, and existing projects or activities in combination with other planned projects or activities that could occur within the same geographic area (spatial) and within the same time (temporal). The project inclusion list in Table 1.4-2 shows existing and planned projects or activities.

Cumulative effects were evaluated where Class 1, 2, or 3 impacts were identified for that particular discipline (as per impact ratings explained in Section 1.4.7). Class 4 ratings indicate that no change would occur as a result of the Thermal Development. Therefore, cumulative effects assessment was not undertaken for issues identified as Class 4.

APPLICATION SCENARIO

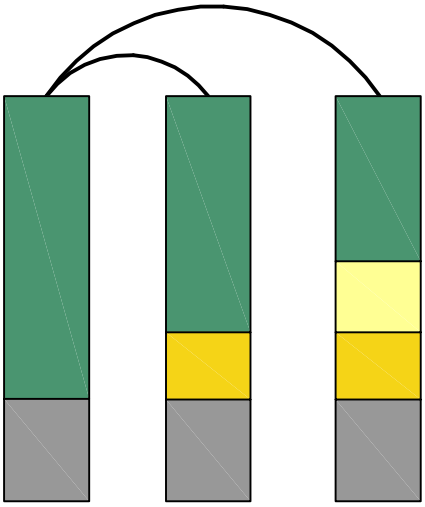
(LSA UNLESS OTHERWISE NOTED)



EXISTING BASELINE SCENARIO | APPLICATION SCENARIO | CLOSURE COMPARISON

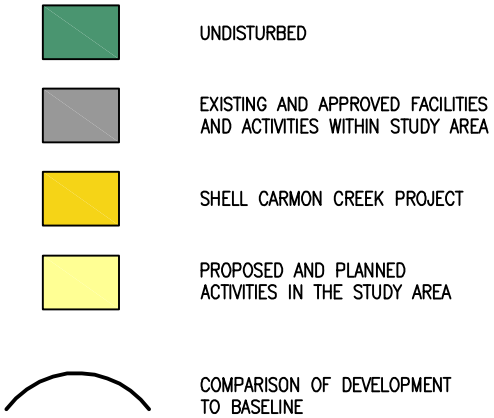
CUMULATIVE EFFECTS SCENARIO

(RSA UNLESS OTHERWISE NOTED)



EXISTING BASELINE SCENARIO | APPLICATION SCENARIO | CUMULATIVE EFFECTS SCENARIO (WITH OTHER DEVELOPMENTS IN THE REGION)

LEGEND



SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Comparisons of Change For Impact Assessment

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M.T.	L.P.	NOV 03/06

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1.4.11.1 Project Inclusion List

The Project Inclusion List (see Table 1.4-2) includes the various anthropogenic disturbances on the landscape that must be included in the applicable assessment scenario to effectively determine project and cumulative effects. As the study areas for each component vary, the project inclusion for a particular assessment also varies. Therefore, each component has modified the comprehensive project inclusion list for their assessment.

The projects included for cumulative effects include other operators as well as facilities associated with the Thermal Development. Few new projects have been disclosed or have provided information on facilities. For those projects included in the CEA project inclusion list, the following information is provided. These projects were included based on their potential interaction with the Thermal Development and location within the study area:

- Associated Shell Infrastructure included electrical transmission lines and the potential source water pipeline upgrade
- Baytex Energy Trust. Letter to EUB dated April 20, 2006. Re: Amendment of the Primary Recovery Scheme for the Recovery of Crude Bitumen. EUB Approval No. 10391A. Peace River Oil Sands Area
- BlackRock Ventures (BlackRock). Letter to the EUB date, July 22, 2005. Re: Application for Primary Recovery Scheme. Peace River Oil Sands Area – Bluesky Zone. Peace River Block. Township/Range 84-17W5M, Sections 11, W 1/2 of 12, W ½ & SE ¼ of 13, 14, 23, 24, 25, 26, S ½ of 35, S1/2 of 36
- Husky Oil Operations Ltd. Letter to EUB dated March 27, 2006. Re: Application for a Primary Recovery Scheme. Peace River Oil Sands Area – Bluesky Formation. Area of Application – Sections 28, 29, 32 and 33-84-18W5M
- Murphy Oil Canada Ltd. Letter to EUB dated April 24, 2006. Re: Application for a Primary Recovery Scheme. Peace River Oil Sands Area. Southern Half section 13-084-18W5M. Section 14-084-18W5M (Hz 00/01-14-084-18W5/2 and 00/04-14-084-18W5/2). Section 15-084-18W5M (Hz 00/01-15-084-18W5/2 and 00/04-15-084-18W5/2)
- CCS Energy Services. Letter to EUB dated July 14, 2006 (disclosed earlier). Re: Application to construct and operate an oilfield waste management facility for the purpose of oilfield waste processing located at Legal Subdivision NW ¼ of 24-85-19W5M
- Daishowa-Marubeni International Ltd. Future cutblock information within the terrestrial RSAs were provided

Table 1.4-2: Comprehensive Project Inclusion List

Status	Baseline Scenario	Application Scenario	Cumulative Effects Scenario
Existing and Approved	Existing Shell Peace River Complex operations (2,000 m^3/d production)	Existing Peace River Complex integrated with the Thermal Development	Existing Peace River Complex integrated with the Thermal Development
	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557
	Asphalt plant	Asphalt plant	Asphalt plant
	BlackRock - Seal	BlackRock - Seal	BlackRock - Seal
	Bonavista Energy Trust Ltd.	Bonavista Energy Trust Ltd.	Bonavista Energy Trust Ltd.
	Boucher Brothers Lumber Ltd.	Boucher Brothers Lumber Ltd.	Boucher Brothers Lumber Ltd.
	Daishowa-Marubeni International Ltd. Facility	Daishowa-Marubeni International Ltd. Facility	Daishowa-Marubeni International Ltd. Facility
	Daishowa-Marubeni International Ltd. existing cutblocks	Daishowa-Marubeni International Ltd. existing cutblocks	Daishowa-Marubeni International Ltd. existing cutblocks
	Husky Oil Operations Ltd. Simons Lakes Gas Plant	Husky Oil Operations Ltd. Simons Lakes Gas Plant	Husky Oil Operations Ltd. Simons Lakes Gas Plant
	Husky Oil Operations Ltd. Slave Lake Gas Plant	Husky Oil Operations Ltd. Slave Lake Gas Plant	Husky Oil Operations Ltd. Slave Lake Gas Plant
	PennWest Energy Trust Ltd. Harmon Gas Plant	PennWest Energy Trust Ltd. Harmon Gas Plant	PennWest Energy Trust Ltd. Harmon Gas Plant
	PrimeWest Energy Trust Ltd. Seal 1	PrimeWest Energy Trust Ltd. Seal 1	PrimeWest Energy Trust Ltd. Seal 1
	PrimeWest Energy Trust Ltd. Seal 2	PrimeWest Energy Trust Ltd. Seal 2	PrimeWest Energy Trust Ltd. Seal 2
	Shining Bank Energy Trust Ltd. Cadotte Gas Plant	Shining Bank Energy Trust Ltd. Cadotte Gas Plant	Shiningbank Energy Trust Ltd. Cadotte Gas Plant
	Talisman Energy Inc. Harmon Gas Plant	Talisman Energy Inc. Harmon Gas Plant	Talisman Energy Inc. Harmon Gas Plant
	Town of Peace River	Town of Peace River	Town of Peace River
	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails
Project	n/a	**Shell Canada Limited Thermal Development**	**Shell Canada Limited Thermal Development**
Planned Projects and Activities	n/a	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)
	n/a	n/a	Associated Shell infrastructure including: • transmission lines • source water pipeline upgrade
	n/a	n/a	Baytex Energy Trust
	n/a	n/a	BlackRock
	n/a	n/a	Husky Oil Operations Ltd.
	n/a	n/a	Murphy Oil Corporation
	n/a	n/a	CCS Energy Services
	n/a	n/a	Daishowa-Marubeni International Ltd. future cutblocks

Note:
n/a – not applicable.

1.5 References

Alberta Environment (AENV). 2006. *Final Terms of Reference, Environmental Impact Assessment (EIA) Report for the Proposed Shell Canada Limited Peace River Oil Sands Carmon Creek Project*. May 2006. Alberta Environment, Edmonton, AB.

1.5.1 Internet Site

Alberta Environment (AENV) 2005. Existing Ambient Air Quality Objectives. Available at: http://www3.gov.ab.ca/env/air/OGS/objexisting. Accessed May 2006.

SOCIO-ECONOMIC
IMPACT ASSESSMENT

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2. Socio-Economic Impact Assessment

2.1 Introduction

Shell Canada Limited (Shell) is requesting regulatory approval to commercially develop the Peace River Oil Sands Carmon Creek Project (Project), located about 40 km northeast of the Town of Peace River, Alberta within Townships 84–86, Ranges 16–19, W5M, in Northern Sunrise County. The Project is an expansion of the existing Peace River Complex and is planned to consist of both thermal recovery (Thermal Development) and primary recovery (Primary Development). This section examines social and economic impacts that could result from construction and operation of the proposed Project.

Potential effects of the Project are analyzed on economic activities in Alberta as a whole, and specifically, on the Regional Study Area (RSA). Baseline socio-economic data is analyzed and assessed for current and future conditions without the Project. These data was also analysed for the application and cumulative effects scenarios, and the economic effects from these scenarios were then used to identify potential Project effects on social services and infrastructure in the RSA. Mitigation being considered to enhance the positive impacts and reduce the negative impacts is also presented.

2.1.1 Issues Scoping

2.1.1.1 Limitations

The Project is still in the conceptual planning phase and, as such, detailed engineering design and cost estimates are not available. Capital spending assumptions have been derived from conceptual engineering design. Calculations of economic effects include a margin of error from engineering inputs plus an additional margin of error that is inherently part of economic assessments. As well, caution should be used when interpreting social effects generated by construction and operational jobs, as the number of jobs presented in this report may be modified as the Project design progresses.

2.1.1.2 Issues

Forecasting economic and social impacts of a proposed project typically starts with determining the extent to which project construction and operation employs the existing regional workforce and draws new workers and their families into the region. When population impacts are identified, it is possible to assess potential impacts on regional infrastructure, services, and the community.

This SEIA considers direct, indirect, and induced impacts. Direct impacts are generated by the direct-hiring of employees by Shell for the Project. The indirect effects are goods and services the Project would purchase (including local contractors). Induced effects result from the spending of earned income generated by direct or indirect employment from the Project.

These potential effects are assessed for both the construction and operation phase of the Project in both the economy of the RSA and the Province of Alberta.

2.1.1.2.1 Economic Issues

The economic issues are primarily focussed on both direct and indirect economic impacts that may result from direct employment created by the Project. Economic issues that potentially relate to the Project's construction and operation are:

- changes to regional employment expressed in person-years of work
- changes to provincial employment expressed in person-years of work
- changes to government revenues

2.1.1.2.2 Social Issues

The social assessment primarily focuses on how potential changes in Project employment, composition of the work force, and regional population during both construction and operation may affect social conditions and infrastructure including:

- demand for services including health, education, recreation, social, and protective services in the RSA
- infrastructure including housing, transportation, and utilities

2.1.1.3 Terms of Reference

In addition to the issues provided above, the assessment also addressed issues identified in the Terms of Reference for the Project as follows:

"Provide information on the socio-economic effects of the Project. Specifically address the following:

- baseline (existing) socio-economic conditions in the region
- the socio-economic impacts of the Project on the communities of the region and on Alberta including
  - local employment and training
  - local procurement
  - population changes
  - stresses placed on local and regional infrastructure and community services
  - housing concerns in local communities
  - construction camps
  - other recreational activities
  - trapping, hunting and fishing
  - effects on First Nations and Métis (e.g., traditional land use and culture)
  - regional and provincial economic benefits
- Shell's policies and programs regarding the use of regional and Alberta goods and services
- estimated industrial benefits including Alberta, other Canadian, and non-Canadian percentages of total project cost for engineering and project management, equipment and materials, construction labour and total project
- a general description of the engineering and contracting plan for the Project
- workforce requirements for construction and operation. Identify local employment and business development opportunities the Project may create

- plans to work with Aboriginal and other local residents and businesses with regards to employment, training needs, and other economic development opportunities arising from the construction and operation of the Project
- impacts of the proposed Project on the availability of affordable housing and the quality of health care services. Identify and discuss the mitigation plans that will be undertaken to address these issues. Provide a summary of any discussions that have taken place with the Municipality and the Regional Health Authority concerning housing availability and health care services respectively
- the impact on local services and infrastructure, taking into consideration other projects that are reasonably anticipated during the life of the Project. This will include consideration of transportation, education/training, social services, urban and regional recreation use, law enforcement, and emergency preparedness. Discuss options for mitigating impacts strategies to mitigate socio-economic concerns raised by the Regional Municipality and other stakeholders in the region."

2.2 Methodology

2.2.1 Spatial Boundaries

The social and economic effects of the Project have been assessed for the RSA. The RSA was selected to include urban and rural areas that would normally provide labour and other resources required for Project construction and operation, or where Project construction or operation may affect infrastructure and social services. The RSA includes the Hamlets of St. Isidore and Marie Reine, the Village of Nampa, settlements at Cadotte Lake and at Little Buffalo, the Towns of Peace River and Grimshaw, and Northern Sunrise County. The RSA is located in the Athabasca-Grande Prairie region. The boundaries of the RSA are presented in Figure 2.2-1.

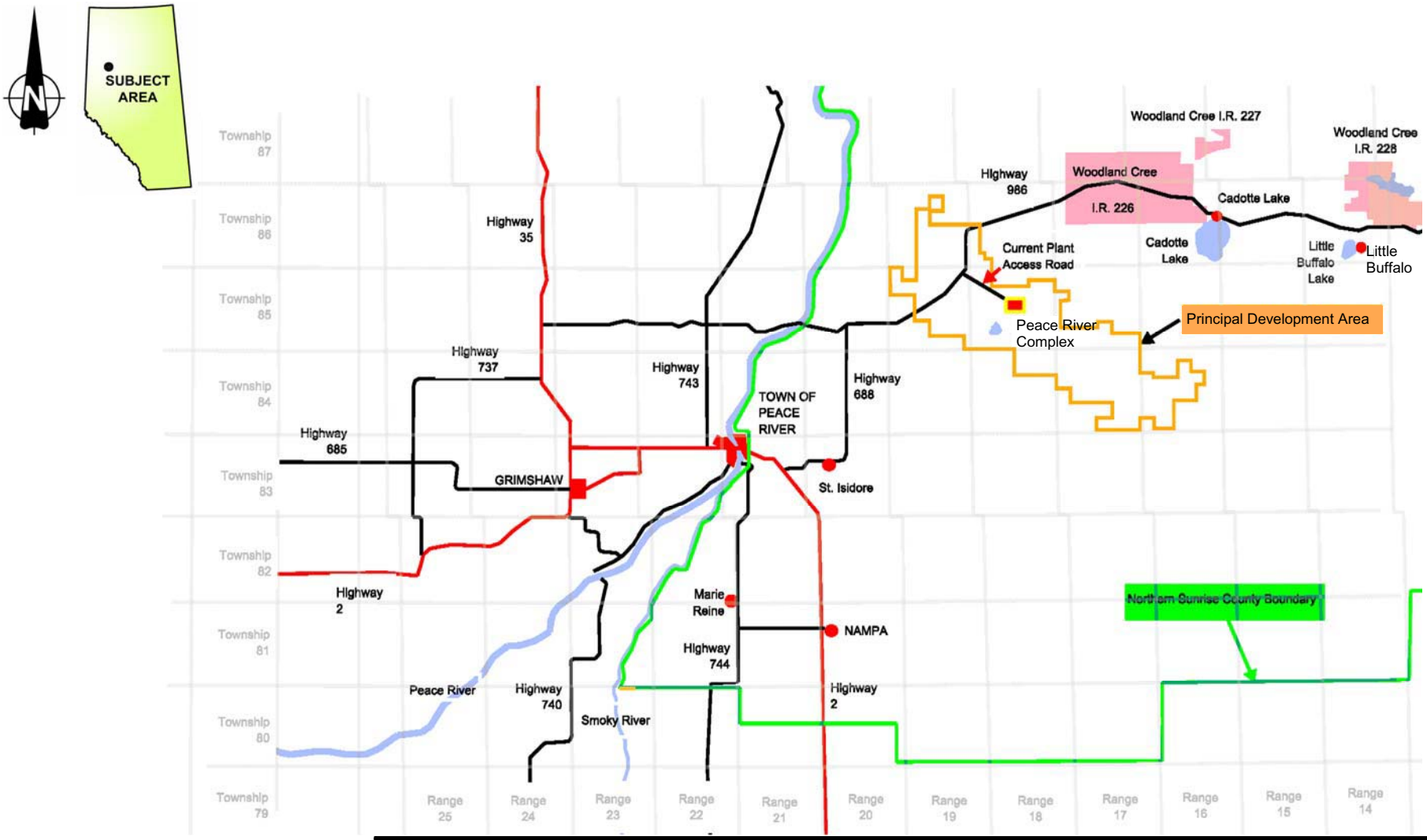
The SEIA also analyzes the potential regional economic impacts of the Project on the province as a whole.

2.2.2 Temporal Boundaries

The Project will have an approximate 40-year operating life. The assessment of potential social and economic effects has focussed on a time frame that is shorter than the operating life because most of the potential social and economic effects are expected to occur in the initial 20 years of the Project life for the purpose of the SEIA. Phase 1 construction is assumed to start in 2008 with production starting in 2010. Phase 2 thermal operations are expected to commence 3–7 years after Phase 1 begins, between 2013–2017. For the purpose of the SEIA, 2017 was used as the start date for Phase 2 as it provides a more conservative estimate of regional economic benefits. The temporal boundaries for this analysis range from commencement of Phase 1 construction in 2008 until 2029.

2.2.3 Data Collection

Data for the SEIA were collected from public domain information and interviews with key stakeholders. A list of stakeholders interviewed for this SEIA is included in Section 2.11.2. Key SEIA stakeholders are those that operate in the RSA and provide social services, support social infrastructure, economic development, or governance.



Regional Study Area (RSA)

0 10 20km

Scale 1:500,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Socio-Economic Impact Assessment RSA

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Interviews were conducted with the Métis community representatives of Region VI and the Local at Cadotte Lake. To date, Woodland Cree First Nation leadership has declined involvement in this study. However, Shell and Woodland Cree First Nation are currently involved in discussions regarding their involvement in an update to this study.

Important sources of public domain data included websites of various municipal governments, traffic information from Alberta Infrastructure and Transportation (AIT) (2005a, b), and population and labour forecasts from Alberta Human Resources and Employment (2004a, b, 2005), and the 2001 census by Statistics Canada (Statistics Canada 2001, Internet site).

There are some limitations to using public domain data. For example, Statistics Canada collects data on the Woodland Cree First Nation and includes the majority of people who are living in the Cadotte Lake settlement which is partly off the Woodland Cree First Nation Reserve. Northern Sunrise County collects data within their jurisdiction, which does not include reserve land but does include the Cadotte Lake settlement. Therefore, both data sets should not be used concurrently to avoid double-counting of people living at the Cadotte Lake settlement (Kirouac 2005, pers. comm.).

2.2.4 Description and Classification of Impacts

Both economic and social effects have been characterized in terms of direction, geographic extent, magnitude, duration, and confidence. The definitions for these attributes differ from the assessment criteria discussed in Volume IID, Section 1: Introduction. In assessing the attributes of the expected socio-economic effects, the following descriptors are used as defined below:

Direction: As socio-economic effects can be either positive or negative in direction and sometimes both, this SEIA considers the estimated net effect and the predominant direction of this net effect.

Geographic Extent: Regional effects (within the RSA) and provincial effects are evaluated in this SEIA. Local effects are not considered within an assessment of this nature.

Magnitude: Table 2.2-1 shows the rating, based on the need for effects management that has been adopted to assess the magnitude of Project effects.

Table 2.2-1: Magnitude of Effect

Rating	Description
Zero	The Project does not impact the indicators
Negligible	Effect may or may not be detectable, but is within the normal range of variability
Low to Moderate	An effect would be clearly detectable, but the existing management for the indicator would be able to adapt to the effect
Moderate to High	An effect would be clearly detectable, and the existing management for the indicator would be able to adapt to the effect with the appropriate mitigation

Duration: In terms of duration, construction effects are considered short-term and operational effects are considered mid-term.

Confidence: A confidence rating of low indicates there is no clear understanding of the interaction among variables that could have an effect on the indicator. A rating of moderate indicates a good understanding of the interaction among variables that could have an effect on the indicator. A high confidence rating indicates a good understanding of the interaction among variables that could have an effect on the indicator based on empirical data.

Final Impact Rating: The final impacts rating has been determined based on quantitative analysis and professional judgement and takes into account the various descriptors for each attribute. The

classification system described in Volume IID, Section 1: Introduction is used for the final residual impact rating with the exception that positive impacts are rated as Class 4.

2.3 Baseline Scenario

2.3.1 Community Overview

Large deposits of bitumen were discovered in the Peace River region in the 1950s. Development of commenced in the 1960s when Shell constructed a pilot project that used steam to decrease the viscosity of the resource. Since then, Shell has developed and tested various technologies for enhancing recovery. Shell's existing operation in Peace River, known as the Peace River Complex, currently employs about 100 people.

Intensive development of the region's forest resources commenced in the 1980s. In 1990, Daishowa-Marubeni International Ltd. (DMI) began operating its new pulp mill located 16 km north of the Town of Peace River. The mill produces approximately 430,000 air-dried metric tonnes of bleached kraft pulp annually and employs about 350 people in the mill, whereas another 600 seasonal contractors are involved in harvesting and transporting timber.

Northern Sunrise County can be characterized as an agricultural area with a rural population. It has no cities, towns, or villages, but contains five hamlets and the settlement of Little Buffalo. In 2001, it had a population of just over 2,100 people. Cadotte Lake, which is the location of the Cadotte Lake settlement, is about 95 km northeast of the Town of Peace River. It is an Aboriginal community comprised of Woodland Cree First Nation band members and Métis. The Hamlets of St. Isidore and Marie Reine are characterized as French-speaking farming communities. The settlement of Little Buffalo, located about 10 km east of Cadotte Lake, is home to the Lubicon Lake First Nation which has been pursuing a land claim for 50 years. The Village of Nampa is approximately 24 km southeast of Peace River on Highway 2.

The Town of Peace River is the largest community in the region. In addition to being a service centre for the surrounding rural population, it is a regional government administration centre and operational centre for oil, gas, and forestry operations in the region. The Town of Peace River also straddles the major north-south and east-west highways in the region and is an important transportation and distributional centre for industry and tourism. Most of the employees at the Peace River Complex and DMI pulp mill reside in the Town of Peace River. The Town of Peace River and surrounding municipalities have an inter-municipal development plan that allows each municipality input on proposed developments in the area (Gazette 2006a).

The Town of Grimshaw is the only other major population centre in the region. It is located at the southern terminus of Highway 35, which provides access to Manning, High Level, and the Northwest Territories. Grimshaw's location was chosen by the Central Canada Railway in 1917 and was originally settled by immigrants seeking agricultural opportunities (Town of Grimshaw 2005, Internet site). Today, Grimshaw is a service and supply centre for agriculture, forestry, and oil and gas exploration.

2.3.2 Existing Economic Conditions

2.3.2.1 Labour Force and Employment

The employment profile for the RSA is reflective of the region's recent economic development. Table 2.3-1 shows that nearly one-third of residents in the Northern Sunrise County (2005, Internet site) are employed in agriculture and other resource-based primary industries, compared to less than 6% of residents of the Town of Peace River. However, for the RSA, employment in these resource-based primary industries was slightly higher than the provincial average. The

percentage of the regional workforce employed in service industries was similar to the provincial average; however, the region has a higher proportion of people employed in health and education, but less employment in business services. The importance of the Town of Peace River as a regional centre for the provincial government is evident in the high proportion of other types of employment. Similarly, most employment in Cadotte Lake relates to providing health, educational, and other services for the Woodland Cree First Nation.

Table 2.3-1: Regional Employment Profile by Industry – 2001

Industry	Northern Sunrise County	Town of Peace River	Town of Grimshaw	Woodland Cree First Nation	RSA	Alberta
Agriculture and other resource-based industries	32.3%	5.6%	13.7%	11.1%	12.4%	10.9%
Manufacturing and construction industries	17.4%	18.6%	19.3%	7.4%	18.3%	15.8%
Wholesale and retail trade	13.2%	15.0%	17.6%	7.4%	15.0%	15.4%
Finance and real estate	3.0%	4.1%	2.1%	0.0%	3.4%	5.0%
Health and education	12.3%	17.7%	16.3%	40.7%	16.9%	15.4%
Business services	11.1%	14.1%	12.9%	7.4%	13.2%	18.8%
Other services	11.5%	24.8%	17.6%	25.9%	20.9%	18.7%
Experienced labour force	1,175	3,675	1,165	135	6,150	1,681,985
Percent of RSA Total	**19.1%**	**59.8%**	**18.9%**	**2.2%**	**100.0%**	**n/a**

Note:
n/a – not applicable.
Source: Statistics Canada 2001, Internet site.

Table 2.3-2 shows a significant change in regional employment between 1996–2001. There was a major decrease (130 jobs) in employment in agriculture and other resource-based industries and service industries (315 jobs), and an increase in manufacturing and construction industries (450 jobs), the majority in the Town of Peace River. During this period, the Town of Peace River also experienced a small decrease in service sector employment. Nearly all new employment since 1996 for Woodland Cree First Nation was in the service sector. Northern Sunrise County reported a shift from agriculture and other resource-based employment to manufacturing and construction, with only 10 new fulltime jobs.

Table 2.3-2: Changes in Regional Employment by Sector, 1996–2001

Industry Sector	Northern Sunrise County	Town of Peace River	Town of Grimshaw	Woodland Cree First Nation	RSA
Agriculture and other resource-based industries	-55	-90	10	5	-130
Manufacturing and construction industries	50	390	10	0	450
Service industries	15	-45	-325	40	-315
Total	**10**	**255**	**-305**	**45**	**5**

Source: Statistics Canada 2001, Internet site.

Within the region, DMI is the largest employer. Assuming that all mill and woodland jobs associated with the pulp mill employ regional residents, DMI accounts for about 15% of regional employment. In comparison, the Peace River Complex accounts for only 2% of regional employment.

In 2001, nearly 75% of regional residents aged 15 and over were active in the labour force (employed or looking for employment), and nearly 70% of those residents were employed. Table 2.3-3 shows a total of about 6,300 people active in the RSA labour force in 2001 and 5,900 were employed, resulting in a regional unemployment rate of 6.3%. This was a full percentage point higher than the provincial average. Within the RSA, unemployment ranged from a low of 3.7% in the Town of Peace River to a high of 26.7% for Woodland Cree First Nation.

Table 2.3-3: Regional Unemployment Rates – 2001

Employment Indicator	Northern Sunrise County	Town of Peace River	Town of Grimshaw	Woodland Cree First Nation	RSA	Alberta
Population 15 and over	1,595	4,750	1,845	250	8,440	2,357,210
Participation rate	74.3%	78.9%	65.2%	61.2%	74.5%	73.1%
Labour force	1,185	3,744	1,203	150	6,282	1,723,124
Employment rate	69.7%	75.9%	57.6%	44.9%	69.8%	69.3%
Employed	1,112	3,601	1,063	110,	5,886	1,633,550
Unemployment rate	5.8%	3.7%	11.7%	26.7%	6.3%	5.2%
Unemployed	73	143	140	40	396	89,574

Increased economic activity in Alberta since 2001 has resulted in steadily declining unemployment rates. Discussions with chief administrators for Northern Sunrise County and the Town of Peace River indicate that unemployment rates in the RSA have dropped since 2001. Table 2.3-4 shows the Alberta unemployment rate dropped from 5.9% in early 2003, to 4.8% in early 2005. The RSA is located in the Athabasca-Grande Prairie region where unemployment rates dropped to 3.3% in 2005. This decline was attributed to increased oil and gas drilling activities (Alberta Human Resources and Employment 2005). Only the Wood Buffalo-Cold Lake region reported a lower rate of unemployment.

Table 2.3-4: Trends in Provincial Unemployment Rates

Alberta Region	Unadjusted 3-month Moving Average (%)			
	January 2003	January 2004	January 2005	January 2006
Wood Buffalo – Cold Lake	5.1	4.1	3.1	3.8
Athabasca – Grande Prairie	5.2	5.7	3.3	2.3
Edmonton region	5.0	4.9	5.0	4.2
Red Deer region	6.6	4.6	3.7	4.0
Banff – Jasper, Rocky Mountain region	6.0	3.7	N/A	3.9
Calgary region	5.3	5.1	4.7	4.4
Camrose – Drumheller	4.2	3.3	3.9	2.4
Lethbridge – Medicine Hat	4.4	3.7	3.6	3.9
Total for Alberta	**5.9**	**5.4**	**4.8**	**4.0**

Note:
N/A – not available.
Source: Alberta Human Resources and Employment (2006) Labour Force, Internet site.

Census information indicates that, on average, earned incomes in the RSA ($31,178) are slightly less than the provincial average ($32,603). Table 2.3-5 shows that there is considerable variation within the region. Average earnings in the Town of Peace River were $2,341 higher than the regional average, whereas average earnings in Grimshaw were about $2,000 lower, and average earnings in Northern Sunrise County were about $3,660 lower. Residents of Woodland Cree First Nation earned 58% of the regional average. Total earned incomes in the RSA in 2001 amounted to just over $200 million, or approximately 0.3% of the provincial total earned income.

Table 2.3-5: Regional Earnings and Income – 2001

	Northern Sunrise County	Town of Peace River	Town of Grimshaw	Woodland Cree First Nation	RSA	Alberta
All persons with earnings	1,175	3,790	1,305	150	6,420	1,768,440
Average earnings	$27,515	$33,519	$29,186	$18,036	$31,178	$32,603
Worked full year, full-time	565	2,030	610	40	3,245	936,180
Average earnings, full-time	$39,475	$45,556	$40,465	$33,653	$43,393	$44,130
Total earned income ($ millions)	$32.3	$127.0	$38.1	$2.7	$200.2	$57,656.4
Composition of total income	100%	100%	100%	100%	100%	100%
Earnings as a percentage of total income	82.3%	86.8%	80.1%	75.1%	84.5%	81.1%
Government transfers	12.5%	7.6%	13.3%	21.9%	9.8%	9.3%
Other money	5.3%	5.7%	6.7%	2.5%	5.8%	9.5%
Total Income ($ Millions)	**$39.3**	**$146.4**	**$47.6**	**$3.6**	**$236.8**	**$71,093.0**

Source: Statistics Canada 2001, Internet site.

Table 2.3-5 also shows that, on average, earnings accounted for nearly 85% of regional incomes. Within the region, government transfer payments accounted for about 10%, and other sources (savings and investments) accounted for about 6% of the total. This pattern is similar to that of Alberta, although residents of the RSA were less reliant on other sources. The pattern is relatively consistent within the region, although residents of Woodland Cree First Nation rely on transfer payments for nearly 22% of their total income.

In terms of current economic development projects, information from Alberta Economic Development (2006 Internet site) identifies 12 major projects that have recently been completed, announced, or are under construction within the RSA, though this list may not be comprehensive. Table 2.3-6 summarizes these projects by sector and status. , the projects have a combined value of more than $103 million, which is $26 million more than for 2005. In terms of costs, more than half of new construction (54%) is occurring in Northern Sunrise County, and 42% is occurring in the Town of Peace River. Details on the 12 projects are provided in Appendix II. Four projects worth $22.5 million were under construction, and eight projects worth $80.6 million had been announced or proposed.

Table 2.3-6: Major Regional Economic Development Projects for 2005

Project Sector	Northern Sunrise County		Town of Peace River		Town of Grimshaw	
	Number	Project Cost	Number	Project Cost	Number	Project Cost
Residential	0	0	0	0	0	0
Commercial and retail	0	0	0	0	1	$5,000,000
Infrastructure	4	$41,300,000	1	$4,500,000	0	0
Tourism and recreation	0	0	1	$4,500,000	0	0
Institutional	0	0	3	$18,400,000	0	0
Agriculture and related	0	0	1	$15,400,000	0	0
Telecommunications	0	0	0	0	0	0
Oil, gas and oil sands	1	$14,000,000	0	0	0	0
Total	5	$55,300,000	6	$42,800,000	1	$5,000,000
Proposed or announced	4	$51,700,000	3	$23,900,000	1	$5,000,000
Completed	0	0	0	0	0	0
Under construction	1	$3,600,000	3	$18,900,000	0	0

2.3.2.2 Municipal Government Finances

The municipal governments of Northern Sunrise County, the Town of Peace River, and the Town of Grimshaw are currently operating with annual budget surpluses that are being used to build their capital reserves. Table 2.3-7 shows Northern Sunrise County had the highest operating surplus ($2.6 million). All three governments currently have debts well below their debt limits. While the Town of Peace River is operating at 35% of its debt limit, the Town of Grimshaw is using less than 8% of its debt limit and Northern Sunrise County has debt less than 1% of its maximum. As a result, annual debt servicing costs are also well below the debt servicing limits.

Table 2.3-7: Municipal Government Finances – 2004

2003 Municipal Finances	(Thousands of Dollars)		
	Northern Sunrise County	Town of Peace River	Town of Grimshaw
Net property taxes	$7,259.8	$4,793.2	$1,278.2
Grants	$1,086.4	$1,637.9	$1,525.4
Other	$1,304.7	$5,291.0	$1,573.1
Subtotal	$9,620.9	$11,722.2	$4,379.7
Expenditures	$6,989.7	$9,170.7	$2,416.6
Net revenues (costs)	$2,631.2	$2,551.4	$1,963.1
Capital adjustments	$2,631.2	$2,551.3	$722.0
Operating surplus (deficiency)	$2,631.2	$2,551.3	$1,241.1
Debt limit	$14,295.4	$16,591.0	$5,660.9
Actual debt	$95.6	$5,835.8	$435.7
Debt servicing limit	$2,382.6	$2,765.2	$943.5
Actual debt servicing	$28.6	$1,243.4	$195.4

In terms of the assessment base for municipal government revenues, Table 2.3-8 shows the total assessment was nearly $1.2 billion in 2005. Northern Sunrise County had the highest assessment base ($775 million), primarily tied to linear developments including roads and pipelines

($470 million). It also had a high assessment base for machinery and equipment ($183 million). In contrast, residential properties accounted for the largest portion of the assessment base for the two towns.

Table 2.3-8: Municipal Assessment Base – 2005

Equalized Assessment	(Millions of Dollars)			
	Northern Sunrise County	Town of Peace River	Town of Grimshaw	Total
Linear	$470.4	$12.5	$3.1	$486.0
Machinery and equipment	$182.8	$0.3	$0.3	$183.4
Non-residential	$49.8	$106.1	$17.9	$173.8
Residential and farmland	$72.2	$199.9	$64.4	$336.5
Total assessment	$775.1	$318.8	$85.8	$1,179.7
Equalized municipal tax rate	0.0094	0.0150	0.0149	n/a

Note:
n/a – not applicable.

2.3.3 Existing Social Conditions

2.3.3.1 Population

In 2001, the population of the RSA was 11,215 people, of which Peace River accounted for 55%. Between 1996–2001, the regional population dropped by 562 people or nearly 5%. As shown in Table 2.3-9, declines were reported for both the rural population and two urban centres, although the population of Woodland Cree First Nation increased by about 100 people. Discussions with the chief administrators for Northern Sunrise County and the Town of Peace River suggest that the regional population, especially the urban portion, is now starting to expand as a result of increased economic activity in the region.

Table 2.3-9: Regional Population Characteristics – 1996 and 2001

Population	Northern Sunrise County	Town of Peace River	Town of Grimshaw	Woodland Cree First Nation	RSA	Alberta
2001	2,123	6,240	2,435	417	11,215	2,974,807
1996	2,264	6,536	2,661	316	11,777	2,696,826
Change	-141	-296	-226	+101	-562	+277,981
Percent change	-6.2%	-4.5%	-8.5%	32.0%	-4.8%	10.3%

Source: Statistics Canada 1996, 2001, Internet site.

Census data for 2001 in Table 2.3-10 suggest that about 17% of the regional population is Aboriginal, divided nearly equally between First Nations and Métis. Table 2.3-10 also shows 205 First Nations people residing in Northern Sunrise County in 2001; this includes some members of the Lubicon Cree Nation living in the settlement of Little Buffalo. According to Aboriginal Affairs and Northern Development (2003), Little Buffalo had a population of 386 people in 2003.

Table 2.3-10: Area Population – 2001

Population	Northern Sunrise County	Town of Peace River	Town of Grimshaw	Woodland Cree First Nation	RSA Total
Non-Aboriginal	1,700	5,455	2,180	30	9,365
Aboriginal	420	795	250	385	1,850
First Nation	205	205	125	370	905
Métis	215	565	125	15	920
Multiple[1]	0	10	0	0	10
Other	0	15	0	0	15
Total	**2,120**	**6,250**	**2,430**	**415**	**11,215**

Note:
[1] Includes persons who reported more than one Aboriginal identity group (North American Indian, Métis, or Inuit) and those who reported being a Registered Indian and/or Band member without reporting an Aboriginal.
Source: Statistics Canada 2001 Census.

For the entire population of the region, mobility information indicates that out-migration since 1996 was actually larger than reported with some losses offset by immigration. Table 2.3-11 shows that about 8% of the regional population in 2001 had moved to Alberta in the preceding five years, whereas nearly 40% had changed addresses in Alberta and 55% had lived at the same location. The highest mobility was reported for the Town of Peace River, whereas Northern Sunrise County's rural population was the least mobile with nearly 70% remaining at the same address. Compared to Alberta, regional residents were less likely to have moved since 1996.

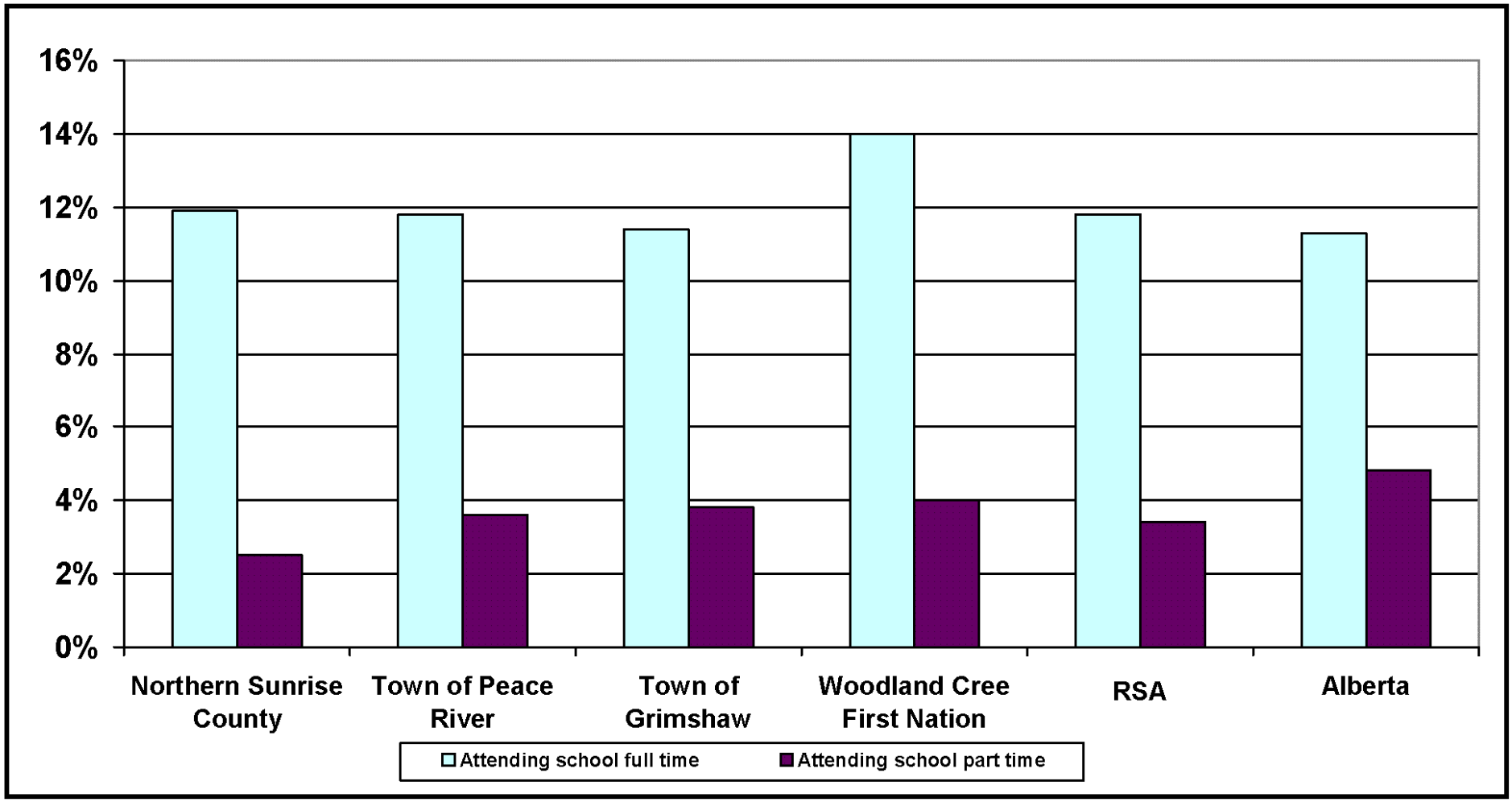
Table 2.3-11: Regional Population Mobility Characteristics – 2001

Residence Five Years Ago	Northern Sunrise County (%)	Town of Peace River (%)	Town of Grimshaw (%)	Woodland Cree First Nation (%)	RSA (%)	Alberta (%)
Same address	69.3	48.0	57.9	54.9	54.5	50.8
Same province but changed address	28.1	39.9	36.0	42.3	36.9	37.5
Different province or country	2.3	12.0	5.8	0.0	8.4	11.7

Table 2.3-12 shows regional residents tend to be younger than the provincial average. About one-third of residents are under the age of 20, compared to 28% of Albertans. However, more than half of the people living in Woodland Cree First Nation were less than 20 years of age.

Population characteristics also show that, in aggregate, males outnumber females by a ratio of 105–100. The corresponding number for Alberta is 100–100. Within the regional population there are some significant imbalances. For example, males aged 20–24 in Northern Sunrise County outnumbered females by 165–100, and males aged 45–54 in the County outnumbered females 121–100. This may reflect the employment of single males in natural resource extraction industries. Within urban communities, the ratio of males to females was almost evenly balanced for all age groups. For Woodland Cree First Nation, males under 19 outnumbered females by about 130–100.

With respect to education, Figure 2.3-1 shows that about 11.8% of the regional workforce attended school full-time in 2001 whereas 3.4% attended part-time. These percentages are slightly higher than the provincial average, but the workforce in the RSA is younger and more likely to be attending school.



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Percentage of Workforce Attending School - 2001

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Table 2.3-12: Regional Age Characteristics – 2001

Population	Northern Sunrise County (%)	Town of Peace River (%)	Town of Grimshaw (%)	Woodland Cree First Nation (%)	RSA (%)	Alberta (%)
Age 0–4	7.5	7.5	8.2	14.5	7.9	6.3
Age 5–14	17.2	16.5	16.0	25.3	16.9	14.5
Age 15–19	9.4	8.5	7.8	12.0	8.6	7.5
Age 20–24	5.2	7.8	5.1	7.2	6.7	7.2
Age 25–44	27.8	33.4	30.2	27.7	31.4	31.9
Age 45–54	15.1	12.7	13.1	7.2	13.1	14.1
Age 55–64	9.2	6.2	8.0	4.8	7.1	8.1
Age 65-74	5.4	4.0	6.4	1.2	4.7	5.8
Age 75 and over	3.3	3.6	4.9	0.0	3.7	4.5
Total Population	**2,125**	**6,240**	**2,435**	**415**	**11,215**	**2,974,805**

Within the region, a higher proportion of Woodland Cree First Nation residents were in school in 2001, and this can also be attributed to age characteristics. Residents of Northern Sunrise County were least likely to be attending school part-time (Statistics Canada 2006, Internet site – Aboriginal Community Profiles).

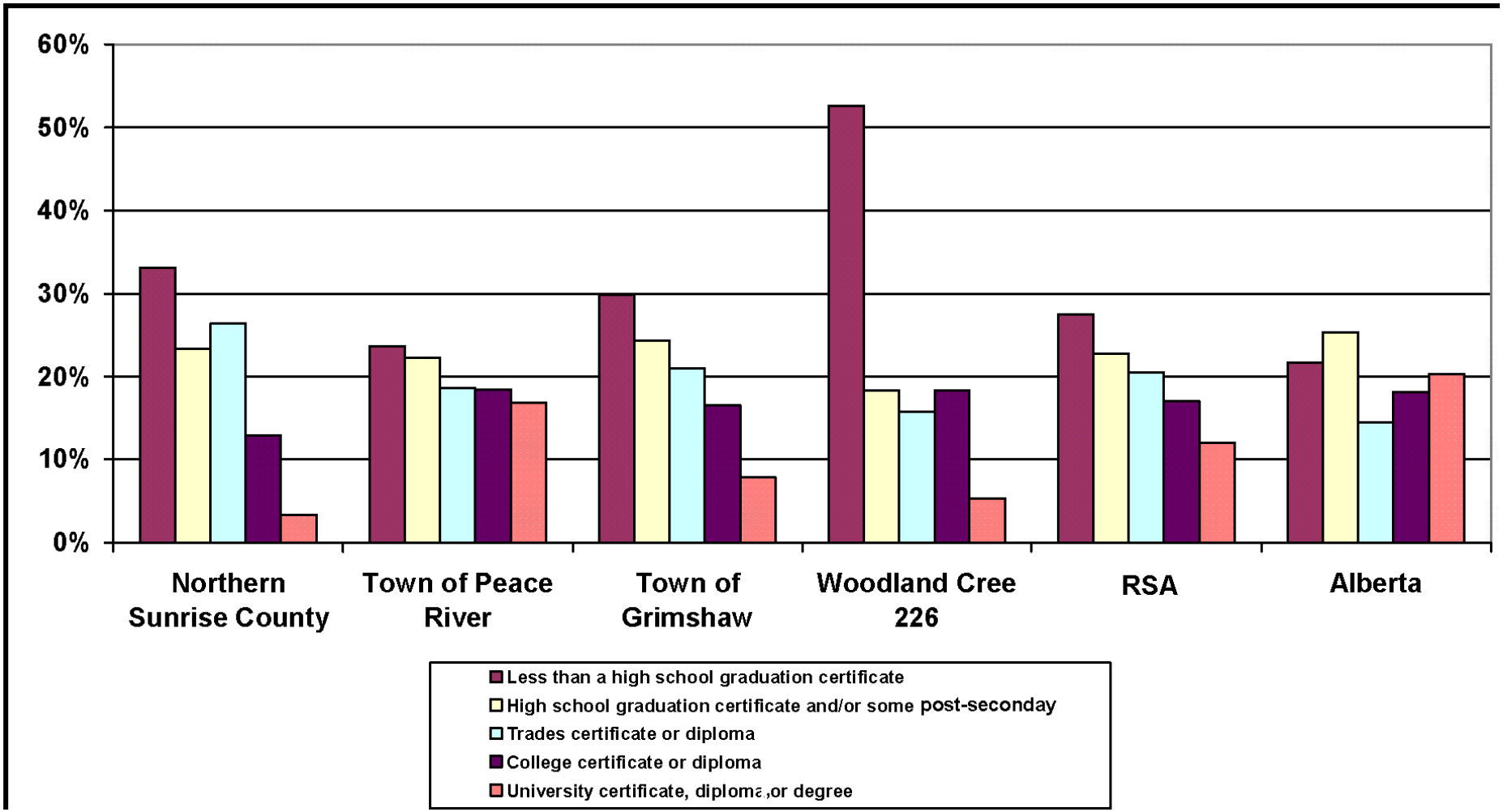
The education qualifications of the regional workforce aged 20–64 are shown in Figure 2.3-2. In general, the regional workforce has less education than the provincial average: a higher percentage of regional residents did not graduate from high school whereas a lower proportion had a trade, or college or university diploma. Within the region, rural residents tended to be less educated than urban residents, with some exceptions. For example, although a much greater percentage of residents of Woodland Cree First Nation did not have a high school diploma, there were proportionately more college graduates than either the Town of Grimshaw or Northern Sunrise County. Residents of the Town of Peace River had the highest levels of education in the region.

2.3.3.2 Housing and Accommodation

2.3.3.2.1 Peace River

Since the Town of Peace River is built on the terraces of the Peace River Valley, the topography poses a number of challenges for community planning and development. Within the town limits, the majority of houses are currently single family homes and there is some high-density development (i.e., duplexes and apartments). Peace River also contains three parks and one subdivision for manufactured homes (Wraight 2005, pers. comm.).

The cost of a single detached home in Peace River ranges from $65,000 to over $400,000 for newer houses. Over the past few years, average housing prices have risen substantially. For example, a single detached house selling for $65,000 in 2002 is now listed from $120,000–$160,000 (Jebb 2005, pers. comm.). In August 2006, there were about 30 single detached homes and over 30 condo units for sale in Peace River (MLS 2006a, Internet site).



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Education Qualifications of Workforce Aged 20-64, 2001

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Peace River has a number of vacant parcels of land available for housing and there has been a significant increase in development activity reflected by a rise in the number of building permits issued annually. There are about 700 acres of developable land within the town boundaries (Town of Peace River 2006). Current demands for serviced land are being fuelled by speculation about economic development (Wraight 2005, pers. comm.). Projects scheduled for 2006 include a 71-unit apartment building on the old Royal Canadian Mounted Police (RCMP) detachment site and a number of new residential subdivision projects (Wraight 2005, pers. comm.; Gazette 2006b).

Approximately 150 homes could be constructed in Shaftsbury Estates, and the Town just approved a subdivision for 31 new lots at Saddleback Ridge, representing the first phase of a plan for approximately 120 single family units. Near Misery Mountain Ski Hill, there is a phased plan to develop approximately 120 units of mixed density single family housing.

People are currently moving to Peace River from Grande Prairie and Fort McMurray where housing is limited. This is placing increasing demand on the housing market in Peace River, and local people trying to enter the market are finding it difficult to purchase a home (Wraight 2005, pers. comm.).

Table 2.3-13 and Table 2.3-14 show the vacancy rate and average monthly rental cost by type of building in Peace River. The Seniors Housing Services Division (2005, Internet site) indicated a total of 21 vacant rental units in Peace River, however, as of August 2006, those vacancies had all been filled (Woitas 2006, pers. comm.).

Table 2.3-13: Rental Accommodation and Vacancies in Peace River by Type – 2005

Type of Rental Accommodation	No. of Units	Vacancies
Bachelor	15	2
1-Bedroom	168	5
2-Bedroom	250	10
3-Bedroom	136	4
4+Bedroom	0	0
Total	**569**	**21**

Note:
The annual survey covers communities with a population of over 1,000 with 30 or more rental units.
Source: Alberta Seniors Housing Services Division (2005, Internet site).

Rental costs range from $406 for a bachelor suite to $683 for a three-bedroom apartment (see Table 2.3-14). In recent years, the number of rental units has decreased and rental prices for the available units have risen. Although this situation would normally encourage people to buy homes, there are few houses for sale (Jebb 2005, pers. comm.).

Table 2.3-14: Average Monthly Rental Cost in Peace River by Type – 2005

Type of Rental Suite	Average Rental Cost ($)
Bachelor	406
1-Bedroom	505
2-Bedroom	572
3-Bedroom	683
4+Bedroom	n/a

Note:
The annual survey covers communities with a population of over 1,000 with 30 or more rental units.
n/a – not applicable.
Source: Alberta Seniors Housing Services Division (2005, Internet site).

The main accommodation facilities for visitors to Peace River include Peace Valley Inns, Travellers Motel, Best Canadian Motor Inn, and the Western Budget Motel. A new Nova Hotel with 88 rooms has also recently opened. Two or three other hotels are potentially lined up depending on land security, although they have not come forward with specific plans and so do not appear on the Alberta Economic Development listing of major projects. Hotel developers appear to be basing inquiries on the prospects of development in the area. In total, there are presently seven facilities, six hotels, and one hotel with suites. There is also one bed and breakfast in Peace River. After the new developments are complete, approximately 550 rooms will be available (Wraight 2005, pers. comm.).

2.3.3.2.2 Grimshaw

Privately-owned, single detached dwellings comprised the majority of housing in Grimshaw in 2001 (Alberta First 2005a, Internet site). Presently, single detached houses range in price from $75,000–$250,000 (Schwendeman 2005, pers. comm.). Prices for homes in Grimshaw have increased by approximately 20–25% within the past year, likely reflecting both a natural rise in market value and an increased interest in Grimshaw by real estate investors (Schwendeman 2005, pers. comm.).

There are a number of new and proposed developments in Grimshaw although none are for low income housing. An area structure plan is currently being developed for the area to determine the zoning and infrastructure (Wallace 2005, pers. comm.; MLS 2006b, Internet site).

The 2005 Alberta Seniors Housing Services Division survey indicates there were a total of five rental vacancies in Grimshaw (see Table 2.3-15) at an average cost of $480.50 per available apartment (see Table 2.3-16). According to Royal LePage, there were no homes on the market in Grimshaw in November 2005 and all but five of the rental apartments were occupied (Schwendeman 2005, pers. comm.).

Table 2.3-15: Rental Accommodation and Vacancies in Grimshaw by Type – 2005

Type of Rental Accommodation	No. Units	Vacancies
Bachelor	0	0
1-bedroom	13	3
2-bedroom	37	2
3-bedroom	0	0
4+bedroom	0	0
Total	**50**	**5**

Note:
The annual survey covers communities with a population of over 1,000 with 30 or more rental units.
Source: Alberta Seniors Housing Services Division (2005, Internet site).

Table 2.3-16: Average Monthly Rental Cost in Grimshaw by Type – 2005

Type of Rental Suite	Average Rental Cost ($)
Bachelor	n/a
1-Bedroom	436
2-Bedroom	525
3-Bedroom	n/a
4+Bedroom	n/a

Note:
The annual survey covers communities with a population of over 1,000 with 30 or more rental units.
n/a – not applicable.
Source: Alberta Seniors Housing Services Division (2005, Internet site).

For visitor accommodation, the Mile Zero Motor Inn has 45 rooms and the DeeJay Motel maintains a total of 15 rooms. One new hotel with 66 suites is being constructed. There are no bed and breakfasts in Grimshaw (Wallace 2005, pers. comm.).

2.3.3.2.3 Northern Sunrise County

A detailed list of housing for Northern Sunrise County is presented in Table 2.3-17. As of 2001, single detached houses accounted for the majority of private dwellings in the County.

Table 2.3-17: Northern Sunrise County Dwelling Occupation Summary – 1996 and 2001

Occupied Private Dwellings by Type	1996	% of Total	2001	% of Total
Apartments	0	0.00	0	0.00
Detached duplexes	10	1.37	5	0.69
Moveable dwellings	60	8.22	105	14.48
Other single attached house	0	0.00	0	0.00
Row and semi-attached house	10	1.37	10	1.38
Single-detached	665	91.10	610	84.14
Total number of occupied private dwellings	730	100.00	725	100.00
Private dwellings, owned	580	79.45	600	82.76
Private dwellings, rented	95	13.01	80	11.03

Source: Statistics Canada 1996, 2001, Internet site (numbers have been rounded).

2.3.3.2.4 Nampa, St. Isidore, and Marie Reine

Nampa has approximately 100–120 housing units, and the current price for older homes is just under $100,000. This community does not have any apartment buildings. There are about 18 or 19 homes in Marie Reine, most of which are large acreages. One house recently sold in Marie Reine for $240,000 but as of November 2005, there were no other homes on the market. There are a total of 50–60 housing units in St. Isidore. Two private houses are under construction but no other lots are available for development. Few houses were placed on the market in 2005 and none of the houses in St. Isidore were on the market in November 2005. Rental units operated by the St. Isidore Housing Co-operative include 20 units within two duplexes and 16, 3-bedroom bungalows. A total of 6 units are allocated for subsidized housing. The average monthly rental price is $625 for a house and $545 for a duplex. There is presently a waiting list for rental accommodation (Lavoie 2005, pers. comm.).

2.3.3.2.5 Affordable Housing

The provision of affordable housing in the North Peace Region is targeted towards low and moderate income families and individuals, senior citizens, people with special needs, and individuals who unable to obtain adequate housing in the private market. Since April 1995, the North Peace Housing Foundation (the Foundation), a non-profit organization established under the *Alberta Housing Act*, has assumed responsibility for the management of family social housing programs in the region. The Foundation has the jurisdiction of 12 municipalities: seven urban and five rural municipalities. The Town of Peace River, the Town of Grimshaw, and communities within the Northern Sunrise County fall within its jurisdiction.

The Foundation maintains self-contained units for seniors, community housing, and rural and native housing in Manning, Peace River, Grimshaw, Fairview, and Hines Creek. Low income and single parent households with some employment income are usually the beneficiaries of the program. Income qualifications for housing determined by the Canada Mortgage and Housing Corporation (CMHC) are similar in Peace River, Grimshaw, and Nampa (see Table 2.3-18). The core needs income thresholds level is the income below which an individual does not have ability to afford housing which is adequate in condition, suitable in size, and affordable.

Table 2.3-18: Core Need Income Thresholds (CNIT) for Low-Income Housing – 2005

Municipality	1 Bdrm CNIT	2 Bdrm CNIT	3 Bdrm CNIT	4+ Bdrm CNIT
Peace River	$20,500	$24,500	$27,500	$31,500
Grimshaw	$20,500	$24,500	$27,500	$31,500
Nampa	$20,500	$24,500	$27,500	$31,500
Source: Walisser 2006, pers. comm.				

The Foundation has a Private Landlord Rent Supplement Program for apartment building operators that offer low-income units. Individuals in the program pay 30% of their income towards rent and the provincial government subsidizes the remainder of the rental cost up to the market value for the suite. The program works well when there are vacancies in the rental market but anything that reduces the vacancy rate puts pressure on the number of available units. Rents rise when the vacancy rate is low thereby increasing the amount the government is required to subsidize on a per-unit basis. This in turn, reduces the number of units eligible for government funding (Walisser 2006, pers. comm.). There is an increasing need for accommodation under this program and given the current vacancy rate in communities such as Peace River, individuals in immediate need of housing will be turned away as the Foundation's 11 units are filled (Walisser 2006, pers. comm.).

The Canada-Alberta Affordable Housing Program Agreement has two initiatives to help develop affordable housing in high-growth, high-need communities, and in northern remote areas of the province:

- The Sustainable Remote Housing Initiative, facilitated by Alberta Seniors and Community Supports, provides one-time grants for eligible capital costs to develop new housing units to accommodate lower income households living in remote northern communities. Currently, there are no low-income homes in either Cadotte Lake or Little Buffalo (Walisser 2006, pers. comm.). However, through this program, the Foundation and Northern Sunrise County in August 2006, approved development of eight new homes in Cadotte Lake (Gazette 2006c)
- The Affordable Housing Partnerships Initiative provides funding for rental projects (Tauber 2006, pers. comm.). There is currently a proposal for 12 manufactured homes to be delivered to individuals presently living in the RSA. No applications have been submitted to this initiative to develop rental units in the RSA.

2.3.3.3 Education

Communities in the RSA are situated in the Peace River School Division (PRSD) No. 10, Holy Family Catholic Regional Division No. 37, Northlands School Division No. 61, and 4 Ward Board of Education. The general policies of each school division are discussed below, followed by a discussion of educational services offered in the RSA on a community-by-community basis.

2.3.3.3.1 Peace River School Division No. 10

The PRSD provides public education from kindergarten to Grade 12 and is responsible for a total of 16 schools and two Hutterite Colony schools. Each school in the division offers assistance for special needs students through individualized programs (Moltzan 2005, pers. comm.). In addition to the regular provincial programs, the PRSD provides the Alberta Initiative for School Improvement, Peace Regional Outreach Program, Peace Academy of Virtual Education, and a home education program. These programs provide students with the opportunity to receive part or all of their education by alternative methods; 60 students are presently using the alternative services (Moltzan 2005, pers. comm.). French Immersion is offered at three schools; 135 students are currently enrolled in these programs that have a combined operating capacity of approximately 270 students (Woronuk 2005, pers. comm.).

The present combined enrolment for the PRSD is 1,070, whereas the operating capacity is 1,418 students. In 2004, average class sizes were below the provincial average with approximately 17 students per class in kindergarten to Grade 3; 22 students per class for Grades 4–6; 23 students in junior high school; and 21 students per class in high school. Table 2.3-19 illustrates the school completion rates. The PRSD's enrolment, like other school districts in Alberta, is declining slowly with some exceptions. The recent declining trend of about 2–4% per year presents a persistent concern about viability of smaller rural schools. Note that PRSD does not have difficulty retaining or recruiting teachers. It has a strong relationship with the educational program at the University of Lethbridge and offers competitive wages to prospective teachers (Woronuk 2005, pers. comm.).

In some instances, the capacity of small high schools to provide core courses on site is a concern. The change in rural demographics is a growing concern for the PRSD, particularly with respect to program delivery and facility utilization. The use of technology as a learning tool for students and as a PRSD-wide communication tool is in place and will continue to receive a major emphasis. The PRSD anticipates that all schools within the division will eventually be connected via videoconferencing. By enabling the delivery of courses such as mathematics and physics to remote communities, this technology will help standardize the quality of education that students

receive in schools across the division; it will also provide a support system for educators living in these communities and allow teachers access to a variety of education resource materials (Woronuk 2005, pers. comm.).

2.3.3.3.2 Holy Family Catholic Regional Division No. 37

Holy Family Catholic Regional Division (HFCRD) No. 37 was formed in 1997 through the regionalization of the former Holy Family Catholic Separate Regional Division No. 17 and North Peace Roman Catholic Separate School District No. 43. The HFCRD provides education to the northern communities of Fort Vermilion, Manning, Grimshaw, Peace River, McLennan, Valleyview, and High Prairie. In addition, St. Mary's virtual school has been established in which students from across the province are enrolled. St. Mary's School is owned by HFCRD and is operated by the Fort Vermilion School Division No. 52. HFCRD also operates St. Francis Holistic Learning Centre in the Youth Assessment Centre in High Prairie (HFCRD 2005, Internet site).

The HFCRD offers a range of programs to students enrolled in its nine schools. The present combined enrolment is 2,254, whereas the operating capacity is approximately 3,586 students. Completion rates for both the HFCRD and PRSD are shown in Table 2.3-19, and illustrate the school systems have graduation rates slightly lower than the provincial average.

The HFCRD maintains a Ten-Year Facility Plan which outlines possible upgrades and modernizations (HFCRD 2005, Internet site). For the most part, the HFCRD does not have difficulty recruiting or retaining teachers. There are some issues finding teachers to staff the French immersion program (Becker 2005, pers. comm.).

Table 2.3-19: Completion Rates for High Schools in the RSA and Alberta, 2003–2004

Program	High School Completion Rates		
	Peace Regional School Division No. 10 (%)	Holy Family Catholic Regional Division No. 37 (%)	Alberta (%)
5-year	69.8	70.3	75.4
4-year	67.9	64.9	73.2
3-year	66.1	57.2	68.9

2.3.3.3.3 Peace River

In Peace River, the PRSD operates the Peace Regional Outreach Campus, Peace River High School, Springfield Elementary School, and T.A. Norris Middle School. McGrath Elementary School, which offered Grades 4–6, is no longer in operation. Average class sizes are approximately 21 students for Peace River High School, 19 students for Springfield, and 23 students for T.A. Norris (Peace River School Division No. 10 2005).

The HFCSD operates two schools in Peace River: the Good Shepherd School which offers kindergarten–Grade 6, and Glenmary School which offers Grades 7–12. Enrolment in the HFCSD peaked in late 1990s but has since declined by approximately 10%. Currently, 400 students are enrolled in Good Shepherd which has an operating capacity of 502 students and 396 students are enrolled in Glenmary where the operating capacity is 637 students. Similar to the PRSD, most class sizes are below the provincial averages. The average class size at Good Shepherd is 17 students for kindergarten–Grade 3, and 22 students for Grades 4–6. At Glenmary, the average class size for Grades 7–12 is approximately 21 students.

Conseil Scolaire du Nord Ouest No. 1 offers a French Immersion school program through École Quatre-Vents for kindergarten–Grade 5. The current enrolment is 48 students with a capacity of approximately 100 students. Given its growth over the past seven years, École Quatre-Vents

expects enrolment to continue to increase as it moves to its new location at McGrath school in 2006 (Grenier 2005, pers. comm.).

2.3.3.3.4 Grimshaw

The PRSD provides public school services in Grimshaw. Presently there are two public schools: Grimshaw Junior/Senior High School offering Grades 7–12 and Kennedy Elementary School offering kindergarten–Grade 6. The current combined enrolment in Grimshaw's public schools is 507 with a combined capacity of 889 students. Enrolment is expected to level off after a decline over the next few years. Within the next five years, there are plans to consolidate the public schools in Grimshaw (Moltzan 2005, pers. comm.).

The HFCSD provides education services from kindergarten– Grade 9 through the Holy Family School. Students continuing in the Catholic school system for senior high school are bussed to Glenmary School in Peace River. Currently, 233 students are enrolled in Grimshaw's separate school system, and its capacity is approximately 270 students. With an average class size of 21 students, there are no planned expansions. Enrolment at the Holy Family School has recently increased due to the movement of young families from Peace River to Grimshaw.

2.3.3.3.5 Cadotte Lake and Little Buffalo

The Woodland Cree First Nation has its own school board, the 4 Ward Board of Education, which is separate from the Northlands School Division No. 61.

Cadotte Lake School was built in 1995 and offers kindergarten–Grade 12 to approximately 240 students, which is beyond the capacity of the school. The school currently has 34 staff members, including 10 admin and support staff, 16 teachers, and 6 teaching assistants who provide the necessary curriculum including mathematics, arts, and sciences, to meet provincial high school diploma requirements (Hum 2005, pers. comm.).

The community would benefit from the development of a trades training program and the 4 Ward Board of Education is currently considering options for the development of a regional trades school (Hum 2005, pers. comm.).

The Northlands School Division No. 61 operates one school in Little Buffalo. The Little Buffalo School has seven portable class rooms, science lab, Cree room, and activity room/gym. The school offers kindergarten to Grade 12. It is at its current capacity with approximately 138 students enrolled and has 11 full-time teachers and 6–7 assistants for various activities. The school recently received approval from Alberta Infrastructure for an additional portable classroom (Ramrattan 2005, pers. comm.).

2.3.3.3.6 Nampa, St. Isidore, and Marie Reine

Nampa Public School, operated through the PRSD, offers Grades 1–6 and is the only school in Nampa. For Grades 7–12, students are bussed to Peace River. There are 63 students currently enrolled at Nampa Public School where the capacity is 157 students. Growth is not anticipated and, as a result, the school may reduce its size to better reflect the enrolment.

St. Isidore does not have its own public school. Therefore, children go to school in Peace River or are transported to Falher to attend École Heritage which is operated through the Conseil du Nord Ouest No. 1. Most students from Marie Reine attend school in Peace River but some travel to Nampa for their elementary education.

2.3.3.3.7 Additional Educational Opportunities

In July 2004, the Northern Alberta Institute of Technology (NAIT) assumed responsibility for the administration of campuses previously administered through Fairview College. NAIT campuses are located in Peace River, Fairview, Grand Prairie, and High Level. NAIT also collaborates with Athabasca University, through a distance learning program, to allow college students the option of obtaining a university degree. Other distance learning programs offered through the University of Alberta, University of Calgary, and Grand Prairie College are accessible to students in the Peace River region. The NAIT in Motion Classroom on Wheels is a fully-equipped mobile classroom that delivers trade-related programs in remote communities.

NAIT has submitted a proposal to the Federal Government to obtain funding to deliver its Aboriginal Pre-Tech program in Peace River by September 2006. This program works in conjunction with the upgrading program at Northern Lakes College to provide students with the pre-requisites necessary to enter the Pre-Tech program. NAIT has developed an Introduction to Trades Program to train people for region-specific skills. (Crocker 2005, pers. comm.).

Distance education options are available through a number of schools and programs. For example, Alberta-North is a partnership of six northern post-secondary institutions that provide distance education opportunities to many communities in northern Alberta. The collaborating partners are Athabasca University, NAIT, Grande Prairie Regional College, Keyano College, Northern Lakes College, and Portage College. Alberta-North has education sites, called Community Access Points, throughout northern Alberta. Northern Lakes College offers academic upgrading in Cadotte Lake, Little Buffalo, and Peace River.

2.3.3.4 Health Services

Peace Country Health (Health Region 8) delivers a full range of healthcare services to the Peace River area. Health Region 8 employs approximately 3,400 people to operate the Peace Country Health Care facilities and programs, and offers services to a population of approximately 130,000 people in 16 communities. When necessary, the Capital Health Authority in Edmonton provides specialized health services.

Health Region 8 provides a variety of other services including special programs for Aboriginals, communities, students, mental health, continuing care, infection control, and rehabilitation. There are also programs for children, adolescents, adults, and seniors.

2.3.3.4.1 Peace River

Medical services in Peace River are offered through the Peace River Community Health Centre. Services include 24-hour emergency care, general surgery, intensive care, obstetrics, occupational therapy, outpatient services, palliative care, paediatrics, physiotherapy, respiratory therapy, cardiac testing, X-ray, laboratory services, and outreach dialysis. Visiting specialists include cardiologists; dermatologists; ear, nose, and throat specialists; ophthalmologists; orthopaedists; psychiatrists; child psychiatrists; and rheumatologists. The Peace River Community Cancer Centre operates in partnership with the Alberta Cancer Board and is staffed by specially-trained registered nurses and local physicians.

The Health Centre is a teaching facility with approximately 14 physicians and 70 nurses. They also expect to add a psychologist to the team in a few months. There are 30 acute care beds in the Health Centre, many of which are currently utilized for long-term care, as there is a long-term care bed shortage. The emergency department at the Health Centre handles about 19,000 visits each year (Peace Country Health 2006, Internet site).

The Health Centre faces challenges in recruiting both physicians and experienced nurses, as do most health regions in the province. According to hospital staff, the Health Centre is in need of

more long-term care beds to ensure the acute care unit has beds available for patients. The need for additional long-term care beds will be of particular importance in the case of a population increase.

Regional paramedical services include:

- six dentists and three denture clinics in Peace River; one dentist in Grimshaw
- Alberta Mental Health Helpline
- ten optometrists in two optometry offices in Peace River, and optometrists working out of the Northern Vision Centre serving the Peace River area
- massage therapists and chiropractors in Peace River

2.3.3.4.2 Community Physicians and Clinics

The Peace River Associate Medical Clinic is a family medical office with 10 physicians (8.5 full-time equivalents) and two registered nurses on staff. In addition to regular medical visits, the clinic provides basic urgent care and acts as a referral centre for the surrounding communities. Within the past three years, it has maintained 15,000 active charts; many of these patients were seen on multiple visits. The clinic is presently experiencing a shortage of physicians and has difficulty taking on new patients, but can deal with urgent cases. Due to the shortage of physicians, patients may wait from six months to one year for a routine check-up. The clinic is currently assessing options to redesign or expand its programs to treat more patients (Deboon 2005, pers. comm.). To service the growing number of patients, the Clinic also needs additional space. Doctors at the Clinic recently announced plans for a Medical Centre of Excellence, and are looking for project funding (Gazette 2006d).

The RSA is also serviced by a public health clinic, located within the hospital complex, which offers the following services:

- audiology
- environmental health
- family and child health
- home care
- immunization
- mental health
- nutrition services
- seniors wellness
- speech language pathology

Seven public health nurses offer a range of services in addition to an early delivery discharge service. Home care nurses are available. The public health clinic also has a team that promotes healthy lifestyles and is interested in providing such services for work camps (Koch 2006, pers. comm.). When pressure points are identified within a particular service, the clinic is able to staff the position. There is, however, some difficulty retaining public health nurses in the rural areas (Koch 2005, pers. comm.).

2.3.3.4.3 Grimshaw

The Grimshaw Berwyn Community Health Complex is a 24-hour emergency care centre with four observational and 10 long-term care beds. There are four physicians on staff including two full-time and two part-time doctors, and 15 registered nurses including casual, part-time, and full-time positions. The facility provides outpatient, emergency, public health, home and palliative

care, physiotherapy and recreation therapy, and x-ray and laboratory services. A visiting dietician performs patient and meal plan assessments, and the facility runs an adult immunization clinic.

Each day, approximately 30–35 people access the emergency room and another 100–120 patients visit the medical clinic. Over the past five years, the clinic has experienced an increase in workload and, currently, patients are placed on a waiting list for annual check-ups (Dehaeck 2005, pers. comm.). An additional nurse in the emergency room would help reduce patient waiting times (Archibald 2005, pers. comm.).

2.3.3.4.4 Cadotte Lake and Little Buffalo

The health centre in Cadotte Lake provides community health services to residents of Cadotte Lake and Little Buffalo. The health centre is home to the community health care programs.

A trailer functions as the health clinic in Little Buffalo. There is no doctor or nurse on staff. There is, however, access to a medical van. The community had a nurse that provided medical services such as immunizations but now, people mainly use services in Peace River.

2.3.3.4.5 Nampa, St. Isidore, and Marie Reine

Residents in Nampa, St. Isidore, and Marie Reine access medical services in Peace River as there are no hospitals or medical clinics in these communities.

2.3.3.4.6 Emergency Medical Services

Peace Regional Emergency Medical Services (PREMS) was formed in 1992 through the amalgamation of the Grimshaw and Berwyn Ambulance Service and the Peace River Ambulance Service. It provides ground ambulance and emergency response service within a 33,000 km^2 area that includes all communities within the RSA except the Town of Peace River and Cadotte Lake, who have their own service.

The base stations for PREMS are located at the Peace River Airport and in Manning. When necessary, helicopter services are obtained through companies in the RSA although use is relatively low (approximately 10 trips per year). PREMS responds to approximately 1,500 calls per year and could take more calls if necessary. Compliance parameters indicate a response time within 30 minutes 90% of the time (Ramer 2005, pers. comm.).

Currently 35 people are available to staff the day, night, and on-call crews. Each emergency medical services (EMS) crew consists of two people: one emergency medical technician and one paramedic. In the case of an emergency, a third crew may be added to the service. PREMS is not currently under-staffed (Thordarson 2005, pers. comm.). The service has not experienced an obvious increase in calls as a result of new industrial activities; however, it has stated that having a station on the east side of Peace River would be a key component of providing increased service to industrial developments in Northern Sunrise County. As well, STARS Air Ambulance is planning to expand services to Grande Prairie by the fall of 2006. The helicopter will be able to reach a radius of 250 km (STARS 2006, Internet site).

The privately-owned First Nation Ambulance Service provides basic life support services to Cadotte Lake. Although Little Buffalo is within the jurisdiction of PREMS, the First Nation Ambulance Service responds to many community calls. There are four full-time emergency medical technicians (EMTs) to staff the 24-hour service based in Cadotte Lake. Each crew consists of two EMTs who work on two-week rotations. On average, services are needed for approximately eight hours within a 24-hour period and, when necessary, PREMS will cover the shifts to give the First Nation Ambulance Service EMTs time to rest (Smith 2005, pers. comm.). The First Nation Ambulance Service receives approximately 832 calls per year (Bailey 2005, pers. comm.). A mutual aid agreement exists between services whereby PREMS will respond to

calls in Cadotte Lake when the First Nation Ambulance Service is busy, there are multiple casualties, or when advanced life support is required.

2.3.3.5 Protection Services

This section provides an overview of the protection services and facilities available in the RSA. Information is not separated by community because the services are mainly regional.

2.3.3.5.1 Policing Services

The RCMP provides protection services to the Peace River region. The Peace River RCMP detachment covers Northern Sunrise County, Town of Peace River, Woodland Cree First Nation (Simons, Cadotte, and Marten Lakes), and Lubicon Cree Nation. With 10 constables and three supervisors, the Peace River detachment is the main policing service for the area.

Over the last 3–5 years, Peace River was ranked as one of the top RCMP detachments, both municipally and provincially, in terms of demand on resources. In 2004, the detachment was ranked fifth municipally and twenty-third provincially. Most of the cases are criminal offences. More of these occurrences take place in town; however, rural areas are also busy (Haney 2005, pers. comm.).

Recruiting of officers is an issue for the RCMP as it takes 12–18 months to secure an additional officer. The Peace River detachment recently went through this recruitment process to add one community liaison position in April 2006. Even with this new liaison officer, the RCMP need additional personnel to meet their current workload. Currently, the Peace River RCMP is working with the Federal Government and the Woodland Cree First Nation to form a tripartite agreement to set up a RCMP office with staff in Cadotte Lake. The RCMP would need to recruit at least two officers for this new office in Cadotte Lake (Grimmelt 2006).

The Peace River detachment is also the location of the Northern Alberta District Support Services that include the Peace River Highway Patrol, a collision analyst, general investigation services, police dog handler, forensic identification unit, and radio workshop. The district unit provides assistance to the Peace River detachment and outlying detachments within northern Alberta (Alberta First 2005b, Internet site).

In addition to the RCMP services, the Town of Peace River also has a Crime Stoppers program, Victim Services program, Block Parent program, Youth Justice Committee, Auxiliary Constable program, and the Drug Abuse Resistance Education program.

2.3.3.5.2 Grimshaw

The Grimshaw RCMP detachment, which consists of four constables and one sergeant, provides service to areas west of Peace River about halfway to Fairview on Highway 2 and north to Dixonville on Highway 35. The number of calls handled by the detachment has increased in the past few years and it currently receives approximately 2,500 calls per year. Most of the calls the detachment responds to are not of a criminal nature, but the RCMP has noticed an increase in calls related to increased economic activity in the area especially during the summer when workers go to town and local campgrounds for their days off (Larrey-King 2005, pers. comm.).

The Grimshaw detachment does not have plans to expand its current service area or hire additional staff but may integrate with Peace River within a year. If integration proceeds, administrative responsibilities will be aligned between the two detachments (Haney 2005, pers. comm.). If the Grimshaw detachment requires an additional position, it would likely take longer than the 12–18 month waiting period estimated for Peace River because of recruitment issues. Similar to the Peace River detachment, if a position were to be approved at this point in time, an officer would not arrive until 2008 (Larrey-King 2005, pers. comm.).

In addition to RCMP services, Grimshaw has a Crime Stoppers program, Victim Services program, Block Citizens on Patrol, and a Rural Crime Watch. There are also two positions in the Auxiliary Constable program (Larrey-King 2005, pers. comm.).

2.3.3.5.3 Fire Protection Services

Within the Peace River region, each district has its own fire protection services and joint agreements with neighbouring municipalities. These agreements cover situations where local resources are unable to cope with a fire emergency. For major calls in the region, the Peace River Fire Department provides primary response and, when necessary, the rural fire departments provide backup (Mroz 2005, pers. comm.).

The Peace River Fire Department typically receives 150–200 fire calls per year and it responded to approximately 475 EMS calls in 2004. A full-time staff of firefighters, EMTs, and paramedics are supported by on-call members and a pool of casual paramedics and EMTs. At its current staffing level, the fire department is adequately equipped to handle the calls it receives.

In addition to traditional firefighting capabilities, the Peace River Fire Department provides response in:

- dangerous goods and hazardous materials
- motor vehicle accident extrication and rescue
- high angle rescue
- advanced life support ambulance
- basic life support ambulance
- first responder capabilities with fire apparatus
- fully integrated fire/EMS, cross-trained emergency response personnel

In conjunction with Peace Regional Search and Rescue Society, the fire department provides:

- water rescue and recovery
- ice rescue

The Peace River Fire Department also provides a variety of non-emergency services such as school visits and community presentations, EMS presentations, fire and EMS training, and fire code and building inspections (Town of Peace River Fire Department 2005, Internet site).

The Grimshaw Fire Department maintains a staff of 25 volunteers who are presently at different stages of achieving their National Fire Protection Association training; eventually, this training will extend to the next level. In Grimshaw, the 10-year average of 40 calls per year has recently increased to upwards of 58 calls. The Grimshaw Fire Department anticipates that as development continues in the area, the volume of traffic on roads in the RSA will increase and results in more calls related to motor vehicle accidents (Arnold 2005, pers. comm.).

In addition to the Grimshaw service, fire protection services are provided through volunteer fire departments in Nampa, St. Isidore, and Cadotte Lake. Neither Little Buffalo nor Marie Reine has a fire department. Marie Reine is serviced by Nampa and Little Buffalo may obtain service from Cadotte Lake.

Among the communities in the RSA, the volunteer fire protection services have varying numbers of personnel and degrees of experience. The Peace River Fire Department has performed training for some of the volunteers servicing the rural fire departments. However, the level of training achieved is not consistent among the communities (Mroz 2005, pers. comm.).

One of the largest issues faced by fire departments in rural communities around Peace River is the retention of trained volunteer staff. In communities such as St. Isidore and Cadotte Lake, there is

a lack of staffing for daytime fire service because volunteer firefighters often work in the surrounding communities (Bennet 2005, pers. comm.).

An initiative has been put forward by the Fire Services Advisory Committee to develop a comprehensive fire services framework to give municipalities and their fire departments standardized training, equipment, vehicles, and operations. The committee has also proposed that municipalities use a community-based risk assessment tool to assess fire protection services in individual communities (Sample 2005, pers. comm.).

2.3.3.6 Family and Community Services

2.3.3.6.1 Recreation

Peace River offers a wide range of municipal and recreation services to the Town and surrounding communities. The area is home to various youth programs, sports and fitness programs, social and environmental clubs and organizations, and offers a number of indoor recreation facilities such as an arena, indoor pool, curling rink, cultural centre, and senior's drop-in centre. Outdoor facilities include a mini golf course, children's water park, ski area, and several kilometres of walking trails. A description of hunting, trapping, and fishing services is included in Volume IID, Section 5: Land and Resource Use.

The Town of Peace River would like to build a regional multi-use recreational facility that would tie into the expansion of Peace River High School and act as an attraction for current and future residents. Partial funding for the centre was secured through the legacy fund, the Town, and some industry in the area. However, the funds are not yet sufficient to build the facility (Wraight 2005, pers. comm.).

Grimshaw Community Services runs various public recreational facilities including an outdoor swimming pool, arena, indoor rink, fitness centre, six ball diamonds, seven parks, playground, and a senior's drop-in centre. Expansion and upgrades to the existing facilities are done on a continual basis. There are also many facilities for recreation in close proximity of Grimshaw such as golf courses and camping facilities. All recreational facilities in Grimshaw experience high use but could accommodate additional people (Halerewich 2005, pers. comm.).

The Nampa and District Complex includes an arena and curling rink. There is hockey and skating at the arena during the winter months. A 350-seat banquet room used for various functions is located on the upper level. The Nampa and District Pioneer Museum operates during the summer, and has a historic house for viewing. In Mill Brown Memorial Park, there are six paved campsites as well as power hook-ups, water supply, playground, tennis court, baseball diamonds, and hiking trails. There is a cultural centre in Marie Reine and St. Isidore has a community hall for recreation and cultural activities. One of the oldest buildings in St. Isidore also serves as a museum and the community organizes one of the biggest winter carnivals in the area (Discover Peace Country 2005, Internet site).

2.3.3.6.2 Social Services and Childcare

The Northwest Alberta Child and Family Services Authority Region 8 is the agency mandated to provide services in the RSA. Services include child protection; family enhancement; foster care; adoptions; youth in transition; family support for children with disabilities; early intervention, and early childhood development; child and youth financial supports; child care; improved services to Aboriginal children, youth, and families; supports for permanency; information technology and business management.

Within Region 8, the Child and Family Services Authority offers services from the main sites including Grande Prairie (four locations), High Level, Peace River, and High Prairie. The

surrounding areas and communities are also served from these sites. Satellite and visiting offices are located in other sites as well (i.e., Grande Cache, McLennan, and Fairview).

Social workers from the Peace River and Fairview offices deliver children's services to all of the communities within the RSA with the exception of Cadotte Lake, where there is an independent agency. Together, the offices maintain a caseload of about 120 children and are fairly well positioned to deal with a slightly higher workload as there is presently no waiting list for services (Northwest Alberta Child and Family Services Authority 2005, Internet site).

The Alberta Alcohol and Drug Abuse Commission (AADAC) area office and the Métis Indian Town Alcohol Association for adults and youth are located in Peace River but serve the entire region. AADAC provides both prevention and counselling services to the RSA. There are presently two full-time addictions counsellors, a part-time position for tobacco reduction, one full-time adolescent counsellor, one full-time manager, and administrative support. There is a high demand for AADAC services throughout the province and this demand has increased over the past five years. People are presently experiencing a two to three week wait for counselling services (Johnson 2005, pers. comm.).

A number of organizations offer employment services to the region. The regional office of the Alberta Job Corp, located in Peace River, provides people on income support or who are facing barriers to employment, with the opportunity to work and earn a wage while increasing employment skills. Participants can access employment development instruction, workshop projects, community work projects, and work placement opportunities. There are many barriers to employment such as educational requirements, addictions, and attitudes towards work but transportation is one of the largest barriers for people living in communities surrounding Peace River. Case loads have declined in recent years but individuals still using the service face extremely high barriers to employment as a result of the challenges listed above, including lack of transportation to remote job sites (Blumentrath 2005, pers. comm.).

The regional office for the Region VI Métis Employment Services is located in Peace River. The office provides employment programs, training, and education support to all Aboriginal people. The services include:

- employment counselling for non-job ready clients
- job board and job leads
- marketing targeted to employers
- educational and community resource information
- applications for Métis Nation of Alberta (MNA) programs
- computer, photocopier, telephone, and fax equipment access for client job search (Métis Nation of Alberta 2005, Internet site)

The Métis Employment Service in Peace River currently serves approximately 150 people per month, including new and repeat users.

The Salvation Army located in Peace River provides a variety of community and family services to the region. The Peace River location and one office operated out of a garage in Berwynoffer, services up to the British Columbia border. The Thrift Store provides access to low cost household items and clothing, and takes in approximately 120 sales per day (Compton 2005, pers. comm.). Residential Services offer support by providing emergency shelter to people who are homeless or in danger of becoming homeless. Clients also have access to counselling, pastoral care, and appropriate referrals to other community services. In Peace River, the Family Services facility provides food to people on a daily basis and serves approximately 50 people per month; 70–80% of these are families and the rest are single individuals. A large proportion of the people using the services are Aboriginal women. The soup kitchen, which used to operate five days per

week, now runs on Monday, Wednesday, and Friday and serves from 20–30 people per day. Over the past few years, demand for Salvation Army services has remained steady. If the regional population were to increase, the Salvation Army would expect an increase in the use of their services (Compton 2005, pers. comm.). The Salvation Army is putting together a strategic plan by next June in order to upgrade their services (Compton 2006, pers. comm.).

2.3.3.6.3 Peace River

Peace River has many social service providers. The Peace River Childcare Association, which is run by a board of directors governed by Alberta Child and Family Services, operates three programs from one centre in Peace River:

- the Sugar Plum Tree Day Care
- Family Day Home
- the Out of School Program

The Sugar Tree Day Care centre is the only licensed daycare facility in Peace River and has the capacity to care for 80 children ages 13 months–six years. Four day homes provide childcare services and the Out of School Program can accommodate 30 children aged six–eight years before and after school. There are also several private child care providers. As of August 2006, there was a waiting list for the daycare, day homes were all in use, and the after school program was full (Koene 2006, pers. comm.). One of the largest issues faced by the daycare is retention of trained staff. Although the Peace River Child Care Association provides training, there is a high turn-over in staff and most people hired have very little training (Koene 2005, pers. comm.). The Sugar Plum Tree Day Care recently received accreditation status for providing an exceptional level of care (Grimmelt 2006).

The Family Resource Centre, funded through Alberta Child and Family Services, operates a number of programs for children under five years of age including mom and baby drop-ins, tot-time, and play and learn. It also offers kids play for children aged 5–9 years, dads and kids classes, meditation for parents, a men's network, La Leche League, and bereavement support. Programs for preschool children are offered through a number of organizations such as the Salvation Army, Peace River Playgroup Society and Nursery, and École Quatre Vents.

2.3.3.6.4 Grimshaw

The Town of Peace River operates the Family Community Support Services in Grimshaw which offers family programming and events, and is a referral service for people needing counselling or other family services (Halerewich 2005, pers. comm.). The Rainbow's End Day Care in Grimshaw is run by the Grimshaw District Early Childhood Development Society and has the capacity to care for 40 children aged 13 months and up. Additionally, the after school program for children up to 12 years old can accommodate up to 20 children. Staffing is sufficient to meet the needs of the 20–30 children in the day care program and the 15 children registered in the after school program. The day care is looking to expand its services to accommodate children less than 13 months. The day care also accommodates children from Peace River when other facilities are full (Monite 2005, pers. comm.).

2.3.3.6.5 Cadotte Lake and Little Buffalo

There is one daycare in Cadotte Lake, but there are no child care services in Little Buffalo.

2.3.3.6.6 Nampa, St. Isidore and Marie Reine

There are no licensed daycare services in Nampa, St. Isidore, or Marie Reine.

2.3.3.7 Transportation Infrastructure

2.3.3.7.1 Roads and Traffic

The RSA is serviced by Highway 2, a primary paved highway, and several secondary highways including 744, 743, 688, and 986. The Peace River Complex is accessible from Highway 986 via the existing Shell plant road (see Figure 2.2-1).

Highway 986 consists of a two-lane undivided roadway primarily running east/west, north of the Town of Peace River and services First Nation Reserves and resource industries in addition to the Project site. According to the AIT Highway Service Classification Map (2002), Highway 986 has a Class 2 service classification.

School buses operated by the Peace River and Holy Family Catholic School Divisions travel by the Shell facility road turnoff located along Highway 986. Ten school buses per day pass by the Shell facility Monday through Friday between 3:00–5:00 pm. Northlands School Division buses occasionally travel down Highway 986 for field trips.

According to AIT's three-year construction plan, some upgrading of Highway 986 will occur between 2005–2008. There will be secondary paving of a 23-km section of Highway 986 east of Cadotte Lake, and a 22-km section west of Lubicon River to Highway 88 will be paved in stages (AIT 2005b).

An upgrade of the road to Seal Lake was announced by Northern Sunrise County in September 2006. CCS Energy Services has applied to build an Oily Waste Treatment Recovery Disposal (TRD) Facility on the existing Shell plant road. This facility will receive oily waste by truck, and as such, Highway 986 and the existing Plant Road will see an increase in traffic volumes going to the CCS Energy Services Oily Waste TRD Facility.

The intersection of Highway 986 and the existing plant road is currently classified as a Type I Modified intersection. The 2005 weighted average annual daily traffic and weighted average summer daily traffic at this intersection was 700 vehicles/d and 610 vehicles/d, respectively (AIT, 2005a). The type of vehicle traveling on Highway 986 at this intersection is assumed to be similar to the type of traffic on Highway 986 in general:

- passenger vehicles: 78.6%
- single unit trucks: 6.1%
- tractor-trailer combinations: 14%
- miscellaneous (recreational vehicles, buses): 1.3%

The traffic volume along Highway 986 has grown over the past 20 years. The historical growth rate for traffic on Highway 986 is 1.5%, which has been tracked since 1985. The five-year and ten-year growth rates are both 2.9% (AIT 2005a).

To determine the traffic generated by the Peace River Complex at the intersection of Highway 986 and the existing Shell plant road, a 12 hour intersection turning movement count at the intersection on June 7, 2006 was conducted. The results from the traffic count on this date were converted to Annual Average Daily Traffic (AADT) and show that the AADT for vehicles accessing the existing Plant Road are 550 vehicles/d (see Table 2.3-20). Therefore, 550 of the 700 vehicles/day that travel on Highway 986 near the existing plant road are accessing that road. The breakdown by type of vehicle that accessed the existing plant road is shown in Table 2.3-20:

Table 2.3-20: Vehicles Accessing the Existing Plant Road – June 7, 2006

Type of Vehicle	Number of Vehicles/d	Percentage of Vehicles/d
Passenger vehicles	261	47
Single unit trucks	51	9
Tractor-trailer combinations	224	41
Miscellaneous (recreational vehicles, buses)	14	3
Totals	**550**	**100**

2.3.3.7.2 Rail

The Mackenzie Northern Railway was purchased by Canadian Nation Railways in 2006 and operates a 968-km regional railway through northwestern Alberta and into the Northwest Territories. The railway provides service to various carload freight customers handling forest products, petroleum, and agricultural products. It runs from Smith to High Prairie and north to Peace River, where it splits west to Hines Creek and north to Hay River (Canadian National Railways 2005, Internet site).

2.3.3.7.3 Air and Bus Service

There are no mass transit systems in any of the RSA communities, with the exception of a pilot program in the Town of Peace River that is scheduled to run until February 28, 2007, after which the Town will review the long-term viability of a public transportation system. School buses run throughout the RSA for both the public and separate school divisions. The Peace River Airport is located 10 km west of the Town and is owned and operated by the Town of Peace River. Its longest runway is 1,525 m with 737 jet capabilities. The terminal building is 1,950 m^2 in size (Town of Peace River 2005, Internet site). As part of a pilot project, Peace River has a bus service with two routes. If successful, it will be implemented full-time. Shell has an existing private airstrip located on the north side of Highway 986 that is currently not in use.

2.3.3.8 Utilities

2.3.3.8.1 Water

The Town of Peace River provides water, sewage, and waste disposal services to its residents. Water is piped from the Peace River and undergoes clarification, sedimentation, filtration, chlorination, and fluoridation treatments before delivery to residents (Town of Peace River 2005, Internet site). There are two water treatment plants and three reservoirs in Peace River. The main plant handles the majority of the town's supply while the second older facility is used as a backup. Future upgrades may be completed within the next two years (Wildeman 2005, pers. comm.).

The Town of Grimshaw's water is supplied by reservoir and a community well, and is distributed via a piped system. Sewage is collected by pipe and is treated in retention ponds consisting of eight anaerobic and five aerobic cells. Reservoir capacity is 5,908 m^3 (Alberta First 2005a, Internet site).

Northern Sunrise County provides municipal water and sewer in the hamlets of Marie Reine and St. Isidore, and Cadotte Lake will soon receive similar services. Rural residents can obtain water from County trunk water lines that service the East Peace Water Co-operative, which provides water to about 300 homes. Rural residents can also obtain water in bulk from keylock stations at Marie Reine, St. Isidore, Three Creeks, Harmon Valley, Reno, Cadotte Lake, and Little Buffalo.

The County is also looking at a broader water and sewer strategy that could involve industrial users including Shell. For additional discussion on this, refer to Volume I.

2.3.3.8.2 Waste Management

The East Peace Regional Landfill has transfer stations at Cadotte Lake, Little Buffalo, Harmon Valley, Reno, Marie Reine, and Nampa. The landfill is owned by the Regional Waste Authority, which is comprised of three partners: Northern Sunrise County, the Village of Nampa, and the Town of Peace River. Northern Sunrise County manages the landfill on behalf of the partners (McDougall 2006, pers. comm.). The East Peace Regional Landfill is located 11 km from the junction of Highway 2, north of Highway 688 on Township Road 840. Grimshaw is part of the Long Lake Regional Waste Management System.

The East Peace Regional Landfill is a Class 2 facility with ample space for municipal waste, and new cells are built as needed. The landfill plans to acquire land for their expansion by 2006 and will be able to handle a greater amount of construction waste. Canadian Crude Separators assists with marketing the landfill site and performing pre-approvals for industrial waste disposal (Miles 2005, pers. comm.). CCS Energy Services is planning to build an oily waste processing and disposal facility within the PDA.

In Peace River, residential garbage pickup is contracted to a private company, Allen Bros. Trucking Ltd. Recycle Plus, which is based out of Grande Prairie, provides residential recycling services for the Town of Peace River. Peace River and Northern Sunrise County are also members of the Northern Coordinated Action for Recycling Enterprises (McDougall 2005, pers. comm.).

2.4 Future Development without the Project

To assess the potential impact of the Project, future economic conditions in the RSA without the Project, are evaluated. In this scenario, the Peace River Complex would continue operating at current production levels for some period of time, after which, the operation would become unsustainable from a commercial perspective. For the purpose of this assessment, this is assumed to be in mid 2010.

The forecast of future conditions considers natural population growth plus announced or disclosed economic activities that will capture the expanding regional workforce as well as attracting workers from outside the RSA. A detailed discussion regarding future development effects, without the Project, is provided in Appendix JJ.

In summary, the closure of the existing Peace River Complex will be the largest single change occurring. This will result in the loss of about 100 full-time jobs, equivalent to about two-thirds of annual new jobs that would have to be created to accommodate natural increases in the workforce and maintain current levels of employment and unemployment. Unless new jobs can be found to accommodate former Peace River Complex employees, as well as the naturally increasing work force, unemployment will increase and people will leave the region in search of alternate employment. The loss of 100 jobs could result in a loss of about 275 people from the region; this represents about 2% of the regional population. People leaving the region would either be former employees unable to find suitable replacement work elsewhere in the region, or new recruits displaced by former employees who were able to find other employment in the region. The closure of the Peace River Complex would also result in a reduced assessment base for property taxes in Northern Sunrise County.

2.5 Application Scenario

For the purpose of the SEIA, the application scenario is compared against the baseline situation assuming the Peace River Complex is operating. To provide a comprehensive assessment of potential socio-economic impacts associated with Shell's activities in the region, the proposed Primary Development has been included in the Application Scenario.

2.5.1 Economic Impacts

The economic impact assessment identifies the incremental effect of Project construction and operation on the regional and provincial economies. A comparison has been carried out which reviews the Project employment and operations in the region and compares that to a base case that would reflect conditions if the Project was not developed. The base case for the Project assumes that existing operations will cease by mid 2010. Employment, income, taxes, and royalties resulting from construction and operation are considered net additions to the regional and provincial economies, although long-term increases in employment due to operations may act to offset employment losses that would otherwise result from closure. Given the differing magnitude and duration of impacts from construction and operation, the economic impacts of each phase of development are addressed separately. All financial values are expressed in 2006 dollars, unless indicated otherwise.

2.5.1.1 Construction

Project construction will be undertaken in phases. Phase 1 is planned to commence in 2008 with the development of access roads, wellpads and a central processing facility (CPF). Production at the facility is anticipated to commence as early as 2010, with well drilling continuing throughout operations. Construction of Phase 2 is scheduled to commence between 2011–2015 with additional wellpads, additional access roads, and the construction of a second CPF. As described in Section 2.2.2, 2017 was used as the production start date for Phase 2 in the SEIA as it provides a more conservative estimate of timing for regional economic benefits.

The Project is still in the conceptual planning phase and, as such, detailed engineering design and cost estimates are not available. Capital spending assumptions are derived from conceptual engineering design. The capital cost for the first phase of the Project has been estimated to be more than $1 billion. For the purpose of the SEIA, a full development cost of the first 20 years was assumed. Table 2.5-1 provides, in percentages, a breakdown of the capital costs for the Project in terms of engineering, the purchase of major equipment and other materials and services, and on-site construction and installation (including roads).

From a provincial perspective, the Project will generate employment and income during the Project construction. As shown in Table 2.5-2, about 92% of the total expenditures will be made in Alberta, including the Peace River and Grande Prairie regions. The remaining 8% will be used to purchase specialized major equipment, such as the planned cogeneration turbine, from suppliers' elsewhere in Canada or from other countries. It is currently expected that all of the engineering, purchase of major equipment and other materials and supplies, on-site construction, and installation can be provided by Alberta suppliers and the provincial work force.

The distribution of expenditures in Table 2.5-2 represents an initial assessment of expenditure patterns.

At the present time, of the expenditures expected to be made in Alberta, it is believed that about 10% will be primarily focussed on labour, goods, or services from suppliers in the RSA. This includes materials and services for on-site construction of the CPF and for drilling and completion of wells. Thus, 90% of Project spending within Alberta will occur outside the RSA.

Table 2.5-1: Breakdown of Assumed Costs for CPFs and Initial 20 Years of Pad Construction and Drilling

Cost Component	Phase 1[1] (%)	Phase 2 (%)	Total Project (%)
Engineering	3	3	6
Major equipment	12	12	24
Other materials and services	18	18	36
On site construction/installation (incl. roads)	17	17	34
Total	**50**	**50**	**100**

Note:
CPFs include cogeneration facilities
[1] Primary Development is included in Phase 1.

Table 2.5-2: Geographic Distribution of Assumed Costs for CPFs and Initial 20 Years of Pad Construction and Drilling

Cost Component	Phase 1[1] (%)	Phase 2 (%)	Total Project (%)
Peace River and Grande Prairie	4	5	9
Other Alberta	42	41	83
Canada	3	3	6
Foreign	1	1	2
Total	**50**	**50**	**100**

Note:
CPFs include cogeneration facilities
[1] Primary Development is included in Phase 1.

2.5.1.1.1 Construction Impacts on Regional Employment

A summary of regional employment impacts during the construction phase of the Project is provided in Table 2.5-3. During the construction of Phase 1 and 2, about 860 person-years of employment will be filled by residents in the RSA for both construction of the CPFs and drilling and completion of wells. About one-third of this (295 person-years) will be direct employment in construction. Peak regional employment will occur in 2009 and 2016 with about 120 person-years of employment in each year. The number of regional jobs affected by Project construction could actually be greater than the numbers shown in Table 2.5-3 as not all employment will be full-time.

To put this in context, the RSA, which has a relatively young demographic, each year will see 150 new people enter the labour force as they finish schooling and seek employment. In-migration to the RSA will also add to the number of people looking for work in the RSA. Therefore, the Project anticipates that it could draw about 860 person-years of employment from workers in the RSA, without creating a labour shortage. If it is possible to allocate more than the 860 person-years of employment to workers in the RSA without creating a labour shortage, then the Project would consider hiring more local workers.

Cadotte Lake Métis expressed a concern that Métis people living in and around Peace River will not obtain trades jobs related to the Project or other developments in the area because of Aboriginal barriers to employment.

2.5.1.1.2 Construction Impacts on Provincial Employment

Project construction will create various types of employment impacts in Alberta. Direct employment includes on-site construction and installation plus off-site engineering and fabrication of major components. Based on total Project spending, it is estimated that 8,510 person-years of employment will be required for the CPFs (Alberta Economic Multipliers 2001). About 4,490 person-years will be required for Phase 1 and 4,020 person-years for Phase 2. Annual employment for construction of the CPF is shown in Figure 2.5-1.

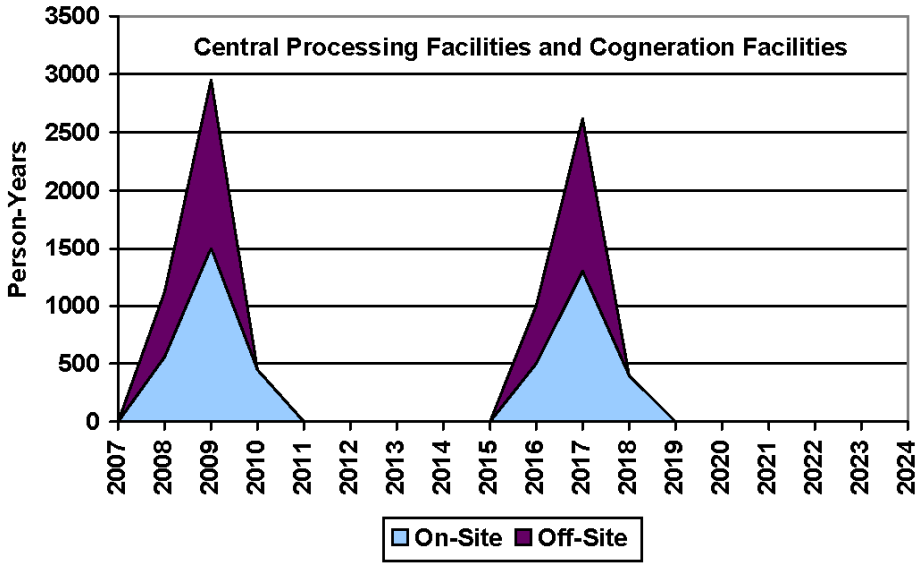
Construction of the processing facilities will directly generate on-site and off-site employment. It is estimated that, in the initial years of construction for each phase of the Project, the workforce will be split nearly equally between on-site and off-site employment, with all employment in the third year of construction being on site. The expected split between on-site and off-site employment is also shown in Figure 2.5-1. Thus, peak on-site construction is estimated to occur in 2009 with 1,500 person-years of employment. Another smaller peak (1,300 person-years) is estimated to occur in late 2016.

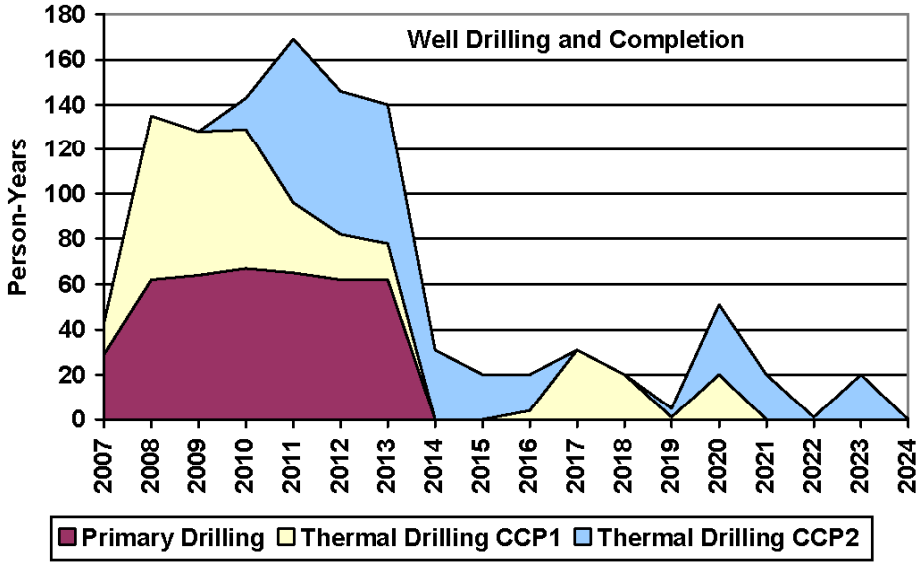
Initial drilling for both primary and thermal production are planned to commence in 2008. Workers will also be required at this time for logistics construction (roads and pads). Drilling of initial wells will peak between 2008–2010, decline through 2012, and occur sporadically after that as new wells and pads are required. A similar pattern would occur for Phase 2, with peak drilling occurring between 2015–2017. Annual Project employment in drilling is also shown in Figure 2.5-1. Over the period from 2007–2029, the cumulative employment associated with drilling and completions will amount to about 1,120 person-years.

About 50% of the workforce will be required to construct the CPFs, 30% for the field facilities (including drilling), and 20% for various other facilities. Figure 2.5-2 shows the mix of construction trades required to build the plant expansion and additional drill pads.

Direct economic activity in one sector also generates activity in other sectors. Information from Alberta Economic Multipliers (2001) indicates that for construction projects, these effects could amount to 69 indirect person-years and 62 induced person-years of employment for every 100 direct jobs. For the drilling component, a similar ratio of indirect and induced employment was assumed. Based on these assumptions, the direct employment for Project construction (8,510 person-years) including the plant and well drilling (1,120 person-years), can be expected to create about 12,785 indirect and induced person-years of employment in various sectors of the Alberta economy. The vast majority of these (87%) will result from construction of the CPFs.

In total, construction of the Project will create about 22,425 person-years of employment in the period from 2007–2029. As summarized in Table 2.5-3, about 31% of this employment would occur in 2009 due to work on the CPF for Phase 1, and another 27% would occur in 2016 as a result of construction the CPF for Phase 2. For every person-year of direct employment created by Project construction, there will be about 1.3 person-years of employment elsewhere in the provincial economy. However, the Project will only provide part-time employment for some workers, so the actual number of Alberta jobs affected by the Project will be larger than the annual totals shown in Table 2.5-4. If out-of province hiring does occur, actual total construction impacts will be less than shown in Table 2.5-4 for the reason that some of the expenditures of wages for out-of-province workers will be spent outside Alberta.





SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Direct Employment during Construction

DRAWN BY:	EDITED BY:	DATE
CB	TG	29 Nov 2006

APPROVED:	FIGURE:
CN	2.5-1

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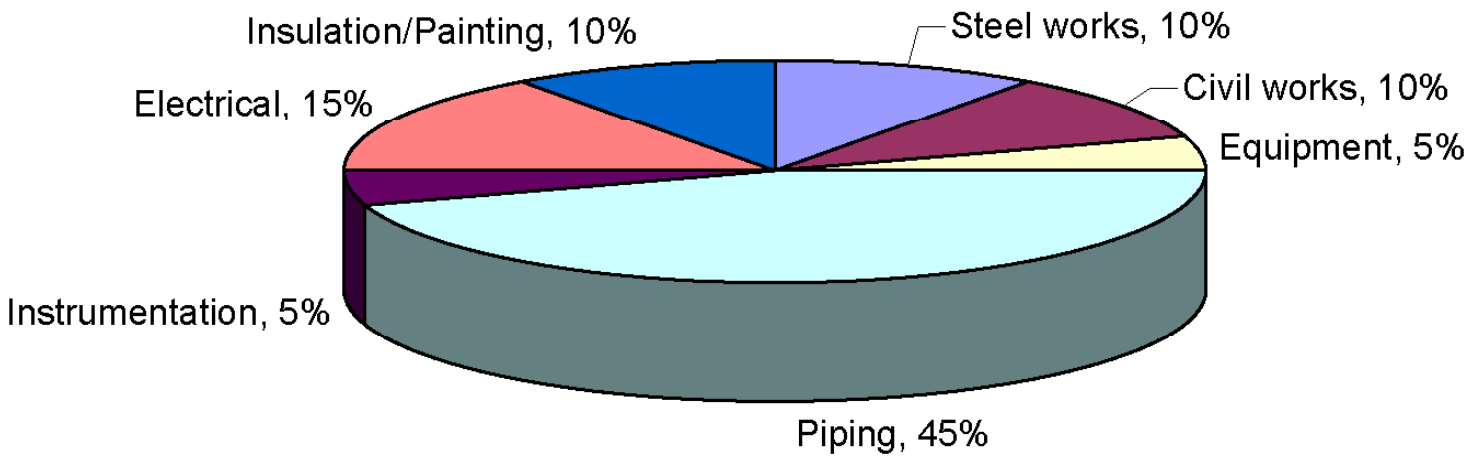

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Typical On-site Workforce Composition

DRAWN BY:	EDITED BY:	DATE
CB	TG	19 Oct 2006

APPROVED:	FIGURE:
CN	2.5-2

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Table 2.5-3: Summary of Regional Employment Impacts Associated with Project Construction (Person-years)

Impact	Source	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021 2029	Total (2007–2029)
Direct	Plant	0	50	50	50	0	0	0	0	50	50	45	0	0	0	0	295
	Drilling	5	8	8	8	8	8	7	7	7	7	7	7	2	7	0	125
	Total	5	58	58	58	8	8	7	7	57	57	52	7	2	7	29	420
Indirect and Induced	Plant	0	50	55	50	0	0	0	0	50	55	50	0	0	0	29	310
	Drilling	6	8	8	8	8	8	8	8	8	7	7	7	2	7	0	130
	Total	6	58	63	58	8	8	8	8	58	62	57	7	2	7	30	440
Total	**Plant**	**0**	**100**	**105**	**100**	**0**	**0**	**0**	**0**	**100**	**105**	**95**	**0**	**0**	**0**	**30**	**605**
	Drilling	**11**	**16**	**16**	**16**	**16**	**16**	**15**	**15**	**15**	**14**	**14**	**14**	**4**	**14**	**0**	**255**
	Total	**11**	**116**	**121**	**116**	**16**	**16**	**15**	**15**	**115**	**119**	**109**	**14**	**4**	**14**	**59**	**860**

Table 2.5-4: Summary of Provincial Employment Impacts Associated with Project Construction (Person-years)

Impact	Source	Component	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021-2029	Total (2007–2029)
Direct	Plant	On site	0	560	1,500	450	0	0	0	0	500	1,300	400	0	0	0	0	4,710
		Off site	0	560	1,420	0	0	0	0	0	500	1,320	0	0	0	0	0	3,800
		Subtotal	0	1,120	2,920	450	0	0	0	0	1,000	2,620	400	0	0	0	0	8,510
	Drilling	Primary	30	60	65	65	65	60	65	0	0	0	0	0	0	0	30	440
		Phase 1	15	75	65	65	30	20	15	0	0	5	30	20	0	20	15	375
		Phase 2	0	0	0	15	75	65	60	30	20	15	0	0	5	30	0	315
		Subtotal	45	135	130	145	170	145	140	30	20	20	30	20	5	50	45	1,130
	Total		45	1,255	3,050	595	170	145	140	30	1,020	2,640	430	20	5	50	45	9,640
Indirect and Induced	Plant		0	1,475	3,830	590	0	0	0	0	1,325	3,435	530	0	0	0	0	11,185
	Drilling		55	175	170	190	220	190	265	40	25	50	40	55	5	65	55	1,600
	Total		55	1,650	4,000	780	220	190	265	40	1,350	3,485	570	55	5	65	55	12,785
Total	**Plant**		0	**2,595**	**6,750**	**1,040**	0	0	0	0	**2,325**	**6,055**	**930**	0	0	0	0	**19,695**
	Drilling		**100**	**310**	**300**	**335**	**390**	**335**	**405**	**70**	**45**	**70**	**70**	**75**	**10**	**115**	**100**	**2,730**
	Total		**100**	**2,905**	**7,050**	**1,375**	**390**	**335**	**405**	**70**	**2,370**	**6,125**	**1,000**	**75**	**10**	**115**	**100**	**22,425**

2.5.1.2 Operation

Extraction and processing of the bitumen from Phase 1 is expected to commence as early as 2010 once construction of the CPF is completed. Production will gradually increase to an average of about 7,000 m^3/d between 2012–2016, at which time production from Phase 2 commences. Full production of about 16,000 m^3/d will commence when both Phase 1 and 2 are operating at capacity.

Figure 2.5-3 describes the annual non-energy operating costs. These include labour, well servicing, and general expenses such as maintenance, insurance, and chemicals.

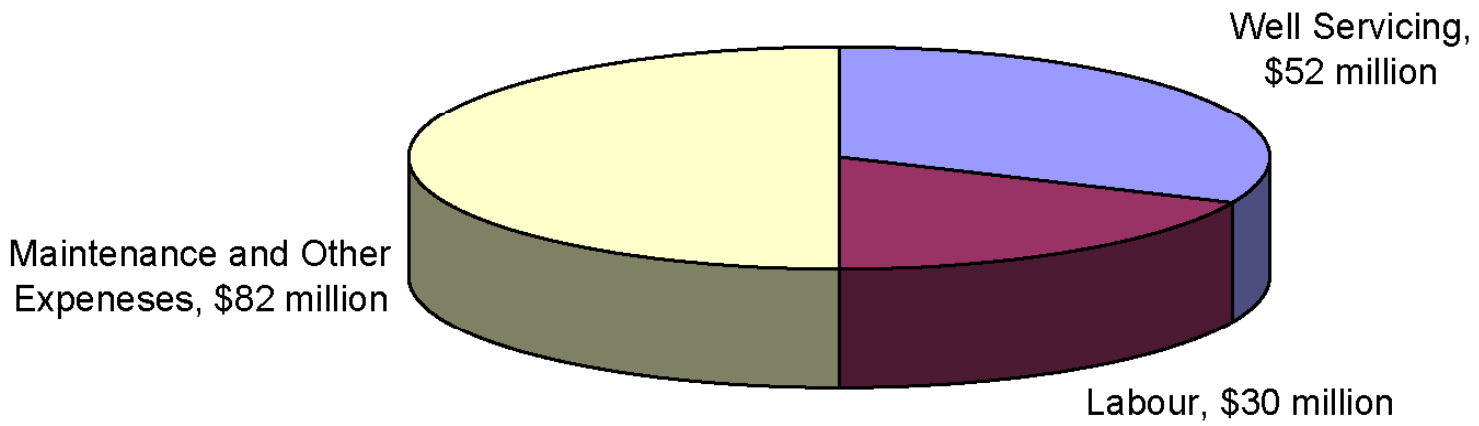
2.5.1.2.1 Operation Impacts on Regional Employment

Regional employment created by operation of Phase 1 would slightly offset job losses that would result if the Project did not proceed and the Peace River Complex closed. The Peace River Complex directly employs about 100 people and the operational workforce at Phase 1 is estimated to be 110 people. The additional 10 people to be employed at Phase 1 represent a net addition to the regional work force. Operation of Phase 2 would require an additional 60 people such that, at full capacity, the Project would employ 70 more people than at present.

Given the education and experience required for Project operations and the low levels of regional unemployment, it is expected that most of the 70 additional people required at the Project will have to be imported from outside the RSA. This number includes people who are either directly employed at the Project or who move into the RSA. Given current education and skill levels in the RSA work force, some of the direct operational jobs could be filled by residents in the RSA if they obtain the necessary training and skills, and if barriers to Aboriginal training and employment are addressed. Training and skill enhancement programs, as well as programs to address barriers to Aboriginal training and employment, are opportunities that the Project can support.

Direct regional employment would also result from the purchase of services and supplies in the RSA. The creation of 170 person-years of direct employment at the Project will generate about 530 person-years of induced and indirect employment in the Alberta economy. This is further discussed in Section 2.5.1.2.2. To determine how many of the 530 indirect and induced person-years of work would occur in the RSA, a review of current operational spending at the Peace River Complex was undertaken; purchases from companies in the RSA account for about 15% of annual expenditures. Assuming a similar expenditure for the Project, it is estimated that about 80 person-years of indirect and induced employment will occur annually in the RSA once Phase 1 and 2 are operating. The actual number of regional jobs that could benefit from these expenditures will exceed 80 because most indirect and induced employment effects will only provide part-time employment.

Based on a 15% annual local expenditure, it is assumed that 15% of indirect and induced employment will be within the RSA. This is equal to about 80 person-years of indirect and induced employment in the RSA. But the net effect on regional employment will be less. For existing operations at the Peace River Complex, it is estimated that current operational spending creates about 315 indirect and induced person-years of employment in Alberta, of which 50 person-years (15%) occur within the RSA. Thus, the incremental effect of the Project will be to create about 30 new person-years of employment for businesses in the RSA, over and above the current 50 person-years of employment generated by the Peace River Complex.



SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Composition of Non-energy Operating Costs

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In summary, the Project will annually generate about 250 person-years of employment in the RSA when operating at full capacity. This includes 170 direct jobs plus 80 person-years of indirect and induced employment. As the Peace River Complex already generates 100 direct jobs and 50 indirect and induced person-years of employment, the incremental job creation will be 70 direct jobs and 30 indirect and induced person years of employment.

It is expected that these 30 person-years of indirect and induced work can be accommodated through the natural expansion of the regional work force, especially if some of the barriers to Aboriginal employment are addressed.

2.5.1.2.2 Operation Impacts on Provincial Employment

Operations of Phase 1 will employ about 110 people. This number is equivalent to the size of the existing workforce at the Peace River Complex, plus about 10 additional employees and full-time contract workers. The estimates include Shell employees and contract workers. About 35% of the workforce at Phase 1 will operate the facility, 20% will be required for maintenance, 10% will be technical specialists, 15% will be involved in administration, and 20% will be contract services including general labour and janitorial services. When Phase 2 comes online, the operational workforce will increase by about 60 people, primarily operators, maintenance staff, and technicians. Thus, at full operations, the Project will directly employ about 170 people.

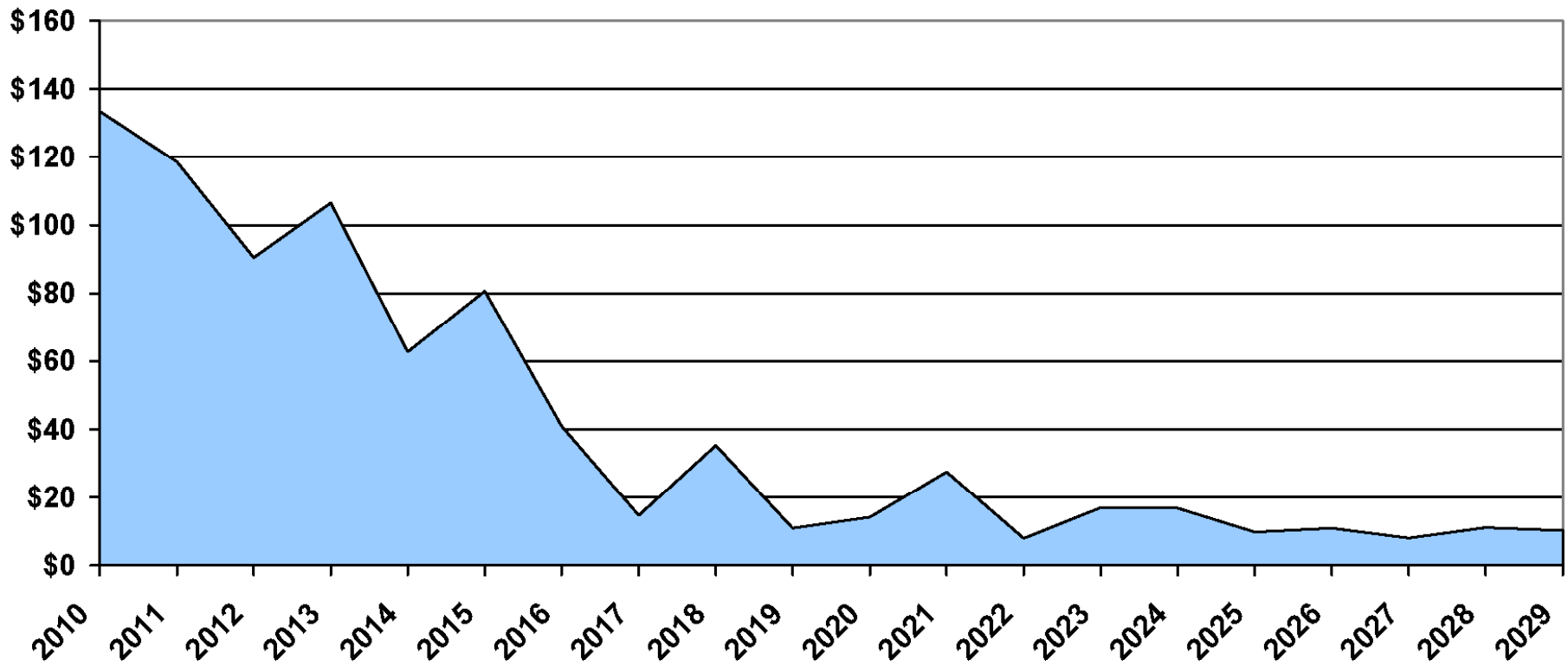
The petroleum and coal products manufacturing industry in Alberta, which includes upgraders and refineries, generates high spin-off employment in other sectors of the economy. According to the Alberta Economic Multipliers (2001), about 2.0 indirect person-years of employment are created for every direct person-year, and as many as 1.1 person-years of induced employment. These numbers capture the effect of producing oil and gas, processing it into its component fractions, transporting it to consumers and distributors for direct consumption, and value-added processing into plastics, fertilizers, and numerous other commodities. Thus, with Phase 1 and 2 in full production, total employment impacts in Alberta could be as high as 700 person-years (400 person-years from the existing Peace River Complex and 300 person-years from the Project's additional 70 direct jobs); however the number could be lower depending on how and where the bitumen is eventually used.

2.5.1.2.3 Operation Impacts on Government Revenues

Operations of the Project will generate revenues for the Federal, Provincial, and Municipal Governments through income taxes, royalties, and property taxes; GST is not included in this calculation. The actual amount of income taxes and royalties will vary from year to year according to the amounts of bitumen being produced and pricing at the time of production. The government revenue estimates reflect the anticipated production, hydrocarbon pricing forecasts from Chenery Dobson Resource Management Limited's "Survey of Hydrocarbon Price Forecasts Utilized by Canadian Petroleum Consultants and Canadian Banks" and current taxation and royalty policies.

Average income taxes during the initial 20-year period are projected to be about $75 million, with $50 million payable to the Federal Government and $25 million to the Alberta Government. Given the variable production, annual income taxes could amount to as much as $225 million in the peak year of production. These represent positive benefits to Canada and Alberta in the long-term.

Estimates of potential royalty payments to the Alberta Government are presented in Figure 2.5-4, and they assume that the structure and rates contained in existing royalty policies remain unchanged throughout the forecast period. Estimates of Alberta royalties will also vary over time in accordance with annual oil production and pricing at the time of production. Over the first 20 years of the Project, total royalties are projected to be about $800 million, or $40 million per year.



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Alberta Royalty Payments ($Millions 2006)

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Municipal taxes are levied on the market value of property and improvements, rather than income, and so are forecasted to remain relatively constant over time. Figure 2.5-5 shows the estimates of taxes payable to Northern Sunrise County. During the first phase of development, annual taxes are estimated to be about $6.5–7.0 million per year and this increases to about $10.0 million per year starting in 2017 once Phase 2 is developed. The majority of taxes are expected to be associated with the CPF, with annual property taxes of $8 million once Phase 2 is completed. As the number of operating wells will vary over time, the annual property tax payments will also change from year to year. The average annual municipal tax payment on wells is forecasted to be about $2 million per year although for the period of 2010–2029, this could range from $2–3 million. The Project is expected to ultimately generate annual property taxes of about $10 million for Northern Sunrise County, about 60% more than the $6 million per year in taxes that is currently being paid by the Peace River Complex.

2.5.2 Social Impacts

This assessment estimates potential impacts on demographics and key services and infrastructure as a result of an individual project and the cumulative impacts of other projects within a specific area. The social impacts are based on the influence of expenditures and revenues made by a project and the impacts these expenditures have on employment opportunities and composition of the work force. Employment opportunities and the structure of the workforce affect population and these, in turn, can alter demands placed on key services and infrastructure.

Initially changes in the population are associated with the construction phase of a project. The population impact at this stage is typically not large because the labour force often continues to live in and commute from their original community or workers are housed on site at a construction camp. Following the construction phase, there is a second population impact when long-term jobs are made available. If these jobs are not filled locally, long-term employees from outside the region are likely to relocate, bringing family members into the RSA.

Measurement of the Project's social impacts will consider population changes during both the construction and operation phases separately, and how changes in population impact the level and quality of services and infrastructure as described in the baseline section.

2.5.2.1 Construction

The Project is planned to begin construction as early as 2008, with Phase 1 operational as early as 2010. Phase 2 is scheduled to begin construction between 2011–2015 (see Section 2.5.1.1 for a more detailed description of construction workforce estimates). During on-site construction for both phases, Shell will generate an average of about 750–800 person years of work with a peak of 1,500 in late 2009 (see Figure 2.5-1). The assessment is based on an assumption that camps will be provided onsite during construction. The majority of construction workers will come from communities outside the RSA and travel to the Project construction camp for their shifts. For the purpose of this SEIA, it is assumed that non-local workers will not relocate on a permanent basis to the RSA during construction. Table 2.5-5 is a summary of the numbers of workers from outside the RSA who will be staying at the camps.

The presence of construction camps with 1,500–2,000 workers during peak construction has the potential to place additional demand on services and resources, and is a concern for stakeholders in the RSA. Shell is committed to addressing potential negative effects that this construction workforce may have in the RSA and, as such, Shell will provide transportation services to the construction site once the workforce reaches an appropriate size that warrants these services. As workers will primarily use the Project's transportation to the site, workers will not have their own vehicles and it will be difficult to travel to communities in the RSA. However, it is anticipated that some workers will still visit communities in the RSA after their work shifts. The potential effect of this workforce on individual social services and infrastructure is discussed below on a sector by sector basis.

Table 2.5-5: Summary of Workforce Residing in Camp during Shifts (Person-years)

Component	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021 - 2029	Total (2007–2029)
Non-Local-Plant	0	510	1,450	400	0	0	0	0	450	1,250	355	0	0	0	0	4,415
Non-Local-Drillers	40	127	122	137	162	137	133	23	13	13	23	13	3	43	6	995
Total	**40**	**637**	**1,572**	**537**	**162**	**137**	**133**	**23**	**463**	**1,263**	**378**	**13**	**3**	**43**	**6**	**5,410**

2.5.2.1.1 Construction Impacts on Housing and Accommodation

Housing prices have increased substantially within the past few years in Peace River and the surrounding communities. Given the prospect of development, there is potential for people to invest in the area's real estate market and increase housing prices further. Area residents have indicated that the situation is positive for people already in the market but not for those looking to buy a home in the near future. There is also concern that there will be a boom and bust scenario in the housing market (Johnson 2005, pers. comm.). The Métis association added a concern for increased homelessness due to lack of employment (Gardner 2005, pers. comm.).

Construction workers are assumed to stay at camp while working on the Project and are not expected to purchase homes in the RSA. Although affordable housing for single people is limited in the region, Project construction is expected to have no effect on the availability of affordable housing.

On days off, construction workers may stay in hotels and motels in Peace River or Grimshaw. As described in the baseline section, after the new hotel developments are complete, Grimshaw and Peace River will collectively have approximately 680 visitor rooms in addition to camping facilities in the area. Construction workers who choose to remain in the area during their days off may place a strain on visitor accommodation, resulting in low vacancy rates and displacement of tourists and other visitors to the region.

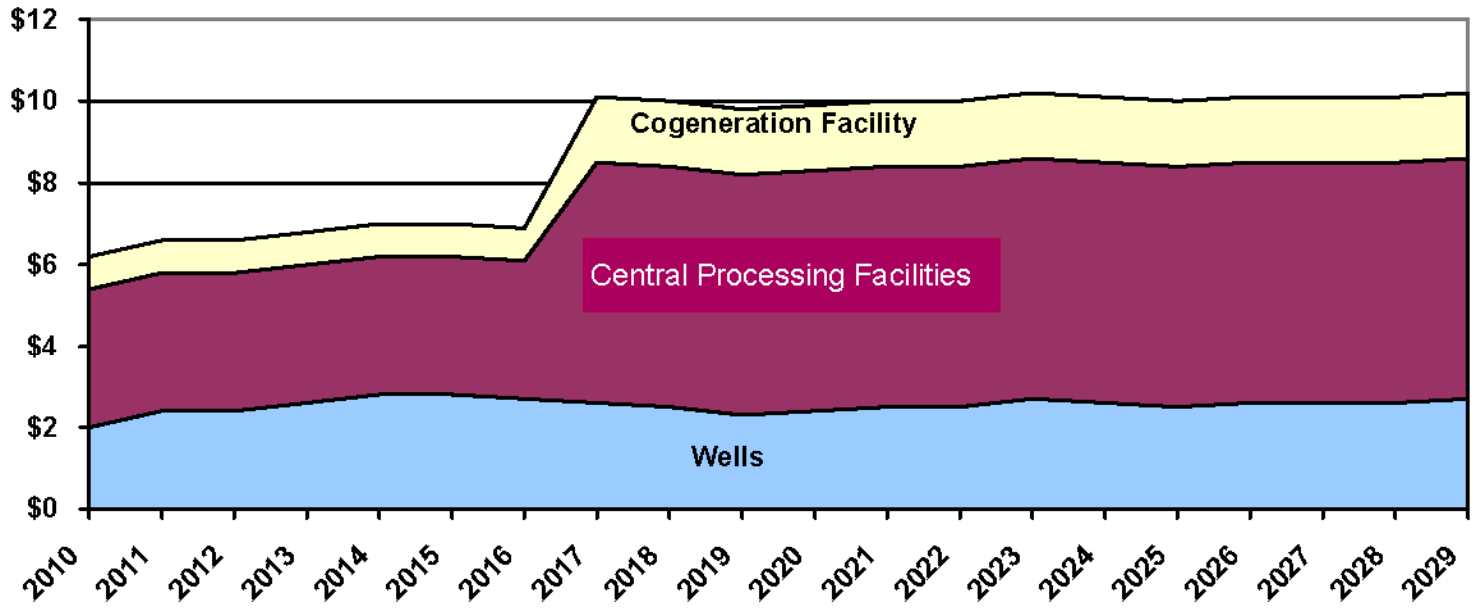
2.5.2.1.2 Construction Impacts on Education

A skilled construction workforce will be required to construct the Project. Construction workers hired by the Project are not expected to relocate to the region; therefore, no additional demand is anticipated for the education system. Increased or sustained enrolment in technical courses such as the proposed Aboriginal Pre-Tech program or Introduction to Trades through NAIT is expected in anticipation of work; this would positively benefit adult education and likely lead to the continuation of trades or training programs in the RSA.

2.5.2.1.3 Construction Impacts on Health Services

The RSA is serviced by a number of emergency medical service providers, including PREMS, Peace River Fire Department, and First Nation Ambulance Service based in Cadotte Lake. The RSA is also part of the Peace Country Health Region (Region 8), with a regional medical centre located in Peace River.

The Project will result in additional workers in the RSA for about 10 years (2008–2017). The Peace Country Health Region will face additional demand on services as a result of the Project, specifically in relation to emergency services. Shell will maintain and staff a health station as required by Alberta Occupational and Health Safety Code for high hazard isolated sites (Human Resources and Employment 2004) to treat emergency cases. The Project's medical aid station will help reduce demand on emergency medical services for cases requiring basic treatment (e.g., minor cuts and burns), however, beyond these basic cases, the Project will have to rely on emergency medical services in the RSA.



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Municipal Property Taxes ($Millions 2006)

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To determine the size of the potential effect on emergency services in the RSA (see Table 2.5-6) the following assumptions were made:

- construction workers who already live in the RSA would use the emergency room with or without the presence of the Project, so they are not considered new demand
- the workforce that lives outside the RSA will access the health services in the RSA during their rotations for everything beyond basic treatments; although these workers do not relocate to the RSA, they will rely on emergency services in the RSA for four days each week
- the volume of emergency room visits is proportionate to the size of the population, i.e., the current population of about 12,500 generates 19,000 emergency room visits each year (see Section 2.3.3.4)

Table 2.5-6: Summary of Potential Increase in Emergency Room Visits as a Result of Construction Workforce in RSA for Four Days Each Week

	Year										
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
RSA population	12,750	13,031	13,318	13,611	13,910	14,258	14,614	14,980	15,354	15,738	16,131
Population at workcamp from outside RSA	40	637	1,572	537	162	137	133	23	463	1,263	378
% Increase in RSA population with workforce	0.3	4.9	11.8	4.0	1.2	1.0	0.9	0.2	3.0	8.0	2.3
Potential increase in emergency room visits	35	530	1,280	430	125	100	100	20	330	870	250

During the peak construction years, the first as early as 2009 and the second between 2013–2017, the Project has the potential to increase demand on emergency medical services by about 10%, while the effect would range from 0.2-4.9% in other years.

If given sufficient notice of anticipated population growth, the facility could accommodate an increase in demand. Age cohort information would help the Health Centre prepare for an increased need for services such as obstetrics. In the past, industry has provided manuals outlining their health care needs and subsequently helped avoid stress on the system (Herritt 2006, pers. comm.; Petluk 2005, pers. comm.).

If given sufficient notice and information about health care requirements of the Project, the Peace River Community Health Centre indicated that they could accommodate an increase in use (Herrit 2005, pers. comm.; Petluk 2005, pers. comm.).

2.5.2.1.4 Construction Impacts on Protection Services

Protection services in the RSA include RCMP, fire protection, and emergency medical service. Emergency medical services were considered in the previous section with medical service providers, so this section focuses solely on RCMP and fire departments.

RCMP staff sergeants from Peace River and Grimshaw expressed a particular concern about the effect of the construction workforce (Haney 2006, pers. comm.; Larrey-King 2005, pers. comm.), including:

- increased use of hotels and campsites during off-work hours by construction workers could place an additional strain on protection
- responding to calls at the camp which on-site security cannot handle will draw on existing resources
- increased traffic during the Project construction period
- increase in transient population that might be drawn to the area on the speculation of work

From a policing perspective, an increase in population will place a strain on services if the RCMP is not given sufficient notice to prepare.

The RCMP is familiar with examples of oil and gas companies that work with community and county officials to support the hiring of new RCMP officers. Although this has not taken place in the RSA, the Peace River RCMP would certainly be in support of industry and government undertaking such an initiative (Haney 2006, pers. comm.).

The Peace River Fire Department indicated that the presence of a work camp could place additional demand on their service. A well-staffed and trained fire fighting unit at the camp and a mutual aid agreement with the Peace River Fire Department could help address this concern (Boucher 2006, pers. comm.).

2.5.2.1.5 Construction Impacts on Family and Community Services

There is a wide range of community and recreation facilities available to the Town of Peace River and surrounding communities. The effects on hunting, trapping and fishing from the Project were determined insignificant, as discussed in Volume IID, Section 5: Land and Resource Use.

Since it is assumed that workers will not relocate to the region, construction crews will not place an additional strain on most family and community services, such as youth social workers. However, the Project could increase demand on family and community services for the following reasons:

- potential influx of transient population (with children) looking to work on the Project
- lack of counselling support offered for contract workers and small businesses working on the Project

The implementation of prevention and educational programs by the Project is viewed as one of the most effective measures to reduce the demand on treatment services. AADAC is interested in working with Shell on their drug and alcohol policies, especially for the construction phase and regarding contractors (Johnson 2006, pers. comm.).

2.5.2.1.6 Construction Impacts on Transportation

The Project's construction will generate additional traffic on roads in the RSA. It is estimated that the flow of traffic associated with the Project's construction should peak in 2009 with approximately 500 vehicles/d and then steadily decrease year by year until 2020 when it should settle at 90 vehicles/d. The 500 vehicles/d peak would be at the intersection of Highway 986 and the existing plant road. The exact route that all Project traffic would take to the Project site will vary depending on the point of origin of the vehicle. For this assessment, it is assumed that the traffic would be evenly split over the routes in the RSA. To assess the worst-case scenario, this assessment focuses on the point where this traffic would eventually merge – the intersection of Highway 986 and the existing plant road.

The effects of traffic at the intersection of Highway 986 and the existing Plant Road were evaluated using an InterSection Design System Program and the Synchro/SimTraffic software

package, developed by Trafficware Ltd. A summary of the assessment is included here for the construction phase and in Section 2.5.2.2.7 for operations of the Project.

The baseline traffic volumes for the intersection of Highway 986 and the existing Plant Road were projected forward to 2009 for the construction phase of the Project. The baseline volumes were multiplied by the 5-year historical growth rate of 2.871%, and then the projected traffic for both the Project and the CCS Energy Services were added on to this future baseline volume. The Synchro/SimTraffic program then projected an AADT for the intersection of about 1,125 vehicles/d. This would be an increase of about 30 percent over future baseline traffic volumes. Of this total, about 860 vehicles/d will be turning onto or off of the existing Plant Road, of which about 500 vehicles/d would be directly associated with Project construction.

As described in the baseline section, Highway 986 is considered a Class 2 Highway, and the intersection at the existing Plant Road is a Type I Modified intersection. This increase in traffic would be within the design specifications of a Class 2 Highway in Alberta; however this volume would exceed the suggested traffic volumes for a Type I Modified intersection. The projected volume of traffic would best be served by a Type IIb intersection. A description of the modifications to raise the intersection to a Type IIb standard are described in detail in Appendix KK.

Transportation of construction workers to the RSA might also include travel by air, which will mean either additional flights at the Peace River Airport, or Shell may fly workers directly into the existing private airstrip. Airstrip upgrades are under consideration.

2.5.2.1.7 Construction Impacts on Utilities

Based on the assumption that there will be no population increase during construction, the Project's effect on utilities including water and waste management will be negligible. The construction camp will have self-contained water treatment and wastewater handling facilities and, therefore, will not rely on public infrastructure for these services.

2.5.2.2 Operation

The social impacts of operating the Project are described after the following discussion of population effects.

2.5.2.2.1 Operation Impacts on Population

Operation of Phase 1 is scheduled to begin in 2010. Phase 2 is assumed to be operational by 2017 as this provides a more conservative estimate of regional economic benefits. Section 2.5.1.2.1 contains a detailed discussion of the regional employment effect of the Project's operation.

To determine the population effect of the incremental jobs, the following assumptions were made:

- most of the 70 additional direct jobs required at the Project will have to be filled by workers from outside the RSA. The population of the region is expected to increase at 2.2% per year in the short run as workers from other parts of Alberta, or likely from outside of Alberta, move into the area to work. This number includes people who are either directly employed at the facility or who move into the RSA to replace any existing regional residents and have the expertise and willingness to leave an existing job in order to work at the Project
- given current education and skill levels in the RSA work force, a small number of the direct operational jobs could be filled by residents in the RSA if training and skills enhancement programs are supported by the Project and if barriers to Aboriginal training and employment are addressed

- it is expected that the 30 person-years of indirect and induced work can be filled by workers who already reside in the RSA through the natural expansion of the regional work force, especially if some of the barriers to Aboriginal employment are addressed. In addition to the in-migration of workers from outside of the RSA, the RSA also has a relatively young demographic, and about 150 new jobs will have to created each year as young people finish schooling and move into the workforce within the RSA. As described in Appendix JJ, about one-third of these young people entering the workforce will be Aboriginal
- about 90 people will permanently move into the area as a result of new employment. These people will either be directly employed by the Project or will move into the region to replace existing regional residents who leave an existing job to work on the Project
- each worker who moves into the RSA to fill an operational job will bring one spouse and one dependent with them (which is consistent with the average household size for the region as per the 2001 Census)

The population increase as a result of the Project's operation could be as high as 300 for the RSA (see Table 2.5-7) if the Project is unable to employ workers from the RSA in many of the indirect and induced jobs, and some of the direct jobs. This number reflects the fact that the current Peace River Complex is already generating a considerable amount of indirect and induced employment in the RSA and, therefore, the population effects of Phase 1 and 2 will be somewhat muted. It also reemphasizes the importance of the continued employment of the 100 workers at the Peace River Complex to the RSA population base, as many of the goods and services that will be needed for Phase 1 and 2 are already being purchased in the RSA for the operations of Peace River Complex.

Table 2.5-7: Population Increase for Project Operations

	2010		2017		Total
	Workers	Spouses and Dependents	Workers	Spouses and Dependents	
Direct	10	20	60	120	210
Indirect and Induced	5	10	25	50	90
Sub Total	15	30	85	170	
Total	**45**		**255**		**300**

For the purpose of this SEIA it is assumed that the 90 people associated with the indirect and induced work already live in the RSA, while the 210 people associated with the direct jobs are new to the RSA. This may overstate the effects of the Project on social services and infrastructure if the Project is able to find and train workers from the RSA with the necessary job skills. The effect of 210 people will be assessed for each of the individual social services and infrastructure in the following sections.

In addition to the 210 people who would move to the region on a permanent basis for the Project, there is also the potential for transient workers to come to the area looking for work, although they may not have the skill sets needed to work on industrial projects. Service providers in the region have noticed an influx of transient workers after the announcement of large development projects (Klemchuk 2005, pers. comm.; Larrey-King 2005, pers. comm.; Haney 2005, pers. comm.). These workers typically stay in the area on a short-term basis (3–12 months), but can place additional pressure on certain service providers. Where applicable, a description of the effect of these transient workers on service providers is included below.

2.5.2.2.2 Operation Impacts on Housing and Accommodation

In the Peace River region, in-migration of employees for the Project's operations is expected to result in the need for approximately 10 new homes in 2010 and another 60 in 2017. Given the low supply of rental properties and the long-term nature of the operations jobs, new residents will likely either buy a home in Peace River, Grimshaw, or the surrounding region.

As the population is predicted to grow by 2.2% until 2011 and 2.5% after this, without the influence of the Project, the number of new homes needed to meet the projected population growth will be about 120 homes per year between 2007–2018. The additional demand of 10 homes in 2010 generated by the Project will likely be met as part of the future demand in the RSA. The additional demand of 60 homes in 2017 will require advanced planning in order ensure this one-time demand does not cause a shortage in supply and a corresponding increase in prices.

The Town of Peace River is likely to become home to the majority of new workers and, as such, will supply many of the new homes. As discussed in the baseline section, the Town's growth study indicates that Peace River has the land base within its current boundaries to support this housing growth in the next ten years. The growth study indicates that 1,567 new dwellings will be needed by 2015 (Brown and Associates 2006), which is higher than the estimate in this study.

Housing in Cadotte Lake may also become an issue as the Project will look to employ Aboriginal people. This may draw members currently living off-reserve back to the community, which will increase demand on housing. For the Woodland Cree First Nation, this could be a particularly important issue as new houses are funded by Indian and Northern Affairs Canada with no automatic, and certainly no immediate, link between population increases and the number of houses funded.

Housing prices have increased substantially within the past few years in the RSA. Given the projected growth in the RSA, this trend is likely to continue as the demand for housing keeps pace with, or slightly outgrows, supply. This will be especially true for the cost of labour to build homes since construction crews may be in limited supply in the short-term. Similar to the issues discussed for the Project's construction period, the prospect of development in the area may lead people to invest in the area's real estate market and push housing prices up further.

In relation to affordable housing, the North Peace Housing Foundation is particularly concerned that people moving into the region for Project-related jobs will put added pressure onto an already burdened system. If vacancy rates for rental units continue to remain low, there will be little incentive for landlords to offer low-income units to individuals or families. The issue of affordable housing in the region will continue to be a concern.

2.5.2.2.3 Operation Impacts on Education

Project operations are expected to result in approximately 210 new residents in the RSA. Of this total, 70 would be dependents. Based on 2001 census data, approximately 23% of the population would be of school age. Thus, of the 70 dependents, it is likely that about 50 of these people could enter the school system during the operations phase. The Public, Catholic, and Francophone school systems have existing excess capacity and would easily absorb these students. The population growth projected without the Project (2.2% until 2011 and 2.5% after this) indicates that the education systems in the RSA will see an additional 80 students each year. These new students are assumed to be spread out evenly over Grades 1–12, and they will be distributed among the different communities in the RSA. As a comparison, the PRSD and the HFCRD have a combined enrolment of about 3,300 students, and have the capacity to handle an additional 1,700 students given their current infrastructure. Therefore, the addition of 80 students per year as part of projected background population growth, along with 7 students per year that the Project will generate, should not create issues for educational service providers.

In relation to adult education, the employment positions for operations jobs at the plant will require advanced levels of education and training. These opportunities may stimulate the demand for post-secondary and technical college training. NAIT offers courses through campuses in Peace River, Fairview, Grand Prairie, and High Level. Additionally, there are distance-learning options accessible to people in the region. These educational services would be able to accommodate an increase in enrolment.

2.5.2.2.4 Operation Impacts on Health Services

Health service providers in the RSA are facing increasing demands as the province's population increases and as the general population ages.

As with many areas in Alberta, the ability of new residents to find a family doctor may pose a challenge. As there is currently a shortage of family doctors in the RSA, any new residents will experience waiting lists for non-emergency services such as annual check-ups.

Peace River Community Health Centre, the Peace River Associate Medical Clinic, and the Grimshaw Berwyn Community Health Complex would have to handle the majority of the increase in demand for health services created by a growing population in the RSA. The population is expected to increase even without the Project, and will add about 350 people to the RSA. The increase in population created by the Project per year over the next ten years (30 people in 2010 and 180 in 2017) would be difficult for health service providers to notice outside of the population growth. All health services providers are experiencing high demand on their services, but the Peace River Associate Medical Clinic will not be able to accommodate this new demand without additional resources and doctors. As a result, the waiting time for medical services by a family doctor will likely become longer.

An analysis of the potential impacts on human health as a result of environmental changes caused by the Project is presented in Volume IIA, Section 5: Human Health Risk Assessment. The conclusions of this study indicate that the Project will not have an adverse effect on human health in the RSA.

2.5.2.2.5 Operation Impacts on Protection Services

The baseline information indicated the RCMP is concerned about any new developments in the area that could lead to increased traffic or bring large numbers of people to the region. As the Project's operation will contribute to increased traffic volumes and will bring new residents to the region, it is assumed the RCMP will see an increase in demand for their services. Increases in demand for policing services and increases in regional population can be mitigated with the addition of new officers. The RCMP will face a challenge, in that the recruitment and training cycle takes 18 months before an officer is ready to be added to the detachment. It is assumed that the RCMP will be able to accommodate the increased demand if information on increased population is shared at least two years in advance of operations (Haney 2005, pers. comm.; Larrey-King 2005, pers. comm.).

As the population is predicted to grow by 2.2% until 2011 and 2.5% after this, even if the Project does not proceed, the RCMP will experience an increase in demand as a result of a larger population. If the RCMP detachments in Peace River and Grimshaw maintain roughly the same ratio of one officer for 900 residents, they will need to add about one new officer every 2–3 years. The addition of 30 people in 2010 and 180 in 2017, as a result of the Project, could be integrated into the RCMP's growth plan operations (Haney 2005, pers. comm.; Larrey-King 2005, pers. comm.).

The RCMP is also concerned about the potential for transient workers to be drawn into the area with the announcement of the Project, although they expect the effect to be short-term.

Between PREMS and fire services in the area, the projected increase in population can be accommodated given current staffing levels and plans for future growth (Thordarson 2005, pers. comm.).

2.5.2.2.6 Operation Impacts on Family and Community Services

Recreation

The RSA has a variety of recreational services and facilities available. As the Project will attract 210 new residents to the RSA, there is some potential for demand on these services to increase.

Families are expected to make up much of the population increase, and it is likely that they will access many of the recreational facilities available in Peace River. Facilities such as the arena, indoor pool, and curling rink, as well as the ski hill and hiking trails, would likely see increased usage. These facilities are currently well used, but have some space for additional use (Wraight 2005, pers. comm.). For example, as a result of the projected background population growth, hockey leagues in the RSA could see an additional 80 players spread out over the various age levels for both boys and girls. The existing leagues would be able to accommodate these new players, provided that community members are willing to volunteer for the leagues.

Social Services and Childcare

It is assumed that most social services will continue to operate at close to full capacity, and this trend will continue in the future when the Project's operations begin. The addition of about 350 new residents in the RSA as a result of projected population growth (without the Project) will increase demand; however, if unemployment remains low, the increased demand will be muted. Service providers have found that new residents who are working do not place as large a demand on their services. However, the service providers are concerned that the Project and growth in the RSA will attract transient workers who do not have the skill sets obtain employment. These individuals have historically placed demands on their services (Johnson 2006, pers. comm.; Compton 2005, pers. comm.). AADAC in Peace River is ill-prepared with respect to staff and funding for any increase in population in the region.

Of particular concern in the RSA is the high demand on licensed childcare services. New residents will place an additional strain on these services. As there are already long waiting lists for this service, additional population will make this wait even longer.

2.5.2.2.7 Operation Impacts on Transportation

The effects of traffic at the intersection of Highway 986 and the existing plant road were evaluated using an InterSection Design System Program and Synchro/SimTraffic software package. The Project's operations will increase traffic volumes in the RSA, specifically at the intersection of Highway 986 and the existing Shell plant road. Future background traffic volumes at the existing intersection were determined using the long-term historical growth rate of 1.5% to the year 2029. The projected vehicle traffic associated with the Project and the CCS Energy Services facility were then added on to this total.

The projected average annual daily traffic at the intersection will be about 1,160 vehicles/d in 2026 based on the Synchro/SimTraffic program. Of this total, about 630 vehicles/d will be turning onto or off of the existing Plant Road, of which about 90 vehicles/d would be directly associated with the Project's operation. This volume of traffic would be within the design capacity of Highway 986 and if the intersection is upgraded to a Type IIb standard by 2009, the intersection would be able to handle the projected volume of traffic during Project operations.

2.5.2.2.8 Operation Impacts on Utilities

The effect on utilities will be based on a population increase from both the projected background population growth as well as population growth from the Project. Assuming new residents relocate to the Town of Peace River or Grimshaw, there is excess capacity to support a larger population base in both of these communities. CCS Energy Services has applied to build an Oily Waste Treatment Recovery Disposal Facility on the existing Shell plant road. Should this site be used to treat wastes from the Project, it may reduce the need for waste transportation on the public road system.

2.6 Cumulative Effects Scenario

Appendix JJ of this report describes the normal growth scenario for the RSA, based on demographic characteristics and a review of the other actions that are expected to drive regional economic growth in the area in the near future. Appendix JJ also describes a list of known projects that have been approved or proposed. The analysis concludes that at least 150 new jobs per year would have to be created in the RSA in order to accommodate normal increases in the regional labour force, and this number would increase over time as the population grows.

The review of approved and reasonably foreseeable projects for the RSA does not indicate any new projects that individually or cumulatively would place demands on the regional labour force that could not be accommodated by its normal expansion. Furthermore, discussions with key informants during determination of baseline conditions indicated that municipal governments and health, education, and protection service providers have factored normal population growth into their business and operating plans. Thus, for this SEIA, no cumulative impacts within the RSA are anticipated beyond the expected Project impacts. There are expected cumulative impacts on the provincial workforce with the Project competing for skilled construction workers with a variety of other major energy projects in the Fort McMurray area and elsewhere in Alberta and western Canada. However, the Government of Alberta is aware of the potential difficulties resulting from cumulative labour demands and is developing policies and implementing programs to address these problems.

2.7 Mitigation

Mitigation implemented by Shell is based on 25 years of operational experience and Shell has a high degree of confidence in their effectiveness. In keeping with the principle of adaptive management, Phase 2 of the Thermal Development will implement improvements learned from Phase 1.

Table 2.7-1 outlines mitigation measures proposed by Shell, to help avoid or minimize potential effects from the Project's construction and operations phases on the RSA.

Table 2.7-1: Socio-Economic Mitigation Measures

Municipal

- Work with all regional municipalities to keep them informed of development plans and timing of key project milestones

Employment

- Develop a detailed summary of the types of jobs and contractors required for construction and operation of the Project
- Share information regarding skills required directly with educational organizations such as NAIT
- Establish a local business registry in conjunction with the Peace River Chamber of Commerce that would help Shell to assess local capacity and business interest
- Develop in conjunction with the Peace River Chamber of Commerce workshops to inform contractors of Shell's contracting process
- Break-down work packages where appropriate to facilitate Aboriginal and local business participation
- Give preference where appropriate to local Aboriginal and local business providers, who are cost competitive and can meet Shell's pre-qualification requirements including safety, quality, and delivery standards
- Work with Aboriginal communities to address the barriers to Aboriginal employment (e.g. provision of transportation to the work site)

Housing

- Share information on the timing of new staffing levels with regional communities and the Northern Peace Housing Foundation, so that they may better identify and plan housing development needs that could be created by the Project
- Plan to build temporary construction camps adjacent to the work site. This will help avoid additional housing strains

Social and Community Services

- Share information with RCMP, local communities, or county officials to help them identify additional policing requirements
- Meet with RCMP in advance of the Project's construction to communicate Shell's security plan at the construction camps
- Develop an appropriate fire prevention and intervention program for the Project, in consultation with the Peace River Area Fire Services Advisory Committee and continue membership in the mutual aid program in the area
- Continue to contribute to the long-term productivity and the health of the community through the Shell Community Investment Program and Community Service Fund. Key focus areas include:
    - Education
    - Health and social agencies
    - Growth-related initiatives related to the Project
    - Aboriginal projects
    - Aboriginal cultural programs

Table 2.7-1: Socio-Economic Mitigation Measures (Cont'd)

Health Services

To reduce the impact of the Project on regional health service providers, Shell is planning to:

- Provide medical services for construction workers at the site
- Share information on construction and operation staffing levels with regional health care authorities and providers for planning purposes
- Work with local emergency service and health care providers to establish appropriate emergency response plans
- Promote health and well being at construction camps
- Continue consultation with Peace Regional Emergency Medical Services and Peace River's health and wellness organizations regarding their endeavours to meet the needs of the community

Education

- Support education initiatives, such as the development of scholarships and apprenticeship programs, with regional educational institutions
- Provide education boards in the Peace River region with information on the schedule for Project hiring
- Shell is committed to developing a Socio-Economic Agreement with locally identified Aboriginal communities. This agreement is intended to address such things as education, environmental stewardship, and economic development

Transportation

Shell will develop a traffic management plan. Key traffic mitigation measures that Shell will consider include:

- Having temporary construction camps on-site to reduce the need for a daily commute
- Implementing a drug and alcohol policy and program for contractors and employees
- Providing bus service for the local construction workers once the workforce reaches an appropriate size that warrants bus transportation, and for operations workers
- Providing air transportation service from a major hub (e.g., Edmonton) for non-local workers once the workforce reaches an appropriate size that warrants air transportation
- Educating employees and contractors on Shell's driver safety standards
- Scheduling heavy hauls and over-sized loads to minimize interference with school bus traffic
- Making reasonable efforts to schedule over-sized loads to minimize interference with local agricultural producers
- Working with government and industry in the region on traffic management
- Upgrading the intersection of the plant road and highway, if necessary
- Working with other land users within the PDA to coordinate safe and reliable access through the Shell lease area

2.8 Residual Impact Classification

2.8.1 Economic Impacts

2.8.1.1 Construction

2.8.1.1.1 Regional Employment

The beneficial effect on regional employment is predicted to be positive in direction, regional in geographic extent, negligible in magnitude, and short-term in duration; therefore a Class 4 impact. Confidence is high.

2.8.1.1.2 Provincial Employment

The beneficial effect on provincial employment is predicted to be positive in direction, provincial in geographic extent, negligible in magnitude, and short-term in duration; therefore a Class 4 impact. Confidence is high.

2.8.1.2 Operation

2.8.1.2.1 Regional Employment

The net effect of the Project's operation on regional employment is predicted to be positive in direction, regional in geographic extent, negligible in magnitude, and mid-term. This is a Class 4 impact. It should be noted that if the Project does not proceed and the Peace River Complex closes, there would be a notable decline in regional employment, especially for the Town of Peace River. Confidence is high.

2.8.1.2.2 Provincial Employment

From a provincial perspective, the employment impacts of operation of the Project would be positive in direction, provincial in geographic extent, negligible in magnitude, mid-term in duration, and therefore a Class 4 impact. Confidence is high.

2.8.1.2.3 Government Revenues

The net effect of the Project's operation on government is predicted to be positive in direction, provincial in geographic extent, negligible in magnitude, and mid-term. This is a Class 4 impact. Confidence is high.

2.8.2 Social Impacts

2.8.2.1 Construction

2.8.2.1.1 Housing and Accommodation

The potential impact on housing and accommodation is predicted to be negative in direction due to the potential for some workers to remain in the region during their days off. Impacts are regional in geographic extent, negligible in magnitude, and short-term in duration. While construction is not expected to affect housing prices or availability, the potential for workers to remain in the region may place seasonal pressures on accommodations and campgrounds. This is considered a Class 3 impact as there is contribution to impacts. Confidence is moderate.

2.8.2.1.2 Education

Education and training programs may benefit from increased enrolment and funding in anticipation of additional work opportunities. The PRSD is confident that school capacities will be able to meet future population increases (Woronuk 2006, pers. comm.), especially considering that the Nampa school is undergoing a $2.05 million upgrade (Gazette 2006e).

The potential effect on education is predicted to be positive in direction, regional in geographic extent, negligible in magnitude, and short-term in duration. As this is positive, it is considered a Class 4 impact. Confidence is high.

2.8.2.1.3 Health Services

The potential effect on health services (specifically emergency services) is predicted to be negative in direction, regional in geographic extent, low to moderate in magnitude as the Project may increase demand on emergency medical services by about 10% during peak construction, while the effect would range from 0.2-4.9% in other years. Duration is short-term for the construction period. This is considered a Class 2 impact, as monitoring will need be undertaken to ensure that the mitigative procedures are effective in reducing the potential impact. Confidence is moderate.

2.8.2.1.4 Protective Services

Potential effect on protective services (specifically RCMP and fire protection) is predicted to be negative in direction, regional in geographic extent, low to moderate in magnitude, and short-term in duration. This is considered a Class 2 impact, as monitoring will need to be undertaken to ensure that the mitigative procedures are effective in reducing the potential impact. Confidence is moderate.

2.8.2.1.5 Family and Community Services

As most construction workers will reside in the construction camp the potential effect on family and community services is negligible in magnitude. Impacts are predicted to be negative in direction, regional in geographic extent, and short-term in duration. While only negligible, there is contribution to impacts and, therefore a Class 3 impact. Confidence is moderate.

2.8.2.1.6 Transportation

The potential effect on transportation infrastructure is predicted to be negative in direction, regional in geographic extent, negligible in magnitude, short-term in duration and, therefore, a Class 3 impact.

2.8.2.1.7 Utilities

Water and disposal services at the construction camp, will not affect the public use of infrastructure. As a result, the potential effect on utilities is predicted to be negative in direction, regional in geographic extent, negligible in magnitude in relation to public usage of utilities, short-term in duration and, therefore, a Class 3 impact. Confidence is moderate.

2.8.2.2 Operation

2.8.2.2.1 Housing and Accommodation

The potential impact on housing is predicted to be negative in direction, regional in geographic extent, and negligible in magnitude in every year except for 2017. This is a mid-term duration impact, lasting for the operation life of the Project. As the region is expected to be able to accommodate the impacts of operation, albeit with need for long-term planning, the impact class is considered Class 3, as the Project will contribute to the effects on regional housing requirements. Confidence is moderate.

2.8.2.2.2 Education

The potential impact on education is predicted to be negative in direction, regional in geographic extent, negligible in magnitude, mid-term in duration. As schools currently are projected to have excess capacity, this is considered a Class 3 impact as there will be changes resulting from the Project, but no issues arising from these changes. Confidence is high.

2.8.2.2.3 Health Services

Project operation will contribute to stress on existing medical services. However the current health services situation is stressed both regionally and provincially. The Project effect on health services is predicted to be negligible in magnitude (due to the lack of family doctors) as the Project will add to the regional population but will have only a small effect within the expected population growth. This issue is regional in geographic extent and mid-term in duration. The Project will contribute to this impact and the impact is Class 3. Confidence is moderate.

2.8.2.2.4 Protection Services

Project operation will contribute to stress on protection services. However, the RCMP, PREMS, and fire protection expect to accommodate the effects with plans for future growth. Impacts are predicted to be negligible as the Project will contribute to the expected population growth. This issue is regional in geographic extent and mid-term in duration. The Project will contribute to this impact and the impact is a Class 3. Confidence is moderate.

2.8.2.2.5 Family and Community Services

While recreation services have capability for more usage, Project operation will contribute to stress on social services and child care. However, the current social services situation is already operating at close to full capacity, and this trend will continue in future when the Project's operations begin. The Project impact is predicted to be negligible in magnitude as the Project will add to the regional population but will have only a small effect within the expected population growth. This issue is regional in geographic extent and mid-term in duration. The Project will contribute to this impact and the impact is a Class 3. Confidence is moderate.

2.8.2.2.6 Transportation

The potential effect on transportation infrastructure is predicted to be negative in direction, regional in geographic extent, negligible in magnitude, mid-term in duration and, therefore a Class 3 impact.

2.8.2.2.7 Utilities Operation

Excess capacity exists to support increased population in the region. The potential effect on utilities is therefore predicted to be negligible in magnitude, regional in geographic extent, mid-term in duration and therefore, Class 3.

2.9 Summary

The Project will have a positive effect on economic activity during both the construction and operational phases, as money is spent in both the provincial and RSA economies. The economic benefits will be generated through a variety of processes, including purchases of goods (materials) and services (labour) as well as through taxes and royalties paid once the Project is operational.

Employment opportunities will be created during both the construction and operational phases. Jobs created during the construction phase will largely be filled by workers from outside of the RSA as the unemployment rate in the RSA is less than 4.0 percent in 2006. Shell is planning to have temporary construction camps onsite to house construction workers. For workers hired by the Project from outside the RSA, Shell will consider providing transportation to the site once the workforce reaches an appropriate size that warrants these services. Jobs created during the operational phase are expected to be filled by workers who relocate to the RSA. Operational jobs will be generated once the Project begins Phase 1 thermal operations (as early as 2010) and then will expand when it starts Phase 2 thermal operations (between 2013 and 2017).

As a result of the economic activities, social infrastructure and services in the RSA will have additional demands placed on them. In general, the majority of impacts will be assimilated into expected growth in the region and are, therefore, considered Class 3. However, the potential exceptions include effects on health services and protection services which are classified as Class 2 impacts. Shell will consult with stakeholders to ensure effectiveness of the mitigative measures implemented and apply corrective actions if needed.

Table 2.9-1 summarizes the impacts for all the chosen SEIA indicators.

Table 2.9-1: Final Impact Rating Summary Table

	Geographic Extent	Magnitude	Direction[1]	Duration	Confidence	Class
Economic Impacts - Construction						
Regional Employment	Regional	Negligible	Positive	Short-term	High	Class 4
Provincial Employment	Provincial	Negligible	Positive	Short-term	High	Class 4
Economic Impacts - Operations						
Regional employment	Regional	Negligible	Positive	Mid-term	High	Class 4
Provincial employment	Provincial	Negligible	Positive	Mid-term	High	Class 4
Government revenues	Provincial	Negligible	Positive	Mid-term	High	Class 4
Social Impacts - Construction						
Housing and Accommodation	Regional	Negligible	Negative	Short-term	Moderate	Class 3
Education	Regional	Negligible	Positive	Short-term	High	Class 4

Note:
[1] Measures of impact direction (positive, negative, neutral) are based on population effect.

Table 2.9-1: Final Impact Rating Summary Table (Cont'd)

	Geographic Extent	Magnitude	Direction[1]	Duration	Confidence	Class
Health Services	Regional	Low-Moderate	Negative	Short-term	Moderate	Class 2
Protection Services	Regional	Low-Moderate	Negative	Short-term	Moderate	Class 2
Family and Community Services	Regional	Negligible	Negative	Short-term	Moderate	Class 3
Transportation	Regional	Negligible	Negative	Short-term	Moderate	Class 3
Utilities	Regional	Negligible	Negative	Short-term	Moderate	Class 3
Social Impacts - Operation						
Housing and Accommodation	Regional	Negligible	Negative	Mid-term	Moderate	Class 3
Education	Regional	Negligible	Negative	Mid-term	High	Class 3
Health Services	Regional	Negligible	Negative	Mid-term	Moderate	Class 3
Protection Services	Regional	Negligible	Negative	Mid-term	Moderate	Class 3
Family and Community Services	Regional	Negligible	Negative	Mid-term	Moderate	Class 3
Transportation	Regional	Negligible	Negative	Mid-term	Moderate	Class 3
Utilities	Regional	Negligible	Negative	Mid-term	Moderate	Class 3

Note:
[1] Measures of impact direction (positive, negative, neutral) are based on population effect.

2.10 Monitoring and Adaptive Management

Shell will continue engagement with stakeholders to determine the effectiveness of mitigation implemented. In keeping with the principles of adaptive management, mitigation strategies will be continually updated throughout the life of the Project.

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APPENDIX II: FUTURE PROJECTS

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Table II-1: Economic Development Projects – 2006 (June)

Company Name	Project	Location	Estimated Cost	Date	Status
Northern Sunrise County	Seal Lake Road NE Access Phase 1	Northern Sunrise County	$3,000,000	2006	Announced
Northern Sunrise County	South Harmon Lake Road Extension Phase 1	Northern Sunrise County	$3,600,000	2006	Under construction
Northern Sunrise County	South Harmon Valley Road Phase 2	Northern Sunrise County	$4,700,000	2006	Announced
Northern Sunrise County	Regional Water Supply Project	Northern Sunrise County (Cadotte Lake, Little Buffalo, and Nampa)	$30,000,000	N/A	Proposed
CCS Energy Services	Oilfield Waste Treatment/Disposal/Recovery Facility	Northern Sunrise County (NE of Peace River)	$14,000,000	2006-2007	Proposed
Peace Country Tender Beef Co-op	Meat Packing Plant, Bio-Digester and Tannery	Peace River	$15,400,000	N/A	Proposed
Town of Peace River	Upgrades to Shaftesbury Water Treatment Plant	Peace River	$4,500,000	2006	Under construction
Alberta Infrastructure and Transportation[1]	Modernization/Addition	Peace River	$8,800,000	2005-2006	Nearing completion
Alberta Infrastructure and Transportation[1]	Modernization/Addition (K to Grade 4)	Peace River	$5,600,000	2005-2006	Nearing completion
Nova Hotels	New Hotel	Peace River	$4,500,000	2006	Proposed
Peace Country Health/Honeywell	Energy Efficiency Upgrades	Peace Country Health Region	$4,000,000	2006-2007	Announced
Town of Grimshaw	Strip Mall	Grimshaw	$5,000,000	N/A	Proposed

Note:

[1] Procurement activities under direction of associated school board.

N/A – not available.

Source: Alberta Economic Development, 2006 Internet site.

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1. Future Development without the Project

This forecast of future conditions considers natural population growth plus announced or disclosed economic activities that will affect the regional workforce and attract workers from outside the Regional Study Area (RSA).

1.1 Population and Demographics

1.1.1 Population

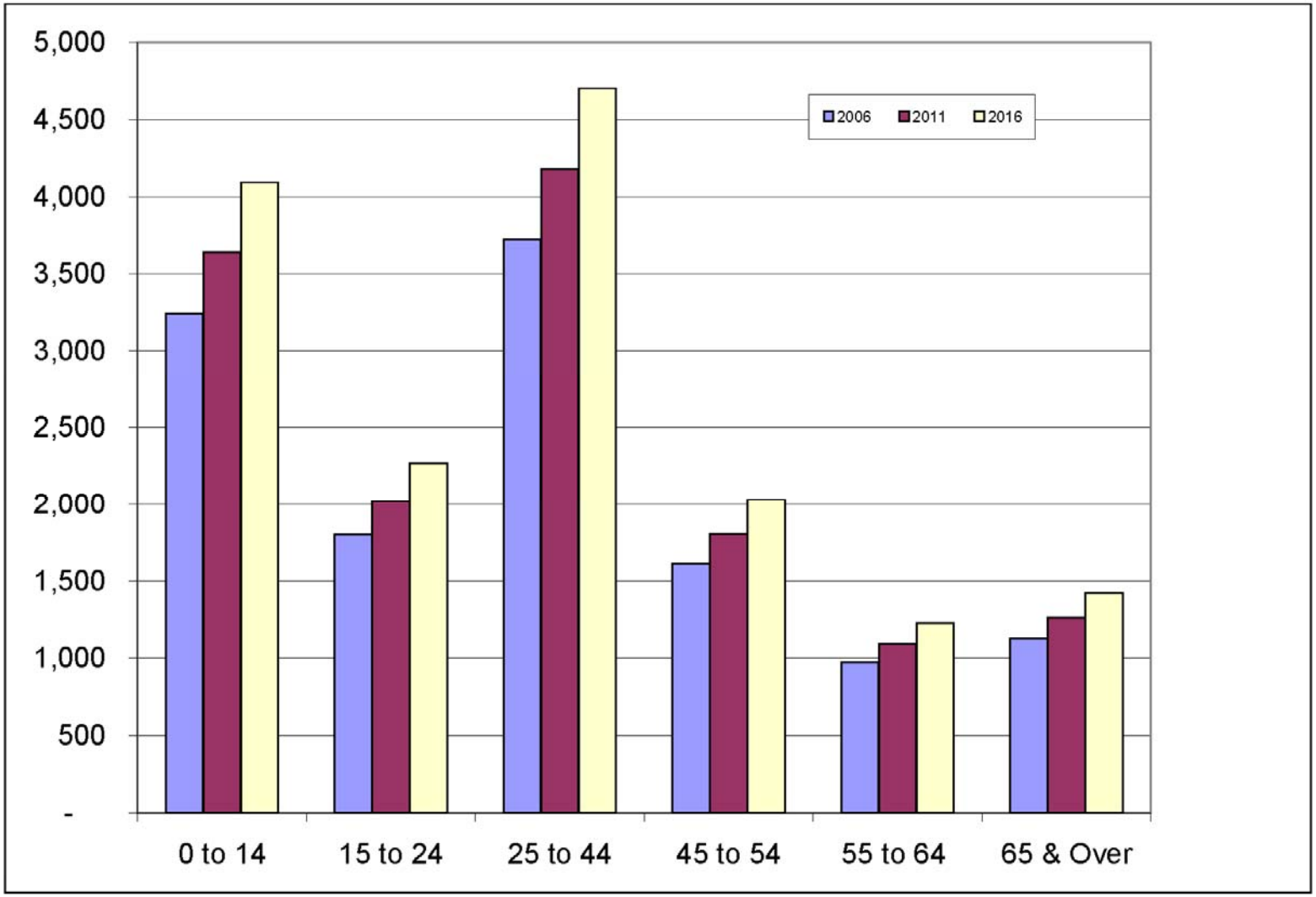
Population projections for this socio-economic impact assessment (SEIA) are based on two separate studies published in 2006. The first study was issued in August 2006 by Alberta Human Resources and Employment (AHRE 2006, Internet site) and compares population growth across eight economic regions in Alberta. The second study was issued by the Town of Peace River (2006). It predicts population growth for the Town assuming all industrial developments, including the Shell Canada Limited Peace River Oil Sands Carmon Creek Project (the Project) are approved and built to full capacity.

The AHRE study prepared five-year population forecasts for each of Alberta's eight economic regions. These forecasts were developed based on age characteristics in 2005, applying standard birth and death rates, with some assumptions about migration patterns. The RSA falls within the Athabasca Grande Prairie Economic Region which was predicted to have a population growth of 1.8%, the same population growth projected for the province as a whole. In comparison, the highest population growth in Alberta is predicted for the Lethbridge – Medicine Hat region with 2.2% growth (AHRE 2006).

The Town of Peace River study, issued in April 2006, was developed as an input into the Town's existing Municipal Development Plan and estimates population growth for the next 50 years. The study assumes a strong economic growth scenario, including the approval and full operation of the Project, as well as other oil and gas developments. The report predicts an increasing growth rate which would peak at 10% in 2020 and gradually decline to 2% by the year 2040 (Town of Peace River 2006).

The forecast population growth in the RSA is based on the AHRE study with some consideration given to the Town of Peace River study. The studies outlined a range of potential growth options that may develop in the RSA. Estimated growth rates for individual age cohort groups were derived from the AHRE's 2006 study and were applied to the corresponding age groups for the RSA as collected in the 2001 Statistics Canada survey. These growth rates were used to predict the population of the RSA for 2006. Population estimates for subsequent five-year intervals were estimated using similar birth and death rates and were then adjusted slightly to reflect the Peace River's prediction for strong economic growth and resulting in-migration to the area. The resulting population forecast is provided in Figure JJ-1.

The population of the RSA was predicted to increase by an average of 2.2% per year to 2011, and by 2.5% to 2016. Under these assumptions, the population of the region is predicted to be about 12,500 in 2006, 14,000 by 2011, and 15,750 by 2016.



SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Regional Population Forecast 2001-2016

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1.1.1.1 Labour Force

The available labour force will also expand as the population increases. Based on the population forecasts in Figure JJ-1, this workforce (people aged 15 and older) will increase from about 9,200 in 2006 to 10,250 in 2011, and 11,600 by 2016. Assuming that 75% of the available workforce is either working or seeking work, and unemployment rates are maintained at current levels, about 150 new jobs per year will have to be created between 2006–2011 to employ the naturally growing regional labour force. Between 2011–2016, annual increases of about 150 full-time jobs per year will be required. Of these new residents entering the workforce, it is estimated Aboriginal youth will account for about one-third of the total even though Aboriginal people in general make up only 20% of the RSA population. If the rate of regional economic development is not adequate to provide this number of new jobs, migration to the region will slow and members of the existing workforce will be forced to leave the RSA in search of alternative employment. For reference, employment in the RSA declined by about 40 full-time positions per year from 1996–2001, and the regional population dropped by about 110 people per year.

1.1.1.1.1 Aboriginal Employment

As noted in previous sections, there is close to full employment in the RSA and as a result, workers from the RSA hired for Project construction are likely, in its absence to be employed on other projects in the area or in other activities in Peace River and surrounding communities. For these workers, employment created by the Project is not incremental.

However, incremental employment will be created if the Project provides opportunities to residents in the RSA who would not otherwise be employed, or who can obtain better jobs as a result of Project construction. These opportunities are probably greatest for Aboriginal communities located in the study area, such as Woodland Cree First Nation and Métis peoples. Currently, a number of barriers to employment exist for these Aboriginal members which the Project would need to address if it wanted to attract this source of labour:

- lack of transportation from Cadotte Lake to job sites in the RSA
- lack of childcare communities for Aboriginal parents including care for pre-school aged children, and before and after school care for children attending school
- lack of commitment from industry to guarantee hiring of Aboriginals who successfully complete training programs and skill improvement courses; as a result, Aboriginal members are hesitant to undertake upgrading or training programs

Special consideration of these issues and a focus on businesses based in the RSA, whether First Nation, Métis, or other, would also increase Aboriginal workers' ability to participate and enhance the incremental benefits of the Project's construction. Shell is currently working to address these barriers by providing transportation from Cadotte Lake for Aboriginals who are assisting with environmental studies at the site.

1.1.2 Regional Economy

Given the rural nature of Northern Sunrise County, future economic development will occur in the primary or resource-based sectors including agriculture, oil and gas, and mineral resources.

1.1.2.1 Agriculture

The value of crop and livestock production will increase but this will be achieved without any increases in employment. Between 1996–2001, the amount of farmland in Northern Sunrise County increased by 4,570 hectares, an increase of 3%, whereas the number of farms dropped from 280 in 1996 to 244 in 2001. As is happening elsewhere in Alberta, agricultural growth is

occurring through intensification. For wheat, other grain, oilseed, and field crop operations, which account for about 54% of farms in the County, this involves converting natural pasture and other farm land to crops; a total of 5,800 new ha of crop were planted between 1996–2001. For livestock operations, which account for 32% of regional farms, intensification means more animals. From 1996–2001, the number of farms with cattle decreased by 4%, but the number of cattle per farm increased by 24%. The intensification of hog operations was even more dramatic, 1,282% more hogs were raised on 20% fewer farms.

However, the costs of farming have continued to rise faster than revenues, even with agricultural intensification. Between 1995–2000, costs increased by 21%, revenues rose by 18%, but net returns to farmers only increased by 7%. This could explain why there were 55 fewer people employed in agriculture in Northern Sunrise County in 2001 than in 1996. Without major agricultural expansion, especially in the intensive livestock industry, this trend in declining employment is expected to continue. At the present time, no applications for new or expanded confined feeding operations in Northern Sunrise County have been received by the Natural Resources Conservation Board (NRCB). Under the *Agricultural Operation Practices Act*, any new or expanding livestock operation larger than specified size thresholds is required to obtain prior approval from the NRCB. A list of all the applications received to date in the Peace River area can be found in the NRCB Decision Reports (NRCB 2005, Internet site)

1.1.2.2 Oil and Gas

The major opportunity for economic expansion in Northern Sunrise County rests with the oil and gas industry. Some of the key companies in the area include BlackRock Ventures (BlackRock), Baytex Energy Trust, PennWest Energy Trust, Murphy Oil Corporation, Husky Energy and Talisman Energy Inc. Detailed information on their future development plans was collected from public disclosure documents and other public documents. There are other companies with potential to develop in the area, but above-mentioned companies are described below in order to highlight the more active operations in the area. As another indication of the oil and gas industry's growth in the area, a 950-head camp was recently developed to provide accommodation for oil and gas workers residing outside the region.

Shell's acquisition of BlackRock was completed on July 10, 2006. Prior to the acquisition by Shell, BlackRock had drilled 76 wells in the central block with 47 wells in the Eastern Block, and had developed an oil processing facility in the Central Block that is currently capable of handling 3,650 m^3 per day. In 2006, BlackRock drilled 15 horizontal wells in the Peace River Block, each averaging about 40 m^3 per day, with plans to drill another 25 wells. While currently primary recovery techniques are being used, opportunities for secondary and tertiary recovery using waterfloods and or thermal applications are under consideration. A 2,860 m^3 per day processing facility is being constructed on the Peace River Block, with completion expected in 2006, and plans are in place to extend the existing Seal heavy oil pipeline to this block in 2007.

BlackRock and its partner, Talisman Energy Canada, also discovered heavy oil at Chipmunk, approximately 40 km southeast of the Project. The partners have acquired rights to about 17,400 ha of undeveloped land. Of the three successful vertical wells drilled in 2003, two are producing at a combined rate of over 80 m^3 per day and the third well is suspended pending completion of permanent road access. In 2005, 3D seismic imagery was shot on about 65 km^2 and data are currently being processed. Two new wells were drilled in early 2006, each producing about 31 m^3/d (BlackRock 2006, Internet site).

Baytex Energy Trust holds a 100% working interest in about 25,900 ha of land in the Seal field (Baytex 2005, Internet site). In early 2006, it was producing approximately 80 m^3/d from six wells located on 130 ha of land. Based on its existing test well data, Baytex estimates that each

square kilometre averages about 3.1 million m^3 of oil in place, although only 3% may be recoverable under primary cold recovery methods. Lack of infrastructure in the region and large distances from heavy oil pipelines has limited development to date. However, as a result of expanding infrastructure development in the region, Baytex plans to drill several delineation wells in 2006–2007, two more horizontal production wells will be brought on stream, and it will undertake a larger scale drilling program in 2007.

1.1.2.3 Other Development

In terms of other industrial development, United Industrial Services Ltd. received approval in 2000 to develop a silica sand deposit north of the Town of Peace River (NRCB 2005, Internet site). Although the central processing was constructed, operations were limited because of financial difficulties. The facility is now under new ownership but is not yet in production.

Two projects that would create long-term employment have been announced in the Town of Peace River. One is the construction and operation of a beef central processing plant. In response to the closure of the US border to Canadian beef due to concerns about Bovine Spongiform Encephalopathy, the Peace Country Tender Beef Cooperative (PCTB) proposed the development of two beef central processing plants in the Peace River region. In 2004, it was announced one of these facilities would be built in Dawson Creek, BC, providing about 60 full-time jobs (PCTB 2004, Internet site). In addition, the plant would provide markets for beef producers in the RSA. According to the Town of Peace River, the second central processing plant of the same design capacity and employment requirements will be constructed in the town, although the timing for construction is unknown (Bunn 2005, pers. comm.). The second major development proposed for Peace River is the construction of a Wal-Mart store. The company has officially announced their intention to build and has submitted an application to the Town of Peace River for development (Gazette 2006).

With all of the increased activity in the oilfield in the Northern Sunrise County, CCS Energy Services is planning to invest up to $14 million to build a facility that will treat, recover, and dispose of oilfield waste (Lesh 2006a). The facility would be located on the existing plant road into the current Peace River Complex. The construction of the facility, which will likely begin this fall, will require 75 people during construction, and the facility will employ between 10–14 full-time employees during operations. The facility expects 25 delivery trucks per day once in operation.

The Town of Peace River also believes that continued heavy oil development in Northern Sunrise County holds potential for the expansion of the oil and gas service sector. In terms of other economic development prospects, the Town noted there was some potential for value-added manufacturing in the forestry sector as well as the possible development of an iron ore deposit near Dixonville (Bunn 2005, pers. comm.). During the March 9, 2006 meeting, the Northern Sunrise County Council decided to draft a new Municipal Development Plan in response to upcoming development in the area (Lesh 2006b), which has yet to be finalized (Miles 2006, pers. comm.).

With respect to Shell's Peace River Complex, two additional thermal pads have been constructed to allow continued production at its currently approved capacity of 2,000 m^3 per day (12,500 b/d). However, despite this short-term extension of its operations, the existing Peace River operation is a demonstration project and is not intended to be operated at its current level over the long term. Shell recently received internal financial approval and regulatory approval to construct and operate two new well pads (Pads 32 and 33); however, there are no plans to expand the current thermal development scheme outside the scope of Carmon Creek. For the purposes of the SEIA, Shell would assume a shut down of the thermal demonstration project.

Thus, the closure of the existing Peace River Complex will result in the loss of about 100 full-time jobs in mid 2010. This is equivalent to about two-thirds of annual new jobs that have to be created to accommodate natural increases in the workforce and maintain current levels of employment and unemployment. Unless new jobs can be found to accommodate former Peace River Complex employees as well as the naturally increasing workforce, unemployment will increase and people will leave the region in search of alternate employment. The loss of 100 jobs could result in a loss of about 275 people from the region; this represents about 2% of the regional population. People leaving the region would either be former employees who were unable to find suitable replacement employment elsewhere in the region, or new recruits to the workforce who have been displaced in cases where former employees were able to find other employment in the region.

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APPENDIX KK: HIGHWAY 986 AND EXISTING PLANT ROAD INTERSECTION UPGRADE

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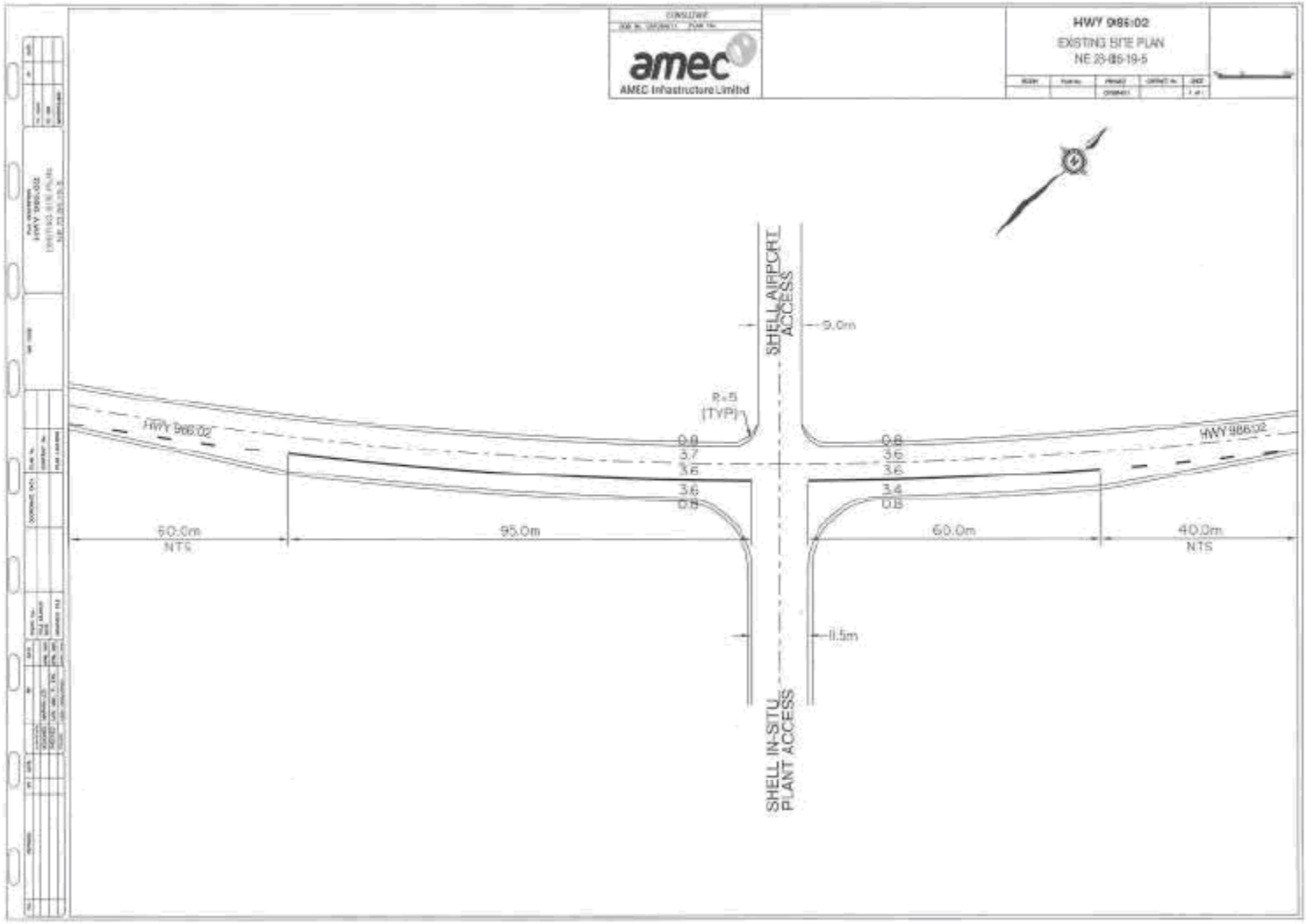
1. Transportation Infrastructure

1.1 Upgrade of Highway 986 and Existing Plant Road

Based on the traffic assessment, the following upgrade is recommended for the Highway 986 and the existing plant road. The north half of the intersection requires the construction of tapers (87.5 m tapers at 25:1) to accommodate a bypass lane. The south half currently exceeds a Type IIb treatment by providing tapers and parallel deceleration/acceleration lanes. Adjusting the pavement markings on the south half to meet new construction standards (87.5 m tapers at 25:1) is required. Figure KK-1 shows the existing intersection and Figure KK-2 shows the recommended upgrade.



SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Existing Intersection Plan

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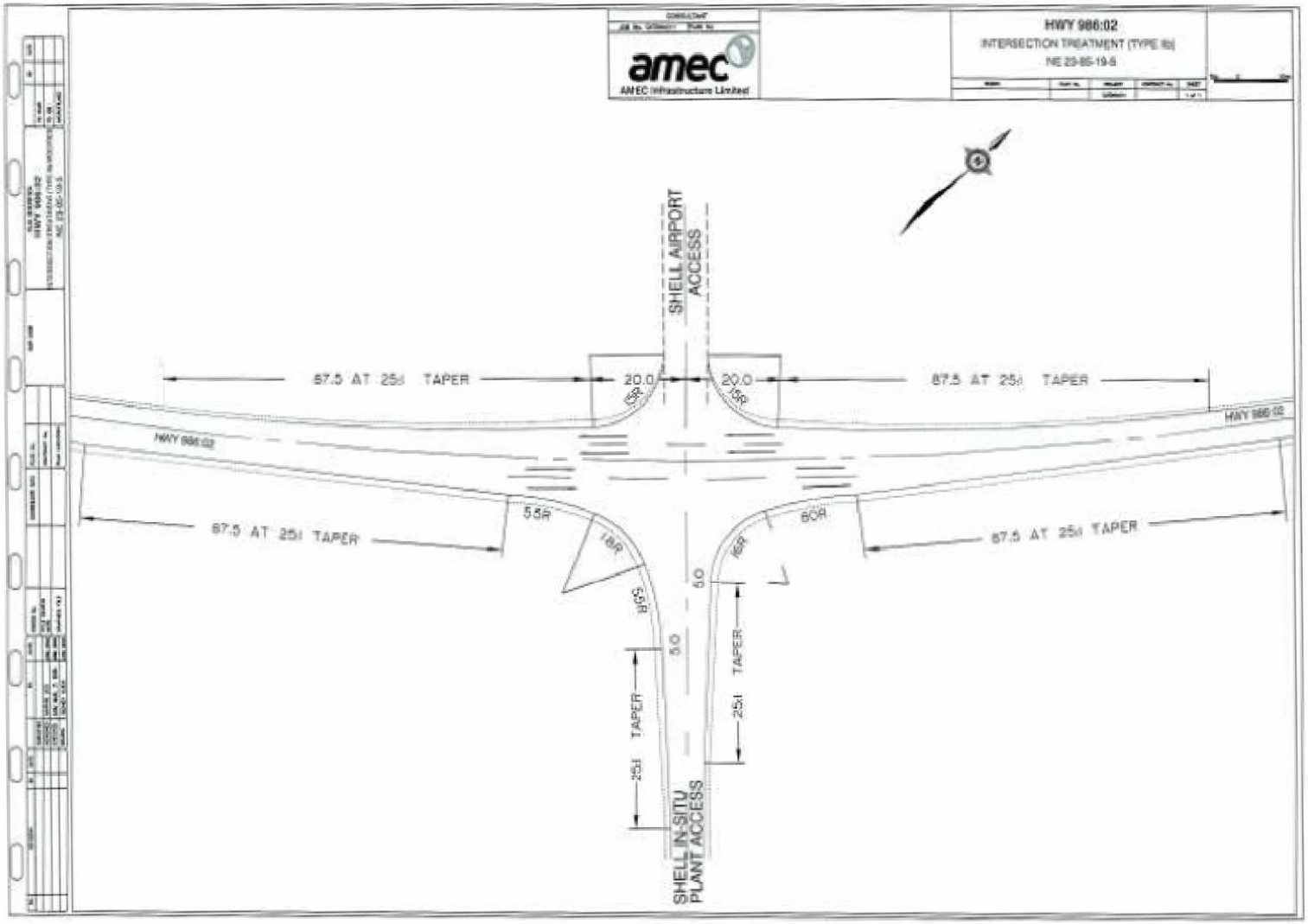

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Proposed Intersection Treatment

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3. Historical Resources

3.1 Introduction

Shell Canada Limited (Shell) is requesting regulatory approval to commercially develop the Peace River Oil Sands Carmon Creek Project (Project), located about 40 km northeast of the Town of Peace River, Alberta within Townships 84–86, Ranges 16–19, W5M, in Northern Sunrise County. The Project is an expansion of the existing Peace River Complex, and is planned to consist of both thermal recovery (Thermal Development) and primary recovery (Primary Development). This section presents the results of the baseline studies and impact assessment for historical resources as part of the Environmental Impact Assessment for the proposed Thermal Development.

Historical resources are comprised of residues of past cultures or societies. Because the cultural milieu in which they functioned no longer exists, these resources are non-renewable. Although the cultures responsible for depositing archaeological material cannot be observed, the preserved context and associations related to the remains can reveal much about past human behaviour, adaptations, and relationships. Many facets of these resources, particularly patterns of cultural deposition (observable in an undisturbed context), are fragile, ephemeral, and the product of unique processes and conditions of preservation. Therefore, site integrity (i.e., an undisturbed state) is important for interpreting the remains. Once a site is disturbed, context cannot be replaced, re-created, or restored.

Historical resources, as defined by the *Alberta Historical Resources Act*, (Alberta Legislature 2000), include archaeological, historic, and palaeontological sites, artifacts, and fossils. Archaeological sites and artifacts are generally classified as either pre-contact or historic. Pre-contact archaeological sites include remains (e.g., stone tools, butchered bones, fire-cracked rock) from the traditional occupation of Alberta by Aboriginal people before contact with European traders in the late 1700s. Aboriginal people have lived in the Peace River region since the retreat of glacial Lake Peace about 10,500 years ago, after terrestrial flora and fauna were established.

Historic archaeological sites are both Aboriginal and non-Aboriginal, including standing structural remains dating from the time of European contact until recent times (i.e., about World War II). Historic artifacts include both industrial and folk-manufactured artifacts made of metal, glass, ceramic, stone, and other materials. Historic structures generally comprise standing, abandoned, or occupied structures pre-dating World War II. Trails and other historic features, including places where significant historical events occurred, can also be considered historic sites. Palaeontological sites and specimens occur in both bedrock and unconsolidated fossiliferous glacial and non-glacial deposits. Specimens include fossils found in ancient sediments and unfossilized remains of plants, invertebrates, and vertebrates.

3.2 Issues Scoping

The main concern about potential impacts to historical resources is the effect development might have on their interpretive potential. This potential relates to associations between artifacts, features, spatial distribution of materials, and all contextual information from a site. Disruption of historical resources and their interpretive potential can occur at two levels:

- the loss of site contents including artifacts, fossils, and cultural or natural residues
- the loss of site contexts that provide the framework within which artifacts, fossils, and cultural or natural residues can be interpreted

Disruption of the contents and contexts of historical resources can occur at either a primary or secondary level. Primary impacts result from planned disturbance factors such as:

- tree clearing
- ground disturbance for facilities and access road construction
- potential erosion induced during construction
- maintenance or development activities requiring ground disturbance during operations
- ground disturbance and erosion associated with decommissioning and reclamation activities

Secondary impacts are unplanned disturbance factors that could occur as a result of improved access into sensitive areas. Improved access, combined with public knowledge of the historical resource potential of an area, could lead to unauthorized collection, excavation, disturbance, or vandalism of pre-contact, historic, or palaeontological sites.

3.2.1 Terms of Reference

In addition to the issues provided above, the assessment also addressed the issues identified in the Terms of Reference for the Thermal Development (AENV 2006) as follows:

"Detail consultation with Alberta Community Development and Aboriginal communities and provide a Historical Resource Impact Assessment (HRIA) for the Project. Provide Alberta Community Development with a copy of the HRIA report, and,

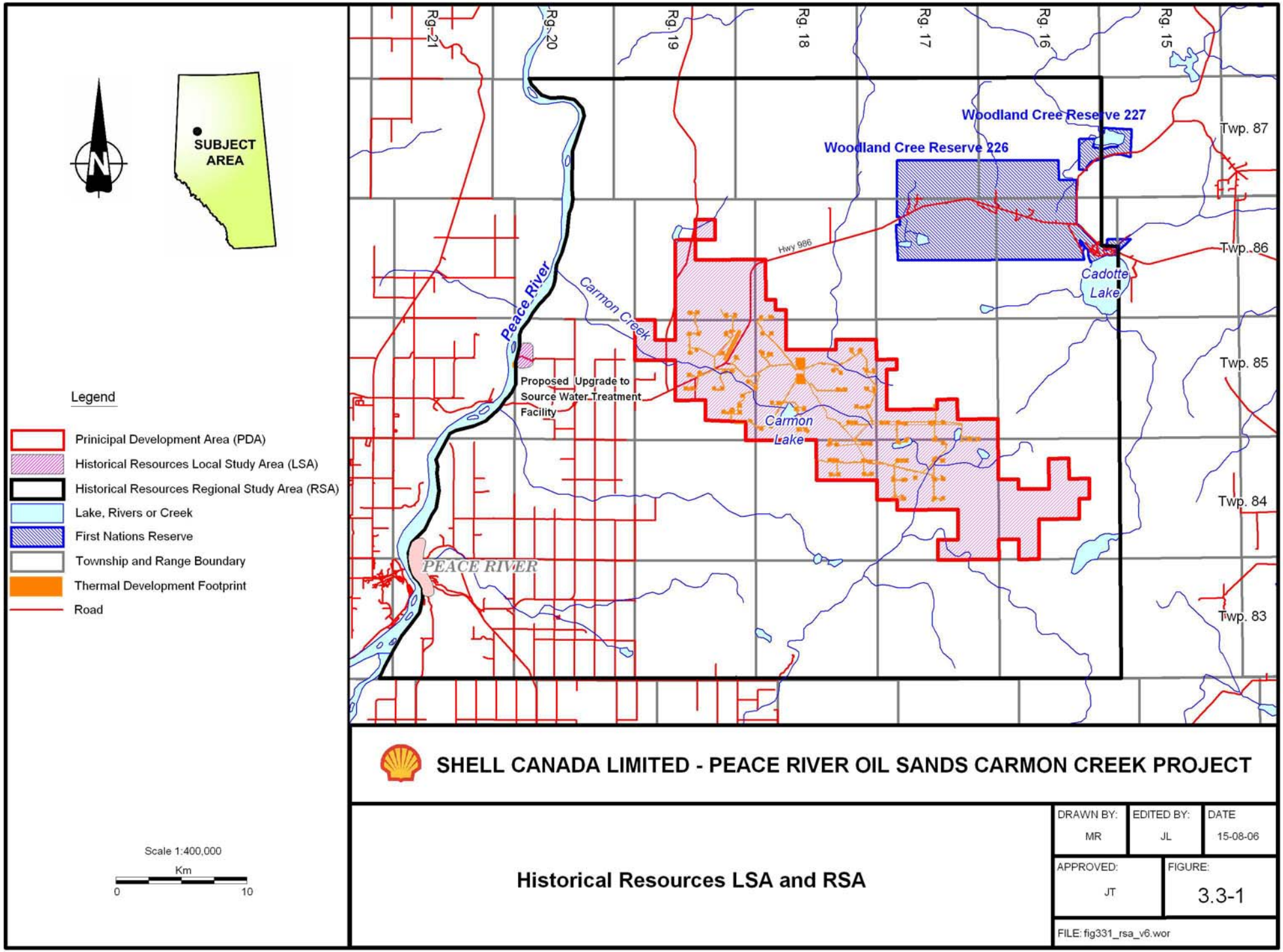
- provide a general overview of the results of any previous historical resource studies that have been conducted in the Study Areas, including archaeological resources, palaeontological resources, historical period sites, and any other historical resources as defined within the *Historical Resources Act*
- summarize the results from the field program performed to assess archaeological, palaeontological and historical significance of the Project
- provide a summary of the results of the HRIA conducted to assess the potential impact of the Project on archaeological, palaeontological and historical resources. The HRIA must encompass all projected development and impact areas with the boundaries of the Project
- provide an outline of the program and schedule of field investigations that may be required to further assess and mitigate the effects of the Project on historical resources
- document any stakeholder concerns with respect to the development of the Project based on the historical significance of the Study Areas."

3.3 Methods

3.3.1 Spatial and Temporal Boundaries

3.3.1.1 Spatial Boundaries

The Historical Resources Local Study Area (LSA) for the Thermal Development includes the Principal Development Area (PDA) as well as a proposed upgrade to the source water treatment facility on the eastern bank of the Peace River (investigated during this assessment). The LSA includes the Thermal Development footprint and adjacent areas that could be subject to surface and subsurface ground disturbance. It encompasses all areas potentially affected by the Thermal Development (see Figure 3.3-1).


SUBJECT AREA
N
Legend
Prinicipal Development Area (PDA)
Historical Resources Local Study Area (LSA)
Historical Resources Regional Study Area (RSA)
Lake, Rivers or Creek
First Nations Reserve
Township and Range Boundary
Thermal Development Footprint
Road
Scale 1:400,000
Km
0
10
Rg. 21
Rg. 20
Rg. 19
Rg. 18
Rg. 17
Rg. 16
Rg. 15
Twp. 87
Twp. 86
Twp. 85
Twp. 84
Twp. 83
Woodland Cree Reserve 227
Woodland Cree Reserve 226
Hwy 986
Peace River
Carmon Creek
Cadotte Lake
Carmon Lake
Proposed Upgrade to Source Water Treatment Facility
PEACE RIVER
SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT
Historical Resources LSA and RSA
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EDITED BY: JL
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FIGURE: 3.3-1
FILE: fig331_rsa_v6.wor

Within the LSA, the spatial boundaries of all previously and newly recorded historical resource sites must be considered in relation to the specific Thermal Development footprint, since specific effects are evaluated relative to individual site value.

A Historical Resources Regional Study Area (RSA) encompassing the LSA was also defined to assess Thermal Development effects on historical resources relative to a broader cultural and environmental area. The RSA was defined after a review of available archaeological data from areas near the LSA. It extends west to the Peace River and includes those archaeological sites closest to the LSA. The Peace River Valley is the most important regional locality where animal and human populations obtain resources. Prehistoric and historic human populations tended to congregate in areas of high resource potential, and understanding an area's geomorphology helps determine areas of high potential for exploitation and habitation. In the Peace River region, lands adjacent to watercourses represent areas of high use potential. Thus, the RSA has been defined to include an extended exploitative region for local Aboriginal groups, extending east from the river valley that is centred on the drainage basin for Carmon Creek (see Figure 3.3-1).

3.3.1.2 Temporal Boundaries

This assessment considers potential impacts to historical resource sites from current baseline conditions onward through reclamation. The phases of analysis begin with pre-construction activities that result in ground disturbance such as tree clearing. Construction and operations include installing facilities, maintenance, extracting equipment and resources, and repairs. Reclamation includes removing facilities, tree-planting, and general landscape reclamation.

3.3.2 Project Inclusion List

Table 3.3-1 lists the existing, approved, and proposed projects reviewed for each of the three assessment scenarios.

3.3.3 Baseline Study Methods

The information used to establish baseline conditions was obtained from a site file search, map consultation, and review of current literature relevant to the LSA (Alberta Community Development (ACD) 2006). The site file search consisted of a review of archaeological site inventory data records maintained by the Heritage Resource Management Branch of ACD. National Topographic Series map sheets 84C/6 and 84C/7, which encompass the RSA, were also examined. These sources provided information on previously recorded archaeological sites, their locations, content, and geographic context. The literature review included reports on Quaternary geology, previous archaeological studies and archaeological context, and regional history.

3.3.4 Impact Assessment Methods

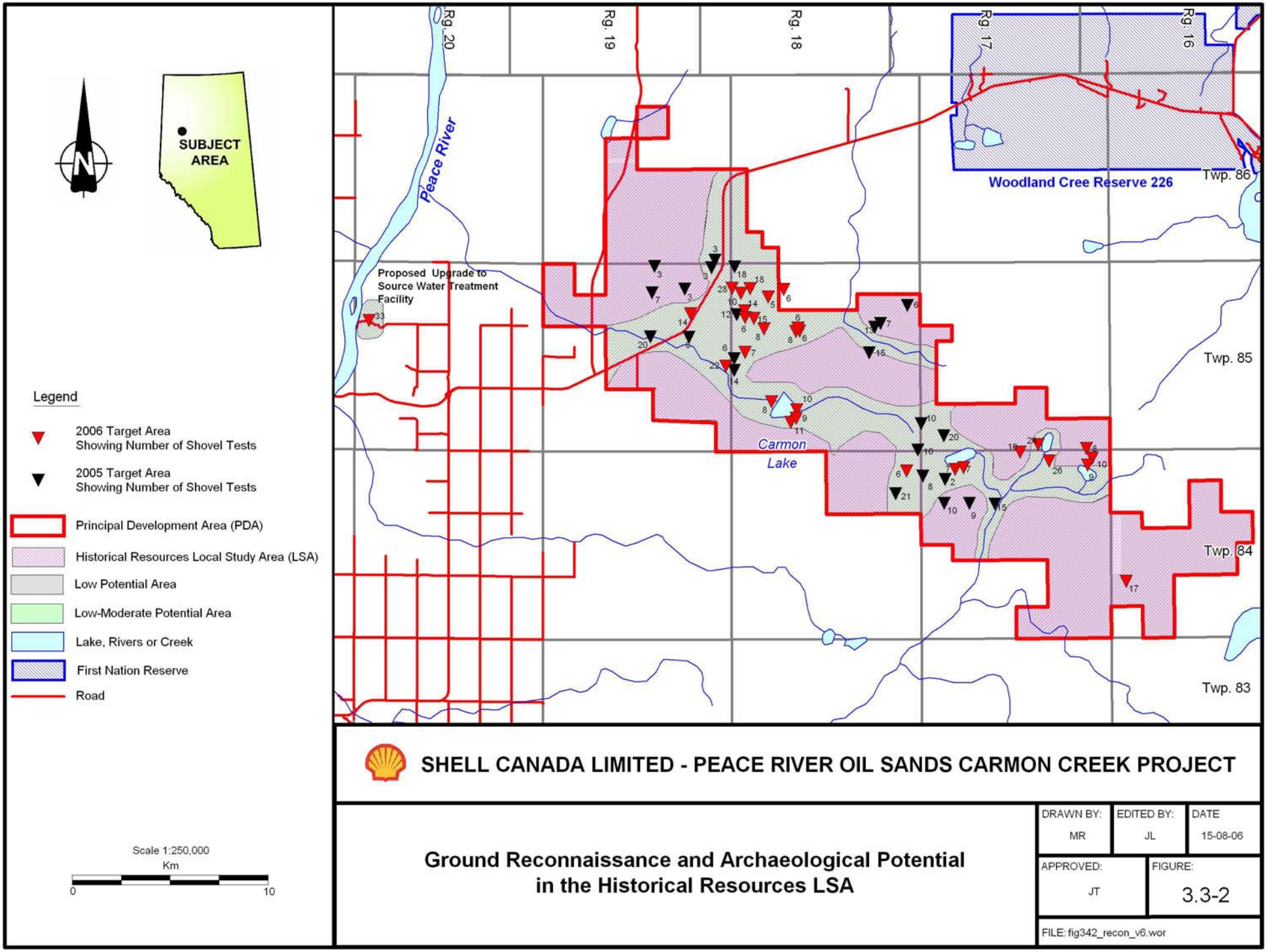
Two field surveys were conducted over the course of the historical resources impact assessment (HRIA). The first took place in September 2005, while the second was competed in June 2006. These investigations consisted of an aerial overflight of the LSA and a pre-disturbance field assessment at targeted portions of the LSA to identify and evaluate archaeological, historic, and traditional use sites in potential conflict with any proposed Thermal Development facilities. The overflight was used to determine routes of access into the LSA and areas of archaeological potential, based on an assessment of drainage and vegetation change across the LSA. Those areas determined to be of archaeological potential were subject to direct inspection using standard assessment methods including an inspection of surficial exposures and the evaluation of shovel tests (Leyden 2006a, 2006b). About 15% of the Thermal Development footprint was traversed either on foot or by all-terrain vehicles. The remaining 85% of the LSA was determined to be of low potential for historical resource sites and was evaluated only via helicopter overflight.

Table 3.3-1: Project Inclusion List

Status	Baseline Scenario	Application Scenario	Cumulative Effects Scenario
Existing and Approved	Existing Shell Peace River Complex operations (2000 m^3/d production)	Existing Shell Peace River Complex integrated with the Thermal Development	Existing Shell Peace River Complex integrated with the Thermal Development
	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557
	Asphalt plant	Asphalt plant	Asphalt plant
	BlackRock Ventures - Seal	BlackRock Ventures - Seal	BlackRock Ventures - Seal
	Daishowa-Marubeni International Ltd. existing cutblocks	Daishowa–Marubeni International Ltd. existing cutblocks	Daishowa–Marubeni International Ltd. existing cutblocks
	Husky Oil Operations Ltd. Simons Lakes Gas Plant	Husky Oil Operations Ltd. Simons Lakes Gas Plant	Husky Oil Operations Ltd. Simons Lakes Gas Plant
	Town of Peace River	Town of Peace River	Town of Peace River
	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails
Project	n/a	**Shell Canada Limited Thermal Development**	**Shell Canada Limited Thermal Development**
Planned Projects and Activities	n/a	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)
	n/a	n/a	Associated Shell infrastructure including: transmission lines source water pipeline upgrade
	n/a	n/a	Baytex Energy Trust
	n/a	n/a	BlackRock Ventures
	n/a	n/a	Husky Oil Operations Ltd.
	n/a	n/a	Murphy Oil Corporation
	n/a	n/a	CCS Energy Services
	n/a	n/a	Daishowa-Marubeni International Ltd. future cutblocks

Note:
n/a – not applicable.

Conditions during both surveys were excellent and the ground was unfrozen and snow free. Before both episodes of ground reconnaissance, an aerial survey was conducted of the LSA. The entire LSA was overflown and areas of high site potential were identified. These included areas near water sources and areas of high relief and better drainage (see Figure 3.3-2). Ground reconnaissance at these locations focused on examining exposures along any existing disturbances, and systematic subsurface shovel testing at any well-drained or slightly elevated landforms. During the 2005 field visit, a total of 241 shovel tests (about 40 cm x 40 cm in size) were excavated at 24 locations. The subsurface testing focused on well-drained areas along flat or slightly raised landforms. The 2006 field assessment was targeted for high potential lands adjacent to water sources and those areas previously determined to be of high relative potential across the entire LSA. This included an assessment of the proposed source water treatment facility located along the eastern bank of the Peace River (about 25 km from Peace River Complex). In total, 368 shovel tests (about 40 cm x 40 cm in size) were excavated across 30 locations. No pre-contact archaeological sites were encountered during either the visual inspection of the targeted areas or as a result of subsurface testing.


SUBJECT AREA
Rg. 20
Rg. 19
Rg. 18
Rg. 17
Rg. 16
Peace River
Woodland Cree Reserve 226
Twp. 86
Twp. 85
Twp. 84
Twp. 83
Proposed Upgrade to Source Water Treatment Facility
Carmon Lake
Legend
2006 Target Area Showing Number of Shovel Tests
2005 Target Area Showing Number of Shovel Tests
Principal Development Area (PDA)
Historical Resources Local Study Area (LSA)
Low Potential Area
Low-Moderate Potential Area
Lake, Rivers or Creek
First Nation Reserve
Road
Scale 1:250,000
Km
0
10
SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT
Ground Reconnaissance and Archaeological Potential in the Historical Resources LSA
DRAWN BY: MR
EDITED BY: JL
DATE 15-08-06
APPROVED: JT
FIGURE: 3.3-2
FILE: fig342_recon_v6.wor

3.4 Baseline Scenario

3.4.1 Regional Overview

3.4.1.1 Archaeology

The RSA is located in one of Canada's earliest ice-free regions to become available for human occupation following the retreat of the Cordilleran and Laurentide ice sheets near the end of the Pleistocene era, between 12,000–10,500 years before present (BP) (St. Onge 1972, Mathews 1980).

The corridor that resulted from the glacier's retreat might have been the initial migration route of humans into the new world, and sets a temporal baseline for the earliest occupation of the region (Klassen 1989).

As new land was exposed, meltwater flowed into areas of low relief and formed proglacial lakes. Upon arrival, the earliest human populations probably inhabited the fringes of these waterbodies. As more land became available in the wake of increasing glacial retreat, the lakes began to drain and tundra formed as terrestrial plant communities developed (St. Onge 1972, Churcher and Wilson 1979). Now-extinct megafauna, including mammoth and giant bison, were a staple of the early hunting and gathering lifestyle of the indigenous people who were drawn to local water sources frequented by these species. The prehistoric margins of the early proglacial lakes are now represented by remnant beach ridges which mark areas of moderate archaeological potential.

3.4.1.1.1 Early Prehistoric Period

The prehistory of northern Alberta is complex and likely combine's influences from adjacent areas to both the north and south (Wormington and Forbis 1965, Ives 1993). Palaeo-Indian cultures of the Early Prehistoric period (12,000 to about 7,500 years BP) typically used stemmed and lanceolate spear points, although such projectiles can also be found in later assemblages (Vickers 1986). These projectiles are associated with big game hunting based on the exploitation of available Pleistocene megafauna.

3.4.1.1.2 Middle Prehistoric Period

The Middle Prehistoric period began about 7,500 years BP and is represented through artifact assemblages reminiscent of plains people to the south and those from more northerly communities. It includes a microblade tradition of striking small stone blades from a well-prepared core rock to construct tools and weapons (Ives 1993). By this period, boreal forest had replaced regional tundra and subsistence was based on bison, elk, caribou, small game, and fish.

3.4.1.1.3 Late Prehistoric Period

The Late Prehistoric period covers the last 2,000 years of local prehistory, and is represented by a variety of small side-notched projectile point styles. Subsistence strategies were diverse and remained reasonably consistent through to the period of European contact (Vickers 1986). It was during the Late Prehistoric that the migration of Athapaskan-speaking people through northern Alberta began. The period is associated with the arrival of European fur traders and explorers.

3.4.1.1.4 The Cree, Beaver, and Métis

During the Late Prehistoric Period, the Peace River region was occupied by the Athapaskan-speaking Beaver Indians. In the later seventeenth century, Algonquian-speaking Cree people

migrated into the region in conjunction with the expanding fur trade. Although initially in conflict, these two groups eventually settled under a peace agreement from which the Peace River was to derive its name. At the time of contact, the Beaver were semi-sedentary people subsisting largely on bison in conjunction with supplementary trapping and small game hunting and fishing. By the mid-nineteenth century, the decimation of local bison populations forced the Beaver to shift to moose as a main food source, causing the fragmentation of larger groups into smaller nomadic bands leading to the deterioration of their cultural traditions. The Cree were traditionally hunters and trappers like the Beaver, however, they tried agriculture and seemed to adapt more easily to basic changes in subsistence (Ridington 1981). Although still susceptible to rampant disease and starvation, the Cree became the predominant native culture in the Peace River region when Treaty 8 was signed. The Métis of the Peace River area primarily arrived in the aftermath of the Riel Rebellion of 1895 and were principally descended from the French, Iroquois, and Salteaux. They began to hunt, trap, garden, and raise cattle and horses. Many Métis worked as guides and freighters, or provided attendant services for the fur traders, missionaries, government surveyors, and settlers travelling to the region (Leonard 2000).

Currently, no major settlements are associated with the Beaver near the RSA. The Cree are locally represented by the Woodland Cree First Nation and the Lubicon Lake First Nation, both situated in communities to the northeast of the Town of Peace River. The Métis are represented through the Métis Nation of Alberta. The Cadotte Lake Métis Local No.1994 is situated northeast of the LSA near Cadotte Lake. Two communities, the Peavine and Utikuma Métis settlements, occur to the south of the RSA.

3.4.1.2 Palaeontology

The RSA is underlain by the Lower Cretaceous Bluesky and Gething formations which are the main bitumen-saturated units in the Peace River Oil Sands. The Thermal Development will extract oil from the Bluesky formation, and wells will penetrate through overlying Cretaceous strata (see Table 3.4-1). The Dunvegan formation is the uppermost bedrock unit in the RSA.

Surficial deposits in the RSA include organic, glaciolacustrine, morainal, and glaciofluvial deposits. They are substantial, ranging from 90–150 m in thickness. Most of the surficial deposits have low palaeontological potential. The glaciofluvial gravels, especially those deposited in terraces along meltwater channels, have high palaeontological potential for early postglacial mammals, but such fossils are volumetrically rare. These deposits are concentrated in the center of the development area. At the source water treatment facility, recent fluvial sediments cover the floodplain and the valley slope is vegetated and made up of slumped colluvial deposits (Bohach 2006).

3.4.2 Review of Previous Studies

Three previous archaeological studies were conducted within the LSA:

- 1978 – two Terms of Reference of an HRIA in support of an-situ project for Shell included the water intake systems at Cadotte Lake, the pipeline to the plant, access roads and disposal lines, fuel gas line and the plant's power transmission line (McCullough and Calder 1978)
- 1984 – Alberta Culture requested an HRIA for the Shell Peace River Expansion Project water supply pipeline (Lifeways 1984)
- 2002 – an HRIA evaluated a smaller Shell project expansion of the Carmon Creek development which did not proceed

Table 3.4-1: General Stratigraphy of the Peace River Oil Sands

Age	Group	Formation	Rock Type	Fossil Content
Pleistocene to recent	-	-	Organic, glaciolacustrine, morainal, and glaciofluvial deposits	Postglacial mammals in glaciofluvial deposits
Cretaceous	Fort St. John	Dunvegan	Sandstone with minor shale, limestone and coal deposited in shallow marine to continental environments	Dinosaur trackways, plants, molluscs, crocodile, turtle and fish scales
		Shaftesbury	Dark marine shale with a band of silt and sand bearing fish remains (e.g. the Fish Scale Siltstone), deposited in a nearshore, marine environment	Plants, molluscs, including ammonites, and fish
		Peace River	Sandstone and shale deposited in a shallow marine to shoreface environment that experienced a fall in sea level	No fossils reported
		Spirit River	Sandstone and basal shale with ironstone deposited in a deltaic to deep marine environment.	Ammonites, clams, fish scales and the earliest deciduous pollen in Alberta
		Bluesky	Glauconitic sandstone deposited in a wave-dominated, estuarine depositional environment	Trace Fossils
	Bullhead	Gething	-	Not assessed
		Cadomin	-	Not assessed
Mississippian to Jurassic	-	-	Various	Not assessed

Source: Modified from Hayes et al. (1994).

McCullough & Calder (1978) included file and report reviews, map and air photograph interpretation, and an overflight reconnaissance and determined that the Peace River Complex and adjacent areas had limited archaeological and palaeontological site potential. No evidence of pre-contact or historic period archaeological sites was observed and no bedrock exposures or fossiliferous sediments were encountered. Although more limited in scope, the 1984 assessment similarly resulted in no new finds (Lifeways 1984). The 2002 assessment reviewed the preliminary project expansion footprint. A pedestrian traverse of the development footprint examined existing exposures with subsurface tests excavated along evaluated, well-drained land forms.

The 2002 assessment was based on an integrative assessment involving the two previous studies in 1978 and 1984. They suggested that Carmon Lake, which occurs within the LSA, acts as a catchment for water pooling from nearby patches of muskeg. Given the featureless terrain that occurs throughout the LSA, any dry patches near Carmon Lake probably represent the highest potential loci for human activity close to the development footprint. This interpretation is probably accurate only in years of moderate precipitation. In wetter periods, areas peripheral to Carmon Lake were probably inundated.

3.4.3 Known Historical Resources

3.4.3.1 Local Study Area

Prior to this investigation, no historical resources were recorded within the boundaries of the LSA. Sections 21, 22, 29, and 30 of Township 85, Range 19, W5M appear in Listing of Significant Historical Sites and Areas. These sections have each been assigned a Historical Resources Value (HRV) of "5" indicating lands of "High Palaeontological Resource Sensitivity (ACD 2006).

3.4.3.2 Regional Study Area

The site file search indicated that eight historical resource sites occur outside the LSA but within the boundaries of the RSA (see Figure 3.4-1). Each site is located near the Peace River Valley. The inventory includes four pre-contact archaeological sites (HcQg-1, HcQg-2, HcQg-3, and HbQg-2) and four historic period sites (HcQh-10, and inventory sites 74972, 45851, and 46788). Each of the pre-contact sites was identified from surface material recovered in cultivated fields.

Settlement within the Peace River region traditionally focused on areas adjacent to the river valley. Many of these areas have been subject to some degree of agricultural development, often resulting in the exposure of underlying sediment. The identified pre-contact sites range in nature from isolated lithic finds to small scatters of lithic material derived from the remnants of stone tools and the refuse accruing from their production. The historic period sites include three structural remains (a residence, farmstead, and historic school) and a cemetery. All are located near the Peace River Valley.

3.4.4 Historical Resources Field Study Results

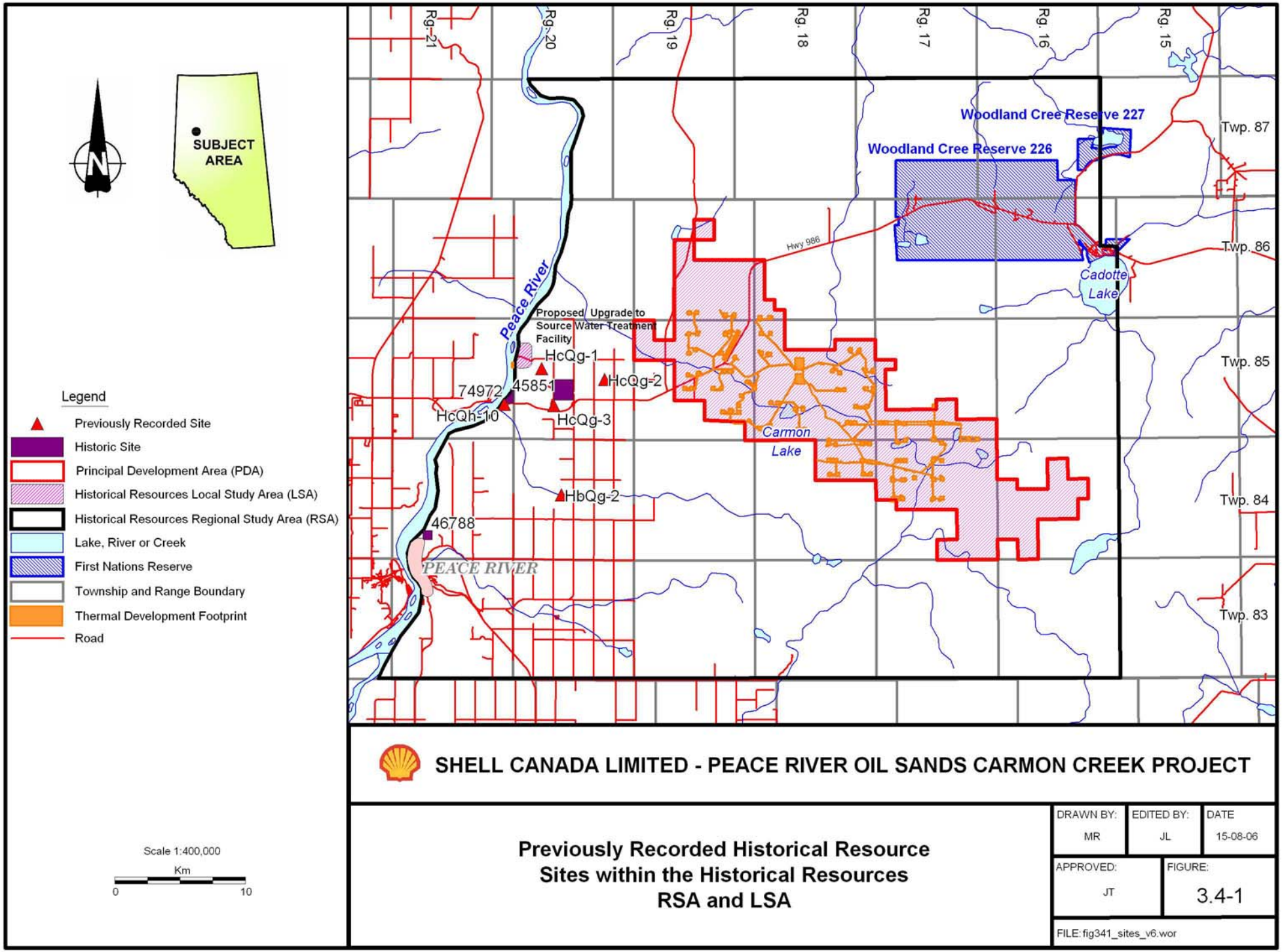
3.4.4.1 Precontact Archaeological Sites

No pre-contact archaeological sites were encountered during either the visual inspection or subsurface testing of the target areas in 2005 or 2006.

3.4.4.2 Historic Archaeological Sites

No historic archaeological sites were encountered during either the visual inspection or subsurface testing in 2005.

Seven new historic archaeological sites were recorded within the boundaries of the LSA during the 2006 field assessment. These sites are all residential or domestic in nature. Most of the sites are associated with registered traplines. Six of the seven sites occur in association with a water source. One of these sites appears to have been previously burned. The seventh site appears to have been moved to its current location at some point in the past. Both this site and the burned site are considered to exist in disturbed contexts. None of these seven new sites are currently in position to be impacted by the proposed facilities associated with the Thermal Development. One new historic period site was also recorded outside of the LSA boundary and will not be affected by the Thermal Development. Those sites that were identified occurred in the areas that had higher relief and greater drainage.


SUBJECT AREA
N
Legend
Previously Recorded Site
Historic Site
Principal Development Area (PDA)
Historical Resources Local Study Area (LSA)
Historical Resources Regional Study Area (RSA)
Lake, River or Creek
First Nations Reserve
Township and Range Boundary
Thermal Development Footprint
Road
Scale 1:400,000
Km
0
10
Rg. 21
Rg. 20
Rg. 19
Rg. 18
Rg. 17
Rg. 16
Rg. 15
Twp. 87
Twp. 86
Twp. 85
Twp. 84
Twp. 83
Woodland Cree Reserve 227
Woodland Cree Reserve 226
Hwy 986
Cadotte Lake
Carmon Lake
Peace River
Proposed Upgrade to Source Water Treatment Facility
HcQg-1
HcQg-2
HcQg-3
HcQh-10
HbQg-2
74972
45851
46788
PEACE RIVER
SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT
Previously Recorded Historical Resource Sites within the Historical Resources RSA and LSA
DRAWN BY: MR
EDITED BY: JL
DATE 15-08-06
APPROVED: JT
FIGURE: 3.4-1
FILE: fig341_sites_v6.wor

The LSA is generally considered to be of low potential for historical resource sites, and field observations verified this. Much of the LSA had little topographic relief. The relative lack of dry, prominent landforms throughout the area is a constraint to archaeological potential. It is likely that during wetter periods throughout its history, the LSA would either have been inundated, or too wet to support sustained occupancy. As a result of both the aerial overflight and subsurface testing regime, some parts of the LSA appear to have greater site potential. These localities tend to have higher relief and better drainage than surrounding areas and many occur near a source of water. Seven new historic period sites were recorded within the boundaries of the LSA during the 2006 field assessment. These sites are all residential or domestic in nature. Most of the sites are associated with registered traplines.

3.5 Application Scenario

3.5.1 Surface Disturbance of Site Contents

3.5.1.1 Potential Impacts

The contents of an archaeological site comprise all fossils, artifacts, and features deriving from past human activity at a given location. These materials are used to reconstruct the behaviour, motivations, and activities of the people responsible for a site's creation. Disruption of a site can lead to mechanical and chemical damage to site contents. Such damage can obscure or alter interpretations made using fossils, artifacts, and features. The potential for damage usually increases with the age of a site.

Within the LSA, surface disturbances resulting from the Thermal Development could potentially result in primary impacts to historical resources. Initially, these impacts could result from:

- tree clearing and ground disturbance for facilities
- access roads and pipeline construction
- potential erosion induced during construction of the Thermal Development

Residual impacts might occur through:

- maintenance or development activities requiring ground disturbance during operations
- ground disturbance and erosion associated with decommissioning and reclamation activities

3.5.1.2 Mitigation

Mitigation implemented by Shell is based on 25 years of operational experience and Shell has a high degree of confidence in their effectiveness. In addition, Shell's Environmental Management Systems are ISO 14001 certified. In keeping with the principle of adaptive management, Phase 2 of the Thermal Development will implement improvements learned from Phase 1.

The seven new historical resource sites identified during this assessment occur within the boundaries of the LSA but are not currently in position to be affected by any of the proposed facilities. No previously recorded sites occur within the LSA. Mitigation is avoidance of all known historical resource sites. Shell will also adjust the Thermal Development footprint to avoid clearing known sacred, burial and historic sites

3.5.1.3 Residual Impacts

As the seven recorded sites occurring within the LSA boundary are not in a position to be affected by any of the proposed facilities, no residual impacts to site contents are expected to occur. This is a Class 4 impact.

3.5.2 Effects of Increased Access on Site Context

3.5.2.1 Potential Impacts

The placement of artifacts in relation to other artifacts and environmental features in a site provides clues about their importance, function, and method of manufacture. This information is known as the context of an archaeological site and it can often provide more information about past human behaviour than the artifacts. When artifacts are moved, or a site is disturbed, the context is destroyed. This process occurs even during scientific investigation of a site. Therefore, detailed recording must be undertaken to preserve as much information as possible about a site's initial context.

Increased access to the LSA could affect site context. Impacts could also occur as a result of improved access providing opportunities for the unauthorized collection, excavation, disturbance, or vandalism of pre-contact, historic, or palaeontological sites, as well as unintentional disturbance from increased traffic flow.

3.5.2.2 Mitigation

Seven historical resource sites were identified within the boundaries of the LSA. Although increased access into the LSA could lead to site impacts, no evidence currently exists of any conflicts. Mitigation includes avoidance of all known historical resource sites. In addition, historical resources awareness will be provided in the basic orientation for workers and contractors, as appropriate. Workers will also be encouraged to report the discovery of archaeological sites, or the vandalism of such sites, to Project supervisors and environment site personnel.

3.5.2.3 Residual Impacts

As no evidence currently exists that increased access into the LSA will lead to site impacts, and that provided mitigation measures are followed, no residual impacts to site contents are expected to occur.

3.5.3 Application Scenario Summary

An analysis of sites occurring in the RSA could be used to provide insight concerning the historical resource potential in the LSA. The sparse and disturbed nature of the pre-contact materials near the river valley reinforces the interpretation that the LSA has low potential for pre-contact historical resources. Furthermore, the proximity of the regional pre-contact sites to the Peace River, and the comparative absence of pre-contact sites in the LSA, provides further evidence that historical resource potential increases near water sources and other substantial geomorphic features. This pattern is also seen among the historic period sites. The sites recorded outside the LSA occur near the Peace River Valley, whereas historic sites within the LSA appear to be located near small lakes and rivers. As most of the lands within the LSA are poorly drained and are not located directly adjacent to a water source, the LSA is considered to be of low potential for historical resources.

A total of seven historical resource sites were identified within the LSA. Six of these new sites were discovered near water sources. The seventh (HcQf – HS3) appears to have been recently moved. These sites are not currently in a position to be affected by the Thermal Development. Therefore, no impacts to either pre-contact or historic period archaeological resources are expected to occur as a result of the construction, operations, or decommissioning, abandonment, and reclamation phases of the Thermal Development. Table 3.5-1 summarizes these findings.

Table 3.5-1: Summary of Identified Historical Resource Sites and Predicted Impacts

Site ID	Site Type	Disturbance (from previous development)	Predicted Effect from the Thermal Development	Historical Resource Value (Scientific, Ethnic or Public)	Recommendations
HbQd - HS1	Historic structures	Undisturbed	No impact	High	Avoidance
HcQe - HS1	Historic structures	Undisturbed	No impact	High	Avoidance
HcQe - HS2	Historic structures	Undisturbed	No impact	Moderate	Avoidance
HcQf - HS1	Historic structures	Undisturbed	No impact	Moderate	Avoidance
HcQf - HS2	Historic structures	Undisturbed	No impact	High	Avoidance
HcQf - HS3	Historic structures	Disturbed	No impact	Low	Avoidance
HbQd 1	Historic refuse and foundation	Disturbed	No impact	Moderate	Avoidance

The Thermal Development will result in surface disturbance and limited sub-surface disturbance within the LSA. This area is covered in thick surficial sediments, and surface disturbance will not affect bedrock. Most of the surficial sediments that will be disturbed have low palaeontological potential, except for the glaciofluvial gravels concentrated in the centre of the LSA. At the source water treatment facility, only recent fluvial and slumped colluvial deposits occurring along the Peace River Valley will be impacted (Bohach 2006).

Subsurface disturbance will affect the Bluesky formation and all overlying stratigraphic units. Of these formations, the Dunvegan, Shaftesbury, and Spirit River formations have high palaeontological potential and contain significant palaeontological resources, including vertebrate material. Disturbance of these units should not be extensive; therefore, the potential impacts to paleontological resources are low. As all disturbances will occur at depth, there is no opportunity for monitoring or other mitigation measures (Bohach 2006).

3.6 Cumulative Effects Scenario

Environmental effects can be cumulative through time and space (Northey 1994). They are caused by the accumulation and interaction of multiple stresses affecting the parts and functions of ecosystems (EUB, AENV, and NRCB 2000). Assessment of the cumulative effect of developments on historical resource sites can be measured in only the broadest of terms.

Interpretation of historical resource materials and the significance of particular sites in a landscape are based on an understanding of the nature of the relationship between archaeological materials and the sediments and strata in which they are contained. Removing or mixing these sediments results in the permanent loss of information basic to the understanding of these resources. As a result, historical resources are increasingly susceptible to destruction and

depletion through disturbance. Table 3.6-1 summarizes the cumulative impacts to historical resources in the RSA.

The inventory of historical resource sites in the RSA has been compiled primarily through impact assessment studies. As a result, growth of the inventory represents an index of the cumulative effects of development on the historical resources in this portion of Alberta. The cumulative effects of secondary impacts on historical resources are much more difficult to measure, as they result from increased human presence, as well as clandestine collection, disturbance, and vandalism of known historical resources.

Within the context of the RSA, 100% of the known pre-contact sites have been disturbed including two isolated finds (50%), one artifact scatter (25%), and a single campsite (25%). The primary mode of this disturbance has been agricultural, and a loss of information has occurred. Information from a minimum of 50% of the historic sites has been lost by way of disturbance resulting from weather damage, vandalism, scavenging, and fire.

Successive developments in a region result in the attrition of information regarding the nature of historical resources and pre-contact lifestyles. However, the direction of effects is also positive through the contribution of information to the current body of knowledge about pre-contact and historic site types and distribution. Relative to the Thermal Development, the cumulative effect of both past projects and the proposed Thermal Development would result in disturbance of about 63% of the total number of recorded historical resource sites in the Borden Blocks for the Peace River area (Borden Blocks are the Canadian archaeological standard used to delineate the historical resources database).

Table 3.6-1: Summary of Cumulative Effects of Development on Historical Resource Sites by Site Type

Pre-contact Site Type	Historic Site Type	Number of Sites in Regional Study Area	Number of Sites Affected by the Thermal Development	Number of Sites Affected by Other Developments (Including Agriculture)	No Data	Total Number of Sites Affected
Isolated Finds		2	0	2	0	2 (100%)
Artifact Scatters		1	0	1	0	1 (100%)
Campsites		1	0	1	0	1 (100%)
Sites of a Special Nature		0	0	0	0	0
Subtotal (% of pre-contact total)		4	0 (0%)	4 (100%)	0	4 (100%)
	Residential/ Domestic	12	0	6	3	6 (50%)
	Transport/ Communication	0		0	0	0
	Industrial	0	0	0	0	0
	Trade Post/Fort	0	0	0	0	0
	Spiritual	0	0	0	0	0
Subtotal (% of historic total)		12	0 (0%)	6 (50%)	3	6 (50%)
Total (% of total)		**16**	**0**	**10 (63%)**	**3 (19%)**	**10 (63%)**

3.7 Monitoring and Adaptive Management

Shell will continue to avoid known historical resource sites throughout the construction, operations and decommissioning and reclamation phases of the Thermal Development. If, any historical resources are encountered during construction or operations, Alberta Community Development will be advised.

As all disturbances will occur at depth, there is no opportunity for monitoring or other mitigation measures relative to any palaeontological resources that might be affected.

Relative to historical resources within the RSA, the effect of the Thermal Development is positive in that seven new historic sites, including one outside of the Local Study Area boundaries, were recorded and added to the provincial database. Scientific data concerning these historical resources were retrieved during the Historical Resource Impact Assessment.

3.7.1 HRIA for Footprint Changes

If at any time, alterations are made to the Thermal Development footprint resulting in effects outside the current PDA, the archaeological potential of the new areas will be assessed. Should such changes in the Thermal Development footprint potentially affect areas of moderate to high archaeological potential, additional assessment in the form of an HRIA may be required. Such changes include altering wellpad locations, rights-of-way, or other facilities, as well as, the addition of new pads, facilities, or developments such as pipelines and roadways.

3.8 Summary of Impacts

A total of seven historical resource sites were identified in the LSA. Thermal Development effects on historical resources are considered to be irreversible. However, none of these sites were determined to be located within the current Thermal Development footprint. This finding indicates that no measurable adverse effects from the Thermal Development will occur at either the local or regional scale (see Table 3.8-1). As there are no effects to quantify, the resulting directional change is considered to be neutral. Thus, no quantitative assessment criteria (geographic extent, magnitude, duration) can be applied. Confidence in this evaluation is considered to be high.

The 2005 and 2006 field assessments, in conjunction with a review of site data available from within both the RSA and LSA, provided information for estimating general site potential. The potential is considered to be low. As a result, the potential local Thermal Development effects and regional effects have been rated as Class 4 impacts. The Class 4 rating indicates that no further action is required, although continued avoidance of the identified sites is required.

The undertaken cumulative effects study indicates that historical resources within the RSA have been subject to cumulative impacts occurring from various activities before the current Thermal Development. The projected land use development associated the current Thermal Development will result in no measurable impact to historical resources in either the LSA or RSA during the life of the Thermal Development and will, therefore, not contribute to any cumulative effects.

Table 3.8-1: Final Impact Rating Summary Table

	Geographic Extent	Magnitude	Direction	Duration	Confidence	Rating	
						Thermal Development Impact	Cumulative Impact
No impacts predicted[1]	n/a	n/a	Neutral	n/a	High	Class 4	Class 4

Notes:
[1] Seven sites were recorded in the LSA; however, none are currently in a position to be impacted.
n/a – not applicable.

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TRADITIONAL ECOLOGICAL KNOWLEDGE AND LAND USE

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4. Traditional Ecological Knowledge and Land Use

4.1 Introduction

Shell Canada Limited (Shell) is requesting regulatory approval to commercially develop the Peace River Oil Sands Carmon Creek Project (Project), located about 40 km northeast of the Town of Peace River, Alberta within Townships 84–86, Ranges 16–19, W5M, in Northern Sunrise County. The Project is an expansion of the existing Peace River Complex, and is planned to consist of both thermal recovery (Thermal Development) and primary recovery (Primary Development). This section presents the results of the traditional ecological knowledge and land use study for the proposed Thermal Development. The Aboriginal groups consulted include Woodland Cree First Nation and Cadotte Lake Métis. Figure 4.1-1 shows the location of these communities in relation to the Principal Development Area (PDA).

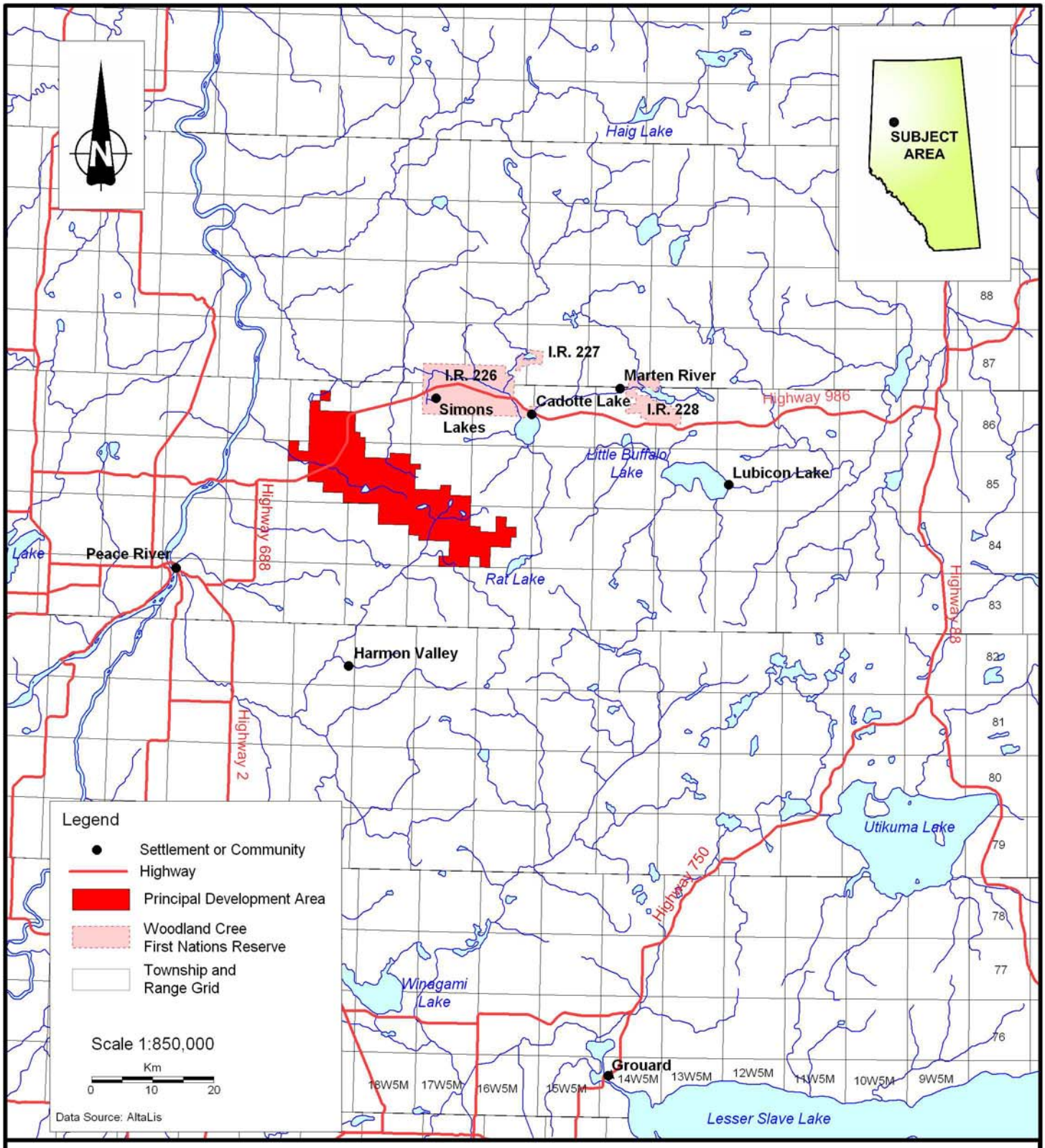
To date, Woodland Cree First Nation leadership have not committed to participate in this study. On several occasions, Métis representatives expressed traditional ecological knowledge and land use study for the Thermal Development would be incomplete without the formal involvement of Woodland Cree First Nation. Shell and Woodland Cree First Nation are currently involved in discussions regarding their involvement in a traditional ecological knowledge and land use study. Shell is committed to working with the Woodland Cree First nation on future traditional ecological knowledge and land use studies and integrating the information from those studies into the Thermal Development.

This section contains the results of the Cadotte Lake Métis Ecological Knowledge and Land Use Study based on information collected through interviews and fieldwork with Métis participants from October 2005 to August 2006. This study has been prepared for use of the Thermal Development‘s Environmental Impact Assessment (EIA). Any other use of the information requires consent of the Cadotte Lake Métis, who are represented regionally by Métis Region VI (see Figure 4.1-2).

4.1.1 Objectives

The objectives of this section are to provide:

- a description of baseline Métis ecological knowledge and land use in both the local study area and the regional study area
- a summary of Métis perspectives on impacts:
  - from the proposed Thermal Development
  - in combination with past, existing, and planned projects and activities (cumulative effects)
- Cadotte Lake Métis recommendations for mitigating potential effects on the community:
  - from the proposed Thermal Development
  - in combination with past and existing projects and activities (cumulative effects)



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Principal Development Area

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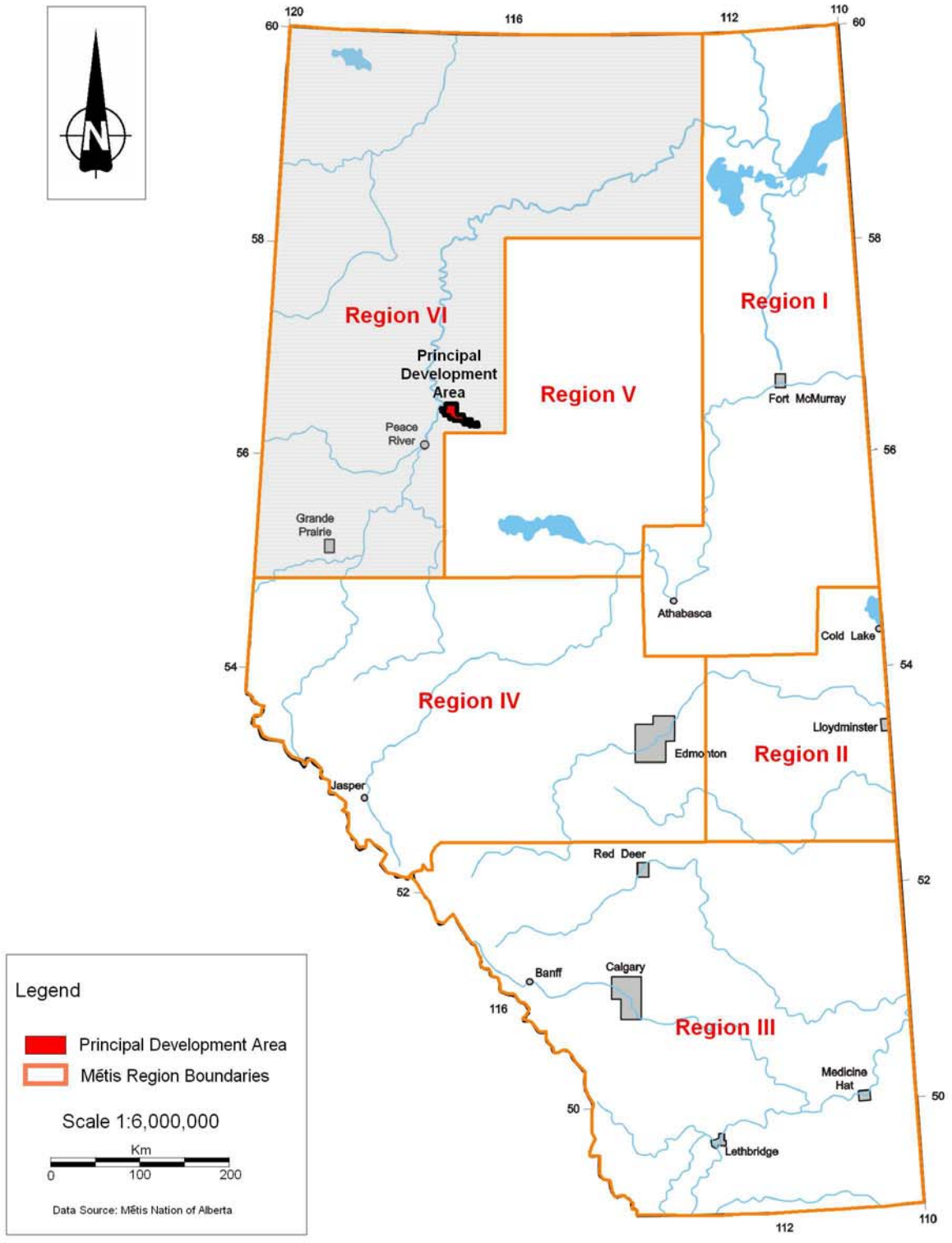

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Métis Nation of Alberta Regional Boundaries, 2006

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4.1.2 Terms of Reference

The Terms of Reference (TOR) (AENV 2006) required that the Environmental Impact Assessment:

- "provide results of consultation with Aboriginal stakeholders to determine the extent of traditional land use of the Local Study Area (LSA). Discuss the vegetation and wildlife used for traditional, food, ceremonial, medicinal and other purposes, and any potential effects the Project may have
- identify the traditional land uses including fishing, hunting, plant harvesting (nutritional or medicinal), and cultural use with specific regard given to local Aboriginal peoples. Identify cabin sites, spiritual sites, and graves. Determine the Project and cumulative impact of development on these uses and identify possible mitigation strategies"

4.2 Study Approach

4.2.1 Context

The Aboriginal concept of 'the land' is integral to the assessment process for it encompasses their personal and cultural identities, their histories, and their religions embedded within complex oral traditions. The 'land' is the matrix containing communities of plants, animals, and humans created by spiritual beings. Humans are integral parts of those communities, not set apart from them. The view is holistic. No one place in a landscape is more significant than any other. All are significant to the individual and collective psyche and worldview (Oakes et al. 1998).

The emerging future with its rapidly changing technologies and demand for resources is resulting in societal changes. This change is evident in Aboriginal cultures. The assessment of effects of the proposed Thermal Development on traditional land use is ultimately of socio-economic relevance because it pertains to the social and physical wellbeing of not only a community but of the individuals within that community. Cultures, past and present, are dynamic works in progress. They are shaped from within and by outside influences. Changes are inevitable but ultimately each culture's goal is to maintain its identity and wellbeing by adapting to the forces of change rather than being subsumed.

4.2.2 Nature of the Information

Aboriginal peoples who have 'lived on the land' often have memories and sensory perceptions that are vivid and detailed, relating to cultural conditioning which makes accurate perception and memory of environmental features and changes an essential condition for survival. Traditional knowledge is passed on orally and current observations can often have a multi-generational time perspective. Information collected from Aboriginal participants is primarily qualitative and is based on sensory data, oral traditions, and cultural norms and values (Berkes 1999).

Traditional knowledge is generally grounded in specific uses of particular ecosystems. It is inseparable from landforms, environmental quality, survival of particular species, and subsistence activities. Knowledge is taught, learned, tested, and expanded through traveling and using a specific territory. Modifying the landscape, biodiversity, or human ecology jeopardizes (traditional) knowledge (Battiste and Youngblood Henderson 2000). Two types of information are collected: Traditional Land Use (TLU) and Traditional Ecological Knowledge (TEK). TLU information focuses on locations and or sites of cultural significance that may be subject to impacts by the proposed Thermal Development. TEK is the wisdom and understanding of the

particular natural environment which has accumulated over generations and can serve to aid Western scientific disciplines in analyzing Thermal Development effects.

TEK can be relevant to the Thermal Development (e.g., design, safety programs, noise, visual aesthetics, reclamation, and abandonment), to the environment (e.g., wildlife, vegetation, fisheries and aquatic resources, hydrogeology, geology and terrain, climate, soils, palaeontology, and air quality), and to Aboriginal culture (health, socio-economics, traditional land use, archaeology, and heritage) (see Table 4.2-1). It also relates to the cumulative effects of past and existing activities to both culture and the environment.

Table 4.2-1: Traditional Ecological Knowledge Information Categories

Project	Environment	Culture	Effects
• project design • safety • abandonment • reclamation	• fisheries and aquatic resources (inland and marine) • wildlife • vegetation • hydrogeology (groundwater) • hydrology (surface water) • geology and terrain • climate • soils • air quality • noise • paleontology • visual aspects	• traditional land use • socio-economic factors • archaeology • heritage • community wellbeing	• effects on culture • effects on environment

4.3 Study Method

This section provides details of the methods used to conduct the Métis Ecological Knowledge and Land Use Study. A series of scoping meetings, interviews, and field visits were carried out from October 2005 to August 2006 to gather information.

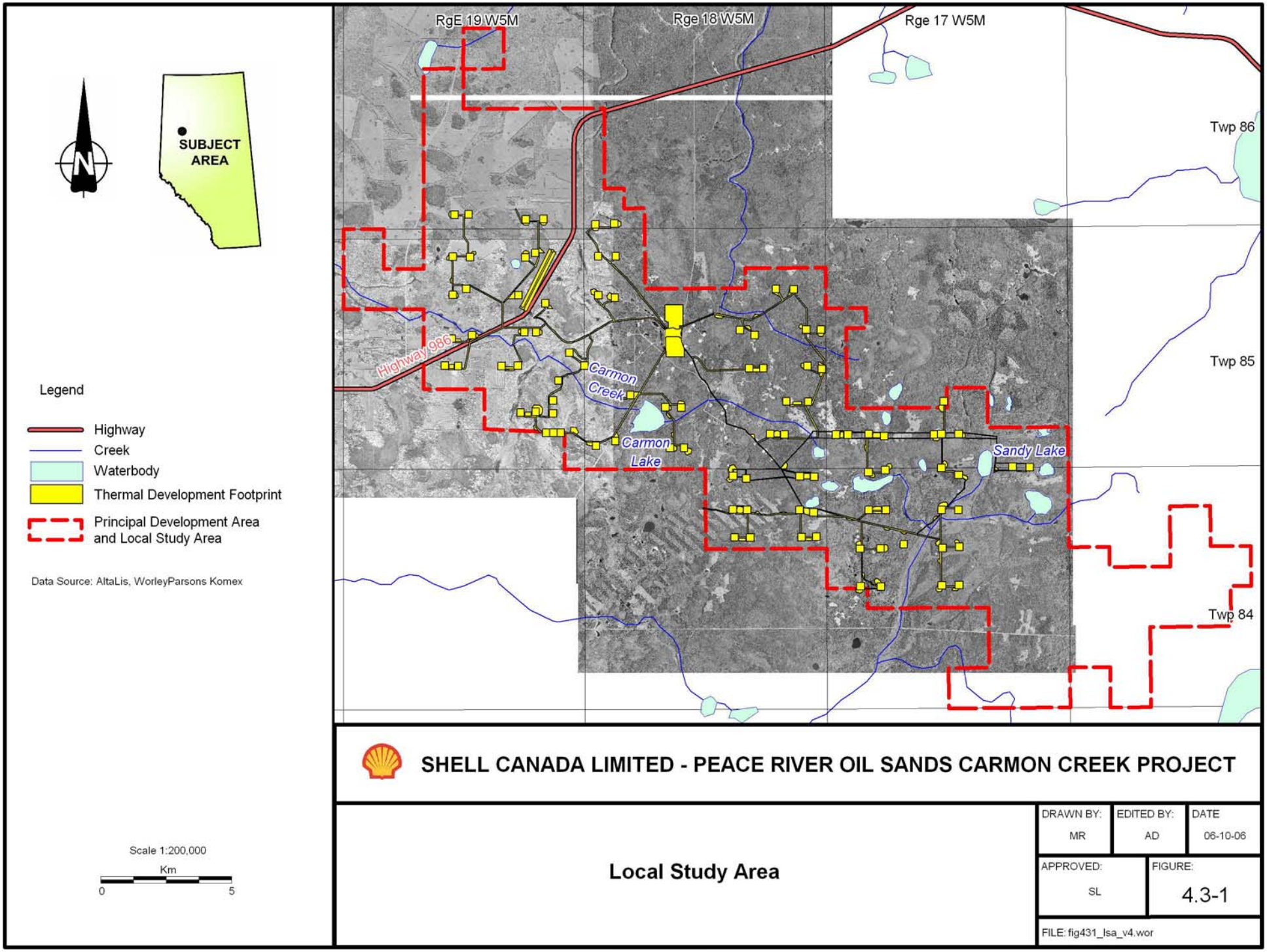
4.3.1 Spatial and Temporal Boundaries

4.3.1.1 Local Study Area

The LSA is defined as the PDA (see Figure 4.3-1). The PDA is the portion of the Shell lease where Thermal Development activities are planned for the production of the bitumen resource. Figure 4.3-1 shows the proposed Thermal Development footprint and PDA presented to Métis participants at the time of the interviews.

4.3.1.2 Regional Study Area

The traditional territory of an Aboriginal group is often used to define a Regional Study Area (RSA). However, Métis participants at Cadotte Lake felt uncomfortable defining a traditional territory, explaining that their land use patterns were dynamic. The RSA, as shown in Figure 4.3-2, delineates the Cadotte Lake Métis land use areas discussed during interviews with participants. It in no way denotes the traditional land use boundaries of the Cadotte Lake Métis.


SUBJECT AREA
Legend
Highway
Creek
Waterbody
Thermal Development Footprint
Principal Development Area and Local Study Area
Data Source: AltaLis, WorleyParsons Komex
RgE 19 W5M
Rge 18 W5M
Rge 17 W5M
Twp 86
Twp 85
Twp 84
Highway 986
Carmon Creek
Carmon Lake
Sandy Lake
Scale 1:200,000
Km
0
5
SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT
Local Study Area
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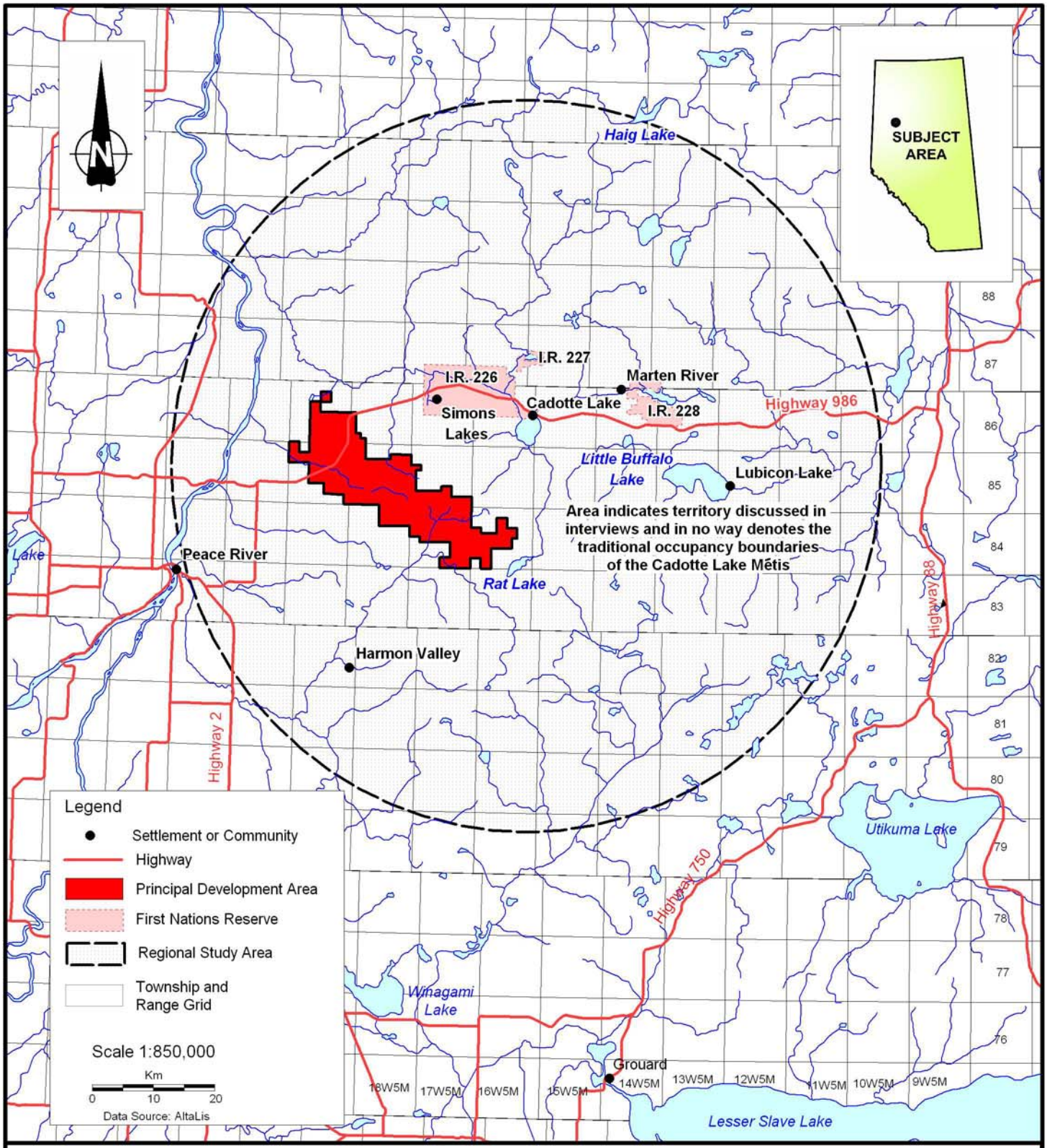

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Regional Study Area

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4.3.1.3 Temporal Boundary

Based on the perspective of Cadotte Lake Métis community members, the temporal boundary against which incremental changes in time are being compared is the 1950s, when logging and oil activities first began in the Peace River area.

4.3.2 Project Inclusion List

The Project inclusion list (see Table 4.3-1) includes developments that occur or are planned to occur in the LSA and RSA. These developments may also occur in traditionally used areas and may contribute to cumulative effects, along with the Thermal Development. From Aboriginal users' perspectives, any activity on the land (i.e., forestry, agriculture, and corridors) is considered an impact to land use.

Table 4.3-1: Project Inclusion List

Status	Baseline Scenario	Application Scenario	Cumulative Effects Scenario
Existing and Approved	Existing Shell Peace River Complex operations (2000 m^3/d production)	Existing Peace River Complex integrated with the Thermal Development	Existing Peace River Complex integrated with the Thermal Development
	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557
	Asphalt plant	Asphalt plant	Asphalt plant
	BlackRock Ventures - Seal	BlackRock Ventures - Seal	BlackRock Ventures - Seal
	Bonavista Energy Trust Ltd.	Bonavista Energy Trust Ltd.	Bonavista Energy Trust Ltd.
	Boucher Brothers Lumber Ltd.	Boucher Brothers Lumber Ltd.	Boucher Brothers Lumber Ltd.
	Daishowa-Marubeni International Ltd. Facility	Daishowa–Marubeni International Ltd. Facility	Daishowa–Marubeni International Ltd. Facility
	Daishowa-Marubeni International Ltd. existing cutblocks	Daishowa-Marubeni International Ltd. existing cutblocks	Daishowa-Marubeni International Ltd. existing cutblocks
	Husky Oil Operations Ltd. Simons Lake Gas Plant	Husky Oil Operations Ltd. Simons Lake Gas Plant	Husky Oil Operations Ltd. Simons Lake Gas Plant
	Husky Oil Operations Ltd. Slave Lake Gas Plant	Husky Oil Operations Ltd. Slave Lake Gas Plant	Husky Oil Operations Ltd. Slave Lake Gas Plant
	PennWest Energy Trust Ltd. Harmon Gas Plant	PennWest Energy Trust Ltd. Harmon Gas Plant	PennWest Energy Trust Ltd. Harmon Gas Plant
	PrimeWest Energy Trust Ltd. Seal 1	PrimeWest Energy Trust Ltd. Seal 1	PrimeWest Energy Trust Ltd. Seal 1
	PrimeWest Energy Trust Ltd. Seal 2	PrimeWest Energy Trust Ltd. Seal 2	PrimeWest Energy Trust Ltd. Seal 2
	Shining Bank Energy Trust Ltd. Cadotte Gas Plant	Shining Bank Energy Trust Ltd. Cadotte Gas Plant	Shiningbank Energy Trust Ltd. Cadotte Gas Plant
	Talisman Energy Inc. Harmon Gas Plant	Talisman Energy Inc. Harmon Gas Plant	Talisman Energy Inc. Harmon Gas Plant
	Town of Peace River	Town of Peace River	Town of Peace River
	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails
Project	n/a	**Shell Canada Limited Thermal Development**	**Shell Canada Limited Thermal Development**

Note:
n/a – not applicable.

Table 4.3-1: Project Inclusion List (Cont'd)

Status	Baseline Scenario	Application Scenario	Cumulative Effects Scenario
Planned Projects and Activities	n/a	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)
	n/a	n/a	Associated Shell infrastructure including: • transmission lines • source water pipeline upgrade
	n/a	n/a	Baytex Energy Trust
	n/a	n/a	BlackRock
	n/a	n/a	Husky Oil Operations Ltd.
	n/a	n/a	Murphy Oil Corporation
	n/a	n/a	CCS Energy Services
	n/a	n/a	Daishowa-Marubeni International Ltd. future cutblocks

Note:
n/a – not applicable.

4.3.3 Information Collection

The study team, serving as facilitators, worked collaboratively with Cadotte Lake Métis community members in the collection of information about the perceived effects of the proposed Thermal Development on land use, ecological knowledge, and community wellbeing from the participants' perspective. This included information which Elders considered to be relevant to provide a cultural/environmental context from which to view the study. Aboriginal participants' observations and concerns are documented fully and reported to the Thermal Development proponent. Recommendations for mitigation of any perceived adverse Thermal Development effects are also reported when provided by study participants.

In addition to information gathered through interviews, public domain literature was also reviewed, for the baseline scenario. This included historical and ethnographic literature, traditional land use studies conducted in northwestern Alberta, and traditional land use documents prepared for other impact assessments in the RSA.

4.3.4 Participant Involvement

4.3.4.1 Scoping Meetings

On October 19, 2005, a scoping meeting was held at the Métis Region VI office in Peace River with representatives from Métis Region VI, the Cadotte Lake Métis, the study team, and Shell.

Topics covered included:

- Thermal Development description
- why the work needed to be done
- how and by whom the information would be used
- how sensitive information could be protected
- how participants would be selected
- where and how interviews and field visits would proceed

Darlene Cardinal, a Cadotte Lake Métis representative, was appointed as a community coordinator and Caron Riley, from the Métis Region VI office, was identified as a historic researcher and liaison for the study team.

A second scoping meeting took place on May 9, 2006, at the Métis Region VI office in Peace River with representatives from Métis Region VI, the Cadotte Lake Métis, Shell, and the study team. At this meeting an updated footprint and description of the Thermal Development was presented. The group discussed how to proceed with interviews and field visits for this portion of the work.

4.3.4.2 Interviews

As outlined in Cadotte Lake Métis scoping meetings, participants were selected and interviews organized by the Cadotte Lake Métis community coordinator. Interviews took place either in the Métis Region VI office in Peace River, or in participants' homes at Cadotte Lake and Marten River. Interviews were conducted in the participants' preferred language and, if allowed by participants, taped. Transcripts were made available to participants upon completion of the study. At the start of each interview, each participant was provided with a Thermal Development description to facilitate participants' understanding including potential impacts. How and for what purpose their input would be used was also explained to participants.

Interviews focused on:

- patterns of land use (e.g. camping, trapping, hunting, fishing, and plant gathering for medicinal, dietary, or spiritual purposes)
- locations of traditional sites (e.g., trails, gravesites, significant landmarks, sacred or spiritual sites, camping places, cabins, and special use sites)
- changes in the landscape and in land use over the individual's lifetime
- ecological knowledge regarding plant and animal health, fish quality, water and air quality, climate change, and environmental health
- issues and concerns based on participants' views of potential impacts both with regard to the proposed Thermal Development and the cumulative effect of other resource development projects in the region
- participants' recommendations on mitigation measures

Study team facilitators ensured that each participant had the opportunity to discuss any and all topics of interest. Participants were free to select the topics relevant to the study that they wanted to discuss, and to make recommendations regarding their issues or concerns.

Air photo base maps of the Thermal Development's lease boundaries and footprint were used to aid the discussions (see Figure 4.3-1). The maps were made available in two sizes: 2' x 3' and 11" x 17". Subject to participant consent, specific sites, features, or areas of importance identified by participants were recorded on the maps for inclusion in the draft report.

Individual and small group interviews were held November 15–18, 2005, December 6–8, 2005, June 26–30, 2006, and August 9, 2006. The individuals identified by Métis Region VI as participants are outlined in Appendix LL. To maintain the confidentiality and privacy of participants, numeric codes (e.g., M1, M8, and M11) have been assigned to individuals and are used to reference participant quotes and statements.

4.3.4.3 Field Visits

Field visits to the LSA were conducted using a four-wheel drive truck and Argo (an amphibious off-road all-terrain vehicle). Three, one-day visits (November 16, 2005, December 8, 2005, and June 29, 2006) were required to gather and record baseline Métis ecological knowledge and land

use information. In addition, a day of helicopter flyovers took place on June 28, 2006. The purpose of the field visits was to:

- view areas in and immediately adjacent to the LSA
- identify previously unrecorded locations of land use importance, and document stories and traditional knowledge associated with them
- discuss areas of interest and potential mitigation strategies

Participants identified by Métis Region VI to be involved in field visits and flyovers are outlined in Appendix LL.

4.3.4.4 Community Verification

On completion of the study, results were presented to Aboriginal participants for review to ensure that their observations and concerns had been accurately reported. This process ensured that the community had an opportunity to review proposed mitigation. The content of this study was verified by participants to ensure accuracy and comprehensiveness at a follow-up meeting held in Cadotte Lake on August 8, 2006 and at a sign-off meeting in Peace River October 25, 2006.

4.4 Baseline Scenario

Baseline results are presented in the following sections:

- Cultural and Historical Context
- Métis Land Use
- Métis Ecological Knowledge
- Community Wellbeing

4.4.1 Cultural and Historical Context

The following section is based mainly on the background literature with some contributions from participants.

The Métis of the Peace River region are largely descendents of the French and Iroquois, or Saulteaux people who travelled west with the fur trade in the early nineteenth century. They were often the principal contacts between Euro-Canadian fur traders and Aboriginal populations. Other Métis were freemen, hunting, trapping, and trading with Aboriginal populations. In the years that followed, many people were born of white traders and Aboriginal women (usually Cree) in the Peace River area. Following the Riel Rebellion, some Métis travelled to the Peace River district (M8) where they began to hunt, trap, garden, and raise cattle and horses. They also served as guides, freighters, or stopping place attendants for the growing number of fur traders, missionaries, government surveyors, and settlers travelling to the region. Through these dynamics, an ever-growing Métis population, culture, and identity emerged (Leonard 2000).

4.4.1.1 The Beginning of Development

In the 1930s, a series of events affected Aboriginal culture and lifeways in the area. A dirt road was constructed from Grouard to Peace River, resulting in an influx of non-Aboriginal people to the Peace River area fleeing unemployment and the Great Depression in southern Canada (M4). Registered fur management areas (RFMAs) were established in 1936, disrupting Aboriginal lifeways and land use (M11). Many view the 1950s and the establishment of the logging and oil industries as the time after which traditional lifeways were irreversibly affected (M4 and M11).

4.4.1.2 Oil Exploration

In the winter of 1949–50, oil exploration crews were working in the Marten River area, and by 1954, a test well had been drilled and capped two miles northwest of Marten River (Goddard 1991). Despite having established a Roman Catholic mission in Marten River in 1961, the Church recommended the community move to Cadotte Lake eight miles southwest of Marten River (M1, M8, and M11). People did not want to leave, but with the priest's persuasion and promise of building materials for new homes in Cadotte Lake and a road to Peace River, all but three families moved. Disillusioned, some families soon returned to Marten River. However, government officials intervened, and trappers, who often could not read, were encouraged to sign a quit-claim surrendering rights to their cabins at Marten River. Three days later, cabins at Marten River were destroyed.

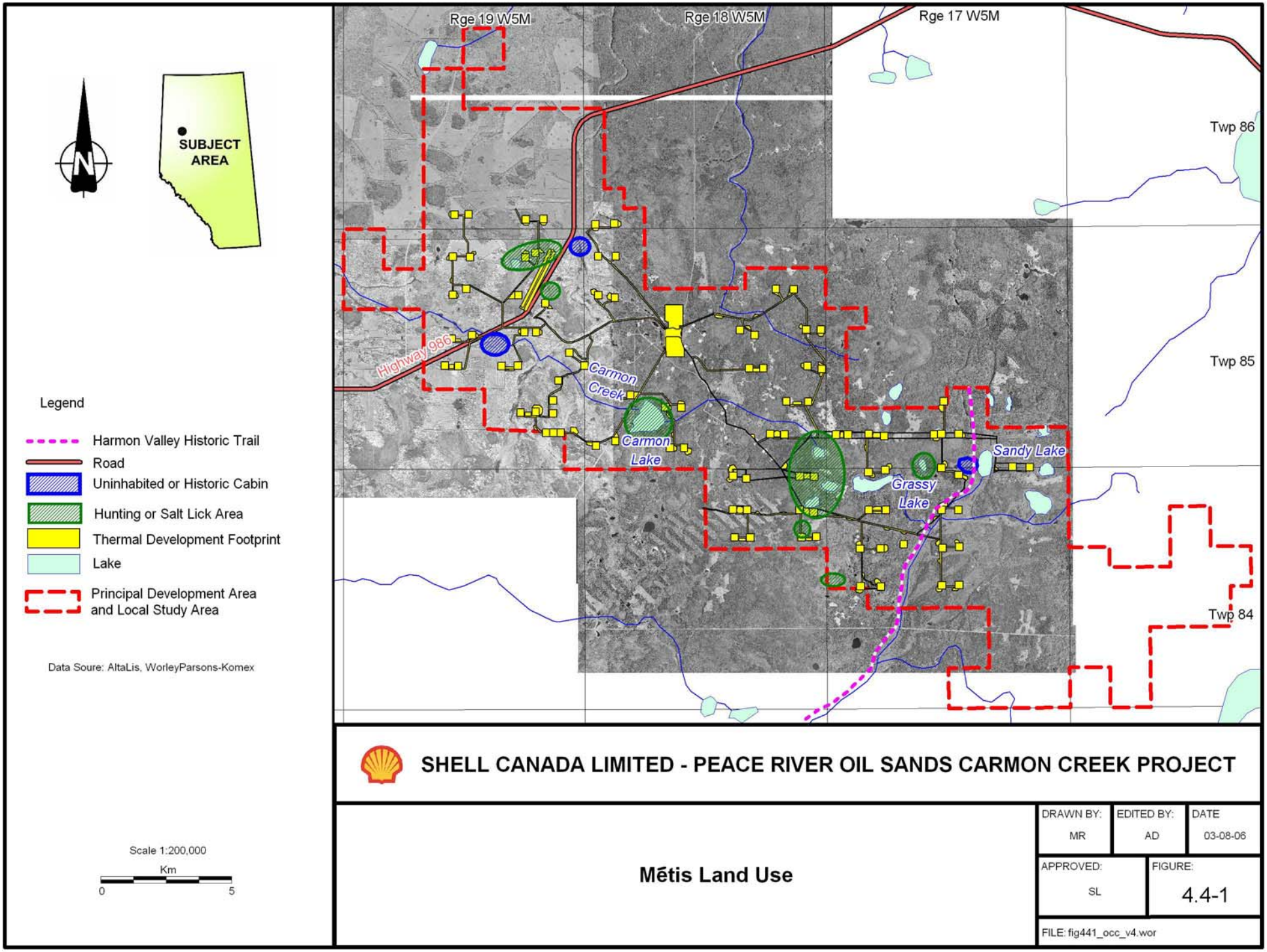
Soon after, the community of Little Buffalo faced the threat of relocation to Paddle Prairie but after a 1969 assessment of the area, residents were allowed to stay. The assessment showed that:

> *The conditions for duck and grouse hunting were considered good to excellent and the moose population in a 50 mile radius of Little Buffalo (was) rated as fairly numerous with an estimated potential harvest of 1,600 animals per year. Good timber stands existed in parts of the region, making forestry a potential industry, and jobs in the oil-and-gas industries were certain to become available. At present roads were terrible. There were no health services, no waterworks, no telephones, no post office. (Goddard 1991)*

In 1973, the Organization of Petroleum Exporting Countries declared an embargo against the United States and Europe. The Alberta government was thus prompted to build roads into the Lesser Slave Lake interior to enhance oil exploration and development, and an all-weather road was begun east from Peace River towards Little Buffalo (Goddard 1991). Before that, most of the roads around Cadotte Lake consisted of wagon trails parallel to creeks (M8). Paving Highway 688 and improving Highway 986 from Peace River to Cadotte Lake (see Figure 4.4-1) substantially shortened trips that once took three or more days by wagon (M2). This had an irreversible impact on traditional lifeways of the people in Cadotte Lake through an influx of non-Aboriginal people and industry to the area, as well as increased access by Aboriginal people to products and services offered in Peace River (M6).

4.4.2 Métis Land Use

The following section outlines baseline results of Métis land use collected during participant interviews and field visits (see Figure 4.4-1). Information regarding travel and access, trapping, cabins and settlements, areas for hunting and camps, fishing areas, plant collection areas, and gravesites is presented.


SUBJECT AREA
Rge 19 W5M
Rge 18 W5M
Rge 17 W5M
Twp 86
Twp 85
Twp 84
Highway 986
Carmon Creek
Carmon Lake
Sandy Lake
Grassy Lake
Legend
Harmon Valley Historic Trail
Road
Uninhabited or Historic Cabin
Hunting or Salt Lick Area
Thermal Development Footprint
Lake
Principal Development Area and Local Study Area
Data Soure: AltaLis, WorleyParsons-Komex
Scale 1:200,000
Km
0
5
SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT
Métis Land Use
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APPROVED: SL
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4.4.2.1 Travel and Access

4.4.2.1.1 Trails

Participants (M2 and M8) reported that countless trails intersect the area in and around the LSA. Such trails connect cabins, hunting camps, communities, trading posts, traplines, game trails, and waterways. Although trails are often overgrown, traces of them are still detectable when people walk in the bush on or near the LSA. Although all of the trails discussed here do not intersect the LSA, an understanding of the regional trail network is necessary to recognize the magnitude of smaller connecting trails in or near the LSA and RSA. Although many historic trails in the Peace River are no longer used, they represent an important link to the past, locally and provincially. Some of the area's major historic travel routes are:

- Grouard to Peace River
- Grouard to Lubicon Lake
- Cadotte Lake to Peace River
- Harmon Valley to Cadotte Lake

Grouard to Peace River

The trail from Grouard to Peace River was historically known as the Peace River Road and connected Peace River to the town of Grouard on Lesser Slave Lake. This trail connected Edmonton with the Peace River Region (see Figure 4.4-2, Canadian Northern Railway Company 1913). Although the route was primarily used by traders, non-Aboriginal settlers, missionaries, and Métis during the late 1800s and early 1900s, it was established 'a long time ago' by First Nations people (Leonard 2000). The trail followed ridges and high ground, and can still be seen today (M4) (see Figure 4.4-3).

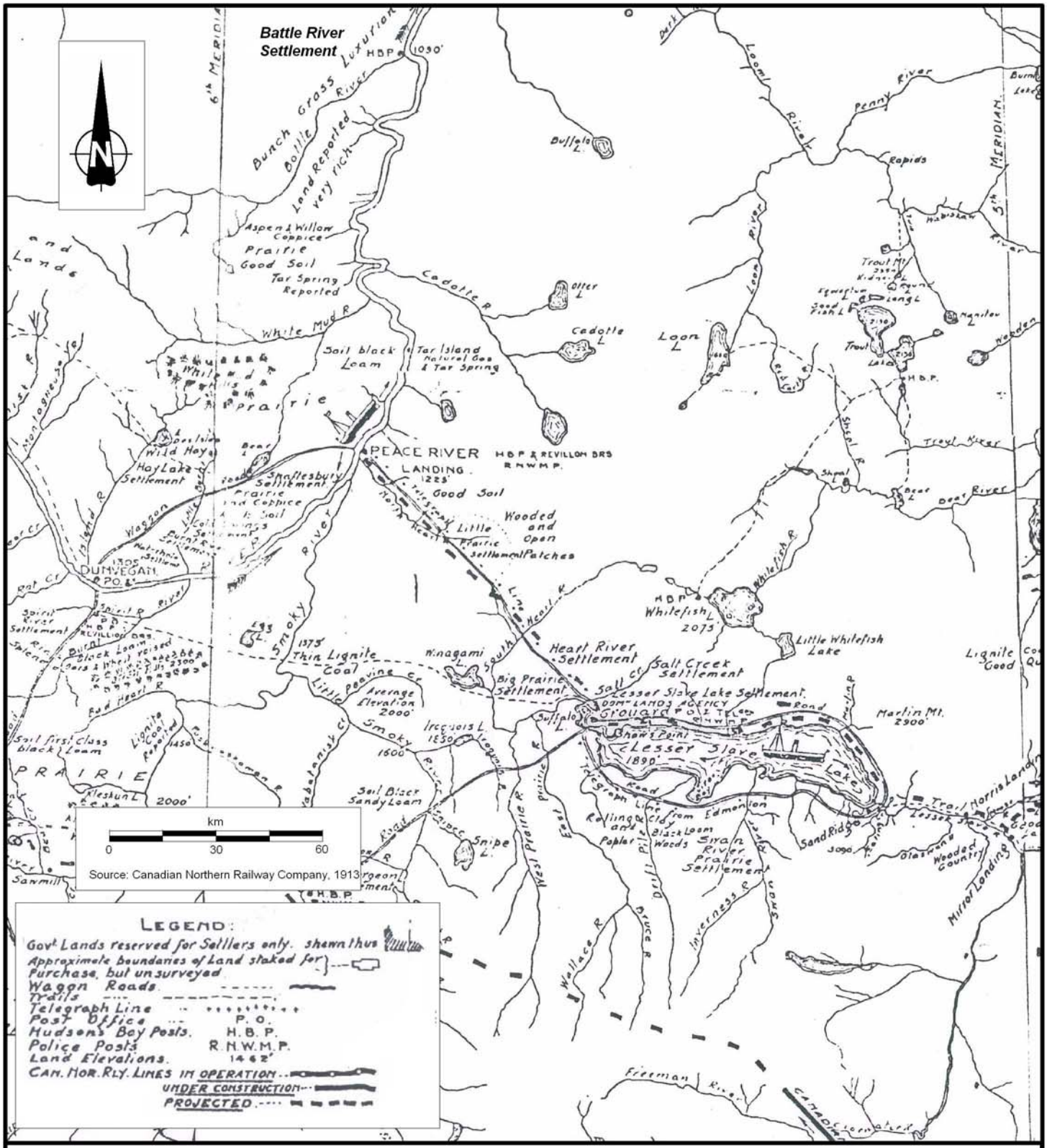
Grouard to Lubicon Lake

The Josi Trail that runs between Grouard and Lubicon Lake is another important historic trail (M1). This trail was named after Joseph (Josi) L'Hirondelle, a Métis man born in 1882, who owned a store on the east side of Lubicon Lake (M1).

Cadotte Lake to Peace River

Participants explained how the current highways to Peace River from Cadotte Lake (Highway 986 and Highway 688) follow sections of traditional travel routes (M1, M3, and M8). These trails evolved into wagon trails, later gravel roads, and were finally paved (Highway 986 was paved in 1992, and Highway 688 was improved from 1979–1981). Figure 4.4-4 illustrates a section of the original trail from Peace River to Cadotte Lake located directly adjacent to Highway 986 (M8).

Participants (M5 and M10) recall travelling from Cadotte Lake to Peace River when the road was a 'bush trail'. It took three to four nights to reach Peace River from Cadotte Lake, and longer in the summer when the trail was wet and muddy (M2). Travellers would stop at Oslie's Store, which once stood at the junction of Highways 986 and 688, on the way from Cadotte Lake to Peace River.



SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Peace River Country Trails and Settlements (1913)

DRAWN BY:	EDITED BY:	DATE
MR	AD	06-09-06
APPROVED:	FIGURE:	
SL	4.4-2	

FILE: fig442_peace_v3.wor

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Grouard Trail (intersected by Right-of-Way)

(Photo from Altimira Consulting Ltd. 2001)

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-3

FILE: N:\projects\61330000\MapInfo\wrkspc\LandUse\TEKLandUse1.wor

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Section of Original Trail from Cadotte Lake to Peace River

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
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Harmon Valley to Cadotte Lake

A wagon trail that ran from Cadotte Lake to Harmon Valley was also described by participants (M1 and M3). Métis families used to travel to Harmon Valley from Cadotte Lake to work for farmers, clearing land and harvesting crops (M6 and M8). They would stay in the area while work was available. Harmon Valley was also described as having an environment that provided an ideal location for picking berries, especially blueberries (M6). Portions of this trail might also have served as an access route to trappers' cabins located between Cadotte Lake and Harmon Valley, as well as a connection to the Grouard Trail (M4). See Figure 4.4-1 for an approximate location of the Harmon Valley Historic Trail.

4.4.2.1.2 Access

Elders remember the old days when they were free to camp anywhere. One Elder recalls how in the past you could *take horses out and put up a tent anywhere. Now you need a permit for everything* (M8). Participants are currently experiencing restricted access to traditional hunting areas because they have been fenced off by oil and gas companies or private landowners. One participant said that his Aboriginal rights should allow him access to Crown Land, despite the presence of oil and gas leases (M8).

In addition to fences and gates, above-ground pipelines also restrict access, especially for trappers. If no overpasses have been constructed, trappers are often forced to go a long distance to access traps on their trapline (M8).

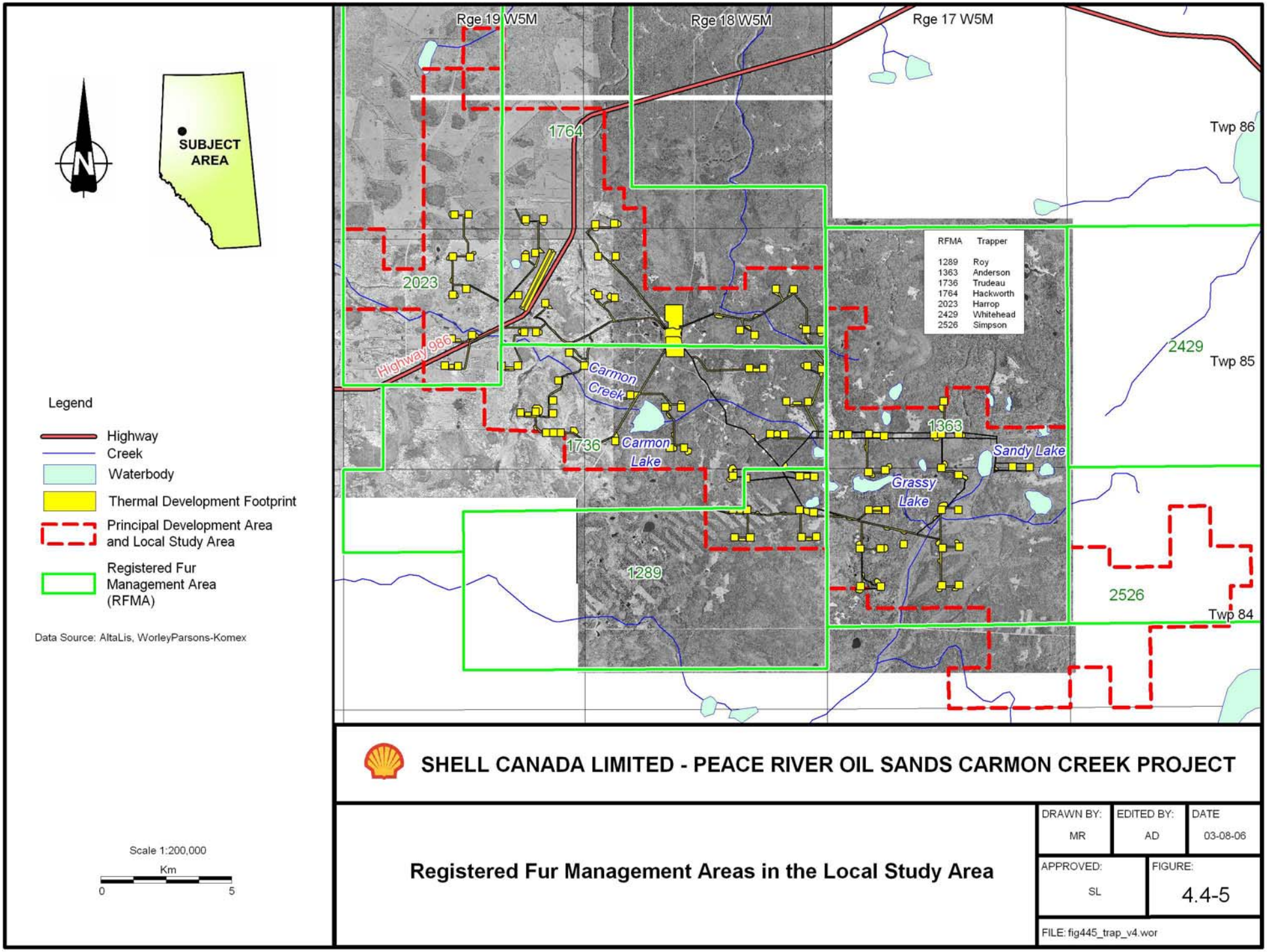
Participants are also concerned about the increase in new access to previously isolated areas as a result of the construction of roads and cutlines. Participants believe that this increase in new access will have detrimental effects, including increased use by non-Aboriginal moose hunters (M8). Participant M4 is concerned that increased access could lead to cabin vandalism and theft. As a result, exact locations of cabins will not be disclosed in this section.

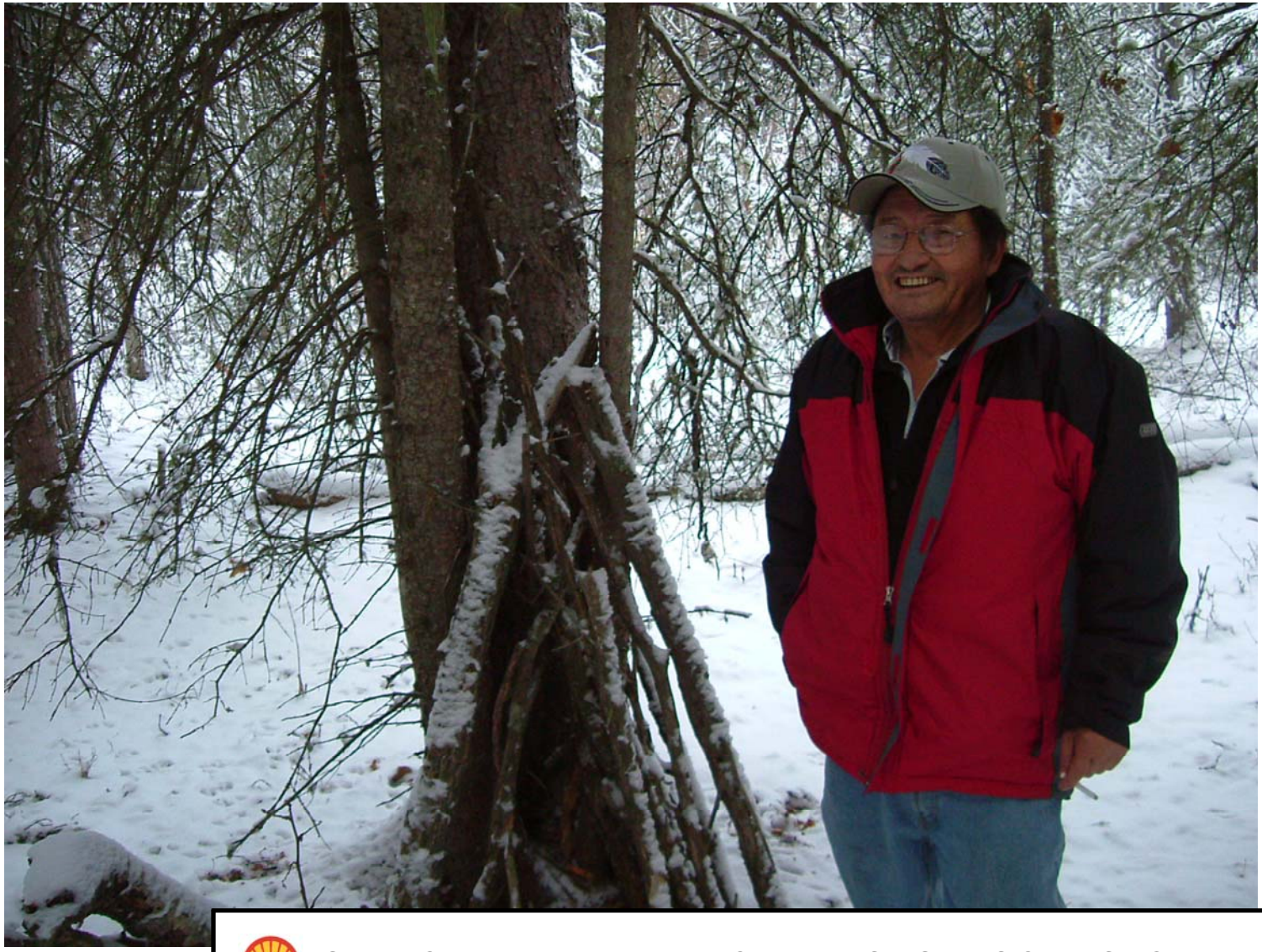
In addition, participants are losing access to areas when private land is sold. The original owners granted them access, whereas some new owners do not (M8). In the old days, non-Aboriginal farmers remembered the people who had worked on their lands clearing bush and helping with harvest. The farmers would let these people continue to use their lands for hunting or other purposes. Now that these farmers have passed away, they have been replaced by young farmers who do not permit access to these lands. Participants said that young farmers are forgetting that it was Aboriginal people who originally cleared the lands that are being used today.

4.4.2.2 Trapping

Currently there are no traplines held by Cadotte Lake Métis members in the LSA (see Figure 4.4-5). However, traplines in the LSA were owned by Cadotte Lake Métis trappers in the past. For example, RFMA 1764 was held by a Métis man, Sam Gladue, until he sold it in the 1960s. Ownership of this trapline changed again in 2000 (M8).

During the December field visits, one participant showed facilitators some of his disabled trapsets that he had left on his old trapline in the LSA (see Figure 4.4-6 and Figure 4.4-7). One Elder described how the area (the LSA) *was good* before Shell built their plant. *You could make a living (trapping). Now the animals have no place to live* (M9). One participant (M1) explained that many people cannot afford to trap today because the income derived from it barely covers expenses. The importance of traplines today is not so much trapping, as the opportunity to enjoy the bush and other traditional activities (M1).


SUBJECT AREA
Rge 19 W5M
Rge 18 W5M
Rge 17 W5M
Twp 86
Twp 85
Twp 84
1764
2023
2429
2526
1289
1363
1736
Highway 986
Carmon Creek
Carmon Lake
Sandy Lake
Grassy Lake
RFMA Trapper
1289 Roy
1363 Anderson
1736 Trudeau
1764 Hackworth
2023 Harrop
2429 Whitehead
2526 Simpson
Legend
Highway
Creek
Waterbody
Thermal Development Footprint
Principal Development Area and Local Study Area
Registered Fur Management Area (RFMA)
Data Source: AltaLis, WorleyParsons-Komex
Scale 1:200,000
Km
0
5
SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT
Registered Fur Management Areas in the Local Study Area
DRAWN BY: MR
EDITED BY: AD
DATE 03-08-06
APPROVED: SL
FIGURE: 4.4-5
FILE: fig445_trap_v4.wor



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George Amato with Lynx Trap

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-6

FILE: N:\projects\61330000\MapInfo\wrkspc\LandUse\TEKLandUse1.wor

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Squirrel Pole

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-7

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4.4.2.3 Cabins and Settlements

There are three seasonally inhabited and four uninhabited or historic (built before 1960) cabins located in the LSA. One historic settlement and one seasonally inhabited cabin are located directly adjacent to the LSA. However, for the purpose of this study, only cabins of significance to Métis participants are described below.

Because of participant concerns about vandalism and theft at cabins, specific cabin and settlement locations will only be shared with Shell for Thermal Development planning use (M4, M6, and M13). Therefore, only general cabin and settlement locations are illustrated in Figure 4.4-1.

4.4.2.3.1 Seasonally Inhabited

There are currently no seasonally inhabited cabins of significance to Métis participants in the LSA.

4.4.2.3.2 Uninhabited or Historic Cabins

A historic cabin, called 'Baseline Cabin', which once belonged to Xavier Noskey, was visited and recorded. This cabin was described by participants as having been situated on the historic Harmon Valley Trail (M3 and M10). It is located on the 'baseline' next to Sandy Lake on Rasmussen Road. It is suspected that Rasmussen Road is on a portion of the historic Harmon Valley Trail.

This cabin has been burned to the ground and all that remains are the burnt foundation, a stove, and a bottle (see Figure 4.4-8). Xavier Noskey was the uncle of one of the participants involved in this study. This participant has lived in the Cadotte Lake area for 75 years and her family was one of the area's earliest settlers. When her family first moved to Cadotte Lake, there were only two households, her fathers, and one of her uncles.

Two cabins are adjacent to Highway 986 in the LSA. One was built in the later part of the twentieth century by the late John Amato and is now abandoned (see Figure 4.4-9). The other site was historic and consisted of an older and a more recent cabin, an outhouse, and several old automobiles (see Figure 4.4-10 and Figure 4.4-11). This site was the home of a Métis man, Sam Gladue, who previously held RFMA 1764 (M8).

During interviews, many participants said they would prefer to *go out and find their cabin in the bush* (M1, M2, M8, and M10) rather than trying to locate it on a map. Participants also explained how, because of forest fires, all that remains of many historic cabins is a foundation and associated materials (e.g., clay stove, lard pail, trail, or squirrel poles, which can be found at some sites) (M8). High-potential areas for cabin locations were described as being close to lakes and spruce bluffs (M4).

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Old Cook Stove at Xavier Noesky's
Baseline Cabin

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-8

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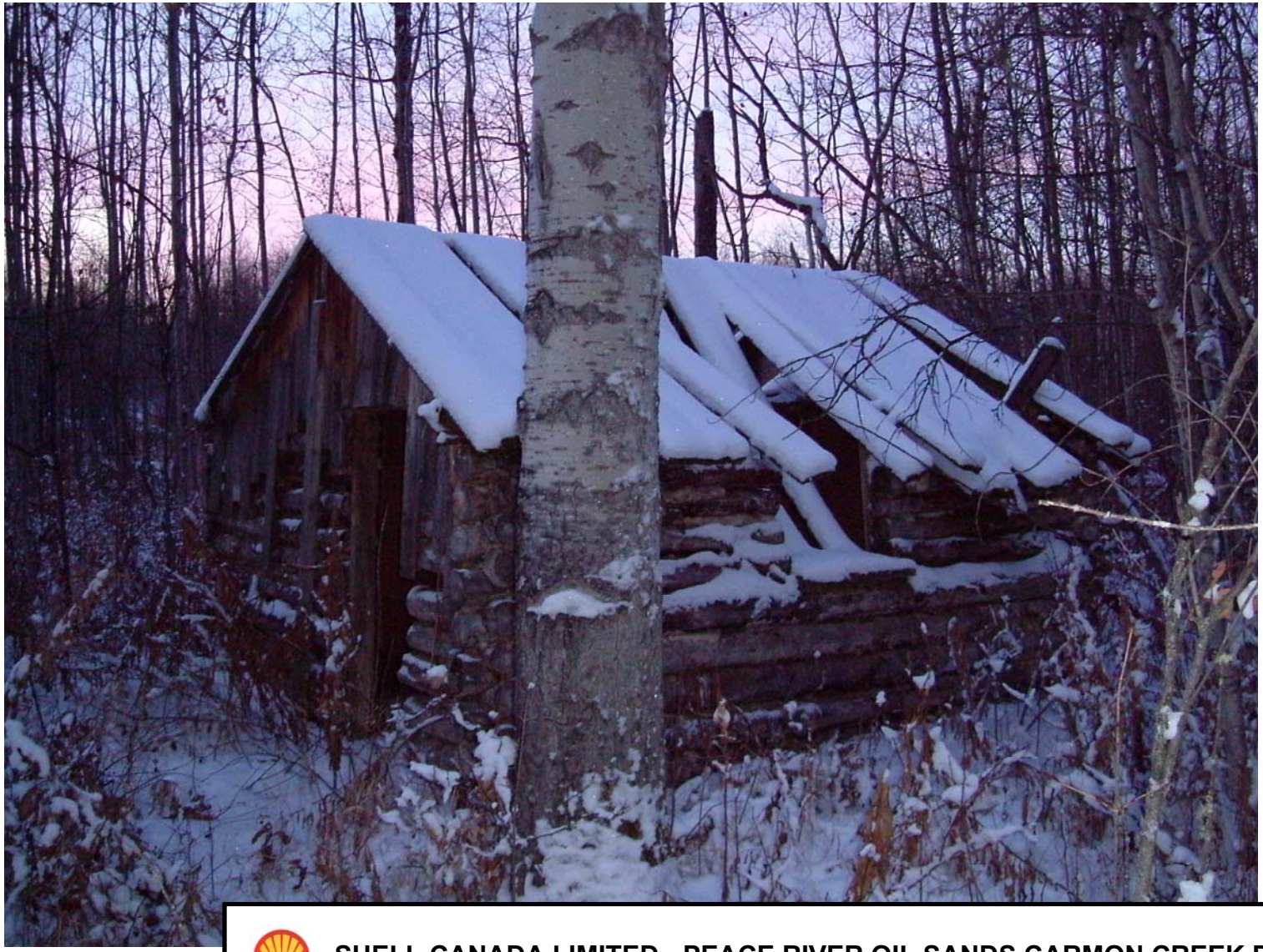
SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Louis Bellrose in Front of a Cabin Built by the Late John Amato

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-9

FILE: N:\projects\61330000\MapInfo\wrkspc\LandUse\TEKLandUse1.wor



SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Historic Cabin Built by Sam Gladue

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-10

FILE: N:\projects\61330000\MapInfo\wrkspc\LandUse\TEKLandUse1.wor

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Historic Cabin Built by Sam Gladue

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-11

FILE: N:\projects\61330000\MapInfo\wrkspc\LandUse\TEKLandUse1.wor

4.4.2.4 Hunting and Camps

Participants described historic camps that were *all over the bush* (M10) with surviving evidence including poles or trails. Participants described the following areas in the LSA that had been used in the past for hunting camps (see Figure 4.4-1):

- a camp used for hunting moose was located along Highway 986 just north of the existing air strip (M1 and M10)
- the Carmon Lake area was used for hunting moose (M1 and M7)
- the area immediately west of Grassy Lake was used for hunting moose (M1 and M7)
- the small lake west of the existing air strip and Highway 986 was used for hunting moose (M1 and M7)
- areas adjacent to the salt licks were also used for hunting moose (see Section 4.4.3.4.6)

Participants described the following current hunting locations:

- moose hunting along the old Buchanan Lumber road (M14)
- hunting and fishing north of Cadotte Lake in the Haig Lake area (M14)

4.4.2.5 Fishing Areas

Participants will not eat fish out of the Peace River and many lakes in the area as a result of water pollution (M1, M4, and M9) (see Section 4.4.3.1.1 and 4.4.3.2). The only lakes described by participants as containing edible fish are a considerable distance north of Cadotte Lake, and include Mink Lake and Haig (Fish) Lake. Although fish used to make up a considerable portion of their diet, participants in the Cadotte Lake area describe the decline in fish quality as leading to a reduction in fish consumption (M9 and M10). In order to have fish to eat, people are now bringing fish in from Whitefish Lake.

Although Cadotte Lake contains jackfish, many participants will not eat fish from this lake. However, one participant described how *fish were getting better [healthier]* (M8) in the Cadotte Lake area and that some people will eat fish out of rivers like Cadotte River. Other participants blamed the decline in the quality of fish from Cadotte Lake on Shell (M9 and M10). One participant described how, when Shell first started to pump water out of Cadotte Lake, Shell built a weir and a fish ladder that adversely affected fish health (M8). Thirty to forty years ago, people drilled for oil at Cadotte Lake and all of the fish died in the lake that year (M11).

4.4.2.6 Plant Collection Areas

Jack pine areas in the Cadotte Lake region are described as having blueberries and cranberries growing in them (M2, M5, and M11). Strawberries are said to be found everywhere (M2, M5, and M11). Participants provided very little land use information regarding plant gathering in the LSA. One participant explained how the LSA did not contain any significant berry-picking areas (M8).

Participants explained that they now have to travel farther to pick berries. For example, *further out to Haig Lake or way off the road* (M5 and M9).

4.4.2.7 Gravesites

Although no gravesites were found during field visits, participants (M4, M6, M10, and M15) said that areas along trails and waterways are high potential areas for graves, as people were often buried where they died in the old days. Areas along waterways were frequented by Aboriginal

people, and areas with river silt provide easy gravesites. One participant explained that *where there are lakes, there are cabins. And where there are cabins, there are graves* (M10). Gravesites were described as *little holes on the top of hills* (M10). Although not in the LSA, a number of gravesites were described by participants.

4.4.3 Métis Ecological Knowledge

The following section summarizes the Métis ecological knowledge that was collected for the baseline scenario. Summaries are based on participant observations and reflect their knowledge and concerns regarding various aspects of the environment.

A decline in environmental health has been observed by participants in the Cadotte Lake area. They believe that industrial development has already had a significant effect on environmental health. Participants stressed that environmental effects from the projects are not restricted to the LSA but extend into the RSA. The following quote from one Métis Elder reveals the devastation many people feel as a result of the decline in environmental quality:

> *It is all ruined and poisoned under the ground…they have cleared and wasted too much land. The Creator made the land for Indian people. Now, everything the Lord gave us is unusable. What are my great-grandchildren going to eat and live on (M11)?*

Other participants shared similar thoughts. One stated that *it is already too late. It will take 10 or 20 years for the animals to come back, but what is the use, (if) the ground is polluted?* (M10). *Soon all the animals will be gone* (M3). One participant said that doing an environmental impact assessment at this stage of development was like *shutting the gate after the horses are out* (M8). This participant said that everything is *already torn up* (M8). He said, *I spent so many hours out here, now there is nothing left* (M8).

Métis ecological knowledge is presented according to the priority indicated by participants and was considered in the relevant baseline scenarios throughout the Environmental Impact Assessment for the Thermal Development.

4.4.3.1 Water

4.4.3.1.1 Water Quality

Water quality in the Peace River region is considered to be poor and is a major concern for participants. As one said, *Water is the number one thing. (The) animals are already sick* (M3). Observations of the dramatic decline in water quality led one Elder to predict that one day people would have to *buy water and air* (M3).

Participants spoke of the past when they would go out into the bush and were free to drink water from anywhere, including the muskeg. *You used to be able to camp anywhere and drink from a creek* (M12). Participants are now afraid of consuming water from the bush. *You wouldn't live three days if you drink the water. You have to watch where you get water to drink. You can't make tea from a creek anymore. When you are in the bush and on the trapline, where are you going to get water?* (M1).

People feel that they cannot use snow, ice from the middle of a lake, or rainwater as drinking water because it tastes different and sometimes contains 'bugs' (M10). The taste difference and presence of 'bugs' was blamed on pollution.

One participant remembered swimming in the backwater of the west Peace River channel as a child (M6). However, the last time she took her grandchildren there, the kids got an itchy rash

from the water. Another participant described how people get a rash if they swim in Cadotte Lake (M12).

Another participant expressed the feeling *that pretty well everything is ruined, including the water. Because water runs all over you can't just blame one place. There is poison in the water, everything is ruined and nothing is good* (M11). Participants said that poor water quality negatively affects vegetation, wildlife, and fish. One participant is worried about the potential impact of acid rain on the quality of local waterbodies (M8).

Participants cited many causes for the decline in water quality from upstream sources, including pulp mills, town domestic wastewater, effluent from the jail, and oil and gas developments (M2, M4, and M6). A plant in Grand Prairie was also blamed for contaminating the Wapiti River (which is in the Peace River watershed) (M7). One participant blamed the province for the poor water quality in the Peace River area (M11). Another participant is concerned that there may be salt water in lakes, possibly as a result of developments (M2). One participant feels that the decline in water quality started about ten years ago (M4). Another participant explained how, *before 1991 you could get water from the bush and now you can't* (M15). This participant blamed the decline in water quality on forestry, explaining that before forestry companies log, they spray the area with a chemical to kill the underbrush. These chemicals contaminate water sources in the area (M15).

Cadotte Lake and River

Shell has been in the Cadotte Lake area from *very early on* (M11). One participant explained how Shell drilled their first well there in 1949 (M11). A participant also remembers Shell claiming that they were making a weir on Cadotte River to raise ducks but said this was a lie (M11). Participants said that the weir was actually constructed to allow Shell to take water out of Cadotte Lake via a water intake line on the west side of the Lake. Participants stated that it was no longer in use because the water levels in Cadotte Lake became too low. They were uncertain whether the line had been removed (M5 and M14).

Participants believe that Cadotte Lake is dirty because of this weir (see Figure 4.4-12). At one time *you could see the bottom of Cadotte Lake and now you can't* (M3). *You don't even want to put your toe in there. Just weeds now. Never used to be* (M12). Another participant reported seeing a skim of oil on the water around Cadotte Lake that was never there in the past (M8). A participant observed that the weir causes the water to stay in one place and become stagnant, which has led to an increase in the size of Cadotte Lake (M10).

Cadotte River is also contaminated and smells bad. *People make a joke about (the smell) when they drive by*, stated one participant (M12). Participant M5 explains how this smell is worse in the fall and is caused by domestic wastewater from the Woodland Cree First Nation sewage lagoon that is released into the river as part of the purification process.

4.4.3.1.2 Water Quantity

Participants have noticed a decline in water quantity in the Peace River area and explained how the area has suffered from a drought over the last seven years (M4 and M7). The area has been drying out over the last ten years as witnessed by a change in *muskeg, rivers, lakes, herbs, and trees* (M8). Old Wives Lake was cited as an example of a lake that has dried up so much *it is not even a slough anymore* (M6).

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Weir on Cadotte River

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-12

FILE: N:\projects\61330000\MapInfo\wrkspc\LandUse\TEKLandUse2.wor

Participant M1 felt that the decline in water quantity was also related to industrial developments like forestry, paper mills, agriculture, and oil and gas. One participant expressed how developers were *draining everything* (M10). Another participant said that the decrease in water quantity in the area was because water had drained into the ground to fill the spaces where bitumen had been removed (M2). One participant felt that water levels in the Peace River are not affected by development in the area (M10).

4.4.3.2 Fish

The following fish species are found in the Peace River region: pickerel, jackfish, sauger, whitefish, trout, maria (ling) cod, and tullibee (cisco) (M4). Some participants mentioned a decline in the fish population in the area (M2 and M5). Joker Lake, east of Marten River, no longer contains fish (M1). The reason for this decline was believed to be related to oil and gas activity in the adjacent area (M1). One participant blamed beaver, saying they close off lakes, subsequently killing the fish (M8).

Waterbodies in and around the LSA, including Carmon, Sandy, and Grassy Lakes, do not contain fish because they are too shallow (M1, M4, and M7). However, one participant described how creeks in and around the LSA used to contain 30–35 centimetre arctic grayling. Because of damming activity by beavers, these fish are no longer present (M8).

4.4.3.3 Air

Métis participants shared several observations regarding air quality in the area. One participant mentioned a pinky airborne substance that forms a scum on rain barrels (M1). Another attributed the origin of this pink scum to dust produced from industry. This participant felt that it is the result of something in tap water, as tap water makes containers go slimy if they are not frequently washed (M6).

Participants reported rainfalls that leave ‘greasy streaks’ on car windshields (M2 and M12). It was felt that this ‘grease’ was from air pollution caused by industry.

Participants would prefer the Peace River Complex to be farther from their community, as they believe that pollution from the plant travels to the community (M2 and M12). Other participants described how, when the wind blows from the direction of the DMI plant, a *fine ash, or coal dust* (M8 and M15) is deposited on vehicles and the snow. It is also said that pollution from flaring is blown by the wind to other areas and kills trees (M8 and M12). This pollution also falls on the snow cover, subsequently poisoning animals who consume the snow (M10). One participant also believes that pollution from plants in the Athabasca oil sands blows to Peace River and is having a negative effect on vegetation and wildlife in the area (M1).

Participants M1, M12, and M15 complained of smelling sour gas from industrial developments near Cadotte Lake.

4.4.3.4 Wildlife

4.4.3.4.1 Moose

Population Levels

Participants cited moose as their most important source of traditional food. Although participants describe a small number of moose currently in the Carmon Lake area (M8), they have witnessed a decline in moose in the LSA. *There are hardly any moose in the area, not like it used to be. Moose are more or less cleaned out. Before you could head out in the morning and bring one (a moose) home by night, not anymore* (M1). *This area used to be thick with moose. Now there are*

less moose because they moved north (M9 and M11). One participant said the declining moose population is a result of oil and gas development because, when searching for a suitable habitat, moose avoid areas with disturbance (M5). Another participant feels that the decline in moose populations is because *people just shoot them from the truck* as more roads exist in the area (M1).

Participants also noticed that moose are having more twins than they did in the past. Proportions of bull and cow numbers have been altered from their historic state by the current system for allocating hunting licences that define the sex of the animal that non-Aboriginal hunters can shoot (M8).

Health

Most participants described moose in the area as *still pretty healthy* and *still tasting good* (M1 and M7). Participants explained how everyone in the community eats moose meat and discussed its importance as a food source for Aboriginal people in the area.

One participant described some moose meat as not 'good' and tasting like the moose had *been in the water too long* (M2). This taste was described as having resulted from the moose eating contaminated browse, *as moose taste like what they eat* (M2). Another participant described how, over the past 20 years, moose meat had begun to *taste different* (M8) as moose had started to eat more grain (from cultivated fields) and grasses sprayed with insecticides and pesticides. Despite this taste difference, this participant felt that if the meat was cooked well enough, it was still safe to consume. Another participant (M11) described moose meat in the area as 'bad' and having no taste. This was believed to be a result of the moose having poison in their blood. Yet other participants described moose as tasting 'different' and had butchered a moose whose flesh was not the 'right' colour, thus rendering it inedible. It is believed that the use of chemicals around plants and moose licking salt on pump jacks adversely affects moose meat (M1 and M10).

One participant (M8) described how, after shooting four moose in September 2005, he was surprised to find that only two of the moose were fat and healthy. The other two moose, a cow and young bull, were skinny and had very little fat on their rumps and around their kidneys. This Elder had also heard stories of skinny moose from other community members.

Participants described how both moose quality and quantity have fluctuated in the past. Participant M7 said in 1918, moose in the area were severely plagued by ticks, causing many to lose weight and die. One participant recalls a time preceding the Great Depression when both moose and ducks were scarce, and his family was forced to move to Haig Lake where they survived on fish, rabbits, and chickens (grouse) (M1). Another participant remembered a time in the late 1950s when moose meat was wormy and bad. The meat contained white nodules that looked like grains of rice (M6).

One participant (M8) described how ticks are found on white poplar trees and that moose become infested with ticks when they brush against a tree. This participant did not remember how many moose had ticks in the past, compared to the present, and said only moose, not deer and elk, suffer from tick infestations. Another participant (M1) mentioned having recently seen a yearling moose with no hair and attributed this to ticks.

Behaviour

When questioned regarding how moose respond to development, some participants described that moose are flexible enough to adapt to environmental changes introduced by projects (M1 and M7). Participants explained how moose have been seen jumping fences two and a half meters high, cohabiting with humans and oil and gas developments, adjusting to noise, and easily emigrating to areas with no development (M1 and M7). One participant explained how *moose*

will stick close to plants for protection as wolves avoid them because of the noise they produce (M8). Another participant described how moose are getting accustomed to people (M7).

Related to a warming and drying trend in the Peace River area, participants have observed that many natural salt licks have dried up (M1) (see Section 4.4.3.4.6). As a result, moose are beginning to lick salt and chemicals from oil and gas installations, pipelines, and roads (M1). Two participants explained how moose had begun to eat mud from old sumps and well sites containing salt water (M1 and M8). Moose and deer are both getting struck and killed on the highway while they lick salt from the road (M1).

Moose are territorial and will die within a ten-mile radius of where they were born (M8). Moose and other animals will create trails as needed to access a salt lick or water source (M8). One participant described how moose eat poplar bark and its thick sap in the spring as a tonic after a long hard winter (M4).

One participant (M8) explained that it is time to hunt bull moose when *fireweed start to fluff up*. This is when they are fattest and are just starting to 'call'. About ten days into rut, the bull moose call can be heard and as the rut proceeds, their calls become louder and louder. This is because bulls do not eat during the rut and as their stomachs get emptier, their calls echo and become louder.

Movement

Participants (M6, M7, and M8) explained how above-ground pipelines fragment habitat because wildlife are unable to cross them. Furthermore, participants view existing wildlife overpasses as inadequate (M8). In response to seeing a pipeline during a field visit, one Elder asked, *How in the hell is a moose supposed to cross that!?* (M8) (see Figure 4.4-13). Participants feel that the necessity for moose to cross pipelines would be increased during rutting season or if a moose was being chased. As explained by one participant, *if a pack of wolves are chasing a moose, is the moose going to look for an overpass?* (M8).

Participants are also concerned that certain arrangements of the proposed pipelines will restrict the ability of moose to get to their local water sources in the LSA (M6 and M7). Certain arrangements of pipelines act like a fence, and may limit access corridors to important water sources. In addition to restricting moose access to important water sources, participants are also concerned that hunters might exploit the arrangement of pipelines to trap or pound moose for easy killing.

4.4.3.4.2 Deer

Participants describe the Peace River area as having a large and increasing deer population. In the past, mule deer were the predominant deer species with few whitetail in the area. Now participants describe how *whitetail deer took over mule deer* (M4 and M7). Participants prefer mule deer to the *bitter* meat of whitetail deer (M1). One participant said that more deer exist because *no one shoots them* (M5). The increase in the deer population has led to more highway accidents, as deer are struck and killed by vehicles while licking salt off roads (M4, M5, and M8).

Some participants described deer in the area as being *sick now* (M2 and M5) and inedible. A deer that had been recently shot at Little Buffalo was shown to be full of worms once its neck was cut open (M12) and had to be discarded. That is why *no one bothers with deer anymore* (M12). One participant attributed the observed sickness in deer to their consumption of salt on roads (M5).

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Existing Pipeline Crossing for Wildlife

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-13

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Participants explained that deer react to development the same way as moose (M6 and M7). Participants believed that deer were flexible enough to adapt to environmental changes introduced by developments. Deer were said to be able to clear heights similar to those achieved by moose, to tolerate motor vehicle traffic, and go anywhere (M7).

4.4.3.4.3 Caribou

Participants M4, M6, and M7 described caribou populations about 50 km north of Cadotte Lake, northwest of Peace River, and on the west side of the river near Sunny Valley. Caribou were also said to be found on the road between Slave Lake and Red Earth and on Highway 40 south of Grand Cache. One participant had heard that caribou were occasionally present in the LSA in the fall between the Shell plant and Highway 986 near a salt lick (M10).

4.4.3.4.4 Elk

Elk were seldom mentioned by participants but were said to be found along river banks. Elk populations were described as low in the area in the past but were recently increasing, as elk were said to have been transplanted to the Peace River area. Most people do not like the taste of elk meat (M7).

4.4.3.4.5 Bison

Woodland bison were historically present in the Peace River area but are no longer found in the region. One Elder (M4) shared the story of the bison's final demise, which occurred in the 1930s. The delta at Grouard was a 20 mile-flat that was excellent for hay. Bison in the region relied so much on this area for feed that the area became known as Buffalo Bay. One fall, a terrible rain storm flooded the delta. That night, the water froze and by morning, the frozen water was so deep that the hay was unreachable. Many bison died, and piles of dead bison were reported across the delta. The survivors traveled to Wood Buffalo National Park where their descendants still live today.

A similar story regarding the decline of the bison is told by Pete Whitehead in, "Turning the Pages of Time" (Nampa and District Historical Society (NDHS) 1982). In this story, the Peace River area had four or five feet of snow in winter, and in January, it turned mild and rained for three days. When it turned cold again, there was such a crust of ice that even the bison could walk on it. In the spring the bison broke through and, unable to move and feed, most of them died. It was said that one could not escape the stench of dead buffalo that summer.

4.4.3.4.6 Salt Licks

Participant M1 explained that game trails frequently converge at salt licks. While flying over the LSA, this participant observed the lack of activity around salt licks known to him to have previously have been in use in the LSA. Related to a warming and drying trend in the Peace River area, participants have observed that many natural salt licks have dried up (M1).

A salt lick located on the east side of Highway 986, previously known to be heavily used by game, had no visible animal tracks or trails as viewed from the air and appeared abandoned during the overflight (M1). Figure 4.4-14 and Figure 4.4-15 show examples of salt licks in and near the LSA.

Other salt lick locations identified in the LSA by participants include:

- an area to the west of Grassy Lake that has at least three salt licks (M7)
- a small lake northeast of Grassy Lake (M10)
- an area south of Grassy Lake towards the southern part of the LSA (M10)

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Salt Lick

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OTHERS	TG	18 Oct 2006

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Salt Lick

DRAWN BY:	EDITED BY:	DATE
OTHERS	TG	18 Oct 2006

APPROVED:	FIGURE:
AD	4.4-15

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- the area north of the existing private airstrip on the west side of Highway 986 which is reported as having at least three salt licks (M10)

Figure 4.4-1 shows the general locations of salt licks identified during interviews and field visits with Métis participants. To protect these locations from the general public, the exact location has not been shown.

4.4.3.4.7 Bears

Participants M1 and M8 described the Peace River region as having a large but fluctuating population of black bears, with sows having more triplets now than in the past (M8). Participant M8 explained how bears were growing accustomed to humans and no longer feared them. One participant explained how, in 2005, black bears did not hibernate on schedule and *did not go to sleep until November* (M10).

Participant M10 described an active bear den located to the southeast of Grassy Lake. This was not investigated during field visits. Participant M10 explained he was not concerned about bear dens in the LSA as *bear dens are only used for so many years* before they are abandoned. He felt it would be almost impossible to locate active bear dens and avoid them.

Participants are strongly opposed to sport hunting bears and bear baiting (M4 and M8). One participant reported a single guide whose clients killed 72 bears in one season (M8). Bears are baited with a barrel with holes that is chained to a tree and filled with cookies (M4).

Grizzly bears are seldom or never found in the Peace River area, but are more prevalent in regions north and south of the Town of Peace River (M4).

4.4.3.4.8 Rabbits

Most participants described a decrease or absence of rabbits in the Peace River area over the last ten years (M1, M4, and M7) while participant M11 described this decline as occurring over the last 25 years. One participant believed that the decrease in the rabbit population was part of a natural cycle. However, this individual thought that the cycle was *lasting too long* (M8).

Participants speculated different causes for the population decline. One participant said that the lack of rabbits may now be because of predators like owls, fox, and fisher (M8). Another participant linked the dramatic decline in rabbits to oil and gas development. He believed that *because of oil drilling and everything they (rabbits) left. They were poisoned* (M11). One participant explained how seismic and oil and gas workers have been killing rabbits (M8).

A participant described a cycle where rabbits would leave for a number of years and then return, with lynx populations being closely associated to rabbit cycles (M8). Rabbits have three litters of 10–14 kits. By the time a rabbit is having its third litter, the offspring from its first litter are already producing litters (M11).

4.4.3.4.9 Beaver

As recorded in the history book, "Turning the Pages of Time", the late Pete Whitehead explained how when he was a boy, *there was so many beaver that you could travel anywhere in a canoe from one dam to the next as the whole country was underwater* (NDHS 1982). The beaver started to die off in about 1960 and in three years there were none. Beaver trapping was subsequently restricted (M7).

One participant (M7) explained how beaver numbers increased about 20 years ago, making it difficult to travel in the area because of their damming activities. Before this, people could travel to their cabins in the LSA on horseback (M1). Many cabins are now accessible only by Argo (M1).

Today, beaver are said to be moving because their food is being *pushed back* (M8). It is also believed that a recent increase in otter populations is keeping beaver populations down. One participant explained how beaver are *short on water, and having to build anyplace* (M8).

A participant explained how dams protect beavers as the water surrounding their homes deters predators (M8). Another participant explained how beavers eat poplar *which makes them fat* (M4). Participant M10 reported witnessing developers building roads over beaver dams.

4.4.3.4.10 Other Furbearers

Other furbearers in the area include marten, fisher, mink, lynx, fox, and otter. During a rabies epidemic in the 1950s, fox and skunk were poisoned and disappeared (M8). Strychnine was put in eggs and was estimated to have killed *seven times* the number of other animals that consumed poisoned animals (M8). During this time, the bush was said to have been *just rotten* (M8). Today, the fox population is slowly rebounding (M8).

In general, rats (muskrat) and other furbearers have been observed to be coming back a little from past pressures of over-trapping (M1 and M8). One trapper described seeing the odd lynx and a few squirrels and otters (M8). Mink are *gone* from the region and marten are *new to the area* (M1).

Mink and otter were described as being responsible for *killing rats off* (M8). Beaver were also blamed for hurting the muskrat population by damaging their food (cattails) through their damming activities (M1). Participant M8 described spruce or timber areas as the best places to trap furbearers, with areas containing cattail and bulrushes as best for rats. *Thick spruce with lots of bush* (M8) is considered lynx country. Lynx were also described as having defined territories and being found *where the rabbits are* (M8). One participant described Alberta as home to two types of porcupine: *bush and plains* (M6).

An excerpt from the Peace River fur record cites how, in 1936, provincial game wardens declared a closed season on red squirrels and prairie chickens because *during the past three years so many have been killed it was felt serious damage had been done* (Riley 2005).

One trapper recalled treating sections of his trapline like summer fallow, rotating through the areas he trapped, which would ultimately result in better fur quality (M8). He explained that trappers were proud and humane, and checked their sets frequently so that animals did not suffer and struggle. This trapper thus hates *weekend trappers* (M8) who leave furbearers to suffer for up to seven days.

4.4.3.4.11 Birds

Waterfowl

Participants expressed an overwhelming fear of contracting the avian flu virus from eating migratory waterfowl and their eggs (M1 and M5). Participants have noticed a recent decline in duck numbers, although one participant (M2), who still consumes ducks, felt that the population was *starting to come back* (M7). Another participant felt that the general decline in ducks in the area was a result of them being poisoned by pollution released into waterways by oil and gas companies (M2).

Participants described the presence of trumpeter swans in the LSA, and white pelicans on Haig Lake (M1 and M13).

Chickens

Despite an aversion to consuming migratory waterfowl due to concerns about the avian flu virus, participants continue to consume 'chickens' or grouse. They describe how, like rabbits, grouse sometimes disappear because their populations fluctuate in a natural cycle (M1, M4, and M7). Participants have noticed a decline in grouse populations in the area. Some participants have noticed their absence over the last ten years (M2 and M11); whereas others say they have only been gone for three to four years (M8). One participant described how 'chickens' were gone for the last ten years but are now coming back (M11). Another explained how years ago you could see 'chickens' all over, but that now they are only seen once in a while (M9).

4.4.3.4.12 Reptiles

Participant M1 explained how there used to be garter snakes in the area around the entrance to the existing Peace River Complex. They have since disappeared.

4.4.3.5 Vegetation

4.4.3.5.1 Berries

One participant described how berries in the Cadotte Lake area *do not grow and taste like they used to* and that berries are *drying up faster* (M2). *Traffic makes them no good* (M2) as berries become covered in dust. Participants have also observed that herbicides damage berries (M8 and M15).

4.4.3.5.2 Trees

An increase in dead or dying spruce and poplar trees was noted by one participant (M7). Another participant felt that pollution from flaring travels in the wind and kills trees in other areas (M8). Participants observed that herbicides damage trees (M8 and M15).

4.4.3.6 Climate Change

Participants described the climate in Peace River as being drier and warmer than when they were younger (M1, M2, M6, and M7). Winters are warmer with less snow, and summers are cooler with less rain. The general drying trend is seen in rivers drying up, decreasing water levels, and less precipitation. A participant described the climate as *not normal anymore* (M8). He had observed *strange things happening*, like the fact that *it used to be real cold* and no longer is (M8). A participant has also noticed an increase in wind (M7). It was felt that industrial development is causing the climate change being experienced in Peace River.

4.4.3.7 Noise

One participant explained that the noise from machinery like Caterpillar tractors scares some animals away (M8). Another participant explained how *moose will stick close to plants* for protection, as wolves avoid them because of the noise they produce (M8), see Section 4.4.3.4.1.

4.4.3.8 Waste Management

One participant has seen abandoned developments full of oil and gas garbage (M7). Another participant described how BlackRock Ventures is running its garbage into Cadotte Lake via Rat Creek (M1). Participants are concerned about how waste will be disposed of, including human waste produced, during the Thermal Development's peak construction times (M15). Participants

are also concerned that moose will lick old sumps that have not been properly decommissioned and are too close to the surface.

4.4.3.9 Reclamation

Participants have seen abandoned and reclaimed wellpads and access roads that are overrun with non-native weedy species.

4.4.4 Community Wellbeing

Community wellbeing is an overriding concern to the Cadotte Lake Métis. Participants requested that the significance they placed on community wellbeing be specifically documented and detailed in this study. Participants describe their community as suffering from poverty including poor health and living conditions (M5, M6, and M13). Community wellbeing information was also considered in the socio-economic section (see Volume IID, Section 2).

4.4.4.1 Socio-economic

4.4.4.1.1 Effects of Bill C-31

Prior to 1985, if a status woman married a non-status man she lost her status. Bill C-31 repealed this gender discrimination and made provisions for the reinstatement of people who had lost their status. These reinstatements, and subsequently the creation of Woodland Cree First Nation, have had a significant impact on community wellbeing at Cadotte Lake. Families were divided and arbitrary divisions drawn. This has created *a lot of pain and hard feelings* (M5) and a clear disparity among the people living at Cadotte Lake.

Despite the re-instatement of status to some Aboriginal people based on Bill C-31, *within the next twenty years the new Status rule will result in the disqualification of hundreds of thousands of descendents of today's Status Indians* (Daniels 1998, Internet site). Participants explained that because of Bill C-31, Woodland Cree First Nation will eventually disappear and a large group of Métis people will be looking for a land base and employment (M5, M10, and M12). Bill C-31 adopts the rule that after two consecutive generations of marrying Non-Status, children of the third generation are not eligible for Status (Daniels 1998, Internet site).

4.4.4.1.2 Employment

Trapping is no longer a viable employment strategy for Cadotte Lake community members because of low fur prices (M10). Without trapping, residents have few options for employment, as they are located some 80 km northeast of employment opportunities in the Town of Peace River and have limited training. As a result, oil and gas contracts represent a large percentage of employment opportunities in the area. Usually, these contracts are in the form of short-term, unskilled, labour-intensive jobs such as slashing. These jobs are geared mostly towards men, do not include childcare, and require transportation. Women have even fewer options for employment. Most of the industry wages are made by men, with women and children receiving little benefit (M5, M6, M13).

Métis participants said that Treaty people get preferentially hired and receive more training opportunities than the Métis, *Métis have to go through the Band for work, and Treaty people get hired first* (M5). One participant noted that, *the Treaties are getting all the pie* (M1). *Shell goes to Woodland (Cree) for work despite the fact that the Métis were the original inhabitants of the area* (M10). It is felt that developers need to *keep it even* (M10) and provide work for both communities. Preferential hiring of less qualified family members and politics were reported as

affecting employment opportunities for both Woodland Cree First Nation and Métis Region VI members (M1, M5, M10, and M13).

One participant explained how companies in the Cadotte Lake area often establish employment standards that the community currently cannot meet (M15). Companies then maintain that they are not able to meet their 'Aboriginal employment quota' because no one in the community met the requirements. At other times, companies apparently fill the quotas with short-term employment, offering no opportunities for long-term careers with room for advancement. The quotas are sometimes filled by non-local people who claim to be Aboriginal. Participant M15's husband has both a Grade 12 diploma and power engineering certificate but is unable to find employment in the Cadotte Lake area, forcing him to work in Fort McMurray away from his family.

Participants are *all for economic development* (M4), but feel if developers are going to *get rich off the land* (M4), then Aboriginal people in the area should also receive some benefits.

4.4.4.1.3 Political Organization of Métis Local No. 1994

The Métis in Cadotte Lake, Local No. 1994, said that they are constantly excluded from regional affairs, with only the Woodland Cree First Nation and the county benefiting. As one participant stated, *Métis people don't get anything and are the last to know. Deals get made with Woodland (Cree) first* (M12). Another explained that *donations all go to Woodland Cree First Nation because the Métis are not recognized as a group* (M8).

The Métis have a family and community support services employee but, because the Métis do not have a building, this position has been taken over by the Woodland Cree First Nation (M5). The Cadotte Lake Métis find it increasingly difficult to govern themselves and hold cultural events because they do not have a building for such activities, nor a computer. As a result, they must rent a hall from the Woodland Cree First Nation. Local representatives feel the stress of trying to manage a Local with little or no money or resources, *there is no money and no bodies. People only complain* (M5).

4.4.4.1.4 Housing

The Cadotte Lake Métis are experiencing a housing shortage in both Peace River and at Cadotte Lake. The need for affordable housing in Cadotte Lake is illustrated by the example of one Elder (M9) who shares a trailer, in poor condition, with 13 other family members. One participant (M13) explained how overcrowding in Cadotte Lake contributes to poor hygiene, puts additional stress on family relationships, and sometimes forces people to stay in unhealthy situations.

One participant describes how low-cost housing in Peace River is difficult to obtain for the Cadotte Lake Métis because of racism (M13). One participant explained how people with the last name Cardinal, or who are said to be from Cadotte Lake, are refused access to low-cost housing, and are even restricted to certain rooms in hotels.

Participants explained how, because they do not offer low-cost housing in Peace River, the Northern Sunrise County (the County) decided to provide seven trailers to the Cadotte Lake Métis at a cost of $75,000 each. Cadotte Lake Métis representative Darlene Cardinal fears that if this program is implemented, Métis residents will not be able to make their mortgage payments and will lose their homes. She is concerned that non-Métis oil and gas employees will purchase these homes, leaving the Métis both homeless and landless.

Participants describe the Cadotte Lake area as being 'Métis territory' (M10) before it was Woodland Cree territory. After Bill C-31 was passed and Woodland Cree First Nation was created, a considerable number of Métis people were granted status and three-quarters of Métis lands at Cadotte Lake were made part of Woodland Cree First Nation reserves. Today, the

Cadotte Lake Métis live on the remaining section of land at Cadotte Lake. The land that the Cadotte Lake Métis currently occupy is owned by the County.

Having lost a considerable portion of their land with the formation of Woodland Cree First Nation reserves, participants are concerned that if the remaining homes owned by the Métis are bought by non-Métis people that the last of the Métis land will be lost. Métis Region VI President Sylvia Johnson explained the status of these lands.

> *The County is keeping the land for the Métis because it is their traditional lands. You never see a trailer for sale in Cadotte Lake because it is never sold, but instead given to a relative. It is an unspoken rule that this is how the land is protected. If they are not Métis they have no right to the land. Other examples of this type of Métis land base include land at Eureka River, Fort Vermillion, and Aspen Grove.*

4.4.4.1.5 Household Water

The Cadotte Lake sewage lagoon is released into the same river from which the community draws its drinking water. As a result, many people in the community have begun to buy water from town (M1) and others fill large water containers at gas stations when in Peace River (M15). Participants explained how bath water in Cadotte Lake gives children sores (M15) and smells bad (M1). Another participant said that Aboriginal people are being *poisoned* (M11). Last summer, the community of Cadotte Lake was issued a boil-only water warning because of *E. coli* in the water (M8).

One participant explained how it was only after 1991, and the creation of the Woodland Cree First Nation, that any services in Cadotte Lake were brought in (M15). The Cadotte Lake Métis did not get running water until 2002 (M15). Many people living at the nearby community of Little Buffalo are still without running water and a sewer system (M15).

4.4.4.1.6 Traffic and Safety

Participants have observed an increased use of the highway to Cadotte Lake, specifically by heavy haulers. As a result of increased traffic related to development in the region, several deaths have occurred. In the past few years, a five-year-old child was killed, as well as a mother of ten. Vehicles related to industry were involved in both of these accidents. Trucks drive very fast on the highway, often hauling gravel and logs for which the drivers get paid by the load (M6, M10, M13, and M15).

One participant, who lives on a farm near the Peace River Complex, describes how she must wait several minutes for the traffic to clear so that she can turn onto Highway 986 (M15). Her children ride the bus to school everyday on this highway and sometimes ride their bicycles on this highway. This participant is concerned about her children's safety.

Accidents involving wildlife have increased on the highway because salt used in winter road maintenance attracts moose and deer (M1).

4.4.4.1.7 Youth

Participants are concerned about youth in Cadotte Lake. Substance abuse, school drop outs, and youth vandalism are described as *high* (M1, M5, and M6). As stated by one participant, *no one wants to go to school today* (M1). Cadotte Lake School instructors and supervisors are described by participants as inexperienced, trying to *make a quick buck and leave*, and *not caring about the kids* (M8). Participants feel the youth would be helped greatly if experienced and trained individuals, willing to make a long-term commitment to the community, could be hired. One

participant's children are actively involved in extra-curricular activities and she explains how she would *rather take kids to hockey than to court* (M15).

4.4.4.1.8 Loss of Traditional Values

Today, Métis participants perceive their ability to practice traditional lifeways on the land as compromised because of a decline in environmental health and accessibility as a result of developments (M1 and M8). Participants feel that this is leading to a loss of traditional values. *In the past people helped each other…today everything is changing* (M2). *In the past, if an old person went hunting or fishing, younger people would go with them. Not anymore* (M1). This decline in social cohesion is attributed to the wage economy and introduction of money (M8). In the past, people worked not for money, but for a wagon, horses, or food to fill their 'grub box' (M8).

Elders lament that *kids would sooner eat pizza and hamburgers than moose meat* (M8) and that people *are different now* (M8). Participants are concerned about the future of their children and the loss of traditional values. *What will the kids do after the oil and gas are gone, they are not skilled* (M1). Today people *just shoot them (moose) from the truck. They used to go out in the bush to hunt* (M1).

Participants described how, in the past, people would take horses to visit their neighbours where they would 'chat and chat'. The youth learned to 'sit and be quiet', to listen, to respect their Elders, and to not interrupt. Elders wish that they had a drop-in centre as a place for them to teach traditional values to the youth. At an Elders' drop-in centre, Métis members could *sit and talk about old things, swap bush stories, and kids would learn to keep up the traditions* (M8).

One Elder felt hopeful about the survival of Métis culture and explained how, even if the younger generation did not share her lifestyle, she hoped to pass her way of thinking on to her grandchildren (M3).

4.4.4.1.9 Keeping Resident Neighbours Informed

Métis Region VI representatives expressed concern regarding continued consultation throughout the lifespan of the Thermal Development as exemplified by the following statement:

> *We wish to convey concern about Shell 'keeping' the Métis people informed. This means in an "ongoing manner" regarding their projects, plans and developments, beyond this approval seeking stage and the upcoming construction stage.*
>
> *The Métis people are a historical and integral part of Cadotte Lake surrounding area – a growing group and voice seeking recognition. Outside entities repeatedly deal with the Woodland Cree Band assuming they've spoken to "the aboriginal community of the area" and they haven't. The band is composed of aboriginal people, yes including a lot of Métis people (esp Bill C-31's) but how can they speak for those who live off-reserve.*
>
> *Cadotte Lake people are close to the Shell development and at risk of being the most affected. It's only fair they know what they are in-for and have opportunities to plan accordingly. Shell's intent to be a good corporate neighbour will take serious study of these historical factors and governing itself in a mutually beneficial manner.*

How would Shell see maintaining and information-flow once the project is up and running? Via a public advisory committee, an inter-industry committee, liaison committee, and/or an annual event?

The formation and use of an advisory type committee is one suggestion. So long as it has a clear mandate, controllable participation, a predictable life span and administrative support (funding). However the term 'advisory' can result in disgruntled participants when "they think" they can advise industry – perhaps "liaison" is a better generic term. Since volunteers are a dying lot, it's also a case of who "should be" at the table, and who "is paying" for the honoraria and travel? This needs to be pre-determined and fair as small "Locals" won't be able to pay what a County, FCSS or MNA reps attending the same meeting will be receiving will be receiving and that will cause a lot of dissention among the ranks. Exactly "what" the committee intends to do must be reinforced at every meeting so it stays focused and achieves that mandate – even going as far as to measure itself once a year! Serious thought and consideration must be given as to the why, who, what, how and when of such an entity to strive for fairness and productivity.

4.4.4.2 Human Health

Participants described an increase in asthma, heart attacks, strokes, diabetes, and general poor health among the local Aboriginal population (M1, M8, and M15). The increase in asthma is attributed to *something in the air* (M8).

One participant explained how before logging an area, forestry companies spray herbicides to kill underbrush (M15). This participant explained how, although forestry industry posts warnings in local newspapers for people to avoid these areas, some people are exposed to the chemicals because they cannot read or do not have access to newspapers. Another participant expressed a similar concern stating that illiterate land users or trappers might not be able to read warning signs and, as a result, might be exposed to dangerous substances like sour gas.

One participant is concerned about what impact improper waste management practices could have on community health, and is worried about cancer (M12). Another participant is concerned about the number of people in the area suffering from brain tumours (M15). She had heard that people from Prince George suffer from the same type of brain tumours leading her to believe that these tumours could be related to exposure to logging and pulp mills.

Participants are also concerned about addictions and substance abuse in the community of Cadotte Lake (M4 and M6) and amongst the younger generation (M8).

4.5 Application Scenario

This section summarizes Métis perspectives on perceived Thermal Development-specific impacts to:

- Métis Land Use
- Métis Ecological Knowledge
- Community Wellbeing

Suggested mitigation for Thermal Development impacts are provided by participants and are included in each subsection. Shell has taken the feedback received from participants into consideration for the Thermal Development design (see Volume I). In addition, their feedback

has been considered in developing the mitigation strategies to be implemented (see Volume IID, Section 1).

4.5.1.1 Métis Land Use

4.5.1.1.1 Resource Use Areas

Many Cadotte Lake Métis participants continue to practise traditional lifeways including hunting, fishing, trapping, and plant collection (for medicinal, dietary, and spiritual purposes), and have rich ecological knowledge. However, participants had few Thermal Development-specific concerns. The LSA contains no traplines or inhabited cabins belonging to Cadotte Lake Métis members.

4.5.1.1.2 Access

Participants are concerned that further development in the area will lead to greater access to traditionally occupied areas resulting in increased hunting pressure on traditionally harvested species as well as theft and vandalism at cabins by non-Aboriginal peoples. Participants are also concerned that further development in the area will lead to increasingly restricted access of local Aboriginal people to traditionally occupied areas. However, as mentioned above, use of the LSA is limited and the concern is generic for the region.

Recommended Mitigation for Access Management

One participant suggested that trapper overpasses be installed along pipelines, so that Aboriginal trappers can cross pipelines to access their traps on ATVs and snowmobiles (M1). However, since there are no Métis trapping areas within the LSA, this is a general concern for future developments.

4.5.1.1.3 Gravesites

Some participants are concerned that continued development of the region will disturb gravesites.

Recommended Mitigation for Gravesite Disturbance

To avoid disturbing gravesites, participants suggested that, as development proceeds in high potential areas, further surveying and monitoring will be required. High potential areas are defined as those along rivers, lakes, and trails or near cabins.

Another mitigation strategy suggested by participants included a regional traditional land use study of the Peace River area. Participants suggested that this study be funded in partnership with Métis Region VI and industry. It would provide an opportunity for previously unmarked gravesites, trails, cabins, and other significant sites to be recorded through further interviews and field visits. This information could then be used as a reference tool in future Thermal Development-specific assessment work as well as an educational resource for school programs in the area.

Participants recommend a committee be formed to oversee such a study and ensure that money is spent appropriately. Money should stay in the community and not be spent on the expensive logistical costs of attending meetings in Edmonton or other cities (M1).

4.5.1.2 Métis Ecological Knowledge

4.5.1.2.1 Water Quality

Participants are concerned that the approval of the Thermal Development would only add to declining water quality conditions in the Peace River area, which they believe is linked to poor fish and animal health.

Recommended Mitigation for Water Quality

Participants recommend that Shell not dispose of polluted water in local watersheds and do everything possible to avoid further contamination of local waters.

4.5.1.2.2 Air Quality

Participants are concerned that the Thermal Development will add to declining air quality and bad odour in the Cadotte Lake area. Participants are also concerned about the effects that poor air quality has on human health.

Recommended Mitigation for Air Quality

One participant would prefer that the Thermal Development's plant be located farther away from Cadotte Lake. However, participants believed that this suggestion would not result in any change (M2 and M13).

4.5.1.2.3 Animal Movement

Participants are concerned about the ability of moose to cross above-ground pipelines and their ability to escape predators and access important water sources. Participants are also concerned about hunters' use of pipeline to 'pound' or 'trap' animals for easy killing.

Recommended Mitigation for Animal Movement

Participants provided recommendations about how to lessen the impact of above-ground pipelines on wildlife. One suggestion was to increase the height of pipelines. *Why not build a pipeline up high so moose can go under it?* (M8). *Pipelines should be higher so moose can go under them* (M1). Another suggestion was that Shell *make more gradual animal overpasses. Make them wider and build them up on both sides* (M8).

One participant suggested that the arrangement of pipelines connecting pads be designed so that access to water sources is not restricted, and hunters are not able to exploit the design for hunting (M6).

4.5.1.2.4 Animal Safety

When one Métis participant questioned an oil and gas company employee as to why gates were used to restrict access, it was explained that it was for public safety as gated areas often contained health dangers like sour gas (M8). This participant would like to know what measures are being taken to protect wildlife in these areas from the same dangers.

4.5.1.2.5 Reclamation

Participants are concerned about proper reclamation strategies. They have seen abandoned wellpads and access roads overrun with non-native weedy species in the area.

Recommended Mitigation for Reclamation

Participants recommended that native plant species be used to reclaim areas cleared for the proposed development.

4.5.1.2.6 Waste Management

Participants are concerned about how oil and gas garbage will be disposed. Participants are also concerned that moose will lick old sumps that are close to the surface.

Recommended Mitigation for Waste Management

Participants recommended that impartial, third-party companies be hired to test and ensure that proper waste management occurs. One participant would like to have old sumps buried deeper so that moose are unable to lick them (M1).

4.5.1.3 Community Wellbeing

4.5.1.3.1 Employment

Unemployment rates are high among the Métis population at Cadotte Lake (M1). As a result, participants are primarily concerned with employment opportunities on new projects developing in the area. Participants looked forward to the possibility of employment representing a positive impact from the Thermal Development.

Training and employment of Métis peoples from Cadotte Lake would be a potential positive impact of the Thermal Development. The Cadotte Lake Métis feel positive about the potential employment opportunities that would result from the Thermal Development as indicated in the following quotes:

- *if Shell works with us, good things will come out of it* (M4)
- *we want to get involved with Shell and grow with them* (M5)
- *it is something you can't run away from. Our old way of life is gone, we might as well take this opportunity to train the little ones* (M5)
- *Cadotte Lake has* lots of people who want to work (M4 and M5)

Recommended Mitigation for Employment

The Cadotte Lake Métis would like to see Shell continue to work with Métis Region VI to provide training and employment opportunities for their community.

Participants recommended that Shell provide the following to the Cadotte Lake Métis:

- contracts
- long-term employment opportunities
- on-site training
- fewer labour jobs and more skilled work

Participants would also like Shell to work in partnership with Métis Region VI to ensure that:

- funding opportunities are available to obtain the necessary tickets required for employment with Shell
- job training is available in the community for both men and women in trades, skilled labour, and high-tech jobs, particularly for the younger generation
- local people are hired preferentially

Participants also suggested support for two programs they believe would greatly facilitate and support the potential positive employment benefits of the Thermal Development:

- a Métis training and employment office
- a community cooperative

Métis Training and Employment Office for Shell Contracts

Participants want the Cadotte Lake Métis to receive opportunities equal to the Woodland Cree First Nation. Because of the past disparity experienced by participants, they would like Shell and Métis Region VI to work together to create a Métis training and employment office. Shell could provide a weekly or monthly listing of available job opportunities allotted to the Métis so that, *we wouldn't have to compete with the Treaties* (M1). The Métis Region VI office could host this 'centre' by facilitating the distribution of information on the availability of specific jobs, organizing any necessary training, and dealing with related administration.

Cadotte Lake Community Cooperative

Participants want industry and Métis Region VI to work together to create a Cadotte Lake Community Cooperative (M6 and M13). Because women are often the ones raising children, they are most in need of income. However, women are often restricted to jobs at the school or store where they can only earn minimum wage. Women are frustrated that they are unable to work for industry because transportation and childcare services are not available. Women participants complained about how men in the community are the only ones who benefit from industry employment.

Participants would like to see a community cooperative created in Cadotte Lake. This cooperative would include a daycare, kitchen, and shop. The cooperative could manufacture a product continually needed by Shell (e.g., a shop in Fort Chipewyan creates Kevlar wrist bands for Syncrude). Women could sign up for either a position in the daycare, kitchen, or shop each day. Janitorial responsibilities would also be available. This cooperative would have 'no strings attached', meaning that women would have no commitment to show up for work. Women could work as often or seldom as they liked, and their wage would be based on the number of days worked (M6 and M13).

This would be a place where women could have their children watched while they made an income, and it would be located in the community, eliminating the necessity for a vehicle or gas money. Women and children would receive proper nutrition, and children would learn skills necessary to succeed in school. Participants hope that through this cooperative, women would garner greater self-esteem, confidence, and independence. Their children would have access to better nutrition and educational resources, helping them to achieve their full potential. Participants believe strongly that women are active agents in positive social change (M6 and M13).

4.5.1.3.2 Household Water

Tap water in the community of Cadotte Lake used for drinking and bathing is reported as being contaminated by waste from sewer lagoons.

Cadotte Lake Métis Recommendations for Household Water

Participants would like Shell to share the water they are piping into their Thermal Development with the community of Cadotte Lake.

4.5.1.3.3 Traffic and Safety

Cadotte Lake Métis Recommendations for Traffic and Safety

Participants made the following recommendations regarding mitigation of regional traffic and safety:

- have truckers lose their licenses or jobs if they are caught speeding on the highway
- impose penalties for companies whose employees speed
- build a detour or bypass around the community of Cadotte Lake
- install speed bumps on the highway through the reserve
- install more street lights along the highway through the reserve
- construct pedestrian walkways along the highway through the reserve
- erect more signage alerting drivers to pedestrians along the highway through the reserve
- employ more police in the community

4.5.1.3.4 Keeping Resident Neighbours Informed

Métis Region VI representatives are concerned about how Shell will continue to keep the Cadotte Lake Métis informed regarding their activities throughout the lifespan of the Thermal Development.

Cadotte Lake Métis Recommendations for Keeping Resident Neighbours Informed

Métis Region VI would like Shell to devise an approach to keep the Cadotte Lake Métis informed throughout the lifespan of the Thermal Development (see Section 4.4.4.1.9)

4.6 Cumulative Effects Scenario

This section describes cumulative effects, from a Métis perspective, that are already being experienced by the Métis or to which the Thermal Development might contribute. Mitigation measures that could be taken by industry in the region to address cumulative effects are also included. The Cadotte Lake Métis view support for these mitigation recommendations as a joint effort among industry players in the RSA.

Participants outlined a number of cumulative effects that they felt could be mitigated through support of Métis programs focused on improving community wellbeing.

4.6.1.1 Métis Land Use

Participants are concerned that approval of the Thermal Development, combined with other developments in the area, will only intensify the effects already being experienced regarding access and gravesite disturbance.

Recommended Mitigation for Access Management

One participant suggested that trapper overpasses be installed along pipelines, so that Aboriginal trappers can cross pipelines to access their traps on ATVs and snowmobiles (M1).

Recommended Mitigation for Gravesites

Participants recommended that further surveying and monitoring occur before development proceeds in 'high potential areas'. A regional traditional land use study of the Peace River area was also recommended.

4.6.1.2 Métis Ecological Knowledge

Although participants believed that the best way to maintain environmental health was for natural habitat to be left undisturbed as *the earth will heal if left alone* (M10), they mentioned some specific mitigation strategies that industry can use to deal with cumulative environmental effects associated with their developments.

Recommended Mitigation for Environmental Health:

- conduct a Cadotte Lake water quality study to assess the effects that the Thermal Development, Shell's source water treatment facility, the weir, and the sewage lagoon has on the lake (M5)
- use non-salty alternatives to de-ice roads in winter, as this would decrease the amount of moose and deer killed on highways
- reclaim areas to their previous condition using native plant species (M6)
- release the Cadotte Lake weir permanently in the hope that the flow of fresh water would improve the cleanliness and health of the lake. Participants believe that if Shell no longer took water from the lake, the weir would no longer be needed (M10)
- conduct comparative studies to see how development affected the environment and community in other regions. These studies could supply 'lessons learned' and the predictions could be applied to similar developments proposed in different areas (M1)
- look ahead 10–20 years when considering impacts (M1)
- create co-managed wildlife reserve areas where industry could partner with Métis Region VI. The reserves would have community-run, controlled hunts with community members and youth monitoring wildlife, fish, and vegetation health, as well as water and air quality. One participant suggested that Aboriginal participants could partner with western scientists to evaluate what species and conditions need to be protected and monitored (M4)
- avoid spruce and 'heavy timber' areas, as most furbearers live there. Avoid pine areas, as people like to camp there. One person suggested that oil and gas developments be constructed in muskeg areas (M8)
- develop strategies that deter moose from plant sites and design projects to avoid animal trails, water sources, and salt licks (M1 and M8)
- participants would like to see less above-ground disturbance. As stated by one participant, *The oil they need is underneath. They don't need to push our trees down on the surface* (M8)

4.6.1.3 Community Wellbeing

Participants are profoundly concerned about the poor level of community wellbeing among the Cadotte Lake Métis. Participants are concerned that approval of the Thermal Development, combined with other developments in the area, will only intensify effects already being experienced by Cadotte Lake community members, such as a lack of affordable housing, difficulties in the political organization of Métis Local No. 1994, increased traffic, problems with the youth, poverty, effects of Bill C-31, loss of traditional values, and declining human health.

Participants provided a comprehensive list of recommendations that could be used to address cumulative effects to community wellbeing.

Cadotte Lake Métis Recommendations for Housing

Participants would like affordable housing in Cadotte Lake for Métis members.

Cadotte Lake Métis Recommendations for Political Organization of Métis Local No. 1994

The Métis would like industry to donate an office to be used by the Cadotte Lake Métis to govern themselves and to hold wakes and other cultural events. One participant explained how, *once we have a hall at least we have a place to organize things* (M5).

The Métis would also like funding for a Métis Local No. 1994 administrator. This individual would facilitate the local membership by assisting people with the paper work and genealogical research necessary to become Métis card holders. This would need to be an ongoing position as the population grows. The local would also like a computer to be donated for use in administration.

Participants want industry to work with Métis Local No. 1994, and to recognize them as partners in development (M5, M10, and M13). Participants want Aboriginal people to have a voice in the development and to be involved in decision-making. They would like industry to work with Aboriginal people to support them in capacity building.

Cadotte Lake Métis Recommendations for Youth

Participants offered several recommendations that could help local youth stay in school and avoid the pitfalls of substance abuse. Programs should focus on Grade 8 students, as participants believed that most youth drop out of school around Grade 9. Some programs could be designed to spark youth interest in the oil and gas industry and start them on the path to future employment. Others could focus on providing youth with more productive and positive ways to spend their time. Participants hoped that industry would partner with Métis Region VI to support the following programs.

Recreation Programs

Participant's recommended that industry subsidize minor hockey fees for Cadotte Lake youth. Other recommendations include hiring a recreation facilitator to run after-school and evening programs in the Cadotte Lake School. Suggested programs include band and dancing. Another recommendation is to build a recreation centre in Cadotte Lake to *get the youth off the road* (M8). Suggestions included a pool hall, swimming pool, or bowling alley.

Oil and Gas Interpretive Centre, Job Shadowing, Field Trips, and School Programs

An oil and gas interpretive centre that explains how bitumen is removed and the associated technology behind the process could be built. This centre would be a place for school fieldtrips and where students could receive hands-on learning. School science programs and projects based on oil and gas technology could be integrated into the school curriculum.

Other suggestions included:

- exposing youth to the environmental aspects of the oil and gas industry through programs related to monitoring wildlife, vegetation, and fish, as well as air and water quality

- setting up long-term job shadowing and a series of fieldtrips to oil and gas developments, to introduce youth to an employment setting and industry needs
- involving youth in EIA studies conducted in the Cadotte Lake area

Cadotte Lake Métis Recommendations for Poverty

Participants suggested that a survey be conducted on a household-by-household basis to examine the true level of poverty among the Cadotte Lake Métis. Participants also recommended that industry partner with Métis Region VI to run programs like Meals on Wheels, as well as offer Christmas and Easter suppers for the elderly. Another suggestion is to build an Elders' drop-in centre that provides meals.

Cadotte Lake Métis Recommendations for Effects of Bill C-31

Participants would like a study conducted surveying the effects of Bill C-31 on families in Cadotte Lake.

Cadotte Lake Métis Recommendations for Loss of Traditional Values

Local History Programs

Local history should be integrated into the Cadotte Lake school curriculum. Participants felt that *maybe they (the youth) would have less anger if they knew where they came from. Youngsters are confused about Bill C-31, Métis, and Status* (M5).

Outdoor Survival Programs

Educational trips for high school students could be conducted to teach them traditional activities such as how to hunt, butcher animals, start a fire, and build shelter. One Elder explained how he wants *some place to bring kids out and teach them about the old days* (M8*). Kids enjoy these camps but there is no funding, they behave themselves in the bush and learn to make fire* (M1).

Cadotte Lake Métis Recommendations for Human Health

Participants recommended that industry and government form a partnership with Métis Region VI to build a drug and alcohol treatment centre in Cadotte Lake. Other suggestions include advertising campaigns or school programs focused on portraying drugs and alcohol negatively.

Thermal Development-specific effects to water and air quality and access to traditional land use areas was a concern. Effects to animal movement from above-ground pipelines, animal safety, reclamation and waste management practices, and gravesite disturbance were also of concern. Participants believed that these could be managed to some degree through suggested mitigation. The Thermal Development was perceived to have potential positive benefits to the community if employment and training opportunities were forthcoming. Another potential positive benefit to the community would be Shell sharing water from their source water treatment facility on the Peace River with the community of Cadotte Lake for household water (see Table 4.6-1).

Perceived effects of the Thermal Development in combination with projects that occur or are planned to occur in the Peace River area include concerns regarding environmental health and community wellbeing such as housing, political organization of Cadotte Lake Métis Local No. 1994, traffic and safety, youth, poverty, effects of Bill C-31, loss of traditional values, and human health (see Table 4.6-2).

Table 4.6-1: Summary of Perceived Thermal Development-specific Impacts and Mitigation Recommended by Métis Participants

Perceived Thermal Development-specific Impact	Mitigation Recommended by Métis Participants
Métis Land Use	
Access	• pipeline overpasses for trappers
Gravesites	• monitoring during disturbance in 'high potential' areas • Regional Traditional Land Use Study
Métis Ecological Knowledge	
Water quality	• no disposal of polluted water
Air quality	• locate plant further away from Cadotte Lake
Animal movement	• increase pipeline height so animals can go underneath • wide and gradual animal overpasses • arrange pipelines and roads carefully to not restrict animals from water sources
Animal safety	• no recommended mitigation
Reclamation	• reclaim with native plant species
Waste management	• third-party testing to ensure proper waste management
Community Wellbeing	
Employment	• creation of a Métis Training and Employment Office for Shell Contracts • creation of a Cadotte Lake Community Cooperative
Household water	• Shell to share water supply with Cadotte Lake Métis
Traffic and safety	• traffic control (speeding truckers lose licenses, penalties on companies whose employees speed, detour or bypass around Cadotte Lake, more police, speed bumps) • pedestrian safety (street lights, pedestrian walkways, signage)
Keeping Resident Neighbours Informed	• implement measures to ensure continued consultation throughout the life of the Thermal Development

Table 4.6-2: Summary of Cumulative Effects and Recommended Mitigation by Métis Participants

Cumulative Effects	Recommended Mitigation by Métis Participants
Métis Land Use	
Access	• no recommendations
Gravesites	• monitoring during disturbance in 'high potential' areas • Regional Traditional Land Use Study
Métis Ecological Knowledge	
Environmental health	• water quality study • salt-free alternatives for road maintenance • reclaim with native plant species • release weir on Cadotte River • comparative environmental studies with previous oil sands developments • long-term projections of environmental impacts • co-managed wildlife reserves • restrict development to muskeg areas and avoid spruce and pine areas • develop strategies to deter moose from plant sites and design industrial sites to avoid animal trails, water sources, and salt licks • limit above-ground disturbance
Community Wellbeing	
Housing	• support creation of affordable housing in Cadotte Lake
Political organization of Cadotte Lake Métis Local No.1994	• provide an office or hall and a computer • provide funding for an administrator
Youth	• recreation programs • oil and gas interpretive centre, job shadowing, field trips, and school programs
Poverty	• household survey of poverty levels • meals for the elderly • elders' drop-in centre
Effects of Bill C-31	• survey of the effects of Bill C-31
Loss of traditional values	• local history programs • outdoor survival programs
Human health	• drug and alcohol treatment center in Cadotte Lake • advertisement campaigns focused on deterring drug and alcohol abuse

4.7 Monitoring

Monitoring is discussed in the Historical Resources (Volume IID, Section 3), Wildlife and Vegetation (Volume IIC, Sections 3 & 4), Aquatic Ecology and Surface Water Quality (Volume IIB, Sections 4 & 5), and Air Quality (Volume IIA, Section 2) sections of this EIA.

4.8 References

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STUDY PARTICIPANTS

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1. Study Participants

1.1 Interviews

The following individuals were interviewed from the Cadotte Lake Métis:

- Archie Cardinal
- Mary Cardinal
- Irene McGillvary
- Louis Bellrose
- Darlene Cardinal
- Caron Riley
- Tony Riczu
- Wendy Goulet
- George Amato
- Irene Carifel
- David Cardinal
- Joe Whitehead Sr.
- Marcella Carifel
- Sylvia Johnson
- Edward Cardinal

1.2 Field Visits

The following field visits were conducted:

- Louis Bellrose in November 16, 2005
- George Amato in December 8, 2005
- Archie Cardinal in June 29, 2006

LAND AND RESOURCE USE

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5. Land and Resource Use

5.1 Introduction

Shell Canada Limited (Shell) is requesting regulatory approval to commercially develop the Peace River Oil Sands Carmon Creek Project (Project), located about 40 km northeast of the Town of Peace River, Alberta within Townships 84–86, Ranges 16–19, W5M, in Northern Sunrise County. The Project is an expansion of the existing Peace River Complex, and is planned to consist of both thermal recovery (Thermal Development) and primary recovery (Primary Development). This section presents the results of the studies and impact assessment for land and resource use as part of the Environmental Impact Assessment for the proposed Thermal Development.

This section analyzes the potential effect of the Thermal Development on other land and resource uses. This assessment will also determine whether the Thermal Development is consistent with the Northern Sunrise County's land and resource development policies, and identify possible mitigation and management strategies that will help avoid or reduce negative effects to industry or resource users.

For the purpose of this assessment, the following definitions were used to describe the terms resource and resource user:

- resource: an aspect of the physical environment that people value and use to meet a need for fuel, food, industrial product, or something else of value
- resource user: person who harvests, extracts, consumes, or otherwise benefits from natural resources, and participates in commercial and non-commercial activities, including oil and gas extraction, agriculture, forestry, tourism, cultural use, food collection, trapping, hunting, and other outdoor recreational activities

The land and resource use assessment, with the exception of the forestry assessment, describes regional development policies and current land uses in the regional study area (RSA). These land uses are discussed in three main classes – linear development and access, consumptive resource use, and non-consumptive resource use.

Linear development and access includes:

- roadways
- special access areas

Consumptive resource use includes:

- existing or leased but not developed surface mineral extraction, including aggregate resources, oil, gas, and minerals
- forestry (commercial and non-commercial)
- agriculture (including dry land crops, livestock, and grazing operations)
- hunting (commercial and recreational)
- trapping
- fishing

Non-consumptive resource use includes:

- parks, protected areas, and environmentally significant areas (including natural areas and heritage rivers)
- recreational use

The assessment does not consider impacts to traditional land use (e.g., traditional plant harvesting or subsistence hunting and fishing). These are discussed in Volume IID, Section 4: Traditional Knowledge and Land Use.

5.2 Issues Scoping

The land and resource use assessment focuses on the potential interactions and implications the Thermal Development might have on other natural resource-based sectors and user groups in the RSA within the context of regional development policies.

In particular, it considers:

- whether the Thermal Development is consistent with, or constrained by, regional land and resource development policies associated with the Northern Sunrise County, environmentally significant areas, special access management areas, heritage rivers, and provincial grazing reserves
- the effect Thermal Development will have on:
  - public access, including non-consumptive recreational user groups, trappers, non-Aboriginal commercial and non-commercial hunters, and anglers
  - businesses holding dispositions within the Shell Canada Limited (Shell) leases
  - commercial and non-commercial productive forested land base, in particular annual allowable cuts and quotas in the forest management agreement, and short and long-term harvesting plans in the principal development area (PDA) (including timber salvage reclamation planning)
  - private agricultural operations and the provincial grazing reserve

The section also describes the process for developing mitigation and management strategies to address the needs of other industry or resource users in the context of avoiding or reducing negative effects caused by the Thermal Development. This includes integrated land management initiatives being pursued by Shell with the province and other industrial operators.

5.2.1 Terms of Reference

In addition to the issues provided previously, the assessment also addresses the issues identified in the Terms of Reference for the Thermal Development as follows:

“Identify the existing recreational, commercial, and traditional land uses, including oil and gas development, agriculture, forestry, tourism, cultural use, food collection, trapping, fishing, hunting and other outdoor recreational activities. Identify the potential impact of the Project on these land uses and possible mitigative strategies, including:

- any anticipated impacts related to changes in public access
- any land use policies and resource management initiatives that pertain to the Study Areas and discuss how the proposed development will be consistent with the intent of the guidelines and objectives of these initiatives
- the implications of those land and resource use policies for the Project, including any constraints to development
- unique sites or special features in the Study Areas such as Natural Areas, Environmentally Significant Areas, Heritage Rivers, and any potential impacts of the Project on these features
- the process for addressing the needs of other users in the Local Study Area

- the impact of development and reclamation on commercial forest harvesting in the PDA. Include opportunities for timber salvage, revegetation, reforestation, and harvest for the reduction of fuel hazard
- determine the amount of commercial and non-commercial forest land base that will be disturbed by the Project. Compare the pre-disturbance and reclaimed percentages and distribution of all forested communities in the PDA. Provide Timber Productivity Ratings for the Local Study Area lands, including identification of productive forested, non-productive forested, and non-forested lands
- determine how the project disturbance impacts Annual Allowable Cuts and quotas within the FMA. Discuss opportunities to integrate this Project with other resource development activities such as logging
- an assessment of the anticipated changes (type and extent) to the pre-disturbance topography, elevation, and drainage pattern within the project area resulting from disturbance during construction, operation, and reclamation activities on existing land uses (see Volume IIC, Section 2 and Volume IIB, Section 3)
- implications of the Project individually and in combination (cumulative) with other (existing and planned) developments for regional recreational activities, public access, and other land uses during and after development activities, including:
  - how regional environmental management initiatives will be incorporated into Shell's land use plan
  - measures to mitigate impacts created on land use by the Project. Identify anticipated impacts on public access for land use in the region
  - how reclamation will return existing land use potentials considering any recommendations from stakeholders within the region."

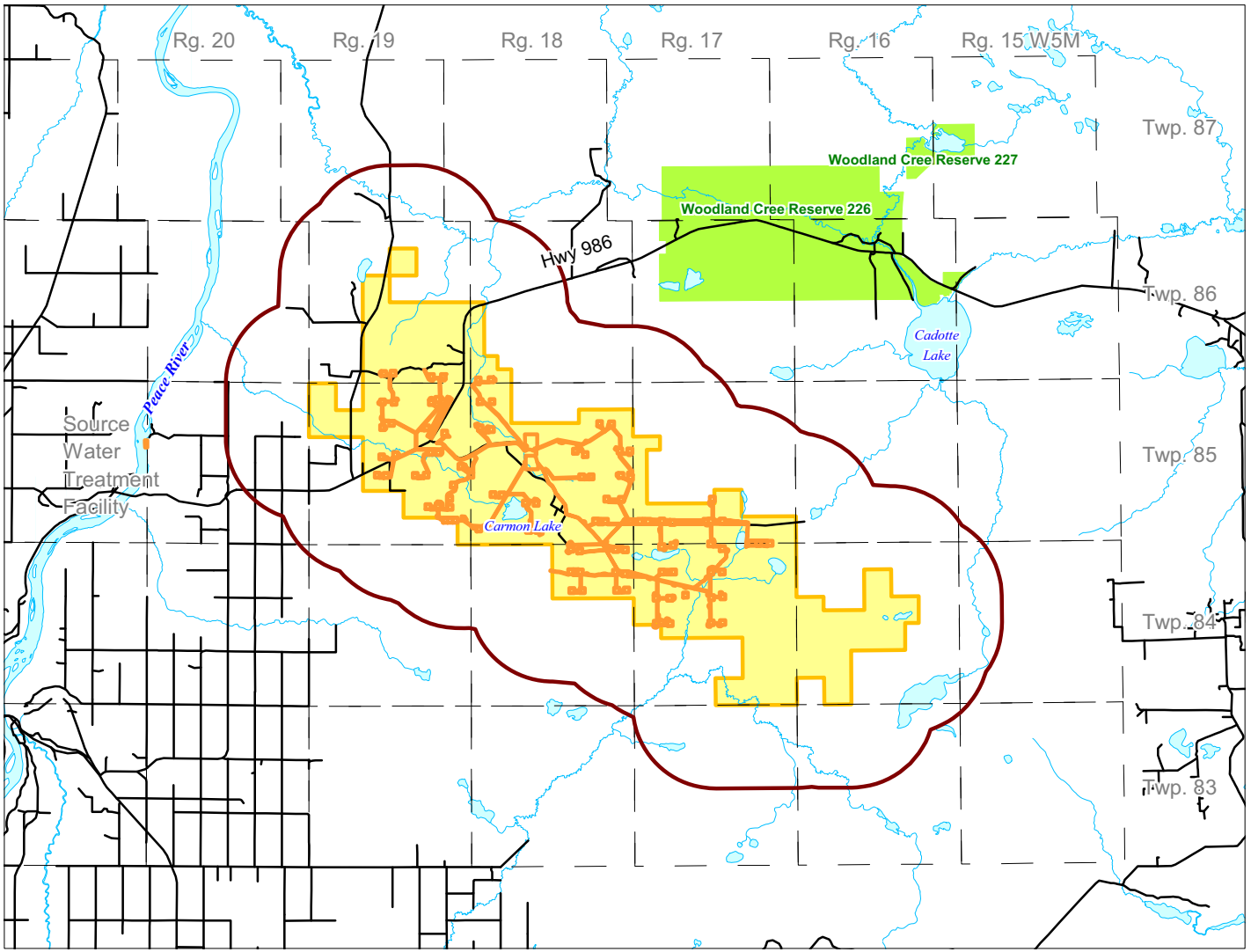
5.3 Methods

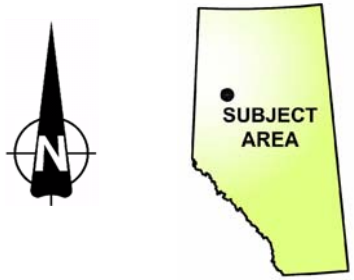
5.3.1 Spatial Boundaries

The local study area (LSA) for the land and resource use assessment is the PDA (see Figure 5.3-1). The LSA was used to evaluate potential impacts to agriculture, forestry, and existing or leased subsurface mineral extraction projects, including oil and gas developments, minerals, or aggregate resources, and unique or special features such as Environmentally Significant Areas (ESAs) and Special Access areas. These aspects of resource use have the potential to be directly affected by the Thermal Development. The RSA consists of a 5 km buffer around the LSA (see Figure 5.3-1). The RSA was considered appropriate for contacting stakeholders with an interest in the land and for describing regional land and resource use policies that apply to the Thermal Development. In the RSA, potential direct and indirect impacts were evaluated for public access, unique sites or special features, hunting, trapping, fishing, tourism, and other outdoor recreational activities.

5.3.2 Temporal Boundaries

The land and resource use assessment adopts a long term-assessment scenario driven by the Thermal Development activities during construction, operations, decommissioning, and reclamation. Activities include site clearing, access management (fencing and gates), construction, and revegetation. The Thermal Development is expected to have an approximate 40-year operating life with reclamation occurring progressively throughout that period. However, the application scenario impact assessment was conducted assuming maximum disturbance, where all parts of the proposed Thermal Development would be constructed and operated concurrently.





LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- Principal Development Area (PDA) / Land Use Local Study Area (LSA)
- First Nations Reserve
- Road

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Land Use LSA and RSA

DRAWN BY:	EDITED BY:	DATE
HW	HW	3 Nov 2006

APPROVED:	FIGURE:
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Residual impacts past closure depend on reclamation practices and timing, and forest succession as it relates to timber harvesting. The simulation model used by Daishowa-Marubeni International Ltd. (DMI) to calculate harvest amounts sets 70 years as the minimum acceptable harvest age for merchantable timber in the FMA (DMI 1999). For this assessment, 75 years is used as a temporal boundary.

5.3.3 Project Inclusion List

Table 5.3-1 lists the existing, approved, and proposed projects reviewed for each of the three assessment scenarios.

Table 5.3-1: Project Inclusion List

Status	Baseline Scenario	Application Scenario	Cumulative Effects Scenario
Existing and Approved	Existing Shell Peace River Complex operations (2000 m^3/d production)	Existing Shell Peace River Complex integrated with the Thermal Development	Existing Shell Peace River Complex integrated with the Thermal Development
	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557	Shell Primary Production Scheme Approval No. 10557
	Asphalt plant	Asphalt plant	Asphalt plant
	BlackRock Ventures - Seal	BlackRock Ventures - Seal	BlackRock Ventures - Seal
	Daishowa-Marubeni International Ltd. existing cutblocks	Daishowa–Marubeni International Ltd. existing cutblocks	Daishowa–Marubeni International Ltd. existing cutblocks
	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails	Rights-of-way, roads, and trails
Project	n/a	**Shell Canada Limited Thermal Development**	**Shell Canada Limited Thermal Development**
Planned Projects and Activities	n/a	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)	Primary production which includes a battery and wellpads on future thermal wellpads (no additional disturbance)
	n/a	n/a	Associated Shell infrastructure including: • transmission lines • source water pipeline upgrade
	n/a	n/a	Baytex Energy Trust
	n/a	n/a	BlackRock
	n/a	n/a	Husky Oil Operations Ltd.
	n/a	n/a	Murphy Oil Corporation
	n/a	n/a	CCS Energy Services
	n/a	n/a	Daishowa-Marubeni International Ltd. future cutblocks

Note:

n/a – not applicable.

5.3.4 Approach

Land uses that have the potential to be directly or indirectly affected by the Thermal Development were considered in the impact assessment. Whenever possible, quantitative data were used to augment the qualitative assessment based on existing information in regard to:

- resource use and resource users
- regional policy outlining management practices

- applicable regulations and guidelines
- input from stakeholder consultations

5.3.4.1 Data Collection

To evaluate land use in the area for the baseline scenario, data was collected from several information sources including:

- a review of work previously conducted for Shell
- published material regarding land use activities
- Internet material regarding land use activities
- municipal, provincial, and industrial land use plans and strategies
- operational guidelines and regulations for industrial activities
- Energy and Utilities Board Land Status Automated System
- discussions with private resource users
- discussions with municipal, provincial, and federal government agencies

This information was used to provide a baseline description of land use within the RSA. Quantitative data was used when available (see Section 5.4.4). Key resource users and service providers were selected based on the Thermal Development's public consultation database and the advice of the Shell Public Consultation Coordinator. An effort was made to contact one representative from each public and private organization related to the resource uses discussed in the assessment. However, not all resource users in the RSA were contacted specifically for this assessment as information was available from Shell's public consultation program. Individuals who were contacted to assess the Thermal Development's potential impacts were asked the following questions:

- could they confirm published information on the baseline state of the resource in the RSA or provide additional information
- did they know of special management plans or guidelines that had implications for the Thermal Development
- do they or their organization have specific issues or concerns related to construction or operation of the Thermal Development in terms of how it may affect their own activity

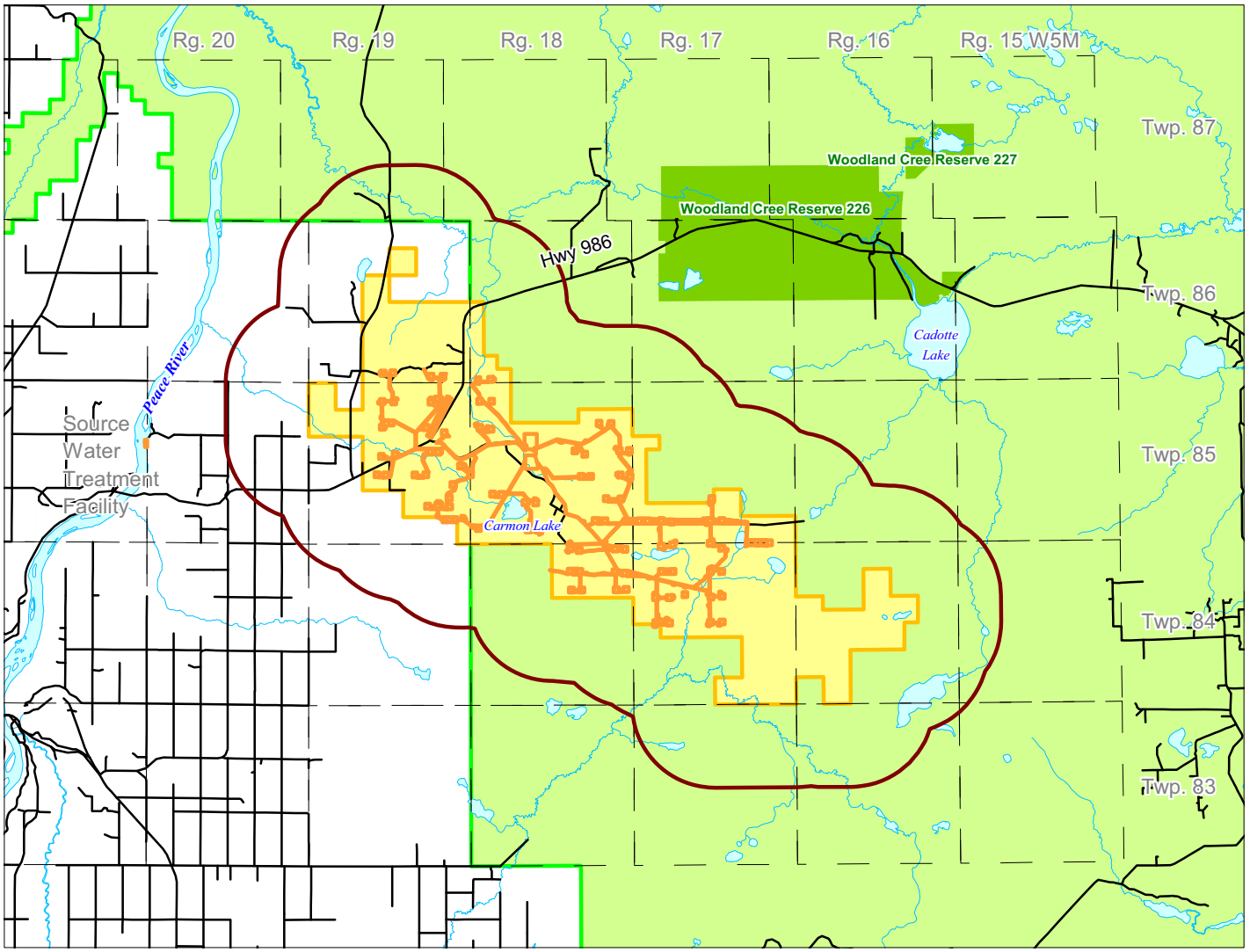
5.4 Baseline Scenario

5.4.1 Introduction to Baseline

The baseline scenario identifies the current state of natural resources in the RSA, characterizes existing land uses, and outlines management practices for these resources and land uses by listing their applicable regulations and guidelines.

5.4.2 Regional Land Use Policy

Provincial and public land (white area and green area) as well as privately held land are within the RSA. The western portion of the RSA falls within Alberta's White Area (see Figure 5.4-1). The White Area includes both private and public land in the settled portion of the province and is managed primarily for agriculture use.



LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- Principal Development Area (PDA) / Land Use Local Study Area (LSA)
- First Nations Reserve
- Green Area
- White Area
- Road

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Green and White Areas in the Land Use RSA

DRAWN BY:	EDITED BY:	DATE
HW	HW	3 Nov 2006

APPROVED:	FIGURE:
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Other managed land uses can include forestry, oil and gas development, recreation, soil and water conservation, and fish and wildlife habitat (ACD 2005a, Internet site).The eastern two-thirds of the RSA are located in the Green Area of Alberta. The Green Area consists of public land that is primarily forested and managed for timber production. Other managed land uses can include oil and gas development, watershed protection, wildlife and fisheries habitat, recreation, and other uses (ACD 2005a, Internet site).

The RSA does not have an integrated resource management plan (Woods 2005, pers. comm.). However, Shell and DMI, the regional forest manager, might develop a plan for an area that would encompass the RSA. The entire RSA is under the jurisdiction of Northern Sunrise County (formerly the Municipal District (MD) of East Peace No. 131). The General Municipal Plan (MD of East Peace 1994) is the primary document outlining the land use planning and environmental management policy for the RSA.

5.4.2.1 General Municipal Plan for MD of East Peace No. 131 (Northern Sunrise County)

The General Municipal Plan (GMP) for the MD of East Peace No. 131 was prepared in accordance with the *Municipal Government Act* (2002), and applies to the entire RSA. The Thermal Development is consistent with the intent of the GMP in that industrial development is encouraged as long as it is planned within the context of other land uses and to ensure protection of natural features. Section 5.5.2 discusses how the Thermal Development is consistent with the intent of the guidelines and objectives of this GMP.

5.4.2.2 Northern Sunrise County Land Use Bylaw (B088/02)

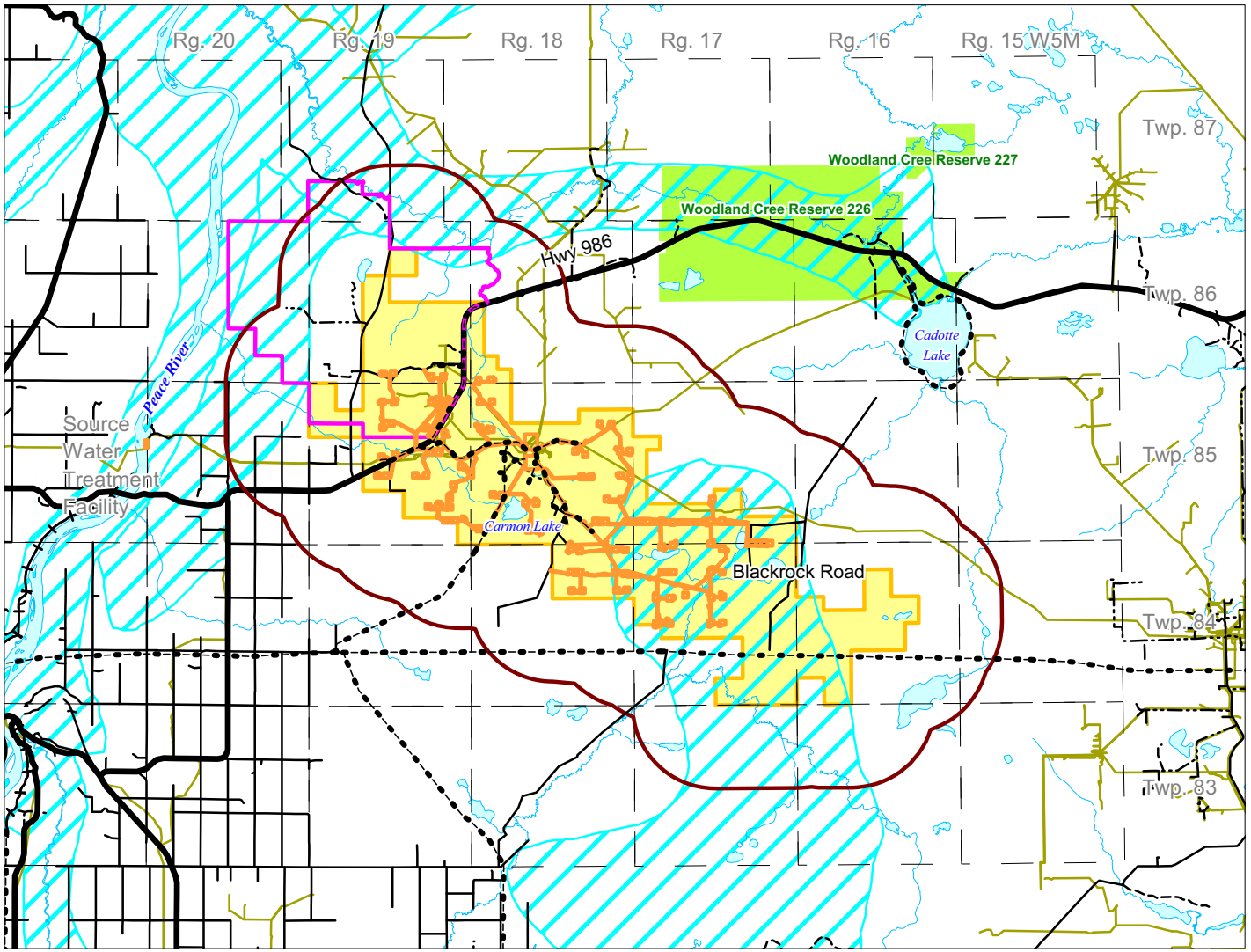
The Northern Sunrise County Land Use Bylaw (B088/02) (Northern Sunrise County 2002) indicates that portions of the RSA are within Forestry District "F". The general purpose of this district is to regulate land use within the Green Area of the County. Permitted uses in the RSA include forestry, gravel, and sand pits, industrial and residential temporary camps, natural resources extraction industries, extensive agriculture, skeet and trap facilities, and stripping of top soil. No special provisions for natural resource extraction exist in the bylaw.

5.4.3 Linear Development and Access

Linear development and access management are becoming increasingly important in the RSA, especially within the context of future industrial development and management objectives for forestry, and fish and wildlife (Woods 2005, pers. comm.). Shell owns and maintains the existing plant road to the Peace River Complex. It is gated for control during emergency situations. Shell has signed road-sharing agreements for use of this access with Baytex Energy Trust, Brigantine Energy, and Husky Oil Operations Ltd. Roadways in the RSA are listed in Table 5.4-1 linear development in the RSA is presented in Figure 5.4-2. The road-sharing agreements permit industrial users to use the existing plant road.

Table 5.4-1: Roadways in the RSA

Road	Maintained by	Description
Highway 986	Alberta Infrastructure	Paved, Two Lane
North–south forestry haul road	DMI	Gravel
Shell plant road	Shell	Gravel
Baytex road	Baytex Energy	Gravel
BlackRock road	Shell	Gravel
Buchanan winter road	Buchanan Lumber	Winter use only
Whiskey Creek subdivision road	County of North Sunrise	Gravel



LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- Special Access Areas
- Principal Development Area (PDA) Land Use Local Study Area (LSA)
- First Nations Reserve
- Three Creeks Grazing Reserve
- Pipeline
- Electrical (Power line)

Roads by Category

- Improved Road
- Major Highway
- Railway
- Truck Trail
- Unimproved Road

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Linear Development in the Land Use RSA

DRAWN BY:	EDITED BY:	DATE
HW	HW	3 Nov 2006

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A major forestry haul road runs north and south in the RSA, through the middle of the Three Creeks Grazing Reserve (ASRD 2001, Internet site). The road was required to shorten the haul of aspen logs to the DMI pulp mill located west of the RSA. To accommodate the Three Creeks Grazing Reserve, numerous underpasses were constructed along the road to allow for the flow of livestock in an east-west direction (Fossum 2005, pers. comm.). Specific policy for creating access in the RSA is discussed in Section 5.4.3.1.

5.4.3.1 Special Access Areas

There are two special access areas that will be affected by the Thermal Development (Figure 5.4-2). One area is found in the eastern side of the LSA and the other encompasses the source water treatment facility at the Peace River. These areas are defined based on healthy moose populations in those areas and key winter ungulate range along the Peace River. Increased access in these areas could negatively affect moose populations.

Northern Sunrise County (2004) has proposed a partnership with industry to develop transportation corridors. ASRD has been in discussions with all operators in the County, including Shell, to develop an access management plan to coordinate access and minimize linear corridor development (Woods 2005, pers. comm.). This is still in the planning stages.

5.4.4 Consumptive Resources

The following is a review of consumptive uses in the RSA that are being considered in this assessment.

5.4.4.1 Mineral Dispositions

The Land Status Automated System (LSAS) is the Alberta Government's official database for recording all surface interests on crown land and is managed by Crown Resources Data and Services. A database search of all surface interests in the RSA was completed in April 2005 (EUB 2005, Internet site). The following sections summarize key findings of the search as they relate to the RSA and the Thermal Development.

5.4.4.1.1 Sand and Gravel

For the RSA, no surface notations related to sand, gravel, and aggregate resources were recorded in the LSAS (EUB 2005, Internet site). Sand, gravel, and aggregate resources are abundant in the Peace region (Condroette 2005, pers. comm.; Peterson 2005, pers. comm.). Within 50 km of the RSA, four private gravel pits and one provincial gravel pit are in operation (see Table 5.4-2). Shell anticipates current gravel suppliers will meet increased gravel demands for the Thermal Development.

Table 5.4-2: Gravel Operators within 50 km of the RSA

Operator	Location	Operation Size
Grimshaw Gravel Sales (three separate pits)	Grimshaw	Large
Inland Concrete	Peace River	Large
Alberta Infrastructure (Woodland Cree)	NW-29-086-17 W5M	Medium
Northern Aggregate	Peace River	Small
Lorenz Construction	Peace River	Small
Source: A Guide to "Surface Material" Resource Extraction on Public Land, ASRD 2001.		

Grimshaw Gravel Sales currently is the main supplier of gravel to the Peace River Complex. Gravel needed for the Thermal Development's facilities and roads will be provided locally, as the area has abundant resources to supply the Thermal Development (Condroette 2005, pers. comm.). No further assessment for sand and gravel is required.

5.4.4.1.2 Surface Dispositions

EUB Directive 056 (EUB 2005) clarifies requirements for notification and consultation with all parties whose rights might be directly and adversely affected by a proposed energy development project. This includes all parties with a direct interest in the land who have a right to conduct an activity on the land such as crown disposition holders. The following section lists surface disposition holders in the RSA. The 409 surface dispositions in the RSA are held by 31 individuals or organizations (see Figure 5.4-3) with the majority of non-oil and gas dispositions related to tree clearing (CTL, ISP), grazing activity (GRR, DRS, PNT) and right-of-way leases (RRD) in the northwest portion of the RSA. Table 5.4-3 lists the nature of specific interests.

Table 5.4-3: Surface Dispositions in the RSA

Disposition Holder	Total Number of Dispositions	Disposition Type and Number of Dispositions
A.T. Rogers	1	MLP (1)
1141523 Alberta Ltd. c/o Rosetta Exploration Inc.	2	LOC (1) MSL (1)
Alberta Transportation, Transportation and Civil Engineering Program Management Branch, Municipal Programs	2	CNT (1) RRD (1)
Andy Trudeau	1	MLP (1)
ATCO Electric Ltd. - Lands and Properties	21	EZE (18) MLL (1) VCE (2)
ATCO Electric Ltd. - Energy Supply	2	EZE (2)
Baytex Energy Ltd.	31	DWD (4) LOC (16) MSL (11)
BlackRock Ventures	64	DWD (10) LOC (30) MSL (23) ROE (1)
ConocoPhillips Canada Resources Corp.	1	ROE (1)

Notes:

CNT – Consultative Notation
CTL – Coniferous Timber Licence
DRS – Disposition Reserve
DWD – Drilling Waste Disposal
EZE – Easement
GRR – Provincial Grazing Reserve
ISP – Industrial Sample Plot
LOC – Licence of Occupation
MLL – Miscellaneous Lease
MLP – Miscellaneous Permit
MSL – Mineral Surface Lease
PIL – Pipeline Installation Lease
PLA – Pipeline Agreement
PNT – Protective Notation
REC – Recreation Lease
ROE – Right-of-Entry Agreement
RRD – Registered Roadway
VCE – Vegetation Control Easement

15 traplines are found in the RSA.

Source: EUB 2005, Internet site.

Table 5.4-3: Surface Dispositions in the RSA (Cont'd)

Disposition Holder	Total Number of Dispositions	Disposition Type and Number of Dispositions
Daishowa-Marubeni International Ltd., Land Use Coordinator, Peace River Pulp Division	13	ISP (12) LOC (1)
Devon Corporation	2	LOC (1) MSL (1)
Devlan Exploration Inc.	7	LOC (1) MSL (3) PLA (3)
East Peace Gas Co-op Ltd.	2	PLA (2)
Edmonton Office, Forest Protection Branch c/o Forest Protection Division, Peace River	1	DRS (1)
Alberta Environment Department of Water Management	1	PNT (1)
Fairview Office, Rangeland District, Public Lands and Forestry, Regional Office	1	GRR (1)
Gordon Buchanan Enterprises Ltd.	7	CTL (1) LOC (6)
Husky Oil Operations Ltd.	73	DWD (3) LOC (26) MSL (31) PLA (13)
J & M Veillet	1	MLP (1)
J.B. Harrop	1	MLP (1)
Murphy Oil Corporation	34	DWD (3) LOC (15) MSL (16)
Northern Sunrise County	63	RRD (63)
Nova Gas Transmission Ltd., c/o TransCanada Pipelines	16	LOC (1) PIL (3) PLA (12)
Peace East/Manning North Office, Rangeland District	17	PNT (17)
Peace River Boating Association	1	REC (1)
Peace River Office, Fish and Wildlife	14	PNT (14)
Peace River Office, Land Use Area, Public Lands and Forests; c/o Manning Public Lands	4	CNT (1) PNT (3)
Peace River Office - Public Lands - Grazing Reserves c/o Fairview Public Lands	2	DRS (1) PNT (1)

Notes:

CNT – Consultative Notation
CTL – Coniferous Timber Licence
DRS – Disposition Reserve
DWD – Drilling Waste Disposal
EZE – Easement
GRR – Provincial Grazing Reserve
ISP – Industrial Sample Plot
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REC – Recreation Lease
ROE – Right-of-Entry Agreement
RRD – Registered Roadway
VCE – Vegetation Control Easement

15 traplines are found in the RSA.

Source: EUB 2005, Internet site.

Table 5.4-3: Surface Dispositions in the RSA (Cont'd)

Disposition Holder	Total Number of Dispositions	Disposition Type and Number of Dispositions
Penn West Exploration Ltd.	10	LOC (4) MSL (5) DWD (1)
Progress Energy Ltd.	6	LOC (3) MSL (3)
Provident Energy Ltd.	8	LOC (3) MSL (5)

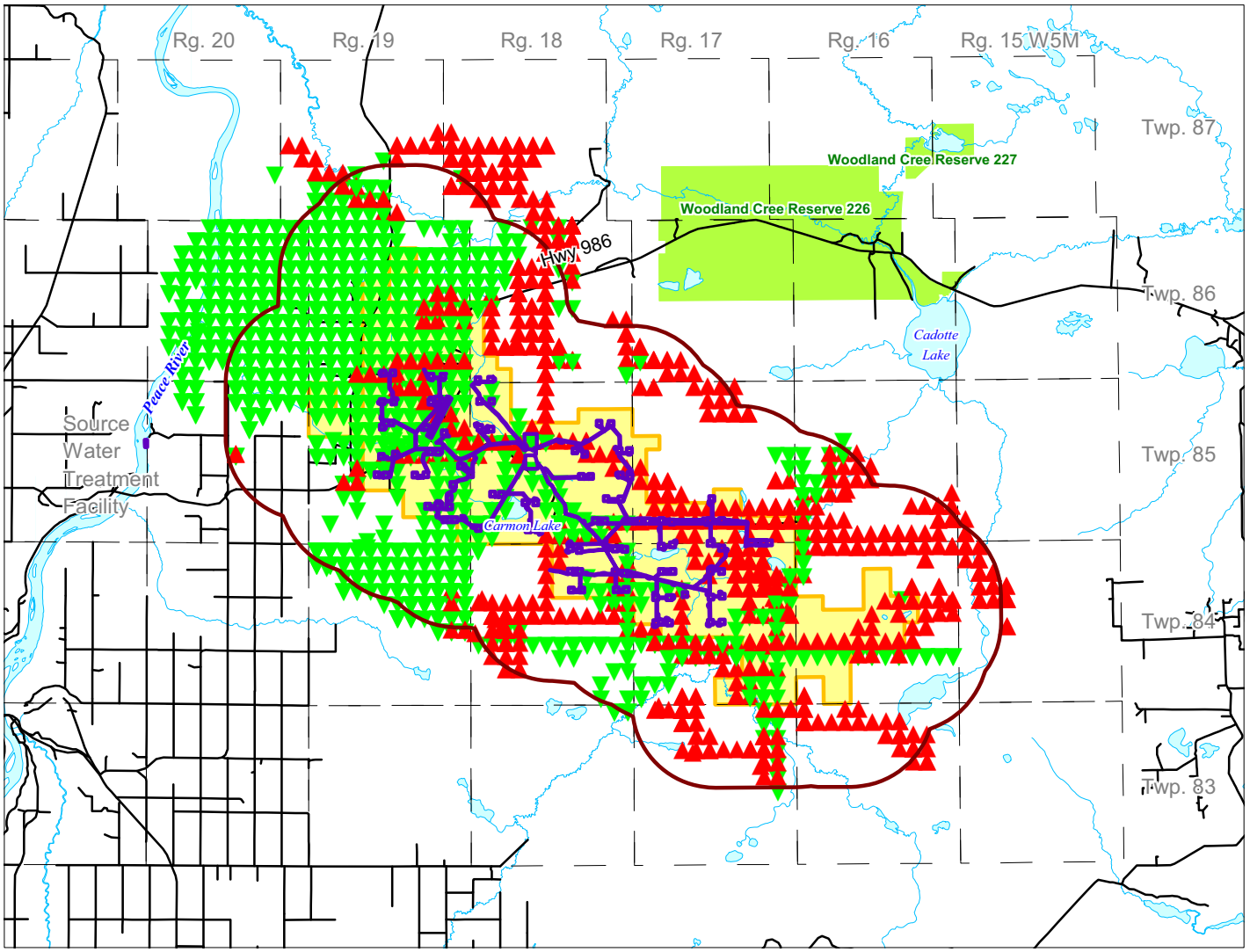
Notes:
CNT – Consultative Notation
CTL – Coniferous Timber Licence
DRS – Disposition Reserve
DWD – Drilling Waste Disposal
EZE – Easement
GRR – Provincial Grazing Reserve
ISP – Industrial Sample Plot
LOC – Licence of Occupation
MLL – Miscellaneous Lease
MLP – Miscellaneous Permit
MSL – Mineral Surface Lease
PIL – Pipeline Installation Lease
PLA – Pipeline Agreement
PNT – Protective Notation
REC – Recreation Lease
ROE – Right-of-Entry Agreement
RRD – Registered Roadway
VCE – Vegetation Control Easement
15 traplines are found in the RSA.
Source: EUB 2005, Internet site.

5.4.4.1.3 Energy, Oil and Gas

In addition to Shell, 14 energy companies have surface land interests in the RSA:

- 1141523 Alberta Ltd., c/o Rosetta Exploration Inc.
- ATCO Electric Ltd. – Lands and Properties
- ATCO Electric Ltd. – Energy Supply
- Baytex Energy Ltd.
- BlackRock Ventures
- ConocoPhillips Canada Resources Corp.
- Devlan Exploration Inc.
- Devon Energy Corporation
- East Peace Gas Co-op Ltd.
- Husky Oil Operations Ltd.
- Murphy Oil
- Nova Gas Transmission Ltd., c/o TransCanada Pipelines Limited
- Penn West Exploration Ltd.
- Progress Energy Ltd.
- Provident Energy Ltd.

Several companies have subsurface interests including shallow gas and metallic and industrial minerals in the RSA. Several shallow gas wells operated by Brigantine Energy in the Three Creeks Grazing Reserve were temporarily shut down because of the "gas over bitumen" issue (Fossum 2005 pers. comm.) Rosetta Exploration Ltd. operates shallow gas wells in the southeast portion of the RSA.



LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- Principal Development Area (PDA) / Land Use Local Study Area (LSA)
- First Nations Reserve
- Road

Surface Disposition Type

- Oil and Gas Disposition
- Other Disposition

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Surface Dispositions in the Land Use RSA

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A permit for metallic and industrial minerals activity overlaps with the RSA. However, no restrictions are associated with this permit (i.e., no "surface access", "Reserves/withdrawn", "subject to", "other", or "30 day" restrictions) (AENV 2006). Agreements for this permit are associated with natural gas storage and phosphate exploration. Although it is clear that the ownership of these minerals is not the Crown, mineral ownership in this area is described as "undetermined" (EUB 2006).

5.4.4.2 Forestry

5.4.4.2.1 Timber Management

Green Area

The Green Area portion of the LSA is an area of 22,892 ha located within forested lands managed under a forestry management agreement (FMA) held by DMI. An FMA is an area-based tenure agreement between a forestry company and the Government of Alberta that provides the holder with the right to harvest, remove, and grow timber (ASRD 2004a, Internet site). Generally, an FMA is granted for a period of 20 years with the option for renewal based on environmental performance and compliance.

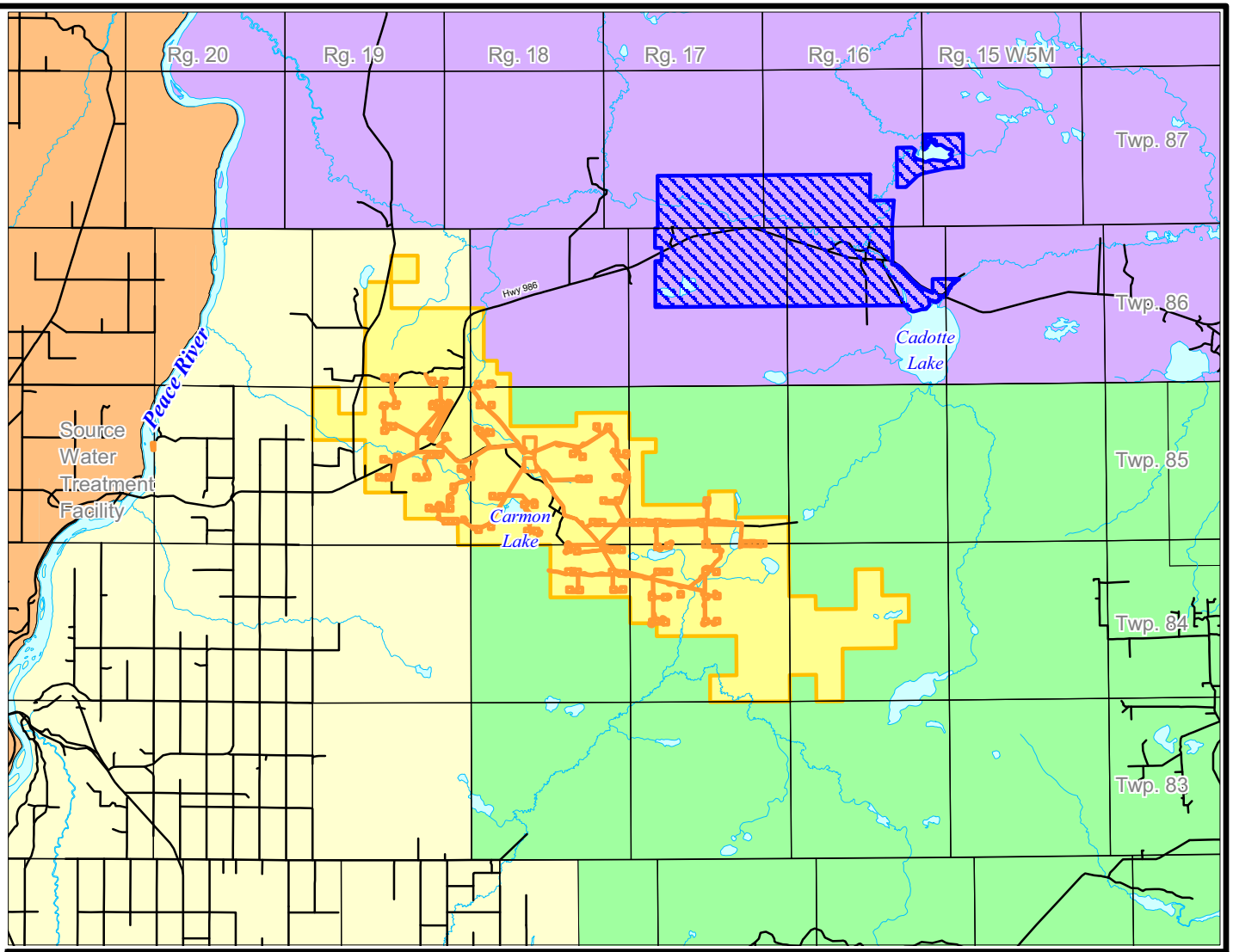
DMI's FMA encompasses the entire Green Area of the LSA and consists of a total 2.9 million ha of public forestland containing both coniferous and deciduous species (DMI 2005a, Internet site). By virtue of its FMA, DMI is responsible for the forested areas found within the LSA, known as forest management units (FMUs). The Green Area of the LSA encompasses portions of DMI's FMUs identified as P3 and P4 (see Figure 5.4-4). Table 5.4-4 shows the total area and percentage of each FMU encompassed by the LSA.

Table 5.4-4: Area and Percentage of each FMU in the LSA

FMU	Total Area (ha)	Area of LSA (ha)	Area of LSA (%)
P3	184,883	22,296	12
P4	388,669	596	2
Total	**573,552**	**22,892**	**3**

DMI is the sole holder of deciduous (hardwood) timber rights in FMU P3 and P4. However, in FMU P3, Gordon Buchanan Enterprises Limited (Buchanan Lumber) and the Community Timber Permit Program are allocated the coniferous (softwood) timber rights (Tink 2006, pers. comm.). In FMU P4, softwood timber rights are allocated to Buchanan Lumber, Boucher Brothers Limited, and the Community Timber Permit Program. Buchanan Lumber has an agreement with DMI to process any hardwood lumber they harvest at DMI's mill (Tink 2006, pers. comm.). Likewise, DMI is required to direct any harvested softwood to Buchanan Lumber.

The harvest rate on provincial land is regulated by annual allowable cut (AAC), which determines a maximum volume of timber that can be cut each year in a given area. AAC is determined from timber supply models that use ecological principles forecast over a 200-year horizon (DMI 2005b, Internet site). DMI's deciduous AAC is a sustained yield unit that includes the FMUs P3 and P4, as well as three other FMUs (P5, F1, and S15) not located within the LSA (Tink 2006, pers. comm.). The current total AAC for these units is 442,000 m^3. However, the amount of volume removed from any specific FMU within this group varies annually (Tink 2006, pers. comm.).



LEGEND

- Thermal Development Footprint
- Principal Development Area (PDA) Land Use Local Study Area (LSA)
- First Nations Reserve
- Road

Forest Management Units and Deciduous Timber Allocation areas

- P01 (DTA)
- P03 (DTA)
- P3 (FMU)
- P4 (FMU)

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Forest Management Units and Deciduous Timber Allocation Areas in the Land Use LSA

DRAWN BY:	EDITED BY:	DATE
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In FMU P3, a coniferous AAC of 34,028 m is allocated to Buchanan Enterprises and 15,517 m^3 is allocated to the Community Timber Permit Program. In FMU P4, Buchanan Enterprises is allocated a coniferous AAC of 24,595 m^3, Boucher Brothers Limited is allocated 24,279 m^3, and the Community Timber Permit Program is allocated 7,957 m^3 annually (Tink 2006, pers. comm.).

The current growing stock volumes of deciduous and coniferous species are an identifier of the productive harvestable classification for determining Timber Productivity Rating (TPR). TPR is the potential timber productivity of a stand based on height and age of dominant and co-dominant tree species. Table 5.4-5 provides the current growing stock volumes for coniferous and deciduous species within each FMU (Tink 2006, pers. comm.)

Table 5.4-5: Current Growing Stock Volumes within FMUs P3 and P4

FMU	Area (ha)	Deciduous Volume (Thousands m^3)	Coniferous Volume (Thousands m^3)	Total Volume (Thousands m^3)
P3	184,883	6,323	4,648	10,971
P4	388,669	13,905	7,797	21,702

Table 5.4-6 provides the timber productivity ratings for forested lands within the Green Area portion of the LSA. Timber productivity ratings were based on Alberta Vegetation Inventory (AVI) polygon data.

Table 5.4-6: Timber Productivity Ratings in the Green Area of the LSA

Timber Productivity Rating	Area of LSA (ha)	Area of LSA (%)
Good	2,154	7
Moderate	8,009	25
Fair	1,398	4
Unproductive	8,419	26
No TPR	2,912	9
Total Area	**22,892**	**71**

Individual commercial operators in Alberta have the right to set their own utilization standards to determine merchantable volumes. To determine stand merchantability, DMI uses a 15/10 utilization standard for hardwood and a 15/11 utilization standard for softwood. The 15/10 utilization standard is defined as:

- minimum stump diameter of 15 cm
- stump height of 30 cm
- minimum top diameter of 10 cm
- minimum merchantable length of 2.8 m

Therefore, all cut volumes from hardwood trees meeting the 15/10 utilization standard are AAC-chargeable. According to DMI's utilization standards, 11,561 ha of the productive land base in the LSA support merchantable timber.

White Area

DMI's FMA does not extend into White Areas. These areas are largely agricultural and are not under DMI's management. However, the Government of Alberta maintains an inventory of White Areas and does occasionally grant licences within these areas to commercial operators for Deciduous Timber Allocations (DTAs) (Barker 2006, pers. comm., ASRD 1997).

DMI holds a DTA within the White Area of the LSA known as P01 (see Figure 5.4-4). However, a licence for DMI to harvest in the P01 DTA area has not been granted for at least the last 17 years. It is uncertain whether another licence will be issued to harvest in the White Area of the LSA, but considering the TPRs shown in Table 5.4-7, it is likely that timber volumes are too low in this particular unit to grant a DTA licence to DMI in the foreseeable future (Barker 2006, pers. comm.).

Table 5.4-7: Timber Productivity Ratings in the White Area of the LSA

Timber Productivity Rating	Area of LSA (ha)	Area of LSA (%)
Good	0.0	0.0
Moderate	33.8	0.1
Fair	12.2	<0.1
Unproductive	0.4	<0.1
No TPR	9,398.9	29.1
Total Area	**9,445.3**	**29.2**

5.4.4.3 Agriculture

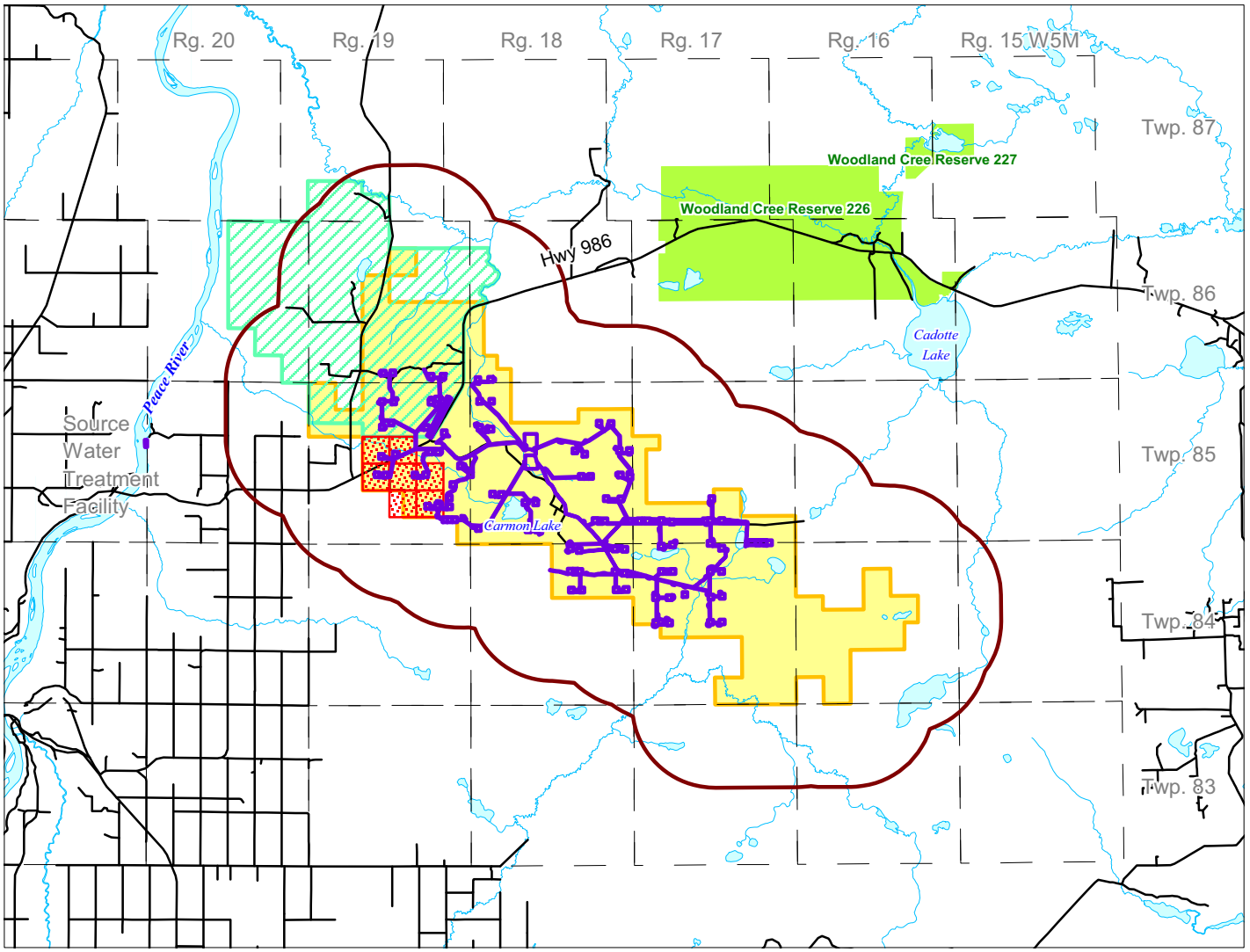
In the White Area portion of the RSA, farming and grazing are the dominant land uses. There are several private dryland farming operations in Sections 10, 11, 14, 15, 16, 21, and 22 of Township 85, Range 19, W5M. The Three Creeks Grazing Reserve is situated in the northern portions of the RSA (see Figure 5.4-5).

5.4.4.3.1 Three Creeks Grazing Reserve

The Three Creeks Provincial Grazing Reserve, situated in the northwest portion of the RSA, has been primarily developed from forested land. Portions of the reserve have been cleared and seeded to tame forage, and 4,230 ha of fenced tame pasture are scattered throughout the reserve's 16,000 ha. The Three Creeks Grazing Association ran about 3,900 cattle on the reserve during the 2005 grazing period. The grazing period starts in the middle of May and extends for about 5–6 months. A full-time pasture manager employed by the Three Creeks Grazing Association lives on-site in a cabin during the grazing period (Connelly 2005, pers. comm.).

The Three Creeks Grazing Association renewed its management agreement with the province in 2005 (Connelly 2005, pers. comm.). The agreement requires the association to maintain 131 miles of wire fencing, 61 dugouts, a corral system, buildings at the headquarters, the road system along the west side of the reserve, and the productivity of the tame pastures. Guiding principles of policy and technical operations are outlined in the Three Creeks Grazing Reserve Industrial Operational Guidelines (ASRD 2005a, Internet site). This document was prepared to:

> *"Ensure industrial operators plan and develop their activities in a manner that allows them to achieve their objectives while protecting the resource and meeting the needs of the Grazing Reserve patrons".* (ASRD 2005a, Internet site)



LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- Three Creeks Grazing Reserve
- Principal Development Area (PDA) Land Use Local Study Area (LSA)
- First Nations Reserve
- Private Agricultural Land
- Road

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Three Creeks Grazing Reserve

DRAWN BY:	EDITED BY:	DATE
HW	HW	3 Nov 2006

APPROVED:	FIGURE:
NR	5.4-5

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The guidelines were also developed to address the following land use objectives within the reserve (Fossum 2005, pers. comm.):

- minimize the impact of industrial operations on the land
- eliminate or minimize impact to any forage resource
- eliminate activities that will disturb livestock rotations and movement
- eliminate activities that will alter grazing distribution
- ensure open communication and consultation on all decisions specific to the livestock operations on the reserve between industry, the public lands officer, reserve agrologist, and Three Creeks Grazing Association

5.4.4.4 Hunting

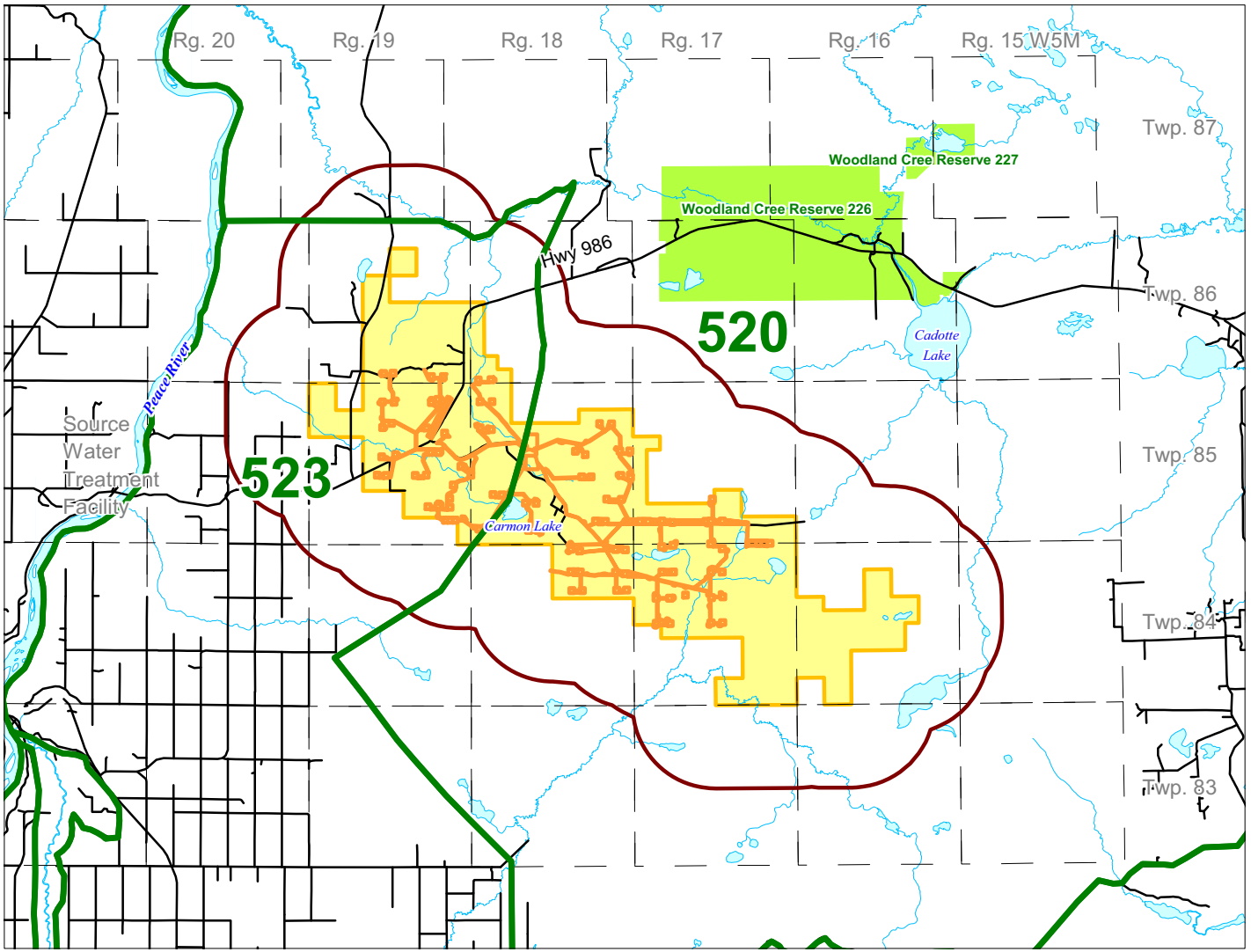
The province of Alberta is divided into five Wildlife Management Areas (WMAs). Each WMA is further divided into subunits called Wildlife Management Units (WMUs). A WMU is a geographical area described by legislation. Most wildlife management guidelines and policies are WMU-specific. The RSA overlaps with two WMUs: Cadotte Lake WMU 520 and Kimiwan-Winagami WMU 523 (see Figure 5.4-6) (ASRD 2005b, Internet site).

These WMUs both have general hunting and archery-only seasons for big game. General hunting seasons (early September–November 30) allow firearms, crossbows, or bows and arrows to be used. Archery-only seasons (generally late August–early September) allow only bows and arrows (ASRD 2005a, b, Internet site). In addition, spring black bear hunting is April 17–June 15. Big game species with open seasons include white-tailed deer, mule deer, black bear, moose, and elk.

Game-birds with open seasons include ruffed grouse, spruce grouse, sharp-tailed grouse, ptarmigan, pheasants, partridge, ducks, coots, common snipe, white-fronted geese, Canada geese, and snow geese. Game bird seasons vary by species but, in general, range from September–December. See Appendix MM for detailed information on hunting seasons.

The Peace River region is a popular area for big game hunters, both Canadian and international. Numerous outfitters work in the region. However, most outfitters do not use the Shell RSA because the ground is too wet and road access is restricted. Other areas preferred by these outfitters occur north of the RSA.

In the wildlife management units, 14 outfitters hold allocations or privileges to guide big game hunting (Alberta Professional Outfitters Society 2005) (see Appendix MM). Of these 14, Bear Paw Outfitting is the only outfitter active in the RSA (Taylor 2005, pers. comm.). They occasionally use the forestry haul road in the northern portion of the RSA to access good hunting grounds to the north. Birch Creek Outfitting and Mike's Outdoor Adventures might occasionally use areas near the RSA for their hunting operations. For detailed information on outfitters in the RSA, see Appendix MM. These recreational users were sent information packages on the Thermal Development, and comment and feedback sheets by the Shell Public Consultation Team. Feedback from all stakeholders is recorded in a database by Shell. In addition to guided hunting for non-residents, Alberta residents may hunt big game throughout public lands or on private lands where they have permission. Guides are not required to hunt upland game birds. There is currently a hold on issuing additional waterfowl outfitting licences in the province (Voaklander 2005, pers. comm.).



LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- Wildlife Management Units
- Principal Development Area (PDA) Land Use Local Study Area (LSA)
- First Nations Reserve
- Road

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Wildlife Management Units in the Land Use RSA

DRAWN BY:	EDITED BY:	DATE
HW	HW	3 Nov 2006

APPROVED:	FIGURE:
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5.4.4.5 Trapping

The Thermal Development is located in Fur Management Zone 2 (ASRD 2005c, Internet site). Furbearers with open seasons in Zone 2 include beaver, coyote, fisher, red fox, lynx, marten, mink, muskrat, otter, red squirrel, weasel, wolf, and wolverine (see Table 5.4-8).

Table 5.4-8: Fur Seasons in Wildlife Management Units 520 and 523

Species	Zone 2 Season	Basic Quota
Badger	Closed	
Beaver	October 1–May 15	No quota
Bobcat	Closed	No quota
Coyote	October 1–February 28	No quota
Fisher	November 1–January 31[1, 2]	5 (WMU 523)
		6 (WMU 520)
Red and arctic fox	October 1–January 31[1]	No quota
Lynx	December 1–February 15[2]	6 (WMU 523)
		6 (WMU 520)
Marten	November 1–January 31[1]	No quota
Mink	November 1–January 31[1]	No quota
Muskrat	October 1–May 15	No quota
Otter	December 1–May 15[3]	2 (WMU 523)
		6 (WMU 520)
Red squirrel	November 1–February 28	No quota
Weasel	November 1–February 28	No quota
Wolf	October 1–May 31	No quota
Wolverine	November 1–January 31[1, 3]	1(WMU 523)
		3 (WMU 520)

Notes:

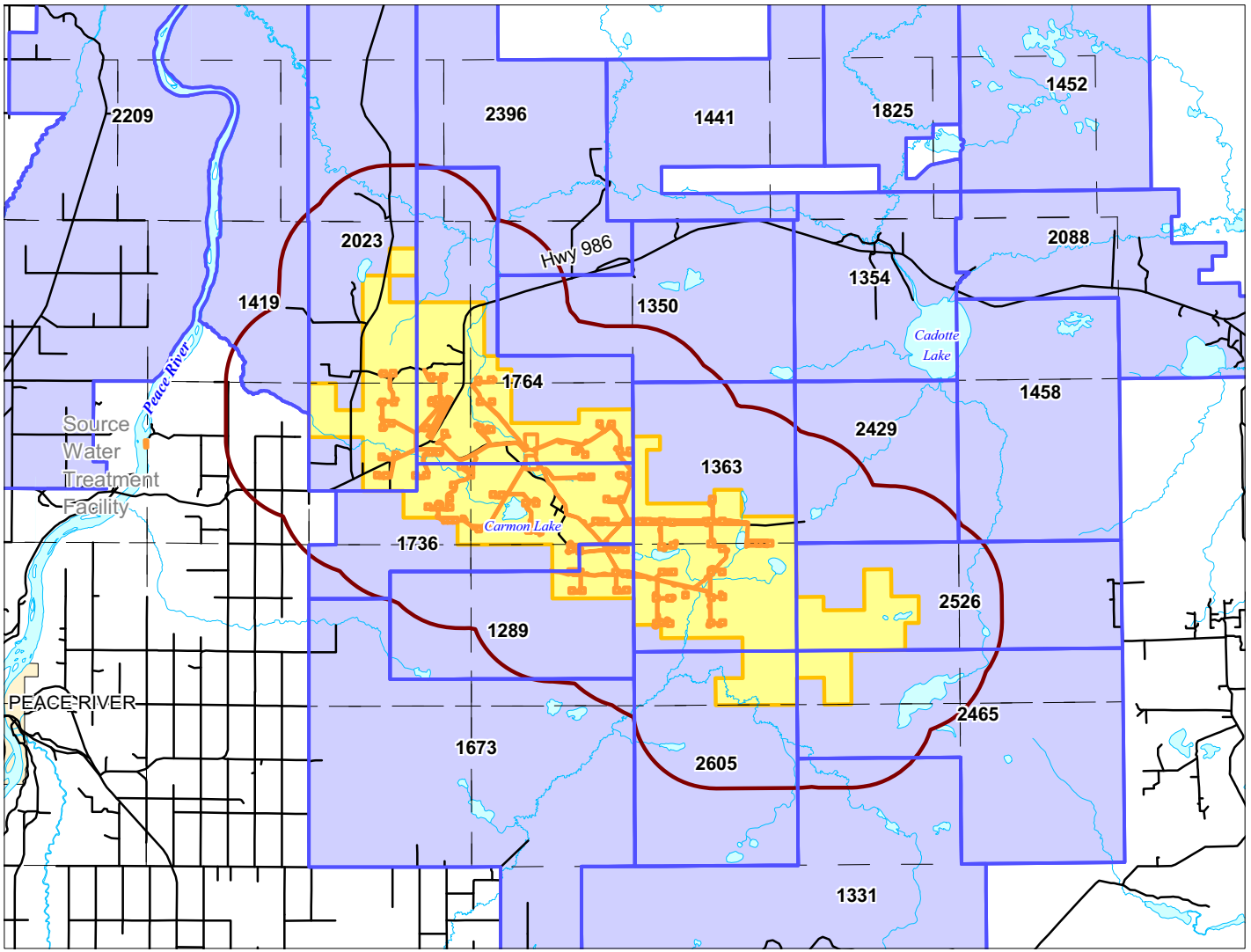
[1] Season is provided only for those who hunt under the authority of a Registered Fur Management Licence.

[2] Season extended to February 15, 2006 in WMU 523.

[3] Season is provided only for those who hunt under the authority of a Registered Fur Management Licence, Indian Fur Management Licence, or Métis Fur Management Licence issued under Métis Settlements Act.

Source: ASRD 2005c, Internet site.

There are 15 Registered Fur Management Areas (RFMAs) in the RSA. Some overlap with, or are located totally within, the LSA (see Figure 5.4-7). Table 5.4-9 presents the furbearer harvest summary statistics for all 15 RFMAs in the RSA. The data suggests that the RSA supports regular trapping activity. Consultation feedback indicates that one of the trappers operating in the RSA is a taxidermist who relies primarily on his trapline to supply animals for his taxidermy business, which is an important source of income.



LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- 1764 — Registered Fur Management Area
- Principal Development Area (PDA) / Land Use Local Study Area (LSA)
- Road
- 1764 — Registered Fur Management Area Number

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Registered Fur Management Areas in the Land Use RSA

DRAWN BY:	EDITED BY:	DATE
HW	HW	3 Nov 2006

APPROVED:	FIGURE:
NR	5.4-7

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Table 5.4-9: Furbearer Harvest Statistics

Species	1999[N]	2000[N]	2001[N]	2002[N]	2003[N]
Beaver	164	196	142	175	137
Black Bear	3	N/A	2	3	3
Coyote	23	24	10	31	46
Fisher	35	34	47	67	50
Fox	0	2	0	4	1
Lynx	1	13	22	34	42
Marten	61	73	31	41	47
Mink	9	7	6	7	0
Muskrat	7	0	0	6	0
Otter	2	1	1	7	5
Red Squirrel	675	1,115	496	2,193	566
Weasel	68	60	24	186	73
Wolf	3	17	0	3	9

Notes:
N – number of individuals.
N/A – not available.
Source: ASRD 2005c, Internet site.

5.4.4.6 Fishing

The RSA is within the Northern Boreal Fish Management Zone 3 (NB3) (ASRD 2002, Internet site). Streams typical of this zone are low gradient, brown water streams from muskeg drainages that are usually small tributaries to larger watersheds. Zone 3 is subdivided into four watershed units that are part of larger drainages into three major rivers: the Athabasca, Peace, and Hay Rivers. The RSA is within the NB3 watershed unit of Zone 3.

No specially managed or stocked lakes, reservoirs, or ponds are in the NB3 watershed unit listed under Alberta's fish stocking program (ASRD 2005d, Internet site). The fishing season is closed from November 1–May 31 (lakes) and April 1–May 19 (rivers and streams).

Common game fish found in Zone 3 include northern pike, walleye, yellow perch, lake trout, arctic grayling, and lake whitefish (ASRD 2005d, Internet site).

No sport or recreational fisheries use (e.g., popular angling areas, guide and outfitter companies, boating) occurs in the RSA because of the shallowness and poor fisheries capability of RSA waterbodies (Eaton 2006, pers. comm.). Better opportunities for sport fishing exist in the Peace and Cadotte Rivers, and Haig and Swan Lakes. See Volume IIB, Section 5: Aquatic Ecology for a full discussion on fisheries in the RSA.

Because of the lack of fisheries resources, Shell has not needed to develop a policy for employee or contractor fishing.

5.4.5 Non-consumptive Resource Use

5.4.5.1 Parks and Protected Areas

The RSA was examined to determine if any parks or areas with special designation exist that would limit or restrict the Thermal Development. Table 5.4-10 summarizes these findings.

Table 5.4-10: Parks and Other Protected Areas in the RSA

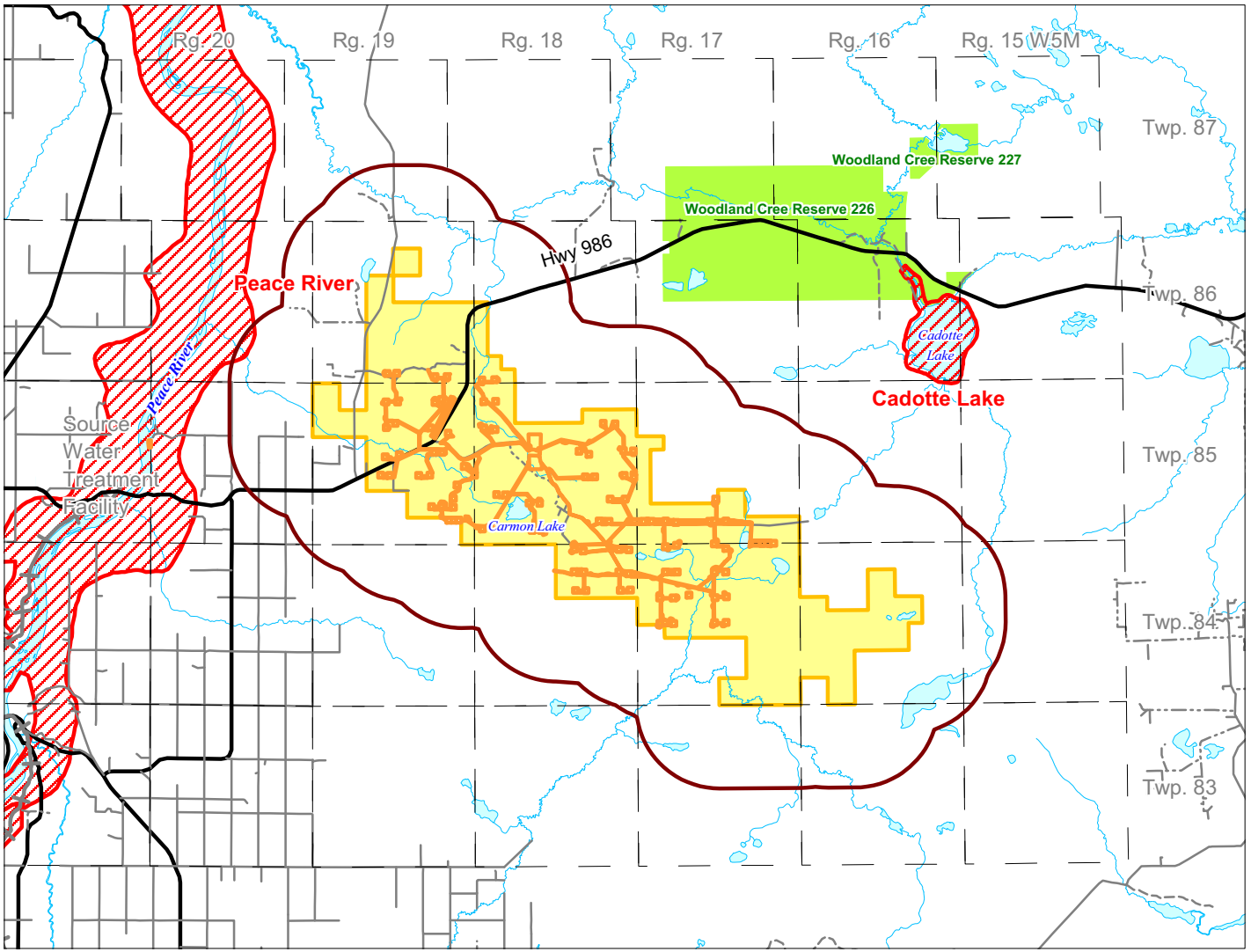
Land Designation	General Definition[1]	In RSA
Provincial parks	Provincially significant natural and historical landscapes and features	None
Wildland parks	Large areas of natural landscape where human developments and interference with natural processes are minimized	None
Provincial recreation areas	Areas which cater to a wide range of intensive recreation pursuits in natural, modified, or man-made settings	None
Ecological reserves	Samples of functioning ecosystems protected for scientific research, education, and heritage appreciation	None
Wilderness areas	Large areas that retain their primeval character, unaffected by human influences	None
Natural areas	Special and sensitive natural landscapes of local and regional significance	None
Heritage rangelands	Preserve and protect natural features that are representative of Alberta's prairies	None
Heritage rivers	Rivers designated under Canadian Heritage Rivers System, Canada's national river conservation program	None
Environmentally Significant Areas (ESAs)	Landscape elements or places which are vital to the long-term maintenance of biological diversity, soil, water, or other natural process, both on-site and in a regional context[2]	One

Sources:
[1] ACD 2005b, Internet site.
[2] Jennings and Reganold 1991.

The Peace River ESA consists primarily of the Peace River Valley, and extends from the British Columbia border to Township 100, more than 150 km north of the town of Peace River (ACD 2001a and b, Internet sites). The Peace River ESA encompasses the source water treatment facility and only a small portion of the western edge of the RSA (see Figure 5.4-8).

The Peace River ESA is ranked as having national significance. A national level of significance indicates that the area has features that are limited in distribution at a national level or are the best and only representatives in Canada. The Peace River ESA is one of the most diverse and productive river valleys in the Parkland and Boreal Forest of Canada. It provides key year round habitat for various species of ungulates, and provides habitat for a high diversity of bird species. The river provides waterfowl habitat and is ranked as regionally important goose staging habitat (Poston et al. 1990). Both wandering and red-sided garter snakes find suitable winter denning sites along the eroded slopes of the river valley.

The Peace River has a high species diversity of fish including lake whitefish, mountain whitefish, bull trout, northern pike, goldeye, walleye, yellow perch, and burbot. The northern pike minnow is endemic to the Peace River, and rare largescale suckers are also found in the river (their distribution in Alberta is restricted to the Peace River drainage). The Aquatic Ecology assessment identified 24 species of fish in the Peace River including all the species listed above (see Volume IIB, Section 5).



LEGEND

- Thermal Development Footprint
- Land Use Regional Study Area (RSA)
- Environmentally Sensitive Area
- Principal Development Area (PDA) Land Use Local Study Area (LSA)
- First Nations Reserve
- Road

Roads by Category

- Improved Road
- Paved Highway
- Truck Trail
- Unimproved Road

0 5 10 km

Scale 1 : 400,000

SHELL CANADA LIMITED - PEACE RIVER OIL SANDS CARMON CREEK PROJECT

Peace River Environmentally Significant Areas

DRAWN BY:	EDITED BY:	DATE
HW	HW	3 Nov 2006

APPROVED:	FIGURE:
NR	5.4-8

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5.4.5.2 Recreation

Most of the RSA is located within provincial public lands. No recreational cabins or campsites exist in the RSA with the exception of trapper cabins belonging to RFMA holders. The Peace River Boating Association has a recreational lease adjacent to the Peace River in the northwest corner of the RSA but the Thermal Development will have no direct impact on this area. Eight recreational organizations (see Table 5.4-11) have the potential to use the RSA. Although some recreational users travel through the Shell leases to access other areas, camping, canoeing, hiking, and boating are not common in the RSA because of wetland conditions, limited access, and existing industrial development.

Table 5.4-11: Potential Recreational Users in the RSA

Organization	Recreational Activities
Peace Valley Conservation, Recreation and Tourism Society	Umbrella organization that provides services to other recreational organizations
Peace Island Tours	Boat cruises on the Peace River, island camping, nature exploration, fossil bed discovery, hiking
La Crete Polar Cats Snowmobile Club	Snowmobiling
Sandy Ridge Ranch and Stables	Boarding and training facility for horses and riders
Northbase Outdoors	Fishing, guided trail rides, guided canoe trips, wildlife viewing, wilderness trips, boat and heli tours
Tangent Park Recreation Society	Camping, canoeing, fishing, hiking, wildlife viewing, and horseback riding
Peace Valley Guest Ranch	River cruises, hiking, mini golf, trail riding, gold panning, and bird watching
Bearhead Creek	Guided ATV tours, cabin rentals, and bird watching

Issues and concerns raised by these user groups have been recorded by Shell and are discussed under Public Consultation in Volume I. No further assessment on recreation is required.

5.5 Application Scenario

5.5.1 Introduction

The following outlines the potential interactions and implications that the Thermal Development might have on other natural resource sectors and user groups occurring within the LSA and RSA.

Baseline investigations determined that the following resource uses have potential to be affected:

- linear disturbance and access
- surface disposition holders including energy (oil and gas)
- forestry
- agriculture
- hunting
- trapping
- provincial ESAs
- visual aesthetics

This assessment will also determine whether the Thermal Development is consistent with the region's land and resource development policies, and identify possible mitigation and management strategies to help avoid and reduce negative impacts to industry or resource users.

Mitigation implemented by Shell is based on 25 years of operational experience and Shell has a high degree of confidence in their effectiveness. In addition, Shell's Environmental Management Systems are ISO 14001 certified. In keeping with the principle of adaptive management, Phase 2 of the Thermal Development will implement improvements learned from Phase 1.

5.5.2 Regional Policy

The Thermal Development is consistent with the intent of regional land and resource development policy. Although no integrated resource plan exists that applies to the RSA, the General Municipal Plan (GMP) (MD of East Peace 1994) for Northern Sunrise County describes many of the principles guiding natural resource development in the Peace region. The GMP supports responsible industrial development as long as it is planned within the context of other land uses and ensures protection of natural features. By undertaking an EIA for the Thermal Development, Shell meets the spirit and intent of the environmental policy section of the GMP.

5.5.3 Linear Development and Access

5.5.3.1 Special Access Areas

The Thermal Development will increase access within the special access area in the LSA. Impacts from increased access can negatively affect moose by increasing hunter access or reducing habitat effectiveness in adjacent areas. The affects could result in population declines.

The potential upgrade of the source water treatment facility will occur at the existing facility at the Peace River. There is currently an all-weather road servicing this facility and therefore no further action is required at this site. However, the winter season is a critical period for moose and, therefore, construction should be scheduled outside this period (January 1–April 30), if practicable.

5.5.3.1.1 Mitigation

The RSA is a multi-use area. ASRD is planning a regional approach to access control and will be consulting with industrial operators as well as with Northern Sunrise County to determine effective mitigation within the special access areas.

5.5.3.1.2 Residual Impacts at Application

Provided mitigation is implemented, residual impacts of increased access in the special access areas at application are expected to be negative in direction and low to moderate in magnitude. This is considered a Class 3 impact.

5.5.3.1.3 Residual Impacts at Closure

At closure, all access for the Thermal Development will be reclaimed. However, if there are any reductions in the moose population due to increased access, recovery will likely extend past reclamation. The residual impact is negative in direct, negligible and considered a Class 3 impact.

5.5.4 Consumptive Resources

5.5.4.1 Surface Dispositions

The RSA for land and resource use is consistent with the Thermal Development Consultation Planning Zone (Lornel Consultants 2005). All disposition holders within this area were provided Thermal Development information, a comments and feedback sheet, and self-addressed

envelopes to facilitate their participation in the public consultation program for the Thermal Development. Participation in the Public Consultation component of the application is an opportunity for disposition holders in the RSA to voice any concerns or conflicting resource management initiatives with Shell's Thermal Development.

Shell works cooperatively with other oil and gas producers on issues of mutual concern (such as access control and road sharing) and will continue to build relationships with other regional operators in the future.

The current Thermal Development footprint and related infrastructure are not anticipated to change or limit energy, oil, or gas-related disposition holders from carrying out their operations. Potential Thermal Development effects to those holding coniferous timber licences (CTL), grazing licences (GRR), or RFMA's are discussed in the following sections.

5.5.4.1.1 Mitigation

The following mitigation will reduce impacts to surface disposition holders, and will be implemented where appropriate:

- work with private agricultural land owners, the Three Creeks Grazing Reserve, trappers, aboriginal groups, surface disposition holders, DMI (the FMA holder) and other industry to optimize well pad locations and pipeline routing during the planning stage so as to minimize adverse effects to other land users
- inform land users of planned activities that have the potential to affect their land uses
- have road use agreements with other operators in the area to minimize the need to create new roads into the area
- in cases where impacts cannot be mitigated, Shell will continue to consult with affected land users (e.g., trappers, forest operators, the Three Creeks Grazing Reserve, and private agricultural producers) in an effort to address any residual impacts.

5.5.4.1.2 Residual Impacts at Application

Providing mitigation is implemented, no residual impacts (Class 4) at application are expected.

5.5.4.1.3 Residual Impacts at Closure

There will be no residual impacts at closure.

5.5.4.2 Forestry

5.5.4.2.1 Potential Impacts

Clearing and construction of wellpads and associated infrastructure for the Thermal Development will remove merchantable timber from the LSA. In the Green Area of the LSA, 1,295 ha or 6% of the forested land will be cleared for the Thermal Development (see Table 5.5-1). This area represents 4% of the landbase within the entire LSA. An additional 513 ha of non-forested land will be cleared in the White Area portion of the LSA. There is also the potential to limit forestry activity adjacent to infrastructure for the duration of the Thermal Development. This will decrease the productive land base available to DMI for harvesting merchantable timber.

Table 5.5-1: Timber Losses from the Productive Land Base (Green Area)

Timber Productivity Rating	Area Covered in LSA (ha)	Percent of Green Area of LSA	Area lost (ha)	Percent of Area Lost from Green Area of LSA
Good	2,154	9	136	1
Moderate	8,009	35	483	2
Fair	1,398	6	117	1
Unproductive	8,419	37	328	1
No TPR	2,912	13	231	1
Total Area	**22,892**	**100**	**1,295**	**6**

5.5.4.2.2 Mitigation

As part of its ongoing stakeholder consultation, Shell continues to work with DMI on an integrated land management plan to reduce the cumulative footprint in forested areas. Shell will require prior consent from DMI, as the FMA holder, before conducting any activity that will impact either timber volumes or the land base on which timber regenerates (DMI 2001) and will follow DMI's best practices for timber clearing, felling, and decking.

Additionally, Shell must obtain a timber permit from DMI and pay a timber damage assessment fee before forest clearing. A timber permit is generally a short-term agreement that can be effective anywhere from 30 days up to five years (ASRD 2004b, Internet site). The timber damage assessment fee compensates for damage to standing timber that DMI can no longer harvest and the loss of growing stock. It also pays for replacement timber the company must purchase and covers DMI's cost to reforest the disturbed area (DMI 2001). The fee is calculated by a DMI forester who visits the sites with a Shell representative. Timber damages will be calculated on an ongoing basis as wellpads and areas for associated infrastructure are cleared.

Non-salvageable timber (woody debris) will be handled in consultation with ASRD.

5.5.4.2.3 Residual Impacts at Application

Impacts to forestry due to a reduction of productive land from the construction of the Thermal Development are predicted to be minimal, provided that mitigation measures are properly implemented to ensure maximum use of commercial timber, and that compensation for timber loss is paid to commercial operators. The impact rating to forestry at application is a Class 3.

5.5.4.2.4 Residual Impacts at Closure

The goal of Shell's reclamation measures concerning commercial forestry (as outlined in Volume II, Section 6) is to achieve land capability equivalent to pre-Thermal Development conditions. Shell will provide DMI with access into areas after the decommissioning of Thermal Development components, thus facilitating the proper planning of future harvests.

In the Green Area, suitable upland sites, padded well sites, and access roads might be reforested in accordance with DMI and in accordance with their specifications for activities such as surface soil preparation for tree planting, species selection, and spacing.

Pre-disturbance and reclaimed areas and percentages of forested land in the LSA are provided in Table 5.5-2 by timber productivity rating. Timber productivity ratings were obtained from AVI data. The proper reforestation of reclaimed areas will require many years after closure to achieve the stand volume and age considered to be commercially productive. To reflect this, areas in the LSA that are assumed to be reforested were set to a TPR of unproductive at time of reclamation. The simulation model used by DMI to calculate harvest amounts sets 70 years as the minimum

acceptable harvest age for merchantable timer in the forest management agreement (DMI 1999). For this assessment, 75 years is used as an outside temporal boundary. Considering this temporal boundary and provided that proper reclamation is implemented, residual impacts to forestry are considered to be neutral in direction at closure. The impact rating to forestry at closure is Class 4.

Table 5.5-2: Pre-disturbance and Post-closure Percentages of Forested Land (Green Area) in the LSA by Timber Productivity Rating

Timber Productivity Rating	Pre-disturbance (ha)	Pre-disturbance (% of LSA)	Reclamation (ha)	Reclamation (% of LSA)
Good	2,154	7	2,017	6
Moderate	8,009	25	7,524	23
Fair	1,398	4	1,279	4
Unproductive	8,418	26	9,570	30
No TPR	2,912	9	2,502	8
Total	**22,892**	**71**	**22,892**	**71**

5.5.4.3 Agriculture

5.5.4.3.1 Potential Impacts

At application, the Thermal Development will affect approximately 80 ha of agricultural (cropped or grazing) land. Wellpads and other infrastructure associated with the Thermal Development will temporarily remove 75 ha from the Three Creeks Grazing Reserve. In addition, the existing private airstrip that may be upgraded by Shell falls within the Three Creeks Grazing Reserve, and would remove an additional 81 ha of usable land from the reserve. Several wellpads are also planned for private agricultural land in the west portion of the LSA, and would reduce the farmers' productive land base.

The Grazing Association and provincial agrologist (Connelly 2005, pers. comm.; Fossum 2005, pers. comm.) have expressed concerns over impacts to the Three Creeks Grazing Reserve including:

- the proposed infrastructure (roadways and above-ground pipelines) affecting grazing distribution and rotation of cattle on the grazing leases
- increased access into the reserve for hunters and other resource users
- industrial introduction of noxious weeds, in particular those considered dangerous or unpalatable to cattle
- Thermal Development effects to water supplies for the reserve

Private agricultural land owners have raised concerns over the effects large equipment will have on their operations during the planting and harvesting seasons and other issues related to public health and safety.

In October 2005, the Three Creeks Grazing Reserve Industrial Operational Guidelines (ASRD 2005a, Internet site) were published to provide information about how industrial operators should engage the Grazing Association before accessing the reserve. The guidelines include management practices and conditions specific to several resource development activities including the following, which could be associated with the Thermal Development:

- general activity
- pipeline activity
- oil and gas well sites

- borrow pits

To date, industrial introduction of noxious weeds, in particular those considered dangerous or unpalatable to cattle, have not been an issue or concern in the reserve (Fossum 2005, pers. comm.).

Oil and gas development in the reserve has always been handled on a case-by-case basis with the provincial agrologist, public lands officer, Grazing Association, and the industrial operator desiring access to the reserve (Fossum 2005, pers. comm.). Shell and the Grazing Association have a positive working relationship in which they communicate and cooperatively plan how best to handle Shell's activities in areas that might affect the reserve.

Private agricultural operators that have potential to be affected by the Thermal Development have been contacted by Shell to determine issues and concerns individuals have with the Thermal Development, and establish a process for ongoing communication with each person.

5.5.4.3.2 Mitigation

Shell will continue to work closely with the Three Creeks Grazing Reserve and private agricultural operators to develop site-specific solutions to manage impacts to agricultural production, grazing distributions, and cattle rotations. Specific mitigation for the Thermal Development, where practicable or otherwise required, to respond to concerns raised by the Three Creeks Grazing Reserve and mitigate impacts to private agricultural operators include the following:

- work with private agricultural land owners and the Three Creeks Grazing Reserve to optimize wellpad locations and pipeline routing during the planning stage so as to minimize adverse effects to other land users, where practicable
- inform land users of planned activities that have the potential to impact their land uses
- provide the Three Creeks Grazing Reserve with access to the results of shallow groundwater and surface water monitoring programs that may be implemented on the grazing reserve in the future
- make information available to the Three Creeks Grazing Reserve regarding compounds being used for dust and ice control, and pest and weed control on Shell roads and pads within the grazing reserve
- minimize the volumes of salt compounds used for ice control to discourage attracting livestock to industrial roadways and to mitigate potential damage to forage resources, where practicable
- in cases where impacts cannot be mitigated, Shell will continue to consult with affected land users (e.g., the Three Creeks Grazing Reserve, and private agricultural producers) in an effort to address any residual impacts.
- schedule activities to minimize potential effects to livestock during planned grazing rotations, where practicable
- work with the Three Creeks Grazing reserve to identify the need for livestock crossings over pipelines

5.5.4.3.3 Residual Impacts at Application

The Thermal Development is expected to have a low to moderate negative effect on agriculture in the RSA that is local in extent and mid-term in duration. However, these effects are expected to lessen in the context of mitigation measures. Negotiated compensation and commitment packages with the Three Creeks Grazing Association and private agricultural producers will reimburse

these operators for impacts to the productive land base, crop damages, and lost production. This is considered a Class 3 impact.

5.5.4.3.4 Residual Impacts at Closure

Shell will work with private agricultural land owners and Three Creeks Grazing Association to determine the appropriate reclamation to be used after decommissioning of wellpads and related Thermal Development infrastructure. No residual impacts at closure are expected, and are therefore rated as Class 4.

5.5.4.4 Hunting

5.5.4.4.1 Potential Impacts

Construction and operation of the Thermal Development has the potential to cause both direct and indirect impacts to hunting. Direct impacts can result from changes in access affecting hunter opportunity. Indirect impacts can result from changes in human populations tied to the increased workforce for the Thermal Development, and increasing competition for game species in the RSA. The Thermal Development is predicted to result in slight decreases for some species of wildlife through impacts primarily to habitat availability thus potentially decreasing hunter success (see Volume IIC, Section 4: Wildlife).

5.5.4.4.2 Mitigation

In order to reduce direct effects to hunting, Shell employees and contractors will be discouraged from hunting or fishing within the PDA, and prohibited from carrying firearms when working on Shell sites. Indirect effects to hunting, including, effects on wildlife populations are discussed in Volume IIC, Section 4: Wildlife.

5.5.4.4.3 Residual Impacts at Application

The RSA was identified as having limited opportunities for local hunters and guides because the ground is too wet and road access is restricted. Hunting guides indicated that there is much better access and opportunity elsewhere in the region.

Although the Thermal Development will require a temporary workforce during construction, employees will be discouraged from hunting within the Shell leases.

In the context of the limited hunting potential in the RSA, superior hunting opportunities outside the RSA and mitigation measures, impacts to hunting at application are negative in direction, negligible in magnitude, and mid-term in duration. This is considered a Class 3 impact. Residual impacts specific to wildlife populations and wildlife habitat are discussed in Volume IIC, Section 4: Wildlife.

5.5.4.4.4 Residual Impacts at Closure

No residual impacts to hunting are expected at closure.

5.5.4.5 Trapping

5.5.4.5.1 Potential Impacts

The Thermal Development has the potential to affect trapping both directly and indirectly. There will be a direct loss of trapping area within several RFMAs because of the construction of wellpads and associated Thermal Development infrastructure. Activity during some Thermal

Development phases has the potential to limit access into trapping areas at certain times because of safety concerns. However, increased access in the LSA, may increase trapping opportunity. The Thermal Development is expected to cause slight decreases in some wildlife populations which may decrease trapper success (see Volume IIC, Section 4). However, predicted impacts are worst-case scenario since not all parts of the Thermal Development will be constructed concurrently.

There are 15 RFMAs in the RSA. Table 5.5-3 summarizes the total land base that will be directly affected by Thermal Development facilities and infrastructure in each RFMA. Five RFMAs will be directly affected by the Thermal Development.

Table 5.5-3: Registered Fur Management Areas in the RSA

Trapline Number	Hectares Disturbed by Footprint: Application Scenario
1289	161
1331	0
1350	0
1363	449
1419	0
1458	0
1673	0
1736	522
1764	558
2023	164
2396	0
2429	0
2465	0
2526	0
2605	0

Although this disturbance will be phased over time, with reclamation occurring progressively as each wellpad is decommissioned, surface disturbance will reduce habitat and movement between core habitats for several species that are commonly trapped, including snowshoe hare and lynx. Wildlife populations within the RSA may decline slightly as a result of habitat loss during the life of the Thermal Development. This will in turn affect trapping success in the RSA, forcing trappers to exert more effort per unit of harvest. Impacts to wildlife are discussed in detail in Volume IIC, Section 4: Wildlife.

Increased access resulting from the construction of above-ground facilities in the RSA might be viewed positively by some trappers that use old roadways, seismic lines, and other linear disturbances as access into trapping areas. Typically, most hunting and trapping occurs near roads or other points of access such as cutlines and, therefore, increasing linear corridors increases the amount of area easily accessible to hunters and trappers (Schallenberger 1980, Westworth 2002, Forman et al. 2003). However, increased access can also have a negative impact on trapping success. During peak construction, about 1,500–2,000 workers will be housed on site in construction camps. During operations of Phase 1, the Thermal Development will require an additional 10 employees. For Phase 2, 60 more workers will be needed. The presence of these construction and operations workers within the RSA may increase impacts to trappers. Impacts could include the disruption or destruction of traps, trapping equipment, or trappers' cabins.

5.5.4.5.2 Mitigation

Shell plans to implement the following mitigations to decrease Thermal Development effects to trapping:

- work with trappers to optimize wellpad locations and pipeline routing during the planning stage so as to minimize adverse effects to other land users, where practicable
- Shell employees and contractors will be discouraged from hunting or fishing within the PDA, and prohibited from carrying firearms when working on Shell sites
- Shell employees and contractors will be required to respect traplines and trapping equipment
- work with trappers to avoid impeding cabin access
- in cases where impacts cannot be mitigated, Shell will continue to consult with affected trappers to identify appropriate compensation for the impacts on their trapping activities

5.5.4.5.3 Residual Impacts at Application

For trappers with RFMAs that are directly affected by the Thermal Development, the impacts are expected to be negative in direction, local in extent, low to moderate in magnitude, and long-term in duration (the impact will persist until Thermal Development infrastructure is removed and reclaimed). These effects will be off-set somewhat through trapper compensation and therefore, this is considered a Class 3 impact.

5.5.4.5.4 Residual Impacts at Closure

For trappers with RFMAs that are directly affected by the Thermal Development, effects to trapping are expected to be negative in direction, local in extent, low to moderate in magnitude and long-term in duration. Some trapped species (e.g., red squirrel and marten) rely on mature forest habitats. Therefore, these species will take several years after reclamation to return to mature forest habitats affected by the Thermal Development. For some species (e.g., snowshoe hare, lynx), younger forests will provide suitable habitat and these species are expected to recover fairly quickly. Overall, this is considered a Class 3 impact to trappers at closure.

5.5.4.6 Visual Aesthetics

Central plant facilities from the Thermal Development will not be visible from either the town of Peace River, the Peace River Valley, or from local roadways. Some wellpads might be visible from Highway 986 and the existing private airstrip is visible from the highway as well. The source water treatment facility is an existing facility that is planned to be upgraded. This facility is visible along the banks of the Peace River. There were no issues raised through the consultation process regarding visual aesthetics and most facilities will not be visible.

Plumes will potentially be visible from the Thermal Development. Process stacks associated with Phase 1 and 2 will be sources of water vapour emissions, a by product of industrial activity. This water vapour will condense and become visible as an elevated plume under meteorological conditions associated with low moisture deficits and low wind speeds. These conditions tend to occur most often during cold winter days when the capacity of the air to retain moisture is small. Under such circumstances observations and theoretical calculations have shown that visible plumes may extend 500 m downwind from the central processing facility. Plumes are currently visible from the existing Peace River Complex and no issues were identified related to visual aesthetics during the public consultation process.

Since no issues were raised regarding visual aesthetics during the consultation process, and since some of the facilities are existing and are planned to be upgraded. There are no impacts anticipated to other land users. Therefore, no further assessment on visual aesthetics is required.

5.6 Cumulative Effects Scenario

Several other projects within the RSA (Table 5.3-1) will affect the various land users. Since no other projects have been disclosed that will affect the Three Creeks Grazing Reserve, there are no cumulative effects to this land user. However, small regulated projects (e.g., well sites, compressor stations, acreage developments) are not required to register their projects with Alberta Economic Development and are difficult to inventory before approval. Unregulated activities (e.g., conversion of native vegetation to agricultural production) cannot be easily predicted or quantified. However, based on the amount of existing oil and gas activity in the RSA and known oil sands and gas deposits, it can be assumed that additional well sites, gas processing and compression facilities, and gathering pipelines will be developed over the life of the Thermal Development.

As a result, a more qualitative approach was taken for evaluating potential changes at a cumulative scale caused by residual project effects. Because thresholds, regional standards, or management objectives are not available for components such as cumulative agricultural land loss, professional knowledge and experience were used to evaluate the nature of potential effects.

The degree of disturbance from existing developments in the RSA has likely already disrupted trapping and agricultural operations, and contributed to linear access in the RSA. The Thermal Development will contribute to these changes. Although the causes, extent, and location of all future losses to the productive land base are not known and effects cannot be fully quantified, in the context of the measures employed by Shell to mitigate impacts to agriculture and compensate the Grazing Reserve and forestry operations, it is not expected that cumulative losses of the productive land base will be significant as a result of this Thermal Development.

Thermal Development effects to trapping occur within the Shell leases. As Shell holds surface and subsurface rights within their leases for the duration of the Thermal Development, the potential for other industrial projects to act cumulatively with the Thermal Development effects to trapping is unlikely.

5.7 Monitoring and Adaptive Management

Shell will continue engagement with stakeholders to determine the effectiveness of mitigation implemented. In keeping with the principles of adaptive management, mitigation strategies will be continually updated throughout the life of the Thermal Development.

5.8 Summary of Impacts

The construction and operation of the Thermal Development will have various impacts on land and resource use within the RSA. In particular, construction and operation of Thermal Development infrastructure will increase linear access, reduce the productive land base for agriculture, hunting, and trapping, and the Thermal Development footprint will affect forestry operations within the LSA.

The Thermal Development will increase linear access within the LSA and specifically within special access areas. The source water treatment facility is planned to be upgraded but since this is an existing facility and an all weather road is already servicing the facility, no further impacts are expected. Within the LSA, increased linear access within the special access area will be

discussed with ASRD within a regional framework with other industrial users and the Northern Sunrise County. Impacts resulting from increased access are predicted to be Class 3.

Shell works cooperatively with other oil and gas producers on issues of mutual concern (such as access control and road sharing) and will continue to build relationships with other regional operators in the future. No impacts to surface disposition holders are expected.

The Thermal Development will remove merchantable timber from the LSA. The potential exists to limit forestry activity adjacent to Thermal Development infrastructure for the duration of the Thermal Development. This will decrease the productive land base available to DMI and coniferous quota holders for harvesting merchantable timber. An integrated land management strategy with DMI is planned to coordinate access and maximize the recovery and use of commercially salvageable timber. Felled timber that meets commercial specifications, as determined by DMI, will be salvaged and included in their AAC as well as the AAC for coniferous quota holders. Thermal Development impacts to forestry are predicted to be minimal provided that proper mitigation measures are implemented. Complete reforestation of reclaimed areas will require many years after closure to achieve the stand volume and age considered to be commercially productive. However, implementing reclamation and monitoring activities will ensure that, with time, growing stock volumes and commercial forest productivity will return to pre-disturbance values. The impact rating to forestry at application is Class 3.

The Thermal Development will reduce the productive land base for agricultural activities in the Three Creeks Grazing Reserve, two private agricultural operators, and trappers holding RFMAs within the LSA. Overall, the impacts to agriculture and trapping are considered low to moderate. Impacts to trapping are expected to last beyond closure, as some trapped species rely on mature forests for habitat. Impacts to agriculture and trapper are expected to be Class 3.

Construction and operation of the Thermal Development has the potential to cause both direct and indirect impacts to hunting. Direct impacts can result from changes in access affecting hunter opportunity. Indirect impacts can result from changes in human populations tied to the increased workforce for the Thermal Development, and increasing competition for game species in the RSA. With mitigation, impacts to hunting are expected to be Class 3.

5.8.1 Impacts at Application

Table 5.8-1 summarizes the impacts to land and resource use for the Thermal Development at application.

Table 5.8-1: Final Impact Rating Summary Table

	Geographic Extent	Magnitude	Direction	Duration	Confidence	Rating at Application	Rating at Closure[1]
Linear access							
Increased access	Regional	Low to moderate	Negative	Mid-term	High	Class 3	Class 3
Surface dispositions							
Limit of activity	n/a	n/a	Neutral	n/a	High	Class 4	Class 4

Note:
n/a – not applicable.
[1]impact descriptors pertain solely to Application. Closure is a final impact rating only.

Table 5.8-1: Final Impact Rating Summary Table (Cont'd)

Impact	Geographic Extent	Magnitude	Direction	Duration	Confidence	Rating at Application	Rating at Closure[1]
Forestry							
Reduction of productive forest land	Local	Low to moderate	Negative	Mid-term	Moderate	Class 3	Class 4
Agriculture							
Reduction of productive land base	Local	Low to moderate	Negative	Mid-term	High	Class 3	Class 4
Hunting							
Decreased success versus effort	Local	Zero	Negative	Mid-term	High	Class 3	Class 4
Trapping							
Reduction of productive land base; decreased success versus effort	Local	Low to moderate	Negative	Long-term	High	Class 3	Class 3

Note:
n/a – not applicable.
[1]impact descriptors pertain solely to Application. Closure is a final impact rating only.

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Table MM-1: Big Game Hunting Seasons for WMU 520 and 523

Species	General Season	Archery Only
WMU 520		
White-tailed deer	September 1–November 30	April 25–April 31
Antlered mule deer	September 1–November 30	April 25–April 31
Antlered moose	September 1–October 31[1] November 1–November 30[1]	April 25–April 31
Black bear (fall 2005)	September 1–November 30	April 25–April 31
Black bear (spring 2006)	April 1–July 15	n/a
WMU 523		
Antlered white-tailed deer	September 17–November 30	April 25–September 16
Antlerless white-tailed deer	November 1–November 30	April 25–September 16
Antlered and antlerless mule deer	September 17–November 30	April 25–September 16
Antlered moose	September 24–October 3[1] November 1–November 30[1]	April 25–September 23
Antlerless moose (calf only)	November 1–November 30[1]	April 25–September 23[1]
Elk antlered (3 point or larger)	September 17–November 30	April 25–September 16
Elk antlerless	September 17–December 20[1]	April 25–September 16
Black bear (fall 2005)	September 7–November 30	April 25–September 6
Black bear (spring 2006)	Apri1 7–July 5	n/a

Notes:
[1] Season only applies to hunters with applicable special licences.
n/a - not applicable.
Source: ASRD 2005a.

Table MM-2: Game Bird Hunting Seasons for WMU 520 and 523

Species	General Season
WMU 520	
Ruffed and spruce grouse	September 1–November 30
Sharp-tailed grouse	September 1–November 30
Ptarmigan	September 1–December 15
Ducks, coots, common snipe, white-fronted and Canada geese, and snow and Ross' geese (including falconry hunting)	September 1–December 16
WMU 523	
Male pheasants	September 1–October 31
Ruffed and spruce grouse	September 1–November 30
Sharp-tailed grouse	October 1–October 31
Grey partridge	September 1–November 30
Ducks, coots, common snipe, white-fronted and Canada geese, and snow and Ross' geese (including falconry hunting)	September 1–December 16

Source: ASRD 2005a.

Table MM-3: Big Game Outfitters with Allocations or Privileges in WMU 523 and 520

WMU	Name
520/523	Bear Paw Outfitting Co. Ltd.
520/523	Plihal's Frank Lake Guiding and Outfitting
520/523	North Alberta Outfitters
520	Happy Hunters Guiding and Outfitting Inc.
520	Peace River Outfitters Ltd.
520	North Alta Ventures
520	Alpine Outfitters
520	Barbara Fuchs
520	Birch Creek Outfitters
520	Stricker Outfitting Ltd.
523	Alberta Bush Adventures
523	Homestead Outfitters Alberta
523	Mike's Outdoor Adventures
523	Magnum Outfitters
Source: Alberta Professional Outfitters Society 2005.	

Table MM-4: Waterfowl Outfitters with Held Allocations or Privileges in WMU 520 and 523

WMU	Name
520	Dallard Dallaire
523	Alberta Bush Adventures
523	Red Willow Outfitters
523	South Peace Outfitters
523	Alberta Waterfowl Hunts Ltd.
523	Whitemud Wilderness
523	North Flite Outfitting
523	David Nadeau
523	Great Canadian Adventures Inc.
523	Blue Sky Outfitters
523	Goose Pro Inc.
523	Magnum Waterfowl
Source: Alberta Professional Outfitters Society 2005a.	