

**FINAL TERMS OF REFERENCE  
ENVIRONMENTAL IMPACT ASSESSMENT REPORT  
FOR VALUE CHAIN SOLUTIONS INC.'S PROPOSED  
HEARTLAND COMPLEX EXPANSION PROJECT**

**Approximately 18 km from the City of Fort Saskatchewan, Alberta**

**ISSUED BY: Alberta Energy Regulator**

**DATE: March 10, 2020**

# TABLE OF CONTENTS

<b>PURPOSE OF THE FINAL TERMS OF REFERENCE .....</b>	<b>3</b>
<b>SCOPE OF THE EIA REPORT .....</b>	<b>3</b>
<b>CONTENT OF THE EIA REPORT .....</b>	<b>3</b>
<b>1 PUBLIC ENGAGEMENT .....</b>	<b>3</b>
<b>2 PROJECT DESCRIPTION .....</b>	<b>4</b>
2.1 OVERVIEW .....	4
2.2 CONSTRAINTS.....	5
2.3 REGIONAL AND COOPERATIVE EFFORTS .....	5
2.4 TRANSPORTATION INFRASTRUCTURE.....	5
2.5 AIR EMISSIONS MANAGEMENT .....	6
2.6 WATER MANAGEMENT .....	7
2.7 WASTE MANAGEMENT .....	9
2.8 CONSERVATION AND RECLAMATION.....	9
2.9 ENVIRONMENTAL MANAGEMENT SYSTEMS.....	10
<b>3 ENVIRONMENTAL ASSESSMENT .....</b>	<b>10</b>
3.1 AIR QUALITY, CLIMATE AND NOISE.....	10
3.2 HYDROGEOLOGY .....	11
3.3 HYDROLOGY .....	12
3.4 SURFACE WATER QUALITY .....	13
3.5 AQUATIC ECOLOGY.....	14
3.6 VEGETATION .....	15
3.7 WILDLIFE .....	16
3.8 BIODIVERSITY .....	17
3.9 TERRAIN AND SOILS .....	18
3.10 LAND USE AND MANAGEMENT .....	18
<b>4 HISTORIC RESOURCES .....</b>	<b>20</b>
4.1 BASELINE INFORMATION.....	20
4.2 IMPACT ASSESSMENT .....	20
<b>5 TRADITIONAL ECOLOGICAL KNOWLEDGE AND LAND USE .....</b>	<b>20</b>
<b>6 PUBLIC HEALTH AND SAFETY .....</b>	<b>21</b>
6.1 PUBLIC HEALTH .....	21
6.2 PUBLIC SAFETY .....	21
<b>7 SOCIO-ECONOMIC ASSESSMENT .....</b>	<b>21</b>
7.1 BASELINE INFORMATION.....	21
7.2 IMPACT ASSESSMENT .....	22
<b>8 MITIGATION MEASURES.....</b>	<b>22</b>
<b>9 RESIDUAL IMPACTS.....</b>	<b>22</b>
<b>10 MONITORING .....</b>	<b>22</b>

## **PURPOSE OF THE FINAL TERMS OF REFERENCE**

The purpose of this document is to identify for Value Chain Solutions Inc. (VCS), Indigenous communities and appropriate stakeholders the information required by government agencies for an Environmental Impact Assessment (EIA) report prepared under the *Environmental Protection and Enhancement Act* (EPEA) for the Heartland Complex Expansion Project (VCS-H Expansion (the Project)).

VCS, a wholly owned subsidiary of Value Creation Inc. (VCI), is proposing an expansion (VCS-H Expansion) to VCI's approved Heartland Oil Sands Processing Plant (Bitumen Upgrader and Specialty Refinery). VCI has approval under the *Oil Sands Conservation Act*, *EPEA* and the *Water Act* for diluted bitumen upgrading and specialty refining production up to 29,890 m<sup>3</sup>/day (188,000 barrels per day) and under *EPEA* for a tank farm serving early phases. The VCS-H Expansion will add three more phases to the approved Heartland Oil Sands Processing Plant, increasing the total production capacity to approximately 119,240 m<sup>3</sup>/day (750,000 barrels per day). The VCS-H Expansion will be located in the designated Astotin Heavy Industrial Area of Strathcona County within the Alberta's Industrial Heartland, northeast of Edmonton, centered in the south half of Section 11, Township 56, Range 21, West of the 4<sup>th</sup> Meridian.

## **SCOPE OF THE EIA REPORT**

VCS shall prepare and submit an EIA report that examines the environmental and socio-economic effects of the Project.

The EIA report shall be prepared considering all applicable provincial and federal legislation, codes of practice, guidelines, standards, policies and directives.

The EIA report shall be prepared in accordance with these Final Terms of Reference and the environmental information requirements prescribed under EPEA and associated regulations, and the *Impact Assessment Act* if applicable. The EIA report will form part of VCS's application to the Alberta Energy Regulator (AER). An EIA report summary will also be included as part of the AER Application.

VCS shall refer to the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* published by Alberta Environment and Parks (the Guide) and these Final Terms of Reference when preparing the Environmental Impact Assessment report. In any case where there is a difference in requirements between the Guide and these Final Terms of Reference, the Final Terms of Reference shall take precedence.

## **CONTENT OF THE EIA REPORT**

### **1 PUBLIC ENGAGEMENT**

- [A] Describe the concerns and issues expressed by the public and Indigenous communities and the actions taken to address those concerns and issues, including how public and Indigenous community input was incorporated into the Project development, impact mitigation, monitoring and reclamation.
- [B] Describe plans to maintain public and Indigenous community engagement following completion of the EIA report to ensure that the public and Indigenous communities will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.

## 2 PROJECT DESCRIPTION

### 2.1 Overview

- [A] Provide a brief project description in sufficient detail to provide context for the EIA, including:
- proponent information;
  - processing technology;
  - amount and source of energy required for the Project;
  - water supply and disposal requirements, including process water and potable water requirements;
  - proposed method to transport product to markets; and
  - development plan and schedule.
- [B] Provide maps and/or drawings of the Project components and activities including:
- existing infrastructure, leases and clearings;
  - processing/treatment facilities;
  - other buildings and infrastructure (e.g., pipelines, access roads and utilities);
  - temporary structures;
  - transportation and access routes;
  - on-site hydrocarbon storage;
  - on-site sulphur and asphaltene storage;
  - containment structures such as retention ponds and storage ponds (e.g., lime sludge, stormwater runoff, boiler blow-down);
  - water wells/intakes, pipelines, and storage structures;
  - sources of aggregate resources, borrow material and other construction material and locations of any stockpiles that will be developed; and
  - waste storage area and disposal sites.
- [C] Provide a development plan that includes:
- the phases of development;
  - overburden and storage areas;
  - processing facilities;
  - infrastructure (pipelines, access roads and power lines);
  - other buildings and structures;
  - field maintenance operations; and
  - activities associated with each stage of the Project.
- [D] Describe the proposed method to transport product to markets.
- [E] Provide a list of chemical products to be manufactured, processed or otherwise used for the Project and describe, in general terms, how these products will be stored and managed. Identify products containing substances that are:
- listed in the *Canadian Environmental Protection Act, Schedule 1, List of Toxic Substances*;
  - listed on the *National Pollutant Release Inventory*;
  - dangerous goods as defined by the federal *Transportation of Dangerous Goods Act*; and
  - on the *Domestic Substances List* and categorized as requiring further assessment under Canada's *Chemicals Management Plan*.

- [F] Describe the nature and amount of on-site hydrocarbon, sulphur and asphaltene storage. Discuss containment and other environmental protection measures.
- [G] Discuss the implications of a delay in proceeding with the Project or any phase of the Project, or not going ahead with the Project. Discuss the key factors controlling the schedule, including restrictions for certain development activities.
- [H] Describe the benefits of the Project, including jobs created, local training, employment and business opportunities, and royalties and taxes generated that accrue to:
  - a) VCS;
  - b) local and regional communities, including Indigenous communities;
  - c) the local authority;
  - d) Alberta, and Canada.
- [I] Provide the adaptive management approach that will be implemented throughout the life of the Project. Include how monitoring, mitigation and evaluation were incorporated.

## **2.2 Constraints**

- [A] Discuss the process and criteria used to identify constraints to development, and how the Project has been designed to accommodate those constraints. Include the following:
  - a) any applicable *Alberta Land Stewardship Act* Regional Plan;
  - b) land use policies and resource management initiatives that pertain to the Project;
  - c) Indigenous traditional land and water use;
  - d) all known traplines;
  - e) the environmental setting;
  - f) cumulative environmental impacts in the region;
  - g) cumulative social impacts in the region;
  - h) results of project-specific and regional monitoring;
  - i) potential for new or additional technology to increase resource recovery at later times; and
  - j) potential for changes in the regulatory regime.
- [B] Discuss the selection criteria used, options considered, and rationale for selecting:
  - a) location of facilities and infrastructure (including linear infrastructure); and
  - b) thermal energy and electric power required for the Project.
- [C] Provide a list of facilities for which locations will be determined later. Discuss the selection criteria that will be used to determine the specific location of these facilities.

## **2.3 Regional and Cooperative Efforts**

- [A] Discuss VCS's involvement in regional and cooperative efforts to address environmental and socio-economic issues associated with regional development.
- [B] Describe opportunities for sharing infrastructure (e.g., access roads, utility corridors) with other resource development stakeholders. Provide rationale where these opportunities will not be implemented.

## **2.4 Transportation Infrastructure**

- [A] Prepare a Traffic Impact Assessment as per Alberta Transportation's *Traffic Impact Assessment Guideline* (<http://www.transportation.alberta.ca/613.htm>).

- a) Describe background traffic and consider the cumulative effects of traffic impacts due to other existing and planned developments using the same highways and accesses.
  - b) Discuss anticipated changes to highway traffic (e.g., type, volume) due to the Project.
  - c) Assess potential traffic impacts for all stages of the Project (e.g., construction, operation, maintenance, expansion, shutdown).
  - d) Determine any necessary improvements and methods to mitigate traffic impacts.
- [B] Describe and map the locations of any new road or intersection construction, or any improvements to existing roads or intersections, related to the development of the Project, from the boundary of the Project Area up to and including the highway access points, and:
- a) discuss the alternatives and the rationale for selection for the preferred alternative;
  - b) discuss compatibility of the preferred alternative to Alberta Transportation's immediate and future plans;
  - c) describe the impacts to local communities of the changes in transportation and infrastructure; and
  - d) provide a proposed schedule for the work.
- [C] Describe any infrastructure or activity that could have a potential impact on existing roads (e.g., pipelines or utilities crossing provincial highways, any facilities in close proximity of the highways, any smoke, dust, noise, light or precipitation generated by the Project that could impact the highway and road users).
- [D] Provide a summary of any discussions with Alberta Transportation in regards to the Project and its traffic impacts.
- [E] Indicate where Crown land dispositions may be needed for roads or infrastructure required for the Project.

## **2.5 Air Emissions Management**

- [A] Discuss the selection criteria used, options considered, and rationale for selecting control technologies to minimize air emission and ensure air quality management.
- [B] Provide emission profiles (type, rate and source) for the Project's operating and construction emissions including point and non-point sources and fugitive emissions. Consider both normal and upset conditions. Discuss:
- a) odorous and visible emissions from the proposed facilities;
  - b) annual and total greenhouse gas emissions during all stages of the Project. Identify the primary sources and provide detailed calculations;
  - c) the intensity of greenhouse gas emissions per unit of product produced;
  - d) the Project's contribution to total provincial and national greenhouse gas emissions on an annual basis;
  - e) VCS's detailed greenhouse gas mitigation and management plans;
  - f) amount and nature of Criteria Air Contaminants emissions;
  - g) the amount and nature of acidifying emissions, probable deposition patterns and rates;
  - h) control technologies used to minimize air emissions;

- i) emergency flaring scenarios (e.g., frequency and duration) and proposed measures to ensure flaring events are minimized;
- j) upset condition scenarios (e.g., frequency and duration) and proposed measures to ensure upset conditions are minimized;
- k) gas collection and conservation, and the applicability of vapour recovery technology;
- l) applicability of sulphur recovery, acid gas re-injection or flue gas desulphurization to reduce sulphur emissions; and
- m) fugitive emissions control technology to detect, measure and control emissions and odours from equipment leaks.

## **2.6 Water Management**

[A] Discuss potential cooperation with other parties regarding water related infrastructure and management including, but not limited to, water intakes, pipelines, water storage and withdrawals, flow monitoring and reporting and ecological monitoring.

### **2.6.1 Water Supply**

[A] Describe the water supply requirements for the Project, including:

- a) the criteria used, options considered and rationale for selection of water supply sources(s);
- b) the expected water balance during all stages of the Project. Discuss assumptions made or methods chosen to arrive at the water balances;
- c) the process water, potable water, and non-potable water requirements and sources for construction, start-up, normal and emergency operating situations, decommissioning and reclamation. Identify the volume of water to be withdrawn from each source, considering plans for wastewater reuse;
- d) the location of sources/intakes and associated infrastructure (e.g., pipelines for water supply);
- e) the variability in the amount of water required on an annual and seasonal basis as the Project is implemented;
- f) the expected cumulative effects on water losses/gains resulting from the Project operations;
- g) contingency plans in the event of restrictions on the Project's water supply source (e.g., due to license conditions, source volume limitations, climate change or cumulative impact water deficits);
- h) potable water treatment systems for all stages of the Project;
- i) type and quantity of potable water treatment chemicals used; and
- j) measures for ensuring efficient use of water including alternatives to reduce the consumption of water such as water use minimization, recycling, conservation, and technological improvements.

### **2.6.2 Surface Water**

[A] Describe the surface water management strategy for all stages of the Project, including:

- a) design factors considered such as:
  - i) site drainage,
  - ii) run-on management,
  - iii) road and plant run-off,

- iv) erosion and sediment control,
  - v) groundwater and surface water protection,
  - vi) wetland and waterbody dewatering,
  - vii) groundwater seepage,
  - viii) produced water management,
  - ix) flood protection, and
  - x) geotechnical stability concerns;
- b) permanent or temporary alterations or realignments of watercourses, wetlands and other waterbodies;
  - c) the pre and post-disturbance alignment and condition of all ephemeral and permanent streams, wetlands and waterbodies, including those created by the Project; and
  - d) factors used in the design through decommissioning of water management facilities with respect to the *Water (Ministerial) Regulation* and where relevant, the *Alberta Dam and Canal Safety Directive*, including consequence classification and expected failure related flood and flood protection.
- [B] Describe and map all roadway, pipeline, powerline and any other utility crossings of watercourses or waterbodies.
- [C] Describe discharges to the surrounding watershed from existing, reclaimed or planned sites and the management strategy for handling such releases.
- [D] Describe how the *Alberta Wetland Policy* was considered in the assessment of impacts, including but not limited to:
- a) avoidance, minimization, reclamation or replacement of wetlands in accordance with the *Alberta Wetland Mitigation Directive*;
  - b) temporary and permanent alterations (direct and indirect) to wetlands classified under the *Alberta Wetland Classification System*;
  - c) any expected changes in wetland class and cause for this change; and
  - d) consideration of cumulative effects in the watershed to wetlands.

### 2.6.3 Wastewater Management

- [A] Describe the wastewater management strategy, including:
- a) the criteria used, options considered and rationale for the selection of wastewater treatment and wastewater disposal and a discussion of why other options were not chosen;
  - b) the source, quantity and composition of each wastewater stream from each component of the proposed operation for all project conditions, including normal, start-up, worst-case and upset conditions;
  - c) the proposed disposal locations and methods for each wastewater stream;
  - d) geologic formations for the disposal of wastewaters;
  - e) design of facilities that will collect, treat, store and release wastewater streams;
  - f) type and quantity of chemicals used in wastewater treatment, including measures taken in the design to prevent or minimize potential impacts to the environment;
  - g) quantity and composition of residual products resulting from proposed wastewater treatment and proposed handling of these materials;
  - h) sewage treatment and disposal;



- i) the options for the disposal of wastewater in the context of best management practices and best available technologies, including the rationale for choosing the preferred option and the measures taken to prevent impacts on potable groundwater, aquatic ecosystems and vegetation;
- j) how make-up water requirements and disposal volumes will be minimized; a monitoring plan for wastewater releases, including the rationale used to determine the frequency of sampling and the parameters to be measured; and
- k) the drinking water treatment systems for both the construction and operation stages of the Project.

## **2.7 Waste Management**

- [A] Discuss the selection criteria used, options considered, and rationale for waste disposal. Include:
- a) the location, availability of on-site waste disposal; and
  - b) site suitability from a water quality protection perspective, geotechnical perspective and with regard to existing and potential human activities.
- [B] Characterize and quantify the anticipated dangerous goods, and hazardous, non-hazardous, and recyclable wastes generated by the Project, and describe:
- a) the composition and volume of specific waste streams and discuss how each stream will be managed;
  - b) how the disposal sites and sumps will be constructed; and
  - c) plans for pollution prevention, waste minimization, recycling, and management to reduce waste quantities for all stages of the Project.
- [C] Describe the nature and amount of on-site hydrocarbon storage. Discuss containment and other environmental protection measures.

## **2.8 Conservation and Reclamation**

- [A] Provide a conceptual conservation and reclamation plan for the Project. Describe and map as applicable:
- a) any existing conservation and reclamation plan;
  - b) current land use and capability and proposed post-development land use and capability;
  - c) anticipated timeframes for completion of reclamation stages and release of lands back to the Crown including an outline of the key milestone dates for reclamation and how progress to achieve these targets will be measured;
  - d) constraints to reclamation such as timing of activities, availability of reclamation materials and influence of natural processes and cycles including natural disturbance regimes;
  - e) post-development land capability with respect to:
    - i) self-sustaining topography, drainage and surface watercourses representative of the surrounding area,
    - ii) existing traditional use with consideration for traditional vegetation and wildlife species in the reclaimed landscape,
    - iii) wetlands,
    - iv) self-sustaining vegetation communities representative of the surrounding area capable of ecological succession, and

- v) reforestation and forest productivity;
  - f) reclamation material salvage, storage areas and handling procedures;
  - g) reclamation material replacement, indicating depth, volume and type;
  - h) management of suitable overburden;
  - i) existing and final reclaimed site drainage plans;
  - j) integration of surface and near-surface drainage within the Project Area; and
  - k) promotion of biodiversity.
- [B] Provide a conceptual revegetation plan for the disturbed terrestrial, riparian and wetland areas. Consider factors such as biological capability and diversity, natural disturbance regimes and end land use objectives.
- [C] Provide a map of the predicted ecosites for the post-reclamation landscape considering potential land uses, including traditional uses and how the landscape and soils have been designed to accommodate future land use.
- [D] Provide a conceptual plan to monitor reclamation performance and success (including soils, vegetation, wildlife and aquatic resources).
- [E] Describe how VCS considered the use of progressive reclamation in project design and reclamation planning.
- [F] Discuss uncertainties related to the conceptual reclamation plan.

## **2.9 Environmental Management Systems**

- [A] Summarize key elements of VCS's existing or proposed environment, health and safety management system.
- [B] Describe adaptive management plans that minimize the impact of the Project. Describe the flexibility built into the Project to accommodate future modifications required as a result of:
- a) any change in environmental standards, limits and guidelines; and
  - b) findings from project-specific regional monitoring programs.
- [C] Describe VCS's current and proposed monitoring programs with respect to:
- a) air emissions, including fugitive emissions;
  - b) wastewater treatment and release; and
  - c) hazardous and non-hazardous waste treatment and storage.
- [D] Describe the emergency response system that will be used to minimize adverse environmental effects while protecting the safety of personnel.

## **3 ENVIRONMENTAL ASSESSMENT**

### **3.1 Air Quality, Climate and Noise**

#### **3.1.1 Baseline Information**

- [A] Discuss the baseline climatic and air quality conditions including:
- a) seasonal variation in temperature and precipitation;
  - b) extreme precipitation statistics;
  - c) projected changes due to climate change in temperature and precipitation, including extreme precipitation statistics, over the life of the Project;

- d) the type and frequency of meteorological conditions that may result in poor air quality; and
- e) appropriate ambient air quality parameters.

### **3.1.2 Impact Assessment**

- [A] Identify components of the Project that will affect air quality, and:
  - a) describe the potential for reduced air quality (including odours and visibility) resulting from the Project and discuss any implications of the expected air quality for environmental protection and public health;
  - b) estimate ground-level concentrations of appropriate air quality parameters;
  - c) discuss any expected changes to particulate deposition, nitrogen deposition or acidic deposition patterns;
  - d) identify areas that are predicted to exceed Potential Acid Input critical loading criteria;
  - e) discuss interactive effects that may occur resulting from co-exposure of a receptor to all emissions; and
  - f) describe air quality impacts resulting from the Project, and their implications for other environmental resources, including habitat diversity and quantity, soil resources, vegetation resources and water quality.
- [B] Identify stages or elements of the Project that are sensitive to changes or variability in climate parameters, including frequency and severity of extreme weather events and discuss the potential impacts over the life of the Project.
- [C] Summarize the results of the noise assessment conducted for the Project, and:
  - a) identify the receptors used in the assessment;
  - b) discuss the design, construction and operational factors to be incorporated into the Project to comply with the AER's *Directive 38: Noise Control*; and
  - c) identify components of the Project that have the potential to increase noise levels and discuss the implications, including:
    - i) potentially affected people and wildlife,
    - ii) an estimate of the potential for increased noise resulting from the development, and
    - iii) strategies to monitor and mitigate any increased noise levels.

## **3.2 Hydrogeology**

### **3.2.1 Baseline Information**

- [A] Provide an overview of the existing geologic and hydrogeologic setting from the ground surface down to, and including, the disposal zones, and:
  - a) present regional and Project Area geology to illustrate depth, thickness and spatial extent of lithology, stratigraphic units and structural features; and
  - b) present regional and Project Area hydrogeology describing:
    - i) the major aquifers, aquitards and aquicludes (Quaternary and bedrock), their spatial distribution, properties, hydraulic connections between aquifers, hydraulic heads, gradients, groundwater flow directions and velocities. Include maps and cross sections,

- ii) the chemistry of groundwater aquifers including baseline concentrations of major ions, metals and hydrocarbon indicators,
- iii) the potential discharge zones, potential recharge zones and sources, areas of groundwater-surface water interaction and areas of Quaternary aquifer-bedrock groundwater interaction,
- iv) water well development and groundwater use, including an inventory of groundwater users,
- v) the recharge potential for Quaternary aquifers,
- vi) potential hydraulic connection between deep disposal formations and other aquifers resulting from project operations,
- vii) the characterization of formations chosen for deep well disposal, including chemical compatibility and containment potential, injection capacity, hydrodynamic flow regime, and water quality assessments, and
- viii) the locations of major facilities associated with the Project including facilities for waste storage, treatment and disposal (e.g., deep well disposal) and describe site-specific aquifer and shallow groundwater conditions beneath these proposed facilities. Provide supporting geological information.

### **3.2.2 Impact Assessment**

- [A] Describe project components and activities that have the potential to affect groundwater resource quantity and quality at all stages of the Project.
- [B] Describe the nature and significance of the potential project impacts on groundwater with respect to:
  - a) inter-relationship between groundwater and surface water in terms of both groundwater and surface water quantity and quality;
  - b) implications for terrestrial or riparian vegetation, wildlife and aquatic resources including wetlands;
  - c) changes in groundwater quality, quantity and flow;
  - d) conflicts with other groundwater users, and proposed resolutions to these conflicts; and
  - e) potential implications of seasonal variations.
- [C] Describe programs to manage and protect groundwater resources including:
  - a) early detection of potential contamination;
  - b) groundwater remediation options in the event that adverse effects are detected; and
  - c) monitoring groundwater levels and associated changes due to production or dewatering impacts.

## **3.3 Hydrology**

### **3.3.1 Baseline Information**

- [A] Describe and map the surface hydrology in the Project Area.
- [B] Identify any surface water users who have existing approvals, permits or licenses.
- [C] Provide surface flow baseline data, including:
  - a) seasonal variation, low, average and peak flows for watercourses; and
  - b) surface water catchment areas.

### **3.3.2 Impact Assessment**

- [A] Discuss changes to watersheds, including surface and near-surface drainage conditions, potential flow impediment, and potential changes in open-water surface areas caused by the Project.
- [B] Describe the extent of hydrological changes that will result from disturbances to groundwater and surface water movement, and:
  - a) include changes to the quantity of surface flow, water levels and channel regime in watercourses (during minimum, average and peak flows) and water levels in waterbodies;
  - b) assess the potential impact of any alterations in flow on the hydrology and identify all temporary and permanent alterations, channel realignments, disturbances or surface water withdrawals;
  - c) discuss the effect of these changes on hydrology (e.g., timing, volume, peak and minimum flow rates, river regime and lake levels), including the significance of effects for downstream watercourses; and
  - d) identify any potential erosion problems in watercourses resulting from the Project.
- [C] Describe impacts on other surface water users resulting from the Project. Identify any potential water use conflicts.
- [D] Discuss the impact of low flow conditions and in-stream flow needs on water supply and water and wastewater management strategies.

## **3.4 Surface Water Quality**

### **3.4.1 Baseline Information**

- [A] Describe the baseline water quality of watercourses and waterbodies. Discuss the effects of seasonal (temporal), spatial, flow and other factors on water quality. Consider appropriate water quality parameters, including those with established guidelines for the protection of aquatic life or known to be influenced or impacted by the proposed Project.

### **3.4.2 Impact Assessment**

- [A] Identify project components that may influence or impact surface water quality.
- [B] Describe the potential impacts of the Project on surface water quality, including:
  - a) changes in water quality that may exceed the *Environmental Quality Guidelines for Alberta Surface Waters* or the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (where relevant Alberta guidelines do not exist);
  - b) changes in water quality parameters determined to be altered by the Project for which provincial or federal guidelines do not exist;
  - c) seasonal and spatial variation;
  - d) project-related and cumulative impacts of acidifying and other air emissions; and
  - e) changes in surface runoff or groundwater discharge.

## 3.5 Aquatic Ecology

### 3.5.1 Baseline Information

- [A] Describe and map the fish, fish habitat and aquatic resources (e.g., aquatic and benthic invertebrates) of the lakes, rivers, ephemeral water bodies and other waters. Describe the species composition, distribution, relative abundance, movements and general life history parameters of fish resources including their use and potential use of habitats. Provide the methods used and rationale for the baseline data collection.
- [B] Describe any species that are:
- listed as “at Risk, May be at Risk and Sensitive” in the *General Status of Alberta Wild Species* (Alberta Environment and Parks);
  - identified by the *Alberta Wildlife Act* as ‘Endangered’, ‘Threatened’, or ‘Species of Special Concern’;
  - listed in Schedule 1 of the federal *Species at Risk Act*;
  - listed as “at risk” by COSEWIC; and
  - traditionally used species.
- [C] Describe and map aquatic habitat including critical or sensitive areas as well as habitat disturbances that are related to proposed, existing and approved projects overlain on surface hydrology.
- [D] Describe the current and potential use of the fish resources by Indigenous, or recreational fisheries.
- [E] Describe and quantify the extent of current aquatic habitat fragmentation.

### 3.5.2 Impact Assessment

- [A] Describe and assess the potential impacts of the Project to fish, fish habitat, aquatic and benthic invertebrates and key indicators, including but not limited to:
- habitat loss and alteration;
  - potential water quality and quantity changes;
  - potential impacts on riparian areas that could affect aquatic resources and productivity;
  - changes to benthic invertebrate communities;
  - increased fishing pressures in the region that could arise from the increased human activity and improved access from the Project;
  - increased habitat fragmentation;
  - acidification and/or eutrophication;
  - groundwater-surface water interactions;
  - potential for thermal plumes to affect aquatic habitat; and
  - fish tainting, survival of eggs and fry, chronic or acute health effects, and increased stress on fish populations from release of contaminants, sedimentation, flow alterations, and/or changes in temperature.
- [B] Discuss the rationale for the selection of the key indicators.
- [C] Discuss the design, construction and operational factors to be incorporated into the Project to minimize effects to fish and fish habitat and protect aquatic resources.

- [D] Identify proposed plans to offset any loss in the productivity as a result of the Project. Indicate how environmental protection plans address applicable provincial and federal policies on fish habitat.

### **3.6 Vegetation**

#### **3.6.1 Baseline Information**

- [A] Describe and map the vegetation communities, wetlands (using the *Alberta Wetland Classification System*), rare plant communities, old growth forests, and communities of limited distribution. Identify the occurrence, relative abundance and distribution of each vegetation community and identify any species that are:
- a) listed as “at Risk, May be at Risk and Sensitive” in the *General Status of Alberta Wild Species* (Alberta Environment and Parks);
  - b) listed in Schedule 1 of the federal *Species at Risk Act*;
  - c) listed as “at risk” by COSEWIC; and
  - d) traditionally and currently used species.
- [B] Describe and quantify the current extent of habitat fragmentation.
- [C] Discuss the potential of each ecosite phase to support rare plant species, plants for traditional, medicinal and cultural purposes, old growth forests and communities of limited distribution. Consider their importance for local and regional habitat, sustained forest growth, rare plant habitat and the hydrologic regime.
- [D] Describe regional relevance of landscape units that are identified as rare.
- [E] Provide timber productivity ratings for both the Project Area and the Local Study Area including identification of productive forested, non-productive forested and non-forested lands.

#### **3.6.2 Impact Assessment**

- [A] Identify the amount of vegetation and wetlands to be disturbed during the life of the Project.
- [B] Describe and assess the potential impacts of the Project on vegetation communities.
- [C] Describe the potential impacts of the Project on rare or endangered plant species.
- [D] Identify key vegetation indicators used to assess the Project impacts. Discuss the rationale for the indicator’s selection.
- [E] Discuss temporary (include timeframe) and permanent changes to vegetation and wetland communities and comment on:
- a) the impacts on other environmental resources (habitat diversity and quantity, water quality and quantity, erosion potential);
  - b) the impacts on recreation, Indigenous and other uses; and
  - c) the sensitivity to disturbance (including acid deposition) as well as techniques used to estimate sensitivity to disturbance and reclamation of each vegetation community.
- [F] Describe the regional impact of any ecosite phase to be removed.

- [G] Discuss, from an ecological perspective, the expected timelines for establishment and recovery of vegetative communities and the expected differences in the resulting vegetative community structures.
- [H] Provide a map of the predicted ecosites that shows the reclaimed vegetation. Comment on the importance of the size, distribution and variety of the reclaimed landscape units from both a local and regional perspective.
- [I] Discuss the impacts of any loss of wetlands, including how the loss will affect the land use.
- [J] Discuss weeds and non-native invasive species and describe how these species will be assessed and controlled in all stages of the Project.
- [K] Discuss the predicted changes to upland, riparian and wetland habitats resulting from increased fragmentation.

### **3.7 Wildlife**

#### **3.7.1 Baseline Information**

- [A] Describe and map the wildlife resources (amphibians, reptiles, birds, and terrestrial and aquatic mammals). Describe species composition, relative abundance, distribution, seasonal movements, movement corridors, habitat requirements, key habitat areas, general life history and their use and potential use of habitats. Also identify any species that are:
  - a) listed as “at Risk, May be at Risk and Sensitive” in the *General Status of Alberta Wild Species* (Alberta Environment and Parks);
  - b) listed in Schedule 1 of the federal *Species at Risk Act*;
  - c) listed as “at risk” by COSEWIC; and
  - d) species of traditional and current use and cultural keystone species.
- [B] Describe and map existing wildlife habitat and habitat disturbance including exploration activities. Identify habitat disturbances that are related to existing and approved projects.
- [C] Describe and quantify the extent of current wildlife habitat fragmentation.

#### **3.7.2 Impact Assessment**

- [A] Describe and assess the potential impacts of the Project to wildlife populations and wildlife habitats, considering:
  - a) how the Project will affect wildlife relative abundance, habitat availability, mortality, movement patterns, and distribution for all stages of the Project;
  - b) how improved or altered access may affect wildlife, including potential obstruction of movements, increased vehicle wildlife collisions, and increased hunting pressure;
  - c) how increased habitat fragmentation may affect wildlife. Consider edge effects, the availability of core habitat and the influence of linear features and infrastructure on wildlife movements and predator-prey relationships;
  - d) the use of setbacks;
  - e) potential effects on wildlife resulting from changes to air and water quality, including both acute and chronic effects to animal health;



- f) the spatial and temporal changes to habitat availability and habitat effectiveness (types, quality, quantity, diversity and distribution);
  - g) the resilience and recovery capabilities of wildlife populations and habitats to disturbance;
  - h) the potential for the Project to be returned to its existing state with respect to wildlife populations and their habitats; and
  - i) the predicted and/or anticipated changes to wildlife and wildlife habitat cumulative effects resulting from the Project's anticipated changes.
- [B] Identify the key wildlife and habitat indicators used to assess project impacts. Discuss the rationale for their selection.
- [C] Comment on the availability of species for traditional use, considering habitat loss, habitat avoidance, vehicle-wildlife collisions, increased non-Indigenous hunting pressure and other Project related impacts on wildlife populations.

### **3.8 Biodiversity**

#### **3.8.1 Baseline Information**

- [A] Describe the terrestrial and aquatic biodiversity metrics, that will be used to characterize the existing ecosystems and potential impacts of the Project, and
- a) describe the process and rationale used to select biotic and abiotic indicators for biodiversity within the selected taxonomic groups;
  - b) determine the relative abundance of species in each ecosite phase;
  - c) provide locations and lists of species, as well as summaries of observed and estimated species richness and evenness for each ecosite phase;
  - d) provide a measure of biodiversity on baseline sites that are representative of the proposed reclamation ecosites;
  - e) rank each ecological unit for biodiversity potential. Describe techniques used in the ranking process; and
  - f) describe the current level of habitat fragmentation.

#### **3.8.2 Impact Assessment**

- [A] Describe the metrics used to assess the potential impacts of the Project. Discuss the contribution of the Project to any anticipated changes in regional biodiversity and the potential impact to local and regional ecosystems.
- [B] Describe and assess the potential impacts of the Project to biodiversity at relevant scales (site-specific to landscape level), considering:
- a) the biodiversity metrics, biotic and abiotic indicators selected;
  - b) the effects of fragmentation on biodiversity potential;
  - c) the contribution of the Project to any anticipated changes in regional biodiversity and the potential impact to local and regional ecosystems; and
  - d) effects during construction, operations and post-reclamation and the significance of these changes in a local and regional context.

### **3.9 Terrain and Soils**

#### **3.9.1 Baseline Information**

- [A] Describe and map the terrain and soils conditions, including;
- a) surficial geology and topography;
  - b) soil types and their distributions. Provide an ecological context for the soils by supplying a soil survey report and maps to Survey Intensity Level 2 for the Project Area;
  - c) suitability and availability of reclamation material (soils, suitable overburden) within the Project Area for reclamation;
  - d) soils that could be affected by the Project, with emphasis on potential acidification (by soil type); and
  - e) descriptions and locations of erosion-sensitive soils.
- [B] Describe and map soil types in the areas that are predicted to exceed Potential Acid Input critical loading criteria.

#### **3.9.2 Impact Assessment**

- [A] Describe project activities and other related issues that could affect soil quality (e.g., compaction, contaminants), and:
- a) indicate the amount (ha) of surface disturbance from plant, overburden disposal, infrastructure (e.g., pipelines, power lines, access roads), waste disposal and other construction and operation activities;
  - b) provide an inventory of the pre- and post-disturbance land capability classes for soils in both the Project Area and the Local Study Area and describe the impacts to land capability resulting from the Project. Indicate the size and location of soil types and land capability classes that will be disturbed;
  - c) discuss the relevance of any changes for the local and regional landscapes, biodiversity, productivity, ecological integrity, aesthetics and future use resulting from disturbance during the life of the Project;
  - d) identify the potential acidification impact on soils and discuss the significance of predicted impacts by acidifying emissions;
  - e) discuss the potential for soil erosion during the life of the Project; and
  - f) describe potential sources of soil contamination.
- [B] Discuss the potential impacts caused by the mulching and storage of woody debris considering, but not limited to, vulnerability to fire, degradation of soil quality, increased footprint.

### **3.10 Land Use and Management**

#### **3.10.1 Baseline Information**

- [A] Describe and map the current land uses in the Project Area, including all Crown land dispositions and Crown Reservations (Holding Reservation, Protective Notation, Consultative Notation).
- [B] Describe the existing land and resource uses and potential conflicts that exist, considering oil and gas development, agriculture, forestry, tourism and outdoor recreational activities.

- [C] Indicate where Crown land dispositions may be needed for roads or other infrastructure for the Project.
- [D] Identify and map unique sites or special features such as Parks and Protected Areas, Heritage Rivers, Historic Sites, Environmentally Significant Areas, culturally significant sites and other designations (e.g., World Heritage Sites, Ramsar Sites, Internationally Important Bird Areas).
- [E] Identify any land use policies and resource management initiatives that pertain to the Project and discuss how the Project will be consistent with the intent of these initiatives.
- [F] Describe and map land clearing activities, showing the timing of the activities.
- [G] Describe the status of timber harvesting arrangements, including species and timing.
- [H] Describe existing access control measures.

### **3.10.2 Impact Assessment**

- [A] Identify the potential impacts of the Project on land uses, including:
  - a) unique sites or special features;
  - b) changes in public access arising from linear development, including secondary effects related to increased hunter, angler and other recreational access and facilitated predator movement;
  - c) aggregate reserves that may be located on land under VCS's control and reserves in the region;
  - d) development and reclamation on commercial forest harvesting and fire management in the Project Area;
  - e) the amount of commercial and non-commercial forest land base that will be disturbed by the Project, including the Timber Productivity Ratings for the Project Area. Compare the baseline and reclaimed percentages and distribution of all forested communities in the Project Area;
  - f) how the Project impacts Annual Allowable Cuts and quotas within the Forest Management Agreement area;
  - g) the operations of any agricultural crown leases and provincial grazing reserves;
  - h) anticipated changes (type and extent) to the topography, elevation and drainage patterns within the Project Area; and
  - i) access control for public, regional recreational activities, Indigenous land use and other land uses during and after development activities.
- [B] Provide a fire control plan highlighting:
  - a) measures taken to ensure continued access for firefighters to adjacent wildland areas;
  - b) forest fire prevention, detection, reporting, and suppression measures, including proposed fire equipment;
  - c) measures for determining the clearing width of power line rights-of-way; and
  - d) required mitigative measures for areas adjacent to the Project Area based on the *FireSmart Field Guide for the Upstream Oil and Gas Industry*.

## **4 HISTORIC RESOURCES**

### **4.1 Baseline Information**

- [A] Provide a brief overview of the regional historical resources setting including a discussion of the relevant archaeological, historic and palaeontological records.
- [B] Describe and map known historic resources sites in the Project Area, considering:
  - a) site type and assigned Historic Resources Values; and
  - b) existing site specific *Historical Resources Act* requirements.
- [C] Provide an outline of the program and schedule of field investigations that Alberta Culture, Multiculturalism and Status of Women may require VCS to undertake to further assess and mitigate the impacts of the Project on historic resources.
- [D] Document any historic resources raised during consultation on the Project.
- [E] Provide an overview of previous Historical Resources Impact Assessments that have been conducted within the Project Area, including:
  - a) a description of the spatial extent of previous assessment relative to the Project Area, noting any assessment gap areas; and
  - b) a summary of *Historical Resources Act* requirements and/or clearances that have been issued for the Project to date.
- [F] Identify locations within the Project Area that are likely to contain previously unrecorded historic resources. Describe the methods used to identify these areas.

### **4.2 Impact Assessment**

- [A] Describe project components and activities that have the potential to affect historic resources at all stages of the Project.
- [B] Describe the nature and magnitude of the potential project impacts on historical resources, considering:
  - a) effects on historic resources site integrity; and
  - b) implications for the interpretation of the archaeological, historic and palaeontological records.

## **5 TRADITIONAL ECOLOGICAL KNOWLEDGE AND LAND USE**

- [A] Provide:
  - a) a map and description of traditional land use areas including fishing, hunting, trapping, water use (e.g., for drinking, cooking and navigation) and nutritional, medicinal or cultural plant harvesting by affected Indigenous peoples (if the Indigenous community or group is willing to have these locations disclosed);
  - b) a map of cabin sites, spiritual sites, cultural sites, graves and other traditional use sites considered historic resources under the *Historical Resources Act* (if the Indigenous community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns; and
  - c) a discussion of:
    - i) the availability of vegetation, fish and wildlife species for food, traditional, medicinal and cultural purposes in the identified traditional land use areas considering all project related impacts,

- ii) access to traditional lands in the Project Area during all stages of the Project, and
  - iii) Indigenous views on land reclamation.
- [B] Describe how Traditional Ecological Knowledge and Traditional Land Use information was incorporated into the Project, EIA development, the conservation and reclamation plan, monitoring and mitigation.
- [C] Determine the impacts of the Project on traditional, medicinal and cultural purposes and identify possible mitigation strategies.

## **6 PUBLIC HEALTH AND SAFETY**

### **6.1 Public Health**

- [A] Describe those aspects of the Project that may have implications for public health or the delivery of regional health services. Determine quantitatively whether there may be implications for public health arising from the Project.
- [B] Document any health concerns raised by stakeholders during consultation on the Project.
- [C] Document any health concerns identified by Indigenous communities or groups resulting from impacts of existing development and of the Project specifically on their traditional lifestyle. Include an Indigenous receptor type in the assessment.
- [D] Describe the potential health impacts resulting from higher regional traffic volumes and the increased risk of accidental leaks and spills.

### **6.2 Public Safety**

- [A] Describe aspects of the Project that may have implications for public safety. Specifically:
- a) describe the emergency response plan including public notification protocol and safety procedures to ensure public safety and minimize adverse environmental effects, including emergency reporting procedures for spill containment and management;
  - b) document any safety concerns raised by stakeholders during consultation on the Project and the actions taken to address those concerns;
  - c) describe how local residents will be contacted during an emergency and the type of information that will be communicated to them;
  - d) describe the existing agreements with area municipalities or industry groups such as safety cooperatives, emergency response associations, regional mutual aid programs and municipal emergency response agencies or other industry partner emergency response/spill response agreements; and
  - e) describe the potential safety impacts resulting from higher regional traffic volumes.

## **7 SOCIO-ECONOMIC ASSESSMENT**

### **7.1 Baseline Information**

- [A] Describe the existing socio-economic conditions in the region and in the communities in the region.
- [B] Describe factors that may affect existing socio-economic conditions including:
- a) population changes;

- b) workforce requirements for all stages of the Project, including a description of when peak activity periods will occur;
- c) planned accommodations for the workforce for all stages of the Project. Discuss the rationale for their selection;
- d) VCS's policies and programs regarding the use of local, regional and Alberta goods and services;
- e) the project schedule; and
- f) the overall engineering and contracting plan for the Project.

## **7.2 Impact Assessment**

- [A] Describe the effects of construction and operation of the Project on:
  - a) housing;
  - b) availability and quality of health care services;
  - c) local and regional infrastructure and community services;
  - d) recreational activities;
  - e) hunting, fishing, trapping and gathering;
  - f) First Nations and Métis (e.g., traditional land use and social and cultural implications); and
  - g) local training, employment and business opportunities.
- [B] Describe the need for additional Crown land.
- [C] Discuss opportunities to work with First Nation and Métis communities and groups, other local residents and businesses regarding employment, training needs and other economic development opportunities arising from the Project.
- [D] Provide the estimated total project cost, including a breakdown for engineering and project management, equipment and materials, and labour for both construction and operation stages. Indicate the percentage of expenditures expected to occur in the region, Alberta, Canada outside of Alberta, and outside of Canada.

## **8 MITIGATION MEASURES**

- [A] Discuss mitigation measures planned to avoid, minimize or eliminate the potential impacts for all stages of the Project.
- [B] Identify the mitigation objectives for each associated impact and describe those mitigation measures that will be implemented. Provide rationale for their selection, including a discussion on the effectiveness of the proposed mitigation.

## **9 RESIDUAL IMPACTS**

- [A] Describe the residual impacts of the Project following implementation of VCS's mitigation measures and VCS's plans to manage those residual impacts.

## **10 MONITORING**

- [A] Describe VCS's current and proposed monitoring programs, including:
  - a) how the monitoring programs will assess any project impacts and measure the effectiveness of mitigation plans. Discuss how VCS will address any project impacts identified through the monitoring program;
  - b) how VCS will contribute to current and proposed regional monitoring programs;

- c) monitoring performed in conjunction with other stakeholders, including Indigenous communities and groups;
- d) new monitoring initiatives that may be required as a result of the Project;
- e) regional monitoring that will be undertaken to assist in managing environmental effects and improve environmental protection strategies;
- f) how monitoring data will be disseminated to the public, Indigenous communities or other interested parties; and
- g) how the results of monitoring programs and publicly available monitoring information will be integrated with VCS's environmental management system.