

**Value Chain Solutions-
Heartland Complex
(Bitumen Upgrader
and Specialty Refinery)
Expansion Project**

**Initial Project Description
Summary**

November 2020

**Submitted to:
Impact Assessment Agency of Canada**

**Submitted by:
Value Chain Solutions, Inc.**



Acronyms

AAAQO	Alberta Ambient Air Quality Objective
ACO.....	Aboriginal Consultation Office
ADC™	Accelerated DeContamination™
AER	Alberta’s Energy Regulator
AIH	Alberta’s Industrial Heartland
bpd	barrels per day
CO	carbon monoxide
CO ₂	carbon dioxide
CO _{2e}	carbon dioxide equivalent
COCT™	Clean Oil Cracking™
COLF.....	Clean Oil La-Fit, VCS-H crude oils brand name
DCO	decontaminated oil
Dilbit	diluted bitumen
DRU	diluent recovery unit
EIA	environmental impact assessment
EPEA	<i>Environmental Protection and Enhancement Act</i>
FAP	Fort Air Partnership
GHG.....	greenhouse gas
H ₂ S	hydrogen sulphide
H ₂	hydrogen
IAA.....	<i>Impact Assessment Act</i>
IAAC.....	Impact Assessment Agency of Canada
LPG	liquefied petroleum gas
NH ₃	ammonia
NO _x	oxides of nitrogen
OSCA	<i>Oil Sands Conservation Act</i>
PM.....	particulate matter
PM _{2.5}	fine particulate matter less than 2.5 µm in diameter
ppm	parts per million
ROW.....	Right-of-Way
SO ₂	sulphur dioxide
VCI	Value Creation Inc.
VCG.....	Value Creation Group
VCS	Value Chain Solutions Inc.
VCS-H	Value Chain Solutions–Heartland Complex
WRHP™.....	Wide Range Hydroprocessing

Background Information

Value Chain Solutions Inc. (VCS) has the focused mission to achieve a fundamental shift in the Oil Sands Industry by converting bitumen to clean oil with best-in-class environmental performance in an economically competitive way. VCS, a wholly owned subsidiary of Value Creation Inc., is the operating company of a partially built bitumen upgrader and specialty refinery, named Value Chain Solutions-Heartland Project, short for VCS-H Project 1 in this document. Value Creation Inc. holds the regulatory approvals of VCS-H Project 1.

An Environmental Impact Assessment (EIA) was completed for the approved VCS-H Project 1 in 2004.¹ Diluted bitumen (DilBit) upgrading/specialty refining with a capacity up to 29,890 m³/day (188,000 barrels/day) was approved by the Alberta Energy Regulator (AER) under:

- *Oil Sands Conservation Act* (OSCA) Approval No. 10330B;
- *Environmental Protection and Enhancement Act* (EPEA) Approvals No. 203303-01-00, 203303-01-01; and
- *Water Act* (WA) Approval No. 1001178 and *Water Act* (WA) License No. 00224750-01-00 to withdraw water from the North Saskatchewan River.

A Tank Farm (petroleum storage facility) with a storage capacity of 256,600 m³ (1.6 million barrels)², serving VCS-H Project 1, was approved in 2017 under:

- EPEA Approval No. 387876-00-00.

1. Project Overview

VCS is proposing to construct and operate the Value Chain Solutions-Heartland Complex Expansion Project (the Expansion or the Project). The proposed Project is the expansion of the approved VCS-H Project 1, that will increase the input capacity by a factor of 4, for a total combined capacity of up to 119,240 m³/day or 750,000 barrels/day. The combined approved VCS-H Project 1 and proposed Expansion is referred to as the VCS-H Complex. The Project life for the VCS-H Complex as a whole is anticipated to be over 50 years.

The proposed Expansion will also increase the petroleum storage capacity by 1,067,000 m³ (6.7 million barrels) to a total capacity of 1,323,600 m³ (8.3 million barrels) for the entire VCS-H Complex. The proposed Expansion will be implemented in 3 stages, following the approved VCS-H Project 1, named Project 2, 3 and 4 constituting the Expansion.

The Project will be located on private land immediately adjacent to the approved VCS-H Project 1. This land is situated northeast of Edmonton, in the designated Astotin Heavy Industrial Area of Strathcona County within Alberta's Industrial Heartland (AIH) (Figure 1). The proposed Expansion is centered at the south half of Section 11, Township 056, Range 21, West of the 4th Meridian, approximately 18 km north east of the City of Fort Saskatchewan and 8 km west of the Town of Bruderheim.

The proposed Expansion will use proprietary technologies to upgrade and refine diluted bitumen to value-added products including premium-medium synthetic crude oil, naphtha, diluent, ultra-low sulphur diesel, cleaned heavy crude oil and low sulphur marine fuel. VCS-H Complex will reduce net greenhouse gas (GHG) emissions, add value

¹ No federal comprehensive study of environmental assessment was triggered under the *Canadian Environmental Assessment Act* (1992) in 2004-2005 during the VCS-H Project 1 EIA review stage.

² The Tank farm serving VCS-H Project 1 has a proposed petroleum storage capacity of 256,600 m³, under the threshold of designating physical activities for petroleum storage capacity of 500,000 m³ or more (SOR-2012-147, Schedule 14 as of 2016).

within Alberta and Canada, free up the pipeline bottleneck, broaden the market, and achieve robust economics against volatilities in oil price and light/heavy price differentials.

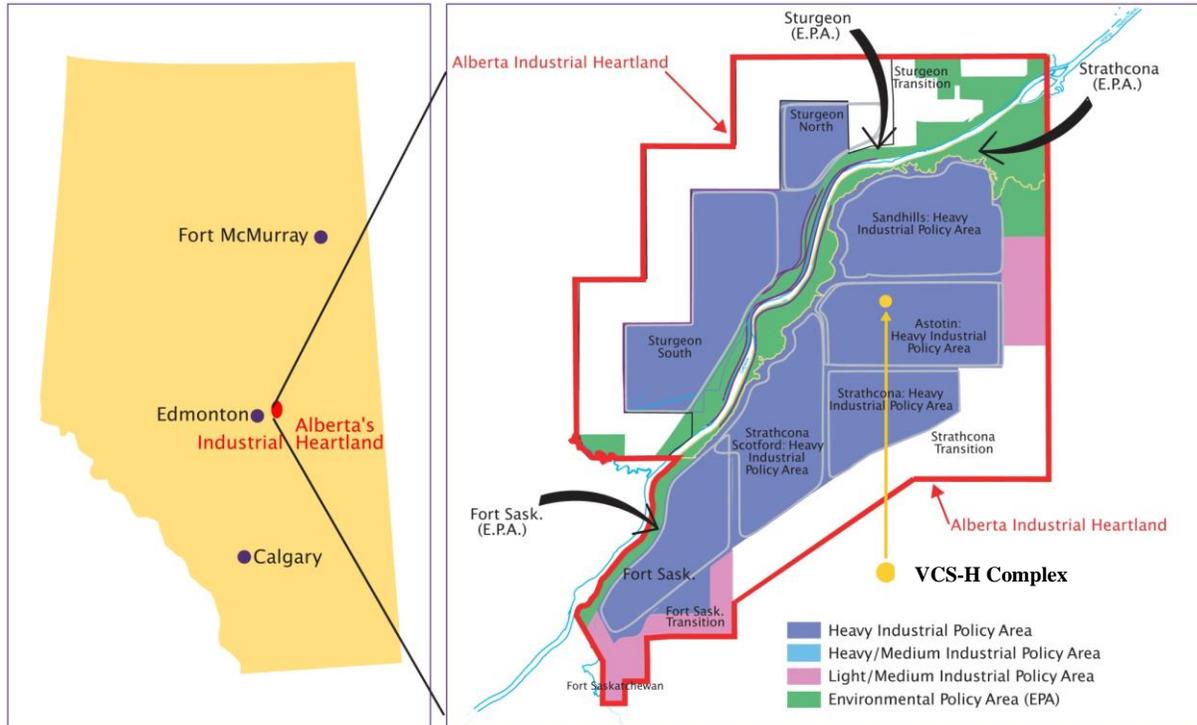


Figure 1 Location of VCS-H Complex in the Alberta’s Industrial Heartland

2. Contact Information

The Project proponent is Value Chain Solutions Inc. (VCS), a wholly owned subsidiary of Value Creation Inc. (VCI).

Value Chain Solutions Inc.
1100, 635–8th Avenue SW Calgary, Alberta T2P 3M3
Telephone: 403.539.4500 (Calgary) or 1-855-908-8800 Fax: 403.539.4501
Website: www.vcsb2co.com

Contacts for the purpose of the description of the proposed Expansion:

Cindy Yin, Coordinator – VCS-H Regulatory Applications
Iva Georgieva, Government, Regulatory & Stakeholder Relations

Project email: VCS.Heartland@vctek.com

3. Engagements Undertaken

Early engagement on the Proposed Expansion has included communication with the municipal authorities in the region of the VCS-H Complex, the AER and the Impact Assessment Agency of Canada (IAAC). In addition to the current Initial Project Description and subsequent Detailed Project Description to be submitted to the IAAC, VCS plans to prepare and submit an integrated EIA and application for the Expansion to the AER. VCS is working with independent environmental consultancy agencies to summarize environmental baseline information and to prepare the applications.

No key issues or concerns on the proposed Expansion have been raised to date. General inquiries on Project timeline and water usage requirements were received during early engagement activities.

4. Indigenous Group and Public Engagements

Indigenous Group Engagements

VCS is committed to timely, continuous, open and meaningful consultation with potentially affected First Nation(s) and/or Metis Settlement(s) in support of the Expansion. The consultation process is transparent and continuous throughout the life of the Project both pre- and post-approval, including site preparation, construction, commissioning, decommissioning and reclamation phases, in a manner designed to understand opportunities and meaningfully address issues, including potential effects on traditional lands. The consultation process is intended to establish a positive foundation for building respectful and effective relationships that can help shape and guide the longer-term commercial development of Proposed Expansion.

In July 2019, VCS submitted a pre-consultation assessment request to the Aboriginal Consultation Office (ACO) of the Government of Alberta for the Expansion to amend the existing *Environment Protection and Enhancement Act* approvals. After reviewing the Project information, ACO determined that no Indigenous consultation is required. VCS will submit a separate pre-consultation assessment request under the *Water Act* for the Proposed Expansion when additional information is available.

In September 2019, VCS alongside leading Alberta First Nations, jointly announced an Alliance Agreement for meaningful participation and investment interests in the VCS-H Project. This alliance hopes to extend beyond the initial First Nation communities.

Engagements with Indigenous communities in the region were initiated for the Project through the distribution of letters and Public Disclosure Documents. VCS invited Indigenous communities to meet and receive more information on the Expansion and to hear and share interests and/or concerns. List of the Indigenous communities that are being consulted and may be affected by the carrying out of the Project is below:

Alexander First Nation
Alexis Nakota Sioux Nation
Athabasca Chipewyan First Nation
Beaver Lake Cree Nation
Blood Tribe
Buffalo Lake Métis Settlement
Chipewyan Prairie Dene First Nation
Descendants of Michel First Nation (Michel First Nation)
Elizabeth Métis Settlement
Enoch Cree Nation #440
Ermineskin Cree Nation

Fishing Lake Métis Settlement
Foothills Ojibway First Nation*³
Fort McMurray First Nation #468
Friends of Michel Society (Michel First Nation)*
Gunn Métis Local 55
Kehewin Cree Nation
Kikino Métis Settlement
Louis Bull Tribe
Métis Nation of Alberta – Region 4
Montana First Nation
O’Chiese First Nation
Paul First Nation
Piikani Nation
Saddle Lake Cree Nation
Samson Cree Nation
Siksika Nation
Stoney Nakoda Nation
Tsuut’ina Nation
Whitefish Lake First Nation #128

During early engagement with Indigenous communities, there have been no issues or concerns raised. Below is a summary of commitments made by VCS based on discussions with Indigenous communities held to date:

- VCS is dedicated to protecting North Saskatchewan River throughout the Project life;
- Once approved, Indigenous communities will be included in the notification list in case of major incidents/emergency during construction and operation of the Project;
- Indigenous communities are open to combine technical review and traditional land use studies, as appropriate, for cost savings and time effective reviews.

VCS will continue to prepare application information and public notices for distribution to Indigenous communities in culturally sensitive, non-technical, plain-language formats. VCS will ensure that information on the proposed Expansion is directly provided to engaged Indigenous groups, at key regulatory milestones through a variety of methods, including:

- hand-delivery;
- mail and/or courier;
- web-based material; and
- email.

In addition to the above, VCS will continue engagement with Indigenous groups via in person meetings and/or tele- and video-conferences, or other methods, as needed. The consultation will synchronize with the planning stage and possible Impact Assessment stage during the Impact Assessment Process led by the IAAC. VCS will actively participate in the Engagement Process involving Indigenous communities as regulated by the *Impact Assessment Act* led by the IAAC.

Overall, VCS has been met with broad general acceptance on proposed Expansion. Most Indigenous communities have expressed interest in contract/service and/or investment opportunities. Future engagement will include regular

³VCS was not able to reach the two groups with asterisks(*) with information packages returned

Project updates to Indigenous communities on key upcoming activities, such as VCS-H Project 1 sanction, service bidding opportunities, employment/apprentice training programs and the Expansion progress.

Public Engagements

VCS remains committed to working with neighbors and community organizations to provide appropriate information about its project and related potential impacts, benefits and opportunities.

VCS held an Open House on March 26th, 2019 in Fort Saskatchewan for early engagement and consultation on the Expansion plan and options. VCS also held an information booth and presented at the Life in the Heartland event at Lamont Community Hall on April 25th, 2019 for Project update and general public information. There was a strong interest and support from the stakeholders for the future growth of the VCS-H Complex.

As part of its early public engagements for the Expansion, VCS distributed notification packages including a Public Disclosure Document and a public involvement area map to the identified nearby residents and businesses. Stakeholders have been directed to access the VCS website for updates and contact information for both general and specific queries and/or concerns.

VCS is in discussion with a small business owner with a residence near the Project site to address the owners' early concerns and mitigation measures for potential Project-specific impacts. The key issues that were raised by this business owner include potential noise, chemicals, traffic, light and ground water impacts to their business-owned residence. These issues and potential mitigation means on Project-specific impacts are expected to be addressed in the detailed environmental impact assessment report.

Consultation and engagement with stakeholders will continue throughout the Project regulatory approval process and the life of the Project.

5. Regional Environmental Study

Although there are no regional assessments as defined in Sections 92 and 93 of the *Impact Assessment Act* in the Expansion Project region, there are quite extensive provincial and municipal environmental management plan and framework set up for the region. Additionally, there were extensive Environmental Impact Assessments completed for several bitumen Upgrader Projects in the region before 2007.

6. Strategic Assessment

The strategic assessment of climate change, published in July 2020, is a strategic assessment conducted under subsection 95(2) of the *Impact Assessment Act*, and it applies to all designated projects under the *Impact Assessment Act*.

7. Purposes/Needs and Potential Benefits

The purpose of the proposed Expansion is to increase the capacity to upgrade and refine Alberta Oil Sands diluted bitumen into clean crudes and high-quality fuel products in an economically and environmentally sustainable way. The VCS-H Complex (approved and proposed) will upgrade/refine up to 119,240 m³ or 750,000 barrels per day of

diluted bitumen feedstock to produce COLF⁴ Premium (a premium medium crude), COLF Heavy (a cleaned heavy crude), diesel, diluent and marine fuels in Alberta.

The available North American conventional refining capacity for medium crudes is widening as a result of significant growth in the production of light oil combined with the steady decline of Alaskan North Slope crude oil. The proposed Expansion will produce COLF Premium to meet the widening demand for medium crude oil, COLF Heavy for existing heavy crude refineries/future customized refinery, diluent to return to the local bitumen producers, ultra-low sulphur diesel and low sulphur marine fuel conforming IMO standard 2020.

VCS-H Complex including the Expansion will provide significant economic benefits to local, regional, provincial and national economies through direct benefits including value-adding in the form of upgraded and refined products, tax revenues, business and employment opportunities, reduced GHG net emissions and product combustion emissions.

Indirect benefits include pipeline debottlenecking, market diversification, opening new export markets, stabilizing volatile light-heavy oil differentials and investment attraction. VCS is also committed to building and expanding alliance for meaningful participation and investment interests with Indigenous groups.

8. Provisions

Under the *Impact Assessment Act*, two designated activities are identified as:

1) the proposed Expansion from the approved capacity of 29,890 m³/day or 188,000 barrels/day to up to 119,240 m³/day or 750,000 barrels/day, an increase in input capacity of 300%, is a designated activity under Provision 38 (a) of SOR/2019-285 *Physical Activities Regulations*; and

2) the proposed Expansion tank farm storage facility from the approved capacity of 256,600 m³ to add storage capacity of approximately 1,067,000 m³, an increase in storage capacity of 416%, is a designated activity under Provision 38 (e) of SOR/2019-285 *Physical Activities Regulations*.

9. Activities, Infrastructure, Structures and Physical Works

Approved Facilities (VCS-H Project 1)

Construction of the approved VCS-H Project 1 was halted in 2008 despite being quite advanced. Site development that was completed includes:

- site preparation;
- installation of underground fire water loop piping and hydrants;
- oily water sewers;
- storm water sewers;
- storm water pond;
- several field constructed tanks;
- API oil-water separator; and
- buildings including the control room/warehouse and administration buildings.

⁴ COLF, standing for Clean Oil La-Fit, is VCS-H crude oils' brand name.

As shown in Figure 2 in the purple boundary, the approved VCS-H Project 1 site is under a preservation program and is manned 24/7. Construction for pilings, foundations for equipment and pipe-racks are well advanced for the entire site. Equipment is preserved on site and stored either in warehouses or kept outdoors with appropriate corrosion-prevention measures. The site is connected to the high voltage power supply, natural gas and river water supply from the North Saskatchewan River. VCS will contract from a third party for water supply for VCS-H Project 1 usage through an existing license under Alberta’s *Water Act* for the diversion of water from the North Saskatchewan River.

VCS-H Project 1 includes the approved tank farm (in orange boundary as in Figure 2), which has a separate provincial regulatory approval (EPEA Approval No. 387876-00-00). The tank farm will cover approximately 45 ha to house all storage tank requirements for feeds and products for VCS-H Project 1 as well as rail and truck loading facilities required to move products and byproducts to the market.

Proposed Project Activities

The proposed Expansion will be located adjacent to the approved VCS-H Project 1, in green boundary as in Figure 2, within the VCI owned land. Construction and operation of the Expansion will be implemented in multiple stages (i.e. 3 stages, Project 2 through Project 4).

Table 1 Project Activities and Locations

Value Creation Inc. Owned Lands	Area (ha)	Project Activities	
		Approved Project 1	The Proposed Expansion
SW 10-056-21 W4M (+Portion NW 03)	93	Main facility for VCS-H Project 1 and Tank Farm	-
SE 10-056 21 W4M	65	Main facility for VCS-H Project 1	-
SW 11-056 21 W4M	64	-	Main facility for the Expansion*
NW 11-056 21 W4M	58	-	Main facility for the Expansion*
SE 11-056 21 W4M	57	-	Main facility for the Expansion* Realigned Astotin Creek*
NE 03-056 21 W4M	59	Railway loop for the VCS-H Project 1 and storm water pond inside railway loop	Tank farm for the Expansion* Railway loop for the Expansion
NW 02-056 21 W4M	62	Rail spur to connect with CP Railway	Tank farm for the Expansion*
NE 02-056 21 W4M	62	-	Storm water pond and flare stacks for the Expansion* Realigned Astotin Creek*
NW 01-056 21 W4M	19	-	Soil storage pile for the Expansion*
Sum Area (ha)	539	179	260

Asterisks(*) denote the Designated Activities as described in Section 9.

Planned construction activities for the Expansion will include:

- site clearing and grubbing followed by site grading, timber salvage and mulching;
- VCS' installation of a new pipeline connecting the Expansion site to a third party North Saskatchewan River water intake facility to be approved under a new *Water Act* license;
- construction of additional water treatment, distribution and disposal facilities;
- installation of a storm water system including a pond, pumps and piping connections;
- construction of administration and new control room buildings and supporting infrastructure with laydown areas and a parking lot;
- additional connection to the electrical grid and new substation;
- construction of a tank farm for diluted bitumen and storage of products;
- additional railway loops, connections and loading facilities;
- re-alignment of Astotin Creek;⁵
- upgrading and construction of access roads connecting to municipal road(s);
- drilling and completion of water disposal wells.

Operation for the proposed Expansion and the approved VCS-H Project 1 will be similar as the common objective will be to produce clean crude oils and fuels. The main differences between the approved and proposed Projects will be in the transportation of the upgraded/refined products to the market. VCS-H Project 1 will make use of pipeline, truck and rail transportation due to the smaller volumes of product while the Expansion will maximize the use of pipeline and rail transportation due to the higher product volumes.

Activities associated with the Expansion Project include:

- commissioning and start-up of bitumen upgrading and refining process units;
- water treatment and use including wastewater/storm water treatment and disposal through deep-well injection;
- water recycling to reduce water disposal;
- planned and unplanned maintenance;
- diluted bitumen receiving;
- products and byproducts loading and shipping.

Supporting process units for the Expansion include Amine Treating Unit for sour gas absorption in the amine absorption towers, Sour Water Stripper for water-soluble sour gas separation from sour water, Mercaptan Treatment Unit, Asphaltene Handling Facilities dealing with the byproduct asphaltene dewatering and loading, Sulphur Recovery Unit that will treat the H₂S to produce elemental Sulphur, Hydrogen Manufacturing Unit that produces hydrogen (H₂) for Hydroprocessing units.

⁵ The current proposed realignment follows the south and east boundary of the Project site on VCI-owned lands west of Range road 211. A conceptual plan for a proper realignment route will be submitted with environmental surveys, construction and monitoring program will be reviewed with AER and Fisheries and Oceans Canada accordingly.

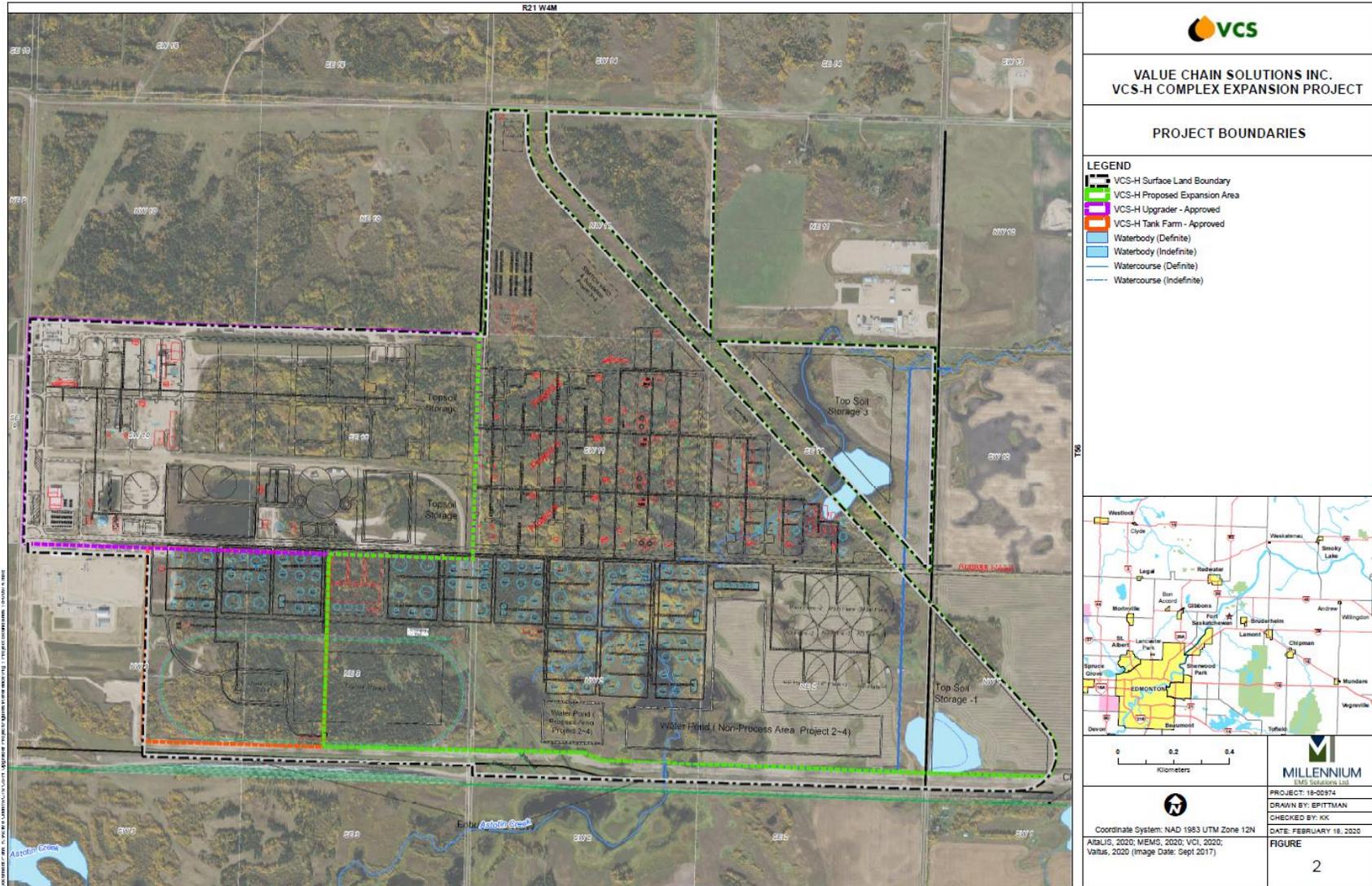


Figure 2 Site Map Showing the VCS-H Complex Boundaries and Components

Utilities and offsites supporting the Expansion include:

- expansion of Amelia substation or a new substation for Project electricity usage;
- river water treatment and wastewater treatment units;
- potable water and sanitary system, storm water ponds;
- cooling tower system;
- fuel gas and natural gas systems;
- nitrogen and air systems;
- steam and condensate systems;
- flare system;
- new petroleum storage tanks and dikes, pumps and piping, vapour recovery units and controlling units; and
- expansion of VCS-H Project 1 rail yard through adding more railway loops, connections, and supporting units including loading facility and unloading pits.

The regional infrastructure supporting the Expansion include:

- tie-in to existing natural gas pipelines;
- DilBit feed supply lateral pipeline(s);
- recovered diluent return lateral pipeline; and
- product sales lateral pipelines.

Activities incidental to the Designated Project Activities with possible third party contracting for construction and operation include:

- installation of high power supply through the expansion of Amelia substation or building a new substation;
- installation of local water pipeline and pumps from water intake facility to Project site;
- transportation and storage of byproduct Asphaltene at depleted mine site(s); and
- construction and operation of Sulphur forming facilities.

At the end of the Expansion project life, any affected soils will be treated onsite or moved to approved disposal facilities. Belowground pipelines will be purged, capped and abandoned in place per regulatory standards. A conceptual conservation and reclamation plan will be provided as part of the environmental impact assessment.

10. Production Capacity and Process Descriptions

At full build-out, the VCS-H Complex is expected to process a maximum⁶ of ~120,000 m³ or 750,000 barrels per day of DilBit to produce diluent, COLF Premium, COLF Heavy, diesel, marine Fuels and smaller quantities of petrochemical products after blending.

The water requirement for the Expansion is estimated to be 1,212 tonnes per hour. The Expansion will require a new *Water Act* application for the required water volume at an existing 3rd party water intake facility for its freshwater withdrawal from the North Saskatchewan River.

The main processing units of the Expansion include:

⁶ A maximum capacity is the capacity the VCS-H Complex could reach after further debottlenecking and optimization on operating conditions, it is expected the maximum total intake capacity of VCS-H Complex (Project 1 and the Expansion) will be ~120,000 m³/stream day or 750,000 barrels/stream day. Proposed capacity is the capacity as shown in the material balance in regulatory applications based on design conditions.

- the Diluent Recovery Unit (DRU), which separates the diluent from the bitumen in the diluted bitumen feedstock;
- the Accelerated De-Contamination unit (ADC™), which separates asphaltene from the bitumen feed to produce De-Contaminated Oil (DCO);
- the Clean Oil Cracking unit (COC™), which thermally cracks half of the DCO into gas oil, distillate and naphtha with unconverted vacuum residue to be removed in the other ADC™ unit; and
- the Wide Range Hydroprocessing units (WRHP™), which accepts the vacuum gas oil, distillates and naphtha for hydrotreating and hydrocracking to produce diesel and refined products for blending into COLF Premium and low sulphur marine fuels. The other half of the DCO is blended with the recovered diluent to produce COLF Heavy.

11. Project Schedule

The staged expansion of the VCS-H Complex will follow conventional project management procedures that include scoping, design, engineering, procurement and construction after which facilities are turned over to operations to maintain and operate for several decades prior to decommissioning and abandonment. Subject to regulatory approvals, market conditions and future investment decisions, design, construction and commissioning of each sub-Project stage of the Expansion will commence three to four years after the previous stage with earliest Expansion operations in 2029 and then continuing for over 50 years. At its current location, there is no anticipation for further expansion beyond the proposed Expansion.

12. Alternative Considerations

Technical alternative considerations include project technology and the byproduct-asphaltene use, electrical substation, water supply and Astotin creek realignment route. Project alternative considerations include other locations for bitumen processing and refining.

A summary of the alternatives considered for the proposed Expansion is provided below in Table 2.

Table 2 Summary of Alternative Considerations

	Potential Alternative Considered
Means of carrying out the Project (technically and economically feasible, including best available technologies)	<ul style="list-style-type: none"> • Upgrading/refining technology <ul style="list-style-type: none"> • VCI’s proprietary technology is more efficient as compared to conventional technology and will be used in VCS-H Project • Byproduct-asphaltene use: <ul style="list-style-type: none"> • Long-term storage at depleted mine pits • Convert asphaltene using commercially ready technologies to paving and roofing asphalt, activated carbon and more in the future • Electrical substation for the Expansion electricity needs: <ul style="list-style-type: none"> • The expansion of the existing Amelia substation • Construction of a new substation • Water supply • Astotin creek realignment route
Alternative to the Project (technically and economically)	<ul style="list-style-type: none"> • A newly built or revamped coastal refinery to refine customized crude streams from the VCS-H Complex • An upgrader/specialty refinery closer to the bitumen producers in the Athabasca region

feasible and directly related to the Project)	<ul style="list-style-type: none"> • An upgrader/specialty refinery at another logistic hub, i.e. Hardisty
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13. Project Location Description

The proposed Expansion will be located adjacent to the approved VCS-H Project 1 facilities (built and planned), strategically located in the pivotal Oil Sands transportation hub in Alberta’s Industrial Heartland (AIH), in the Astotin Heavy Industrial Area of Strathcona County, northeast of Edmonton. The legal land description for the center of the proposed Expansion is the southern half of section 11, Township 056, Range 21, West of the 4th Meridian, approximately 18 km northeast of the City of Fort Saskatchewan and 8 km west of the Town of Bruderheim, see Figure 3 below.

The Expansion site is located on private land zoned for heavy industrial activities. The land is also within the treaty land boundaries of Treaty 6 First Nations and Métis Nation of Alberta Region 4. The closest First Nation communities include the Enoch Cree Nation located approximately 60 km southwest and the Alexander First Nation approximately 60 km west of the Project site (Figure 3). AIH has been an active industrial area for the past 20 years. There are no current or known traditional uses of the Project site to date and VCS is not aware of any anticipated impacts on hunting, fishing, or gathering uses by Indigenous people at the Expansion site.

Federal lands in the proximity of the Project include the Elk Island National Park (approximately 25 km southeast of the Project in Figure 3), the Canadian Forces Base Edmonton (Edmonton Garrison, approximately 35 km southwest of the Project) and the Redwater Helicopter training site (approximately 15 km northeast of the Project).

The 2018 updated Area Structure Plan for AIH reinforced that the area is primarily to be developed as heavy industrial with transitional border areas.

In addition to the public notification and Open House/industrial community meetings, VCS is committed to more tailored public engagement based on public safety, potential concerns and the emergency planning zone for Proposed Expansion. This tailored engagement group includes the nearby residents, landowners and industry land users in the area inside and adjacent to the estimated emergency planning zone. Besides the nearby industry land users, there are two residences about 1 kilometer from the nearest VCS-H Complex boundary to the south (one residence at ~1.1 km, one business shop at ~1.5 km) and one business residence (~300 m) to the northeast.

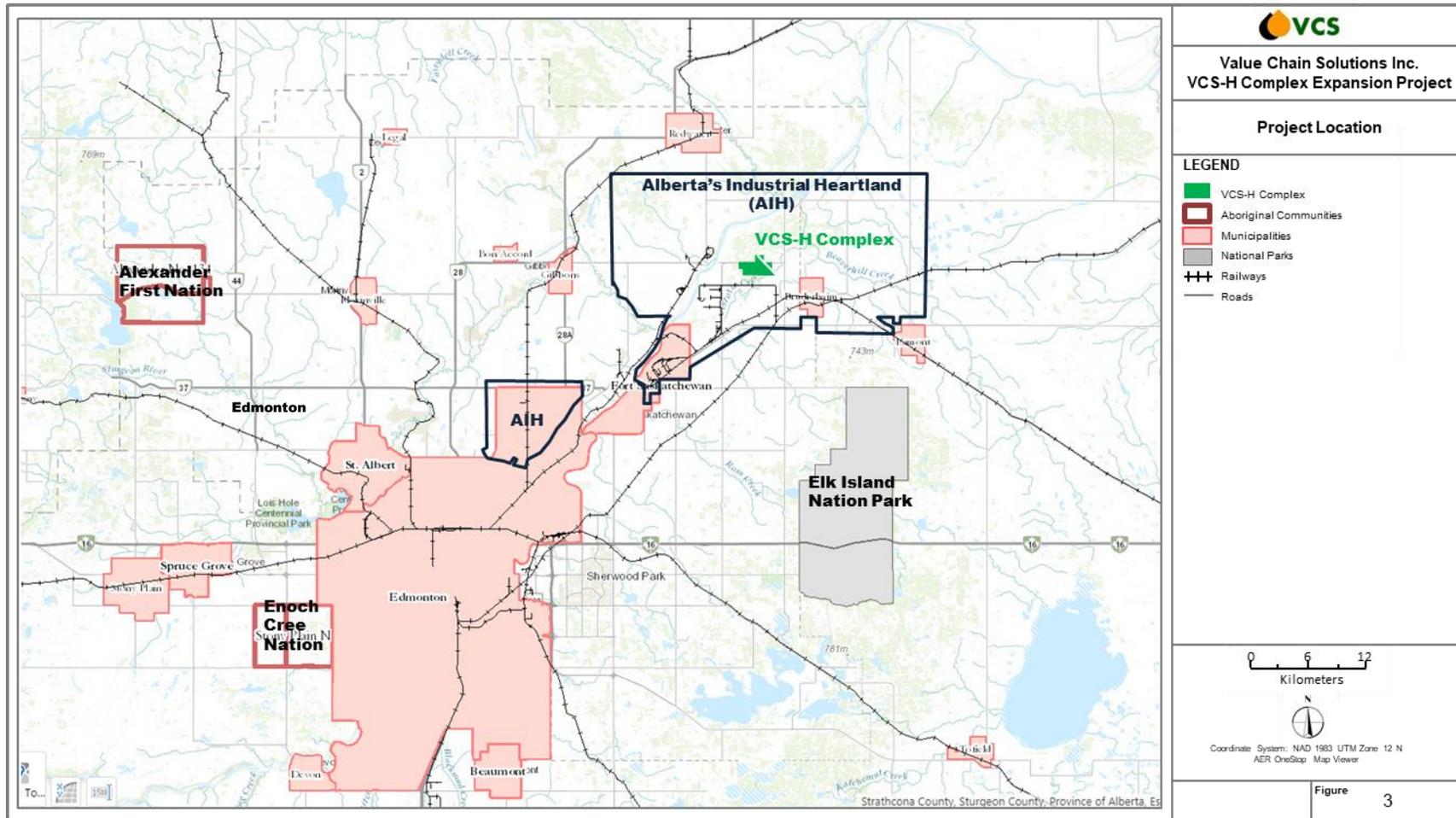


Figure 3 Project Location

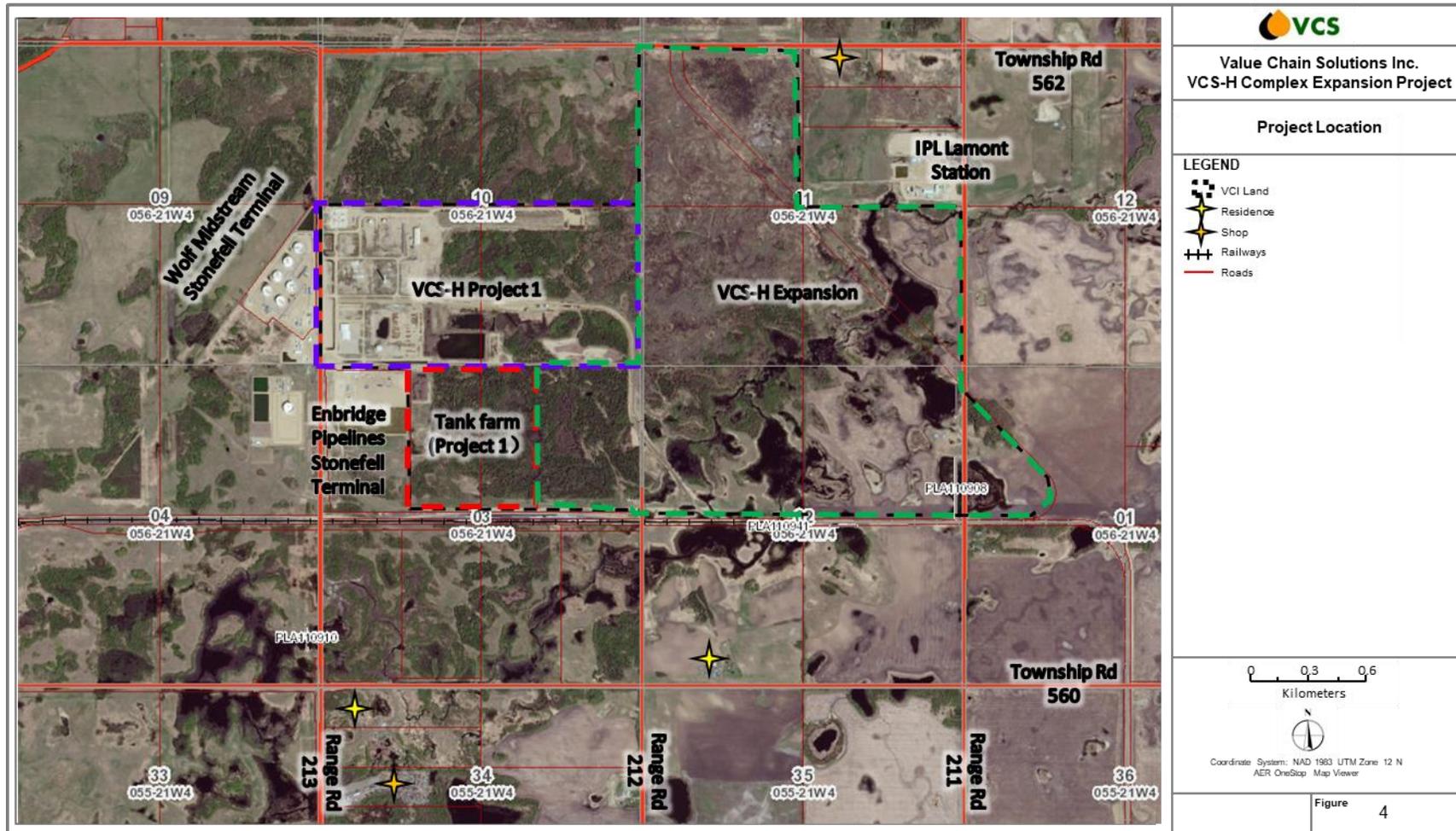


Figure 4 Site Map Showing the VCS-H Complex Location

14. Physical and Biological Environment

VCS and affiliated environmental consultants have conducted environmental baseline work that will be incorporated into an environmental impact assessment for the Project. All potential environmental and social impacts will be identified, and appropriate mitigation and monitoring will be proposed to minimize or eliminate potential project effects.

The previous designation of the Astotin Natural Area located north of the Expansion Project area was repealed in 2007 as the result of an earlier land swap with the Government of Alberta. Lands that were exchanged as part of the agreement include lands near Miquelon Lake Provincial Park, the Lois Hole Centennial Park, the Ministik Lake Game Bird Sanctuary and Beaverhill Lake Heritage Rangeland Natural Area. Subsequently, the Astotin Natural Area designation on the west half of Section 11, Range 056, Township 21, West of the 4th Meridian was repealed.

For the proposed Expansion project area, around 60 ha land is cleared (approximately 17%, contract farmed), and the remaining area is undisturbed land (300 ha, approximately 83%).

Subject to further discussion with the Strathcona County, two range roads (RR) can be used to access the Project site: Range Road 213 along the west end (primarily for VCS-H Project 1 access) and Range Road 211 along the east, which will be used to access the Expansion project site. Township Road 562 runs along the north boundary of the VCS-H Complex, which will also provide access for the Expansion (Figure 4).

The Expansion Project site is surrounded by major industrial facilities, linear disturbances and agricultural lands with environmental considerations as described in the following sections.

Air Quality: AIH is an area designated by the Province of Alberta for heavy industrial growth. Ambient air quality in the Heartland is monitored and reported by Fort Air Partnership with 10 continuous monitoring stations that measure certain air contaminants on a 24-hour basis, and a network of 47 passive monitors that measure concentrations of sulphur dioxide and hydrogen sulphide on a monthly average basis. Air quality is in the low health risk level, as measured by the Air Quality Health Index most of the time (refer to Fort Air Partnership website for details).

Noise: The Expansion is located within AIH which consists of dozens of large-scale industrial facilities that are regulated by the AER as well as the Alberta Utilities Commission. All existing industrial facilities within the study area will be included in the noise assessment for the EIA, using the regional noise model that has been generated by the Northeast Capital Industrial Association (NCIA).

Soils and Terrain: The proximity of the Redwater Plain to the North Saskatchewan River explains the presence of sandy, glaciofluvial deposits that dominate the area. A portion of these deposits have been wind-worked into dune topography and subsequently stabilized by vegetation.

Aquatic Resources: The Expansion is situated in the Astotin Creek watershed. Astotin Creek originates at Astotin Lake located in Elk Island National Park and drains into the offsite Beaverhill Creek which, in turn, drains into the offsite North Saskatchewan River. No sport fish species have been recovered in either Astotin Creek or the lower section of the offsite Beaverhill Creek, and none of the fish species known to reside in either Astotin Creek or the lower section of offsite Beaverhill Creek are listed in any of the schedules of the *Species at Risk Act* or as candidate species by Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Surface Water: The Expansion will overlap Astotin Creek and several open water, fen, marsh, and swamp wetlands. The Project area is located within the Dry Mixedwood Natural Subregion. Lakes within this subregion are among the least sensitive to acid deposition compared to other lakes in Alberta.

Groundwater: The regional geology in the Fort Saskatchewan area has been influenced by pre-glacial, glacial and postglacial events. The geological sequence consists of a succession of unconsolidated Neogene and Quaternary-aged deposits unconformably overlying Cretaceous-aged deposits. Water wells in the Fort Saskatchewan area are completed in the surficial sand deposits, the sand and gravel deposits of the Beverly Channel, and the upper bedrock. The majority of the wells are for domestic or domestic and agricultural use. There are no known active groundwater wells in close proximity to the Expansion Project site.

Vegetation: The Project site is located within the Dry Mixedwood Natural Subregion, which is characterized by aspen forests, cultivated lands, and fens typically occurring in low-lying areas.

Wildlife: The Project is located in a portion of Strathcona County that falls within AIH, an area that is predominantly characterized by agricultural and industrial land uses. Wildlife habitat within a fragmented landscape is largely a function of forest clearings and the amount of edge habitat relative to interior habitat.

15. Health, Social and Economic Regional Information

A human health risk assessment and socioeconomic impact analysis is underway and will cover detailed analyses in due course. Following is an overview of the background information on health, social and economics in the region.

According to the Community Social Profile published in 2018 by Strathcona County, there are 27,345 residents living in the rural area of Strathcona County in 2016 with 70,700 residents in the urban Sherwood Park. This places Strathcona County as the fourth largest municipality in Alberta after Calgary, Edmonton and Red Deer. Four percent (4%) of the Strathcona County population was identified as Aboriginal as of 2011.

The median age of the population in Strathcona County was 37.8 in 2006, 39.1 in 2011 and 40.1 in 2016, indicating a larger portion of the population is aging from 2006 to 2016. The life expectancy in the Edmonton Zone where Strathcona County lies within is 81.8-82.0 years from 2011 to 2017, as compared to that of 81.8-82.1 years in Canada.

The economics of the region was affected largely by the energy industry downturn due to the economic effect of a decline in oil prices. The workforce population reached the lowest point in July 2016 and slowly recovered but is not back to the level that was observed in 2013. As of 2016, the unemployment rate in Strathcona County is 6.5%, as compared to 9% in Alberta.

In their 2013 community profile for Strathcona County, Alberta Health indicated the following:

- In 2010, the disease with the highest prevalence rate (per 100 population) in Strathcona County was hypertension. The rate associated with this disease was similar to the provincial average (13.7 vs. 14.2 in Alberta).
- The age-standardized rate for people with three or more chronic diseases (per 100 population) was similar in Strathcona County compared to the province (2.1 vs. 2.2 in Alberta).
- The mortality rate (per 100,000 population) due to all causes was similar in the County compared to the province (497.6 vs. 519.2 in Alberta), and the most frequent cause of death reported between 2001 and 2010 was diseases of the circulatory system.

In 2012, Strathcona County undertook a telephone survey to assess residents' perceptions about health and lifestyle issues. Survey respondents were asked to rate their personal health. The key findings of the health aspects of the survey were that:

- two-thirds (67%) of Strathcona County residents rated their personal health as very good/excellent; and
- higher proportions of rural residents (71%) rated their personal health as very good/excellent as compared to Sherwood Park residents (66%).

Although conducted more than a decade ago, but still relevant with respect to baseline health, Alberta Health’s Fort Saskatchewan and Area Community Exposure and Health Effects Assessment Program examined health records to compare residents of Fort Saskatchewan with residents of a reference location (Lethbridge, Alberta) for selected morbidity and mortality measures, with a particular focus on respiratory disease. The study concluded that Fort Saskatchewan had higher rates of doctor visits for respiratory diseases (including the common cold), but not for illness or death from asthma, bronchitis, chronic obstructive pulmonary disease (COPD) or other chronic respiratory diseases.

16. Federal Financial Support

VCS has not received Federal financial support to date, while VCS is open to funding programs supporting GHG benefits this Project will bring.

17. Federal Land Use

No federal land will be used for the development of the Expansion.

18. Jurisdictions with Powers, Duties or Functions

The Federal jurisdictions potentially having powers, duties or functions in relation to the assessment of the proposed Expansion’s environmental effects are listed in **Table 3** below:

Table 3 Federal Jurisdictions and Legislative Acts

	Legislative Acts	Related Permits
Impact Assessment Agency of Canada	<ul style="list-style-type: none"> • <i>Impact Assessment Act</i>, 2019 • <i>Migratory Birds Convention Act</i>, 1994 (MBCA) • <i>Species at Risk Act</i>, 2002 (SARA) • <i>Fisheries Act</i>, 2019 	Notice of Determination and Decision statement for Impact Assessment (if required)
Environment and Climate Change Canada	<ul style="list-style-type: none"> • <i>Migratory Birds Convention Act</i>, 1994 (MBCA) • <i>Species at Risk Act</i>, 2002 (SARA) • <i>Fisheries Act</i>, 2019 	<i>Species at Risk Act</i> Permit
Fisheries and Oceans Canada	<ul style="list-style-type: none"> • <i>Species at Risk Act</i>, 2002 (SARA) • <i>Fisheries Act</i>, 2019 	<i>Fisheries Act</i> Authorization <i>Species at Risk Act</i> Permit
Transport Canada	<ul style="list-style-type: none"> • <i>Railway Safety Act</i>, 2019 	Railway operating certificate

19. Changes to the Environment within the Fisheries Act, Species at Risk Act and Migratory Birds Convention Act

Fish and Fish Habitat within the *Fisheries Act*

The Expansion Project may cause changes to fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act*, specifically in Astotin Creek.

A summary of the potential changes to fish and fish habitat are as follows.

Potential Effects from Changes to Surface Cover: The proposed Project footprint will be comprised of a number of facilities and infrastructure developments, which may potentially affect runoff to Astotin Creek. The assessment will consider a worst-case condition, whereby the Project footprint is considered completely enclosed for the life of the Project and none of the runoff from the Project footprint returns to Astotin Creek.

Potential Effects from Changes in Drainage Patterns and Changes in Channel Morphology: While there will be no transfer of water from one watershed to another as a result of the Project, the proposed Project footprint will cross Astotin Creek, which will be realigned from its current channel in NW 02, SE 11, Township 056, Range 11 W4M. The fish resources that have been recovered in the portion of Astotin Creek that would be re-aligned consist of mostly small-bodied species, one large-bodied species, and no game fish species. This portion of Astotin Creek is classified as *Stream-Recurring*, i.e., a river/stream with a stream bed that is often dry during certain times of the year due to climatic conditions and/or a limited area of drainage⁷. The proposed Astotin Creek realignment work will be in accordance with all applicable provincial requirements and the Federal Department of Fisheries requirements as stated in the *Fisheries Act*. Potential effects from changes in channel morphology downstream of the Project area, including changes in frequency of channel overtopping and flooding, are not anticipated. Similarly, because effects of any changes in surface runoff associated with Project development are expected to be negligible, sediment concentrations in Astotin Creek are not expected to increase.

Potential Effects from Surface Disturbance and Construction Activities: Surface disturbance and fill handling during construction (clearing and stripping of vegetation and topsoil to facilitate Project construction), operation, and decommissioning and dismantling of Project infrastructure may result in sediment deposition to the aquatic environment, which may affect surface water quality and sediment quality.

Potential Effects through Discharge of Project-Affected Waters and Accidental Spills: Discharge of Project-affected water into surface waters is not proposed for the Project. It is expected that process-produced water from the Project will be recycled to the extent possible. Accidental spills of fuels, hydrocarbons, chemicals, and waste products used for the Project could negatively affect water quality and sediment quality. The storage and handling of deleterious substances (*e.g.*, fuels, chemicals, contaminating materials, *etc.*) or hazardous materials would be dictated by applicable environmental legislation, regulations, standards, or codes.

Potential Effects from Changes in Groundwater Quality and Quantity: Project activities present a potential risk of contaminating groundwater, which in turn has the potential to result in adverse effects on surface water quality and sediment quality. There are two potential pathways of concern with respect to groundwater contamination that will be investigated and assessed: overland flow and accidental release of deleterious substances. The Project is located within the areal extent of the buried Beverly Channel aquifer. The buried channel is separated from surface activities by a thick layer of clay and clay till deposits and is not expected to be impacted by the Project.

Potential Effects through Instream Works: Watercourse crossings may be required as part of the proposed Project, and these will be designed and constructed in compliance with the *Alberta Code of Practice for Pipelines and Telecommunication Lines Crossing a Waterbody* and the *Alberta Code of Practice for Watercourse Crossings*.

⁷ As defined in <https://geodiscover.alberta.ca/geoportal/catalog/search/resource/details.page?uuid=%7B7F9C0F33-6DDB-4479-B2D9-1419D79E2D26%7D>

Results from formal watercourse crossing assessments that will be conducted will guide the selection of appropriately sized crossing structures such that flows are not impeded during times of high flow and channel erosion does not occur.

Potential Effects due to Increased Fishing Pressure: Astotin Creek does not contain sport fish species. There is recreational fishing associated with larger waterbodies such as lower Beaverhill Creek and the North Saskatchewan River and the construction labour force for the Project may create incremental fishing pressure on local sport fish resources.

Potential Regional Effects: The potential effects of the Project described above may extend regionally, to lower Beaverhill Creek and to the North Saskatchewan River. The Regional Study Area for aquatic resources will include lower Beaverhill Creek and an extended part of the North Saskatchewan River below the confluence of Beaverhill Creek so as to assess any potential regional effects.

Potential Effects of Acidifying Emissions: The Project may release acidifying emissions of NO_x and SO_x that can result in the acidification of waterbodies with subsequent effects on fish and fish habitat in those waterbodies. Evaluation of these potential effects will be conducted in the Regional Study Area adopted by the Air Quality component.

Species Listed Under Schedule 1 of the *Species at Risk Act*

A number of wildlife species may occur in the Fort Saskatchewan Area that are listed federally as “Special Concern” (may become a threatened or an endangered species) or are Schedule 1 species as defined under the *Species at Risk Act*. These include northern leopard frog, western tiger salamander, bank swallow, barn swallow, evening grosbeak, horned grebe, olive-sided flycatcher, rusty blackbird, short-eared owl, Sprague’s pipit, western grebe, and yellow rail. Terrestrial and aquatic habitats in the Fort Saskatchewan Area may support one or more of these species of conservation concern and may be affected by Project development.

Potential Effects from Changes to Surface Cover: The proposed Project footprint will be comprised of a number of facilities and infrastructure developments, which may affect federally-listed wildlife species that potentially occur in the area through several mechanisms. These effects include direct (e.g., vegetation clearing, wetland drainage, channel realignment, etc.) and indirect (e.g., noise/sensory disturbance) loss and/or alteration of habitats and potential reductions in local and regional habitat connectivity (i.e., movement corridors) resulting from habitat fragmentation. The assessment will assume a worst-case scenario where the Project footprint will be altered for the life of the Project, particularly as it relates to changes in terrestrial and aquatic habitats.

Potential Effects from Surface Disturbance and Construction Activities: Surface disturbance and fill handling during construction (clearing and stripping of vegetation and topsoil to facilitate Project construction), operation, and decommissioning of Project infrastructure may result in increased mortality risk for any federally-listed bird and amphibian species. Potential concerns are associated with destruction of nests, wetland drainage, and channel realignment.

Potential Effects through Discharge of Project-Affected Waters and Accidental Spills: Discharge of Project-affected water into surface waters is not proposed for the Project. It is expected that process-produced water from the Project will be recycled to the extent possible with the remainder disposed of via an approved deep well disposal facility. Accidental spills of fuels, hydrocarbons, chemicals, and waste products used for the Project could negatively affect water quality and sediment quality and any terrestrial areas adjacent to a spill site which could

directly and/or indirectly affect federally-listed wildlife species. The storage and handling of deleterious substances (e.g., fuels, chemicals, contaminating materials, etc.) or hazardous materials would be dictated by applicable environmental legislation, regulations, standards, or codes.

Potential Regional Effects: The potential effects of the Project described above on federally-listed wildlife species may extend regionally to adjacent terrestrial habitats to aquatic habitats associated with Astotin Creek and to the North Saskatchewan River. The Regional Study Area for wildlife will include terrestrial and aquatic habitats within a 50 km² area around the Local Study Area so that any potential regional effects on federally-listed species are addressed.

Potential Effects of Acidifying Emissions and Other Pollutants: The Project may release acidifying emissions of NO_x, SO_x, or other pollutants. The primary mechanisms through which federally-listed wildlife can be affected include effects on habitat quality (e.g., inhalation and deposition on terrestrial vegetation or into water) and availability and quality of food (e.g., ingestion of benthic invertebrates and/or terrestrial/aquatic vegetation). These potential effects will be assessed in the context of the Regional Study Area defined for the Air Quality component.

There are no aquatic species in Astotin Creek that are listed in any of the schedules of the *Species at Risk Act* or as a candidate species by COSEWIC. Therefore, no changes to aquatic species as defined in subsection 2(1) of the *Species at Risk Act* as a result of the Project are anticipated.

Migratory Birds within the Migratory Birds Convention Act

The Expansion may affect migratory birds as defined by the *Migratory Birds Convention Act*. Potential Project-related effects on migratory birds are expected to be largely related to direct (e.g., vegetation clearing, wetland drainage) and indirect (e.g., noise/sensory disturbance) loss and/or alteration of habitat, and increased mortality risk (e.g. nest destruction, collisions with Project infrastructure, etc).

Other potential effects on migratory bird resulting from the construction, operation and decommissioning of the Project may include increases in ambient concentrations of criteria air contaminants, or accidental spills of deleterious substances (e.g., wildlife health through inhalation or ingestion) and reductions in habitat security and abundance (habitat loss and species displacement to adjacent habitats).

Mitigation Measures

To address the environmental aspects of the Expansion, VCS is committed to using appropriate adaptive best management practices (BMP) and mitigation measures that will be identified, analyzed and considered in the Project design.

Based on Project characteristics, VCS mitigation measures will be developed to directly address every identified potential impact. A Construction Environmental Management System (CEMP) will be prepared to provide a targeted mitigation plan that focuses on addressing possible effects on various specific environmental resources.

As well, the CEMP will be based on applicable provincial and federal regulations and permit requirements, the environmental conditions at the site and mitigations developed from the environmental impact assessments processes will be implemented in a timely manner.

Furthermore, VCS will seek the services of a qualified environmental professional (QEP) from a reputable environmental consulting company to detail in a CEMP all the potential construction-related environmental aspects.

The plan will identify, develop, document and implement applicable mitigation measures and BMPs to avoid or reduce adverse construction impacts on the identified environmental aspects.

20. Changes to the Environment to Federal Lands

The Expansion's environmental impact assessment will be addressed in details in the EIA including any potential impacts to the nearby Federal lands including:

- an air quality impact assessment, which will include:
 - a description of the potential for reduced air quality resulting from the Project;
 - an estimation of ground-level concentrations of appropriate air quality parameters;
 - a discussion of any expected changes to particulate deposition, nitrogen deposition or acidic deposition patterns; and
 - a description of 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.
- a noise impact assessment, which will include identification of components of the Project that have the potential to increase noise levels and a discussion of the implications, including:
 - potentially affected people and wildlife;
 - an estimate of the potential for increased noise resulting from the development; and
 - strategies to monitor and mitigate any increased noise levels.
- a human health risk assessment, which will evaluate the potential human health risks that would be posed by emissions from the Project.

The Expansion will enable approximately 25-30% reduction of GHG emissions from upgrading and refining diluted bitumen to fuel products as compared to those of baseline without the Project (see Section 23 for details).

21. Impact to the Indigenous People of Canada on Physical and Cultural Heritage, Traditional Land Use and Historical Resources

The closest First Nation or Métis communities are approximately 60 km away. The proposed Expansion is located within AIH, an area dedicated to heavy industrial activities and development. No issues have been raised during the early consultation with the Indigenous communities. Below is a summary of commitments made by VCS based on discussions with Indigenous communities held to date:

- VCS is dedicated to protecting North Saskatchewan River throughout the life of the Project;
- Once approved, Indigenous communities will be included in the notification list in case of major incidents/emergency during construction and operation of the Project; and
- Indigenous communities are open to combine technical review and traditional land use studies, as appropriate, for cost savings and time effective reviews.

An historical, archaeological, paleontological study including ground reconnaissance was conducted for VCS-H Project 1 which included part of the Expansion Project area in the 2004 EIA. An *Historical Resources Act* Clearance was granted for VCS-H Project 1 following the Historical Resource Impact Assessment. A record review is currently underway for the Expansion through a screening application to the Alberta Culture, Multiculturalism and Status of Women.

VCS will gather information, including potential impacts, related to Indigenous physical and cultural heritage, traditional land use and historical, archaeological, paleontological or architectural significance for the proposed Expansion during the consultation process with Indigenous communities. Collected information will help VCS to avoid or mitigate any potential adverse impacts of the proposed Project activities to the Indigenous communities.

22. Impact to the Indigenous People of Canada on Health, Social or Economics

The nearest Indigenous communities are approximately 60 km away from the Expansion site. It is expected there are no adverse health, social or economic impact to the Indigenous People of Canada. Health risk assessment and socioeconomic impact assessment will be discussed within the regional and local study area centered at the Project in the EIA report.

It is expected that the Indigenous People of Canada will benefit from business/employment opportunities from the Project construction and potential partnership for direct economic benefits to uplift Indigenous wellbeing and wellness, all in harmony with sustainable growth of the Oil Sands upgrading industry.

23. GHG Emissions Estimates

The Expansion will generate GHG emissions throughout the construction, operation and decommissioning stages. Avoided domestic GHG emissions was calculated based on a life cycle analysis comparing the GHG emissions with or without the application of VCI technologies. The avoided domestic GHG emissions is estimated at 0.02 tonne CO₂e/barrel of bitumen processed with approximately 1,800 kt/year of net GHG emissions for the Expansion. The emission intensity is projected to be approximately 0.014 tonne CO₂e/barrel of bitumen for the Expansion.

24. Waste and Emissions

The air emissions used in the Air Quality assessments include Base Case emissions (i.e., emissions of existing and approved projects in the area) and the Expansion project emissions. Relative to the Base Case, the Expansion results in a small increase to regional SO₂, NO_x, PM, or CO emissions in the range of 3% to 15%. The maximum increase in regional emissions attributable to the Expansion is 15% for CO.

Table 4 The Expansion Solid Waste and Wastewater Information

	Quantity [t]	Frequency	Disposal Method
Solid Wastes			
Spent Catalysts for Hydroprocessing	1,800	3 years	Return to supplier for recycle
Spent Catalysts for Hydrogen Manufacturing	90	3 years	Return to supplier for recycle
Spent Zinc Oxide from Hydrogen Manufacturing	143	year	Third-party landfill
Spent Shift Catalyst from Hydrogen Manufacturing	154	3 years	Third-party landfill
Spent Adsorbents for Hydrogen Manufacturing	377	20 years	Third-party landfill

Spent Catalysts for Sulphur Recovery	500	3 years	Return to supplier for recycle
Spent Ceramic Balls (catalyst support)	580	3 years	Third-party landfill
Spent Air Desiccant	100	10 years	Third-party landfill
Spent Ion Exchange Resins for Water Treatment	200	7 years	Third-party landfill
Miscellaneous (filters, containers, domestic garbage, etc.)	To be determined	year	Third-party landfill
Wastewater for Deep Well Disposal			
Desalter reject water from process units	276	hour	Deep Well Disposal
Reject water from water treatment units	50.5	hour	Deep Well Disposal

Liquid and semi-liquid (sludge) wastes management includes waste oils, spent liquid chemicals, sanitary sewage, and wastewater (see Table 4) . Waste oils will be stored in the existing slop oil tank and will be re-processed in the process units if suitable. Spent liquid chemicals, including contaminated oily wastes that are not suitable for re-processing, will be stored in designated containers, and shipped offsite by licensed third-party contractors for disposal or recycle. Sanitary waste will be hauled off-site by a licensed third-party contractor for further treatment and disposal.