

SCHEDULE 1

AGREEMENT TO PROCESS CROWN ROYALTY BITUMEN

DESCRIPTION OF THE FACILITY

1. GENERAL

1.1 Capitalized Terms

Capitalized terms used in this Schedule have the definitions as set out in the Agreement to Process Crown Royalty Bitumen (the “**Processing Agreement**”) entered into between Alberta Petroleum Marketing Commission and North West Redwater Partnership.

1.2 Processing Agreement Reference

This Schedule is referenced in Sections 1.1, 1.3, 4.2 and 4.3 of the Processing Agreement.

1.3 Order of Precedence

In the event of any conflict or inconsistency between sections 2.1 and 2.6 of this Schedule, the provisions of section 2.1 shall govern.

2. DESCRIPTION OF THE FACILITY

2.1 Core Elements and Attributes of the Facility

The core elements and attributes of the Facility are as follows:

- a. it shall be a bitumen feedstock refinery;
- b. it shall be located in the Province of Alberta on the land with the following short legal descriptions:

Legal Parcel (short description)	Title Number
4;21;56;18;SW	092 281 289
4;21;56;18;NE	092 037 542
4;21;56;18;SE	082 522 097 +1
0823780;2;1	082 175 650
4;21;56;19;NW	072 708 734 +1

- c. it shall be designed on the basis that the Facility will have a capacity to process approximately 77,000 BPD of Bitumen Blend containing approximately 50,000 BPD of Bitumen;
- d. it shall be designed in a manner consistent with an intended full-cycle (4 year period) operating reliability of a minimum of 338 days per calendar year for an overall availability of more than 92%;
- e. it shall be designed in a manner consistent with requiring a major shutdown for general maintenance not more frequently than once every four years, excepting the hydrocracking unit and the shift reactor catalysts of the gasification unit which shall be designed consistent with requiring a shutdown not more frequently than once every two years;
- f. it shall have appropriate and sufficient connections with Feeder Pipelines, to allow for the receipt of a minimum of approximately 77,000 BPD of Bitumen Blend;
- g. it shall be connected to a 240KV power substation which shall be fed from two sources;
- h. as contemplated by Section 4.2 of the Processing Agreement, no major individual component of the Facility shall be designed beyond what Good Engineering Practices would reasonably require for the Design Capacity, provided that the following systems, equipment or assets may be designed for, or make allowance for, operations in respect of future development on the site of the Facility, including Phase 2 as contemplated in Section 16 of the Processing Agreement:
 - i. the land on which the Facility is situated (as set out in clause (b) above) and the clearing, fencing, trenching and landscaping of such land;
 - ii. interconnections with power, including the substation;
 - iii. interconnections with raw and waste water including pipelines, ponds and disposal wells;
 - iv. interconnections with potable water, sewer and natural gas;
 - v. firewater pumps and systems;
 - vi. interconnections with product pipelines, Feeder Pipelines and terminalling facilities (excluding any pumps and ancillary equipment necessary to achieve maximum design flow for future phases); and
 - vii. the marshalling room in the main control building.
- i. it shall have the following six primary processing units:

- i. atmospheric crude and vacuum distillation units (non-licensed technology);
 - ii. residue hydrocracking unit (consisting of an ebullated bed residue hydrocracking unit using LC-Fining technology);
 - iii. hydroprocessing unit (consisting of a hydrocracking unit and hydrotreating unit using UOP technology);
 - iv. light-ends recovery unit (non-licensed technology);
 - v. gasification unit (consisting of a multi-purpose gasifier using Lurgi technology including an industry standard sour gas conversion technology, Rectisol acid gas removal process licensed from Lurgi, and an industry standard methanation process using commercially available standard catalysts); and
 - vi. sulphur recovery unit (using Jacob's and Shell technologies);
- j. it shall be designed to produce discrete refined products. The table below represents the type and an estimate of the approximate volumes of refined products (in both BPD and percentage, where applicable) that the Facility will be designed to be capable of producing. APMC acknowledges that the Facility will be designed constructed and operated with a view to optimizing its profitable operations. APMC acknowledges that the Processor does not represent, warrant or guarantee the approximate volumes set out in the table below as they will vary with operational factors.

Refined Products	approximate volume (BPD)	approximate volume (percentage)
Ultra-Low Sulphur Diesel	36,187	46.6%
Naphtha	18,157	23.4%
Diluent	14,344	18.5%
Vacuum Gas Oil	8,276	10.6%
Butane	771	.9%
Liquefied Petroleum Gases		
CO2	3500 tonnes/Day	
Elemental Sulphur	362 tonnes/Day	

- k. it shall have onsite storage capacity designed in a manner consistent with the Design Capacity, the intended operating availability (as set out in clause (d) above), the requirements of interconnecting pipelines and suitable for receipt, storage and staging of Feedstock, intermediate products, and Refined Products;

- l. it shall have access to existing provincial highways with intersection improvements completed by the Processor as approved by Alberta Transportation;
- m. it shall have appropriate infrastructure (rail and truck loading facilities and pipelines) for shipping Refined Products to other sales, storage, loading or terminalling points;
- n. it shall be designed with a view to reducing water usage through the use of air cooling, recycling treated waste water (including capture of on-site surface water runoff), optimizing recovery of low-pressure steam, segregating water streams and brine concentration, in an effort to optimize recycling and minimize fresh water intake; and
- o. it shall have the following systems and processes to increase operational efficiency and reduce the Facility's impact on the environment:
 - i. a carbon dioxide capture system that will be connected to the Enhance Energy Inc. carbon dioxide system;
 - ii. a system to utilize fuel gas generated in the upgrading process; and
 - iii. a system to withdraw water from the North Saskatchewan River using existing third party infrastructure to minimize river disturbance;

2.2 Major Components of the Facility and Description of Process

- a. The Facility will process and convert / refine Feedstock (a mixed blend of Cold Lake Bitumen and or Athabasca Bitumen with transportation diluents) into Refined Products such as light ends liquids, naphtha (diluent), diesel (ULSD) and high quality gas oil products suitable for downstream refinery markets and high purity carbon dioxide.
- b. See drawing 10-00-BFD-49-9001 Rev A referenced in section 2.6 of this Schedule below for the overall block flow diagram of the Facility.
- c. The fundamental processing elements of the Crude and Vacuum Unit, Unit 10, will incorporate initial desalting of the feed and the subsequent separation (fractionation) of conditioned feed into stabilized naphtha, atmospheric gas oil (AGO) and vacuum gas oil (VGO) products including heavy vacuum residue via the integration of atmospheric crude distillation and vacuum distillation columns.
- d. Stabilized naphtha product is routed to diluent storage. Sour off-gas from the overhead of the atmospheric crude column, the naphtha stabilizer column and the vacuum distillation column are combined within Unit 10 and routed to the Light Ends Recovery Unit (LER), Unit 50, for further processing, via Unit 31 PSA tail gas compression (i.e. recovery /

production of sweet fuel gas, light ends and stabilized light naphtha diluent).

- e. Vacuum residue from Unit 10 is routed to Unit 20, the Resid Hydrocracking Unit, for primary conversion into distillate, gas oils and lighter products. Atmospheric gas oil (AGO) and vacuum gas oil (VGO) products from Unit 10 along with naphtha, distillate and vacuum gas oil products from Unit 20 are fed to the Hydroprocessing Unit, Unit 30, for further secondary processing and finishing. Products from Unit 30 include stabilized naphtha (sales diluent or segregated naphtha product), finished distillate (diesel and/or kerosene) and unconverted gas oil (UCO) material. The primary product from Unit 30 is ultra low sulphur diesel (USLD).
- f. Heavy residue from the Resid Hydrocracking Unit, Unit 20, is routed to the Gasification Unit, Unit 40, for the production of high purity hydrogen required to support Unit 20 hydroconversion and Unit 30 hydroprocessing requirements.

2.3 Description of Feedstock

- a. The Processor will take delivery of Bitumen Blend and other crude feedstocks from a number of gathering pipelines and terminals in the Edmonton & Alberta Industrial Heartland region. The Processor will pursue connection options so as to allow the Processor to receive deliveries of Base Crown Supply and Optimized Supply from many production sources and support optimization of the crude diet into the Facility. Bitumen feed streams will be segregated in tanks on receipt and blended prior to processing.
- b. The Facility will be designed with regard to an idealized and optimized feedstock containing the following fractions and approximate boiling point ranges:

Fraction	Boiling Point Range
Naphtha	C ₅ – 199°C
Atmospheric Gas Oil	199°C - 343°C
Vacuum Gas Oil	343°C - 524°C
Vacuum Residue	524°C+

2.4 Description of Products

- a. The Facility will be designed to allow the Processor to produce the Refined Products set out in Schedule 8.
- b. The Facility will be designed with regard to an idealized Refined Products output, based on the feedstock identified in section 2.3 of this Schedule, containing the following fractions and approximate boiling point ranges:

Fraction	Boiling Point Range
Light Ends Liquids	C ₂ – C ₅
Diluent	C ₅ – 199°C
Naphtha	C ₅ – 199°C
Ultra-low Sulphur Diesel	199°C - 343°C
Unconverted Oil	343°C - 524°C
Carbon Dioxide	N/A

2.5 Facility Equipment Design Margins

To avoid overdesign of equipment, the design margins guiding the design of the equipment will be consistent with the Design Capacity and the intended operating availability (as set out in section 2.1(d) of this Schedule) of the Facility.

The design margins guiding the design of different equipment types are as follows:

Equipment Type	Margin	Remarks
Pumps	Rated capacity shall be 110% of normal flow	For pumps with continuous minimum flow through RO and open valve, calculate minimum flow and add to pump flow.
Reflux / Pumpharound Pumps	20% on normal flow	
Loading / transfer Pumps	20% on normal flow	This margin is to facilitate accelerated loading/ export, if required.
Hydraulics	Design for 100% on normal flow and check for 110% on normal flow	Higher margin on flow shall not be used to compensate for length of pipe uncertainty during plot plan development.
Exchangers / Coolers	NIL	Fouling factor shall be based on EOR operation and turnaround period of

		the plant.
Condensers/ Reboilers	10% on normal flow and duty	
Fired Heater	10% - 15% on duty (15% for Crude Heater)	Cold start-up operation when heat integration is not providing the required heat will also be considered.
Compressors	Rated flow shall be 110% on normal flow	An additional 10% (to be corrected on available Vendor data) shall be considered for spillback of reciprocating compressors.

Turndown operations must be considered in determining equipment sizes. Equipment will be selected to operate at approximately 50% turndown rates.

2.6 Description of the Facility by Reference to Design Work and Approvals

The Facility design is further set out, as of the Execution Date, in the following documents, which have been obtained and reviewed by APMC:

- a. Process Design Basis and Criteria – Doc# 10-00-EC-49-0001 Rev. B;
- b. Overall Block Flow Diagram – Doc# 10-00-BFD-49-9001 Rev A;
- c. The NWU Proposal;
- d. Province of Alberta, *Environmental Protection and Enhancement Act*, Amending Approval, Approval No. 217118-00-01, as amended; and
- e. Alberta Energy and Utilities Board, “North West Upgrading: Application to Construct and Operate an Oil Sands Upgrader in Sturgeon County, August 7, 2007” EUB Decision 2007-058 (August 7, 2007).

Subject to and without any derogation of Section 4 of the Processing Agreement, the Parties acknowledge that although the Design Basis and Criteria document referred to in clause (a) above is subject to revision and that engineering and design work will continue during construction of the Facility, changes, modifications and improvements to the Facility design shall be in all material respects consistent with the description of the Facility in this Schedule 1.