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27 September 2019

Mr. Bruce Chapman
General Manager
Northern Pulp Nova Scotia Corporation
260 Granton Abercrombie Branch Rd
Abercrombie, NS B2H 5C6

Dear Mr. Chapman:

This letter confirms that Nova Scotia Department of Transportation and Infrastructure Renewal (TIR) is continuing to hold talks with Northern Pulp regarding a possible pipeline route to the mill's proposed new Effluent Treatment Facility. It is anticipated these talks will continue this fall.

Regards,

for Mark S. Peachey, P.Eng.
Executive Director Maintenance and Operations

c: Peter Hackett, Chief Engineer
Troy Webb, District Director, Northern
Greg Chisholm, Area Manager, Colchester

Construction Methodology and Design Report

Effluent Pipe Line (Overland Portion) Detailed Design

Document No. TF19103601-0000-DD10-RPT-0001

Prepared for: Northern Pulp Nova Scotia Corp.

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Construction Methodology and Design Report

Effluent Line (Overland Portion) Detailed Design
Effluent Treatment Plant Replacement
Abercrombie Point
Pictou County, Nova Scotia
Project #TF19103601

Prepared for:

Northern Pulp Nova Scotia Corp.
PO Box 549, Station Main, New Glasgow, NS B2H 5E8

9/25/2019

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Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited

9/25/2019

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Executive Summary

This Construction Methodology and Design Report applies to the development of the design of the overland portion of the new effluent outfall pipeline that Northern Pulp Nova Scotia Corp (NPNS) intends to install to convey treated pulp mill effluent from their new Effluent Treatment Facility (ETF) at Abercrombie Point to the discharge outfall and diffuser to be located in the Northumberland Strait off Caribou NS. The overland portion of the pipeline begins on the north side of Pictou Harbour and ends at Caribou. The effluent line will run in a corridor adjacent to provincial highway Route 106. The overall pipeline will be approximately 15 km in total length of which approximately 8.6 km is included in the overland section. An additional short land based section of effluent line will be installed on mill property as a part of the ETF design by KSH Solutions.

The effluent line will be designed to convey a maximum flow of 85,000m^3/day of treated effluent. References to "the pipeline" included in this report relate to the overland portion of the pipeline from the north side of Pictou Harbour to Caribou only.

Design

The pipeline system will be designed using High Density Polyethelene (HDPE) pipe manufactured in resin designation PE4710. The overland portion of the pipeline will be constructed from nominal 900mm (36") SDR 13.5 pipe with a wall thickness of 67.7mm (2.667"). This material has a service pressure rating of 124 psig at the design temperature of 38ºC and a maximum recommended operating temperature of 60°C. Nominal 900mm (36") SDR 17 pipe with a wall thickness of 53.8mm (2.118") is an appropriate and safe design choice for this service, but the decision to use SDR 13.5 in the overland portion was taken to provide a higher safety factor in the watershed areas.

Hydraulic Design

Initial hydraulic analysis for the effluent pipeline was completed and it shows that at peak flow conditions of 85,000 cubic metres per day the velocity in the effluent line is 1.92 m/sec (6.3 ft/sec) with a maximum pressure in the line of 72 psig. This pressure is well within the pressure limits of the HDPE pipe providing a factor of safety of approximately 1.7. At normal operating flow conditions of 62,500 m^3/day this factor of safety is 2.3.

Pipeline Material

HDPE is classified as a thermoplastic material and is manufactured to established standards. In this case the pipe material specified conforms to ASTM D3350 and is manufactured from PE4710 resin. PE 4710 resin was introduced to the market in 2005 and represents an improvement in resin composition over previous resin specifications. PE 4710 has a higher hydrostatic design stress and has a superior resistance to slow crack growth over previous resins. HDPE materials are generally resistant to attack from many chemicals and are compatible with chemical pulp mill effluents to operating temperatures of 60ºC.

Potential for corrosion of the HDPE pipe is non-existent and treated pulp mill effluent has minimal suspended solids. This coupled with the high abrasion resistance of HDPE results in virtually no loss of pipe wall thickness due to erosion. Chemical pulp mill effluent applications using HDPE pipe in the Maritime Provinces includes:

- 48" PE4710, Twin Rivers Paper, Edmunston NB, 2017
- 36" PE4710, Northern Pulp Nova Scotia, 2009 (East River Effluent Line Crossing)

System Automation & Control

System automation and control ensures that the effluent pipeline operation conforms to the limitations of the engineering design. In general, the effluent pipeline will operate with the ETF as a fully automatic system with information being gathered and transmitted to the ETF control system.

The operation of the pipeline will be monitored on a continuous basis with the following status information sent to the ETF control system:

- Pump discharge pressure at the main pump station.
- Effluent Pipeline flow rate
- Operating temperature in the pipeline.

The pipeline system will be designed to operate with the following capabilities.

- Initiate an alarm when an abnormal operating condition is detected including high pressure condition, low flow, high flow and high temperature.
- Initiate an alarm when a potential leak is detected.

Leak Detection

A leak detection system employing advanced detection technologies will be installed with this effluent pipeline to monitor for leaks in the overland portion of the route. Advanced detection technologies utilize fibre optic sensing systems and advanced computational algorithms based on in-line instrumentation and data collection to provide the highest level of leak detection sensitivity. These systems have been deployed on water systems as well as liquid petroleum systems in pipelines of steel and other materials including HDPE. Specific technologies have demonstrated success in detecting leaks as small as 60 l/hr. Final technology selection for the leak detection system will be completed during detailed design.

Secondary Containment

The design and material selection for this pipeline are very robust and resistant to catastrophic failure and therefore after proper installation, testing and commissioning, the effluent line should be leak free over its design lifetime. However, the route proposed for the new effluent line will pass through the Town of Pictou and its water shed area and recognizing the presence of municipal and residential water wells in the area of the pipeline corridor the pipeline material specification is increased to 900mm(36") SDR 13.5 providing a heavier wall thickness and increased factor of safety for the pipeline from station 2+500 (North side of Pictou Harbour) to station 11+099 (transition to the marine section at Caribou). This coupled with a leak detection system utilizing advanced detection technologies provides robust protection against leaks and early detection in the very unlikely event that one occurs. Therefore dual wall containment is not necessary for this application.

Construction Methodologies

It is expected that a vast majority of the land-based portion of the effluent pipeline will utilize trench and bury methodology for effluent line installation. It is anticipated that both wet land compensation and water course alteration permits will be required for construction.

Close construction monitoring will ensure that the pipe is properly joined and placed in the pipe trench. Pipe placement is accomplished with quality pipe bedding material placed and compacted in the trench bottom in accordance with the engineering design. After the pipe is laid in the trench embedment material is placed around the pipeline and compacted. The re-use of excavated soils for pipe backfill above the bedding materials will be considered where appropriate.

Pipe Jacking (sometimes also referred to as micro-tunneling) is a technique that involves the installation of pipe via powerful hydraulic jacks that push a specially designed pipe through the ground behind a steerable cutting head. Thrust and reception pits are constructed at each end of the alignment. A thrust wall is constructed in the thrust pit to provide a surface upon which the hydraulic jacks push. In poor ground conditions (or shallow thrust pits) structural frameworks or piles may be required. The pipe placed via this method would be maintained as a carrier pipe through which the HPDE pipe will be installed.

Horizontal Directional Drilling (HDD) is defined as a trenchless construction method used to install pipelines of various sizes and materials below the ground surface.

HDD methods can be applied to various road, highway and watercource crossings where it proves more feasible than using the pipe jacking, open cut, or dam and pump methods considering the length, surface/stream restoration requirements and traffic disruption. In this case, because of the size of the pipe and the construction requirements it is unlikely that HDD will be utilized.

Erosion and Sediment Control

Projects such as the installation of this effluent line will require the clearing of the pipeline corridor to make way for construction activities. The clearing and construction activities will cause the exposure of considerable amounts of soil to rain and running water and risk siltation of downstream watercourses, if the construction is not properly managed. The general contractor will be required to develop an erosion and sedimentation control plan that appropriately addresses these issues and identifies comprehensive actions/interventions to focus on the minimization of soils disturbances, runoff control and clarification in advance of discharge.

Corridor Restoration

Once the installation of the effluent line is complete, the effluent line corridor will be restored to finished contours and vegetated appropriately. Required signage notifying the public of the presence of the effluent line will be posted in accordance with provincial regulations.

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1.0 Introduction

Northern Pulp Nova Scotia Corp (NPNS) intends to install a new effluent pipeline to convey treated pulpmill effluent from their new Effluent Treatment Facility (ETF) at Abercrombie Point to the discharge outfall and diffuser to be located in the Northumberland Strait off Caribou NS. The pipeline will be designed to transport up to 85,000 m3/day of treated mill effluent from the mill site to the effluent diffuser. The pipeline will be approximately 15 km in total length of which approximately 8.6 km is included in the overland section between the north side of Pictou Harbour to Caribou. This Construction Methodology and Design Report applies to the development of the design of the overland portion of the effluent outfall pipeline and its construction. This report outlines the design basis, material selection, design considerations and measures for operations monitoring for the pipeline. It also identifies and discusses the probable construction techniques for its installation.

2.0 Design Basis

2.1 Pipeline Corridor

The effluent line will run in a new pipeline corridor. The corridor will have an approximate width of 10m and will run adjacent to provincial highway Route 106. Current effluent line alignment drawings including profiles along the corridor are included in Appendix A of this report.

The start of the pipeline, Chainage 0+000, has been designated as the discharge of the treated effluent pumps at the new Effluent Treatment Facility (ETF). The line runs from this point to the south bank of Pictou Harbour where it leaves the mill property and runs submerged across Pictou Harbour emerging on the north bank. The overland portion of the pipeline begins at this location (station 2+460) and runs essentially parallel to and on the east side of Route 106 to station 10+760. At this point the line crosses Route 106 to the west side and enters the Northumberland Strait at station 11+099. The overland portion of the effluent pline ends at this location, however the line continues from this point and runs submerged to the eventual discharge Point at approximate station 15+350.

2.2 Codes and Standards

The effluent outfall pipeline will be designed and constructed in accordance with the latest edition of the following applicable codes and standards:

ASME B31.3	Process Piping Code
CSA B137.1	Polyethylene Pipe, Tubing and Fittings for Cold Water Pressure Services
CSA 41-GP-25M	Pipe, Polyethylene for the transport of Liquids
CSA C22.1	Canadian Electrical Code, Part I
CSA C22.2	Canadian Electrical Code, Part II
CSA A23.1	Concrete Material and Method of Concrete Construction
CSA A23.3	Design of Concrete Structures
ASTM D3350	Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
ASTM D2837	Test Method for Obtaining Hydrostatic Design Basic for Thermoplastic Pipe & Materials
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F1473	Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
ASTM F1804	Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation
ASTM D698	Tests for Moisture-Density Relations of Soils and Soil- Aggregate Mixtures, Using 2.5 kg Rammer and 300 mm Drop
ASME B16.5	Pipe Flanges and Flanged Fittings
ASTM D2657	Heat Joining Polyolefin Pipe and Fittings
NEMA	National Electrical Manufacturers Association
NBC	National Building Code of Canada
OHSA	Occupational Health and Safety Act and Regulations

2.3 Process Design Basis

The process design criteria was provided by NPNS and corresponds with the design output of the ETF. The pipeline system will be designed for a maximum flow rate of 85,000 m^3/day of treated Kraft pulp mill effluent. The system will be designed based on the following design data and conditions.

Max. Flow Rate:	85,000 m^3/day
Normal low Rate:	62,500 m^3/day
pH Range:	6-9
Specific Gravity:	1.0
Temperature:	37°C

The fluid transported by the effluent line is treated Kraft mill effluent. Raw mill effluent is processed by the ETF and the treated effluent produced will have the following characteristics:

Parameter	Units	Amount
BOD_5	kg/day	≤ 1,875
	mg/L	≤ 25
COD	kg/day	≤ 37,500
	mg/L	≤ 500
TSS	kg/day	≤ 1,875
	mg/L	≤ 25
AOX	kg/day	≤ 225
	mg/L	≤ 3
pH		6 - 9

The treated effluent does not contain strong oxidizers or significant levels of hydrocarbons.

2.4 Pipe Materials

HDPE pipe has been used in North America for water and wastewater services since the 1980s. While the chemical formula for PE has remained the same, improvements made to the polymer structure have improved significantly the serviceability of PE piping in areas of tensile strength and failure resistance.

HDPE is classified as a thermoplastic material and is manufactured to established standards. In this case the pipe material specified conforms to ASTM D3350 manufactured from PE4710 resin. PE 4710 resin was introduced to the market in 2005 and represented a significant improvement in resin composition over the traditional PE3408 that was introduced in the 1980s.

The pressure rating of HDPE pipe is determined by laboratory testing per ASTM D2837 (2013f). "Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products." ASTM standard D2837 establishes the "hydrostatic design basis," (HDB), of HDPE pipe material. The HDB categorizes pipe material's long-term hydrostatic strength. The HDB for PE4710 is 1,600 psi. The pipe pressure rating can be calculated from the hydrostatic design stress by applying a design factor (DF) to the HDB which are set by the Plastics Pipe Institute's (PPI) Hydrostatic Stress Board to allow the pipe to function at design pressures and temperatures indefinitely under typical service conditions. PE 4710 has a Hydrostatic Design stress of 1000 psi. In addition PE4710's molecular structure provides improved serviceability including:

Slow Crack Growth (SCG) Resistance

Severe stress concentrations, impingements, defects and other localized stress intensifications may lead to the development of cracks in plastics at stresses less than their tensile strengths. This can affect pressurized pipe operating at or below its hydrostatic design stress. The gradual extension of such a crack over time is referred to as slow crack growth or SCG. The key in preventing SCG is to make the material tough enough that cracks never develop, or, if they do, they cannot propagate. PE 4710 SCG Resistance is significantly superior to that of earlier PE generations and as a result slow crack growth is uncommon.

Surge Pressures

Sudden changes to flow can create water hammer (surge pressure) in the pipeline. Design standards for HDPE pipe anticipate and account for potential water hammer permitting frequent recurring surges in the pipeline to be as great as 1.5 times the pipe’s allowable service pressure. AWWA standards also permit occasional surges up to two times the allowable service pressure. These standards provide a safety factor between the pipe’s ductile rupture (dynamic burst strength) and the peak surge pressure, as well as protecting against fatigue due to recurring application of the surge pressure. This effluent line is not subject to frequent or sudden pressure surges. The pumping system flow is relatively constant and the pipeline does not contain block valves or other infrastructure that could generate sudden large pressure pulses.

Fatigue Resistance

In 2012, on behalf of PPI, an engineering assessment of the resistance of HDPE pipe to fatigue loading was conducted. The assessment included a literature comparison of PE and PVC fatigue resistance. It also included a literature review and utility survey to confirm design fatigue loads and surge velocities (Fatigue of Plastic Water Pipe – Plastic Pipe Institute, Oliphant et al. 2012). The primary finding of the study was that the fatigue resistance of PE4710 materials, based on the available data, was excellent.

A 2015 study completed for the Environmental Protection Agency (EPA) by the Water Research Foundation and the Water Environment Research Foundation (Durability and Reliability of Large Diameter HDPE Pipe for Water Main Applications, Najafi et al. 2015) found through a designed test program that the predicted cycles to failure for a 16” PE 4710 test pipe material to be 2515 years at maximum pressure surges of 1.2 times the pressure class and 390 years for pressure surges to 1.5 times the pressure class (based on 50 pressure surges/day). This shows PE4710 piping materials to be very durable with very high fatigue failure resistance.

Leakage

HDPE pipe systems are typically constructed using butt fused joints where the ends of pipe sections are thermally fused together in a controlled process to produce a homogeneous joint that is as strong or stronger than the base pipe. PPI reports that allowable water leakage for PE pipe is zero as industry standard, as compared to allowable water leakage rates of 10% or greater typically accepted in the industry. Properly executed fused joints result in leak-free joints.

Chemical Resistance

HDPE materials are generally resistant to attack from many chemicals. The following excerpt regarding HDPE (PE4710) chemical resistance and pipe performance is taken from Chapter 3 of the Handbook of Polyethylene Pipe published by PPI. (Note: PR stands for standard Pressure Ratings and PC stands for Standard Pressure Classes)

"The following is a general representation of the effect of different kinds of fluids on the long-term hydrostatic strength of PE pipe materials and the de-ratings, if any, that are normally applied in recognition of this effect:

- **Aqueous solutions of salts, acids and bases** – Because PE is immune to electrolytic attack these solutions have no adverse effect. Consequently, the PR or PC for water is also appropriate for the conveyance of these type materials.
- **Sewage and wastewater** – Normally, these fluids do not include components that affect PE. Therefore, for this case the PR and PC established for water is also appropriate.
- **Surface active agents (e.g. detergents), alcohols and glycols (including anti-freeze solutions)** – If these agents may be present in the fluid a precautionary measure is to specify PE pipe which is made from a material which exhibits very high resistance to slow crack growth (e.g. materials for which the second number in their standard designation code is either 6 or 7, such as PE2708, PE3608, PE3708, PE3710, PE4608, PE4708 and PE4710). For such materials no de-rating is needed.
- **Fluids containing oxidizing agents** – Strong oxidizers can gradually cause damage to PE material. The rate at which this damage occurs depends on the concentration and the chemical activity of the oxidizing agent. If the rate of damage on unprotected PE is low, then PE pipe made from material that is adequately stabilized can be used. But if the rate is high PE pipe may not be the most appropriate choice. Thus, the determination of the suitability of PE pipe and/or the extent to which it needs to be de-rated should be made on a case-by-case basis. For this purpose, it is suggested that the reader contact PPI or its member companies for references regarding the known performance of PE pipes in similar applications.
- **Inert gases such as hydrogen, nitrogen and carbon dioxide** – These kinds of gases have no adverse effect and the PR and PC established for water is also appropriate.
- **Hydrocarbon gases of lower molecular weight, such as methane and hydrogen sulfide** – Studies and long-term experience show that the resultant long-term strength is at least equal to that established when using water or air as a test fluid. Therefore, no de-rating is required."

Some of the fluid components included in the quotation above may be found in treated mill effluent including solutions of salts, acids and bases, surface active agents and dissolved gases such as nitrogen, carbon dioxide, and hydrogen sulfide. Treated mill effluent does not contain strong oxidizers or significant levels of hydrocarbons. It can therefore be concluded that HDPE 4710 piping materials will be free from chemical attack in this application**.** Additionally, corrosion of the HDPE pipe is non-existent and treated pulp mill effluent has minimal suspended solids. This coupled with the high abrasion resistance of HDPE results in virtually no loss of pipe wall thickness due to erosion. Chemical pulp mill effluent applications using HDPE pipe in the Maritime Provinces include:

- 48" PE4710, Twin Rivers Paper, Edmunston NB, 2017
- 36" PE4710, Northern Pulp Nova Scotia, 2009 (Submerged East River Crossing Replacement)

2.5 Pipe Selection

Two pipe sizes have been considered for this effluent line. These include:

- 900mm (36") SDR 17 – (53.8mm (2.118") wall thickness)
- 900mm (36") SDR 13.5 – (67.7mm (2.667") wall thickness)

These two pipe sizes differ primarily in wall thickness. The thicker wall pipe will have a greater maximum allowable working pressure rating.

Wood has completed initial hydraulic analysis for the effluent pipeline using BOS Fluids hydraulic modeling software. BOS Fluids is a hydraulic modelling software package that does both steady state and transient analysis for flow of liquids and gases in piping systems.

At peak flow conditions of 85,000 cubic metres per day the velocity in the 36"pipe is approximately 1.92 m/sec (6.3 ft/sec). This is an acceptable velocity for this size of pipe. For peak service, the maximum pressure is approximately 70 psig in the 900mm SDR 17 pipe and 73 psig in the 900mm SDR 13.5 pipe. Accounting for operating temperature the following table summarizes the operating pressures and safety factor and maximum allowable operating pressures for the two pipe sizes.

Pipe Size	Operating Pressure	Rated max Pressure at 38ºC	Safety Factor
900mm SDR 17	68 psig (Peak Flow)	97 psig	1.4
900mm SDR 13.5	72 psig (Peak Flow)	124 psig	1.7
900mm SDR 17	46 psig (Normal Flow)	97 psig	2.1
900mm SDR 13.5	53 psig (Normal Flow)	124 psig	2.3

In order to provide a higher factor of safety for operating pressure, a 900mm SDR 13.5 pipe specification is selected for the overland route of the effluent line between station 2+500 (North Bank of Pictou Harbour) to station 11+099 (Caribou). Additional benefits resulting from an increased maximum allowable operating pressure include greater resistance to surge pressures and increased fatigue resistance.

Due to friction losses and elevation changes in the pipeline, the pressure changes along the length of the pipeline. In this case, the pressure in the line decreases and becomes slightly negative at the highest point in the pipeline which occurs near station 9+700 located approximately 1300 m south of the ferry terminal at Caribou. From this point, flow to the discharge diffuser is essentially by gravity. A vacuum break valve (vent) will be installed near station 9+700 to bleed air as the line is filled and to allow air to bleed into the system relieving the vacuum during normal operation.

The detailed piping material specification is included in Appendix B of this report.

2.6 Design Guidelines

2.6.1 Bending Radius

The minimum bend radius recommended by PPI for the selected pipe with fused joints is 27 times the pipe diameter or 25m. The selected bending radius for the pressurized HDPE pipe for this application is fifty (50) times the outside diameter of the pipe or 45m (148 ft). This is a conservative minimum bend radius selection intended to provide additional construction flexibility.

2.6.2 Depth of Cover

The buried piping system will have a nominal depth of cover of 1.6 meters (5’3”). The cover depth may vary slightly in certain areas to suit terrain conditions.

At installation, the pipe is bedded in approved granular material. Bedding and approved surround material is placed around and over pipe to a minimum of 300 mm (12”) above top of pipe, and compact to 95 % of Standard Proctor Density at or near optimum moisture content.

The trench is then backfilled with an approved site excavated material with particle size not exceeding 100 mm (4’), in maximum lifts of 200 mm (8”) and compacted to 95% of Standard Proctor Density at or near optimum moisture content.

2.6.3 Buoyancy

Flotation of shallow buried pipe is a concern for all piping materials and must be given consideration in situations where high ground water is located at or above the elevation of the buried pipe. Flotation results when groundwater surrounding the pipe produces a buoyancy force that is greater than the combination of the weight of the pipe, pipe contents and saturated and dry soil directly above the pipe. As there may be occasions when the pipe is not full the flotation evaluation should not consider the weight of any pipe contents.

Generally, the areas of greatest concern for pipe flotation would be those areas with the least amount of soil cover, due to the reduced soil weight above the pipe. Areas with pipe cover of 1.0m or less and with ground water levels at the surface are at risk of flotation. This is based on assumptions regarding the unit weight of soil and a very conservative assumption regarding ground water level. Soil parameters and groundwater levels will be confirmed with geotechnical investigation. For this project a minimum depth of cover of 1.6 m is specified. Detailed design will confirm negative buoyancy is maintained for the pipeline.

2.6.4 Collapse

At road crossings and in all areas of heavy equipment passage, a pipe loading analysis is completd during design to ensure that the vertical deflection, wall buckling and wall compression in the pipe does not exceed the values recommended by the manufacturer. The analysis is performed based on the criteria for flexible pipe.

2.6.5 Freeze Protection

The temperature of the effluent that will be discharged from the new wastewater treatment facility will be in the order of 25 to 37 degrees Celsius and the effluent flow rate will be in the order of 85,000 m^3/day. It is not expected that freezing will be an issue when the pipeline is in operation, however, there may be risk of freezing during prolonged pipeline shutdowns if the pipeline remains full.

Historical data collected by the National Research Council of Canada has suggested that frost depths in the range of 0.6m to 1.8m can be expected for this part of Nova Scotia, depending on the amount of snow cover and soil type. Many municipal utilities across the province require a minimum of 1.6m of cover over all watermains and it is recommended for freeze protection purposes the same depth be used for this pipeline.

2.6.6 Utility Chambers

All buried pipeline facilities including air release/vacuum valves, drain valves etc. will be housed in a valve chamber. The valve chambers will typically be constructed using pre-cast concrete or HDPE. All valve chambers will be insulated and designed leakage-tight with a secure access.

The HDPE pipe entering the pre-cast concrete chamber shall be provided with a carbon steel sleeve and a water tight mechanical seal.

Where HDPE type chambers are utilized the pipe entrance sleeve will form an integral part of the chamber. The pipe entering into the chamber shall be sealed watertight by fusion weld of the pipe to the entrance sleeve.

The valve chamber shall be sized to provide adequate space for the facility it intends to house. The access hatch will be large enough to enable removal or insertion of the largest piece of equipment in the chamber. A cage ladder is provided for access, operation and maintenance and a vent pipe to the atmosphere to facilitate venting of air to/from the pipe will be included.

The top of the valve chamber will project a minimum of 150 mm (6”) above the surrounding finished grade, and the ground shall slope away from the installation.

In areas of high water table, the buoyancy force acting on the installation shall be investigated and determined. If required, the uplift force should be counteracted using concrete weights. The assembly will be designed with negative buoyancy.

2.6.7 Isolation Valves

Isolation valves after the main effluent pump discharge isolation valve(s) are not planned to be installed in the effluent line.

2.6.8 Air Release / Vacuum Valves

An air / vacuum valve or combination air valve arrangement will be installed at the high point and in areas where sharp changes in gradient occur in the system. The preliminary effluent line design completed by NPNS indicated two Air/Vaccuum vent locations.. Detailed design will determine the actual number of chambers and air release/vent valves to be installed.

The air / vacuum valve shall be sized to allow sufficient quantities of air to pass when filling the pipeline and to close water tight when the fluid enters the valve. The air & vacuum valve shall also permit sufficient quantities of air to enter through the valve when the pipeline is being drained to break the vacuum. Under normal operation it is expected that only the vacum break valve will be operating to allow air to bleed into the system at the system high point. This is because the hydraulic analysis indicated that the line flows by gravity from the high point to the discharge diffuser.

A manual isolation valve will be installed in the branch line upstream of the air & vacuum valve to enable the unit to be isolated for maintenance or removed and replaced. The size of the vent line shall be equal to the size of the air & vacuum valve outlet.

During detailed design, the use of a standpipe to eliminate the air release/vacuum valves will also be analysed for suitability.

2.6.9 Drain Valves

A drain valve will be installed at a low point of the system on mill property and will be used for draining the pipeline.

The drain valve will be a ball valve with a minimum size of 6′′ to be installed in a valve chamber at the chosen location.

2.6.10 Connections

Connections with the marine segments of the pipeline will be located at the North side of Pictou Harbour and at Caribou. These connections are required to facilitate field fit up of the joins as construction proceeds. Connections will be either flanges or electrofused and will be secured by concrete thrust blocks on the overland pipeline adjacent to the connection.

2.7 Risk Management

The effluent pipeline alignment crosses through the watershed area for the Town of Pictou adjoins privately held lands. Therefore, pipeline design integrity and performance monitoring are of critical importance. Risks associated with the installation and operation of the pipeline include the following:

1) Pipeline failure due to operational excursions
2) Pipeline failure due to poor construction/installation quality control
3) Pipeline failure due to external mechanical damage

Risks will be managed/mitigated through engineering design and construction monitoring as indicated below:

2.7.1 Engineering Design

2.7.1.1 Operational Excursions

Engineering safety factors will be applied to the design and selection of piping materials and equipment that will provide an operational buffer to address the potential for operational excursions beyond the stated process design conditions.

2.7.1.2 System Automation & Control

System automation and control ensures that the effluent pipeline operation conforms to the limitations of the engineering design. In general, the effluent pipeline will operate with the ETF as a fully automatic system with information being gathered and transmitted to the ETF control system.

2.7.1.2.1 System Monitoring

The operation of the pipeline will be monitored on a continuous basis with the following status information sent to the ETF control system:

- Pump discharge pressure at the main pump station.
- Effluent Pipeline flow rate
- Operating temperature in the pipeline.

2.7.1.2.2 System Operation & Control

The pipeline system will be designed to operate with the following capabilities.

- Initiate an alarm when an abnormal operating condition is detected including high pressure condition, low flow, high flow and high temperature.
- Initiate an alarm if a leak is detected.

2.7.1.3 Leak Detection

Leak Detection Programs (LDP) for liquid pipeline systems generally fall into 2 catagories including:

- External
- Internal

External systems are systems where detection of leaks is accomplished through observation or sensory infrastructure external to the pipeline. Examples of external leak detection systems include:

- Visual Checks including aerial inspections, video surveillance.
- Accoustic Emission monitoring
- Fibre Optic cable systems sensing temperature, pipe strain or other operational telltales.

Internal systems are systems that utilize the continuous sensing of operational characteristics of the pipeline and through analysis of the measured data detect the presence of a leak. These systems include:

- Operational Systems Checks
- Line Balance metering for volume flow, pressure loss, flow/mass balancing
- Automated Computational Methods such as statistical models and/or Real Time Transient Modeling (RTTM)

Automated Computational Methods utilize measured system parameters such as flow, pressure and temperature as inputs to advanced computational algorithims to detect abnormal pipeline operation, analyse the abnormalities to determine the presence and approximate location of a leak. The leak detection system alerts the pipeline control system accordingly for operator action. LDP utilizing fibre optic systems, line balance metering and RTTM methods generally provide the highest level of sensitivity however, the accuracy of the system is dependent on the accuracy of the sensing elements and the derived information. These systems have been deployed on water systems as well as liquid petroleum systems in steel and other materials including HDPE and selected systems have demonstrated success in detecting leaks as small as 60 l/hr.

A leak detection system employing advanced detection technologies as described above will be installed with this effluent pipeline to monitor for leaks in the overland portion of the route.

2.7.1.4 Secondary Containment

Secondary containment of pipeline systems is a design method that can be utilized to prevent any leakage that may occur from a pipeline leak from entering the surrounding soil. Secondary containment systems for a pipeline generally involve the installation of the primary pipeline inside a secondary containment pipe. An air gap is provided by installing spacer rings or pads on the primary line as it is pulled through the secondary containment pipe. The secondary containment pipe is terminated at an underground chamber which is then monitored for an accumulation of liquid via level measurement or conductivity sensing. If a leak developed in the main pipeline, the leak would be contained in the containment pipe and flow to the chambers. The location and number of chambers would be specific to each installation with the chambers generally installed at the low points along the pipeline route. Simple lining of the pipe trench with an impermeable liner will not provide containment of a pipeline leak if it occurs.

The design and material selection for this pipeline are conservative and the likelihood of a leak occurring after the proper installation and commissioning of the line is extremely small. As discussed in section 2.4 Piping Material, PE 4710 materials have eliminated small crack growth failures that were experienced with earlier PE materials and proper installation and testing can ensure pipeline joints are leak free. PE4710 has excellent resistance to fatigue and recurring surge pressures and resists shatter-type or rapid crack propagation catastrophic failures. A properly designed, specified, installed and tested/commissioned pipeline will result in a leak free system over its design lifetime. This coupled with a modern leak detection system as discussed in section 2.7.1.3 provides a very robust system design. Therefore dual wall secondary containment is not necessary for this installation.

2.7.2 Construction Monitoring

Ongoing monitoring of construction to ensure proper construction techniques and conformance with engineering design intent is important to ensure that pipeline integrity is not compromised through the construction process. Proper pipeline trench preparation, bedding installation, spooling and joint fusion, pipe laying and backfilling is necessary to avoid damage to the system and ensure long term pipeline integrity. Testing programs to monitor proper execution of the pipe jointing program and the integrity of the finished pipeline will also be undertaken.

3.0 Construction Methodologies

3.1 Trench and Bury

It is expected that a vast majority of the land-based portion of the effluent pipeline will consist of trench and buried pipeline. As a result, wetland compensation and water course alteration permits will be required for the effluent line construction. Nova Scotia OHS regulations require that open trenches more than 1.2m deep must have side slopes to within 1.2m of the bottom of the trench unless the trench is cut in sound and stable rock or a trench box is utilized. The proper bedding and backfilling of buried HDPE pipe are crucial as HDPE pipe is “flexible” and the final structural strength of the buried pipe is very much dependent on the density of soil surrounding the pipe.

The contractor’s work plan will determine exactly how the trench and bury pipeline installation will proceed. For example, pipe manufactured on-site can be fabricated in much longer sections than can be easily transported by truck on public roadways. For “traditional” HDPE pipeline installation methods several pipe segments, typically a maximum of 15m in length, are fused on the surface adjacent to the open trench and the pipe is lowered into the open trench. Before the pipe is placed in the pipe trench a quality pipe bedding material is placed and compacted in the trench bottom. After the pipe is laid in the trench select embedment material is placed around the pipeline in compacted lifts. The re-use of excavated soils for pipe backfill will be considered where appropriate. Where ground water is encountered dewatering will be necessary to allow pipe installation to proceed as the pipe shall not be laid in the trench with standing water. The contractor shall also divert any surface water runoff away from the open trench. Any water pumped from pipe trenches must be discharged to appropriate sediment removal devices.

Typically, compaction of pipe bedding and surround is accomplished with a gas-powered jumping jack or plate tamper. Trench backfill above the pipe may be accomplished with larger equipment such as a hydraulic plate tamper (connected to excavator) or possibly a small roller.

3.2 Trenchless Construction

3.2.1 Pipe Jacking

Pipe Jacking (sometimes also referred to as micro-tunneling) is a technique that involves the installation of pipe via powerful hydraulic jacks that push a specially designed pipe through the ground behind a steerable cutting head. Thrust and reception pits (typically manholes) are constructed at each end of the alignment. A thrust wall is constructed in the thrust pit to provide a surface upon which the hydraulic jacks push. In poor ground conditions (or shallow thrust pits) structural frameworks or piles may be required. The pipe placed via this method would be maintained as a carrier pipe through which the HPDE pipe could be installed.

Distances of up to 30m are achievable with the equipment employed by local contractors. Distances greater than this would be better suited to Horizontal Directional Drilling. This technology is expected to be the technology of choice for crossing Provincial roadways.

3.2.2 Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) is defined as a trenchless construction method used to install pipelines of various sizes and materials below the ground surface. While HDD has proven itself to be a valuable construction technique for the installation of pipelines soils conditions and length are the greatest risks to a successful HDD installation. Design constraints that may contribute directly to increasing such risk include:

- archaeological buffers;
- wetland buffers;
- riparian buffers; and
- rare plant/animal buffers.

The ability and appropriateness of HDD is dependent on a number of factors including pipe size and subsurface conditions. Sub surface conditions are never fully known in detail until after the crossing has been installed, however, throughout the crossing investigation, design, and construction, the state of knowledge of subsurface conditions advances significantly. At any juncture during the investigation-design-construction process, subsurface conditions initially appearing benign can turn out to possess undesirable details, which threaten the likely success of pipe pullback.

HDD crossing length is limited by the tensile strength of the pipe to be pulled back. In this case, due to the allowable tensile load for the pipe material the maximum HDD length is limited and therefore it is unlikely to be used on this project.

3.3 Erosion and Sediment Control

Projects such as this, which cause the exposure of considerable amounts of soil to rain and running water risk siltation of downstream watercourses, if the construction is not properly managed. The general contractor must develop an erosion and sedimentation control plan that addresses erosion and sedimentation and is coordinated with the general contractor’s construction plan. However, there are some general practices that should be considered in the development of any erosion and sediment control plan and are summarized as follows:

1) Minimize Disturbed Soil - The Contractor will coordinate the work plan development with the erosion and sedimentation control plan. For example, the staging of construction such that disturbed areas that are exposed at any one time are kept to an absolute minimum. This could be accomplished by minimizing the cleared area ahead of the pipe laying operations and restoring the area behind the pipe laying operations as quickly as possible with hydroseed, mulch etc.

2) Prevent Runoff from offsite flowing across disturbed areas - The Contractor will install interceptor ditches to divert runoff from undisturbed areas upstream away from the construction area.

3) Slow Down Runoff across disturbed areas - The Contractor will implement erosion and sediment control features that will reduce the velocity of runoff that flows across the disturbed areas. This can be addressed with several different features that can be implemented in different locations. For example, surface roughening can be used to reduce overland flow velocities on longer steep gradients. Seeding and mulching and or the application of straw and wood waddles (logs) on long steep gradients as soon as possible would also be good practice. Check dams can be constructed in swales and diversion ditches to slow the flow of water.

4) Removing Sediment from Water Before it leaves the site – where erosion cannot be avoided it will be critical to remove the sediment from the water before it leaves the site. There are several strategies that are typically employed to accomplish this goal. Silt fences are the most common and simplest device to accomplish this. Combinations of filter berms and sediment basins can also be employed to capture sediment before it leaves the site.

3.4 Construction Site Considerations

3.4.1 Laydown and Work Area

Land areas required for the project are estimated below.

- Corridor: nominally 10 m width, to be confirmed in the detail design stage
- Temporary work space @ road crossings: 6 m x 50 m parcel, on each side of the crossing road, within the pipeline corridor
- Temporary material laydown areas: Accomodated within the corridor

3.4.2 Traffic Control

Traffic Control during construction will be critical as even though the new pipeline will be installed off the highway shoulder, it will require construction activities from the shoulder and at times from the roadway. The Nova Scotia Temporary Workplace Traffic Control Manual outlines minimum standards for construction, maintenance and utility work on or alongside roads and indicates that the type of traffic control measures required will be dictated both by the location of the work (off shoulder/shoulder/lane) and the duration of the traffic disruption (<30min,30min-24hours,>24hours). The Contractor's work plan will have significant impact on the traffic control requirements as it will detail material deliveries, crew transportation, equipment transportation etc.

As Highway 106 is the primary route connecting the Caribou Ferry terminal to the rest of the province it will be critical that it remain open during times when heavy vehicle traffic can be expected (such as the arrival of the ferry from Prince Edward Island). Therefore, the contract documents should add requirements for the contractor to remove lane closures during certain hours that should be coordinated with the ferry schedule.

3.4.3 Construction Noise

The construction activities for this project will be carried out by construction equipment typically utilized on many heavy civil highway projects in the province. Therefore, it is anticipated that construction activities will be compliant with provincial and municipal noise regulations.

Appendix A - Drawings

Appendix B - Piping Material Specification

PIPING MATERIAL SPECIFICATION

CHECKED:	TEM	DATE:	20July19	**NORTHERN PULP NOVA SCOTIA TREATED EFFLUENT LINE**		PROJECT NO:	**19103601**	**MATERIAL IDENTIFICATION:**			
APPROVED		DATE:									
REVISED:		DATE:		DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	See Table for Pressure / Temperature Rating	PRESSURE CLASS:		SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	2 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Extruded	See SDR Table	Plain End	ASTM F714 ASTM D3035	51
FITTING								
90º Ell, 45º Ell, Lateral Cap, Reducer, Tee,	2 – 12	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Butt Fusion	ASTM D3261 Mfg Std	50, 51
Long Radius Bends 3-D	2 – 8	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Fabricated	See SDR Table	Butt Fusion	ASTM D3261 Mfg Std	50
90º Ell, 45º Ell, Lateral Cap, Reducer, Tee,	14 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Fabricated	See SDR Table	Butt Fusion	ASTM D3261 Mfg Std	50
Fusion Branch Saddle	2 – 8	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Socket Weld	ASTM D2467	50
IFlange Adaptor	2 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Butt Fusion	ASTM D2467	50
FLANGE								
Backing Flange	2 – 36	Stainless Steel	A351 CF8M	Cast	IPP Deltaflex SS-SDR	RF Flange	B16.5 Drilling	
Blind Flange	2 - 36	Stainless Steel	AA182 F316/316L	Forged	Class 150	RF Flange	B16.5	
GASKET	ALL	Restructured Teflon	Garlock 3545		$^{1}/_{8}$” Thick	Full Face	B16.21	
BOLT	All	Stainless Steel	A193/A320 Gr B8M Class 2	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Stainless Steel	A193/A320 Gr B8M Class 2	Forged	Cl 2A UNC/8UN	Threaded	B18.2.1	14
NUT	All	Stainless Steel	A194 Grade 8M	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	
WASHER	All	Stainless Steel	ASA 316SS	Hardened		Flat	B18.22.1	

PRESSURE – TEMPERATURE - WALL THICKNESS

SDR	73°F (1.0)	90°F (.90)	100°F (.78)	110°F (.75)	120°F (.63)	130°F (.60)	140°F (.50)
7.3	320 PSIG	288 PSIG	250 PSIG	240 PSIG	202 PSIG	192 PSIG	160 PSIG
9.0	250 PSIG	225 PSIG	195 PSIG	187 PSIG	157 PSIG	150 PSIG	125 PSIG
11.0	200 PSIG	180 PSIG	156 PSIG	150 PSIG	126 PSIG	120 PSIG	100 PSIG

PIPING MATERIAL SPECIFICATION

CHECKED:	TEM	DATE:	20July19	**NORTHERN PULP NOVA SCOTIA TREATED EFFLUENT LINE**		PROJECT NO:	**19103601**	**MATERIAL IDENTIFICATION:**			
APPROVED		DATE:									
REVISED:		DATE:		DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	See Table for Pressure / Temperature Rating	PRESSURE CLASS:		SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

PRESSURE – TEMPERATURE - WALL THICKNESS

SDR	73°F (1.0)	90°F (.90)	100°F (.78)	110°F (.75)	120°F (.63)	130°F (.60)	140°F (.50)
13.5	160 PSIG	144 PSIG	124 PSIG	120 PSIG	100 PSIG	96 PSIG	80 PSIG
17.0	125 PSIG	112 PSIG	97 PSIG	93 PSIG	78 PSIG	75 PSIG	62 PSIG
21.0	100 PSIG	90 PSIG	78 PSIG	75 PSIG	63 PSIG	60 PSIG	50 PSIG
26.0	80 PSIG	72 PSIG	62 PSIG	60 PSIG	50 PSIG	48 PSIG	40 PSIG
32.5	63 PSIG	56 PSIG	49 PSIG	47 PSIG	39 PSIG	37 PSIG	31 PSIG

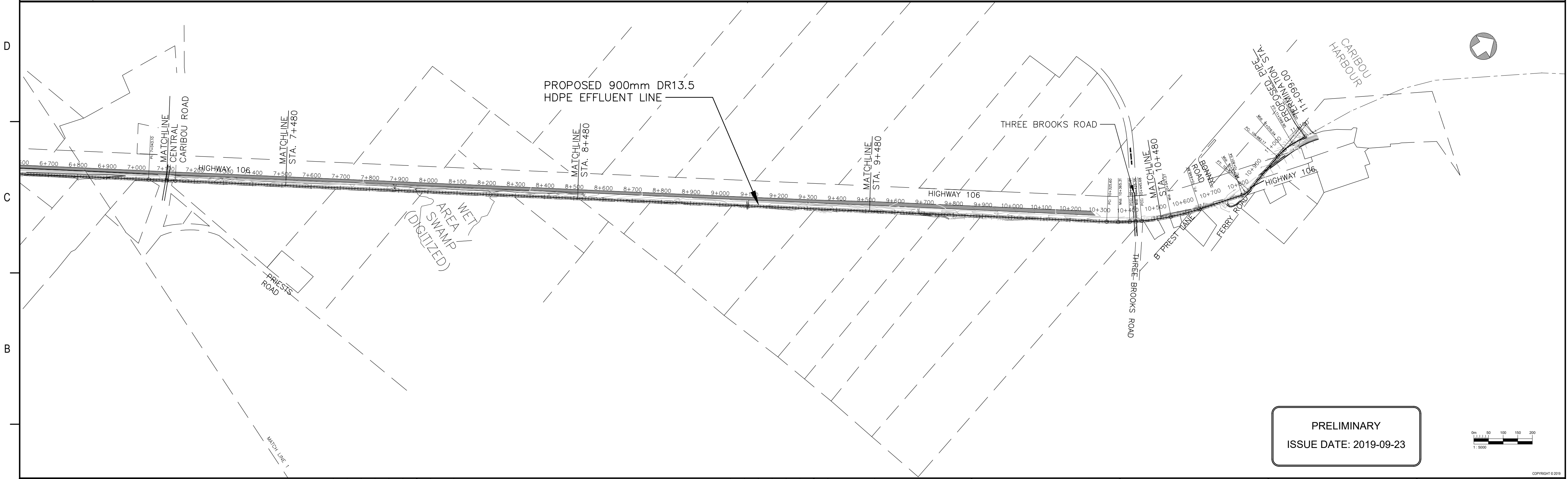
BRANCH CONNECTIONS

HEADER SIZE	2 – 36	All Branches Use Tees or Reducing Tees. Reducing Branch Saddles May be used.

NOTES	REFERENCE SPECIFICATIONS
14) Bolt threads shall be coated with molybdenum disulfide before engaging. 16) See Service Index for Valve and Insulation codes. 23) Specification limited by flange ratings. 24) Specification limited by pipe wall thickness including manufacturing tolerance and corrosion allowance. 47) Flange assembly and bolt torque shall be in accordance with PPI TN-38 and Flange Manufacturers Guidelines. 50) Fabricated fittings shall be produced in the SDR required to withstand the full pressure of the specified, adjoining pipe. 51) All pipe shall be fabricated and installed and butt fusion performed in accordance with the Plastic Pipe Institute. 201) All Heat Fusion of HDPE Joints shall be bonded in accordance with ASTM D2657, PPI Handbook of PE Pipe, Ch 9 and the Applicable ASME Piping Code.	PPI Plastic Pipe Institute

ABBREVIATIONS

DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		



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NOVA SCOTIA CORPORATION
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SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE LINE
PICTOU CAUSEWAY TO CARIBOU HARBOUR
SITE PLAN

wood.

AREA

CLIENT DWG NO.

DRAWING NO. TF19103601-3010_DWG 1 OF 10

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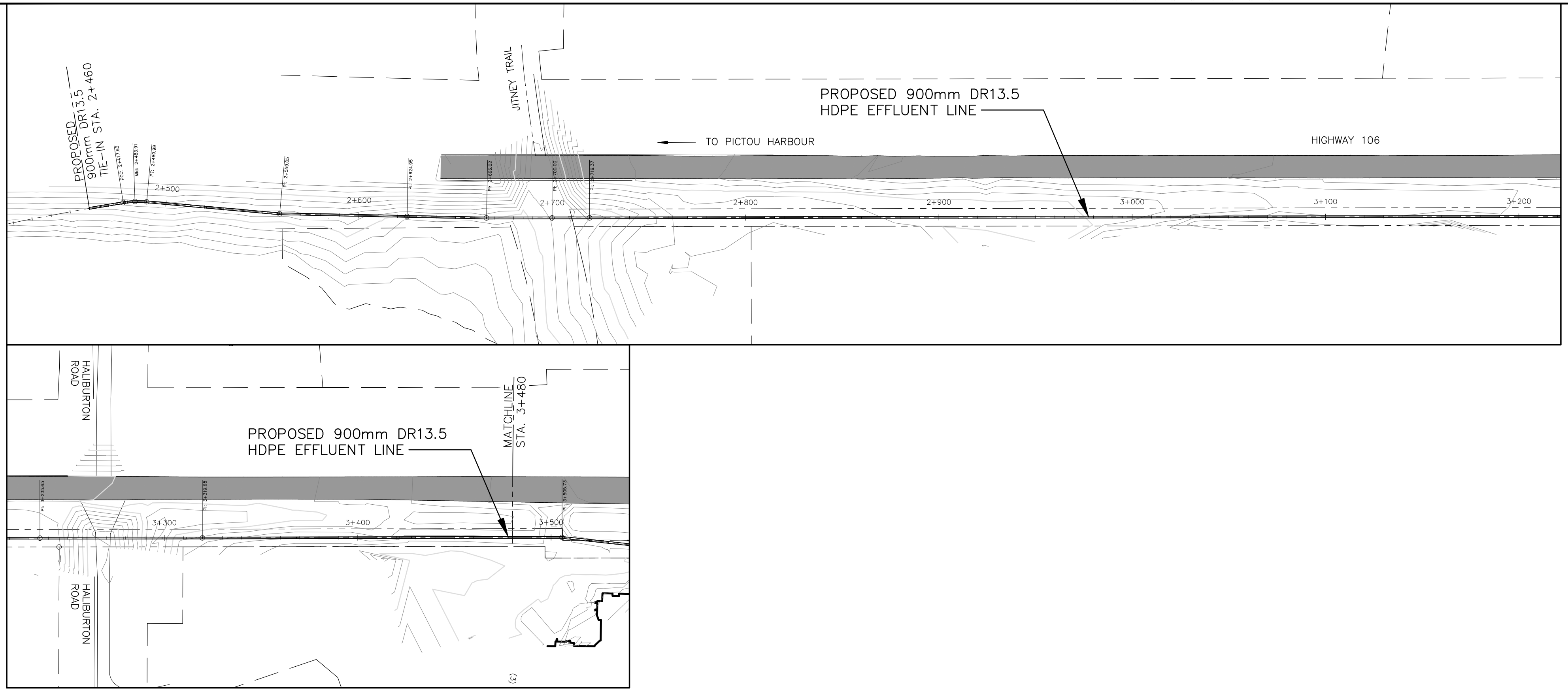

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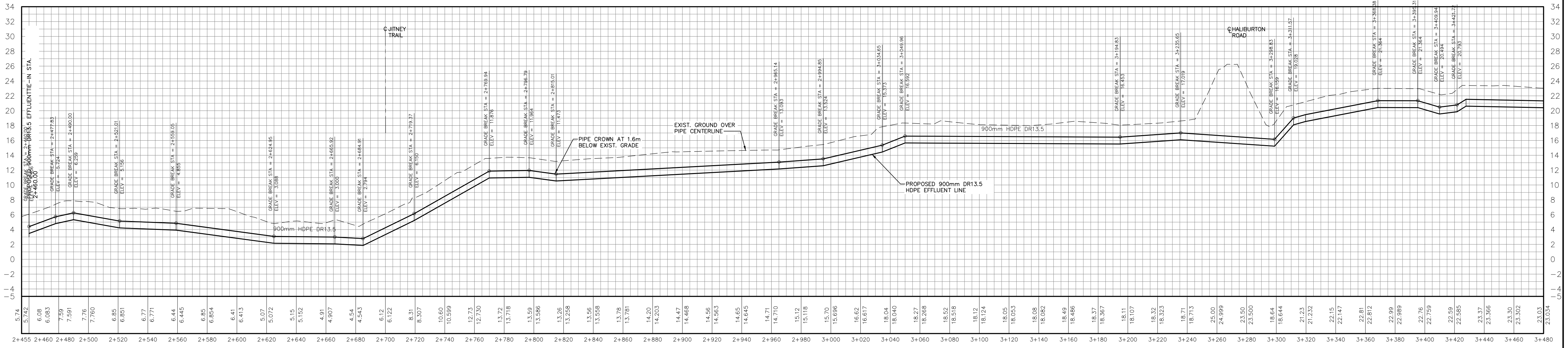

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SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE
PLAN AND PROFILE
STA. 2+460 TO 3+480

AREA

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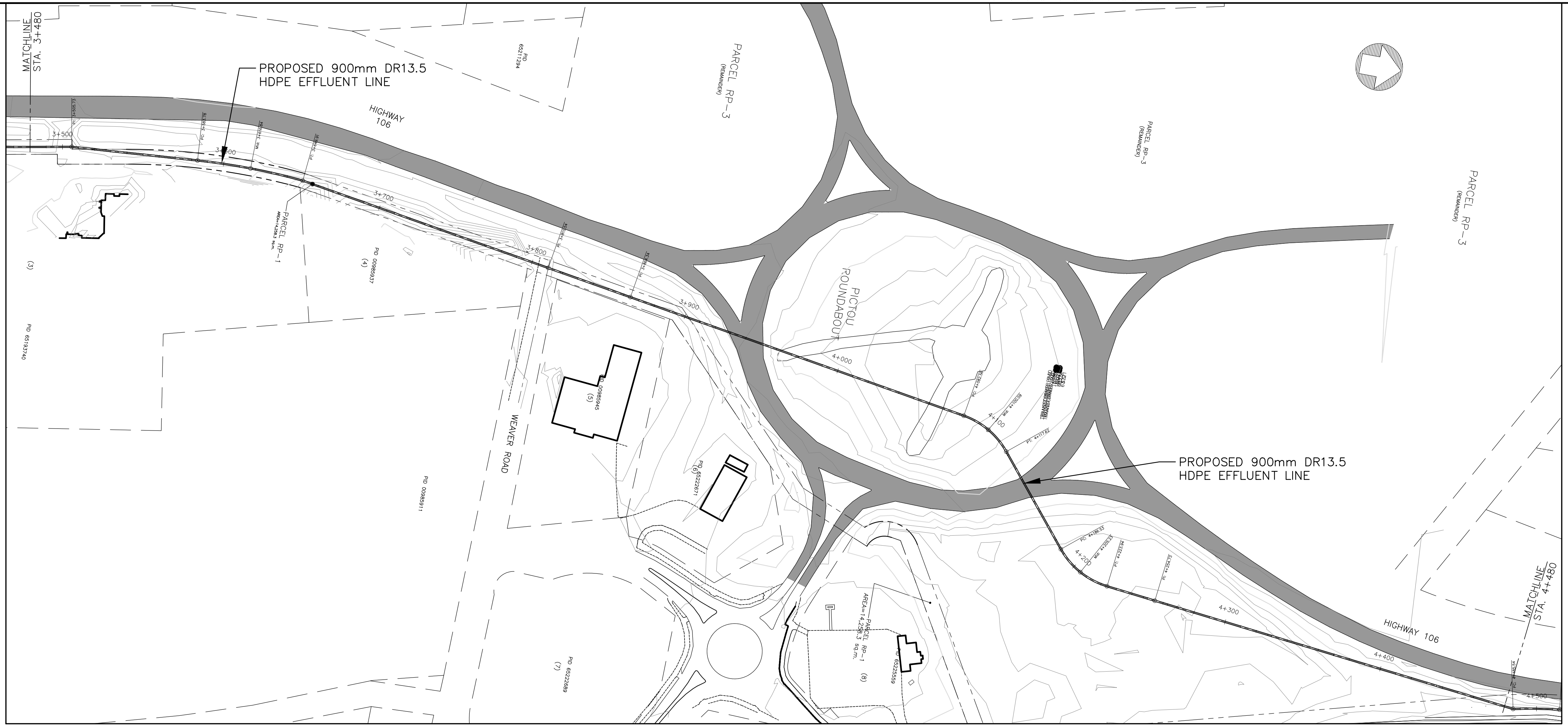

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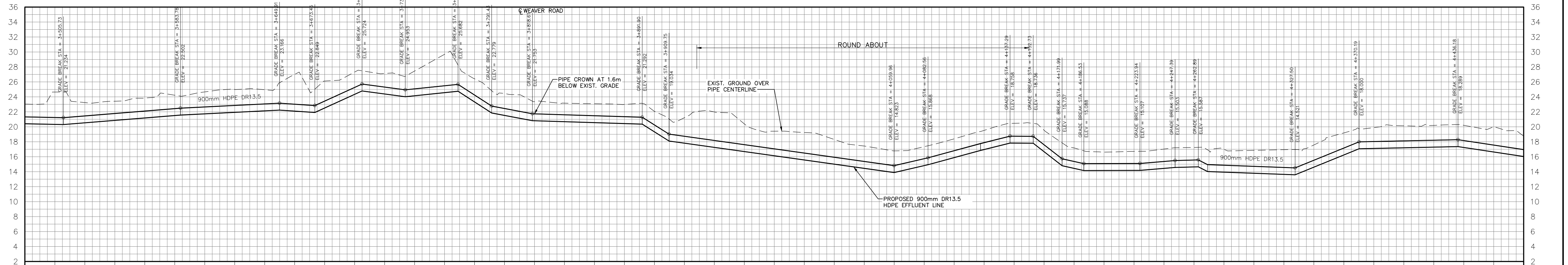

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3+520	23.24	23.240
3+540	23.42	23.424
3+560	23.84	23.839
3+580	24.22	24.222
3+600	24.66	24.661
3+620	24.99	24.994
3+640	24.96	24.956
3+660	27.01	27.009
3+680	26.12	26.116
3+700	27.31	27.315
3+720	27.12	27.125
3+740	27.45	27.450
3+760	29.69	29.692
3+780	26.41	26.413
3+800	24.45	24.449
3+820	23.37	23.374
3+840	23.16	23.161
3+860	23.08	23.076
3+880	22.99	22.986
3+900	22.07	22.074
3+920	21.22	21.218
3+940	21.99	21.988
3+960	20.39	20.392
3+980	19.41	19.415
4+000	19.23	19.232
4+020	18.31	18.313
4+040	17.43	17.434
4+060	16.78	16.780
4+080	17.35	17.347
4+100	18.39	18.392
4+120	19.52	19.524
4+140	20.47	20.469
4+160	19.55	19.549
4+180	17.18	17.177
4+200	16.62	16.624
4+220	16.72	16.718
4+240	17.03	17.025
4+260	17.25	17.246
4+280	16.98	16.983
4+300	16.85	16.850
4+320	16.95	16.946
4+340	17.57	17.575
4+360	19.18	19.185
4+380	19.89	19.892
4+400	20.13	20.133
4+420	20.19	20.192
4+440	20.20	20.203
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SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE
PLAN AND PROFILE
STA. 3+480 TO 4+480

wood.

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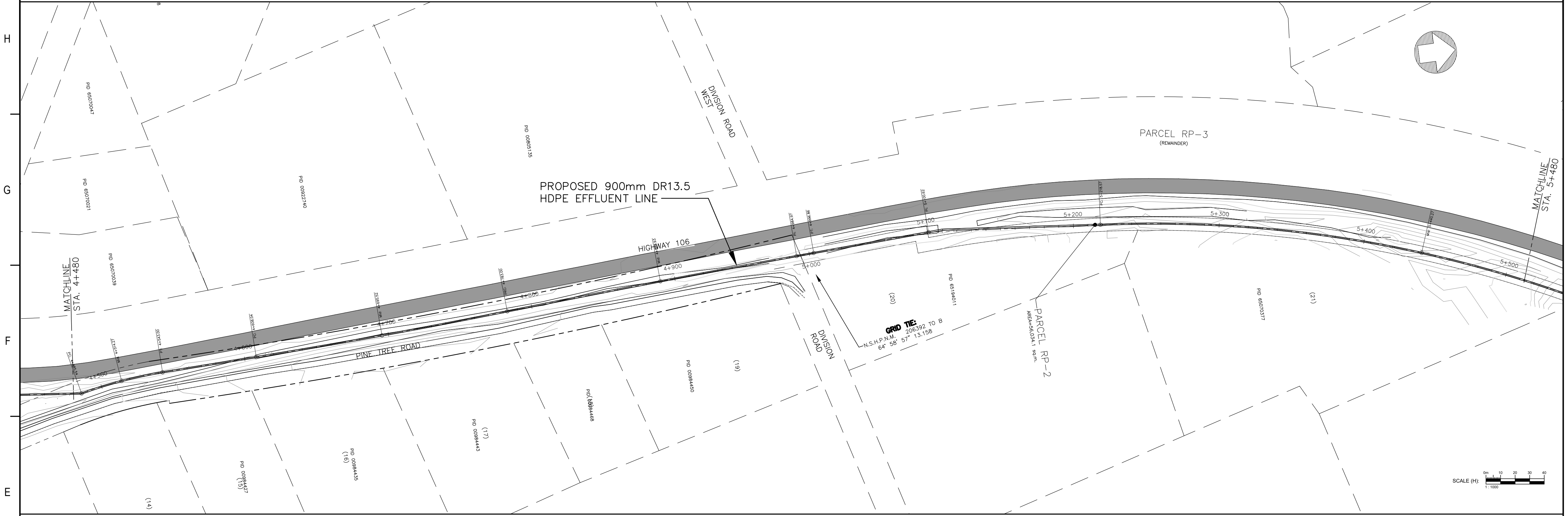

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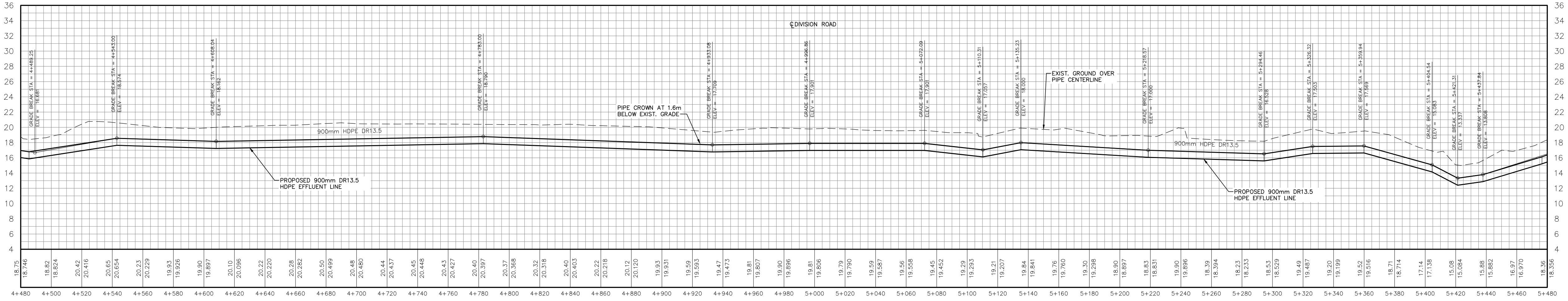

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SUBJECT
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900mm DIA. EFFLUENT DISCHARGE LINE
PLAN AND PROFILE
STA. 4+480 TO 5+480

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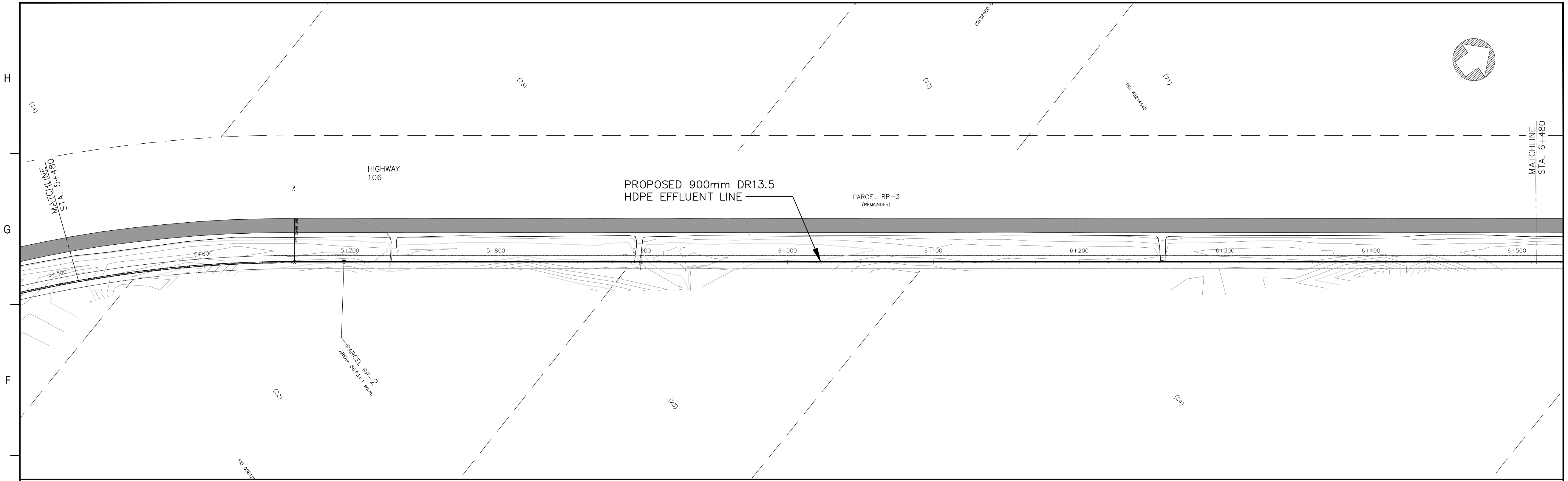

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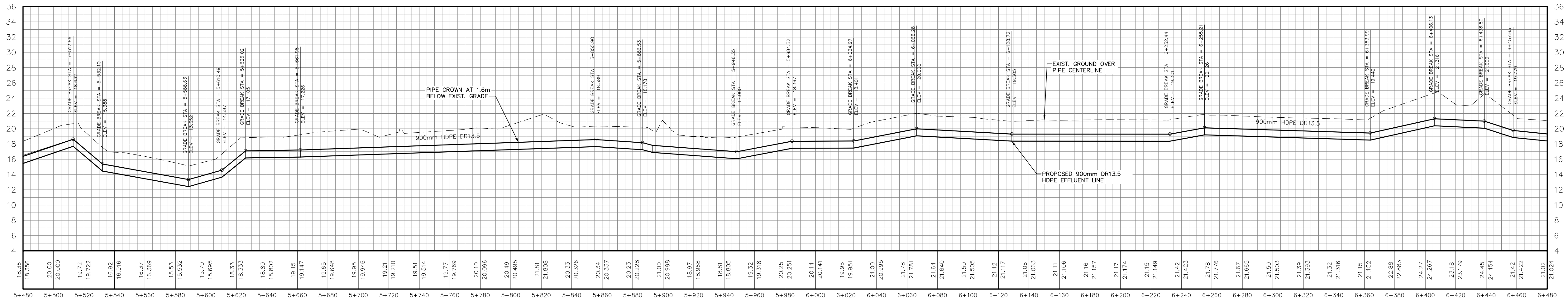

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	BY	DDMMMYY
DES	TM	
DRN	WM	2019/08/03
CHK	NS	
APP		

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE LINE
PLAN AND PROFILE
STA. 5+480 TO 6+480

wood.

AREA

CLIENT DWG NO.

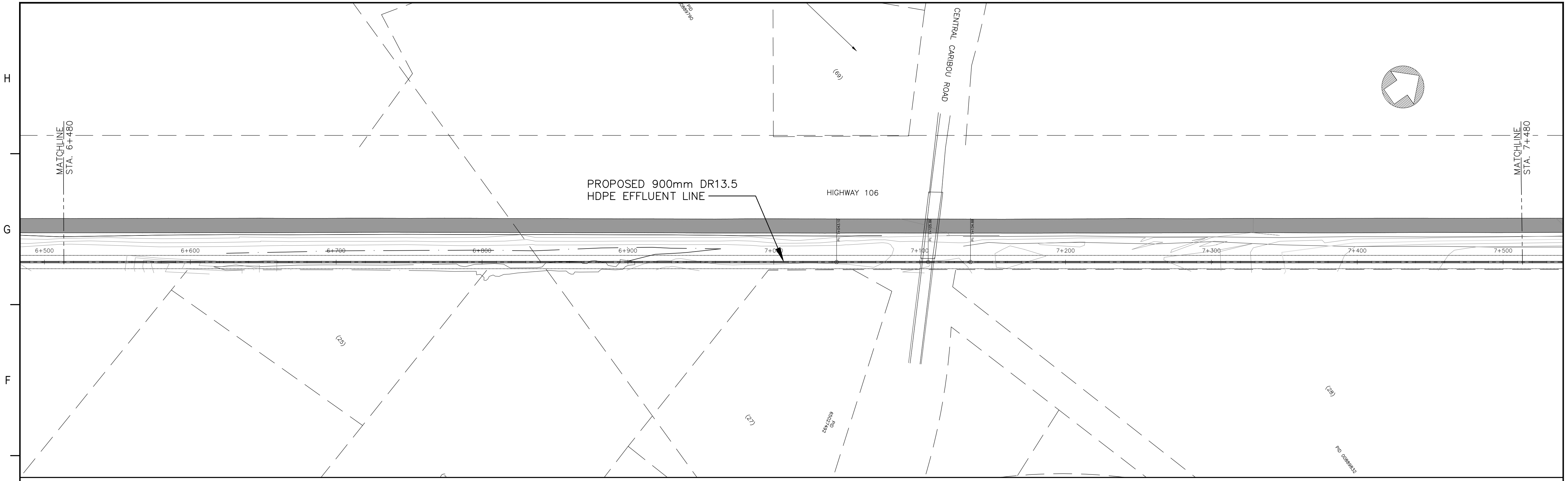
DRAWING NO.
TF19103601-3010_DWG 5 OF 10

REV
B

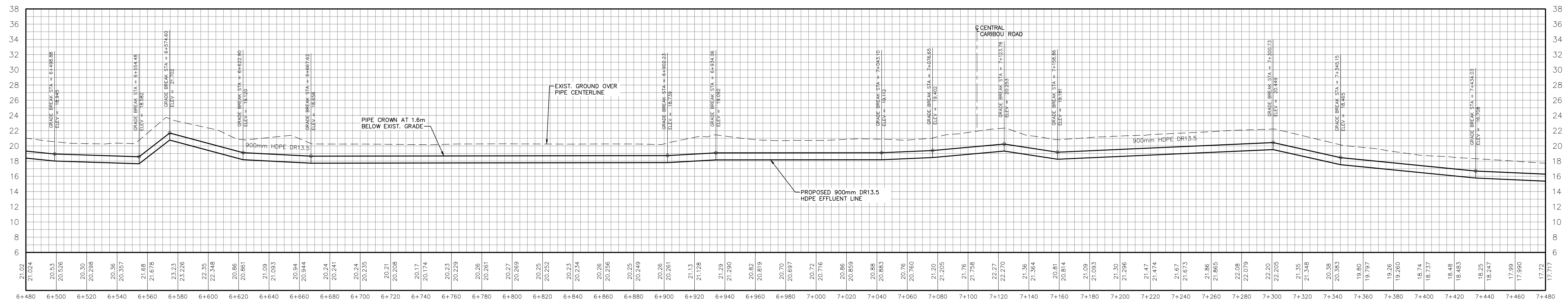
CAD FILE: T:\HFX-FS1P\TF19103601 NORTHERN PULP\TF19103601-RTE 106 EFFLUENT LINE PLAN AND PROFILE 2019-09-09.DWG

SAVED: 26-Sep-19 11:38 AM PLOTTED: 26-Sep-19 12:22 PM USER: MESSER, WENDELL

ANSI E-34x44



CL PIPE STA. 6+480–7+480 (2019–09–25)



SCALE (H): 1 : 1000

PRELIMINARY

ISSUE DATE: 2019-09-25

SCALE (H): 1 : 1000

SCALE (V): 1 : 200

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
B	25/SEPT/2019	GENERAL REVISION	WM	TM				
A	23/SEPT/2019	ISSUED FOPR REVIEW AND COMMENT	WM	TM				

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

APPROVED FOR ___________

CLIENT PROJECT MGR
DEPARTMENT MGR
PROJECT MGR

PROJECT PHASE

PROJECT NO.
TF19103601

SCALE
1:1000

	BY	DDMMMYY
DES	TM	
DRN	WM	2019/08/03
CHK	NS	
APP		

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

wood.

SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE LINE
PLAN AND PROFILE
STA. 6+480 TO 7+480

AREA

CLIENT DWG NO.

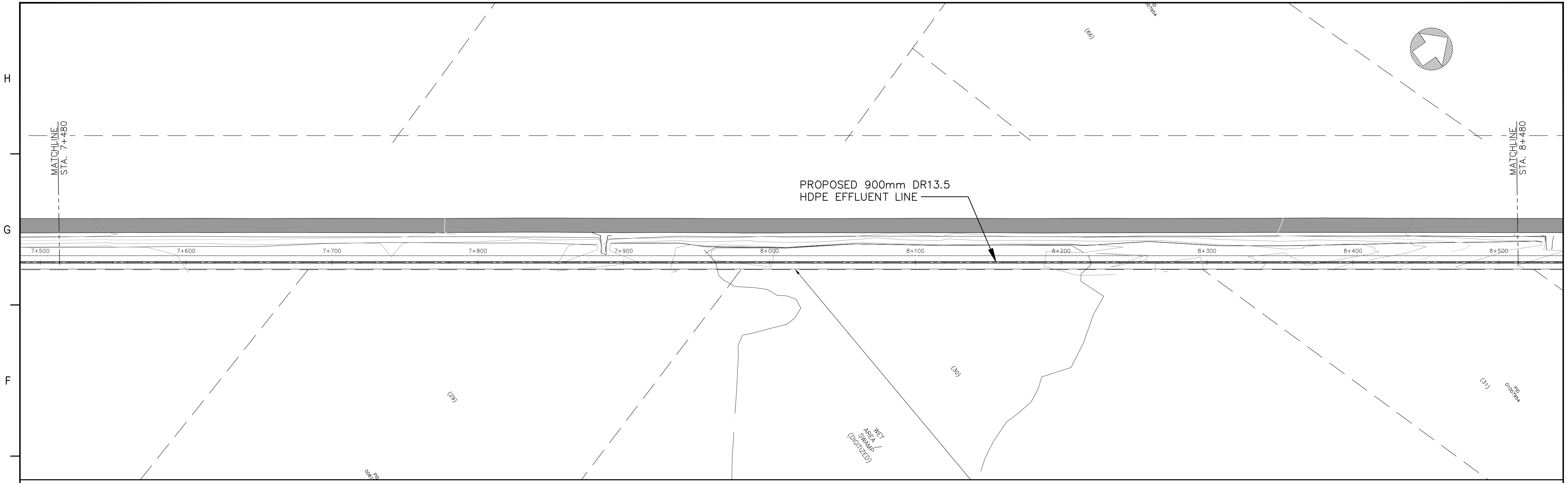
DRAWING NO.
TF19103601-3010_DWG 6 OF 10

REV
B

CAD FILE: T:\ HFX-FS1PT\F19103601 NORTHERN PULP\TF19103601-RTE 106 EFFLUENT LINE PLAN AND PROFILE

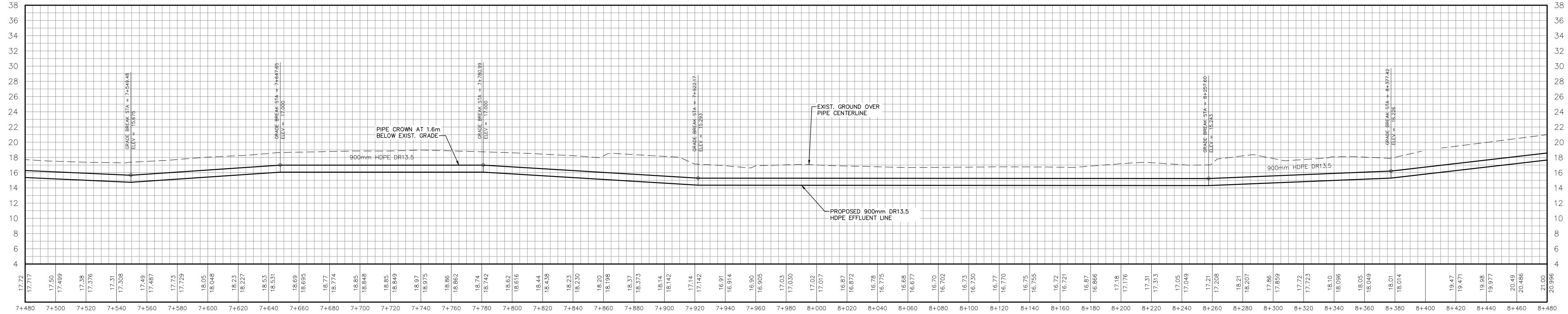
SAVED: 26-Sep-19 11:38 AM PLOTTED: 26-Sep-19 12:22 PM USER: MESSER, WENDELL

ANSI E-34x44



SCALE (H): 0m 10 20 30 40 1 : 1000

CL PIPE STA. 7+480–8+480 (2019-09-25)



7+480	17.72	17.717
7+500	17.50	17.499
7+520	17.38	17.376
7+540	17.31	17.308
7+560	17.49	17.487
7+580	17.73	17.729
7+600	18.05	18.048
7+620	18.23	18.227
7+640	18.53	18.531
7+660	18.69	18.695
7+680	18.77	18.774
7+700	18.85	18.848
7+720	18.85	18.849
7+740	18.97	18.975
7+760	18.86	18.862
7+780	18.74	18.742
7+800	18.62	18.616
7+820	18.44	18.438
7+840	18.23	18.230
7+860	18.20	18.198
7+880	18.37	18.373
7+900	18.14	18.142
7+920	17.14	17.142
7+940	16.91	16.914
7+960	16.90	16.905
7+980	17.03	17.030
8+000	17.02	17.017
8+020	16.87	16.872
8+040	16.78	16.775
8+060	16.68	16.677
8+080	16.70	16.702
8+100	16.73	16.730
8+120	16.77	16.770
8+140	16.75	16.755
8+160	16.72	16.721
8+180	16.87	16.866
8+200	17.18	17.176
8+220	17.31	17.313
8+240	17.05	17.049
8+260	17.21	17.208
8+280	18.21	18.207
8+300	17.86	17.859
8+320	17.72	17.723
8+340	18.10	18.096
8+360	18.05	18.049
8+380	18.01	18.014
8+400		
8+420	19.47	19.471
8+440	19.98	19.977
8+460	20.49	20.486
8+480	21.00	20.996

PRELIMINARY
ISSUE DATE: 2019-09-25

SCALE (H): 0m 10 20 30 40 1 : 1000
SCALE (V): 0m 2 4 6 8 1 : 200

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
B	25/SEPT/2019	GENERAL REVISION	WM	TM				
A	23/SEPT/2019	ISSUED FOR CMD REPORT	WM	TM				

REF	NUMBER	TITLE

STAMP/SEAL

APPROVED FOR ____________
CLIENT PROJECT MGR DEPARTMENT MGR PROJECT MGR
PROJECT PHASE

PROJECT NO.: TF19103601
SCALE: 1:1000

	BY	DDMMMYY
DES	TM	
DRN	WM	2019/08/03
CHK	NS	
APP		

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE LINE
PLAN AND PROFILE
STA. 7+480 TO 8+480

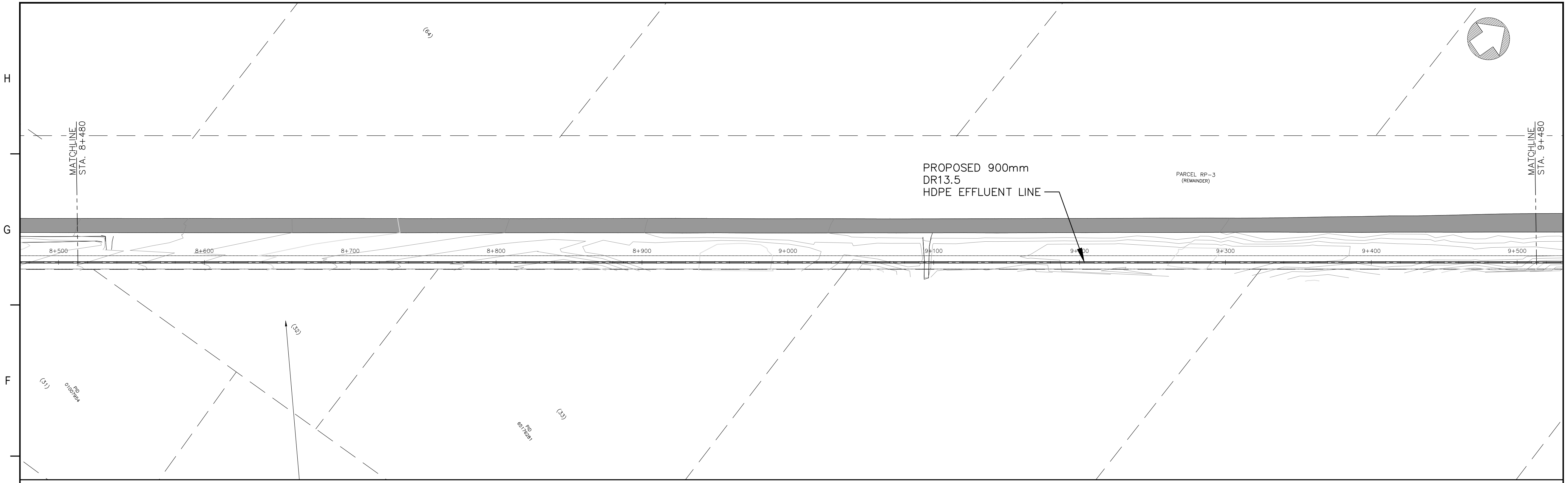
wood.

AREA
CLIENT DWG NO.
DRAWING NO.: TF19103601-3010 DWG 7 OF 10
REV: B

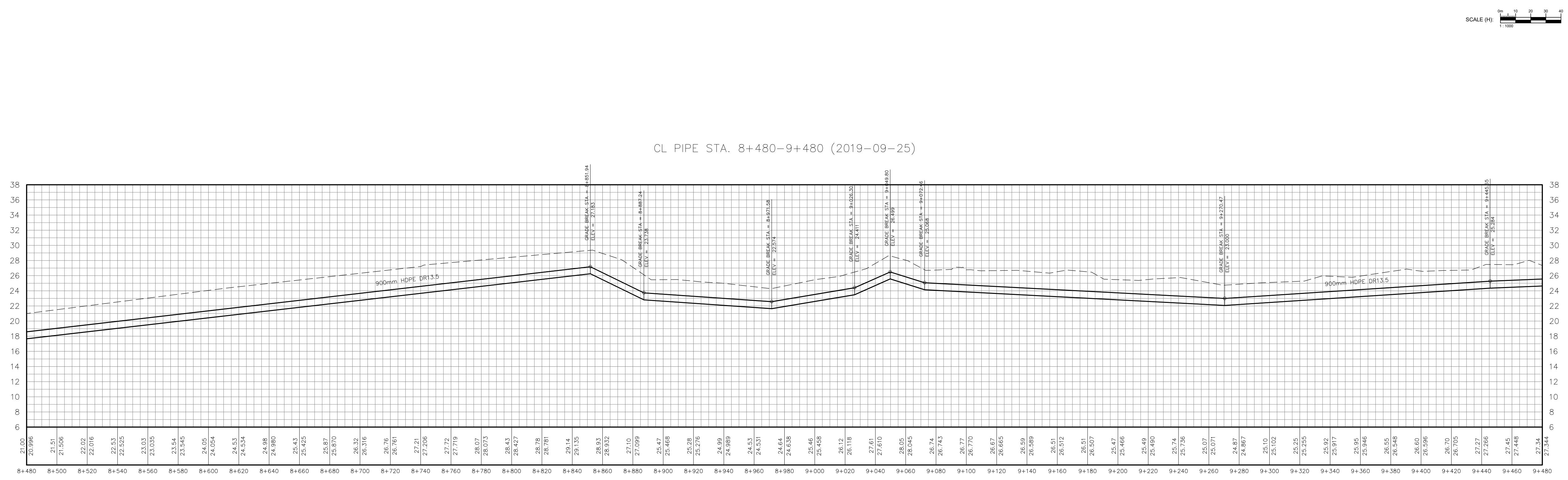
SAVED: 26-Sep-19 11:38 AM PLOTTED: 26-Sep-19 12:20 PM USER: MESSER, WENDELL

CAD FILE: T:\HFX-FS1PTF19103601 NORTHERN PULP\TF19103601-RTE 106 EFFLUENT LINE PLAN AND PROFILE

ANSI E-34x44



CL PIPE STA. 8+480–9+480 (2019-09-25)



21.00	20.996	8+480
21.51	21.506	8+500
22.02	22.016	8+520
22.53	22.525	8+540
23.03	23.035	8+560
23.54	23.545	8+580
24.05	24.054	8+600
24.53	24.534	8+620
24.98	24.980	8+640
25.43	25.425	8+660
25.87	25.870	8+680
26.32	26.316	8+700
26.76	26.761	8+720
27.21	27.206	8+740
27.72	27.719	8+760
28.07	28.073	8+780
28.43	28.427	8+800
28.78	28.781	8+820
29.14	29.135	8+840
28.93	28.932	8+860
27.10	27.099	8+880
25.47	25.468	8+900
25.28	25.276	8+920
24.99	24.989	8+940
24.53	24.531	8+960
24.64	24.638	8+980
25.46	25.458	9+000
26.12	26.118	9+020
27.61	27.610	9+040
28.05	28.045	9+060
26.74	26.743	9+080
26.77	26.770	9+100
26.67	26.665	9+120
26.59	26.589	9+140
26.51	26.512	9+160
26.51	26.507	9+180
25.47	25.466	9+200
25.49	25.490	9+220
25.74	25.736	9+240
25.07	25.071	9+260
24.87	24.867	9+280
25.10	25.102	9+300
25.25	25.255	9+320
25.92	25.917	9+340
25.95	25.946	9+360
26.55	26.548	9+380
26.60	26.596	9+400
26.70	26.705	9+420
27.27	27.266	9+440
27.45	27.448	9+460
27.34	27.344	9+480

PRELIMINARY
ISSUE DATE: 2019-09-25

SCALE (H): 0m 10 20 30 40 1 : 1000
SCALE (V): 0m 2 4 6 8 1 : 200

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
B	25/SEPT/2019	GENERAL REVISION	WM	TM				
A	23/SEPT/2019	ISSUED FOR CMD REPORT	WM	TM				

REFERENCES

REF	NUMBER	TITLE

STAMP/SEAL

APPROVED FOR ___________

CLIENT PROJECT MGR DEPARTMENT MGR PROJECT MGR

PROJECT PHASE

PROJECT NO.
TF19103601

SCALE
1:1000

	BY	DDMMMYY
DES	TM	
DRN	WM	2019/08/03
CHK	NS	
APP		

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE LINE
PLAN AND PROFILE
STA. 8+480 TO 9+480

wood.

AREA

CLIENT DWG NO.

DRAWING NO.
TF19103601-3010_DWG 8 OF 10

REV
B

CAD FILE: T:\HFX-FS1PTF19103601 NORTHERN PULP\TF19103601-RTE 106 EFFLUENT LINE PLAN AND PROFILE

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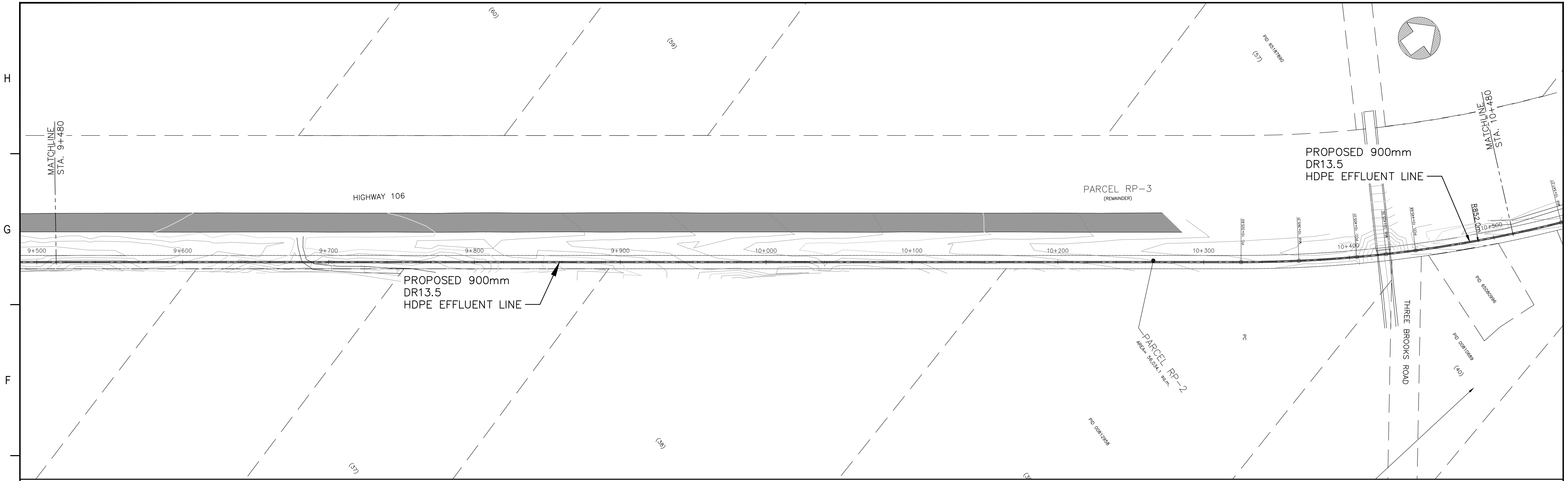
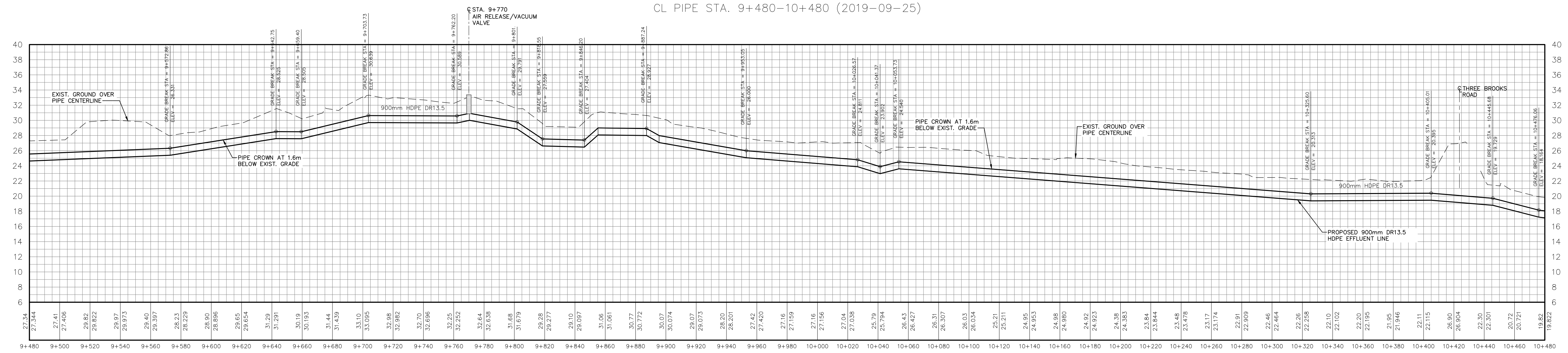


SCALE (H): 1 : 1000

CL PIPE STA. 9+480–10+480 (2019-09-25)



PRELIMINARY

ISSUE DATE: 2019-09-25

SCALE (H): 1 : 1000

SCALE (V): 1 : 200

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REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
B	25/SEPT/2019	GENERAL REVISION	WM	TM				
A	23/SEPT/2019	ISSUED FOR CMD REPORT	WM	TM				

REF	NUMBER	TITLE

REFERENCES

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CLIENT PROJECT MGR DEPARTMENT MGR PROJECT MGR

PROJECT PHASE

PROJECT NO. TF19103601

SCALE 1:1000

	BY	DDMMMYY
DES	TM	
DRN	WM	2019/08/03
CHK	NS	
APP		

NORTHERN PULP NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE LINE
PLAN AND PROFILE
STA. 9+480 TO 10+480

wood.

AREA

CLIENT DWG NO.

DRAWING NO. TF19103601-3010_DWG 9 OF 10

REV B

CAD FILE: T:\HFX-FS1\PTF19103601 NORTHERN PULP\TF19103601-RTE 106 EFFLUENT LINE PLAN AND PROFILE

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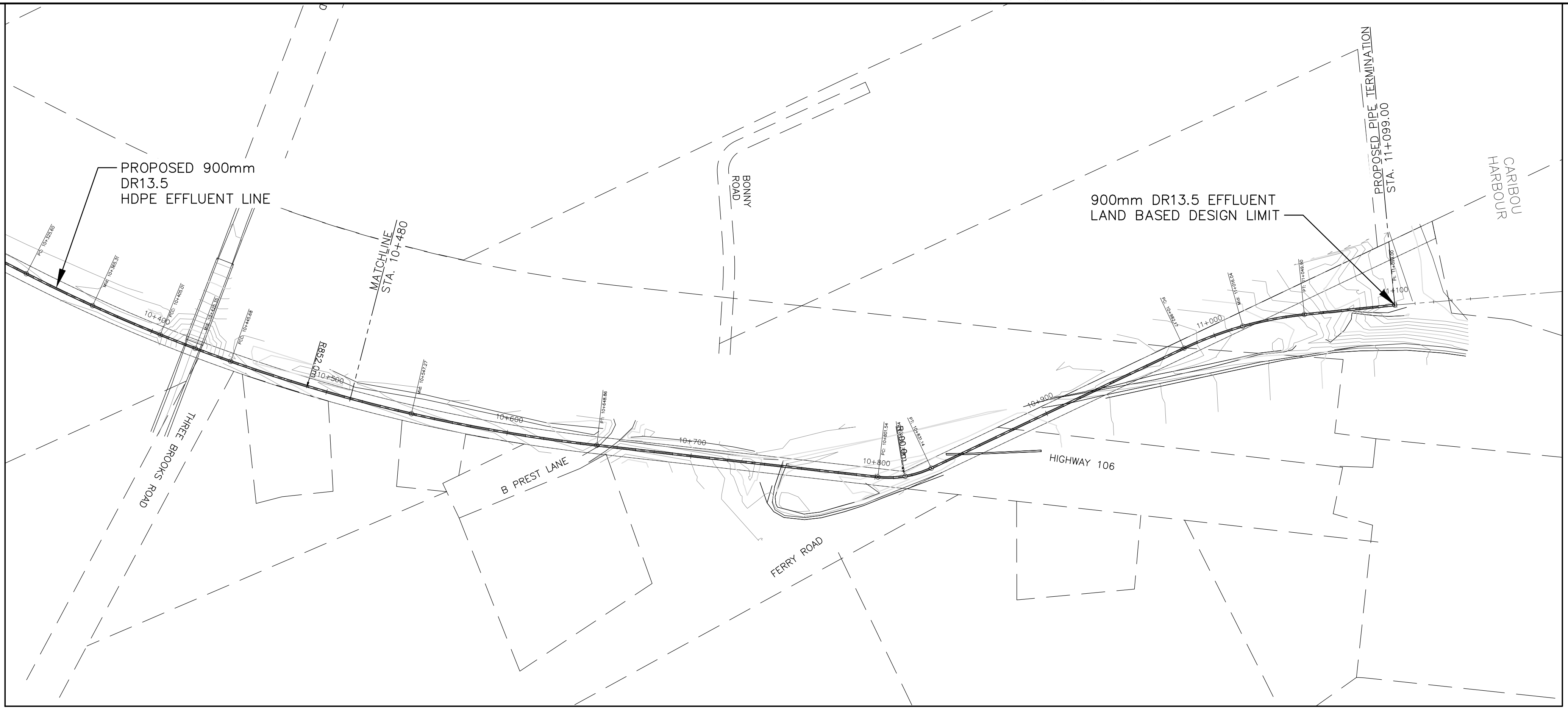
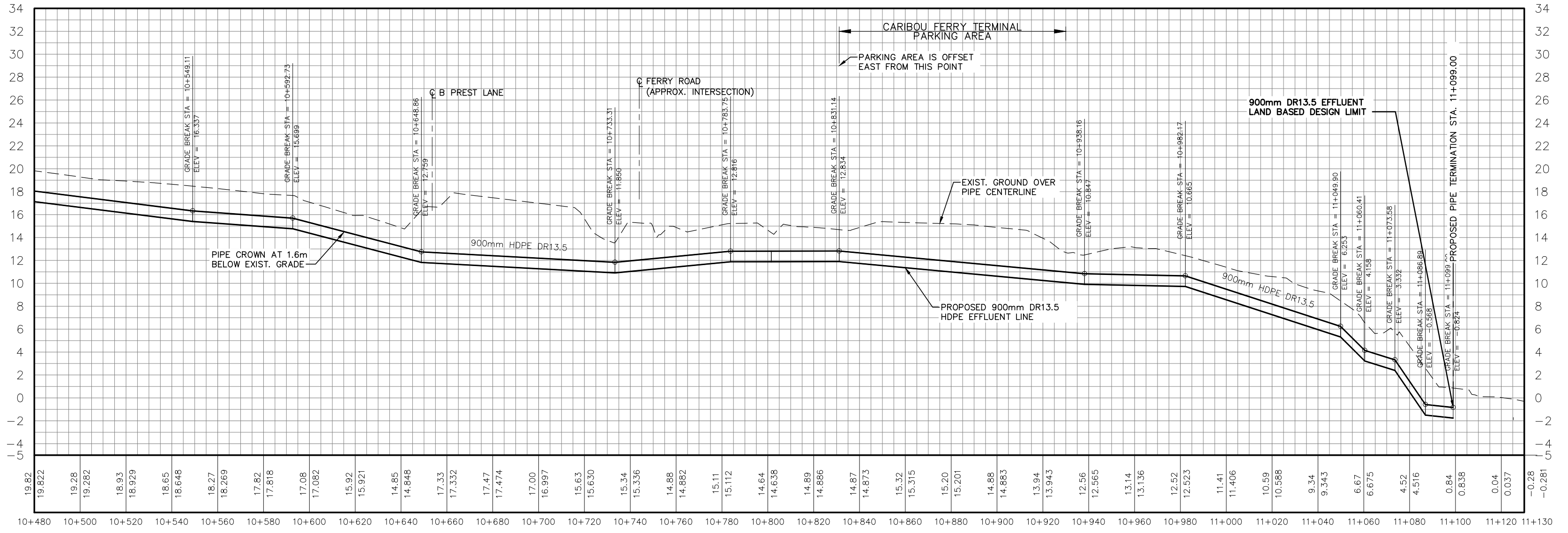


SCALE (H): 0m 10 20 30 40 1 : 1000

CL PIPE STA. 10+480–11+130 (2019–09–25)



PRELIMINARY

ISSUE DATE: 2019-09-25

SCALE (H): 0m 10 20 30 40 1 : 1000

SCALE (V): 0m 2 4 6 8 1 : 200

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
B	25/SEPT/2019	GENERAL REVISION	WM	TM				
A	23/SEPT/2019	ISSUED FOR CMD REPORT	WM	TM				

REF	NUMBER	TITLE

REFERENCES

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APPROVED FOR ___________

CLIENT PROJECT MGR DEPARTMENT MGR PROJECT MGR

PROJECT PHASE

PROJECT NO. TF19103601

SCALE 1:1000

	BY	DDMMMYY
DES	TM	
DRN	WM	2019/08/03
CHK	NS	
APP		

NORTHERN PULP
NOVA SCOTIA CORPORATION
A PAPER EXCELLENCE COMPANY

wood.

SUBJECT
NORTHERN PULP
900mm DIA. EFFLUENT DISCHARGE LINE
PLAN AND PROFILE
STA. 10+480 TO 11+130

AREA

CLIENT DWG NO.

DRAWING NO. TF19103601-3010_DWG 10 OF 10

REV B

SAVED: 26-Sep-19 11:38 AM PLOTTED: 26-Sep-19 12:18 PM USER: MESSER, WENDELL

CAD FILE: T:\HFX-FS1PT\F19103601 NORTHERN PULP\TF19103601-RTE 106 EFFLUENT LINE PLAN AND PROFILE

<u>THIS QUIT CLAIM DEED</u> made this 31st day of October , 2012.

BETWEEN:

<u>HER MAJESTY THE QUEEN</u> in right of the Province of Nova Scotia represented in this behalf by the Minister of Natural Resources, duly authorized by Order in Council 2012-144 dated May 1, 2012

(hereinafter called the "Grantor")

OF THE FIRST PART

-and-

Town of Pictou, a body corporate with its registered office at Pictou, in the County of Pictou, Province of Nova Scotia

(hereinafter called the "Grantee")

OF THE SECOND PART

NOW THIS INDENTURE WITNESSETH that in consideration of the sum of One Dollar ($1.00) of lawful money of Canada and other good and valuable consideration to the Grantor in hand well and truly paid by the Grantee at or before the sealing and delivery of These Presents, the receipt whereof is hereby acknowledged, the Grantor hereby remises, releases and quits claim unto the Grantee, its successors and assigns forever, all those certain lots, pieces or parcels of land more particularly described in Schedule "A" and "B" attached to this Quit Claim Deed;

IN THIS QUIT CLAIM DEED the singular includes the plural and masculine includes the feminine, with the intent that this Quit Claim Deed shall be read with all appropriate changes of number and gender;

IN WITNESS WHEREOF the said Grantor has signed and sealed These Presents on the day and year first above written.

SIGNED, SEALED AND DELIVERED)
in the presence of)
)
Barbara J Hunt) Charlie
Witness) Minister of Natural Resources
) for the Province of Nova Scotia
)

Schedule "A"

ALL that certain lot, piece or parcel of Crown land (former Canadian Government Railways Pictou Spur and a portion of Canadian Government Railways Oxford Subdivision) lying within the Town of Pictou, Pictou County, Nova Scotia and being more particularly described as follows:

Pictou Spur:

BEGINNING at the point where the centerline of the connector corridor and the centerline of the Pictou Spur merge at or about Mile 0.22 (centerline chainage 11+60), as shown on Canadian National Atlantic Lease Plan, Mile 0.02 to 1.88 of Pictou Spur, Canadian Government Railways, Pictou, Nova Scotia dated March 17, 1992 having plan number 11418-28 (Corr. File No. A-64285) and continuing in a general easterly direction to the western boundary of Depot Street. Limits of corridor and width (each side of centerline) as shown on subject plan registered as plan number 101574813 at the Pictou Land Registry Office on September 20, 2012.

Excluding any portion of the above referenced Pictou Spur which crosses over Creighton Street, Coleraine Street, Kempt Street, Commercial Street, South Market Street, Highway No. 106 and any other public street, roadway or highway along its corridor.

Connector Corridor (from junction of Oxford Subdivision easterly to junction with Pictou Spur):

BEGINNING at centerline chainage 3553+90.5 (Oxford Subdivision) = 0+00 (Pictou Spur), as shown on Canadian Government Railways Plan (Oxford Subdivision), Plan Of Right Of Way Scottsburn To Sylvester, Mile 60 To 73 Oxford Subdivision dated May 19, 1993 (CN Real Estate Dept., Moncton, NB):

THENCE following a counterclockwise curve (8 degree CL and TA 69 degrees 41 minutes) in an easterly direction for 1,000 feet more or less, or until it merges with the centerline of the Pictou Spur. Corridor width on northern side of centerline as shown on subject plan and width on southern side being 49.5 feet from plan centerline.

Oxford Subdivision (westerly and northwesterly to Town of Pictou limits):

BEGINNING at centerline chainage 3553+90.5 (Oxford Subdivision) = 0+00 (Pictou Spur), as shown on Canadian Government Railways Plan (Oxford Subdivision), Plan Of Right Of Way Scottsburn To Sylvester, Mile 60 To 73 Oxford Subdivision dated May 19, 1993 (CN Real Estate Dept.):

THENCE continuing in a general northwesterly direction for 2,150 feet more or less to approximate centerline chainage 3532+40, or to the Gut Bridge at the town boundary. Limits of corridor and width (each side of centerline) as shown on subject plan.

Subject to an easement over the former CN rail corridor from Market Street to Gut Bridge for the purpose of public access as a recreational trail.

Schedule "B"

ALL that certain lot, piece or parcel of Crown land (which includes the former Canadian Government Railways train station lot plus additional land to the east of the train station property) lying within the Town of Pictou, Pictou County, Nova Scotia and being more particularly described as follows:

<u>PID 65078685</u>

Location: **Pictou**
Municipality/County: **Town of Pictou/Pictou County**
Designation of Parcel on Plan: **Lot 4A**
Area of Parcel: **5.27 acres +/-**
Title of Plan: **PLAN OF SUBDIVISION, showing Lot 2B, Lot 3 and Lot 4A, being a subdivision of lands of E. Casey & M. Porter, lands of Her Majesty the Queen in right of the Province of Nova Scotia and lands of H. M. in right of Canada and plan of survey showing Parcel C, lands of H. M. in right of Canada being added to Depot Street, at Front Street and Depot Street in the Town of PICTOU, County of Pictou, Province of Nova Scotia**
Public Works and Government Services Canada Plan Number: **S-4064**
Registration District: **Pictou County**
Registration Reference of Plan: **Plan Number 5921**
Registration Date of Plan: **May 27, 2003**

DATED this 31st day of October, 2012

BETWEEN:

HER MAJESTY THE QUEEN, in right of the Province of Nova Scotia, represented in this behalf by the Minister of Natural Resources, duly authorized by Order in Council 2012-144 dated May 1, 2012

(hereinafter called the "Grantor")

OF THE FIRST PART

- and -

TOWN OF PICTOU, a body corporate with its registered office at Pictou, in the County of Pictou, Province of Nova Scotia.

(hereinafter called the "Grantee")

OF THE SECOND PART

QUIT CLAIM DEED
