

REPORT

Erosion and Sediment Control Plan

Soil Remediation at Former Wellsite Unipkat I-22, Inuvialuit Settlement Region, Northwest Territories

Submitted to:

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1.0 INTRODUCTION

1.1 Background

WSP Canada Inc. (WSP) has prepared this Erosion and Sediment Control Plan (the Plan) on behalf of Shell Canada Limited (Shell) to support the soil remediation at the former wellsite Unipkat I-22 (the Site) in the Inuvialuit Settlement Region (ISR), Northwest Territories (NWT) (the Project). The Plan provides measures to control erosion and sedimentation during the ice road construction, maintenance and use, remediation and transportation activities at the Site by identifying potential Project-related effects and mitigation measures to minimize erosion and sedimentation potential.

The Plan will be effective upon its approval and will be implemented during the Project. Paper copies of this Plan will be available at the Site and all personnel will have access to paper and digital copies.

1.2 Location and Description

The Site is approximately 115 kilometres (km) northwest of Inuvik, in the ISR in the Mackenzie Delta, NWT at latitude 69°11'36.07" N and longitude 135°20'33.88" W. The site location is presented in Figure A1 (Appendix A).

Access to the Site in winter will be via ice road extension from the Inuvik to Aklavik public ice road and snowpack ramp, as presented in Figure A2 (Appendix A). The ice road extension to the Site will pass through Inuvialuit 7(1)(A) Private Lands and will follow the Mackenzie River East Channel and Arvoknar Channel (Figure A2, Appendix A). Access to the Site in summer will be via barge, boat or helicopter.

Shell developed the Site as an exploratory natural gas well site in 1972 and 1973 and re-entered in 1996 for additional well abandonment activities. Historically, the Site consisted of a camp sump, a well centre (e.g., a historical well marker), a drilling waste sump, a drilling flare pit and wood pilings used to support surface infrastructure above the ground.

1.3 Project Summary

The scope of work for the Project consists of the following activities:

- Potential mobilization of a self-contained barge camp with select soil remediation equipment (e.g., soil treatment equipment, loaders, excavators etc.) stored on-board in late summer or early fall of 2025 (submitted under Environmental Impact Screening Committee [EISC] Registry File [04/25-18]) to be anchored at the Site and frozen-in and winterized for the winter field program that will use an ice road extension for access.
- Construction of an approximately 110 km long ice road extension from a junction approximately 30 km north along the Government of Northwest Territories (GNWT) Inuvik to Aklavik public ice road. This will allow site access for equipment as well as the off-site transport and disposal of waste materials. The ice road extension will cross Inuvialuit 7(1)(A) Private Lands and will follow the Mackenzie River East Channel and Arvoknar Channel (Figure A2, Appendix A). It is expected that ice road reconnaissance and profiling will begin in December 2025 and construction will be completed in February 2026. A snowpack ramp will be constructed at the Site to allow access for equipment and crew.
- Mobilization of remaining equipment (office trailer, including heated portable toilets, soil treatment equipment, skid steers, loaders, excavators, fuel trucks and fuel tanks, and other miscellaneous equipment) and self-

contained winter camp (if the barge camp was not mobilized and frozen-in at the Site) to the Site via the ice road for the duration of the winter season.

- Excavation and on-site thermal treatment of approximately 3,800 cubic metres (m³) of soil containing petroleum hydrocarbons (PHCs) contaminants of concern (CoCs; PHC Fraction F2 and Type B Hydrocarbons) at concentrations above the proposed soil quality objectives (SQOs) at the Site using Enhanced Thermal Conduction (ETC). ETC involves transfer of a heated airstream (typically between 300 and 450 degrees Celsius [°C]) to volatilize and destroy PHCs in soil whose concentrations are above the proposed SQOs. To facilitate this, soil will be placed in treatment cells in which heat is applied via a dedicated air burner fueled by diesel. Prior to heating, the cell of soil is covered as a means of capturing the PHC vapour off-gas that is generated by the heating. Throughout the process, the generated PHC vapours will be channeled to a thermal oxidizer outside of the treatment cell for destruction prior to atmospheric release. The thermal oxidizer will be operated within defined parameters and monitored to ensure the efficient and complete destruction of PHC vapours. The proposed site layout and remedial extents are presented in Figure A3 (Appendix A).
- Excavation and off-site disposal of approximately 100 m³ of soil containing barite (i.e., true total barium) at concentrations above the proposed SQOs, at an approved disposal facility.
- If remediation activities are completed during the winter of 2026, select equipment may be demobilized from the Site via the ice road prior to breakup. Some equipment may be secured on site or on the barge camp (potentially anchored at the Site) to be demobilized from the Site following 2026 spring breakup.
- Select equipment that was demobilized from the Site prior to breakup, and a barge camp (if a winter camp was used) will be re-mobilized by barge and boat to the Site in June 2026 to resume soil remediation, if required. If a barge camp was used during the winter of 2026 (potentially anchored at the Site), it will remain during breakup and re-open to continue operations for the summer of 2026, if required.
- If required, remedial activities, including ETC treatment, may resume during the summer and fall months of 2026.
- Installation of post-remedial groundwater monitoring wells and pre- and post-remedial thermistors (proposed locations in Figure A3, Appendix A) during the winter (pre-remedial) and summer/fall (post-remedial) months of 2026, including monitoring well sampling of existing and newly installed groundwater monitoring wells.
- Final demobilization by barge in the summer/fall of 2026, before freeze-up.
- Post-remedial groundwater and thermal monitoring, completed as day trips from Inuvik via boat or helicopter access, in the summer/fall of 2027.
- Removal of remaining wood pilings at the Site using the previously employed perimeter drilling method (EISC Registry File [10/22-01]) anticipated during a 2027/2028 winter field program.
- Fuel storage at the Site will be in appropriate fuel tanks and trucks for refueling of the equipment and ETC units, fuel storage and refueling areas will be bermed. Drip trays and secondary containment will be used at fuel storage and refueling areas.



1.4 Project Contacts

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1.5 Roles and Responsibilities

Shell is responsible for the overall content and assignment of responsibilities of this Plan. Shell's contractors are responsible for the implementation of this Plan and are expected to adhere to it. All personnel working on the Project, including Shell employees, contractors and consultants, will be made aware of this Plan.

1.6 Guidelines and Standards

The Plan was developed using the following guidelines.

- Erosion and Sediment Control Manual (GNWT 2016);
- Code of Practice: Ice Bridges and Snow Fills (DFO 2022); and
- Interim Code of Practice: End-of-pipe fish protection screens for small water intakes in freshwater (DFO 2020).

2.0 MITIGATION MEASURES

The following sections describe the planned erosion and sediment control (ESC) measures for the ice road and remediation components of the Project.



2.1 Ice Road Construction, Maintenance and Use

In early winter, an approximately 110 km long ice road extension will be constructed from the Inuvik to Aklavik public ice road to the Site to allow Site access for the crew and equipment as well as off-site transport and disposal of waste materials. The route from Inuvik to the Site will originally follow the Government of Northwest Territories Inuvik to Aklavik public ice road to approximately the 30 km mark. From there, the ice road extension will follow the Mackenzie River East Channel and Arvoknar Channel with portions crossing through Inuvialuit 7(1)(A) Private Lands with a short snowpack ramp access to the Site.

- Dolly Varden (Salvelinus malma) is the only aquatic species potentially occurring in the surrounding area that is listed under Schedule 1 of the federal Species at Risk Act (SARA 2024, internet site).
- The work will not include realignment of the watercourse, dredging, grading, excavating or placing fill on the bed or banks of the watercourse.
- No temporary or permanent structures will be constructed below the high-water mark (with the exception of the snowpack ramp).
- Access to the Site from the ice road will be via a temporary snowpack ramp and will not interfere with fish passage or constrict the channel width.
- The ice road will not cross any water bodies.

2.1.1 Fish Protection

The following measures will be implemented to protect fish.

- There will be no in-water works.
- Water pumps used to withdraw water for winter access construction will include screened intake pipes to prevent entrainment or impingement of fish as per DFO's Interim Code of Practice for End-of-pipe Fish Protection Screens for Small Water Intakes in Freshwater (DFO 2020). This code of practice was developed to guide water intake rates of up to 150 litres per second. Any water withdrawal required for the Project will not exceed this limit. Water will be withdrawn from the Mackenzie River channels for ice road construction and for construction of snowpack ramp (if required to strengthen the thickness of compacted snow for the protection of underlying vegetation and terrain to a thickness of 15 centimetres [cm]).
- Implement speed limits on the ice road and limit public use to minimize auditory disturbance of fish.

2.1.2 Protection of Fish Passage

Fish passage is not expected to be affected by the Project. The temporary snowpack ramp will be built to a minimum thickness of 15 cm and will cover the transition area from the shore to land. Clean snow and, if required, water from the Arvoknar Channel will be used with no logs or woody debris required to strengthen the structure.

2.1.3 Protection of the Riparian Zone

Protection of the riparian zone will include the following.

- Use existing trails and previously disturbed areas to the extent possible.
- Limit vegetation clearing to the area required for access to the excavation and treatment areas.



- Construct the snowpack ramp perpendicular to the Arvoknar Channel.
- Construct the snowpack ramp with clean compacted snow and ice to a minimum thickness of 15 cm.

Restore the banks and riparian vegetation affected by the activities to their natural state through grading and recontouring to facilitate natural revegetation, if needed.

2.2 Remediation Area

The remediation area will include equipment and work areas to support excavation activities. Erosion and sediment control at the remediation area is described below.

2.2.1 Pre-Excavation

Prior to any excavation, the remediation area will be visually inspected to identify any additional ESC measures potentially required to minimize erosion. The ESC measures may take the form of earth works or placement of temporary engineered controls. Prior to starting excavation activities in any area, the following ESC measures will be considered.

- The potential winter camp (if on land) and the office trailer used to support remediation activities will be stationed on a minimum 15 cm pad of snow and ice in previously disturbed area of the Site, if possible.
- The barge camp (potentially anchored at the Site) landing area and access will be selected based on experience of the operator and monitored closely for sediment disturbance.
- The fuel truck and fuel tanks that will be temporarily staged at the Site will be in a designated fuel storage area and refueling areas will be bermed and at least 30 m away from the high-water mark of the Arvoknar Channel (refer to the Spill Contingency Plan [Appendix E of the Project Description] for details) with secondary containment.
- Temporary engineered controls such as straw wattles, silt curtains or silt fencing will be installed, seasonally, at the perimeter of each work area and next to sensitive features (i.e., waterbodies), as required.

2.2.2 Excavation and Backfilling

During excavation and backfilling, the following mitigation measures may be implemented as required:

- The work will include the excavation of soil near the bank of the Arvoknar Channel (Figure A3, Appendix A). This excavation will be prioritized for excavation, backfilling and grading (to match the bank profile along the river) during the winter of 2026. The frozen condition of the soil and river surface during the winter months will mitigate the potential for suspended sediments reaching aquatic organisms in the river.
- Walls of excavations will be properly sloped to prevent loose material from falling into the excavation.
- Dust control measures during the summer months may include the spraying of dusty areas and treated soil piles with water obtained from the Arvoknar Channel. During the winter months, when it is too cold to use water for dust control; treated soil piles (i.e., the source of dust during the winter) will not be worked on in conditions when on site recorded windspeeds exceed 20 kilometres per hour (km/h) and, as much as possible, dust that may reach off-site areas will be removed using a snow plow and loader. The scraped-up dusty snow will be stored and managed on site in a snow storage area.



 Excavations will be backfilled in with nominal compaction in lifts to make them less susceptible to erosion and settlement.

- Roughening of slopes on the contour or tracking with dozer tracks will help to capture moisture and seep to promote natural revegetation and minimize erosion.
- Installation of additional ESC controls as needed (such as the use of biodegradable erosion control blankets, silt fencing, and/or tarping of erosion susceptible areas and materials) in accordance with applicable best management practices and/or the Government of the Northwest Territories (GNWT) Erosion and Sediment Control Manual (GNWT 2016).
- Restore the banks and riparian vegetation affected by the activities to their natural state through grading and recontouring to facilitate natural revegetation, if needed.
- The work will not include realignment of the watercourse, dredging, grading, excavating or placing fill on the bed of the Arvoknar Channel.

2.2.3 Post Excavation

Areas with a potential risk of erosion, such as slopes and gullies, will be monitored pre- and post-excavation for signs of erosion of material that may enter the Arvoknar Channel. Should additional sediment capture methods be required, the Plan will be amended, and new/additional measures will be installed. All temporary engineered controls will be removed from the remediation area once the Project is complete.

The southern boundary of the Site has been naturally eroded by the Arvoknar Channel at a rate of erosion ranging between 1.2 and 3.8 metres per year, since 2007. To mitigate continuing erosion, the remaining wood pilings at the Site will remain in place during remediation activities and will be removed following remedial excavation during the winter of 2027/2028 to not impede navigation through the natural erosion of the Site. Holes generated by the removal of the pilings will be backfilled and compacted with the drill cuttings.

It is expected that erosion may continue at the Site, though the rate is uncertain, and in some cases sedimentation may occur.

2.2.4 Permafrost

Thermistors will be installed at the Site to monitor permafrost during and after the Project. Thermal monitoring will be completed to monitor site-specific permafrost conditions. To mitigate potential effects on permafrost (i.e., permafrost melting), the following measures will be implemented as described in the Permafrost Protection Plan (Appendix H of the Project Description):

- Recontour disturbed areas as part of reclamation activities. Excavation of impacted soils will be completed in stages, limiting the duration of permafrost exposure.
- The permafrost at the base of the excavation will be insulated, as necessary, to limit deterioration if exposed. At a minimum, extruded polystyrene insulation (and/or soil) will be temporarily placed at the base of the excavation and topped with soil fill. Additional protection measures may be implemented as required.
- Clearing of vegetation (if required) will be limited to the area of the excavation, soil treatment cells and staging area. Vegetation and organic layer will protect the underlying permafrost outside the soil treatment areas.
- Prevent surface water from entering an open excavation, using grading, ditches or berms and prevent precipitation from entering the excavation, using tarps or other cover.



 Excavations will be backfilled as soon as possible to reduce interactions with the water table following excavation of contaminated material or debris. Backfilling to be completed in nominally compacted lifts to minimize erosion/washout.

- Disturbed areas will be graded and recontoured.
- Continue thermal monitoring through the installed thermistors at the Site.
- The Permafrost Protection Plan (Appendix H of the Project Description) will be implemented during all phases of the Project.

3.0 INSPECTION AND MONITORING

During and following the remediation activities, regular checks of all ESC measures will be completed to assess placement and function. All ESC measures will be repaired or replaced as necessary. Additional ESC measures may be required and will be documented.

The Erosion Control Inspection and Maintenance Form (Appendix B) will be used during regular Site inspections to track the performance of the installed ESC measures.

A final inspection will be completed prior to demobilization from the Site.

Thermal monitoring will continue throughout the Project and after completion of the Project. A post-remedial monitoring schedule is provided in the Reclamation, Closure and Monitoring Plan and may be modified as per the future Inuvialuit Water Board Water Licence.

4.0 REFERENCES

Literature Cited

- DFO (Fisheries and Oceans Canada). 2020. Interim Code of Practice: End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater. Available at: https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html
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- GNWT (Government of the Northwest Territories). 2016. Erosion and Sediment Control Manual.

https://www.inf.gov.nt.ca/sites/inf/files/resources/dot erosion and sediment control manual - mar 31 16.pdf

Internet Site

SARA (Species at Risk Act). 2024. Species at Risk Public Registry. Available at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html.



5.0 STATEMENT OF LIMITATIONS

WSP Canada Inc. (WSP) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

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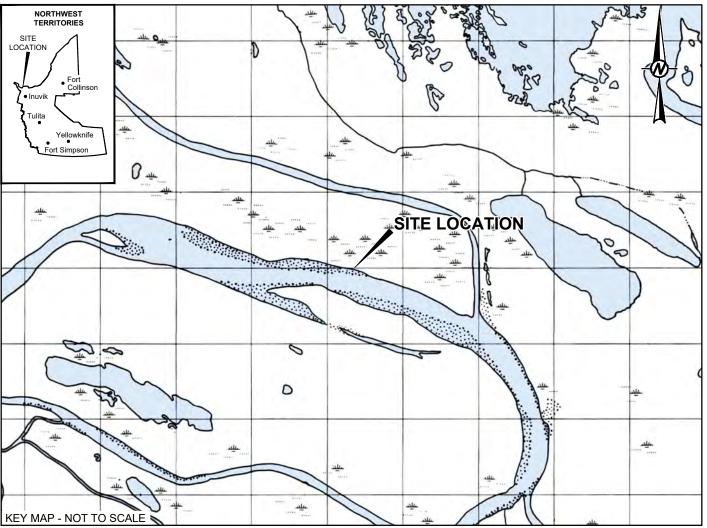
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APPENDIX A

Figures

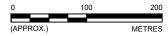




2024 SHORELINE

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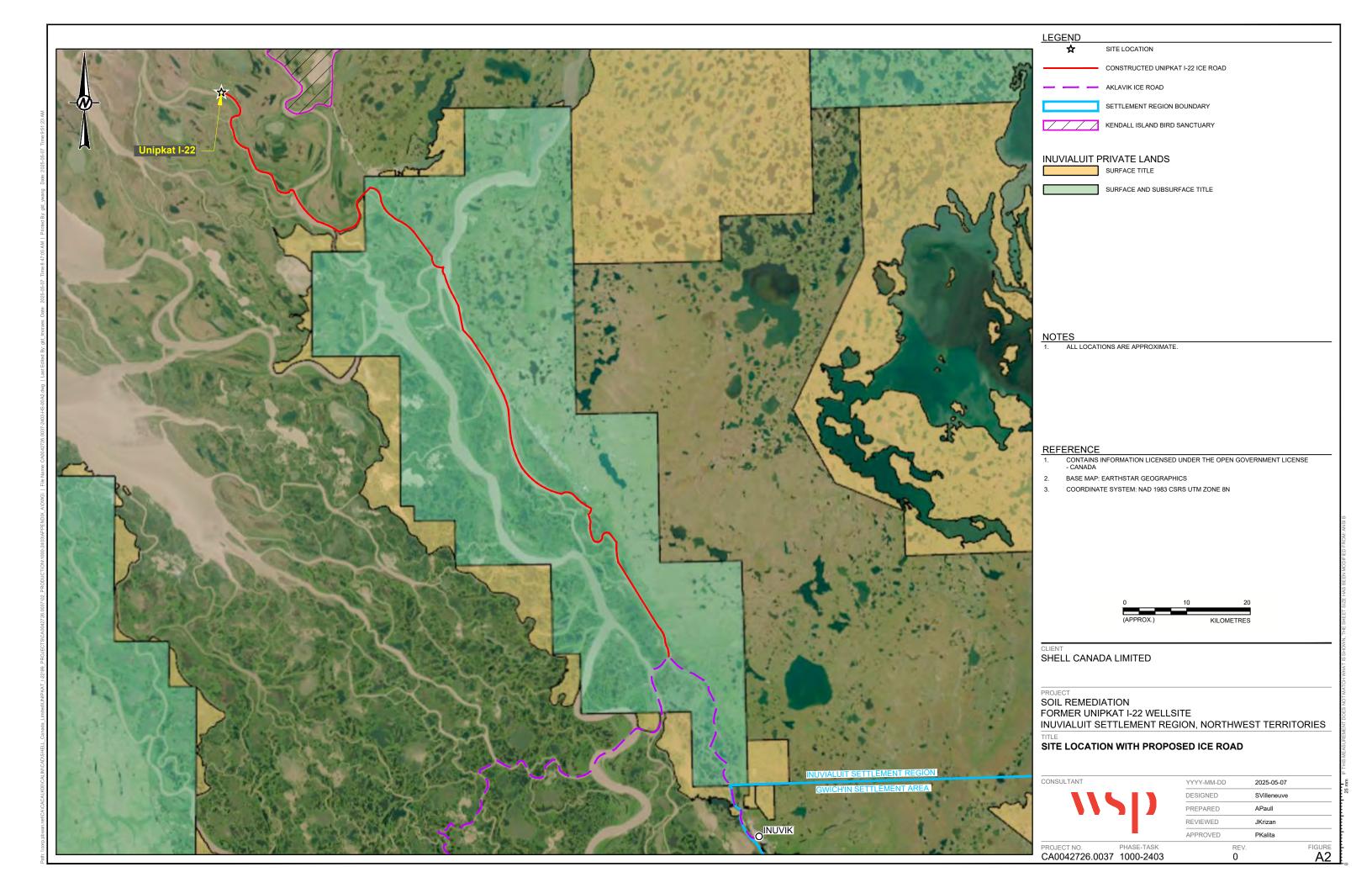
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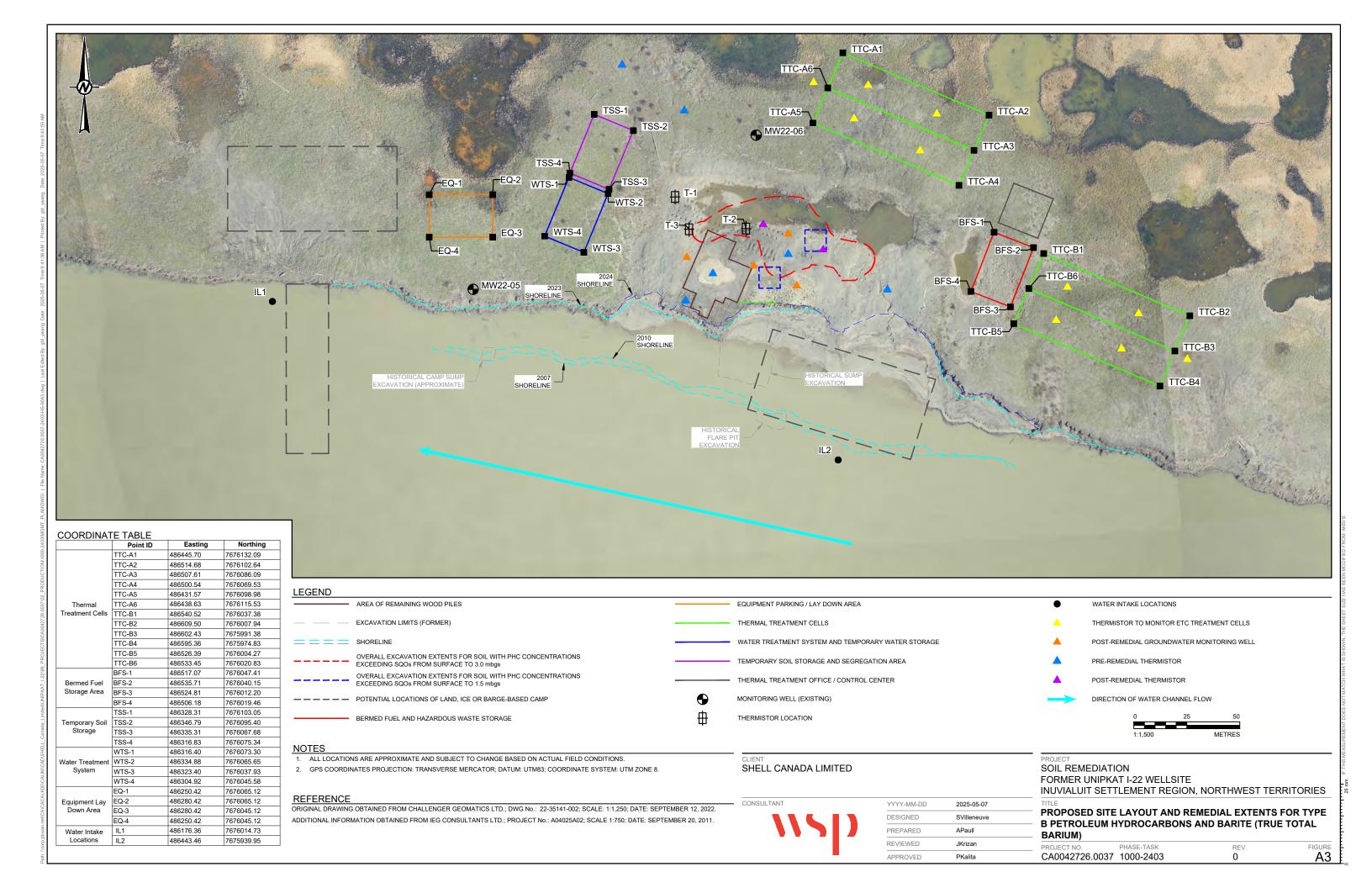
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	REVIEWED	JKrizan
l	APPROVED	PKalita

SOIL REMEDIATION FORMER UNIPKAT I-22 WELLSITE INUVIALUIT SETTLEMENT REGION, NORTHWEST TERRITORIES

SITE LOCATION PLAN

FIGURE A1 PROJECT NO. CA0042726.0037 1000-2403





APPENDIX B

Erosion Control Inspection and Maintenance Form

EROSION CONTROL INSPECTION AND MAINTENANCE FORM

Contractors on Site:

Contract Number:

Construction Site Location: Heavy Equipment on Site: Date: Date of Last Inspection:			mm of rain in last week: mm of rain in last 24 hours:				Construction Activities on Site: Current Weather: Weather Forecast:			
Type of Measure (BMP)	Location on Construction Site	Intended Function	Sediment Levels	General Condition	General Performance	Maintenance Required	Type of Maintenance Required	Site Manager Notified	Date Repairs to be Completed By	
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
			0 - 1/4 - 1/2 - 3/4 Full not applicable	poor fair good	poor fair good	yes no		yes no		
Notes:	·									
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