



3rd Floor Gallery Building
4923-52nd Street, P.O. Box 1500
Yellowknife, NT X1A 2R3

February 23, 2018

Attention: Julian Morse
Regulatory Officer
Mackenzie Valley Land and Water Board
P. O. Box 2130
YELLOWKNIFE NT X1A 2P6

Dear Mr. Morse,

**Re: Bullmoose Ruth Remediation Project
MV2016X0013 / MV2016L8-0004
Addenda to the Waste Management Plan & Construction Monitoring Plan**

On November 27, 2017, Indigenous & Northern Affairs Canada – Contaminants & Remediation Division (INAC-CARD) submitted notice to the Mackenzie Valley Land and Water Board (MVLWB) of our intention to cancel the planned landfarm at Bullmoose Mine. This change was due to a lack of a suitable location where a landfarm could be feasibly built, as was discussed with MVLWB staff during a site visit in August last year. In responding on December 1, 2017, you requested that INAC-CARD update relevant management plans as required by Part B, Condition 5 of the Water Licence, which states:

The Licensee shall review the plans, programs, studies and manuals annually, or as directed by the Board, and make any necessary revisions to reflect changes in operations. All revised plans, programs, studies and manuals shall be submitted to the Board, for approval, at least 60 days, unless otherwise specified, prior to implementing any proposed updates or changes in the approved plan, program, study or manual, and shall be accompanied by a brief summary of the changes made. All revised plans, programs, studies, and manuals shall be presented in a format consistent with the Board's Standard Outline for Management Plans.

The approach taken to treating PHC-contaminated soils used previously approved operational processes, such as screening soils and the use of lined and bermed Temporary Storage Areas to contain materials until confirmatory sampling is completed. Due to the aged nature of the PHCs



found in soils at Bullmoose-Ruth, the screening process used to size granular materials also had the added effect of aeration (or "air-stripping"), which effectively replicates treatment in a landfarm, although on a shorter timeframe and without constructing a purpose-specific facility. Aeration promotes biodegradation of the contaminant and the aged PHCs required no further treatment. Confirmatory sampling, as described for the project in the Construction Monitoring Plan, was applied to the PHC-contaminated soils to confirm that the soil could be beneficially reused as backfill in previously disturbed areas and all soils at Bullmoose Mine were confirmed to be below Site Specific Target Levels described in the Remedial Action Plan.

Although the operational approaches taken were described in Management Plans previously approved by the MVLWB, clarifications would be useful to understand how these approaches were used in the field. I would like to provide the attached memos, which are intended to be addenda to the Waste Management Plan and the Construction Monitoring Plan, respectively, to clarify field operations during the Project.

I hope this information clarifies how decontamination of PHC-contaminated soils was achieved at the Bullmoose-Ruth Project. If you have any questions or concerns regarding this, please do not hesitate to contact me at 867-669-2743 or at ron.breadmore@aandc-aadnc.gc.ca.

Sincerely,

Ron Breadmore
Project Manager, INAC-CARD

cc: Tawanis Testart, Project Officer, INAC-CARD
Carey Ogilvie, Senior Manager, INAC-CARD

Encl:

- i) Memo – Addendum to Waste Management Plan
- ii) Memo – Addendum to Construction Monitoring Plan

To:	Public Services and Procurement Canada	From:	Chris Bowie
	Attention: Caitlin Moore, Project Manager		Stantec Consulting Ltd. 1331 Clyde Avenue, Ottawa, ON K2C 3G4
File:	123511323	Date:	February 21, 2018

Reference: Addendum #1 – Waste Management Plan V11 – Treatment of PHC Impacted Soils Method

Stantec Consulting Ltd (Stantec) has prepared the following addendum to Rowes Outcome Joint Venture (ROJV) Waste Management Plan (V11, dated July 10, 2017) for Public Services and Procurement Canada (PSPC) to report on the discrepancies related to the proposed method (i.e., landfarm) for the treatment of petroleum hydrocarbon (PHC) impacted soils versus the actual method of treatment completed during the 2017 field season at the Bullmoose and satellite mine sites, specifically Beaulieu Mine, Spectrum Mine, and Joon Mine.

CONTEXT

As stated in the construction specification titled: *Specifications and Drawings Environmental Site Remediation Bullmoose Area Mine Sites, NT*, dated June 30, 2016, prepared by Stantec for PSPC (construction specifications) the PHC impacted soils were to be treated by landfarming at the Bullmoose Mine site prior to reinstatement of these soils.

Challenges associated with obtaining a satisfactory location, specifically locating a relatively flat area large enough at the Bullmoose Mine site, for siting of the landfarm precipitated evaluation of alternate methods for treating PHC impacted soils, leading to selection of a soil screening approach.

PHC impacted soils were treated at one of two lined and bermed Temporary Storage Areas (TSAs) located at the Bullmoose Mine site using the following method:

1. PHC impacted soils were excavated as and where required.
2. PHC impacted soils were stockpiling within the two TSAs. These storage areas were constructed with bermed perimeters and high density polyethylene (HDPE) geomembrane liners.
3. The soils were aerated by being passed through a soil screener as the method of treatment. The PHC soil stockpiles were screened as required and subsequently sampled and submitted for laboratory analysis to ensure the PHC concentrations were below the applicable Site Specific Target Levels (SSTLs) outlined in the *Bullmoose Area Mine Sites NWT Updated Remedial Action Plan*, dated January 5, 2016, prepared by Stantec.
4. Once PHC concentrations met the SSTLs the soil was made available for use as excavation backfill or as grading material where required within areas of previously excavated PHC soil impacts.

Reference: Addendum #1 – Waste Management Plan V11 – Treatment of PHC Impacted Soils Method

5. During the screening processed oversize material (stone) was removed from the soil matrix and used as excavation backfill as noted above, as outlined in Stantec memorandum *PHC Evaluation of Screened Oversize – Bullmoose-Ruth Remediation Project*, dated September 7, 2017 as provided to PSPC.

DISCREPANCY WITH WASTE MANAGEMENT PLAN

The treatment of PHC impacted soils was originally to be completed using an engineered landfarm as per the June 20, 2016 construction specification and as outlined in the project Construction Monitoring and Verification Plan (CMP) v1.2, dated June 23, 2017, prepared by Stantec.

The following references within the WMP relating to the construction, use, and decommissioning of the proposed landfarm versus actual remediation events completed in 2017 are summarized below:

Table 1 – Landfarm References within the WMP

Landfarm Reference within WMP	Location of Reference within WMP	Addended Action Completed
Information Requirements of the Water Licence (MV2016L8) <ul style="list-style-type: none"> • Information pertaining to disposal of PHC impacted soils including quantity of soils (approximately 7,100 m³) to be treated, location of disposal, confirmatory sampling plans. • Wastewater management 	Table 3	TSAs were built, as described above as screening areas to treat PHC impacted soils. The quantity of soils which have been treated, and the locations of the TSAs will be provided to the Crown in the 2017 Annual Construction Report. The annual report will also contain the information required for annual water licence reporting. No leachate was observed to breach the perimeter of the TSAs.
Project description: <ul style="list-style-type: none"> • Construction of a landfarm • Excavation, placement, and treatment of PHC impacted soils 	Section 1.7	TSAs were built, as described above as screening areas to treat PHC impacted soils at the Bullmoose mine site. PHC impacted soil from the satellite sites are currently stockpiled waiting for the 2018 winter roads to be completed prior to being disposed of off-site at a licensed facility or within the
Waste Streams – PHC impacted soils	Section 2.1.6.1	

Reference: Addendum #1 – Waste Management Plan V11 – Treatment of PHC Impacted Soils Method

Landfarm Reference within WMP	Location of Reference within WMP	Addended Action Completed
		<p>Bullmoose landfill once constructed.</p> <p>Approximately 94% of PHC impacted soil was located and treated at the Bullmoose mine site.</p>
Infrastructure Required for Waste Management - Landfarm	Section 3.1	<p>TSAs were built, as described above as screening areas to treat PHC impacted soils.</p> <p>No additional treatment was required to achieve the SSTLs.</p>
Legacy Waste Management – PHC Impacted Soils	Appendix A – Section E	<p>TSAs were built, as described above as screening areas to treat PHC impacted soils from the Bullmoose mine site. PHC impacted soils from the satellite sites were excavated and staged in lined TSAs and are to be disposed of off-site at a licensed facility during winter road operation in winter 2018.</p>
Confirmatory Sampling of Source (PHC impacted soil) Areas	Appendix B – Section 2.1	No change.
Impacted groundwater downstream of landfarm	Appendix B – Section 2.2	<p>Due to the short duration of the TSA's operation (less than 4 months) groundwater monitoring wells were not installed.</p>
Remediation Option Selection Rationale	Appendix C – Section 1.2	<p>TSAs were built, as described above as screening areas to treat PHC impacted soils at the Bullmoose mine site. PHC impacted soil from the satellite sites are currently stockpiled waiting for the 2018 winter</p>
Selected Remedial Options – Bullmoose Mine	Appendix C – Section 2.2.2	

Reference: Addendum #1 – Waste Management Plan V11 – Treatment of PHC Impacted Soils Method

Landfarm Reference within WMP	Location of Reference within WMP	Addended Action Completed
		roads to be completed prior to being disposed of off-site at a licensed facility or within the Bullmoose landfill once constructed (Joon mine site: <1 m ³ of PHC impacted soil). Approximately 94% of PHC impacted soil was located and treated at the Bullmoose mine site.
Selected Remedial Options – Spectrum Mine	Appendix C – Section 4.1.2	PHC impacted soil will be disposed of off-site at a licensed facility as opposed to at the Bullmoose Landfarm (29 m ³ from Beaulieu and 192 m ³ from Spectrum).
Selected Remedial Options – Beaulieu Mine	Appendix C – Section 5.1.2	
Selected Remedial Options – Joon Mine	Appendix C – Section 6.1.2	PHC impacted soil (<1 m ³) will be disposed of within the Bullmoose Landfill once constructed.

SUMMARY

Based on analytical results collected from the treated soil stockpiles, the PHC soil treatment method (Bullmoose) and the disposal of off-site PHC impacted soil (satellite sites) met the intention of the original WMP regarding PHC impacted soils.

CLOSURE

This letter has been prepared for the sole benefit of PSPC and INAC. The letter may not be used by any other person or entity without the express written consent of Stantec and PSPC. Any use that a third party makes of this letter, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken, based on this letter. This letter was prepared by Chris Bowie, CET, and reviewed by David Wilson, M.A.Sc., P.Eng.

Respectfully submitted,

STANTEC CONSULTING LTD.



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Public Services and Procurement Canada
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Reference: Addendum #1 – Waste Management Plan V11 – Treatment of PHC Impacted Soils Method

Chris Bowie CET
Project Manager, Environmental Services
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chris.bowie@stantec.com

To:	Public Services and Procurement Canada	From:	Chris Bowie
	Attention: Caitlin Moore, Project Manager		Stantec Consulting Ltd. 1331 Clyde Avenue, Ottawa, ON K2C 3G4
File:	123511323	Date:	February 21, 2018

Reference: Addendum #1 – Construction Monitoring and Verification Plan V1.2 – Treatment of PHC Impacted Soils Method

Stantec Consulting Ltd (Stantec) has prepared the following addendum to the Construction Monitoring and Verification Plan (V1.2, dated June 23, 2017) for Public Services and Procurement Canada (PSPC) to report on the discrepancies related to the proposed method (i.e., landfarm) for the treatment of petroleum hydrocarbon (PHC) impacted soils versus the actual method of treatment applied during the 2017 field season at the Bullmoose and satellite mine sites, specifically Beaulieu Mine, Spectrum Mine, and Joon Mine.

CONTEXT

As stated in the construction specification titled: *Specifications and Drawings Environmental Site Remediation Bullmoose Area Mine Sites, NT*, dated June 30, 2016, prepared by Stantec for PSPC (construction specifications) the PHC impacted soils were to be treated by landfarming at the Bullmoose mine site.

Challenges associated with obtaining a satisfactory location, specifically locating a relatively flat area large enough at the Bullmoose mine site, for siting of the landfarm precipitated evaluation of alternate methods for treating PHC impacted soils, leading to selection of a soil screening approach.

PHC impacted soils were treated at one of two lined and bermed Temporary Storage Areas (TSAs) located at the Bullmoose mine site using the following method:

1. PHC impacted soils were excavated as and where required.
2. PHC impacted soils were stockpiling within the two TSAs. These storage areas were constructed with bermed perimeters and high density polyethylene (HDPE) geomembrane liners.
3. The soils were aerated by being passed through a soil screener as the method of treatment. The PHC soil stockpiles were screened as required and subsequently sampled and submitted for laboratory analysis to ensure the PHC concentrations were below the applicable Site Specific Target Levels (SSTLs) outlined in the *Bullmoose Area Mine Sites NWT Updated Remedial Action Plan*, dated January 5, 2016, prepared by Stantec.
4. Once PHC concentrations met the SSTLs the soil was made available for use as excavation backfill or as grading material where required within areas of previously excavated PHC soil impacts.

Reference: Addendum #1 – Construction Monitoring Plan V1.2 – Treatment of PHC Impacted Soils Method

5. During the screening processed oversize material (stone) was removed from the soil matrix and used as excavation backfill as noted above, as outlined in Stantec memorandum *PHC Evaluation of Screened Oversize – Bullmoose-Ruth Remediation Project*, dated September 7, 2017 as provided to PSPC.

DISCREPANCY WITH CONSTRUCTION MONITORING PLAN

The treatment of PHC impact soils was originally to be completed using an engineered landfarm as per the June 20, 2016 construction specification and as outlined in the project Construction Monitoring and Verification Plan (CMP) v1.2, dated June 23, 2017, prepared by Stantec.

The following references within the CMP relating to the construction, use, and decommissioning of the proposed landfarm versus actual remediation events completed in 2017 are summarized below:

Table 1 – Landfarm References within the CMP

Landfarm Reference within CMP	Location of Reference within CMP	Addended Action Completed
Building a Landfarm at Bullmoose Mine Site - Key Remedial Activity	Section 1.1.2	Two TSAs were built, as described above, as screening areas to treat PHC impacted soils.
Excavation, placement, and treatment of PHC impacted soils from Bullmoose and satellite sites within the Bullmoose landfarm	Sections 1.1.2 – 1.1.4, and 1.1.7	At the Bullmoose mine site PHC impacted soils (>90% of excavated PHC impacted soil from all sites) were aerated by being passed through a soil screener as the method of treatment. PHC impacted soil from the satellite sites are currently stockpiled waiting for the 2018 winter roads to be completed prior to being disposed of at a licensed off-site facility (Beaulieu and Spectrum mine sites: 29 and 192 m ³ respectively) or within the Bullmoose landfill once constructed (Joon mine site: <1 m ³ of PHC impacted soil).
CMP Requirements as outlined in the Water Licence, specifically: <ul style="list-style-type: none"> • Monitoring of leachate or runoff 	Table 2-1	No leachate was observed to breach the perimeters of the TSAs. Due to the short duration of the TSA's operation (less than 4 months), groundwater monitoring wells were not installed.

Reference: Addendum #1 – Construction Monitoring Plan V1.2 – Treatment of PHC Impacted Soils Method

Landfarm Reference within CMP	Location of Reference within CMP	Addended Action Completed
<ul style="list-style-type: none"> • Downstream sampling of surface water bodies • Regularly inspected for failure 		<p>The TSAs fell within the construction areas that were subject to Construction Monitoring activities, as outlined in the monthly Surveillance Network Program reports prepared separately.</p>
<p>Construction Activity Monitoring: Downstream sampling of surface water bodies</p>	<p>Section 3.1.2</p>	<p>The TSAs fell within the construction areas that were subject to Construction Monitoring activities, as outlined in the monthly Surveillance Network Program reports prepared separately.</p>
<p>Regulatory Compliance Monitoring and Sampling: Surface water, and groundwater sampling around perimeter of landfarm</p>	<p>Section 3.1.4</p>	<p>The TSAs were regularly inspected by Stantec Departmental Representatives (DRs) during operation including during the transfer of soils, treatment, and reinstatement.</p> <p>Due to the short duration of the TSA's operations (less than 4 months) groundwater monitoring wells were not installed.</p>
<p>Adaptive Management Remedial Components:</p> <ul style="list-style-type: none"> • Groundwater sampling • Visual monitoring of landfarm • Soil and surface sampling 	<p>Table 3-2</p>	<p>Due to the short duration of the TSA's operations (less than 4 months) groundwater monitoring wells were not installed.</p> <p>The TSAs were regularly inspected by Stantec DRs during operation including during the transfer of soils, treatment, and reinstatement.</p> <p>Confirmatory soil sampling is to be completed post-TSA decommissioning.</p> <p>The TSAs fell within the construction areas that were subject to Construction Monitoring activities, as outlined in the monthly</p>

Reference: Addendum #1 – Construction Monitoring Plan V1.2 – Treatment of PHC Impacted Soils Method

Landfarm Reference within CMP	Location of Reference within CMP	Addended Action Completed
		<p>Surveillance Network Program reports prepared separately.</p> <p>No Action Points as defined in the Adaptive Management Plan occurred during the operation of the soil treatment method defined above.</p>
<p>Post Construction Monitoring:</p> <ul style="list-style-type: none"> Monitoring of landfarm until decommissioning 	Table 3-3	<p>The TSAs were regularly inspected by Stantec DRs during operation including during the transfer of soils, treatment, and reinstatement.</p> <p>The TSAs are to be decommissioned in 2018.</p> <p>Confirmatory soil sampling is to be completed post-TSA decommissioning.</p>
<p>Regulatory Framework:</p> <ul style="list-style-type: none"> Effluent Quality Criteria for the landfarm (Part F, items 17,19, and 21 of the Water Licence) 	Section 4.0	No effluent was produced within either of the TSAs.
<p>WL Effluent Quality Criteria:</p> <ul style="list-style-type: none"> Landfarm point of discharge 	Section 4.4	No discharges were required from either of the TSAs.
<p>Visual/Performance Monitoring</p> <ul style="list-style-type: none"> Bullmoose landfarm (including visual inspections, and groundwater monitoring) 	Section 5.1	<p>The TSAs were regularly inspected by Stantec DRs during operation including during the transfer of soils, treatment, and reinstatement.</p> <p>The TSAs are to be decommissioned in 2018.</p> <p>Confirmatory soil sampling is to be completed post-TSA decommissioning.</p>
<p>Monitoring Locations and Responsibilities:</p>	Appendix B	<p>Baseline sampling was conducted.</p> <p>Confirmatory soil sampling is to be</p>

Reference: Addendum #1 – Construction Monitoring Plan V1.2 – Treatment of PHC Impacted Soils Method

Landfarm Reference within CMP	Location of Reference within CMP	Addended Action Completed
<ul style="list-style-type: none"> • Baseline sampling • Compliance sampling 		<p>completed post-TSA decommissioning.</p> <p>Due to the short duration of the TSA's (less than 4 months) groundwater monitoring wells were not installed.</p>

SUMMARY

The remedial objectives for PHC impacted soils were met through application of the above described PHC impacted soil treatment method. The treated soil met the project SSTLs prior to being used for backfilling purposes.

CLOSURE

This letter has been prepared for the sole benefit of PSPC and INAC. The letter may not be used by any other person or entity without the express written consent of Stantec and PSPC. Any use that a third party makes of this letter, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken, based on this letter. This letter was prepared by Chris Bowie, CET, and reviewed by David Wilson, M.A.Sc., P.Eng.

Respectfully submitted,

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