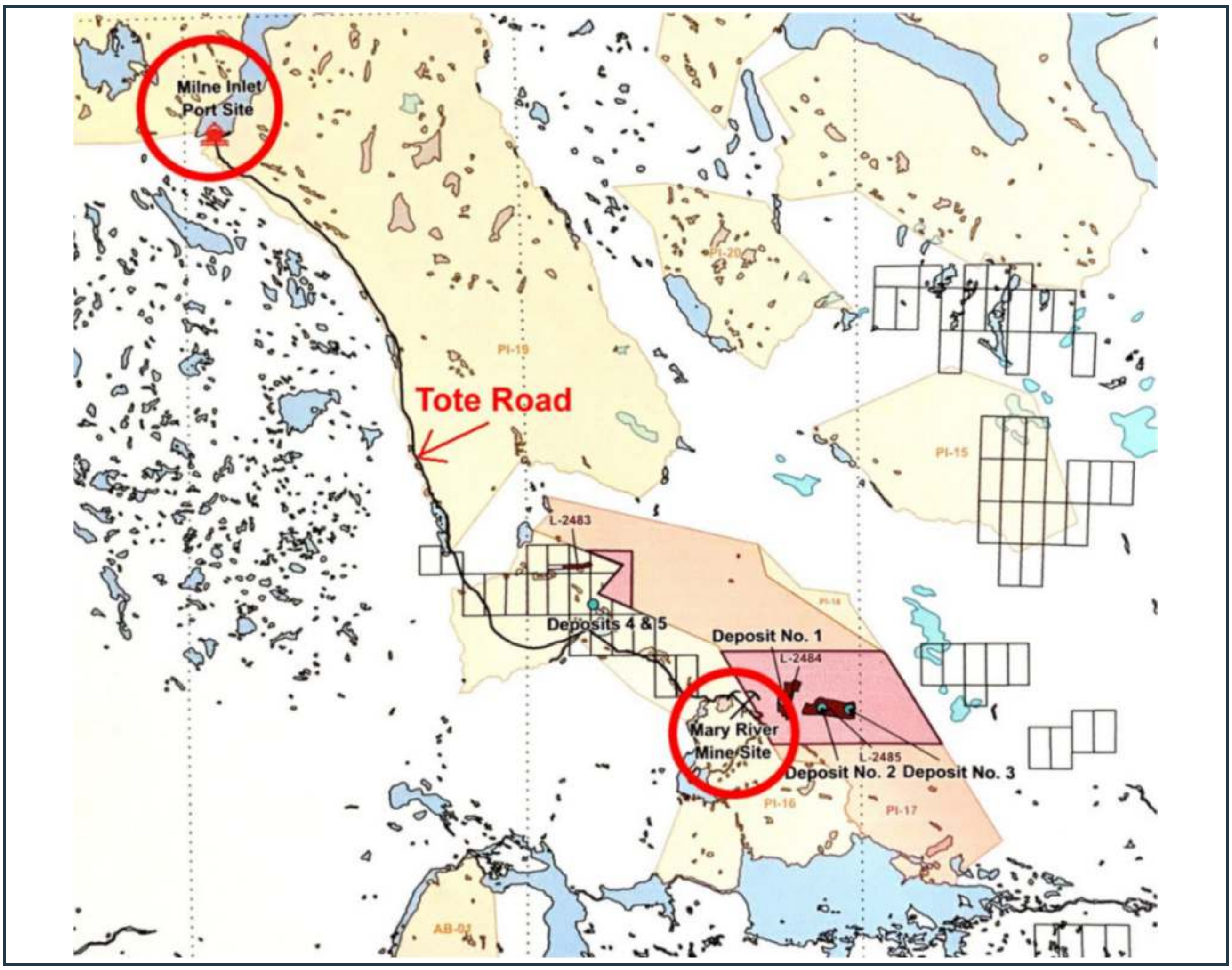
Baffinland Iron Mines Corporation

Project #: TC190307

Annual Geotechnical Inspections – 2020 Report 1.

Mary River Iron Mine Complex – Nunavut



September 4, 2020
TC190307

Mr. Connor Devereaux - Environmental Superintendent, Mary River Iron Mine, and
Mr. Aaron MacDonell - Environmental Superintendent, Mary River Iron Mine
Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
Oakville, Ontario
L6H 0C3

Re: Annual Site Inspections and Reporting - Mary River Iron Mine Complex, Nunavut

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), has been retained by Baffinland Iron Mines Corporation to carry out Annual Geotechnical Engineering Services at the Mary River Iron Mine Complex in Nunavut. Based on information and guidance provided in connection with the site's infrastructure, the undersigned has completed the first of the planned two inspections for 2020 and summarized the findings in the following report. In addition to field observations, the following historic reports had also been reviewed:

- Annual Geotechnical Site Inspections (2016) – SNC Lavalin
- Annual Geotechnical Site Inspections (2017) – ARCADIS Design and Consultancy
- Annual Geotechnical Site Inspections (2018) – SNC Lavalin
- Annual Geotechnical Site Inspections (2018 August and October) – B.H. Martin Consultancy
- Tote road bridges – Abutment Review (2018 December) – B.H. Martin Consultancy
- Annual Geotechnical Site Inspections (2019) – Wood Environment & Infrastructure Solutions

We trust that the content of this report meets your expectations. Should you have any questions regarding the details presented in the following document, please do not hesitate to contact our office.

Sincerely,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

L. BODI
LICENSEE
REGISTERED PROFESSIONAL ENGINEER
NT/NU

Laszlo Bodi, M.Sc.; P.Eng. – Principal Civil/Geotechnical Engineer
Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited

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1.0 Introduction

Wood Environment & Infrastructure Solutions (Wood), has completed the first geotechnical field inspection of 2020 at the Mary River Iron mine complex, which is a condition of the Type "A" Water Licence No: 2AM-MRY1325 – Amendment No.1 ("Water Licence").

Based on the requirements outlined in the Water Licence, the field inspections shall include the review of various facilities and structures that contain waste materials (hazardous and non-hazardous), and store or retain / convey water (settling ponds and ditches) at the Mary River Mine and Milne Inlet Port sites. The field review assessed the current condition of the berms and slopes, and report on potential seepage or stability problems at the ponds, if any.

In addition to the condition survey of the above noted infrastructure components, critical watercourse crossings (bridges and selected culverts) were also reviewed along the Tote Road, connecting the Mary River and Milne Inlet Port sites. As specified by the Nunavut Water Board, the conditions of the above listed infrastructure components need to be visually inspected twice a year and documented by photographs. The inspected structures and facilities in the summer of 2020 included the followings:

A. Mary River Mine Site

a) Polishing/Wastewater Stabilization Ponds (3)
b) Hazardous waste berms - (HWB-1 to HWB-7)
c) MS-06 and MS-08 surface water collection/settling ponds and ditches
d) Genset pond (i.e., located adjacent to the generators)
e) Fuel Storage Farms (3) – Aerodrome jet-fuel storage, MS-03 and MS-03B diesel fuel farms
f) Solid-waste disposal site (non-hazardous landfill)
g) CLSP silt sedimentation check dams and berms, adjacent to the water intake
h) Water (effluent) discharge area
i) Deposit 1 pit walls
j) QMR2, D1Q1 and D1Q2 rock quarries

B. Milne Inlet Port Site

a) Hazardous waste berms - (HWB-1 through to HWB-4)
b) MP-01A, pond
c) MP-03 fuel tank farm
d) MP-04 landfarm and MP-04A contaminated snow pond
e) MP-05, MP-06 and Settling Pond #3 surface water settling ponds and drainage ditches
f) Q01 rock quarry
g) Surface water collection ditches (P-SWD-3, -5, -6, -7, W3/W14, 380M pad and PSC ditches)
h) Tote road culverts (conveying surface water from the quarry area)

C. Tote Road between the Mary River mine site and Milne Inlet Port

a) Bridges (4)
b) Culverts (12)

The above listed infrastructure components were visually inspected between June 26 and July 7, 2020, by the author of this report, Laszlo Bodi P.Eng. of Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited. During the inspection program their current conditions were documented, and the findings are summarized in the following report. The locations of most of the inspected structures, settling ponds and ditches are shown in the following Figures:

a) Mary River Mine site - Northern, Central, Quarry – Pit 1 and Waste rock areas: Figures 1 to 4
b) Milne Inlet Port site - Figure 5
c) Representative section of the tote/haul road - Figure 6

Photographs of the inspected structures are shown in the following documents (attached to the report):

a) Appendix A: Mary River Mine site – Figures 7 to 52
b) Appendix B : Milne Inlet Port site - Figures 53 to 88
c) Appendix C: Bridges and culverts along the tote road: Figures 89 to 120

Figure 1: Site layout – Mary River Mine Site - Northern Zone, adjacent to the runway

Figure 2: Site layout – Mary River Mine Site - Central Zone

Figure 3: Site layout – Mary River Mine Site – QMR2 quarry area

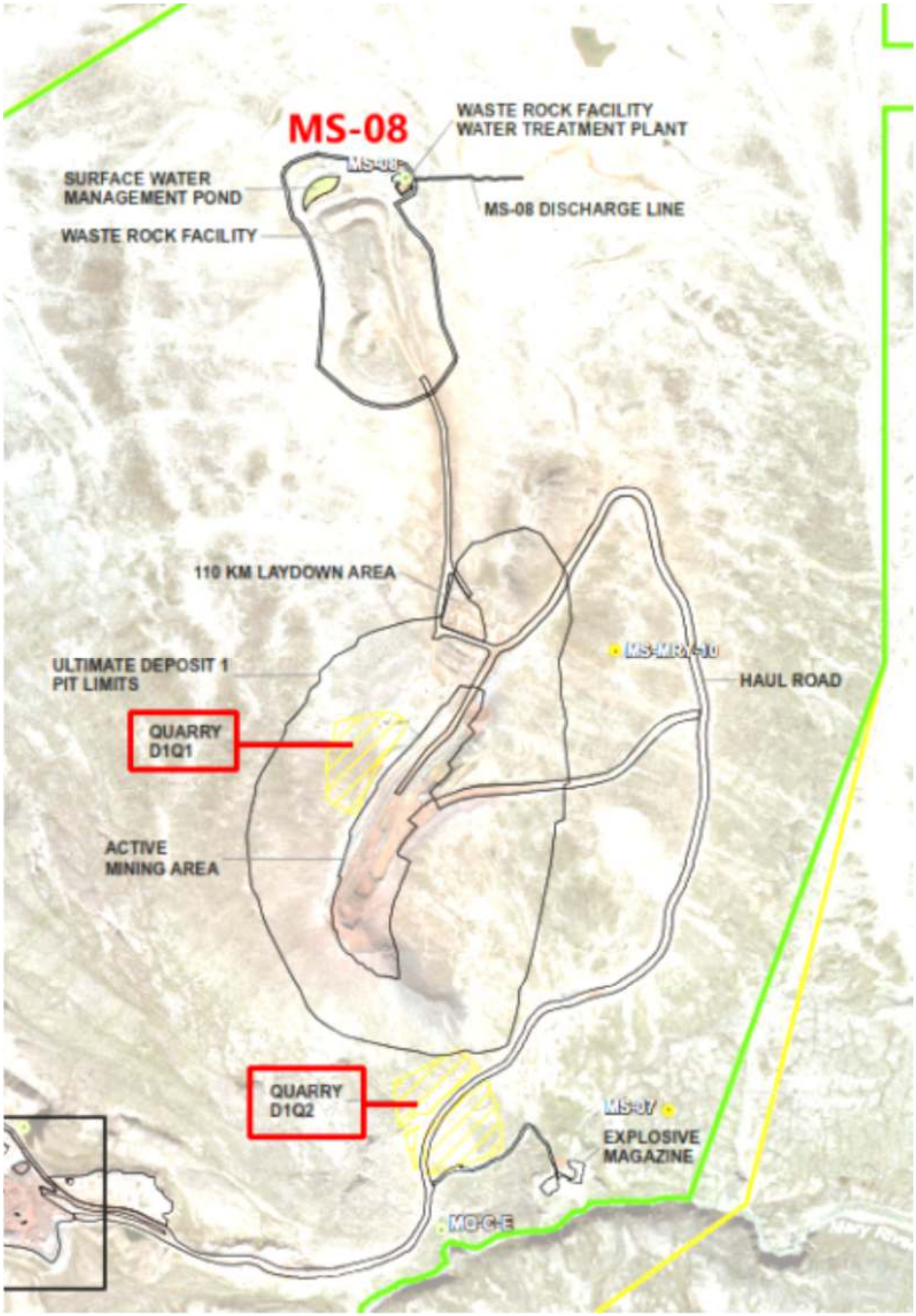

Figure 4: Site layout – Mary River Mine Site – Pit 1, D1Q1 and D1Q2 quarries and MS-08 pond

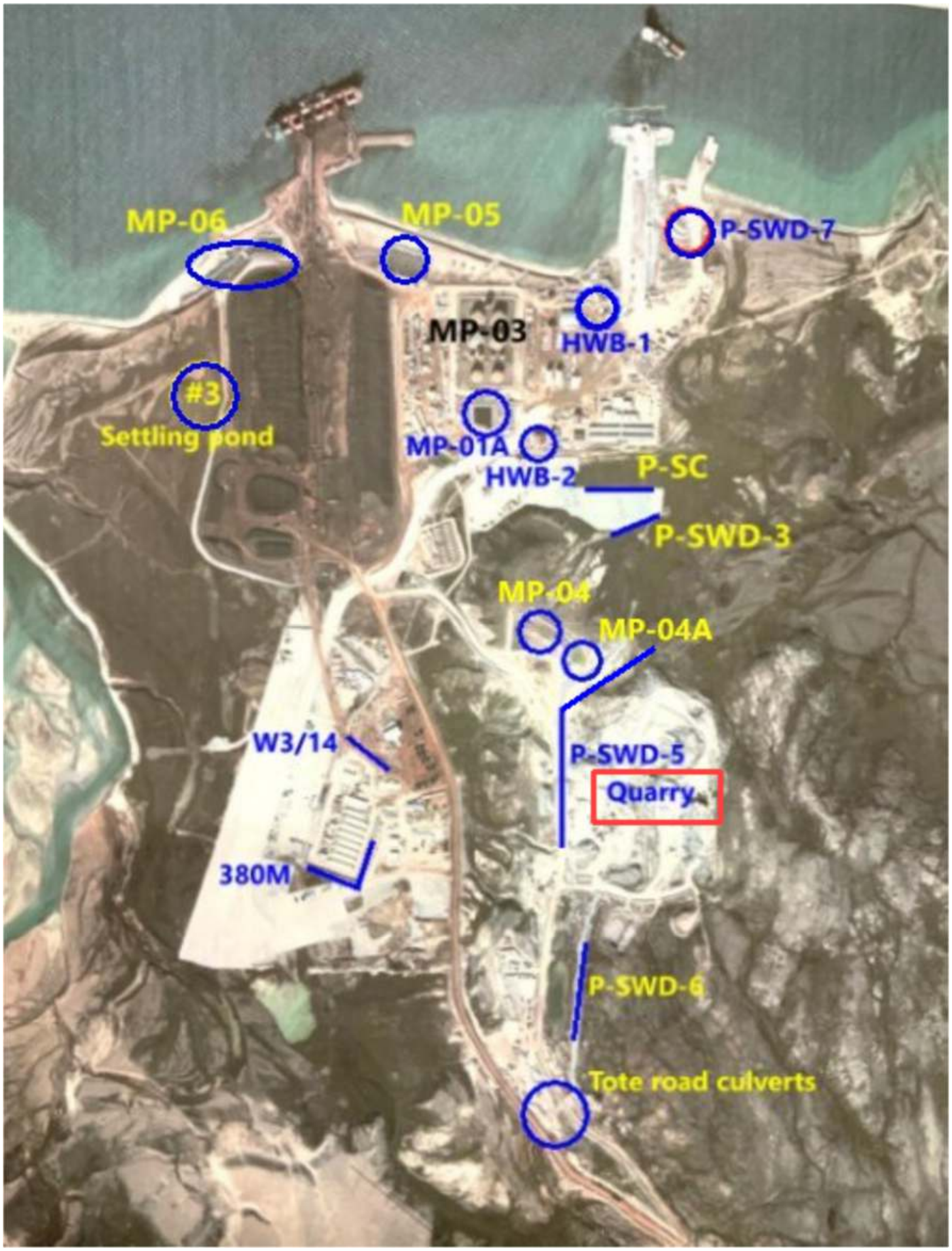

Figure 5: Site layout – Milne Inlet Port Site

Figure 6: Section of the tote/haul road between the Mary River Mine site and Milne Inlet Port

Details of the condition survey of the individual structures are summarized in the following sections of the report, while the photographs are shown in Appendix A, B and C, as integral parts of the document.

2.0 Mary River Mine Site

2.1 Polishing/Waste Stabilization Ponds (3 PWS ponds)

There are three polishing/waste stabilization ponds, located adjacent to the central part of the runway, as shown in Figure 1. Pond #1 is a single structure, while Ponds #2 and #3 had been constructed as a twin-cell structure, as shown in Figure 7. According to previous inspection reports, these ponds were associated with the exploration phase of the mine, and currently serve as emergency holding ponds in case problems would arise, which would prevent the discharge of treated effluent directly to the receiving environment.

The stable berms around the ponds generally comprise granular materials (rock fill, sand, and gravel), supporting High Density Polyethylene (HDPE) geomembrane liners. The liners are secured in anchor trenches on the crest of the berms, and no damage is visible on the membranes on the upstream face of the slopes (see Figures 8 and 9). However, there was a minor "sinkhole" visible on the crest of Pond #3, shown in Figure 10. It appears that the finer sand particles migrated down into the larger voids within the rock fill. The sinkhole should be filled with clean sand and gravel and the crest of the berm should be regraded by using hand tools (shovels and rakes). Timber/lumber debris was also noted around the sinkhole, which should be removed to prevent potential damage to the liner.

As shown in Figure 7, the berms around the three ponds appear to be stable, having shallow downstream slopes. They were built by using non-frost-susceptible compacted granular materials. Based on site observations, it appears that the subgrade around the berms comprise thaw-stable, predominantly granular soils with trace to some fines. With this observation, the berms are assumed to have stable foundations, which is further supported by the fact that there are no indications of ground displacement or sloughing at and around the berms.

As pointed out above, the berms appear to be structurally stable, and no visible wet downstream slopes and toe seepage was noted. However, as shown in Figure 11, the surface appearance was not found to be orderly at the front of the water discharge pipes at the middle of the south-western perimeter berm at its juncture with the central berm between Ponds #2 and #3. Namely, heavily wrinkled surficial liner was observed to cover the crest at this location and at the junction.

Pieces of timbers and miscellaneous other elements (e.g., used tires etc.) are utilized as weight to secure the surficial liner in-place at the berm's crest at this location. The downside of this measure is potential ice development in areas of trapped water within the wrinkles, and this could have a potential to displace the above elements across the liner and consequently, result in liner damage (e.g., cracking). As a cautionary measure, it is recommended to clean-up this area and remove all hard materials other than used tires from above the liner. Existing tires, and perhaps addition of more used tires to at least counterweight the removed weight, will protect from / reduce risk of wind uplift effects. Furthermore, timbers should also be removed from inside the ponds.

2.2 Hazardous Waste Berms (HWB-1 to HWB-7)

There are seven hazardous waste berms at the Mary River mine site (HWB-1 to HWB-7). HWB-6 is located at the north side of the runway near the incinerator, as shown in Figure 1. The other six areas are located opposite of HWB-6, at the south side of the runway.

All HWB areas are lined and comprise shallow, stable perimeter berms. There is no visible instability at the berms (sloughing, excessive settlement, or tension cracks), other than some soil displacement caused by foot and truck traffic on the surface of the slopes and crests at some locations, as shown in the relevant images in Appendix A. It is recommended that foot and truck traffic on the slopes and crest of the berms should be limited, with controlled/ramped access point (preferably one) provided for trucks and skid-steers to dispose/remove materials in the cells.

a) HWB-1

This cell is currently empty, as shown in Figure 12. Based on information obtained during the 2019 summer inspection, concerns had been raised in the past to suspected liner damage within this cell, and consequently no material is stored in this cell.

b) HWB-2

As shown in Figure 13, the perimeter berm around this cell appears to be stable. The presence of water visible within the cell demonstrates that the liner is intact. No visible seepage from the cell was noted around the berm, and the cell operates as intended, although no material is currently stored here.

c) HWB-3 and HWB-4

These cells are located side-by side and were called in previous reports as "Fuel Containment" cells. As shown in Figures 14 and 15, currently there are fuel barrels stored on wooden pallets in both cells.

The photographs of the cells attest stable berm condition, and good liner performance (e.g., ponding water in the cells). However, it is also shown in the images that foot traffic had caused some disturbance on the slopes and crests of the berms and that should be avoided.

d) HWB-5

As shown in Figure 16, the shallow berms around this cell appear to be stable and there is no visible liner damage. It is also shown that the cell is currently empty. As recommended above, foot and truck traffic on the slopes and the crest of the berm should be prohibited with controlled / ramped access points (preferably one) provided for the skid-steers to dispose designated materials in the cell, if required.

e) HWB-6

The HWB-6 cell was in poor condition during the 2019 summer inspection. However, as shown in Figures 17 and 18, extensive rehabilitation of this cell has recently been completed. The berms have been regraded, stabilized and the floor of the cell covered with granular fill. Currently, there are a few waste cubes on wood pallets stored in the cell, located adjacent to the incinerator.

f) HWB-7

HWB-7 cell was a bulk fuel storage facility in the past. Currently, only one large fuel tank is stored in the cell, as shown in Figure 19. The perimeter berms around the cell appear to be stable and the visible water (rain and melted snow) within the cell is indicative of adequate liner performance.

2.3 MS-06 and MS-08 Surface Water Collection Ponds and Ditches

a) MS-06 – Surface Water Collection Pond Adjacent to the Crusher Pad

The MS-06 settling pond collects surface water from the area of the crusher site. The water is collected in perimeter ditches around the crushed and stockpiled ore and conveyed via open ditches to the settling pond. There are two intake locations to the pond at the northeast and southeast corners, and there is an emergency spillway located opposite to the intakes. The liner within the pond and on the upstream slopes of the berm is intact (see Figure 21), and no wet downstream slopes or toe seepage were visible at the time of the inspection.

The side slopes of the surface-water collection ditches were observed to be stable (see Figure 22) and the ditches are clean. However, some damages to two culverts were noted where the ditches cross the roads, as shown in Figures 23 to 25. One of the two culverts is located near the southeast inlet to the pond, while the other is located beneath the tote road, adjacent to the northeast corner of the pond. It is recommended that these culverts be cleaned, and their inlet and outlet ends be repaired to facilitate uninterrupted flow of water via the ditches into the settling pond.

b) MS-08 – Surface Water Collection Pond Adjacent to the Waste Rock Facility

The recently reconstructed MS-08 settling pond is surrounded by new perimeter berms, as shown in Figures 26 to 28, in Appendix A. The berms have been completely reconstructed using granular soils form borrow sources similar in composition as the ones underlying the base of the pond / mine complex. The pond is lined with exposed new HDPE liner that is secured in place in anchor trenches on the crest of the berms. Based on information provided at the site, the retained water requires further treatment and is pumped to the adjacent plant.

The berm structures around the MS-08 pond appear to be stable (no evidence of tension cracks or crest subsidence). There was a small area on the berm; however, where the finer soil from the berm's crest has migrated down into the larger voids within the rock fill, shown in Figure 28. Granular fill should be placed into the cavity in this area, followed by the reestablishment of the geotextile and geomembrane to match undisturbed arrangement elsewhere on the berm.

Contact water from the waste rock facility is collected in two perimeter ditches and flows to the settling pond from the east and west. As shown in Figures 29 and 30, the drainage ditches are well maintained, having stable slopes and clean channels. The two images also show that, according to Baffinland's Environment Department, Non-Acid Generating (NAG) rock fill berms were placed along the drainage ditches (along waste rock facility side).

As pointed out above, the water from the pond is pumped to the nearby designated facility for treatment. There is a lined treatment cell in a good condition located immediately next to the plant with confined stable perimeter berms, as shown in Figure 31.

2.4 Genset Pond

The "genset pond" contains melted snow and rainwater that previously contained fuel bladder for the gensets. The pond is located immediately adjacent to the power generators, south-west of the hazardous waste cells (Figure 1). As shown in Figures 32 to 34, the perimeter berm around the pond generally comprises granular materials and the pond is lined. Disturbance by foot-traffic, exposed geotextile and liner were visible along some locations on the berm's crest and minor sloughing of the upstream slope of the berm is also visible along the southern section of the berm.

In addition, minor slope deterioration was also visible along the berm adjacent to the generators, as shown in Figure 33. Trucks bypassing ponding surface water on the nearby road encroach into the toe of the berm and this encroachment requires re-establishment to the original configuration using compacted granular fill to prevent potential for local instability (i.e. regressive erosion / sloughing). The slope should be regraded manually, and the new fill shall be compacted using a plate tamper or like equipment. In addition to the repair work on the slope, the southern, somewhat lower section of the berm should also be reconstructed to its original geometry, and truck traffic on the berm must be avoided.

2.5 Fuel Farms (3)

There are three fuel farms at the Mary River mine site. One is located at the airfield and two adjacent to the main office complex of the mine. The berms and liners at these facilities are in excellent condition, as shown in the relevant images in Appendix A.

a) Jet fuel Tank Farm

The jet fuel tank farm is located at the aerodrome and it is surrounded by a stable perimeter berm. In addition, a second berm provides additional protection at two sides of the facility, constructed by using crushed rock fill, as shown in Figures 35 and 36. The facility is lined to the crest of the perimeter berms, and the liner within the cell appears to be in good condition.

b) MS-03 Diesel Fuel Tank Farm

The stable berms around the first (historic) diesel fuel tank farm are in excellent condition (see Figure 37) and they are well maintained. The collected rainwater (and melted snow) within the cell is clean and its presence indicates that the liner system is fully functional (i.e., no seepage from the cell is visible and the liner is well protected by granular fill throughout the facility).

c) MS-03B New Fuel Tank Farm

A new, large capacity fuel tank farm has recently been constructed adjacent to the tote road, shown in Figure 38. Based on our field review in 2019 the new tank farm was constructed as specified in the design drawings (subgrade, berms, bedding layer, liner, and protective cover). Our recent observations confirmed that the liner is intact, and all berms are stable and well maintained. This facility is surrounded by a chain-link fence with locked gates for security reasons.

2.6 Solid Waste Disposal Area

The solid waste disposal area is located in the southern zone of the Mary River mine site, as shown in Figure 3. Only non-hazardous solid waste is placed into this unlined facility without a leachate collection system. As shown in Figure 39, the solid waste placed into the facility is covered as required with layers of locally available clean soils (daily covers). The facility is now surrounded by a new chain-link fence and a lockable gate for security reasons. No stability issue was noted/recorded at the solid waste disposal site.

2.7 CLSP Silt-sedimentation Check Dams and Berms

The CLSP silt sedimentation control berms and check dams are located along the access road to the mine's water intake jetty. The primary purpose of these structures is to collect fine soil particles (silts and clays) that are eroded down from the adjacent road and slopes, and to prevent the siltation of the lake around the water intake structure. As shown in Figure 40, the berms are stable, and the check dams are fully functional. Erosion of the channel's floor, at its steepest section, was recently eliminated by the placement of crushed rock fill (riprap) along the channel's floor and side-slope, as shown in Figure 41.

2.8 Water (Effluent) Discharge Area

The effluent discharge point is located south of the Mary River mine complex, as shown in Figure 3. There are several discharge pipes at that location, conveying the discharged water down the slope toward the adjacent river. Trucks also bring water for discharge to this location and let the water flow down on the adjacent embankment, comprising crushed rock fill, as shown in Figure 42. The rock fill slope appears to be stable although minor surface erosion was noted at a small section of the slope, as shown in the image.

At this stage this erosion does not seem to affect the overall stability of the rock-fill slope as this relates to the water discharge area; however, it would be beneficial to fill the eroded section of the slope with crushed rock fill to prevent any localized regressive erosion in the future.

2.9 Deposit-1 Pit Walls

The pit wall at the "deposit-1" open pit is globally in stable condition (Figure 43) with sporadic local friable weathered zones (Figure 44) visible at a few locations. The access/haul road into the open pit is appropriately wide and the eroded rock fragments are removed from the toe of the pit walls as needed, and the traffic on the haul road is safely maintained.

2.10 Quarry Areas (QMR2, D1Q1 and D1Q2)

a) QMR2 Quarry

No activity was noted in the QMR2 quarry (Figure 45) at the time of the inspection. The rock slopes in the quarry generally appeared to be in stable conditions, although potential fall hazards were noted in a few areas. Such hazards, represented by the presence of weak veins within the pit walls, loose boulders, and rock wedges prone to skidding are shown in Figure 46. It is recommended that such hazards (noted at approximately 2% to 3% of the pit walls) should be eliminated by rock scaling, prior to restarting the quarry's operation.

As shown in Figure 47, the lowest plateau of the quarry exhibited poor surface water control. Rainwater and melted snow cover the quarry's main level feeding a flow path along the edge of the access road into the quarry. High energy of this large surface water volume has damaged the embankment by erosion, as shown in Figure 48. This embankment was most likely constructed with the use of poorly graded rock fill, covered with finer sand and gravel sized crushed rock. The flowing water has washed the finer material into the large voids of the underlying rock fill in some areas, resulting in large cavities along the edge of the road. In order to maintain traffic safety along the access road, immediate repair of the road was recommended, together with the solution of adequate surface water control (excavation/formation of drainage ditches at strategic locations) in all parts of the quarry. The damaged road section was repaired during our inspection; however, the surface water control still needs to be addressed in the area.

b) D1Q1 Quarry

The D1Q1 rock quarry will be a source of crushed aggregate in the future. Currently, the designated area is undeveloped, with no road or any excavation activity at this particular location. As shown in Figure 49, the gentle slope in the area is covered by cobbles and boulders that will be mined and crushed in the future.

The area will be revisited during the fall inspection, should any activity be reported by that time.

c) D1Q2 Quarry

Similar to the D1Q1, the D1Q2 quarry will be developed as a future source of crushed aggregate. As shown in Figure 4, the selected area of this quarry is located south of the "Deposit-1" open pit, along both sides of the haul road. Maintenance work on the access road to the southern part of the future quarry was carried out during our inspection in July 2020. As shown in Figures 50 to 52, improvement to the surface water control process must still be completed in the area. Currently, all rainwater and melted snow flow without control (proper ditching) along the access road and the culverts, shown in Figure 51, require relocation. In order to improve the surface drainage in the area, ditches with proper sloping reporting to culverts at the lowermost point should be excavated along the road, as proposed in Figure 52.

3.0 Milne Inlet Port Site

3.1 Hazardous Waste Berms (HWB-1 to HWB-4)

There are four hazardous waste berms at the Milne Inlet Port site. HWB-1 and HWB-2 cells are single detached structures, located north-east and south-east of the large fuel storage area, respectively. HWB-3 and HWB-4 were constructed as twin-cells, located south/south-west of the fuel storage farm.

a) HWB-1

The HWB-1 cell covers a relatively large area, surrounded by a stable perimeter berm, constructed of granular fill material, as shown in Figures 53 and 54, in Appendix B. The stored materials in the cell appear to be well organized and predominantly contain cubes of lubricants and other materials, stored on wooden pallets. Ponding water was visible across the deeper area of the cell, indicating that the liner within the cell is intact. No seepage from the cell was visible around the toes of the berm. However, ripped geotextile and exposed liner were noted at one location at higher elevation along the sea-side berm (near its crest), as shown in Figure 54 (yellow circle). It is recommended that as part of the maintenance program the disturbed areas of the berm (generally caused by foot traffic) on the slopes and crest should be re-graded manually and the exposed liner areas should be covered with a protective layer of soil (clean sand and gravel).

b) HWB-2

The HWB-2 is a small cell that is currently empty, except rainwater and melted snow ponding within the cell. Exposed geotextile and liner were noted at a few locations on the internal slopes of the otherwise stable berms, as shown in Figure 55 (yellow circles). It is recommended that the exposed liner areas should be covered with a protective layer of soil (clean sand and gravel) during cell maintenance.

c) HWB-3 and HWB-4

The HWB-3 and HWB-4 cells are located immediately next to each other (twin-cells) and contain solid waste in shipping containers only, as shown in Figures 56 to 59. The berms around and in between the cells appear to be in stable condition with no indication of slope movements or settlement. The liner within the ponds are intact; however, they are exposed at a few locations on the crest and downstream slopes of the berms. It is suggested that all exposed liner areas be regraded and covered with protective granular fill (clean sand and gravel), to prevent potential damage to the liner in the future.

3.2 MP-01A Pond

The MP-01A polishing waste stabilization pond is located immediately south of the MP-03 fuel tank farm. As shown in Figure 60, the berm around the well-maintained pond is in excellent condition and the liner appear to be intact. No sign of slope instability, settlement or seepage from the pond was noted during the field inspection.

3.3 MP-03 Fuel Tank Farm

The MP-03 fuel tank farm occupies a large area in the center of the Milne Inlet port complex. As shown in Figures 61 and 62, the stable berms around the facility are well maintained and are in excellent condition. The visible ponding water within the internal cells of the fuel farm is an indication of proper liner functionality. The facility is fenced in and no indication of berm instability or seepage was noted on and around the berms, comprising compacted granular materials.

3.4 MP-04 and 04A Landfarm and Contaminated Snow Disposal Cells

The MP-04 cell is located south of the port complex at a higher elevation, adjacent to the rock quarry. It is a large landfarm cell that stores contaminated soils, as shown in Figures 63 and 64. The berm structure around the cell appears to be in stable condition. The ponding water in one corner of the cell indicates proper liner functionality and no wet downstream slopes and toe seepage were noted (see Figure 63). Exposed liner was visible on the downstream slope of sections of the berm, particularly along the north berm. It is recommended that the exposed liner be covered (weighed down by a gravel layer) along the toe of the slope to prevent wind uplift related impacts.

MP-04A is a smaller cell used generally for the disposal of contaminated snow. This pond was constructed immediately adjacent to the MP-04 landfarm cell, shown in Figure 65. No seepage from the cell was noted anywhere around the pond; however, exposed liner was visible at the access ramp to the cell, as shown in Figure 66. The exposed liner area of the ramp should be regraded and covered with protective granular fill material (clean sand and gravel), to prevent potential damage to the liner in the future.

3.5 Surface Water Collection Ponds and Ditches (MP-05, MP-06 and Settling Pond #3)

The high-grade iron ore that is mined, crushed, and screened at the Mary River mine is transported to Milne Inlet, and stockpiled across a large area that can accommodate up to 4 million metric tonnes of ore. Contact water from the area is collected along the west and north sides of the ore stockpile in side-ditches and conveyed into three (3) water collection settling ponds strategically located around the ore storage area.

a) MP-05 Settling Pond

The MP-05 settling pond is located adjacent to the north-east corner of the stockpile, while MP-06 has been constructed at the north-west corner. Both settling ponds are in excellent condition with stable, well maintained berms and intact geomembrane liners, as shown in Figures 67, 70 and 71.

No instability, erosion or settlement was noted at the berms and no toe seepage from the pond is visible anywhere around the ponds' perimeter. The surface water from around the stockpile is collected in generally well-maintained drainage ditches. Minor liner damage: however, was noted on the slope of the southern intake channel to the pond, as shown in Figure 68. Also, erosion on the slope of the drainage ditch to the MP-05 pond was noted at one location, shown in Figure 69. It was recommended that the liner and erosion damage should be repaired as soon as possible.

b) MP-06 Settling Pond

The MP-06 settling pond (Figure 70) is divided into two parts by a liner-covered internal berm and the northern cell is called the "overflow pond" (Figure 71). Both settling ponds have emergency spillways and the water level in both ponds was well below the spillways' inverts at the time of the inspection. The stable berms around the ponds are in excellent condition and no seepage was noted from the cells. The drainage ditch to the MP-06 pond is in excellent condition, as shown in Figure 72.

c) Settling Pond #3

Settling Pond #3 was recently constructed west of the ore storage area, as shown in Figure 5. The pond is surrounded along three sides with a stable, lined berm and contains two sumps, as shown in Figures 73 and 74. The geomembrane and protective geotextile on the internal slope of the berm extend 2.5 m below the surface and anchored into the permafrost zone to prevent any seepage from the pond into the ground below. Excess water from pond #3 is pumped into the nearby, large capacity MP-06 settling pond.

3.6 Q01 Rock Quarry

No activity was noted in the Q01 quarry at the time of the inspection. The rock slopes in the quarry appeared to be stable conditions, as shown in Figure 75. Surface water is collected and drained well, into nearby drainage ditches.

3.7 Surface Water Collection Ditches (P-SWD-3, -5, -6, -7, W3/W14, 380M and P-SC ditches)

There are several surface water collection drainage ditches (listed above), some of them still under construction or improvement, as shown in Figures 76 to 85. These open ditches are excavated somewhat into the native soils and then their sides and inverts receive erosion protection layers comprised of fine crushed rock aggregate. It was noted during the inspection that geotextile have been used wherever the native subgrade composed of fine-grained material to prevent migration of fines into the rockfill and eventually into the ditches. The condition of these ditches should be monitored, particularly prior to the spring freshet, and any potential slope deterioration should be rectified prior to the anticipated increased flow during the thaw period of the years. Some current problems in these ditches are summarized below:

- Sloughing of the sides of ditch P-SWD-3, adjacent to the LP2 laydown area, is visible at several locations along the ditch, as shown in Figures 76 and 77. The sloughing is a result of uncontrolled sheet-flow of surface water, drained into this area by the P-SWD-5 ditch. It is suggested that the two ditches be connected by one drainage ditch to eliminate the development of sheet-flow from the current end of the P-SWD-5 toward the P-SWD-3 ditch.
- The riprap is missing at a small section of the P-SWD-5 ditch, shown in Figure 78. The riprap should be replaced in this area of the ditch to prevent erosion of the finer soil within the channel.
- Minor sloughing of the riprap in the 380M ditch was also visible that should be repaired (Figure 83).
- The P-SC drainage ditch is still under construction. The riprap on the slope at a culvert in that ditch should be rectified, and the culvert should be shortened at this location to facilitate uninterrupted flow of water within the ditch (Figure 85).

3.8 Tote Road Ditches and Culverts Near the Rock Quarry

Surface water from higher elevation of the rock quarry is collected in drainage ditch P-SWD-6, and conveyed down the slope through corrugated galvanized steel culverts (Figure 86), installed under an internal haul road and then under the Tote Road (Figure 87). The water in the ditches is conveyed to small natural ponds, located along the west side of the tote road, as shown in Figure 88. No siltation in the ditches or within the culverts was noted during the recent inspection.

4.0 Tote Road between Mary River and Milne Inlet - Bridges and Culverts

Four (4) bridges and twelve (12) culverts were inspected during the recent site visit. The general conditions of those structures are summarized below, and the images are shown in the attached Appendix C document.

4.1 Bridges (4)

a) **Bridge 17** (located approximately 17 km from Milne Inlet port)

As shown in Figures 89 and 90, the abutments of this bridge are stable and no scour in the riverbed around the abutments was noted during the recent site visit. The abutments show no differential settlement or any structural discrepancy like deterioration of the foundation concrete. There are two historic abutments located immediately adjacent to the "new" ones. The metal front and wing walls of both "old" abutments have suffered some damages in the past, particularly the south abutment. To maintain the stability of the currently used bridge abutments it was recommended during the last year inspection that the two old (somewhat damaged) abutments should be kept in place since they provide additional support to the adjacent new abutments.

b) **Bridge 63** (located approximately 63 km from Milne Inlet port)

As shown in Figures 91 and 92, the abutments of this bridge are stable and no scour in the riverbed was noted during the recent site visit. The abutments show no differential settlement or any structural discrepancy like cracking on the foundation concrete. Similar to the previous bridge, there are two historic abutments, located immediately adjacent to the "new" ones and damage to the metal front and wing walls of both old abutments are visible. In order to maintain the stability of the currently used bridge abutments, the two old abutments should be kept in place since they provide support to the adjacent new abutments.

c) **Bridge 80** (located approximately 80 km from Milne Inlet port)

As shown in Figures 93 and 94, the abutments of this bridge are stable and no scour in the riverbed was noted during the recent site visit. The abutments show no differential settlement or any structural discrepancy like cracking on the foundation concrete. Similar to the previous bridges, there are two historic abutments, located immediately adjacent to the "new" ones, providing support to the new abutments and road embankment. Therefore, removal of these structures is not recommended.

d) **Bridge 97** (located approximately 97 km from Milne Inlet port)

As shown in Figures 95 and 96, the abutments of this bridge are stable and no scour in the riverbed was noted during the site visit. The abutments show no differential settlement or any structural discrepancy like cracking on the foundation concrete. Similar to the previous three bridges, there are two historic abutments located adjacent to the "new" ones. At this location, the old abutments are located somewhat away from the new ones and they appear to be structurally stable. Since no access is provided to them from the road they shall be kept in place.

4.2 Culverts (12)

Twelve culverts (CV-076, CV-078, CV-083, CV-094, CV-102, CV-107, CV-110A, CV-111, CV-112D, CV-114D, CV-202, and CV-225) were inspected during the recent site visit, installed beneath the Tote Road between the Mary River and Milne Inlet sites. These culverts were selected for inspection based on construction work on these crossings having been recently completed. The majority of the culverts are in good condition and they provide uninterrupted flow of water from their upstream to their downstream sides. Photographs of the inlet and outlet ends of all inspected culverts are shown in Figures 97 to 120, in Appendix C.

Culverts (6) that require some repair/rehabilitation work are listed below:

CV-078 (Figures 99 and 100): The outlet end of one of the four culverts at this location is damaged slightly, although the "cut" at the top of the corrugated pipe has no effect on the flow within the pipe. The pipe should be checked during regular maintenance and be repaired if necessary.

CV-083 (Figures 101 and 102): The outlet of this culvert appears to be short. It should be extended by about 1.5 m and the adjacent road embankment shall be upgraded to a more stable slope with the placement of crushed rock riprap around the culvert. Crushed rock fill should also be placed adjacent to the culvert at its inlet to prevent erosion of the road embankment by the flowing water in the creek.

Improvement of the creek's alignment at the front of the inlet is also recommended (minimize water flow parallel with the embankment at its toe, to prevent toe erosion and subsequent potential slope instability).

CV-107 (Figures 107 and 108): Both ends of this culvert are short, particularly at the inlet side. Consideration shall be given to replace this culvert with a longer and somewhat larger pipe. It is visible in Figure 107 that the inlet's invert is currently located above the water level in the creek resulting in ponding water at the front of the pipe's inlet. A larger and longer pipe would facilitate uninterrupted flow of water from upstream to the downstream side of the road embankment.

CV-110A (Figures 109 and 110): Minor damage is visible on the outlet of this culvert at the slope of the embankment (yellow circle in Figure 110); however, the "cut" at the top of the corrugated pipe has no effect on the flow within the pipe. The culvert should be checked during regular maintenance and be repaired if necessary.

CV-112D (Figures 113 and 114): The outlet end of one of the culverts at this location appears to be short and no crushed rock riprap was placed around that particular culvert. As a result, erosion of the embankment slope is visible which may lead to sloughing of the edge of the embankment. This culvert should be extended, and riprap should be placed around the outlet end of the pipe to prevent slope erosion and embankment failure.

CV-114D (Figures 115 and 116): Both ends of this double-barrel culvert are damaged and too short, particularly at the outlet end. Both pipes should be repaired and extended (or simply replaced with longer culverts). Once the pipes are repaired and extended, the road embankment should be widened at the downstream end of the pipes, and riprap must be placed around the culverts to provide stable embankment slopes.

5.0 Conclusions

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), has completed the first of the two required geotechnical field inspections of 2020 at the Mary River iron mine complex in Nunavut. Based on field observations, the condition of the inspected infrastructure components can be summarized as follow:

- All settling ponds and waste areas are enclosed by relatively shallow, stable berms. The berms show no signs of instability, there are no tension cracks or excessive settlements and no detrimental slope erosion is visible at the berms. These structures were constructed by using thaw-stable granular materials, placed over thaw-stable subgrades (based on observations of adjacent areas along their footprints). Minor disturbance on the surface of the slopes and crests were noted at some of the berms, however, these discrepancies can be rectified by a more frequent maintenance (regrading) program. Foot and truck traffic on the berms must be limited and only one ramped access point should be provided.
- The water and waste storage settling ponds and cells comprised of HDPE liners are generally in good condition. No seepage from the currently operating cells was noted. Minor damages to the liner were noted at a few locations above the water lines. As specified within this report, these damages to the liners should be repaired as soon as practically possible.
- Open drainage ditches across the Mary River and Milne Inlet sites are generally in good conditions with some erosion and slope sloughing visible at a few locations. As part of a more frequent maintenance program the eroded sides of the ditches should be repaired/regraded.

- The abutments at the four inspected bridges are in good condition and no scour in the riverbed around the abutments were noted at the time of the site visit.
- Water crossings by culverts at the inspected locations are generally in good conditions. At a few locations, culverts were noted as being either too short or somewhat damaged. As specified within the report, those culverts should be repaired as soon as practically possible.

6.0 Closing Remarks

We trust that the above technical report provides you with satisfactory information in connection with the reviewed infrastructure components at the selected sites of the Mary River Operation.

Should you have any questions regarding this report, please do not hesitate to contact our office.

Sincerely,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Prepared by:

Laszlo Bodi, M.Sc., P.Eng.
Principal Geotechnical Engineer
Tel: (905) 568-2929
laszlo.bodi@woodplc.com

Reviewed by:

Aleksandar (Sasha) Živković, M.Sc., P.Eng.
Principal Geotechnical Engineer
Tel: (905) 568-2929
aleksandar.zivkovic@woodplc.com