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Hawk Inlet Diffuser and Pipeline Inspection

**Green Creeks Facility
Hecla Mining Company**

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Hawk Inlet Diffuser and Pipeline Inspection – Summary Report

Global Diving & Salvage, Inc. mobilized a two-man remote-operated vehicle (ROV) team departing from Juneau, Alaska to Hawk Inlet on October 17, 2022. The fast response jet-drive vessel *Hurricane* was used as a survey platform for conducting the work. Onboard the *Hurricane*, a surface controlled ROV with pilot voice over communication and color video were deployed to support the inspection work.

A Video Ray Pro 4 vehicle was utilized to capture both still images and video documentation of ~~the breakwater barge, anchor chains, main float and the piling.~~ This vehicle has a standard definition color camera with pan and tilt functions. The vehicle is rated for 1000 fsw and was supplied with 250 ft. of tether for this project.

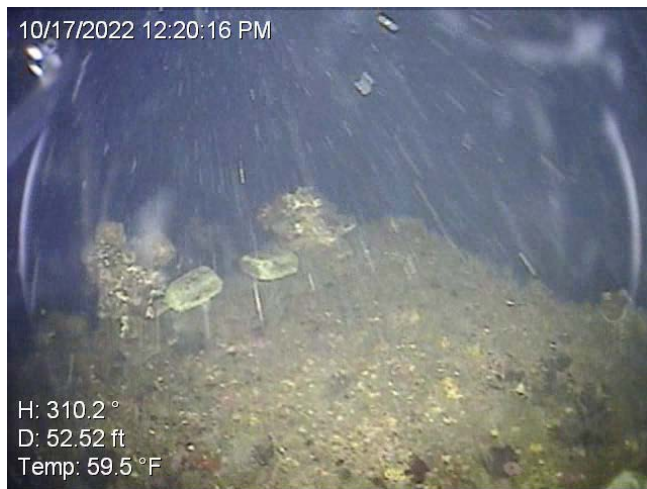
The conditions were marginal from several weeks of rain prior to the inspection, which made the water murky for the inspection. Winds were 5-10 knots from the Northeast in the channel during transit, with seas at 1-2 feet. Weather was overcast with light rain in Hawk Inlet, with calm seas, light winds and some current. Underwater visibility during the inspection was five -six feet.

Diffuser Inspection Findings

During a slack tidal cycle, the ROV was deployed over the side of the *Hurricane* while a technique called “live boating” was used to hold station over the work area. The inspection findings cover the anode condition, the condition of the duckbill valves, the blind flange and associated hardware as well as the overall condition of the diffuser. Additional details related to these findings is within the video submissions. The amount of burial and scouring is the only notated change with the outfall compared to previous years. It can be expected that the amount of sediment burial will change year to year. In several places, the pipeline is now buried at or above the spring line; however, this does not in any way affect the diffuser’s overall function as the duckbill valves are still exposed and operating as intended.

- The anodes the ROV could access on the type-4 anchors were inspected and found to be in good shape. A majority of the anodes noted 80-90% of the anode remaining. There are a few exceptions with a couple anodes noted in the video at 60%. Divers did replace several of these anodes as recently as 2021. All the stainless steel hardware appears to be in good condition, remains intact, and is functioning as designed.
- On the type-2 anchors, the anode nuts that were replaced in 2021 have approximately 90% of the anode remaining. Once again, the 3-year dive cycle seems to satisfy the depletion rate of all anodes. As demonstrated by the previous dive in 2021, the remaining zinc protection will be sufficient for at least two more years.
- On the diffuser pipe itself, no damage was found, and outside of moderate marine growth, the pipeline appears to be in very good condition. All types of anchors appear to be intact and acting as designed.

- The “duckbill” valves inspected seem to be flowing freely without obstruction. Moderate marine growth was found on the duckbills. As the ROV cannot measure the difference in volume of water coming out of the duckbills, however, as seen in the video, all the duckbills do seem to be flowing and working as intended. The anodes on the duckbill flanges are intact with an estimated 80% or more remaining.
- The blind flange on the end of the diffuser remains intact and has had its hardware recently replaced in 2021. A new stainless steel flange was installed along with new hardware and two new zincs. These zincs looked to have 90% or more remaining. The blind flange appears to be in excellent condition and should not require further attention for some time.
- As seen in the previous years, scouring on the East side of the diffuser remains. On the West side, the natural bottom still comes half way up on the pipeline in some places as noted in the video above the spring line. This is a sign that the inflow of sediment is slowly covering the pipe from the Chatham Strait side. The scouring that has occurred on the Hawk Inlet side is from the back eddies as the current is disrupted by the diffuser. All scouring and back filling is minimal and does not hinder the diffuser from working at this time but needs to be monitored each year.



Type-4 Anchor Block Anodes



Typical Diffuser Condition

Outfall Pipeline Inspection Findings

The pipeline was inspected throughout its length and found to be in very good overall condition. There were no abnormalities or items of note about the anchor blocks and all the stainless hardware was found intact. The limited capabilities of the ROV make it difficult to see each individual nut due to marine growth. Divers did replace zincs in 2021 so it is estimated that 90% of the zinc nuts remain on all of the anchor blocks. The three flanges noted in the corresponding videos show the condition and make up. No damage was noted and all the hardware seen was intact. The flanges are stainless steel as is the hardware used in them. There are two new anodes on each flange, which were installed in 2021 and have an estimated 90% remaining. The pipeline lays on nature bottom and all the anchors appear to be evenly spaced, except as noted, where the pipeline drops into deeper water on a steep angle and these blocks are spaced more closely, and secured as intended. For all practical purposes, this pipeline remains true to its design.



Good Zinc Nut on Anchor Block



Flange 3 Condition

Final Remarks

The overall condition of the Hawk Inlet pipeline and outfall is in good to excellent condition. As the anodes start to deteriorate beyond 40% life remaining, Global recommends that they be replaced. As seen in the video, anodes below 40% have a tendency to break off in the current and thus leave the parent metal unprotected. The type-4 anchor blocks on the diffuser remain in excellent condition, as do the anodes attached to these. At the time of this survey, the duckbill flanges and the pipeline (3) flange areas are in satisfactory condition, with newer zincs having been installed in 2021. As seen in years past, the life span of the zinc nuts seems to be consistently around 3-5 years and diving to replace zinc nuts every three years seems to satisfy the depletion cycle. The only recommendation for next year would be the annual monitoring of the diffuser.

Reported Prepared By:
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