Memorandum

To:	Travis Ritchie, Yukon Energy Corporation
From:	EDI Environmental Dynamics Inc.
Date:	May 13, 2022
Project No:	22Y0197
Re:	Marsh Lake Low Water Investigations - Monitoring Event 3 Fieldwork Summary

Monitoring Event 3

- Date of monitoring event: May 11 – 12, 2022
- Field staff: James McGrath, Jonathan Lowey, Annina Alther (EDI)
- Weather: Partly cloudy/Windy, 5°C
- Marsh Lake elevation
    - May 11; 9 am to 5 pm average = 653.759 m (0.041 m below low supply level)
    - May 12; 9 am to 5 pm average = 653.757 m (0.043 m below low supply level)
- Areas monitored: Lewes Marsh area near Sawmill Road and Alaska Highway, Kettley's Canyon wetland, Yukon River connected wetland 3.7 km downstream of Marsh Lake, Marsh Lake at unnamed creek mouth, north end of Marsh Lake, Judas Creek and Tagish River bridge wetland (Map 1).

Methods

Drone imagery collection

Drone imagery was collected at each monitoring location along pre-determined flight paths at a consistent height of 80 m using a mini-drone (DJI Mavic Mini 2) by operators with a valid drone operators certificate. Identical flight paths will be used for subsequent monitoring events to ensure consistent imagery collection. During each flight, field staff monitored the imagery for areas of interest and recorded any wildlife observations. Following the completion of all monitoring events, the recorded imagery will be reviewed to compare conditions at different water levels throughout the duration of monitoring period.

Collection of bird and wildlife observations

Bird and wildlife observations were recorded by field staff on the ground and in the air (via drone) at each monitoring location. Species and number of individuals were recorded for each observation, as well as any signs of wildlife activity (tracks, muskrat push ups, etc.).

Fish Sampling

Small-mesh gillnetting was conducted on May 12, 2022 in the Lewes Marsh area near sites LM1, LM2, and LM3. Three types of gillnets were used, and each gillnet was composed of three panels 22.9 m in length, each with different mesh sizes. The gillnets used are consistent in size and composition to those used for similar purposes in past years to allow for the later comparison of results. The intention of the small-mesh gillnetting was to monitor the quantity and variability of fish species in the Lewes Marsh area during different times of the year and across a range of Marsh Lake elevations.

The following mesh sizes were used:

- Net gang type 1: 13 mm (0.5 in), 19 (0.75 in) and 25 mm (1.0 in);
- Net gang type 2: 25 mm (1.0 in), 38 mm (1.5 in) and 52 mm (2.0 in); and,
- Net gang type 3: 32 mm (1.25 in), 38 mm (1.5 in) and 44 mm (1.75 in).

Results

General site conditions

Conditions were similar across all monitoring locations. Pockets of open water in the wetlands associated with creeks and ground water seeps continue to increase in size, with snow and ice still covering the majority of each area. The Yukon River open channel that extends from the outlet of Marsh Lake downstream through the Lewes Marsh is getting wider as ice begins to break up on the riverbanks. Representative photos of each site are shown in Photo 1 to Photo 12 included at the end of this summary.

The riverbank erosion adjacent to site LM6 seemed to have little change compared to the previous monitoring trip (Photo 13). Photos of this location will continue to be collected during subsequent monitoring events.

Bird Observations

A total of 45 bird species were detected during the monitoring event (Table 1) including two Species at Risk (Horned Grebe and Rusty Blackbird). One unusual bird species (Great Blue Heron) was observed flying over the north end of Marsh Lake. Given the seasonal timing, the bird species observed includes primarily migrants either passing through or using the area as stopover habitat. The bird species observed included a range of waterfowl/waterbirds using open water habitats, shorebirds using exposed mudflats, and other species either flying through the area (raptors) or using the riparian and surrounding forest areas (passerines). The open Yukon River channel continues to contain a relatively high diversity of waterfowl and waterbirds, particularly diving birds. There was also an apparent increase in the number and diversity of shorebird species observed in comparison to the May 4, 2022 survey.

Wildlife Observations

Wildlife observations were recorded at some sites during the monitoring event. Two river otters were observed swimming around the Tagish bridge at site TR (Tagish River). Otters were also periodically seen at sites LM2 and LM1 and could be the same pair that were observed during the previous monitoring event. Two moose were observed on May 12; one at the back of site LM2 (Kettly's Canyon wetland) and one approximately 800 m downstream of LM2. Clusters of animal tracks were again observed at open water areas/areas of exposed mud in Lewes Marsh (LM3-A, LM1, LM2 and LM5). The exposed mud areas are increasing in size as warming temperatures continue to melt snow and ice from the areas.

Fish Sampling

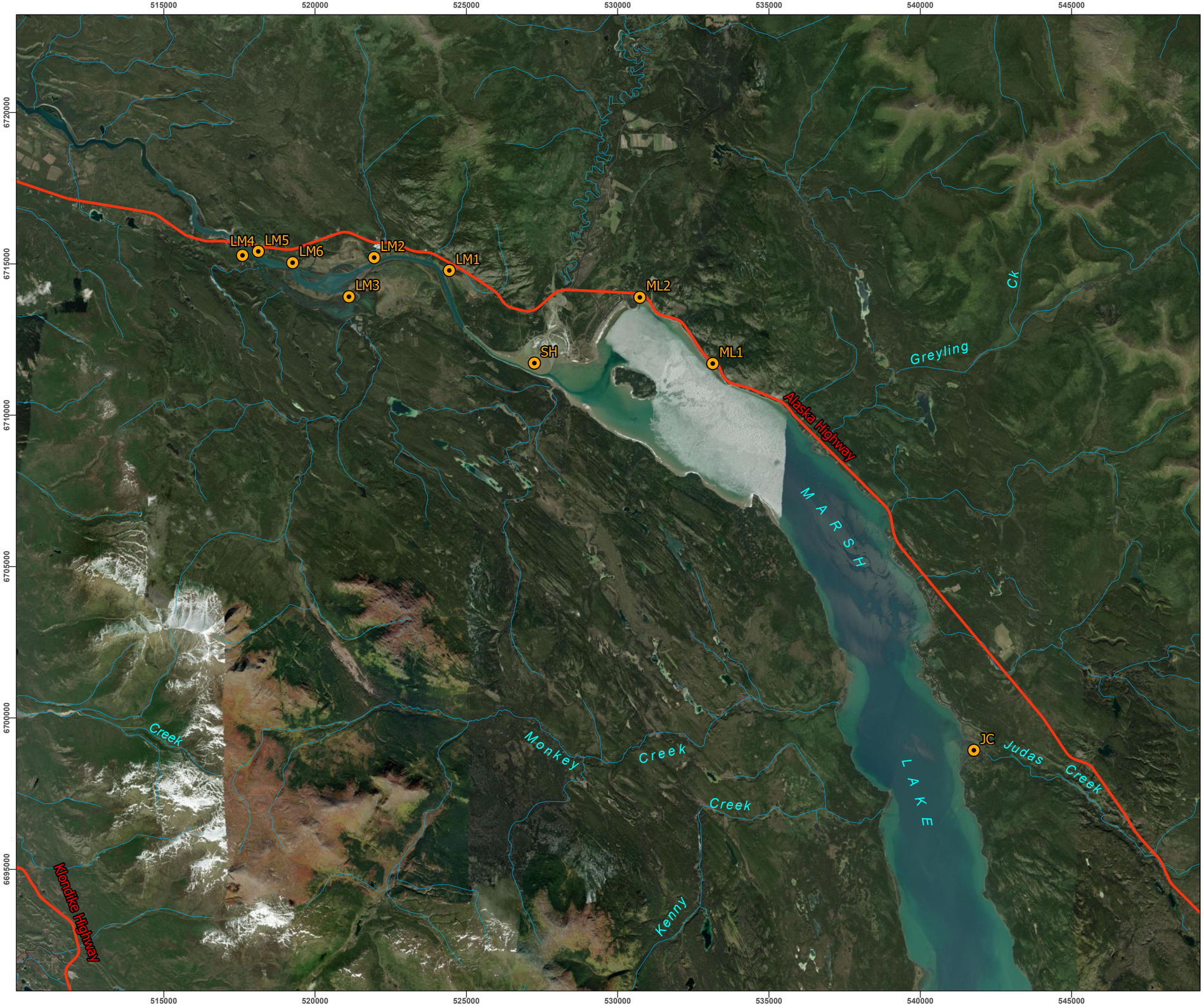
A total of 5.5 hours of small-mesh gillnetting was completed on May 12, 2021, capturing 16 fish over 11 sets. Fish captured included round whitefish, lake whitefish, pygmy whitefish, and arctic grayling. Fish sampling will continue to be conducted once a month over the duration of the monitoring program.

Table 1. Summary of bird species observed during the May 11, 2022 monitoring event.

Species	Bird Species Detected					
	LM1	LM3	Yukon River channel	ML1	ML2	JC
Canada Goose		✓			✓	✓
Snow Goose						✓
Trumpeter Swan		✓				✓
Unidentified Swan		✓				✓
Northern Shoveler			✓			✓
American Wigeon	✓	✓	✓		✓	✓
Mallard	✓	✓	✓		✓	✓
Northern Pintail		✓	✓		✓	✓
Green-winged Teal	✓	✓	✓		✓	✓
Unidentified dabbling duck		✓				✓
Canvasback			✓			
Ring-necked Duck			✓			
Greater/Lesser Scaup			✓			
Surf Scoter			✓			
White-winged Scoter			✓			
Long-tailed Duck			✓			
Bufflehead		✓	✓			
Barrow's Goldeneye		✓	✓			✓
Common/Barrow's Goldeneye						✓
Common Merganser			✓			
Red-breasted Merganser			✓			
Unidentified merganser			✓			
Unidentified diving duck			✓			
Horned Grebe			✓			
Unidentified 'peep' sandpiper		✓	✓			

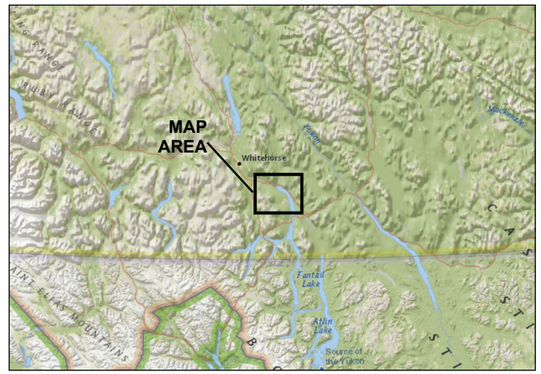
Species	Bird Species Detected					
	LM1	LM3	Yukon River channel	ML1	ML2	JC
Semi-palmated Plover		✓	✓			
Long-billed Dowitcher						✓
Lesser Yellowlegs	✓	✓	✓		✓	✓
Unidentified Shorebird		✓	✓			✓
Bonaparte's Gull	✓	✓	✓		✓	✓
Short-billed Gull	✓	✓	✓		✓	✓
Arctic Tern					✓	
Great Blue Heron					✓	
Bald Eagle	✓	✓			✓	✓
Belted Kingfisher			✓			
Three-toed Woodpecker		✓				✓
Black-billed Magpie				✓		
Common Raven		✓	✓	✓	✓	✓
Violet-green Swallow					✓	
Ruby-crowned Kinglet		✓	✓	✓	✓	✓
Varied Thrush						✓
American Robin	✓	✓	✓	✓	✓	✓
Bohemian Waxwing						
American Pipit	✓	✓			✓	✓
Common Redpoll		✓				
American Tree Sparrow			✓			
Dark-eyed Junco	✓	✓	✓		✓	✓
White-crowned Sparrow		✓	✓		✓	✓
Savannah Sparrow		✓	✓		✓	✓
Rusty Blackbird		✓			✓	
Yellow-rumped Warbler	✓	✓	✓	✓	✓	✓

Map 1. Overview of Marsh Lake low water investigation sites.



Legend

- Survey Points of Interest
- Highway
- Local Road/Access
- Watercourse
- Private Property Boundary



0 2 4 6 8
Kilometers

Map Scale = 1:125,000 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 8N

Data Sources

- Inset Basemap. National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
- Main Basemap. World Imagery: Earthstar Geographics

Disclaimer
EDI Environmental Dynamics Inc. has made every effort to ensure this map is free of errors. Data has been derived from a variety of digital sources and, as such, EDI does not warrant the accuracy, completeness, or reliability of this map or its data.

Drawn:	Checked:		
OL	BSc	Map 1	Date: 2022-05-05

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Photo 1. View of conditions at monitoring site LM1 (Yukon River wetland 3.7 km downstream of Marsh Lake) on May 11, 2022.

Photo 2. View of conditions at monitoring site LM2 (Kettley's Canyon wetland) on May 11, 2022.

Photo 3. View of conditions at monitoring site LM3-A (Lewes Marsh adjacent to Sawmill Road) on May 11, 2022.

Photo 4. View of conditions at monitoring site LM3-B (Lewes Marsh adjacent to Sawmill Road) on May 11, 2022.

Photo 5. View of conditions at monitoring site LM3-C (Lewes Marsh adjacent to Sawmill Road) on May 11, 2022.

Photo 6. View of conditions at monitoring site LM4 (Lewes Marsh adjacent to Sawmill Road) on May 11, 2022.

Photo 7. View of conditions at monitoring site LM5 (Lewes Marsh) on May 11, 2022.

Photo 8. View of conditions at monitoring site LM6 (Lewes Marsh) on May 11, 2022.

Photo 9. View of conditions at monitoring site ML1 (unnamed creek mouth on Marsh Lake) on May 11, 2022.

Photo 10. View of conditions at monitoring site ML2 (north end of Marsh Lake) on May11, 2022.

Photo 11. View of conditions at monitoring site JC (Judas Creek) on May 11, 2022.

Photo 12. View of conditions at monitoring site TR (Tagish River) on May 11, 2022.

Photo 13. Eroding bank adjacent to monitoring site LM6 (Lewes Marsh) on May 11, 2022.