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April 28, 2017

***Re: Balfour Osprey 2000 Gear Oil Spill - Summary of SCAT Assessment - April 26, 2017***

**Survey Date:** April 26, 2017. 9:00 – 12:30

**Weather:** Overcast, periods of light rain. No wind to light wind.

**Crew:** Allan Irvine

**Kootenay Lake Level** (Queen's Bay): 532.06 m

Kootenay Lake level at time of incident (April 15, 2017): 531.97 m

Kootenay Lake forecast for April 30, 2017: 532.18 m

Kootenay Lake forecast for June 5, 2017: 533.74 m

A 925 m length of shoreline, located on the West Arm of Kootenay Lake, was resurveyed on April 26<sup>th</sup>, 2017 (Tables 1 – 2), as a follow-up to Shoreline Cleanup Assessment Technique (SCAT) surveys completed on April 17<sup>th</sup> and April 20<sup>th</sup>, 2017. Sub-sections 2c and 3a were further divided from previously delineated areas based on observed conditions with results summarized below (Table 2, Figure 1, Photos 1 - 16). A summary of the April 26<sup>th</sup>, 2017 SCAT assessment, shoreline treatment options and monitoring follows.

Table 1. Sections delineated during the April 17<sup>th</sup> initial SCAT survey.

<b>Section ID</b>	<b>*Length (m)</b>	<b>Comments</b>
1	120	Upstream of Terminal - From second dock upstream of terminal piers to dock in front of Holly's Diner.
2	<b>95</b>	Downstream of Terminal - From dock in front of Holly's Diner to Dock'n' Duck dock.
3	<b>90</b>	Downstream of Dock 'n' Duck - From Dock'n' Duck dock to small old docks.
4	<b>85</b>	Upstream of First Marina Dock - From small old docks to first marina dock.
5	<b>70</b>	Downstream of First Marina Dock - First marina dock to Graham Marine dock.
6	<b>150</b>	Downstream of Graham Marine - Graham Marine dock to dock government boat launch.
7	315	Downstream of Government Boat Launch - Government boat launch to private dock 315 m downstream.
Total	925	Results of April 17, 2017 SCAT survey indicate oil observed on <b>495 m</b> of river bank shoreline

\*Bolded lengths indicate river bank shoreline sections where oil was observed during April 17, 2017 SCAT Survey.

Table 2. Sub-sections and assessment summary from April 26<sup>th</sup> SCAT survey.

<b>*Sub Section ID</b>	<b>Length (m)</b>	<b>Comments</b>
1	120	Upstream. No oil detectable by sight, smell or feel. No subsurface oil. No impacted wildlife observed.
2a	15	No oil detectable by sight, smell or feel. No subsurface oil. No impacted wildlife observed.
2b	2	Under ferry ramp beside upstream pier. No oil visible on shoreline. No subsurface oil. Very small amount of silver film produced when shoreline washed. No ambient smell. No impacted wildlife observed.
2c-1	61	No oil detectable by sight, smell or feel. No subsurface oil. No impacted wildlife observed.
2c-2	12	Starts ~15 m upstream of Dock 'n' Duck dock. Silver to iridescent film on standing water located above water line. Oil film visible on < 1 % (trace) of beach immediately (1 - 2 m) above water line. No subsurface oil. Silver film produced when shoreline washed. Slight ambient smell. Odor when sand brought to nose. No impacted wildlife observed.
2d	5	Either side of Dock 'n' Duck dock. Silver to iridescent film on standing water located immediately above water line. Oil film visible on < 1 % (trace) of beach immediately (1 - 2 m) above water line. No subsurface oil. Silver to iridescent film produced when shoreline washed. Slight ambient smell. Odor when sand brought to nose. No impacted wildlife observed.
3a-1	64	Downstream of Dock 'n' Duck dock. Silver to iridescent film on standing water located immediately above water line. Oil film visible on < 1 % (trace) of beach immediately (1 - 2 m) above water line. No subsurface oil. Silver to iridescent film produced when shoreline washed. Slight ambient smell. Odor when sand brought to nose. No impacted wildlife observed.
3a-2	15	No oil visible on shoreline. No subsurface oil. Silver film produced when shoreline washed. No ambient smell. No impacted wildlife observed.
3b	11	Either side of two old small docks. No oil visible on shoreline. No subsurface oil. Silver to iridescent film produced when shoreline washed. Silver film around dock. No ambient smell. Slight odor when handfuls of sand brought to nose. No impacted wildlife observed.
4a	75	No oil visible on shoreline. No subsurface oil. Silver to iridescent film on up to 1 m of lake water adjacent to shore. Silver film produced when shoreline washed. No ambient smell. No impacted wildlife observed.
4b	10	Either side of first Marina dock. No oil visible on shoreline. No subsurface oil. Silver film produced when shoreline washed. Silver film around dock and most boat slips. No ambient smell. No impacted wildlife observed.
5	70	No oil visible on shoreline. No subsurface oil. Silver film produced when shoreline washed. Light silver film around docks in quiet areas. No ambient smell. No impacted wildlife observed.
6	150	No oil detectable on shoreline by sight, smell or feel. Light silver film around docks in quiet areas. No impacted wildlife observed.
7	315	No oil detectable by sight, smell or feel. No subsurface oil. No impacted wildlife observed.

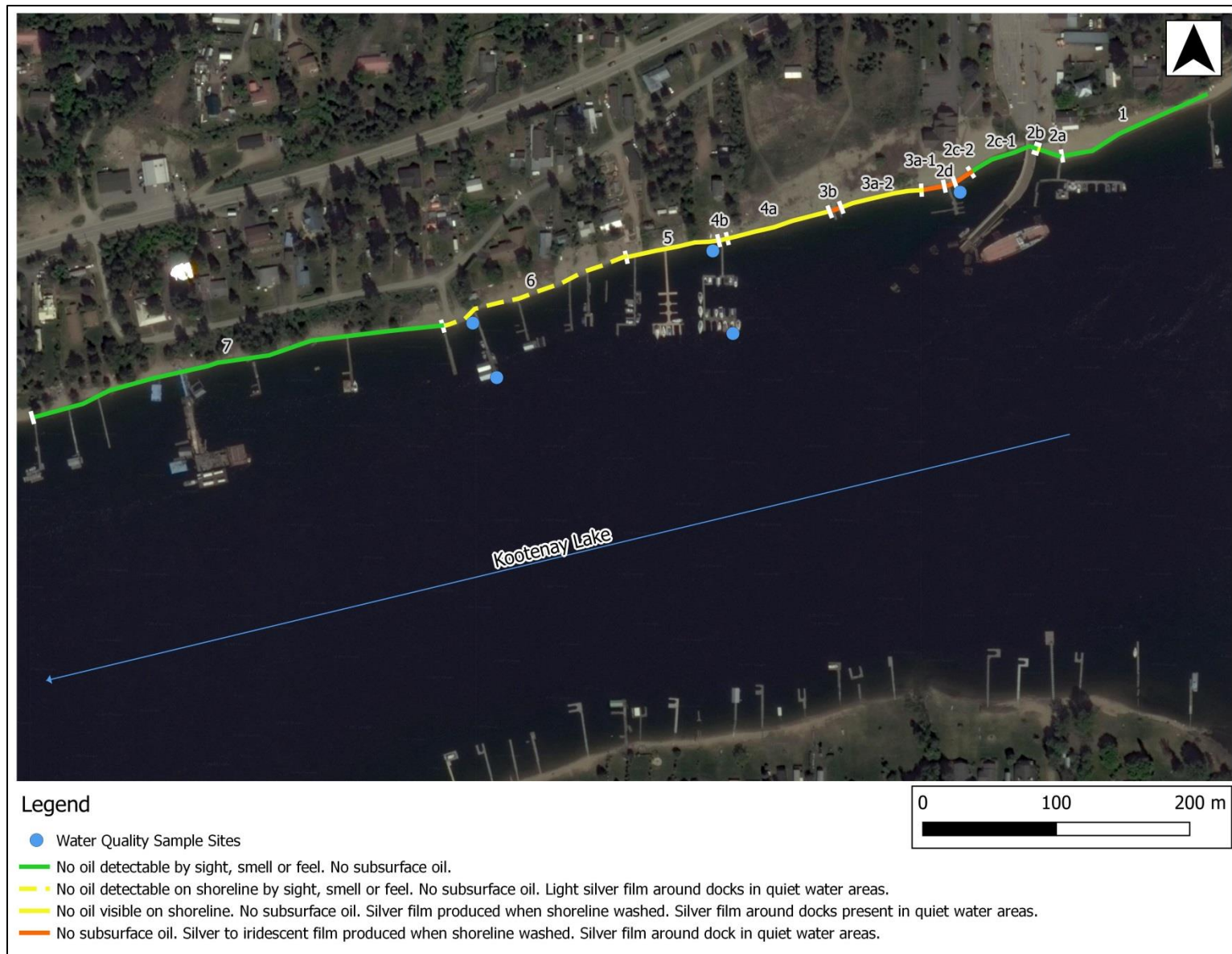


Figure 1. Map of sub-sections and assessment result summary.





Photo 1. Section 1 - Downstream view.



Photo 2. Section 2a– Upstream view



Photo 3. Section 2b (under ferry ramp) – Downstream view.



Photo 4. Section 2b (under ferry ramp) – Pit – No subsurface oil.



Photo 5. Section 2c – 1 – Downstream view.



Photo 6. Section 2c – 2 - Silver to iridescent film on standing water located immediately above water line.



Photo 7. Section 2d – Silver to iridescent film on standing water and portions of shoreline above water line.



Photo 8. Section 3a – 1 - Silver to iridescent film on standing water immediately above water line.



Photo 9. Section 3a - 2 – Downstream view.



Photo 10. Section 3b – Silver to iridescent film in quiet water areas between and either side small docks.





Photo 11. Section 4a – Silver to iridescent film on up to 1 m of lake water adjacent to shore.



Photo 12. Section 4b – Silver film in quiet water areas around dock.



Photo 13. Section 4b –Light silver film present in quiet areas around marina dock and boat slips



Photo 14. Section 5 – Downstream view



Photo 15. Section 6 – Downstream view



Photo 16. Section 7 - Downstream view

## Assessment Summary

- Water
  - Silver to iridescent film on standing water located above water line in Sections 2c-2 to 3a-1 (combined length of ~80 m).
  - Silver to iridescent film on up to 1 m of lake water adjacent to shore in Section 4a (~75 m).
  - Silver film from product observed on water surface next to docks and boat slips in Sections 4 – 6. Product present in quiet water areas where water does not flow through structures.
  - Silver to iridescent film observed in quiet water areas around docks in Subsections 2d and 3b.
- Shoreline
  - Oil film visible on small patches (< 1 %) of beach immediately (1 - 2 m) above water line in Sections 2c-2 to 3a-1 (combined length of ~80 m).
  - No oil detectable by feel in any section.
  - Washing the shoreline within 1 – 2 m of water level generates no film throughout Sections 1, 6 and 7.
  - Washing the shoreline within 1 – 2 m of water level generates silver film throughout most of Sections 2 – 5 (combined length of 340 m).
  - Washing the shoreline within 1 – 2 m of water level generates silver to iridescent film within Sub-sections 2d, 3a-1, 3b (combined length of 80 m).
  - Subsurface
    - No subsurface oil present in any Section.
    - No film observed in any pits excavated in Sections 2 – 6.
  - Odor
    - Slight ambient smell in Sections 2c-2, 2d and 3a-1 (combined length of 81 m).
    - Odor when handfuls of affected sand brought to nose in Sections 2c-2, 2d, 3a-1 and 3b (combined length of 92 m).
- Wildlife
  - No impacted wildlife observed.

## Discussion

Lake levels for the April 21<sup>st</sup> survey were 0.06 m lower than levels at the time of the spill, while levels at the time of the April 26<sup>th</sup> survey were 0.09 m higher. This increase in water level for the April 26<sup>th</sup> survey has resulted in increased contact between the lake and the substrates that were at lake level at the time of the incident. This has caused remobilization and slight concentration of the oils along the shore/water interface resulting in an observable film on standing water and small portions of substrate adjacent to the watermark.

## Treatment Options

1. Allow oil to be removed by natural processes.
  - Oil observed as surface film throughout areas of the site is in low concentrations and not recoverable by absorbent pads.
  - Significant flushing of the shoreline substrates has occurred at the site over the 10 days since the spill due to flows, wave action, precipitation and fluctuating water levels in the West Arm of Kootenay Lake. Continued flushing of the product through these processes is expected.
  - Fortis BC forecasts that water levels in the main lake will rise to 0.21 m above the levels recorded at the time of the spill by April 30, 2017. Preliminary forecasts from Fortis BC indicate that lake levels will rise to 1.8 m above the elevation of the spill by June 5, 2017.
2. Temporary relocation of docks in sub-section 3b to increase lake water circulation to shoreline area.
3. Remobilizing oil in Sections 2d, 3a-1, 3b by raking.
  - Remobilization of product in these areas will result in some reductions in product concentrations if wind and/or current directs floating product downstream.

## Monitoring Plan

- SCAT survey in 1 – 2 weeks.

If you have any questions or comments please feel free to contact us.

Sincerely,

Al Irvine, RPBio

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