Streamlining SCAT with Drones and Dogs

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SCAT Updates

- Several recent potential streamlining field strategies and tactics for the Shoreline Cleanup Assessment Technique (SCAT) process (Clean Gulf 2017).

- This presentation briefly considers two significant advances to support SCAT programs and field surveys:

  - Unmanned Aerial Systems (UAS)
  - Oil detection canines (K9 SCAT)

UAS – UAV Platforms

- Chevron 2016

- Husky 2016
- ExxonMobil 2017

- Chevron 2017

- AV Puma - hand launched fixed wing
- LM Indago - quadcopter
- DJI Phantom 3 - quad
- Indago - quad with HD x30 zoom
- Inspire 1 - quad with HD x7 zoom*
- 3DR Solo - quad with Kodak 360°
- Acturus Jump 20 - VTOL fixed wing/multirotor
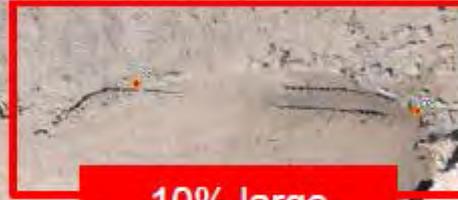- Puma - fixed wing
- Indago - quad

* tethered

Targets

7.5% oil patch

20% weathered oil patch

40% heavy oiling

Overflight 1 @ 2000': Gaviota State Beach

80% large oiling target

10% large oiling target

50'

Targets configured in 5, 15, 30 and 50 % distributions

Chevron October 2016 Results - 1

- No difference between platforms (fixed wing or quadcopter)

- Better results on Day 2 compared to Day 1

- Better results for sand substrates (71%) versus gravel, cobble or wrack (60%)

- Better results for the 30 and 50% distributions than for the 5 and 15%
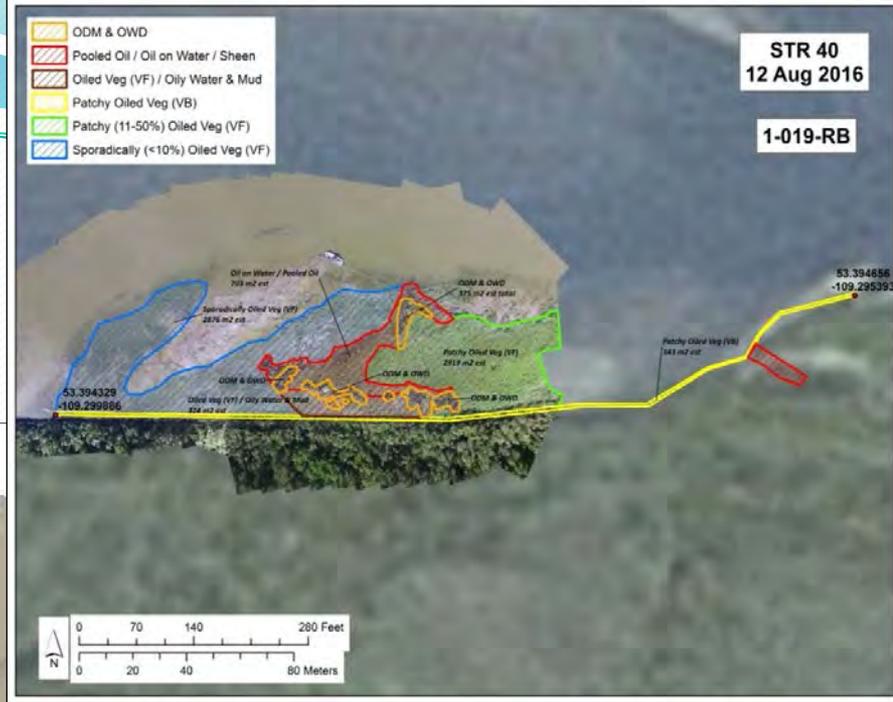
Chevron October 2016 Results -2

SAND
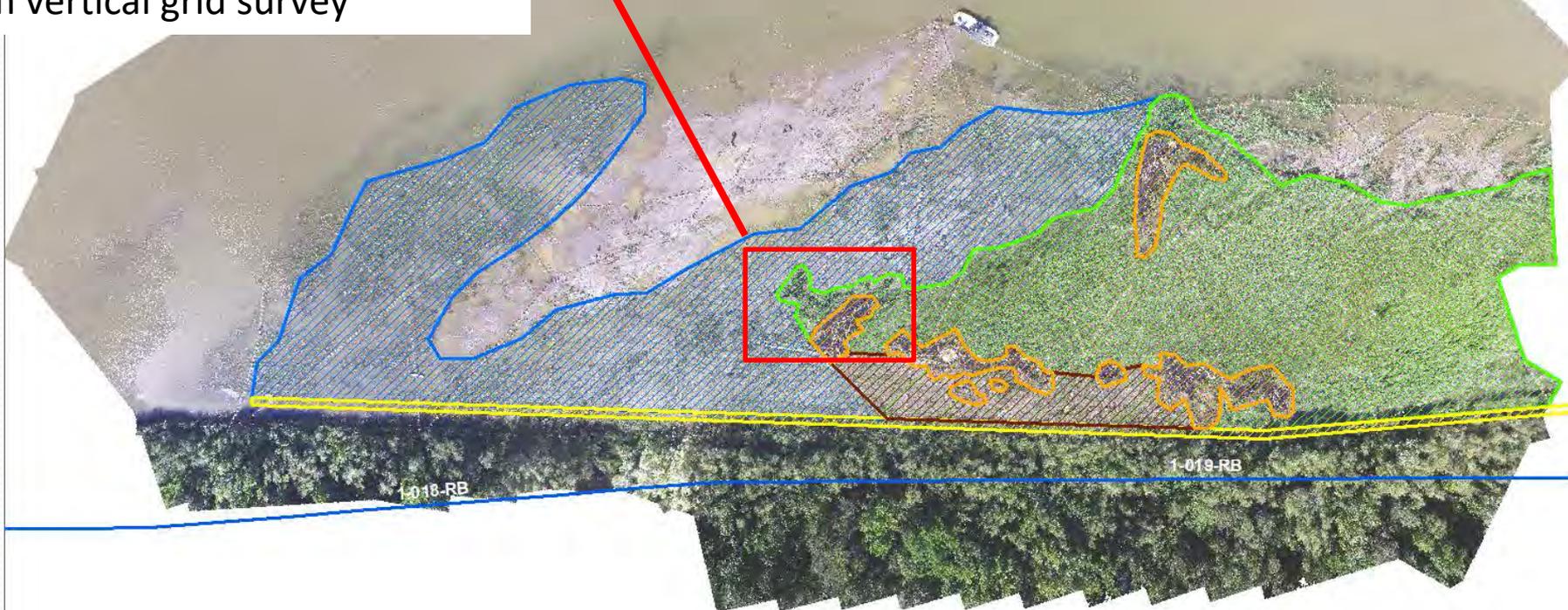- 10/10 - 30 and 50% distributions
- 2/3 - 5 and 15%

GRAVEL/COBBLE
- 9/10 - 30 and 50%
- 2/6 - 15%
- 0/4 - 5%

High resolution images

Oiled Zones Delineation Mosaic - from vertical grid survey

Legend:

	ODM & OWD
	Pooled Oil / Oil on Water / Sheen
	Oiled Veg (VF) / Oily Water & Mud
	Patchy Oiled Veg (VB)
	Patchy (11-50%) Oiled Veg (VF)
	Sporadically (<10%) Oiled Veg (VF)

STR 40
12 Aug 2016

1-019-RB

Chevron October 2017: Applications for Shoreline Surveys

- Test of process for rapid shoreline reconnaissance
- Monitoring for ICP support – so remote decision makers who cannot be in the field can "see" the sites (tethered/untethered)

Recon SCAT Process

- For Recon SCAT at the very start of a spill:
  - Can remotely and quickly generate a Shoreline Oiling Aerial Reconnaissance (**SOAR**) form – "short SOS form"
  - Use this to create a Rapid Response Treatment Recommendation (**RRTR**) proposal and submit to EU
  - Follows standard SCAT and EU protocols but in a time-condensed manner
  - *Enables rapid decisions and directions for shoreline cleanup to areas of* **high oil concentrations that have high remobilization potential/risk**.

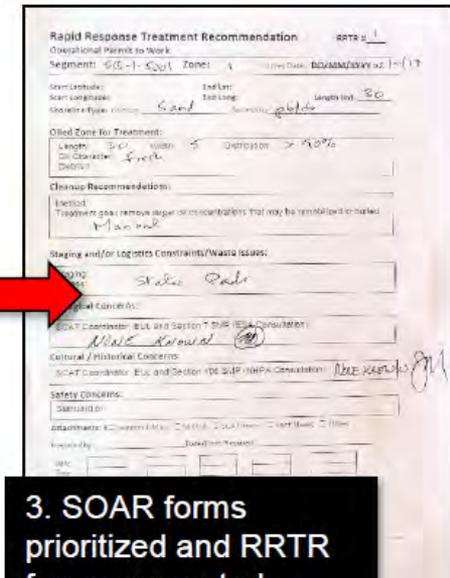# Shoreline Oiling Aerial Reconnaissance (SOAR) workflow

- Imagery → SOAR form → Rapid Response Treatment Recommendations
- 'Blind' test using beach targets
- Rapid turnaround of imagery for heavy + moderate oiling → target cleanup
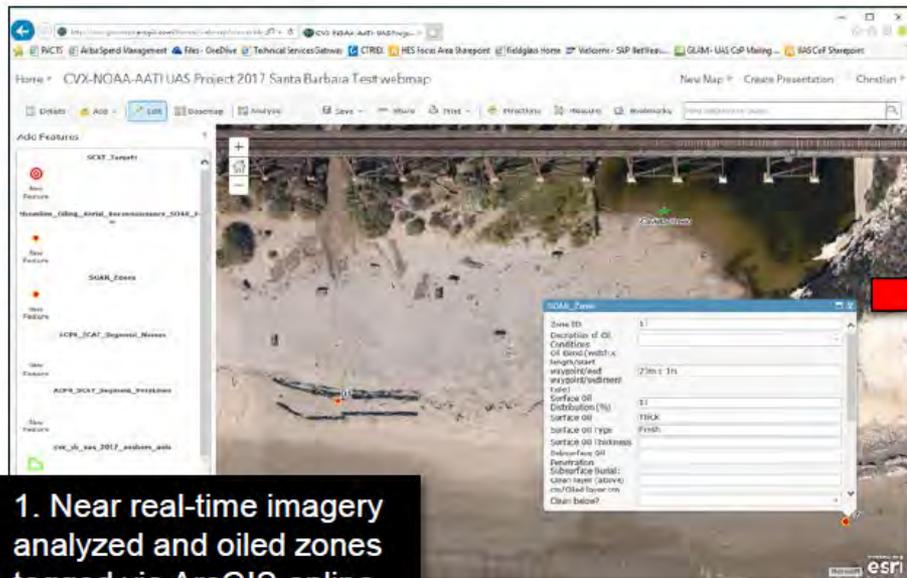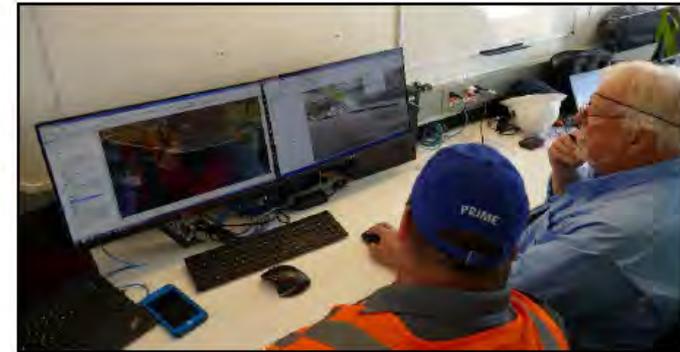
1. Near real-time imagery analyzed and oiled zones tagged via ArcGIS online
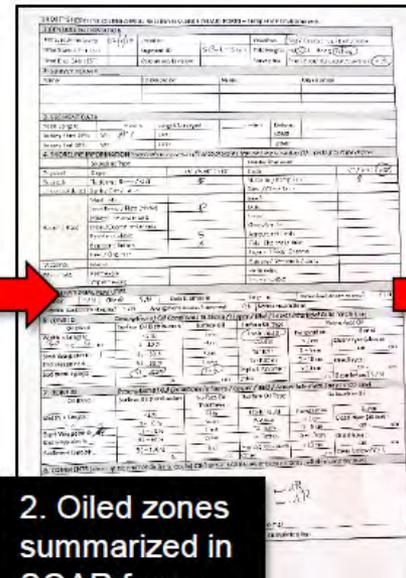
2. Oiled zones summarized in SOAR form

3. SOAR forms prioritized and RRTR forms generated

SCAT Data - COP

- SCAT data **DOES NOT** go directly from the field to the ICP and/or COP

- field information goes into the database from which the Oiling Categories (H-M-L-VL-T) are generated; then this derived information and data goes to the COP

- this is the reason why SCAT data/forms do not go electronically directly to the COP as there are QA/QC steps that must be followed;

- ***Drones may save time and effort, but do not change the process or the protocols***

Quick Summary

- If simply looking for **Heavy** and **Moderate** oiling categories, then visual aerial observations are adequate under most circumstances

- If looking for **Light** and **Very Light** oiling categories, then aerial visual observations are a low confidence technique

- A UAS may be able to fly when other platforms are grounded due to weather

2. Oil Detection Canines (K9 SCAT)

K9 SCAT support is a game changer

- **High confidence** of finding oil and **low risk** of missing subsurface oil

- Proven that a K9 SCAT team is much quicker and more efficient than "traditional" SCAT for **subsurface oil (and shallow-water bottom oil)** detection

- Can rapidly clear large areas where no surface oil or low oil concentrations (not actionable oil) are suspected

- *Huge time and effort savings*

Recent Field Projects

- 2015 API Field Trials: controlled proof of concept
- 2016 Chedabucto Bay, NS, *Arrow* post-2015 spill field study
- 2016 North Saskatchewan River (NSR) spill response
- 2017 Prince William Sound, AK: subsurface oil field study
- 2017 NSR 2nd year SCAT program
- 2018 Texas, San Antonio: certification test site established
- 2018 NSR scheduled 3rd year SCAT program

2016 ECCC
Chedabucto Bay, NS
Field Study

7:40 am 6/3/2016 1:02 pm
6/3/2016

Eddy Point Light Rd
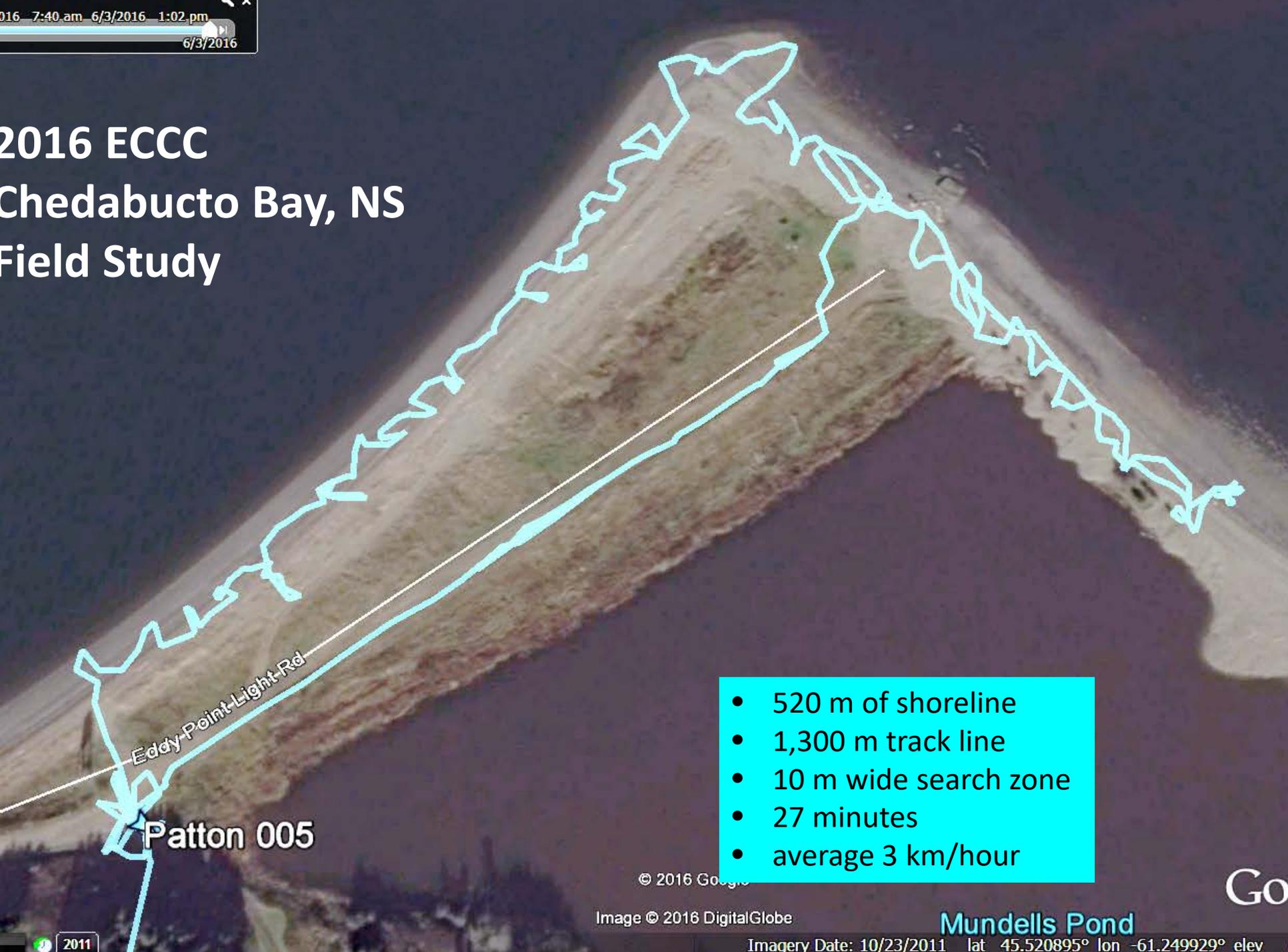
Patton 005

- 520 m of shoreline
- 1,300 m track line
- 10 m wide search zone
- 27 minutes
- average 3 km/hour

© 2016 Google

Image © 2016 DigitalGlobe

Mundells Pond

Imagery Date: 10/23/2011   lat 45.520895° lon -61.249929° elev

2011

North Saskatchewan River (NSR) Spill Response

- 2016 - 2 teams 114 field days

- 2017 - 4 teams, 202 field days
  - 8,792 behaviour indications ("alerts")

Oct.	Max. Temp	Min. Temp	Mean Temp	Total Snow	Snow on Ground	Dir. of Max Gust	Speed of Max Gust
DAY	°C	°C	°C	cm	cm	10's deg	km/h
25	4.3	-2.1	1.1	6.6	1	3	50
26	0.4	-5.5	-2.6	0	4	36	26
27	2.2	-3.6	-0.7	0	1	36	24

RIVER BANK K9-SCAT FORM (16Tan 27 May 2017) — **16Tan Incident**

1. GENERAL INFORMATION		DATE	SEGMENT ID	Survey Type
				by foot
SCAT Team	G. Macdonald	2017-06-10	2-084-RB	Survey direction
				with wind
K9 Handler Name	Paul Bunker			Canine Name
				Kaye

6. POSITIVE ALERTS

Alert #	Wpt #	Verified ? (Oil Observed?)	Alert type	Comment (simple oil description*)
1	735	Yes	stare	Surface / Sticky / ODP / TO / 1 debris / average size : 12 cm / oil recovered : Yes
2	749	No		
3	750	No		
4	751	Yes	stare	Surface / Sticky / WD / CV / 1 debris / average size : 3 cm / oil recovered : Yes
5	752	Yes	stare	Surface / Sticky / ODP / CV / 1 debris / average size : 6 cm / oil recovered : Yes
6	753	Yes	stare	Surface / Weathered / SR / CV / 1 debris / average size : 4 cm / oil recovered : Yes
7	754	Yes	stare	Surface / Sticky / ODP / CV / 1 debris / average size : 6 cm / oil recovered : Yes
8	755	Yes	stare	Surface / Weathered / WD / CT / 1 debris / average size : 3 cm / removed / oil recovered : Yes
9	756	Yes	stare	Surface / Sticky / WD / CV / 1 debris / average size : 5 cm / oil recovered : Yes
10	757	No	stare	oil recovered : Unknown
11	758	Yes	stare	Surface / Sticky / ODM / TO / 1 debris / average size : 40 cm / oil recovered : Yes
12	759	No	stare	
13	760	Yes	stare	Surface / Weathered / OV / CT / 1 debris / average size : 2 cm / oil recovered : Yes
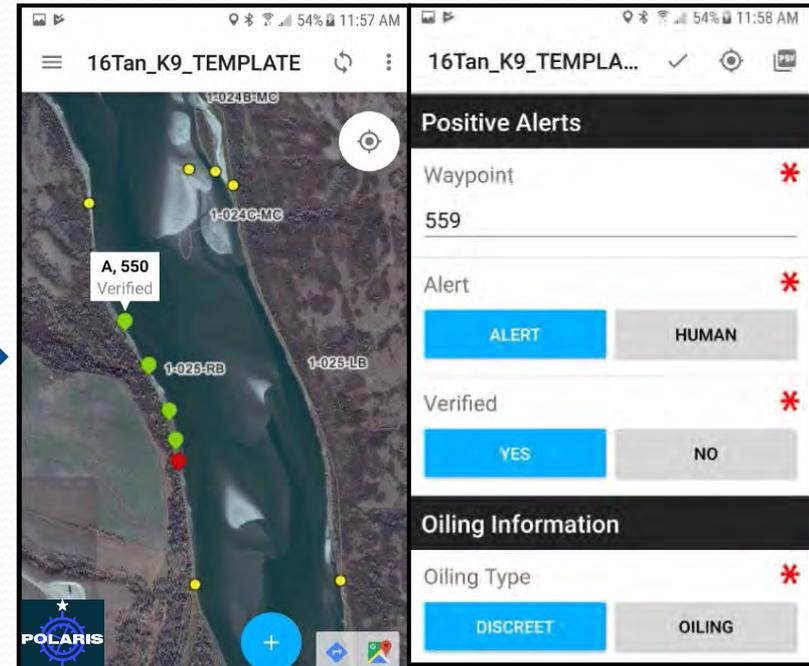
- With so many alerts, developed an App to save field and data entry time

Verification

Project	Alerts or Targets	Verified	%	Comments
2015 API Field Trials	704	702	**99**	3-day program; strictly controlled design of oiled and non-oiled targets: very high confidence
2017 PWSSC Study	28	18	64	3-day field study; verification constrained as very difficulty to dig pits in the coarse sediments
2017 North Saskatchewan River Oil Spill Response	8,792	7,831	**89**	4 dogs, continuously for 13 weeks from May-October; surveyed 718 river shoreline km

Oil Detection Canine Team Certification

- International Police Work Dog Association – IPWDA
- Assessment site has been established in Somerset (near San Antonio), Texas
- First certification will be conducted April 2018
- Annual re-certification requirement

Benefits from **Small Adjustments**

- **UASs** are a small adjustment to a SCAT program
- Small adjustments definitely save time and effort, but *not big time game changers*

Benefits from **Strategic Adjustments**

K9 SCAT: quicker, more reliable and more efficient than "traditional" SCAT for **subsurface oil** detection and for rapidly clearing large areas with little/no oil: *a real game changer*

Will always need boots on the ground.