Developing a Quantitative Oil Spill Risk Model

Modeling Team
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Legislative background

- ESHB 1578 was passed in 2019 to reduce the risk of oil spills, and protect Southern Resident Killer Whales

- Ecology’s Spills Program tasked to undertake or assist with multiple policy initiatives in the bill, including the development of an oil spill risk model
Research philosophy

- Transparent: Open, Inclusive
- Reproducible: Well documented, Methodologically sound
- Credible: Peer reviewed, Validated
Model development project goals

- Produce a **tool** to quantitatively assess current and potential oil spills risks from covered vessels in Washington waters

- Provide a **framework** for future oil spill risk analyses
Modeling Approach

- **Vessel Movement Module**: Vessels move in the system according to their empirical distribution.

- **Encounter Module**: Measures and evaluates relationship of each vessel to the shore and other vessels.

- **Accident Module**: Evaluates situations for their potential to lead to accidents.

- **Oil Outflow Module**: Estimates the size of oil spills that result from accidents.
A step by step approach to building modules

- **Introduction**: June – August 2020
- **Model Development**: September 2020 – May 2021
- **Model Validation**: June – January 2022

- **Vessel Movement Module**
- **Vessel Encounter Module**
- **Vessel Accident Module**
- **Oil Outflow Module**
Module Component Summaries

- Written description of selected components
- Feedback requested

Technical Input and Discussion Sessions

- Open format discussion sessions
- Solicit input from experts on our planned approach to specific module components
Vessel Movement Module

Purpose:

- Simulate vessel activity and potential changes in traffic volume with AIS driven model
Vessel Movement Module: Components

- Geographic Area
- AIS Messages
- Track Identification
- Route Identification
Geographic Area

Includes entirety of VTS Traffic Separation Scheme

Bounded to the North above Nanaimo

Bounded to the West just offshore of the traffic lanes
AIS Messages

Series of sequential messages sent every 2-10 seconds for underway vessels

Contains information on vessels
- Name
- Dimensions
- AIS Vessel Type
- Speed
- Latitude/Longitude
Track Identification

Vessels can take any number of different paths between an origin and destination.

A track is a series of sequential points.

With a start and end based on our track creation algorithm.
Route Identification

Many vessels share common origins and destinations

Each has a unique track

A route = a collection of tracks with the same origin and destination
Route Identification

The tracks within a route can be distributed based on factors like vessel type.
Vessel Movement Module: Components

- Geographic Area
- Track Selection Factors
- AIS Messages
- External Rules
- Track Identification
- Dependent Vessels
- Route Identification
- Non-AIS Vessels
Track Selection Factors: Vessel Type

Need to classify vessels by type:

- Vessel type information provided by AIS is not specific enough to meet our needs
- For instance, vessels with the AIS type of “cargo” may range in size from a deep draft container ship to an interisland landing craft
Track Selection Factors: Others

Need to identify other potential factors in track selection:

• A list of potential factors
• Statistical hypothesis testing to determine influence on track selection
Upcoming events

October 21\textsuperscript{st}, 2020 -- 1 pm to 3 pm
- Technical Discussion Session: Factors associated with track selection

October 27\textsuperscript{th}, 2020 -- 1 pm to 3 pm
- Technical Discussion Session: Rules that may effect vessel movements in the Salish Sea

October 29\textsuperscript{th}, 2020 -- 1 pm to 3 pm
- Technical Discussion Session: Movements associated with the movements of other vessels
Upcoming events

November 4th, 2020 -- 1 pm to 3 pm
- Technical Discussion Session: Modeling vessels that do not transmit (AIS) data

November 19th, 2020 -- 1 pm to 3 pm
- Vessel Movement Module: Outstanding Topics and Follow Up
Contact Info

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https://ecology.wa.gov/Spills-Cleanup/Spills/Oil-spill-
prevention/Safety-of-Oil-Transportation-Act/Risk-model