THE GLOSTEN ASSOCIATES
Consulting Engineers Serving the Marine Community

COOK INLET RISK ASSESSMENT: PROJECT MEMORANDUM

Task 7.2 Reduced Risk of Oil Spill with a Cross Inlet Pipeline

TO: Nuka Research: Sierra Fletcher, Tim Robertson

DATE: 13 September 2013

FILE NO. 11054.03.0020

FROM: Eleanor Kirtley

References

1. *Cook Inlet Maritime Risk Assessment Spill Baseline and Accident Causality Study*, Rev. -, 29 June 2012.
2. *Cook Inlet Vessel Traffic Study Report to Cook Inlet Risk Assessment Advisory Panel*, January 2012.
3. Cook Inlet Risk Assessment Advisory Panel Meeting for Task 6, 22 February 2013.
4. Email and phone call from Dave Eley, Cape International, Inc., 11 September 2013.

Summary

This memorandum assesses the reduction in oil spill risk with the addition of a subsea pipeline between Drift River and Nikiski. The pipeline would displace 38 one-way crude carrier transits across the inlet per year, or about 3 per month. There would be 35.1 less traffic-days in the system per year. The spill rate for tankers is 0.0030 spills per traffic-day. There would be an estimated 0.105 less spills per year without the crude carrier traffic displaced by the addition of the subsea pipeline.

This memo follows the assumptions and formulations as applied in the *Cook Inlet Risk Assessment* (CIRA) *Task 4 Spill Baseline and Accident Causality Study* to formulate the number of spills, and the following presents an estimated distribution of spills sizes for a double hulled crude carrier (Reference 1). The reduced spill volume with the addition of a subsea pipeline is not forecast. The purpose of this memorandum is to provide input to a benefit cost analysis to be performed by Northern Economics.

Background

The Cook Inlet Risk Assessment (CIRA) launched in 2011 to address the risk of oil spills from marine vessels. The Glosten Associates calculated a baseline spill rate and forecasted an annual number of spills in Task 4. Risk reduction options (RROs) were identified in Task 6. The subsea pipeline was selected for further study in Task 7, *Evaluate RROs*. This memorandum studies the reduced risk associated with the pipeline. Baseline or remaining risk is not addressed. The increased risk from the pipeline is studied separately. Both the reduced and increased risk of an oil spill from the pipeline are input to a benefit cost analysis for the RRO.

Reduced Number of Spills

Inputs

Traffic Days

The pipeline would displace 38 one-way crude carrier transits across the inlet between the Drift River Terminal and Nikiski per year. There are 12 roundtrips (24 one-way transits) and 14 one-way transits, annually. Per Reference 2, "The Drift River Terminal supplies crude oil collected from the various Cook Inlet oil production platforms on the west side of the Inlet." The Tesoro facility and refinery and Kenai Pipeline dock are in Nikiski. Both ballast voyages from Nikiski to Drift River and laden voyages from Drift River to Nikiski are included. Both time in transit and time at the dock are included. The sum of transit and docked time represents the total exposure time in the system.

Risk is a function of exposure time. It is counted in the unit of a traffic-day (24 hours). The 38 transits translate to 35.1 traffic-days per year. There are 2.6 less traffic-days in transit and 32.5 less traffic-days at the dock. Annual transits and traffic days were provided by David Eley, Reference 4. Adding in a subsea pipeline removes these 35.1 traffic-days and their associated risk.

Spill Rate

For every traffic-day, there is an associated probability of a spill. This probability is defined by the spill rate. The spill rate is the number of spills per traffic-day. It is calculated from historical spills and traffic during the years 1995 through 2010. The tank ship spill rate groups both product tankers and crude carriers. The spill rate for tank ships is 0.0030 spills per traffic day, per Reference 1, Tables 3 and 4. This tank ship spill rate is applied to estimate the reduced number of spills.

Output

The number of spills is found by multiplying the traffic-days and the spill rate. The baseline number of spills from tank ships forecast for the 2010-2014 time period in the CIRA Task 4 was 0.72 spills per year, Reference 1 Table 3. Adding in a subsea pipeline removes an estimated 35.1 x 0.0030 = 0.105 spills per year.

Spill Volume

Spill volumes for small, medium, large, and worst case discharges are estimated in the event of a spill. Small, medium, and large are defined as the 25^{th}, 50^{th}, and 95^{th} percentile spills. A percentile spill is the spill volume associated with the n^{th} probability. In other words, the volume for the n^{th} percentile is larger than n% of spills. The n^{th} percentile is smaller than 100 – n% of spills. The 25^{th} percentile spill volume is larger than one quarter of spills, and smaller than three quarters of all spills for that vessel type and cause. The 50^{th} percentile spills is the median. Only 1 in 20 spills (5%) is larger than the 95^{th} spill. The estimated spill volume distribution is derived from historical spills.

Spill sizes for a double hulled crude carrier by incident type are presented in Table 1. An impact incident is an allision, collision, or grounding. A non-impact incident includes fire, equipment failure, and operations error. The transfer error incident type includes both cargo transfer and bunker error. These volumes are repeated from the *Task 4 Appendix Cook Inlet Maritime Risk Assessment*, Table A53 (Reference 1). Given that a spill has occurred, Table 1 presents the spill size probability distribution.

Table 1 Spill Volumes from a Double-Hulled Crude Tanker

	Small 25th %ile (gallons)	Moderate 50th %ile (gallons)	Large 95th %ile (gallons)	Worst Case Discharge (gallons)
Impact	500	20,000	15,000,000	28,500,000
Non-Impact	100	2,000	8,000,000	28,500,000
Transfer Error	1	10	2,000	75,000,000