Mid-Scale Tests of *In Situ* Burning in a New Wave Tank at Prudhoe Bay, AK

by

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A series of research burns was carried out in the fall of 1997 in Prudhoe Bay, AK in a new wave tank purpose-built for *in situ* burning studies. These tests were the culmination of a three-year research project by Alaska Clean Seas (ACS) and SL Ross into the effects of oil type, emulsification, temperature and waves on *in situ* burning in Arctic open water conditions. Previous AMOP papers in 1995 and 1996 have described the lab-scale tests.

A custom tank was commissioned for this project. It is of all-steel construction and was designed to be road-transportable. The inside dimensions of the tank are: 12 m long x 2.4 m wide x 2.25 m high. The tank is fitted with a simple, hydraulically-driven wave paddle at one end and passive wave absorbers. With 1.8 m of brackish water taken from Prudhoe Bay in the tank, the wave maker was capable of generating waves with heights of over 45 cm with periods ranging from 1.7 to 3.3 seconds. Smaller waves with shorter wavelengths were also possible. The wave absorbers functioned as designed and almost completely eliminated any reflected waves from the ends of the tank.

The experimental program involved conducting mid-scale (1.7 m diameter) burns with fresh and weathered ANS and Milne Pt. crude oils and emulsion slicks in 0, 15 and 23 cm high waves. Over 60 individual burns were conducted varying slick thickness, water content, wave energy, degree of weathering and oil type. These mid-scale tests in waves provided additional data on the effects of waves on *in situ* burning of fresh, weathered and emulsified slicks and on the scaling of *in situ* burning processes in waves. Most significantly, it was possible to burn 60% water content emulsions of heavily weathered ANS crude in the highest wave conditions tested (23 cm high waves with a length of 4.7 m and a period of 2 seconds) with the addition of emulsion breakers. The 60% water emulsion of the weathered Milne Pt. crude was burnable in these waves without emulsion breaker addition.

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