



January 13, 2009

Gary S. Mauseth  
Polaris Applied Sciences, Inc.  
12525 - 131st Court NE  
Kirkland, WA 98034-7713

**RE: Draft Letter Report - Chemical Fingerprinting of Three Oiled Bird Feather Samples;  
UMAR267, UMAR154, UMAR155.**

Dear Mr. Mauseth,

NewFields Companies, LLC is pleased to provide you with this draft letter report describing the initial results of our chemical fingerprinting analysis of three (3) bird feather samples collected by the US Fish and Wildlife Services and purportedly associated with the Selendang Oil Spill. The final report, which will include **all** supporting data (data tables, chromatograms, plots, QA/QC) will be completed on January 23, 2009.

The bird feather samples were collected on January 30 and 31, 2005 and arrived at Alpha Woods Hole Laboratory (Mansfield, MA) on June 17, 2008. A copy of the chain-of-custody is presented in Attachment 1. The sample information is listed in Table 1, and the analytical results are provided in Attachment 2.

**Table 1. Sample Information**

Sample ID	Lab ID	Matrix	Date Collected
UMAR 154	0806075-01	Feather	1/30/05
UMAR 267	0806075-02	Feather	1/31/05
UMAR 155	0806075-03	Feather	1/30/05

The objective of this study was, to the extent possible, identify the type of product present in the three (3) bird feather samples and compare the field samples to oil samples collected directly from the Selendang Ayu or during fuel loading at port. Field and source oil samples were analyzed for total petroleum hydrocarbons (TPH) and a suite of diagnostic hydrocarbon compounds that provide a chemical picture of the sample (e.g., gas chromatogram), degree of weathering (e.g., evaporation), biodegradation, and genetic source relationships between samples. These diagnostic compounds include alkanes, parent and alkylated polycyclic aromatic hydrocarbons (PAHs), the sulfur containing compounds benzothiophenes, dibenzothiophenes, and naphthobenzothiophenes (thiophenes)<sup>1</sup> and biomarker compounds such as the source diagnostic hopanes and triaromatic steranes<sup>2</sup>.

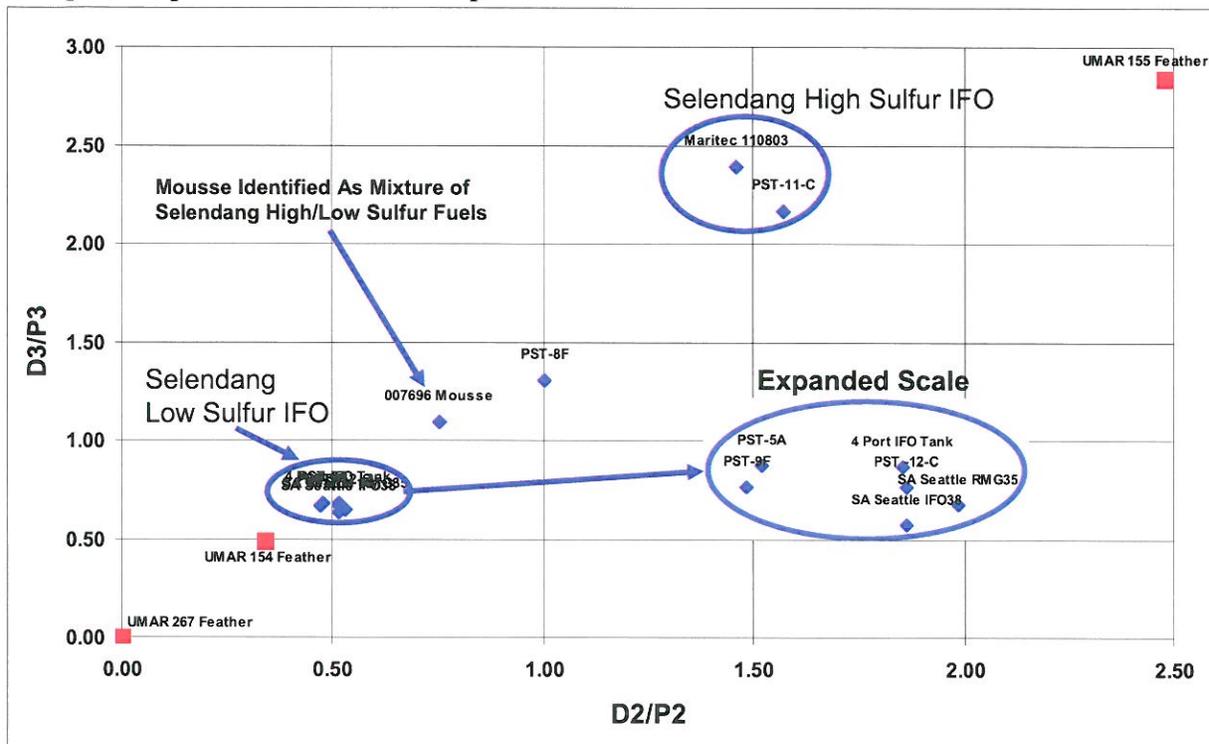
An exhaustive interpretive analysis of the chemical data was performed to determine if the hydrocarbons present on the feathers were derived from the Selendang AYU fuel oils. The chemical signatures (e.g., C2-dibenzothiophene/C2-phenanthrene source ratios<sup>3</sup>, biomarker distributions) of each bird feather sample were compared to each source fuel oil and to a representative range of fuel oil mixtures. The results of these analyses are summarized in the source ratio plot provided in Figure 1.

<sup>1</sup> Wang, Z and Stout, A.S. 2007. Oil Spill Environmental Forensics. Academic Press, Burlington, MA.

<sup>2</sup> Peters, K.E., Moldowan, J.M. 1993. The Biomarker Guide. Prentice-Hall Inc. Englewood Cliffs, NJ, 07632.

<sup>3</sup> Douglas, G.S., Bence, A.E., Prince, R.C., McMillen, S.J. and Butler, E.L. 1996. Environmental stability of selected petroleum hydrocarbon source and weathering ratios. *Environ. Sci. Technology*, 30(7):2332-2339.

**Figure 1. Diagnostic oil source ratio analysis plot of C2-dibenzothiophenes/C2-phenanthrenes versus C3-dibenzothiophenes/C3-phenanthrenes. Blue diamonds represent potential source oils, red squares represent each feather sample.**



Based on our analysis of the chemical fingerprints associated with the feather samples, we conclude the following:

1. Feather sample UMAR 267 contains trace amounts hydrocarbons that are **not** chemically related to the Selendang AYU fuel oils or any possible mixtures of these fuels.
2. Feather sample UMAR 154 is a low sulfur heavy oil that is **not** chemically related to the Selendang AYU fuel oils or any possible mixtures of these fuels.
3. Feather sample UMAR 155 is a high sulfur heavy oil that is **not** chemically related to the Selendang AYU fuel oils or any possible mixtures of these fuels.
4. There is no chemical evidence to indicate the presence of Selendang AYU fuel oil(s) in any of these feather samples.

Please let me know if you have any questions concerning these results. As noted above, the final report will be available by January 23, 2009.

Sincerely,

Gregory S. Douglas, Ph.D.  
Senior Consultant