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April 10, 2015

CERTIFIED MAIL RETURN RECEIPT REQUESTED
7013 2250 0001 8744 0415

Mr. Dan Mahar
NWCAA
1600 South Second Street
Mount Vernon, WA 98273

Dear Mr. Mahar:

Subject: Odor Event Emissions Estimates

Shell Puget Sound Refinery is submitting the emissions estimates found in Attachment 1 as a follow-up to the Excess Emissions Report submitted to your office on March 30, 2015.

Contact Mr. Tim Figgie at 293-1525 if you have any questions related to this information.

Based on information and belief formed after reasonable inquiry, I certify that the statements and information in contained in this letter are true, accurate, and complete.

Sincerely,

SHELL PUGET SOUND REFINERY

Shirley Yap
General Manager

TCF

Cc: Air Toxics Coordinator – Office of Air Quality
US-EPA Region 10
1200 Sixth Ave
Seattle, WA 98101

Attachment 1
Emission Estimation Methodology

Online sulfur instrumentation on the East Flare had been isolated from service to avoid water damage prior to the odor release incident that occurred on February 20, 2015[1]. Therefore, emissions from the flare that occurred during the flare decontamination process were estimated based on available information regarding the composition of components in the flare Knock Out (KO) drum. A process flow dynamic simulation of the flare system from the KO drum to the flare tip was constructed using Unisim simulation software. This simulation utilized the physical characteristics of Puget Sound flare system and process operating information provided by plant personnel and process control instrumentation. The output from the simulation was an estimate of the flow and chemical composition of the gas going to the flare tip.

The chemical composition of the flare gas derived from the dynamic simulation model was then used in a combustion efficiency model cited in peer review comments of the US EPA paper, "Parameters for Properly Designed and Operated Flares" (April 2012)[2].

Combustion efficiencies were calculated on a minute-by-minute basis during the east flare odor event. These minute-by-minute combustion efficiencies where then applied to the dynamic simulation flow and composition estimates to obtain estimates of emissions leaving the flare tip. These data are listed in Table 1 below and are total emissions for the release period from 12:50 PM to 4:18 PM on February 20, 2015.

Table 1

Estimated Emissions

H2S	Methyl mercaptan	Ethyl mercaptan	Propyl mercaptan	Dimethyl sulfide	Benzene	VOC	Methane, ethane, & hydrogen	SO2
lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs
2.3	65.6	16.2	4.4	17.9	0.9	127.7	471.0	114.5

Reportable Quantities for the above compounds, in LBS, per 40 CFR 302.

100	100	N/A	N/A	N/A	10	N/A	N/A	500

[1] The online sulfur instrumentation on the flare line had been isolated when steam was added to the flare line. This was done to protect the instrument from water damage. At the time the sulfur instrumentation was isolated from service, the east flare line had been blocked in from the main flare header and flare gas recovery so that no process flow could reach the east flare.

[2] The combustion efficiency expression suggested by Reviewer B of this paper was utilized to estimate combustion efficiency.