Impacts of oil spills on air quality, June 8, 2020.

Follow-up Answers to Questions Not Addressed During Webinar

Audience Questions	**Panelist Answers**
What are best practices for converting technical information into actionable and intuitive information for responders and the impacted public?	Best practices for disseminating technical information is through opportunities such as this webinar series to reach as wide of an audience as possible. We continually look for technical seminars and other engagements (live or virtual) to update decision makers, first responders, and the public on our findings.
Multiple questions asked about the impacts to animals…	Each burn team has a spotter to watch for marine life. *In situ* burns ignite the oil vapor on top of the floating oil slick. We regularly measure water temperatures below the burning oil slick and only the top inch to two of water are heated during the burning process. Burning the oil quickly removes volatiles that could be harmful to humans and wildlife.
Could you consider burn oil as one Oil Spill Response Solution?	The bulk of my research focuses on *in situ* burning (ISB), so I'm a bit biased. ISB is one of several oil spill response techniques in addition to mechanical recovery and chemical dispersants. It really came into its own as a technique during the DWH response; however, every oil spill presents different issues and requires different strategies. During the *Exxon Valdez* response, a successful burn test was conducted, but the weather conditions deteriorated to the point that burning the oil was no longer an option. ISB is not currently conducted near population centers, but it is a proven response for oiled marsh environments as it protects the roots of the marsh plants and only the vegetation above the water line is impacted. It is also one of the best options for spill removal in the Arctic. Fire booms are quite expensive, but we are working on herding agents to naturally thicken the oil slicks so booming would not be required.
How do you determine if burn efficiency is satisfactory?	One needs to look at each specific burn to determine if the burn was efficient. If the burn protected an area of senstitive habitat, I would determine it was satisfactory. One of the positive things about the technique of in situ burning is how rapidly it works in removing large volumes of the oil from the marine environment. We calculate how much residual oil remains after the burn compared with the estimated starting volume to determine burn efficiency. Any burns that removed 85% of the oil are considered efficient. We are working on techniques and technologies to increase burn efficiencies.
How about the rate of sedimentation when you burn the oil? Increase or not?	Sedimentation is one of many weathering processes of oil. I am not aware of any research on the rate of sedimentation with respect to *in situ* burning, but would suspect that if the oil was left untreated on the surface of the water, the rate of sedimentation would increase versus an *in situ* burn. Burning the oil rapidly (minutes) removes it from the surface of the water. If 90-98% of the oil is removed, there is very little burn residue, and best practices are to physically remove any residues available for natural sedimentation.

Are there oceanographic conditions that support fire whirls? Or is it an atmospheric/wind-driven structure?	Excellent question. There is no scientific literature on this topic, but I suspect that yes, there are indeed oceanographic conditions that support fire whirls. My research is focusing on physical means to encourage fire whirls on water such as boom configurations and ignition patterns. (The fire service uses similar techniques for prescribed burns.)
Then fire increases the emulsion processes ?	I research both the emulsification processes and in situ burning, and no, *in situ* burning does not create emulsions. In fact, the heat from the fire breaks the emulsions. The water in the emulsion must first boil off before the oil can be burned, but my research indicates that this water might actually increase burn efficiency. As the water boils off, it helps atomize the oil droplets making them available for combustion. We are actively studying this phenomenon.
My study site is the Salish Sea, between Vancouver Island and the NW Washington and Western Canada coasts. Would burning oil for a large spill be an appropriate response for locations that is adjacent to high-density populations? Are the particulates from burning a better choice than evaporative components?	When oil spills on water, the wind tends to separate the oil into many separate oil slicks. Currently, *in situ* burning (ISB) is not conducted within three miles of population centers. However, some of the technologies such as the Flame Refluxer and the BSEE Burner greatly reduce emissions, so ISB could be an oil spill response tool in certain situations. The particulates do fallout relatively close to the plume and air monitoring downwind of the plume is always conducted to protect the health of first responders and populations.