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TITLE

Swift Water Oil Spill Response Guidance

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ABSTRACT

Swift water oil spill response (SWSR) has many different aspects that present more of a challenge than slow moving or static water oil spills. The American Petroleum Institute (API)/Association of Oil Pipelines (AOPL) Emergency Response Work Group's inland SWSR Guide will be a compilation of industry best practices describing initial spill response management and operational tactics in these uniquely challenging conditions. This paper will summarize the API Guide which focuses on the highest priorities of spill response including people, environment, and assets. The intended audience for this paper are responders that have baseline spill response knowledge. Operations managers will be able to use the API Guide to develop timely Incident Command System (ICS) 201 briefs, organizational structures, and Incident Action Plan (IAP) operational work assignments. Safety of responders will be emphasized, particularly site safety, and personal protective equipment (PPE). Site safety and job specific hazard identification best practices will inform responders, managers, and Incident Commanders of the important aspects of overall safety management. Site evaluation topics will cover the following areas: access, staging area, boat launches, shoreline composition, and wildlife considerations. Response strategies involving equipment for containment and recovery will be described for effective SWSR. Additional factors that must be considered include riverbed composition, current velocity, flow pattern, water depth, water course width, and obstructions. There is a limited amount of literature on the unique response techniques of SWSR developed by industry groups or governmental agencies.

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INTRODUCTION

The American Petroleum Institute (API)/Association of Oil Pipelines (AOPL) Emergency Response Work Group identified the need to create an Inland Swift Water Spill Response (SWSR) Guide as a major priority in 2019. Oil spill response tactics have made significant improvements over the last 30 years in both the coastal and inland areas. One area of spill response with limited collaborative industry association guidance is on Inland SWSR. Several publications by the U. S. Coast Guard Research and Develop Center (RDC) noted the gap on Inland SWSR guidance. According to Drieu and Hanson (2003), "Very little has been done to improve oil spill response in this environment." The RDC is one of the primary governmental agencies that leads and conducts oil spill response research. It is responsible for evaluating equipment and tactics for U. S. Coast Guard mission areas, including environmental response (Research and Development Center, 2020). For example, in 2018 the RDC conducted testing of an underwater barrier system to mitigate impacts for sunken oil in Lake Huron (Research and Development Center, 2018).

Several individual SWSR guides have been developed by a couple of companies. Robert Ballesteros from Chevron and Elise Decola of Nuka Research presented a poster at the International Oil Spill Conference in 2017 entitled, "Raising Responder Competency in Oil Spill Response" (Ballesteros and Decola, 2017). The Chevron Guide provides recommendations for spill response tactics and manning levels in a SWSR scenario (Ballesteros and Decola, 2017). Additionally, Mark Cook, from Alyeska Pipeline Service Company, presented a paper at the 2014 International Oil Spill conference entitled, "Advance Fast Water Spill Response Tactics," (Cook, 2014). The Trans Alaska Pipeline operated by Alyeska covers some of the most remote areas of the United States and has one of the highest fast water environments seasonally (Cook, 2014). Helicopters are used to move swift water response equipment to improve response times (Cook, 2014). One of the main differences between response in water moving above one knot and water moving less than one knot, is that the placement of response resources is critical (Cook, 2014). Diversion booming in faster water to slower moving water is another important technique in swift water response (Cook, 2014). The Trans Alaska Pipeline Spill Response Guide focused a great deal on remote area spill response resource deployment.

The API/AOPL Emergency Response Work Group wanted to provide the industry a collaborative SWSR guide that was concise and focused on overall swift water tactics that covered most of the United States. The Work Group wanted to create a guide that was vetted through a majority of inland pipeline companies. SWSR is extremely challenging and has increased responder safety risks compared to spills that are less than 1 knot. Swift water response challenges include dynamic maneuvering aspects for spill response boats and containment boom deployment (Coe, 1999). Additionally, rapid deployment of spill resources in a swift water response is critical in protecting sensitive areas (Coe, 1999). The API/AOPL Emergency Response Work Group's primary goal was to create a SWSR Guide that was usable for contractors or supervisors from pipeline companies deploying spill response equipment in the field.

The API/AOPL Emergency Response Work Group focused on tactical issues relating to responding to oil spills, along with cross company learning and good practice sharing among peers in the response community. The Work Group is composed of most of the United States pipeline companies whose members meet face to face quarterly. The API/AOPL Emergency Response Group falls under the Oil Spill and Emergency Preparedness and Response (OSEPR) Subcommittee, while the OSEPR falls under the API Midstream Committee. The API

Midstream Committee idfentifies opportunities for technical research to address issues related to the development of U.S. operational procedures, and safety, health and environmental performance. This paper is a summary of the methods, results, and conclusions of the API Inland SWSR Guide.

METHODS

The API/AOPL Emergency Response Work Group reviewed numerous prioties to focus on in 2019. A collaborative decision was made that developing an Inland SWSR Guide was one of the Work Group's highest priorities. The Chair of the API/AOPL Emergency Response Work Group chose two members to lead the research efforts in developing the initial draft of the Inland SWSR Guide. The API Midstream and Industry Operations Policy Advisor assigned to support API/AOPL Emergency Response Work Group assisted the paper authors in researching a broad range of information to develop the initial Inland SWSR Guide draft. A listing of the references utilized in developing the guide are shown in the Bibliography. The draft guide was sent out for review before the second quarter API/AOPL Emergency Response Work Group's two day meeting. During this meeting, the Group determined its primary focus would center on experienced response operations.

Three core principles identified for the Inland SWSR Guide include people, environment, and safety. Safety of pipeline operators and Oil Spill Removal Organization (OSRO) personnel became the overall theme of the Inland SWSR Guide. As a result, consise illustrations were incorporated throughout the Guide to help responders understand the tactics described in the Inland SWSR Guide. The Work Group's decision to focus the Inland SWSR Guide beyond basic spill response topics, allowed for the development of a concise document that could be used in the field. The API/AOPL Emergency Response Work Group members went through several interations of reviews. Edits and recommendations from work group members occurred between and during the last two quarterly meetings for 2019. The Inland SWSR Guide was then circulated through the API publishing team towards completion. The API Technical Report, First Edition, was published in October 2019.

RESULTS/DISCUSSION

The Inland SWSR Guide was completed in the first quarter of 2020 by the API publishing team. The first core priority term of the Guide was focused on people. Safety of response personnel and the public is the first priority for the Inland SWSR Guide. The second priority of focus is on protection of the environment,. The third priority of focus was on assets, including minizming damage to structures and equipment. These three core priorities were articulated into different sections of the Inland SWSR Guide. The three priorities were broken down into specific sections from arriving on site to actually completely an inland SWSR containment tactic. The six overall sections of the Inland SWSR Guide are safety, site evaluation, watercourse characteristics, response equipment, anchoring, and containtment tactics.

The first section of the Guide provides information on safety equipment, personal protective equipment, site safety, and job specific hazard identifiaction. Personal protective equipment (PPE) choices are described and broken down by Boat Captain/Crew, Shoreline Crew, and Standard Crew. PPE was chosen as the first element of Safety because you cannot be part of any effective inland SWSR without PPE. PPE descriptions in the Guide include fire retardant coveralls, boots, gloves, hard hats, eye and hearing protection, life jackets, waders, etc. The importance of developing a response specific Health and Safety Plan (HASP) is emphasized to identify any other unique PPE to the inland SWSR opertation. After the appropriate PPE is determined for inland SWSR operations, site safety needs to be the next priority. Site safety predeployment/tailgate meetings are emphasized as a fundamental process in inland SWSR where superviosrs communicate operational tactics.

Site evaluation is the next section of the Inland SWSR Guide and includes evaluation of access, staging area, work area, boat launch, site vegatiation, and shoreline composition. This task should include engagement with key stakeholders whenever possible. Accessing shorelines can be a very challenging undertaking. The Inland SWSR Guide recommends a Net Environmental Benefit Analysis (NEBA) be conducted to determine the best path for equipment setup during a SWSR deployment. Low impact techniques should always be considered whenever possible such as matts and pallets. Next, the identification of a good staging area is critical towards a successful inland SWSR response. The optimal staging area will be able to function effectively based on the anticipated scope of the response, infrasture to protect equipment, and traffic flow plan. The work area should focus on containment and collection, access and mechanical recovery, utilization of shoreline protection, storage capacity, all while minimizing the impact to the environment. Boat launching tips in the Guide include pre-identification of launch areas, documentation existing conditions, and avoidance of introducing invasive species. An understanding of site vegetation can be very helpful in determining anchor points in deploying equipment. The overall shoreline composition can have an impact on water flow and turbidity. For example, if you have bedrock shorelines your water flow will typically be much higher, whereas, if you have a mud/clay bank, the turbidity levels will be much higher. Good site evaluation is linked to good outcomes for inland SWSR.

The third section of the Guide deals with watercourse characteristics, which is an extremely important feature for effective inland SWSR. The key watercourse characteristics include current velocity, riverbed composition, flow pattern, water depth, water course width, and obstructions. The current velocity can determine changing conditions for sand bars, shoals, rapids, pools, etc. that impact effective inland SWSR. The riverbed composition can be made of many different substrates that include bedrock, boulders, cobble, gravel, and mud. The substrate type can impact different travel pathways for oil. Awareness of the flow pattern is critical because it can vary depending on the time of year. Another factor to be aware of is that obstructions, for example, dead heads in a swift water environment can impact containment and recovery. They can also be a major safety hazard for boat operators and crew members handling response equipment on the water. The next step after reviewing watercourse characteristics for inland SWSR is to look at response equipment.

The fourth section of the Guide relates to response equipment, which is crucial important for inland SWSR. The Guide classifies equipment into two groups: containment and recovery. Containment boom optimal skirt size is 3-6" to prevent entrainment. The addition of boom deflectors can increase the efficiency of the containment boom. Recovery equipment includes skimmers, such as Circus, Drum, and Pedco types.

Anchoring, the fifth section of the Guide, is a critical component of inland SWSR and comprises one the largest sections of the Guide. The different types of anchors and what type of substrate is most effective for each is covered for the following anchors: Rake, Sarca, and Danforth. Shore anchoring involves setting up T-posts in a daisy chain and triangle formation as an alternative to instream anchoring. Instream anchoring recommendations include the tandem anchor system that can have multiple anchors and different types of anchors to ensure boom deployment success. These different types of response equipment must be deployed using industry proven containment tactics.

Containment tactics is the sixth section of the Inland SWSR Guide is divided into three parts: boom angles, hand lines, and implement strategies. Boom angle setup will make or break the ability to contain oil. Setting boom angles at less than 30 degrees is very important for inland SWSR response to prevent anchor drag. These boom angles are more difficult to set in the SWSR environment due to fast moving water. Boom angles less than 30 degrees are required for higher water flow due to more force on the boom anchor set. Hand lines are an effective containment tactic to assist in the deployment of response equipment as they offer a mechanical advantage and can decrease the number of responders needed to set different containment systems. Several implementation strategies are recommended, including the closed chevron, shore to shore, cascading, and trolley line. The closed chevron should be utilized in moderate to strong currents with the oil on the surface. Shore to shore containment is an option for medium to small water flow. Cascading and diversionary boom is also recommended for medium to small water flow with oil on the surface. Lastly, the trolley line system is covered in the Guide for environments where bank to bank deployment is not feasible.

The Inland SWSR Guide sections provide high level descriptions of the most important aspects of this challenging spill response environment. The setup of the Guide leads a responder through the steps of responding to a SWSR starting with prioritizing safety, followed by site evaluation, watercourse characteristics, response equipment, anchoring, and containtment tactics. A glossary in the last section of the Guide to ensure responders can obtain additional information on inland SWSR terms. The API/AOPL Emergency Response Work Group hopes this API Techinical Report will add to the existing literature for inland SWSR.

CONCLUSION

The API/AOPL Emergency Response Work Group determined a gap existed for inland SWSR. As a result, the Group assembled and reviewed research in 2019 and collaboratively developed this Inland SWSR Guide. The major topics covered in the Guide include safety, site evaluation, watercourse characteristics, response equipment, anchoring, and containment tactics. It is important to note that there is no "cookie cutter" approach to inland SWSR. The purpose of this Guide is to provide a set of tools for responders to utlilize in intial spill response management and operational tactics.

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