A Bayesian Network Risk Model for Oil Spill Response Effectiveness in the Canadian Arctic (OSRECA)

by

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Submitted in partial fulfilment of the requirements
for the degree of Master of Applied Science

at

Dalhousie University
Halifax, Nova Scotia
December 2022

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Summary

Throughout the years, there has been an increase in various marine-related activities in the Arctic due to globalization. These include shipping activities, tourism, fisheries, research, mining, and offshore oil drilling. Such actions can lead to potential oil spills, the risk of which has been an increasing concern. Focusing on potential oil spills from shipping activities alone can have serious negative consequences on marine ecosystems, lead to critical economic costs, and have widespread socio-economic, cultural, and health impacts.

Even though several oil spill response effectiveness models have been previously proposed, no model has been developed for assessing the response effectiveness of the various response types, for strategic preparedness and response planning in the Canadian Arctic. This thesis aims to generate a Bayesian Network model for oil spill response processes, to provide insights in how effective a selected response type can respond to an oil spill, accounting for selected contextual conditions. After applying an iterative approach to develop the model, several oil spill scenarios are applied in the model to provide insights in the response effectiveness.

Determining the efficiency of oil spill responses can help mitigate some of the negative consequences, by providing information for strategic planning of response resources. To do this, a model needs to be created as an analysis support where different spill types, clean-up technologies, human and environmental conditions are considered. By creating a model, insights can be obtained in how the system performs under a range of conditions, considering the relationships which bring about this behaviour. As is common in risk analysis contexts, the developed model and the evidence on which it builds involves various uncertainties. This is due in part to the complexity of the response system, and because of the lack of strong knowledge about various aspects of the system performance. Variables involving significant uncertainties include the oil spill location, oil spill incidents, and oil spill size.

A Bayesian Network Model is used to aid in understanding the effectiveness of oil spill responses for various scenarios in the Canadian Arctic. While the proposed model can be used as a basis for exploring response effectiveness, adequate attention to the strength of evidence on which the model is built is required. Hence, a strength of evidence, sensitivity

analysis, and criticality matrix supplements the risk model, to provide information on the sensitivity of the effectiveness of the sub-models and the evidence on which the model is based.

Section 1: Introduction

1.1 Oil spills and Arctic Region

Countries around the globe have in recent years and decades developed an increasing interest in the world's Arctic regions. Due to its abundance of various natural resources, including oil, gas, and mineral resources, and the fact that it is becoming more accessible because of the reducing ice extent caused by climate change (Barnhart et al., 2014), the Arctic is slowly gaining focus as an area for maritime transportation (Johannsdottir & Cook, 2019). Due to this, human-related movements around the Arctic have increased. While most of the traffic in the area is based on destination (Brooks & Frost, 2012), there has been an increase in shipping activity, particularly in the cruise industry. Despite legal and economic uncertainties, there is growing interest as well using Arctic shipping routes for transit traffic from Asian to European markets along the Northern Sea Route (Beveridge et al., 2016) with similar possibilities existing in the Canadian Arctic (D. Lu et al., 2014). Increases in maritime traffic activity in the Arctic poses various risks to marine ecosystems and coastal communities, e.g. due to the impacts of noise to marine mammals (Halliday et al., 2017) and the various severe consequences stemming from possible oil spills (Afenyo et al., 2019). Figure 1 shows a ship going through Arctic waters, which likely will become a more common sight in the years and decades to come.

Figure 1 Image of a ship going through the Arctic waters(Arctic Corridors Research, n.d.)

The prospects of increased shipping operations in the Arctic leads to heightened concerns about oil spills (Afenyo et al., 2021). Major accidents have raised global awareness of an oil spill's risk, the environmental impacts, and its impact on socio-economic and cultural human activities (Cabrera Aguilera et al., 2016). In open waters, many activities could potentially lead to oil spill disasters. Such activities include shipping due to research, mining, tourism, fisheries, and offshore oil production. Oil spills can be located worldwide, cause a wide range of economic impacts such as fisheries or tourism industries (Roudneshin & Azadeh, 2019).

During the occurrence of an oil spill around the Canadian Arctic, emergency responders will select effective oil spill responses and combatting equipment to minimize potential oil damages. When looking at oil spill incident conditions in ice-infested waters alone, one must consider the different ice circumstances found. The Environmental Response program is the current operation arm of the Government of Canada(Government of Canada, 2021). Within the program, the Canadian Coast Guard is responsible for ensuring an appropriate response to shipping, facilities, or other pollutions incidents in Canadian waters. In addition, they will act as 'Incident Commander' and always respond to a sudden oil spill (Government of Canada, 2021). As part of the National Marine Oil Spill Preparedness and Response Regime, the Canadian Coast Guard provide a national preparedness capacity and ensure a response to marine pollution incidents.

With oil transportation worldwide growing, many communities are at risk of oil spill disasters and must anticipate and prepare for them (Chang et al., 2014). The Canadian Arctic is an area with several communities at risk. Figure 2 showcases the area within the Canadian Arctic which will be considered in the remainder of this thesis.

Figure 2 Map of Canadian Arctic Area provided by the Canadian Coast Guard (Government of Canada, 2021)

Oil, when spilled into Arctic waters, will immediately begin to spread and disperse. How it spreads depends on the type of oil and the wind, waves, temperature, currents, and other aspects of the marine environment (Prevention & Response (EPPR), 2017). These conditions can significantly affect the selection of response options and their effectiveness (Hu et al., 2020). Figure 3 showcases an example of an oil spill in an Arctic environment.

Figure 3 An example of an oil spill leak within the Arctic Circle; based on the Norilsk oil spill disaster ("Arctic Circle Oil Spill Prompts Putin to Declare State of Emergency," 2020)

It is beneficial to investigate and understand previous oil spill events to improve response to possible future occurrences. However, there are several problems and challenges related to this. One problem is that limited data is available for previous disasters. However, there are many contextual conditions which affect the effectiveness of available response options, so a limited set of spill cases cannot give comprehensive insights in how well various response perform under a range of conditions. Another challenge is that there is a large variety in oil spill disasters in the sense that oil spills can evolve differently depending on where the oil spill occurs, and in what geographical, ecological, societal, and temporal contexts (Chang et al., 2014). Oil spills are one of the most significant man-made disasters to marine ecosystems, where in general, the longer it takes to clean up the spill, the more severe the negative consequences. Thus, in order to improve marine pollution preparedness and risk management planning, it is important to have a comprehensive understanding of the effectiveness of oil spill response options. Given the limitations of knowledge obtained from particular events, there is a need to have tools and techniques available to enable an assessment of the effectiveness under a range of scenarios.

1.2 Objective

The research objective this thesis aims to do is to develop a Bayesian Network (BN) model of 10 different oil spill response options available for Canadian Arctic environments, focusing on a high-level assessment of the effectiveness of these response types based on relevant contextual conditions. This model is intended for strategic purposes. A Bayesian Network Model is used to aid in the intricacy of oil spill responses by identifying and developing scenarios for planning and seeking to understand vulnerability to potential spill responses. This proposed technique will guide in the analysis of various oil spill response equipment effectiveness. To aid in the model's accuracy and validity, expert's opinions (both from research and/or responders) were inputted to help achieve this.

A Bayesian Network is a knowledge-based modeling technique, which enables the incorporation of various types of evidence in its development and application. It enables explicit consideration of a large set of scenarios in a compact form, while explicitly handling uncertainties (Fenton & Neil, 2018). It is a widely applied technique in risk assessment, and considerable use has been made of it in maritime transportation risk assessment (Kulkarni et al., 2020) and marine ecosystem risk management (Parviainen et al., 2021). Several articles showcase risk effectiveness and responses over a single response type or in selected sea areas that is not the Canadian Arctic (Lehikoinen et al., 2013; Liu & Callies, 2019; L. Lu et al., 2019). However, no Bayesian Network models currently exists for supporting strategic planning in terms of the oil spill response effectiveness in Arctic conditions.

Considering the complexity and context-dependent nature of actual oil spill response operations, it is not intended to be used for operational decision making after an oil spill occurs.

To address the question how effective the various response options are in a Canadian Arctic marine environment, the BN model is first developed. Once the model is available, several oil spill scenarios are applied using the model to give insights in the effectiveness of different response options. The main intended use of such a model is to support strategic marine oil spill preparedness and response risk management, in particular for informing long-term planning and selection of policy and management alternatives, similarly as in the framework by Laine et al.(Laine et al., 2021).

Determining the effectiveness of oil spill response options will help mitigate some of the negative consequences of marine oil spills. To achieve this, a model needs to be created as analysis support where different types of spilled oil, clean-up technologies, and human and environmental conditions are considered and systematically linked. A model is an abstraction of a real system, which can bring insights in the performance of the a system under certain conditions, accounting for the variables and relationships that bring about this behaviour. Developing a model for emergency response planning for oil spill incidents involves significant complexity and uncertainty as various variables and their interrelationships need to be considered, for which there often is limited empirical data available. A Bayesian Network model will be used to aid in the intricacy of oil spill responses by identifying and developing scenarios for planning and seeking to understand the effectiveness of potential spill response options.

The remainder of this thesis is organized as follows: Section 2: Background on oil spill combatting process describes an overview of the oil spill combatting process, distinguishing different available response options. Section 3: Literature review is dedicated to the literature review, focus especially on earlier proposed risk models for maritime oil spills and on models for assessing the effectiveness of response operations. Section 4: Methods and materials presents the development process applied to create the Bayesian Network model for oil spill response effectiveness in Canadian Arctic marine environments. Subsequently, Section 5: Model Application & Results shows the developed Bayesian Network model, while Section 6 introduces the evidence underlying this model, and, in line with state-of-the-art risk perspectives, its associated strength.

Section 2: Background on oil spill combatting process

Transport Canada is the lead federal regulatory agency responsible for the Canadian marine oil spill preparedness and response regime (2019). It sets the guidelines and regulatory structure for the preparedness and response to marine oil spills. The Canadian Coast Guard provides a national preparedness capacity and ensures an appropriate response to marine pollution incidents. In addition, the Canadian Coast Guard maintains a response capability to respond when the polluter is unknown, unwilling, or unable to respond.

Currently, the primary and accepted type of response being used in the Canadian Arctic is mechanical recovery (North Slope Spill Response, 2015). It is typically the first choice, as the other two response methods, in-situ and dispersant applicant, are currently illegal or are challenging to attain approval for, causing delay in time-sensitive spill response situations. However, setting aside regulatory approval challenges, when considering the physical conditions surrounding a spill, such as weather and sea conditions, oil thickness, ice conditions, oil spill location, available resources and storage, other oil spill response types such as in-situ burning or deployment of chemical dispersants can be just as, if not more effective than mechanical recovery (North Slope Spill Response, 2015). Only when one can confirm that the benefits outweigh the drawbacks can a particular oil spill combatting process be selected. Therefore, to understand how one different response type could be more beneficial than another, which closely relates to the aim of the thesis to assess the effectiveness of particular response techniques, it is beneficial to have a basic understanding of the three oil-spill response types, along with knowledge about the advantages and disadvantages of using them.

2.1 Mechanical Recovery Response

Mechanical Recovery is an oil spill response method that retrieves oil from the water surface and eventually disposes of it elsewhere. It is a process that utilizes a skimming device or direct fluids recovered through suction and pumping to a storage system. It usually uses both booms and skimmers (North Slope Spill Response, 2015). Booms function by limiting the spread of oil on the sea surface and by concentrating it to facilitate recovery. Skimmers work by removing oil from the water surface and are used as an active device for oil recovery (Wadsworth, 2015). Figure 4 shows an image of a boom being deployed between two vessels to contain heavy crude oil. Figure 5 presents an image of a small skimmer being used.

Figure 4 An image of a boom being deployed between two vessels (Use of Booms in Oil Pollution Response, 2014)

Figure 5 An image example of a small skimmer being used (Use of Skimmers in Oil Pollution Response, 2014)

Based on information from the Department of Fisheries and Oceans Canada, mechanical recovery is the primary and preferred type of response used in the Canadian Arctic (Fisheries and Oceans Canada, 2020). Effectiveness of mechanical cleaning may be severely restricted by wind or wave conditions, and often is very limited in terms of the recovery in terms of volume of spilled oil. Even commonly used rules of thumb of a 10-30% recovery may be an overestimate, especially for large spills (Etkin & Nedwed, 2021). This then brings the question of whether mechanical recovery will be sufficient. If the answer is "no," the option of using dispersants or in-situ burning will be examined.

Using mechanical recovery equipment can be very challenging as the conditions in the Arctic, such as the effects of wind, waves, and ice conditions are harsher than elsewhere. Waves or ice sheets can cause the containment process to be more difficult and decrease the volume of oil successfully recovered by the skimmers (Prevention & Response (EPPR), 2017). High winds, waves, or icy spray may make it difficult or unsafe to deploy or retrieve equipment from the deck of a vessel (Wadsworth, 2015). Generally, mechanical recovery techniques only recovers a relatively small proportion of the spilled oil ("Research Spotlight," 2020). Sea state, weather conditions and equipment operability can significantly limit the effectiveness of mechanical response. Furthermore, the remoteness of Arctic areas, and the harsh navigational environments (Stoddard et al., 2016), are significant barriers to successful execution of mechanical recovery operations, as bringing the necessary assets to the spill location can be very challenging. Similarly, the operability of vessels in ice conditions can be severely restricted, with especially compressive ice conditions possibly resulting in vessels becoming stuck in ice (L. Lu et al., 2021).

For using mechanical recovery, wind conditions can affect the ability to release and retrieve the equipment such as skimmers and booms, and the ability to store oil (*Arctic Response Technology | Oil Spill Preparedness* |, n.d.; *Use of Booms in Oil Pollution Response*, 2014; *Use of Skimmers in Oil Pollution Response*, 2014; Fisheries and Oceans Canada, 2020; North Slope Spill Response, 2015; Prevention & Response (EPPR), 2017; Wadsworth, 2015). Severe sea states in the Arctic can lead to difficulties for mechanical recovery due to high waves, as it significantly complicates the storage of oil and the release and retrieval of the equipment. Low temperatures can cause parts of equipment to freeze, potentially clogging the equipment and leading to malfunctions. Sea ice coverage conditions can affect the ability to release and retrieve parts of the equipment, where ice may get stuck in the equipment so that this becomes inefficient in the recovery process. However, sea ice can also assist in the oil recovery as it creates a natural barrier to contain the oil as long as the ice does not overwhelm the equipment parts (*Arctic Response Technology | Oil Spill Preparedness* |, n.d.; *Use of Booms in Oil Pollution Response*, 2014; *Use of Skimmers in Oil Pollution Response*, 2014; Fisheries and Oceans Canada, 2020; North Slope Spill Response, 2015; Prevention & Response (EPPR), 2017; Wadsworth, 2015).

In this thesis, four variations of mechanical recovery will be investigated, namely: ‘two vessels with boom’, ‘single vessel with an outrigger’, ‘three vessels of opportunity with boom’, and ‘single vessel in ice’ (Prevention & Response (EPPR), 2017). The principles of these mechanical response types are briefly considered next.

2.1.1 Mechanical Recovery Response Variation: two vessels with boom

The ‘two vessels with boom’ system works by using two distinct vessels (Prevention & Response (EPPR), 2017). One vessel is used to deploy the skimmer and supports one side of the containment boom. The second vessel is a much smaller vessel that is responsible for towing the other end of the boom. This system intends to contain and recover oil in an offshore environment but can also be used in areas near shore when the water is sufficiently deep. It is mainly intended to be used in areas with open-water conditions or very open-pack ice.

2.1.2 Mechanical Recovery Response Variation: single vessel with an outrigger

The ‘single vessel with an outrigger’ system works by depending on one large vessel to support the skimmer system, the storage unit(s), and one end of the containment boom. An outrigger would then be attached to the vessel that supports the boom (Prevention & Response (EPPR), 2017). This system intends to contain and recover oil in an offshore environment but can also be used in areas near shore when the water is sufficiently deep. It is mainly intended to be used in areas with very open-pack ice.

2.1.3 Mechanical Recovery Response Variation: three vessels-of-opportunity with boom

The ‘three vessels-of-opportunity with boom’ system uses three vessels of opportunity, with one vessel deploying the skimmer and other related storage devices. In contrast, the other two vessels are responsible for moving on either end of the active booming system (Prevention & Response (EPPR), 2017). Vessels of opportunity are defined as vessels that can be used for fishing or commercial transportation activities and is not usually dedicated to oil spill response. This system is mainly intended to contain and recover oil in a nearshore environment with open water conditions. It is considered applicable mainly for conditions with no ice, or contexts with low ice concentrations of pack ice.

2.1.4 Mechanical Recovery Response Variation: single vessel in ice

The ‘single vessel in ice’ system is unique since it does not use a containment boom and is intended to contain and recover oil spilled in the ocean by utilizing the high concentrations of ice in its surroundings. Concentrated sea ice can be defined as close or very-close pack-ice to a compact pack ice (Prevention & Response (EPPR), 2017). Appendix A showcases how close or very-close pack-ice is defined visually. Because it relies on the sea ice on the water surface to contain oil spreading, this system is not helpful in lower ice concentrations. The single vessel in ice system is a highly specialized system requiring a high ice-class vessel, which can be considered highly applicable in certain conditions around the Canadian Arctic.

More information on what the best conditions are when using Mechanical Recovery can be found in Appendix D: Tables Description of Bayesian Network Model's States.

2.2 In-Situ Burning Response

In-situ burning is another oil spill response method that will be included in the model and of which the effectiveness assessed under various conditions. In-situ burning concerns a controlled burn of oil on the water's surface(Prevention & Response (EPPR), 2017), i.e. it refers to the process of burning floating oil at sea, at or close to the site of a spill. This method requires the usage of vessels and booms to accomplish the task of adequately igniting and burning the oil slick. For the burning process to initiate and proceed, the oil must be concentrated, and an ignition source applied. Usually, only a limited amount of oil can be removed through in-situ burning in open sea areas, and residues remain in the marine environment (Fisheries and Oceans Canada, 2020). This technique is usually only considered in offshore areas away from populated coastal areas.

Considering the challenges of in-situ burning in the Arctic, wind conditions can affect the ability to target where to ignite the equipment to the oil, leading to potentially harming the health and safety of the crew with flames from the fire or the inhalation of smoke (*In Situ Burning*, 2019). Sea state or wave conditions can lead to difficulties as high waves can prevent oil containment and complicate the release and retrieval of the equipment. Sea ice coverage can lead to difficulties for using the boom properly, but it also may serve as a positive factor as it can contain the oil naturally, so that no boom is needed. Oil on icy waters can only be burnt if it sufficiently thick and is often difficult to ignite ("Research Spotlight," 2020). Environmental concerns over *in-situ* burning include effects on air emissions quality, and the residues remaining in the marine environment (Fingas, 2011a, p. 21).

Three variations of the in-situ burning response are: 'vessels with fire boom', 'helicopter with ice containment', and 'helicopter with herders'. Figure 6 and Figure 7 showcase images of an in-situ burning response deployed and in progress, respectively.

Figure 6 Image of In-Situ burning response being deployed through a vessel (In Situ Burning, 2019)

Figure 7 Image of In-Situ burning response in progress (In-Situ Burning, 2022)

2.2.1 In-Situ Burning Response Variation: vessels with a fire boom

The ‘vessels with a fire boom’ system intends to remove oil on the surface by containing it properly with booms so that oil can be ignited and burned. This process can be used in both offshore and nearshore environments.

2.2.2 In-Situ Burning Response Variation: helicopter with herders

The ‘helicopter with herders’ system aims to remove oil floating on top by combining it with chemicals to a sufficient thickness, so that it will volatize and burn. The chemical and fluid are brought over the oil slick area from a device flung under a helicopter. This system can also be used in both offshore and nearshore environments.

2.2.3 In-Situ Burning Response Variation: helicopter with ice containment

The system ‘helicopter with ice containment’, oil on the surface that has been naturally contained among floating pack ice is targeted, so that the system will ignite the oil and burn it away. The burning process is initiated by dropping the burning fluid flung under a helicopter. This variation can only be used offshore (Prevention & Response (EPPR), 2017).

More information on what the best conditions are when using In-Situ Burning can be found in Appendix D: Tables Description of Bayesian Network Model’s States.

2.3 Chemical Dispersant Response

Chemical dispersion is the final oil spill response method that will be considered. In general, it disperses oil in the water column and potentially reduces the extent of pollution (Liu & Callies, 2019). Chemicals can be deployed through vessels or aircraft. Chemical dispersants add chemicals to the oil surface or slick to aid in advancing the dispersion process of the oil droplets into the water column (Prevention & Response (EPPR), 2017). The oil is removed from the water surface, but the oil particles are still in the water column. Although removing the oil from the water surface can potentially reduce contamination of especially coastal areas, the window of opportunity for deploying the dispersants to be effective is short, and there are concerns about potential side effects on marine life ("Research Spotlight," 2020). Typically, the window of opportunity for an effective application for dispersant is "within hours to one or two days after an oil spill" (Liu & Callies, 2020). Therefore, this shows the importance of selecting and responding to the oil spills rapidly and effectively.

Dispersants work by breaking up oil slicks into tiny oil droplets that are then mixed into the water column. The benefits of using dispersants can include reducing surface oil and enhancing the natural biodegradation, because of the oil surface being substantially increased. On the other hand, the downsides of using dispersants can include potentially damaging effects on local marine life, such as marine flora and fauna, due to the dispersant being toxic (*ITOPF*, 2014). Therefore, decisions regarding the use of dispersants in the Canadian Arctic involve negotiations among the benefits and drawbacks in the presence of high uncertainty.

Like other types of oil spill responses, the effectiveness of dispersants depends significantly on the oil properties and weather conditions at the oil spill site. Focusing on only chemical dispersion, the chemical properties of the oil spill or the type of oil spill are important as it aids in figuring out whether the oil is dispersible or not (*ITOPF*, n.d.-a; *ITOPF*, 2014; Fingas, 2011b; Liu & Callies, 2019; Olsvik et al., 2012). Once one established that a spilled oil is dispersible, it is important to ensure that sufficient assets are available, including the chemical dispersant itself, as well as equipment and trained personnel for its deployment. The type of dispersant used can also be affected as too strong winds can prevent the sprayed dispersant droplets from reaching the oil (*ITOPF*, n.d.-a; *ITOPF*, 2014; Fingas, 2011b; Liu & Callies, 2019; Olsvik et al., 2012).

To conclude on utilizing chemical dispersants in the Arctic and its challenges, wind conditions can affect the ability to apply a proper amount of dispersants into the oil (*ITOPF*, n.d.-a; *ITOPF*, 2014; Fingas, 2011b; Liu & Callies, 2019; Olsvik et al., 2012). Sea state or water conditions in the Arctic can lead to difficulties if the water is too calm, leading to insufficient mixing between the dispersants and oil, and consequently resulting in an ineffective dispersion. On the other hand, if waves are very high, the oil will disappear as it will disperse naturally and lead to the oil being mixed with the marine ecosystem (*ITOPF*, n.d.-a; *ITOPF*, 2014; Fingas, 2011b; Liu & Callies, 2019; Olsvik et al., 2012). Low temperatures can lead to difficulty in releasing the dispersants, as these may freeze or have increased viscosity. Sea ice coverage conditions can also affect the ability to properly mix the dispersants and oil and lead to an ineffective dispersion since thick sea ice can reduce wave strength and thus mixing.

There are three variations of chemical dispersant response methods: ‘vessel application’, ‘airplane application’, and ‘helicopter application’ (Prevention & Response (EPPR), 2017). Figure 8 and Figure 9 below depict images of chemical dispersant being deployed through a vessel and one being deployed through an aircraft, respectively.

*Figure 8 Image of dispersion being deployed through the vessel (*ITOPF*, 2014)*

*Figure 9 Image of an Air Tractor spraying from an under-wing spray boom onto crude (*ITOPF*, 2014)*

2.3.1 Chemical Dispersant Response Variation: vessel application

The ‘vessel application’ system intends to disperse oil on the surface by dropping a measured dose of dispersants in fine droplets from a vessel and mechanically mixing the oil slick and water column (Prevention & Response (EPPR), 2017). This process can be deployed in both offshore and nearshore environments.

2.3.2 Chemical Dispersant Response Variation: airplane application

With ‘airplane application’, the system intends to disperse oil on the surface by dropping a measured dose of dispersants in fine droplets from a fixed-wing aircraft. This process can also be deployed in both offshore and nearshore environments.

2.3.3 Chemical Dispersant Response Variation: helicopter application

Finally, with ‘helicopter application’, the system intends to disperse oil on the surface by dropping a measured dose of dispersants in fine droplets from a device flung under a helicopter (Prevention & Response (EPPR), 2017). Unlike the other two variations, it can only be deployed in nearshore environments.

More information on what the best conditions are when using Chemical Dispersant can be found in Appendix D: Tables Description of Bayesian Network Model’s States.

2.4 No Response

A typical response option is not responding to an oil spill or letting natural dispersion take its course. Before decision-makers can decide on an effective response among the available options, responders typically consider the option of not deploying any response, even if conditions are favourable for combatting response equipment (Prevention & Response (EPPR) 2017). Reasons can be due to legality issues with using certain response types, such as using specific types of chemical dispersants or waiting for approval for using specific response equipment, with chemicals and in-situ burning posing most challenges due to the need to balance the benefits and drawbacks mentioned earlier. Thus, in some cases, the oil can disperse itself due to the high wave energy and it may be decided that there is no added benefit gained by deploying response types such as in-situ burning or chemical dispersants (Prevention & Response (EPPR), 2017).

For example, if there are high waves, responding by using a mechanical recovery or an in-situ burning will be ineffective, but chemical dispersants could be useful. However, in such cases, responders may find that the wave action is exceedingly strong so that oil may naturally disperse itself, so that they may find no added benefits to spraying chemicals into the environment.

Considering performing no response is technically possible in any situation (although perhaps often not societally desirable), the 'no response' option will not be considered as part of the Bayesian Network development.

Section 3: Literature review

Different types of models are reviewed to help gain insights for modeling oil spill response effectiveness for preparedness and response risk management planning. Oil spill modelling from outside Arctic areas will be looked at as an aid in justifying the selecting Bayesian Network modeling as a technique, to contextualize the thesis in the state of the art oil spill risk modeling literature, and also to serve as a knowledge source for considering what variables to include in the developed model for spill response effectiveness. Areas for which oil spill risk models have been developed include Chinese sea areas, the Mediterranean, and the Baltic Sea. While models developed for other sea areas may serve as a basis for the current work, it is not overlooked that, according to (Johannsdottir & Cook, 2019):

"*a significant oil spill may have more serious consequences in the Arctic than in other parts of the world, given factors such as the fragility of Arctic ecosystems. Furthermore, it is pointed out that oil spills in ice infested waters are harder to deal with than in open water, and that Arctic waters 'might never recover from an environmental catastrophe like the one in the Gulf of Mexico (Stotts, 2010)*'"

Models can be either quantitative, qualitative, or both. The following methods were identified and will be discussed: Contingent Valuation Method, Bowtie method, Cost analysis method, and Bayesian Network. It is noted that across the articles applying different methodologies, there was a general agreement that there is limited data, and that where it is available, it is challenging to use. An example of such a data log is the National Resource Damage Assessment (NRDA) (Afenyo et al., 2019).

The contingent valuation method has been used for calculating the effect of environmental disasters such as oil spills. This method helps inform what users are prepared to value or not to value in a future scenario where impacts are expected to be significant (Afenyo et al., 2019). Contingent valuation is mainly used as a survey-based technique, and questions are mainly hypothetical, for example: *"Respondents are asked to estimate what they would be willing to pay to sustain, improve, maintain, protect, or repair natural and* *environmental resources."* This method can be used to analyze how much an industry loses in money from oil spilling incidents.

An example of this approach is presented by (Richardson & Brugnone, 2018), where a contingent valuation method is used to estimate the potential economic damages of a hypothetical situation of an oil spill of around 2.5 million gallons. The paper presents a passive use loss of around $7 billion resulting from the oil spill damage alone, with an initial estimate of around $3 billion. It is noted that the paper discussed many other negative economic impacts outside of the company, such as a reduction in demand for oyster fishing, dolphins dying due to oil poisoning, and a decline in tourism, but these impacts were not assessed with the contingent valuation method.

Overall, the contingent valuation method brings a strong strength in its flexibility and suitability for environmental assessments or economic impact (Nautiyal & Goel, 2021). This method could be considered as there is not enough recorded data that can be used to generalize the effectiveness of oil spill response activities accurately. Even though this method may be applicable, a prominent weakness is that it relies primarily on expert-based reporting on the losses, and that it ignores many other crucial impacts (Afenyo et al., 2019). Since the method assesses the variables and their impacts exclusively based on a survey questionnaire based on hypothetical scenarios, it may lead to the resulting estimates being subjective and not accurate at all. The method has also been criticized as both expensive and time-consuming (Jones, 2018).

A bowtie method is a primarily qualitative risk analysis method that describes risks through a causal chain from causes to the potential impacts (Subagyo et al., 2021). This method consists of a visual diagram, which links hazards to consequences through a chain of events, which is a logical sequence representing scenarios through which hazards can lead to consequences. Bowtie diagrams focus on events and barriers as control measures which are in place to mitigate the risks. They can also be used as a basis for risk quantification, where uncertainties about hazards, events, and barriers are assessed (Wengang et al., 2016). It is noted that the bowtie diagram's main purpose is to visualize scenarios and communicate risk, while fault and event trees, which are closely linked to bowtie diagrams, are usually used to quantify the risks. Cui Wengang et al.(Wengang et al., 2016) presents an oil spill risk analysis based on a bowtie model, focusing on causes and consequences of the oil spill during the operation of tanker handling operations, which is followed by a fault tree and event tree analysis to quantify the risk. Finally, with the different consequence probabilities estimated, the associated costs of these can be calculated.

A bowtie diagram is usually not enough to be used on its own and needs to be complemented with various other analysis tools, especially when quantitative results are desired. The bowtie method is a powerful graphical representation of the risk assessment process, which can relatively easily be understood by non-specialists or public stakeholders (Helle et al., 2015). Even though this is a strength, as communication of risks related to the effectiveness of oil spill response methods in the Canadian Arctic is important, the weaknesses outweigh the benefits. Apart from the lacking ability to quantify risks, a major drawback is that bowtie diagrams, as well as fault and event trees, can become very large and unwieldy when there are multiple causal variables and scenarios to be considered, which often is the case in complex problems, such as oil spill response operations.

A Bayesian Network model can be considered a good and effective quantitative risk assessment technique for oil spill emergency preparedness planning. Currently, several Bayesian Network models have been developed to assess various aspects of risks of marine oil spills in different sea areas (Parviainen et al., 2021). The technique has also been used to a limited extent for oil spill risk analysis in Arctic environments, for instance to estimate related economic consequences (Afenyo et al., 2020), for coping with ambiguity in an oil spill risk governance context (Parviainen et al., 2019), and for assessing ecological impacts of oil spills (Nevalainen et al., 2018). Bayesian Networks have also been used to assess aspects of oil spill response operations, for instance the costs of cleanup (Montewka et al., 2013), the effectiveness of chemical response in German sea areas (Liu & Callies, 2019), and the effectiveness of mechanical recovery in the Gulf of Finland (Lehikoinen et al., 2013; L. Lu et al., 2020).

More generally, Bayesian Networks are widely seen as good tools for risk analysis and management for oil spill pollution preparedness and response, as these have several attractive features and benefits (Laine et al., 2021; Parviainen et al., 2021). These include the ability to combine different types of knowledge, the explicitly consideration of uncertainties, the usefulness of the visual model component for risk communication, the ability to summarize information about a large set of scenarios in a compact form, and the efficiency of computational techniques to perform the underlying probabilistic calculations.

Goerlandt & Montewka (2015) use Bayesian Network as a basis for developing a framework for risk assessment in maritime transportation systems, illustrated through a case study of ship-sources oil spill risks in the Gulf of Finland. The framework consists of a two-stage risk analysis, where a Bayesian Network is used as part of an uncertainty-based risk perspective, alongside a qualitative evidence assessment, to determine a first estimate of risks. Then, combining a sensitivity analysis with the evidence assessment, critical assumptions and model aspects are identified, which is used along with the results of the first risk estimate to determine a final judgment of the risk. While the application case focuses on oil spills caused by collision accidents, the framework is presented as a generic approach to perform risk analysis using Bayesian Networks.

Lu et al. (2019), building on earlier work by Lehikoinen et al. (Lehikoinen et al., 2013) and making use of the framework by Goerlandt and Montewka (Goerlandt & Montewka, 2015), developed a Bayesian network model for analyzing the effectiveness of mechanical oil spill recovery operations in the ice-covered Northern Baltic Sea area. The model showcased the complexity of oil spill recovery operations, and the highly contextual nature of the effectiveness of these. The model was divided into the following sub-model categories: Oil Spill, Response, Forcing Representative Scenarios, Weathering and Transport, Atmospheric Environment, Sea Ice Environment, and Recovery sub-model. As evidence to construct the model, used was made of directly measured data, synthetic data obtained through model simulation runs, information gathered from published documents, and expert judgments, to parametrize and analyze the qualitative and quantitative parts of the model. The article also provides details how each variable in the model is defined, what evidence it is based on, and how strong the evidence is for that particular model aspect. This information is important as it eventually helps the explicit consideration of uncertainties in risk assessment, which is an important aspect of state-of-the-art risk management approaches, see e.g. Parviainen et al. (Parviainen et al., 2021). Through application of the developed Bayesian Network model for a range of scenarios, the results provided insights into how effective mechanical recovery can be expected to be, and under what conditions. This information is used to obtain insights in the limitations of the response system in Lu et al. (L. Lu et al., 2020), and to create knowledge about what aspects of the response system are critical to improve the overall performance.

In addition to the studies mentioned above, there are several other articles discussing the effectiveness of using Bayesian Network models for assessing and analyzing aspects of oil spill risks and response. For a recent comprehensive overview of oil spill risk assessment for pollution preparedness and response and maritime oil spill risk management, the reader is referred to Parviainen et al. (Parviainen et al., 2021).

Despite the progress made in using Bayesian Networks for oil spill risk assessment, and while the approach has been used to gain insights in response effectiveness in selected sea areas or for specific response operation types, there currently is no comprehensive model for assessing the response effectiveness of the three main different response types, i.e. mechanical, chemical dispersants, and in-situ burning, in the Arctic.

Several articles showcase risk effectiveness and responses over a single response type or in selected sea areas (Lehikoinen et al., 2013; Liu & Callies, 2019; L. Lu et al., 2019). However, no Bayesian Network models currently exists for supporting strategic planning in terms of the oil spill response effectiveness in Arctic conditions. Considering this, the purpose of the current research is to develop such a model for the different possible response operation type, to obtain broad insights in their effectiveness in Canadian Arctic areas. The model is intended to be used for strategic planning purposes as described by Laine et al. (Laine et al., 2021) and Parviainen et al. (Parviainen et al., 2021), i.e. to support planning of what assets could be useful for procurement purposes, considering the conditions in the Canadian Arctic. Hence, considering the complexity and context-dependent nature of actual oil spill response operations, it is not intended to be used for operational decision making after an oil spill occurs. Other decision support systems, such as those described by Fetissov et al. (Fetissov et al., 2021) and Li et al. (Li et al., 2016) are considered more suitable for those purposes

Section 4: Methods and materials

The methodology applied in this thesis to develop the Bayesian Network is summarized in Figure 10. This overall methodology includes the following parts;

1) Defining a risk-theoretical basis associated with the model development and use, rooted in an uncertainty-based risk perspective,

2) Identifying and summarizing background knowledge to identify the variables to be included in the model, their interrelations, and the quantities expressing uncertainties about these for given scenarios,

3) Creating a Bayesian Network model using an iterative model development process, and

4) Performing a strength of evidence assessment of the knowledge underlying the model construction and executing selected validation tests to establish the plausibility of the model.

To identify evidence to develop the model, a literature review is performed, which consists of published journal articles, case studies, and technical information reports. Furthermore, expert judgments are obtained for developing the model contents and structure, and to express the uncertainties through knowledge-based probabilities.

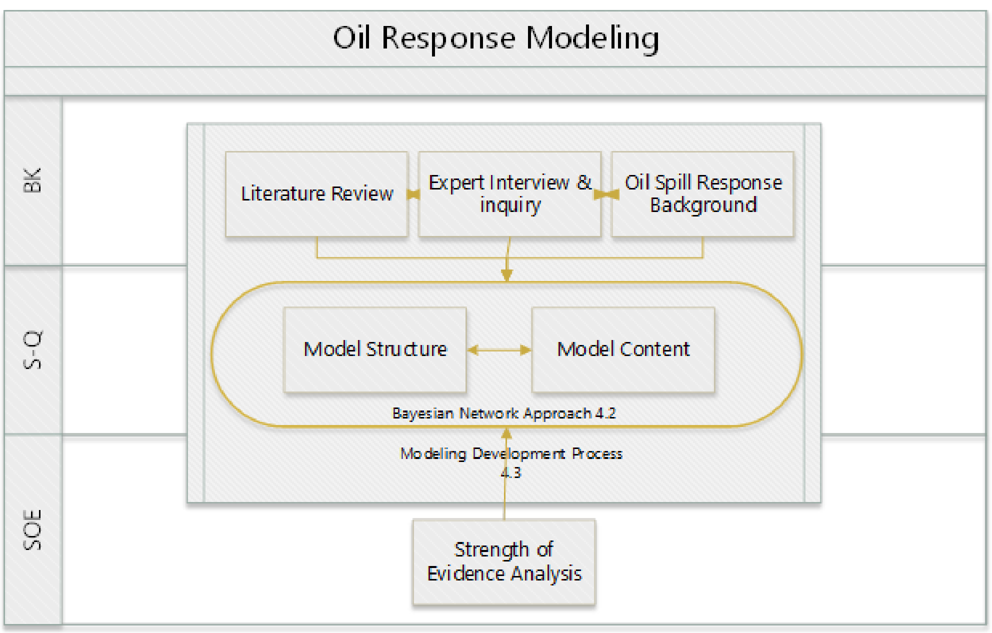

Figure 10 Model Development Process framework

4.1 Risk concept and perspective

Risk describes the uncertainty about and the severity of the events and consequences of activity with respect to something that humans value (Aven et al., n.d.; Fenton & Neil, 2018). Risk analysis can be described as answering the three questions:

1) What can go wrong,

2) How likely is it, and

3) What would be the consequences (Kaplan, 1997).

While the concept of risk has been understood in different ways in academic and professional contexts, recent risk perspectives focus on describing uncertainties about possible outcomes, while also comprehensively addressing the issue of how good the knowledge underlying these uncertainty assessment is (Aven, 2013). This is typically done through a strength-of-evidence assessment (Goerlandt & Reniers, 2016). Further developing ideas initially formalized by Kaplan, established (Kaplan, 1997), the uncertainty-based risk perspective can be described symbolically using following equation (Goerlandt & Reniers, 2018)

$$R \approx (S, Q, SOE|BK)$$

Equation 1

Where S are the scenarios described through causal variables, events and consequences to the considered activity, Q are the uncertainties associated with these scenarios, usually described through knowledge-based probabilities, and SOE represents the strength of evidence assessment. The entire risk description is conditional to the background knowledge BK, which should also be made explicit. Under this risk perspective, a model will depict a chain of events, influenced by certain contextual variables, which stand in complex relationships to one another, and to the consequences these lead to Therefore, for this thesis, the risk is described in terms of scenarios and uncertainties, for which a Bayesian Network model will be used, with in addition a strength of evidence assessment to contextualize how well-grounded the model is and how strongly a decision maker can rely on the various insights obtained from the model. The background knowledge will also be explicitly linked to the various model aspects and the strength of evidence assessment.

4.2 Bayesian Network model theoretical basis

Bayesian Networks have gained significant popularity for modeling environmental-related impacts when there is limited data and uncertainties are high (Chen & Pollino, 2012). With a Bayesian network model, each node represents an event, causal or contextual variables, or consequences, while relationships between these are specified by the arcs between these nodes (Fenton & Neil, 2018). Each node is discretized into a number of states, and each node is associated with a probability table or conditional probability, which expressed the uncertainty about the states or the conditional dependencies between these. The following paragraphs briefly outline the main structural properties and mathematical implementation of Bayesian Networks. For further detail, the reader is referred to the work by Fenton & Neil (2018).

A Bayesian Network is defined as an explicit description of the direct dependencies between a set of variables. This description is in the form of a directed graph and a set of node probability tables (NPTs). The directed graph defines the structure of the Bayesian Network, which consists of sets of nodes and arcs. The nodes correspond to the variables, and the arcs describe the conditional dependencies between the variables.

If there is an arc from node_A to node_B, this means that there is a direct causal dependence of node_A on node_B. Within the Bayesian Network formalism, node_A denotes as a parent to node_B, and node_B is considered as a child to node_A. It is also important to note that there cannot be cycles in the graph, so circular dependencies cannot be considered in Bayesian Networks. Each node has an associated probability table called the node probability table. The node probability table is the probability distribution of the node given, conditional to the set of the parents of that node. For a node without parents, it is considered a root node, and the node probability table of that node is the unconditional probability distribution of that root node. The full joint probability distribution can be defined as the following if Parents(Ai) denote the set of parent nodes of the node Ai:

$$P(A_1, A_2, \dots\dots\dots\dots, A_n) = \prod_{i=1}^{n} P(A_i | Parents(A_i)) \qquad \text{Equation 2}$$

The marginal distribution for any variable or node in a Bayesian Network can be computed based on marginalization by variable elimination. When creating Bayesian Networks, it is important to determine the relationships between the variables, and to carefully consider how the probability distributions can be meaningfully discretized, so that the conditional probability tables of the dependent child nodes do not become overwhelmingly large, to avoid the need for excessive expert elicitation. In practice, this often means striking a balance between the number of states in the nodes in the network, and the number of incoming arcs from parent nodes to child nodes. This is one of the reasons why an iterative development process is recommended in practice.

4.3 Bayesian Network development process

The model developed in this thesis is framed within a context of a risk analysis of oil spill preparedness and response, focusing on the effectiveness of different available spill response types in plausible contextual conditions in the Canadian Arctic. Based on generic literature on Bayesian Networks (Fenton & Neil, 2018), and similarly to the method applied in comparable applications in the academic literature (L. Lu et al., 2019; Valdez Banda et al., 2016), the model development process is divided into two stages. The first stage focuses on the model content and structure, i.e. addressing which variables need to be included in the model, and what links should be established between them. The second stage addresses the model parameterization, i.e. determining the conditional probability tables based on the evidence about the model contents and structure. This second stage often heavily relies on expert judgments, in which knowledge-based probabilities are determined by analysts and experts based on the evidence basis established in the available background knowledge (Aven & Guikema, 2011; Chen & Pollino, 2012). Figure 2 below shows the modelling procedure for the first stage.

As presented in Figure 11, the modelling process begins with establishing the background knowledge through reviews of published academic literature, publicly available technical reports about oil spill response, and descriptions of spill response cases. The comprehensive background knowledge will aid in drafting up the initial model development. Model 1 is generated based on all the information obtained from the earlier sources. After creating the first model, the model structure and the model content are updated through a series of expert interviews. In these interviews, the process from detecting an oil spill, to initiating the response, the on-site operation, and the variables affecting the effectiveness of the various response options, is discussed as appropriate to the expert's knowledge.

The participants invited to the interviews are capable and knowledgeable professionals about the oil spill recovery process, with expertise in oil spill response in Canadian waters, or in areas with ice conditions. Experts are identified based on government websites, industry associations, attendance lists of oil spill conferences, and the academic literature. Their expertise is established based on the number of years of being involved in field operations or because of their research activity on related topics. The experts who accepted to join, agreed to participate with expert elicitations being anonymous, in line with data collection procedures approved under the university's research ethics board (REB file: 2021-5454). A total of 6 experts were contacted. Experts came from various backgrounds such as professors, consultants with at least 5 years experience, coast guards, and Bayesian Network model experts.

Interview sessions lasted around 2 hours and were performed through online meeting platforms, with each interview following the same process. First, the author described the purpose of the model and provided an overall overview of the model and what main components are included. After that, the a systematic discussion is held about each variable included in the network, and its interrelations with other nodes in the network. This also included consideration of the definition of and the states included in the node. Where necessary, nodes and links were added and updates made, to reflect the mental model of the expert in light of their knowledge about specific aspects of the model space. After this systematic inspection of the model nodes and links, there were open discussions about the model, considering issues beyond what was already questioned. This sequential updating of the Bayesian Network model is performed until a satisfactory model has been developed. Each new revision was based on the most updated model developed, with the finally developed model subjected to several validation tests to ascertain the plausibility of the results, see Section 4.4. Appendix B showcases the sample consent form and what is required by the potential interviewers.

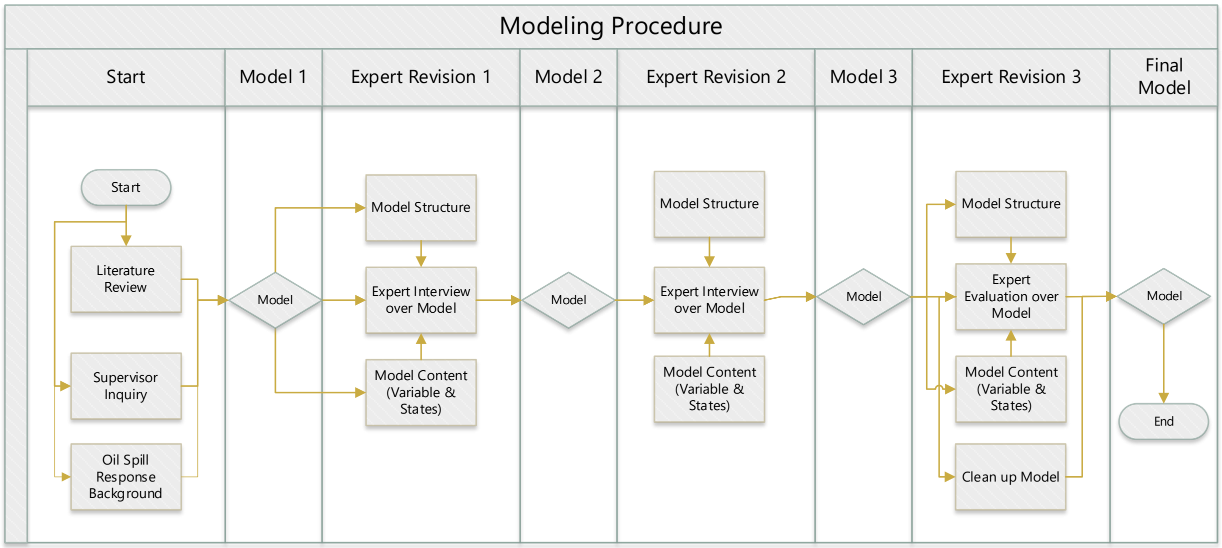

Figure 11 Bayesian Network modelling procedure in relation to the model's content and structure

The software used to create the Bayesian Network model in this thesis is called GeNIe (*GeNIe Modeler*, n.d.). GeNIe Modeler is a graphical user interface to SMILE Engine, an engine for calculating probabilistic graphical models, and provides an interactive model building environment. Some of its functionalities include creating a visual representation of probabilistic graphical models, definition of (conditional) probability tables, and sensitivity analysis

After the states and probabilities of all the variables have been defined, the Bayesian Network model can be analyzed through quantitative forms of model evaluation, including probabilistic updating and sensitivity analysis. All assumptions, descriptions, data, and reasoning for each variable are documented in Section 5, and are used as a basis for a qualitative Strength of Evidence assessment, which is external to the Bayesian Network model.

4.4 Bayesian Network Model Validation Process

Bayesian Network models can be difficult to validate, especially when these are extensively based on expert knowledge (Pitchforth & Mengersen, 2013). In this thesis, validity is defined as the ability of a model to describe the system intended to describe both in the output and in the mechanism by which that output is generated, in line with the work by (Pitchforth & Mengersen, 2013). A Bayesian Network model's validity can be considered in terms of three aspects: model contents and structure, node discretization, and parameterization of the (conditional) probability tables over these discretized states.

It is essential to seek evidence to inform the definition of the variables and to substantiate the uncertainty descriptions. Expert judgment is used for populating the probability tables. While this is a common approach in risk analysis, its limitations should be considered. Typically, experts are not clairvoyant and cannot provide imperfect information to make accurate risk estimates. However, they have expertise in a given knowledge domain, so that the knowledge-based probabilities P(A|A') can be understood as an expression of an expert's knowledge about a phenomenon, acknowledging (through a strength of evidence assessment), that this knowledge may not be necessarily very strong.

To aid in the validation process for the expert-elicited Bayesian Network model, selected tests included in the framework proposed by by Pitchforth & Mengersen (2013) will be considered. This framework is developed based on insights in social sciences and the general operations research modeling literature and consists of a series of questions which can be used to instill confidence in the model and its results. The following questions are considered for the validation process:

- Can it be established that the BN model fits within an appropriate context in the appropriate literature?
- Does the model structure (the number of nodes, node labels and arcs between them) look the same as the experts would expect, and is does this correspond to the established literature?
- Do the parameters (i.e. probabilities) of the input nodes and the CPTs adequately correspond to the expert knowledge and domain literature?
- Are the parameters of nodes in the model similar to those in comparable models available in the literature?
- Is the model behaviour similar to how the real system being modeled may be expected to behave under comparable conditions?

According to the risk perspective outlined in Section 4.1, tools are required to assess the strength of evidence qualitatively. In this thesis, a method suggested by Goerlandt & Reniers, 2016 will be applied for this purpose, to systematically assess the strength of the evidence for the various nodes of the Bayesian Network model. This approach is also applied for models for comparable problems, see e.g. Valdez Banda et al. (Valdez Banda et al., 2016) and Lu et al. (L. Lu et al., 2019). The following tables illustrate how the strength of evidence is assessed, based on the four main evidence aspects considered: data, model, judgement, and assumption. Tables 1 through 6 below shows the definition or classification of the SoE assessment.

Table 1 SoE Classification

<table>
<tr><th colspan="8">Strength of Evidence</th></tr>
<tr><th>Main Item</th><th>Model Aspect</th><th colspan="2">Data</th><th colspan="2">Model</th><th>Judgement</th><th>Assumption</th></tr>
<tr><td rowspan="4">Sub-Item</td><td>Variable</td><td rowspan="4">Quality</td><td rowspan="4">Amount</td><td rowspan="4">Empirical Validation</td><td rowspan="4">Theoretical Viability</td><td rowspan="4">NA</td><td rowspan="4">NA</td></tr>
<tr><td>Structure</td></tr>
<tr><td>States</td></tr>
<tr><td>Parameterization</td></tr>
<tr><td>Classification</td><td colspan="3">Low</td><td>Medium</td><td colspan="3">High</td></tr>
</table>

Data is assessed based on the data quality and the amount of data. The models are assessed based on their empirical validation and theoretical validation.

Table 2 Strength of Evidence Criteria on Data

Data Criteria:	Strong	Weak
Quality	• A low number of errors • Reliable data source	• A high number of errors • Unreliable data source to no data source found
Amount	• Some till much data are available or accessible	• Little to no data available or accessible

Table 3 Strength of Evidence Criteria on Model

Model Related Criteria:	Strong	Weak
Empirical Validation	• Existing experimental tests agree with implemented model output well. • Experimental tests were performed.	• Existing experimental tests do not fully agree with implemented model output well. • Few if no experimental tests were performed.
Theoretical Viability	• Model expected to present decent predictions	• Model expected to present poor predictions

Table 4 Strength of Evidence Criteria on Judgement

Judgement	
Strong	Most, if not all, have suggested or supported the judgement (75% or more)
Medium	Few or several have suggested or supported the judgement (25%~75%)
Poor	Few if not no judgement was made (0%~25%)

Table 5 Strength of Evidence Criteria on Assumptions

Assumptions	
Strong	Most, if not all, have stated the assumptions (75% or more)
Medium	Few or several have stated the assumptions (25%~75%)
Poor	Few if not no assumptions were made (0%~25%)

Sensitivity analysis is commonly applied in risk analysis (Fenton & Neil, 2018), and is also part of the adopted framework for maritime risk assessment proposed by Goerlandt and Montewka (Goerlandt & Montewka, 2015). A sensitivity analysis can measure how sensitive the output of a Bayesian Network is in relation to the inputs to the network. This is important, especially when the evidence for specifying the probabilities associated with these inputs are based on evidence which may be relatively weak. The purpose of sensitivity analysis is to analyze the relative importance of variables included in the model.

Together with the strength of evidence assessment, this sensitivity analysis provides an elaborate contextualization of the overall uncertainty associated with the model and its results, which is essential in uncertainty-based risk perspectives for responsible risk management. A disadvantage of model-based sensitivity analysis is that its techniques only focus on the model as already built, so that sensitivities to possibly relevant variables not considered in the model are not considered. The iterative model building strategy and the sequential expert updating and validation can help alleviate this problem. (Fenton & Neil, 2018).

Section 5: Model Application & Results

Each oil spill is unique, and several variables that can influence the environmental conditions can eventually influence the operability of the oil spill response equipment used to for spill combating. Therefore, to investigate the overall effectiveness of the three different response types selected (In-situ Burning, Chemical Dispersion, and Mechanical Recovery), severable variables and their relation to response effectiveness, are considered.

When an oil spill occurs, different variables must be considered in the Canadian Arctic. For example, cold water temperatures and the presence of ice can severely change the weathering, and the natural dilution of oil once spilled. However, the ice can also trap oils, so the oil spill response options and the time available to implement a proper response can be extended before the response becomes useless (NEBA,2014). The variables introduced and explained below, as well as their related node probability tables used in the developed Bayesian Network model were all included with evidence based on web reports, published data and articles, and anonymized expert interviews. More information about what evidence is used to support the development of different parts of the model can be found in the strength of evidence table in Section 6: Bayesian Network Model Assessment.

For ease of understanding, the variables were grouped into the following seven categories: Site-related variables, Response Operability variables, Oil-Related variables, Base-Related variables, Season and Time, and Effectiveness. Season and Time, Section 5.1, concern two variables that provide information about the season and daytime conditions in the Arctic. Oil Related variables, Section 5.2, concern variables relating to the oil spill itself. Response-Related variables, Site-related variables, Section 5.3, discusses variables related to the environmental conditions of where the oil is spilled. Base-Related variables, Section 5.4, include variables related to the environmental conditions where the responders are stationed before being deployed to respond to an oil spill, Section 5.5, address issues about the response type selected, e.g. the response assets and their equipment. Operability variables, Section 5.6, relates to the created categories of operability for each sub-model response and looks into the effectiveness per each sub-model. Finally, Effectiveness, Section 5.7, includes variables used to assess the overall effectiveness of the response types and how the contextual conditions affected these.

Figure 12 presents the colour legend for the OSRECA BN model with the full model in Figure 13. More details related to the variables are listed in Appendix A: Full Strength of Evidence Assessment, while state definitions can be found in Appendix D.

For an overview of the OSRECA BN model Figure 15 to Figure 18 shows the variables and connected nodes related to the 4 different types of mechanical recovery response sub-models, Figure 20 to Figure 22 relates to the 3 different types of chemical dispersant response sub-models, and finally, Figure 24 to Figure 26 relates to the 3 different types of in-situ burning response sub-models.

Legend

Site-related Variables	**Operability Variables**	**Oil-Related variables**	**Response-Related variables**	**Base-Related variables**	**Season & Time**	**Effectiveness**

Figure 12 Colour Legend for Model

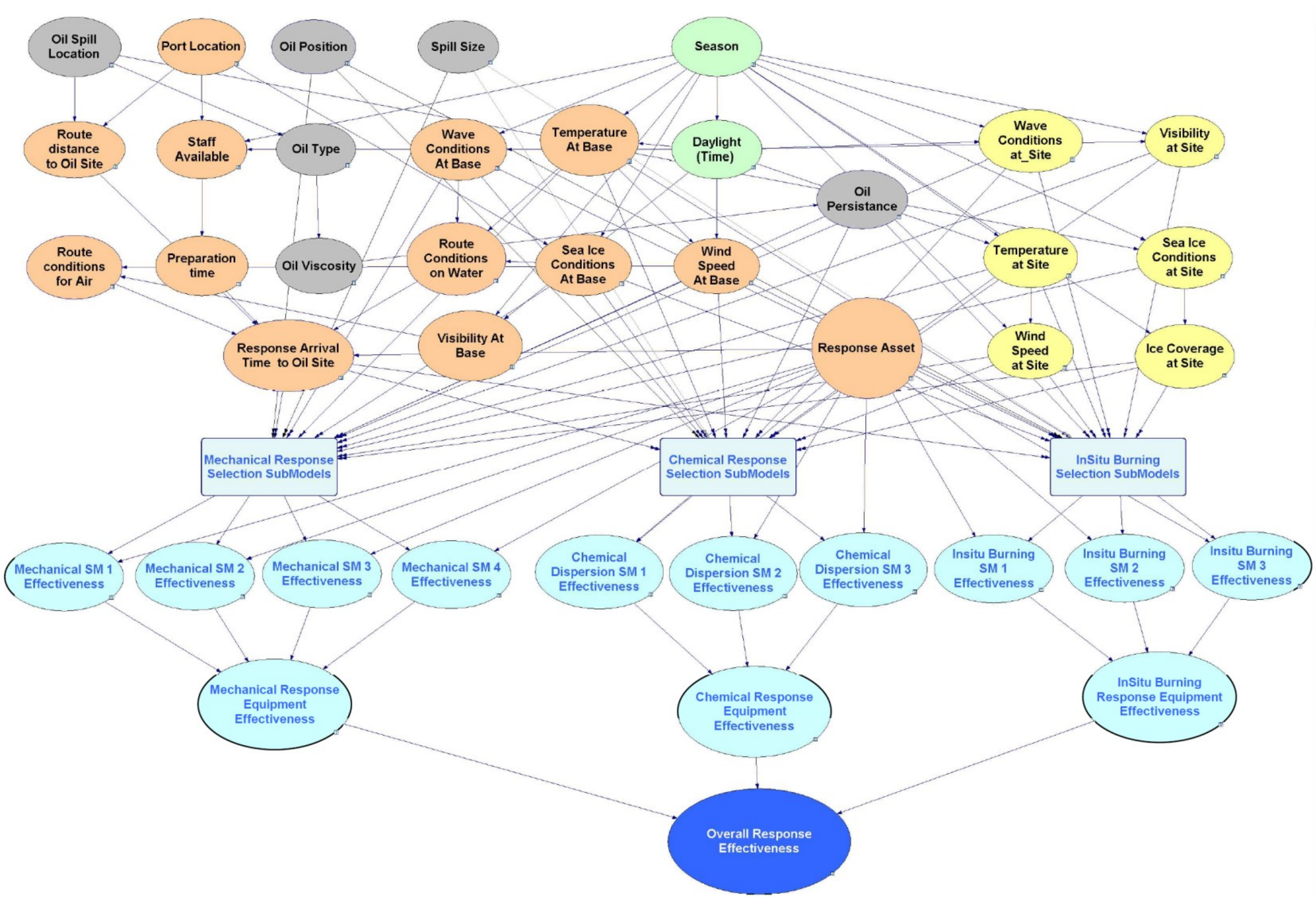

Figure 13 Finalized Full OSRECA Bayesian Network Model with all Sub-models

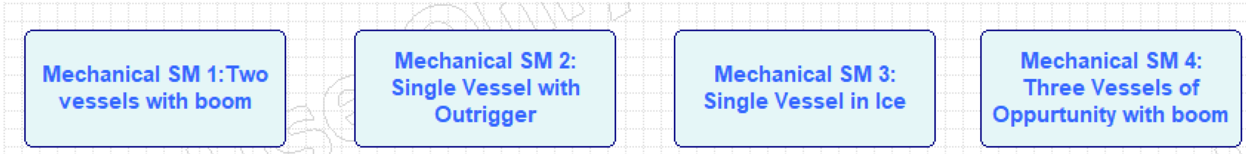

Figure 14 Response Type: Mechanical Sub-models for the OSRECA BN model

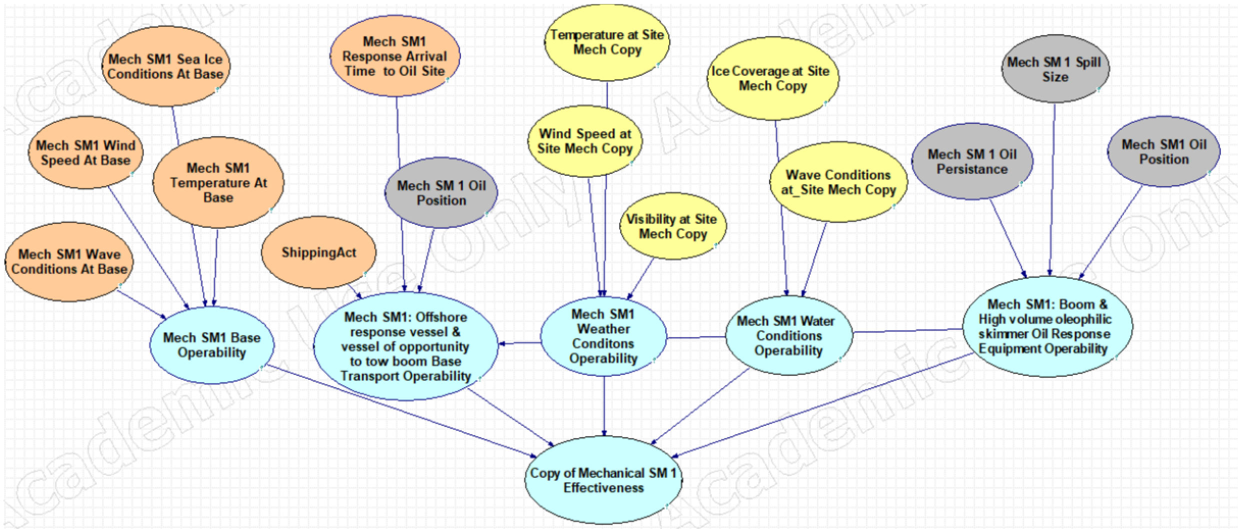

Figure 15 Mechanical Sub-model 1: Two vessels with boom

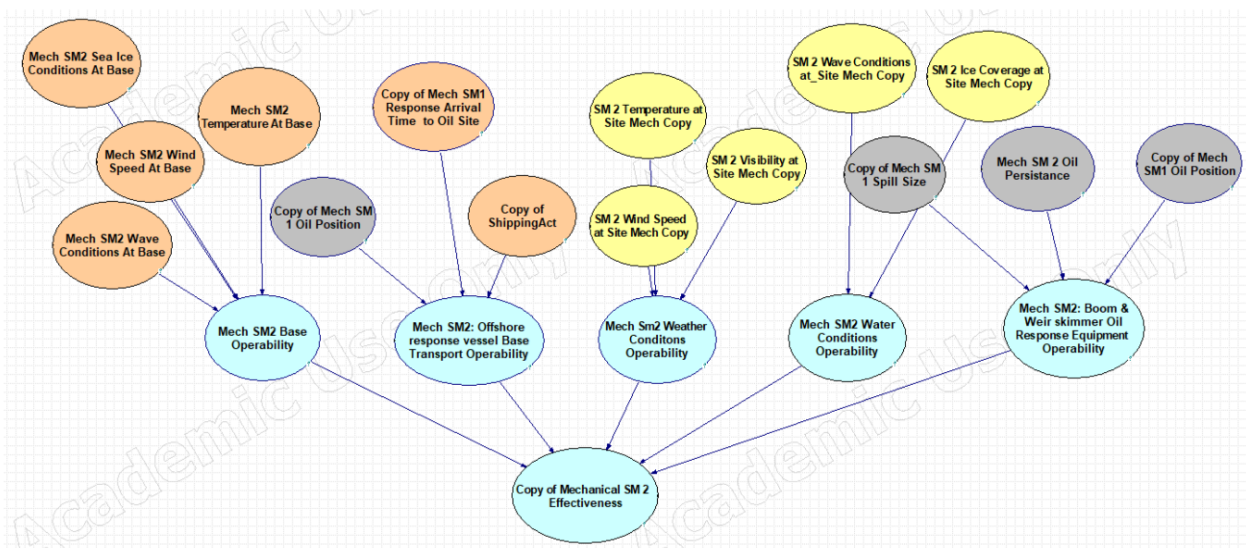

Figure 16 Mechanical Sub-model 2: Single Vessel with Outrigger

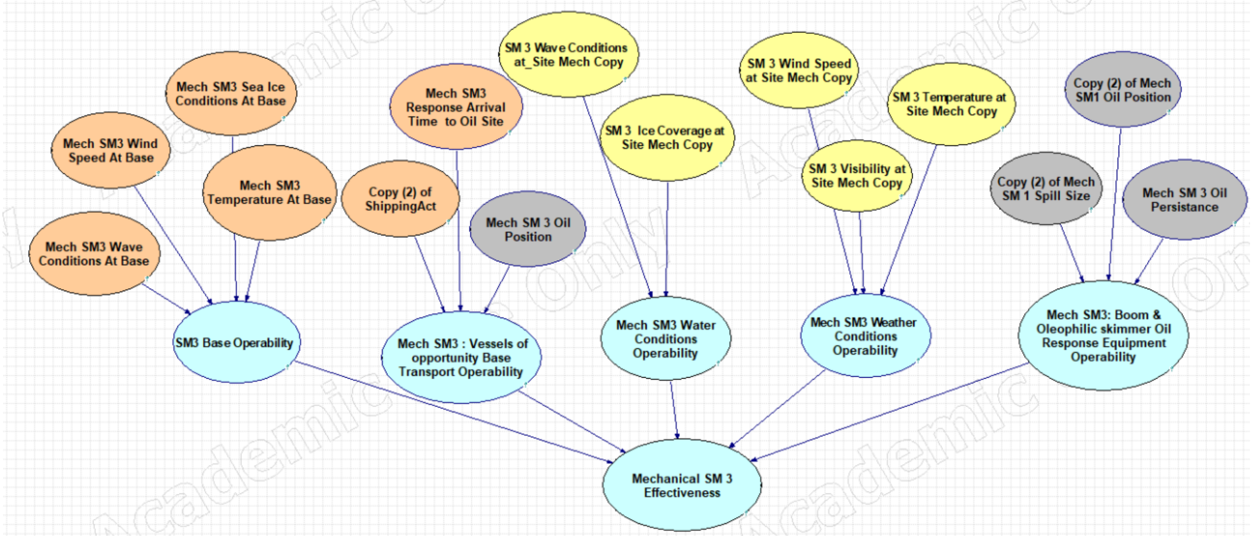

Figure 17 Mechanical Sub-model 4: Single Vessel in Ice

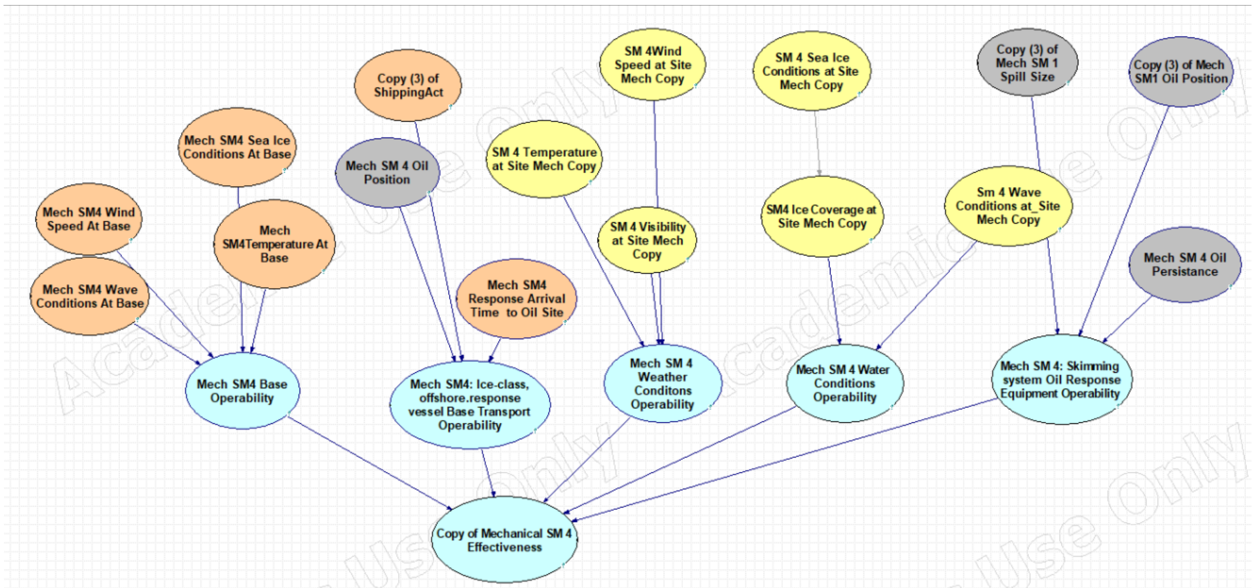

Figure 18 Mechanical Sub-model 4: Three Vessels of Opportunity with Boom

Figure 19 Response Type: Chemical Sub-models for the OSRECA BN model

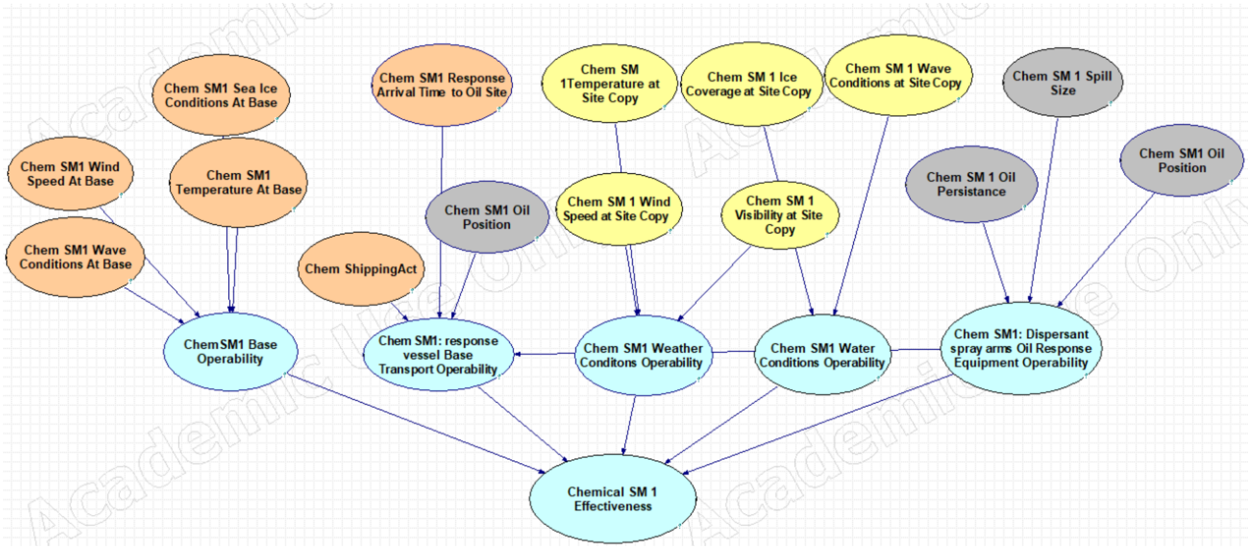

Figure 20 Chemical Sub-model 1: Vessel Application

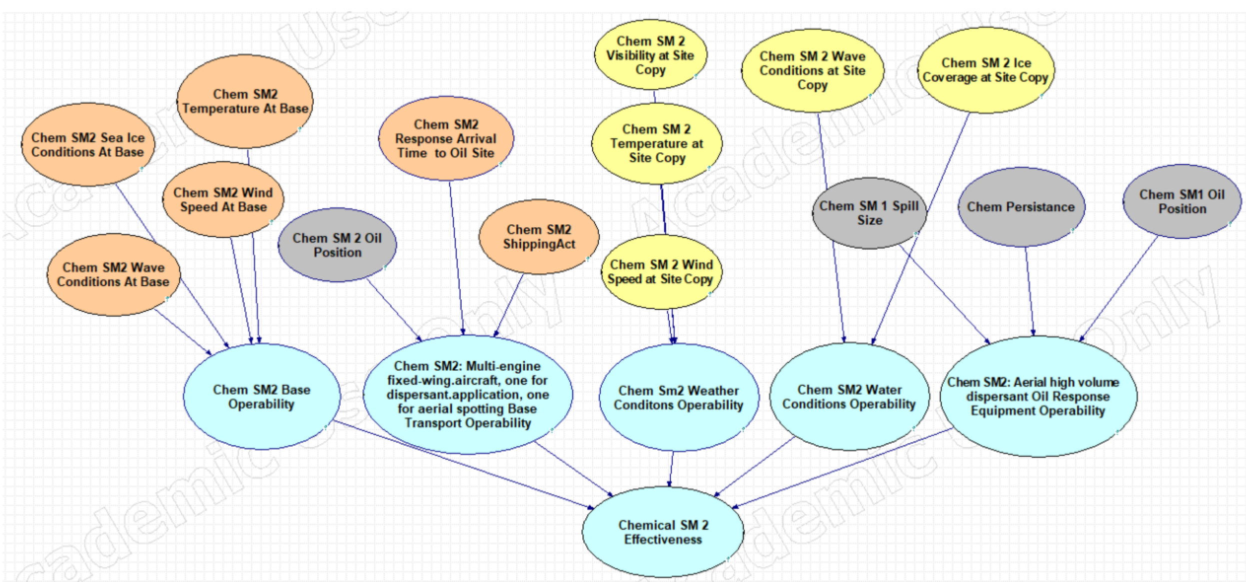

Figure 21 Chemical Sub-model 2: Airplane Application

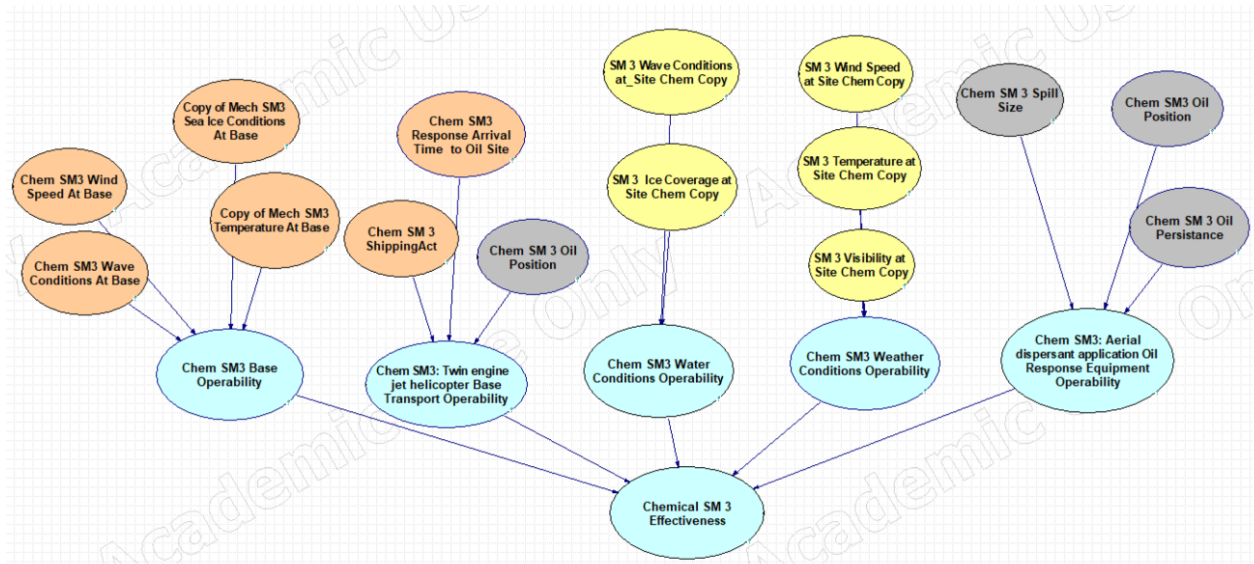

Figure 22 Chemical Sub-model 2: Helicopter Application

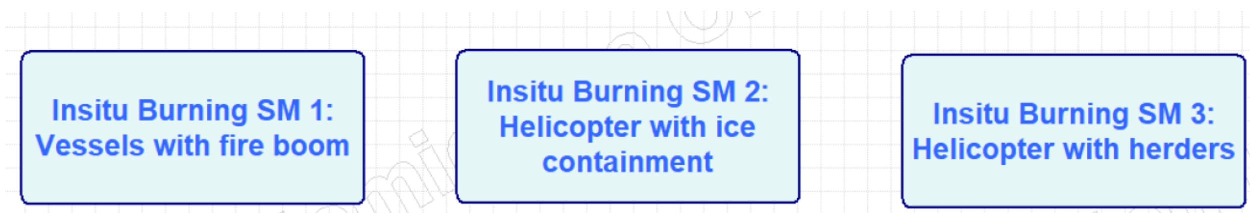

Figure 23 Response Type: In-Situ Burning Sub-models for the OSRECA BN model

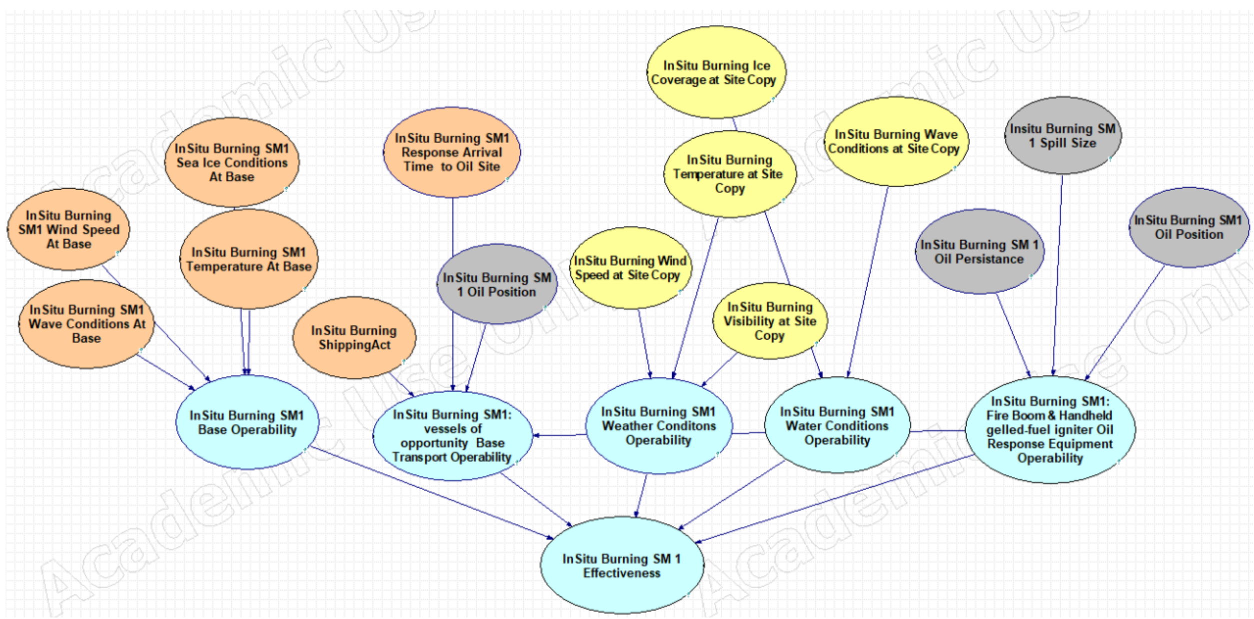

Figure 24 In-Situ Burning Sub-model 1: Vessels with fire boom

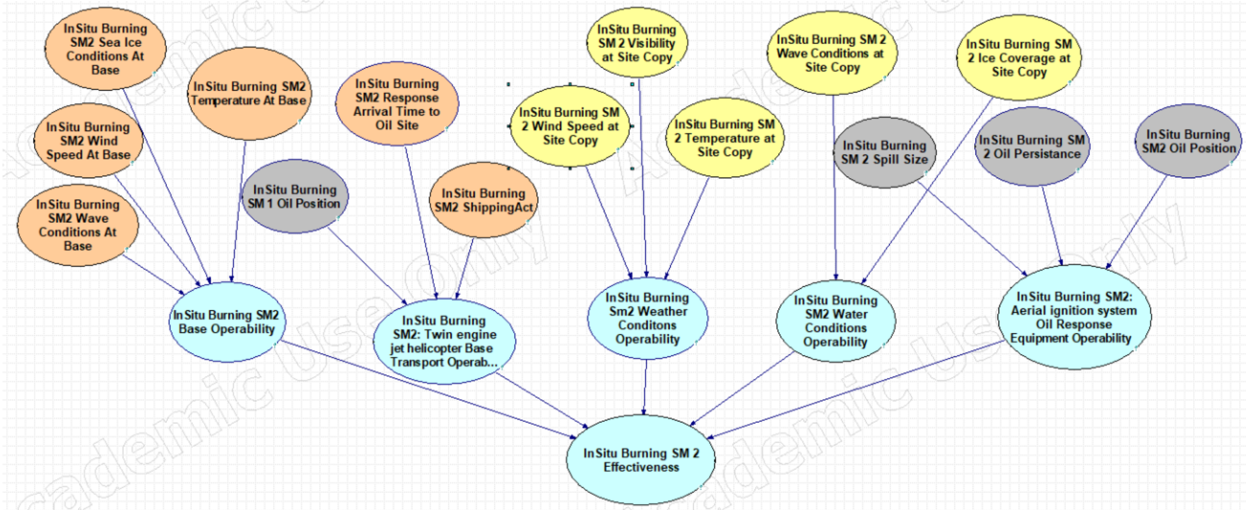

Figure 25 In-Situ Burning Sub-model 2: Helicopter with ice containment

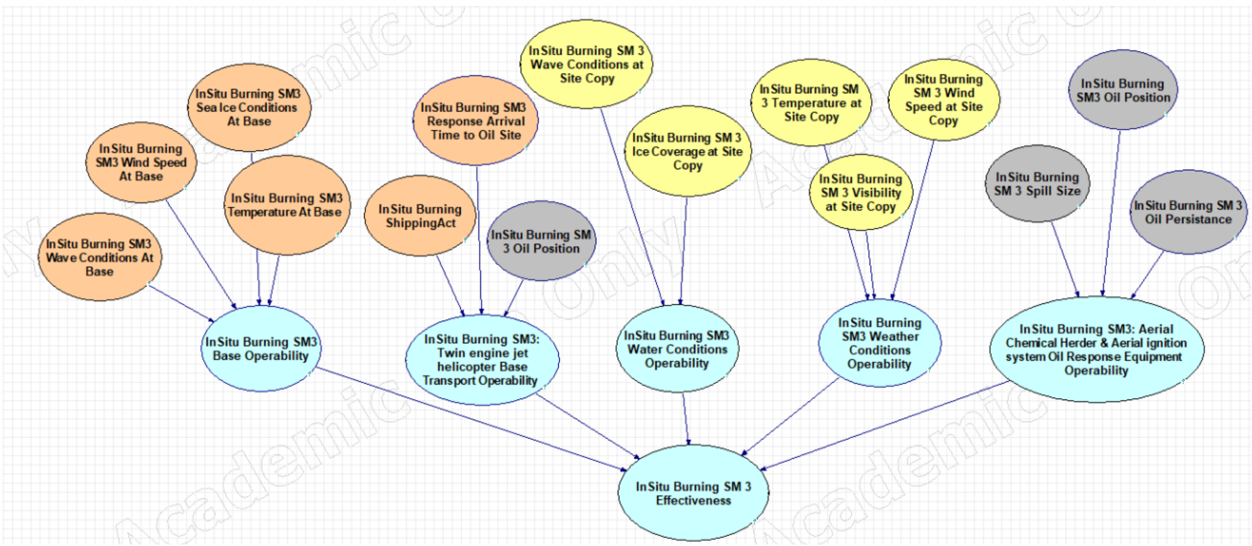

Figure 26 In-Situ Burning Sub-model: Helicopter with herders

Table 6 Table of abbreviations of Sub-models and their meaning

Abbreviation	Definition	Response Type
Mech SM 1	Mechanical Sub-Model Type 1	Two vessels with Boom
Mech SM 2	Mechanical Sub-Model Type 2	Single Vessel with Outrigger
Mech SM 3	Mechanical Sub-Model Type 3	Single Vessel in Ice
Mech SM 4	Mechanical Sub-Model Type 4	Three Vessels of Opportunity with Boom
Chem SM 1	Chemical Sub-Model Type 1	Vessel Application
Chem SM 2	Chemical Sub-Model Type 2	Airplane Application
Chem SM 3	Chemical Sub-Model Type 3	Helicopter Application
In-Situ SM 1	In-Situ Burning Sub-Model Type 1	Vessels with Fire Boom
In-Situ SM 2	In-Situ Burning Sub-Model Type 2	Helicopter with Ice Containment
In-Situ SM 3	In-Situ Burning Sub-Model Type 3	Helicopter with Herders

The table below provides a glossary of factors, variables, and states used throughout the OSRECA BN model.

Table 7 Glossary of words used throughout the OSRECA BN model

Name	Interpretation
A. Fishing	Fishing Vessels route between 2011-2016
B. General	General Cargo route between 2011-2016
Base	Oil Spill Responder's Site
Boom	Limits the spread of oil on the sea surface and by concentrating it to facilitate recovery.
C. Pleasure	Pleasure Crafts and Passenger Ship routes between 2011-2016
Daylight (Time)	Light condition corresponding to the time of the day
Fire Boom	Ignite and burning with booms surrounded
Herder	Chemical herder application system
HFO	Heavy Fuel Oil; a low value fuel products that is essentially an industrial fuel
Ice Coverage	The amount of sea covered by ice as per the ice formation and typ
LFO	Light Fuel Oil; a crude oil distillate used mostly in the production of heat in domestic and small commercial liquid-fuel burning equipment
Nearshore	Waters close to shore and may be influenced by either shallow-water depths or land masses.
Offshore	Open ocean area where environment has little or no influence from shallow-water or land masses.
Oil Persisitence	How fast an oil can break up and dissipate or not
Oil Spill Location	The geographical location where the oil has been spilled
Oil Spill Position	Oil spill location based on how close it is to land
Oil Spill Size	Size of oil
Oil Type	Classification of oil itself
Oil Viscosity	Physical attribute of the spilled oil
Outrigger	A projecting structure on a boat that supports the boom
Port Location	The location/port for the response vessel to prepare and set up equipment
Preparation Time	Time it took to prepare and install equipment on allocated transportation method
Response Arrival Time to Oil Site	Time it takes for responders to arrive at the oil spill site with appropriate equipment.
Response Asset	response transportation equipment selected based on the three different response types considered
Route Conditions on Air	Atmosphere conditions en route to the direction of the oil spill site

Route Conditions on Water	Water conditions en route to the direction of the oil spill site
Route Distance to Oil Site	Distance from where the responders are deployed to the oil spill location
Sea Ice Conditions	ice type and form at the location where the oil spill site is located
Season	Four Divisions of the year
Skimmer	Removes oil from the water surface and used as an active device for oil recovery.
Staff Available	Availability of staff at allocated port location
Temperature	Air temperature
Vessels-of-Oppurtunity	Vessels that can be used for fishing or commercial transportation activities and is not usually dedicated to oil spill response.
Visibility	Visibility condition at specified location.
Wave Conditions	Wave speed or the wave direction.
Wind Speed Conditions	Wind speed or the wind direction.

5.1 Season & Time

5.1.1 Season

The variable '*Season*' is interpreted as the four divisions of the year (Spring, Summer, Winter, and Fall). As the seasons change, this affects the weather patterns and daylight hours. In general, there are 4 seasons, but in the Arctic, the months during each season are slightly different. There are 4 months that are considered Summer in the Arctic: June to September, while December to March are the 4 months of Winter (National Oceanic and Atmospheric Administration, 2021; Stoyanova & Dunbar, 2008). That leaves April and May for Spring and October and November for Fall, respectively.

For the OSRECA BN model the variable '*Season'* is a parent node, which affects the following child nodes: '*Daylight (Time)*', '*Staff Availability', 'Wind Speed at Base', 'Visibility at Base', 'Sea Ice Conditions at Base', 'Wave Condition at Base', 'Wind Speed at Site', 'Ice Coverage at Site', 'Visibility at Site', 'Sea Ice Conditions at Site'*, and '*Temperature at Site'*. Considering other known conditions and variables that are affected by the seasons, Fall and Winter will be combined into one state, and Spring and Summer as another state. This is done because of the similarities between these seasons and the conditions and the relationships that is focused on with the other connected nodes(National Oceanic and Atmospheric Administration, 2021; Perovich et al., 2020; Stoyanova & Dunbar, 2008). Table 8 below shows the node probability table for the states of '*Season*'.

Table 8 States of Season

Season	Probability
Summer	0.5
Winter	0.5

5.1.2 Daylight (Time)

Another variable that will be considered is '*Daylight or Time*' once a spill has occurred. This variable is interpreted as the light condition corresponding to the time of the day. In general, during the Arctic summer, there are 24 hours of light (ESPG, n.d.; *All About Arctic Climatology and Meteorology*, 2020; National Oceanic and Atmospheric Administration, 2021). While In contrast, winter in the Arctic has the darkest time of the year, the Winter Solstice, with long periods of darkness every day.

The '*Daylight (Time)'* variable is a node with the variable '*Season*' as the parent node. It links to the following child nodes: '*Visibility at Site*', '*Visibility at Base*', '*Sea Ice Conditions at Site*', '*Temperature at Site*', and '*Staff Availability*'. As the only major difference between the times are during the daytime and nighttime, and as to not overload the model structure and the number of states in the conditional probability tables, only those two states will be considered in the OSRECA BN model ((National Oceanic and Atmospheric Administration, 2021; Prevention & Response (EPPR), 2017; Stoyanova & Dunbar, 2008). Table 9 below shows the node probabilities for the variable '*Daylight (Time)*'.

Table 9 States of Daylight (Time) per Season

Season		**Summer**	**Winter**
Daylight (Time)	**Day**	0.6	0.4
	Night	0.4	0.6

5.2 Oil-related variables

5.2.1 Oil Type

The '*Oil Type*' variable is a node with the variable '*Oil Spill Location*' as the parent node. It diverges to the following child node: '*Oil Viscosity*'. For this model, the oil type refers to the classification of the oil itself, in particular the oil's physical and chemical properties. Heavy Fuel Oils and Light Fuel Oils are the two different types of oils that will be considered as they are the two most commonly being used in the Arctic (L. Lu, 2021; Prevention & Response (EPPR), 2017). Heavy Fuel Oils or HFO is considered a low value fuel products that is essentially an industrial fuel (*Government of Canada*, 2010). Light Fuel Oil or LFO is a crude oil distillate used mostly in the production of heat in domestic and small commercial liquid-fuel burning equipment. Most ships operate with heavy fuel oils as it is currently the preferred fuel(Comer et al., 2016). Section 5.2.2 will elaborate on the variable '*Oil Viscosity*', and Section 5.2.6 will provide further information about the variable '*Oil Spill Location*'. Table 10 below shows the states of the variable '*Oil Type*' and its probabilities.

Table 10 States of Oil Type per Oil Spill Location

	Oil Spill Location	**Fishing**	**General**	**Pleasure**
Oil Type	HFO	0.3	0.99	0.99
	LFO	0.7	0.01	0.01

5.2.2 Oil Viscosity

The viscosity is a physical attribute of the spilled oil, which is important for selecting the most effective response type, as it can alter the effectiveness of the response (L. Lu, 2021; Prevention & Response (EPPR), 2017; Wadsworth, 2015). The '*Oil Viscosity*' variable is a node with the variable '*Oil Type*' as parent node. It diverges to the following child node: '*Oil Persistence*'. As per the descriptions of the fuel types selected, the viscosity and density can differ. Heavy fueled oils are more viscous than low fueled oils (*Government of Canada*, 2010). Table 11 below shows the state of the Oil Viscosity and its probabilities.

Table 11 States of Oil Viscosity per Oil Type

Oil Type		HFO	LFO
Oil Viscosity	Low	0	1
	High	1	0

5.2.3 Oil Persistence

Persistency of an oil depends on the viscosity of the oil which depends on the oil type. Persistent oils are defined as oils that can break up and dissipate slower in the oceans and would need a combatting process. Non-persistent oils can disintegrate far quicker through evaporation, which leads for these oil spills not always require an active response (Anderson, 2001). The faster the oils can dissipate; the less time responders have to try and properly respond to the oil spill leading to an inefficient response process. The '*Oil Persistence*' variable is a node with the variable '*Oil Viscosity*' as the parent node. It diverges to the following child node: '*Oil Response Equipment Operability*'. Table 12 below shows the states of the oil spill persistence variable.

Table 12 States of Oil Spill Persistence Variable

	Oil Viscosity	Low	High
Oil Spill Persistence	Persistent	0.1	0.9
	Nonpersistent	0.9	0.1

5.2.4 Oil Spill Size

The size of an oil spill can also affect the selection of the oil spill response equipment. The '*Oil Spill Size*' variable is interpreted as the amount of oil spill that has spilled. It is implemented as a node with no parent node. It diverges to the following child node: Oil Response Equipment Operability. Table 13 below shows the states of the oil spill size variable.

Table 13 States of Oil Spill Size Variable

Oil Spill Size	Probability
Light	0.4
Medium	0.4
Severe	0.2

5.2.5 Oil Spill Position

The '*Oil Spill Position*' variable is a node with no parent node. It is interpreted as the oil spill location based on how close it is to land, and it diverges to the following child node: '*Oil Response Equipment Operability*'. Table 14 below shows the states of the oil spill position variable.

Table 14 States of Oil Spill Positions

Oil Spill Position	Probability
Near Shore	0.6
Offshore	0.4

5.2.6 Oil Spill Location

When responding to an oil spill, responders need to be able to locate the oil and target the proper combatting response to the thickest part of the slick (Prevention & Response (EPPR), 2017). The '*Oil Spill Location*' variable is the geographical location where the oil has been spilled. This variable has no parent node, and it diverges to the following child nodes: '*Response Arrival Time to Oil Site*', *'Route distance to Oil Site'*, and '*Sea Ice Conditions at Site'*.

For the OSRECA BN model, it was decided to assign possible spill locations along three representative unique routes, aligned with the overall high-level shipping traffic patterns provided by the Arctic Corridors (Arctic Corridors Research, n.d.). Location A is based on the typical trend route of Fishing Vessels between 2011-2016, Location B is based on General Cargo route between 2011-2016, and finally Location C is based on both Pleasure Crafts and Passenger Ship routes between 2011-2016. Figure 27 provides a highlighted diagram showing each the division of each location in the Arctic, indicated with a label. Evidently, it is important to note that the routes per each location do cross each other but they are mainly routed around the selected/highlighted areas. Table 15 below shows the states of oil spill location and their respective probability.

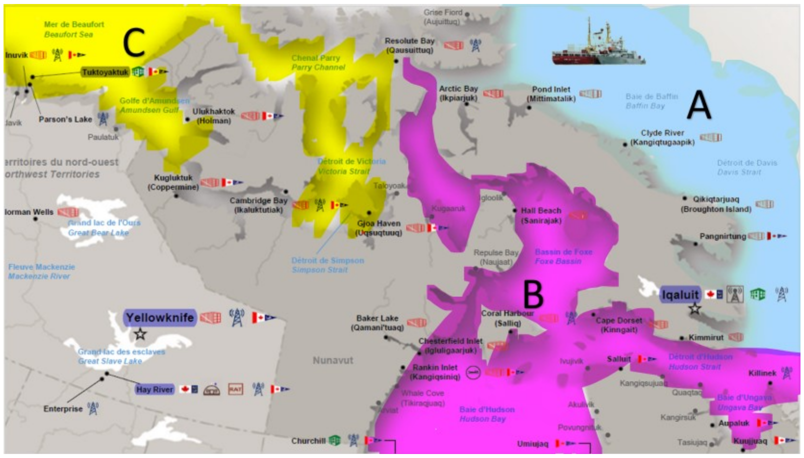

Figure 27 Image with highlighted geographical location where oil can be released in the Arctic (F. and O. Canada, 2021)

Table 15 States of Oil Spill Location

Oil Spill Location	Probability
A. Fishing	0.33
B. General	0.33
C. Pleasure	0.33

5.3 Spill Site Variables

5.3.1 Visibility at Site

In general, with visibility in the Arctic, the winter climate is generally quiet and cold, but there is a chance of visibility being poor locally if there are open channels in the sea ice of water. That same visibility will get worse if there are high winds (*Climate of the Arctic*, 2019; *All About Arctic Climatology and Meteorology*, 2020; National Oceanic and Atmospheric Administration, 2021).

The '*Visibility at Site*' variable is defined as the visibility condition at the location of the oil spill, i.e., how well a human observer can see the oil. This variable has '*Season'* and '*Daylight (Time)'* as its' parent node, and it diverges to the following node: '*Weather Conditions Operability*'. The visibility conditions are important to know as it can affect the safety of the transportation method being used, as well as it can affect the effectiveness of completing the response task as a whole (Prevention & Response (EPPR), 2017; Wadsworth, 2015). The states of the '*Visibility at Site*' and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.3.2 Temperature at Site

In general with how temperature is in the Arctic; there is not much difference in temperature during the Arctic summer season (*Climate of the Arctic*, 2019). During the summer months, temperatures remain close to $0°C$, while winter months have an average temperature of less than -20 $°C$. The Arctic winter is typically clear and visible which are colder than cloudy days.

The variable '*Temperature at Site*' has Season and '*Daylight (Time)'* as its' parent node, and it diverges to the following node: '*Weather Conditions Operability'* and '*Wind Speed at Site'*. This variable is defined as the air temperature at the location of the oil spill. Low temperatures can lead to issues with the safety of the responders and create difficulty with responders completing the response task as handling the response equipment becomes harder (Prevention & Response (EPPR), 2017). The states of the '*Temperature at Site'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.3.3 Wave Conditions at Site

The variable '*Wave Conditions at Site'* has '*Season'* and '*Daylight (Time)'* as it's parent node, and it diverges to the following node: '*Wind Speed at Site'*. This variable is defined as the wave speed or the wave direction at oil spill site.

In relation to deployment, depending on which vessel is used, sea state or wave conditions can affect the safety of the crew working and the ability to operate vessels or low-flying helicopters(Prevention & Response (EPPR), 2017). How effective the response type is to the oil spill also depends on the severity of the wave conditions. The states of the '*Wave Conditions at Site'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.3.4 Ice Coverage at Site

The variable 'Ice Coverage at Site' has '*Season'* and '*Sea Ice Conditions at Site'* as its' parent node, and it diverges to the following node: '*Water Conditions Operability'*. This variable is defined as the amount of sea covered by ice as per the ice formation and type.

The total area of ice increases through the Winter, with its maximum reached during the month of March. During Spring, ice begins to melt, shrinking to its minimum by September (Perovich et al., 2020). Sea ice minimums and maximums occur toward the end of Summer and at the end of Winter because ocean conditions are delayed compared to other parts of the world in warming up and cooling down.

In relation to deployment, depending on which vessel is used, sea ice coverage and ice state conditions can affect the safety of the vessel itself as well as functioning the vessel to start, stop, and maneuver (Prevention & Response (EPPR), 2017). Furthermore, sea' ice coverage can also affect the ability to the recovery and response process of oil spills.

The definition of Open Water, Drift Ice, Close Ice, and Compact Ice all depend on the ice concentration. Table 16 below shows ice concentration percentages related to the variables and a table in Appendix E: OSRECA Variables' States and Probabilities showcases the states of the '*Ice Coverage at Site'* and the related probabilities.

Table 16 Table of Ice Coverage categories and their corresponding ice concentration

Ice Coverage Type	Concentration
Open Water	<40%
Drift Ice	>40% – 70%
Close Ice	>70%-99%
Compact Ice	100%

5.3.5 Wind Speed at Site

The variable '*Wind Speed at Site'* has Season and '*Temperature at Site'* as its parent node, and it diverges to the following node: '*Weather Conditions Operability'*. This variable is defined as the wind speed or direction at oil spill site. Wind Speeds can affect how specific equipment are able to respond to the oil spill. For example, wind speeds of at least 5m/s are needed to generate waves for good dispersion of chemicals applied to combat a spill (Liu & Callies, 2020). Depending on the wind speed it can either help or hinder the response process.

The wind speed's severity in relation to the human operator's ability to perform an operation in an exposed environment depends on the temperature. If the Arctic temperature is below -33º C then it is considered severe and may cause frostbite, and exposed skin can freeze in 30 about seconds; if the temperature is between -33º C and -13º C then the severity is considered medium causing possible frost nip; and anything above -13º C may be unpleasant but contains low to no impact which is a light severity. The states of the '*Ice Coverage at Site'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.3.6 Sea Ice Conditions at Site

The variable '*Sea Ice Conditions at Site'* has '*Season'* and '*Oil Spill Location*' as its parent node, and it diverges to the following node: '*Ice Coverage at Site'*. This variable is interpreted as the ice type and form at the location where the oil spill site is located.

One of the important aspects to consider in the Canadian Arctic is the sea ice. It can cover the entire Arctic Ocean, depending on the season, and "it damps surface and internal waves, and modifies transfer of wind momentum to the water" (Woodgate, 2014). It is also why the Arctic Ocean is considered to be 'quiet'.

Sea ice can grow throughout the months of Fall and Winter, and melts throughout the Spring and Summer (Perovich et al., 2020). Each Fall, as there is less sunlight in the Arctic and air temperatures drop, new sea ice starts forming, while old ice generally survives year-round. Seasonal ice gets thicker in the Winter and then thaws in the Summer. Depending on the state of the ice conditions can alter the effectiveness of response deployments. The states of the '*Sea Ice Conditions at Site'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4 Base Related Variables

5.4.1 Visibility at Base

The '*Visibility at Base'* variable is defined as the visibility condition at responders' site as they head over to the oil spill site. This variable has '*Season'* and '*Daylight'* as its' parent node, and it diverges to the following node: '*Route Conditions on Air'*. Visibility conditions are important to know as it can affect the safety of the transportation method being used, as well as it can affect completing the response task as a whole (Prevention & Response (EPPR), 2017; Wadsworth, 2015). The states of the '*Visibility at Base'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities. Although the conditions and probabilities are similar to what was mentioned in spill site variables, it is important to consider that these conditions may change based on the distance between the response base and where the oil spill site is located.

5.4.2 Wave Conditions at Base

The variable '*Wave Conditions at Base'* is interpreted as the wave speed or direction at responders' site. This variable has '*Season'* and '*Daylight (Time)'* as the parent nodes and diverges to the following node: '*Route Conditions on Water'* and '*Base Operability'*. In relation to deployment, depending on which vessel is used, sea state or wave conditions can affect the safety of the crew working and the ability to stop or drive vessels or low-flying helicopters (Prevention & Response (EPPR), 2017). How effective the response type is to the oil spill also depends on the severity of the wave conditions. The states of the Wave Conditions at Base and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

Although the conditions and probabilities are similar to what was mentioned in spill site variables, it is important to consider that these conditions may change based on the distance between the base for responders and where the oil spill site is located.

5.4.3 Port Location

The variable '*Port location'* is a parent node that is based on the top 3 ports that is currently being used by the DFO with staff and equipment ready for combatting oil spills (F. and O. Canada, 2021). It diverges to the following nodes*: Sea Ice Conditions at Base, Staff*

Available, and *Route Distance to Oil Site.* The port's location affects the travel distance to reach the oil spill. This variable is defined as the location/port for the response vessel to prepare and set up equipment.

Based on the anonymous interviews, it was found that the top three equipment resources were Iqaluit, Yellowknife, and Tuktoyaktuk, with Yellowknife's port location having the largest and most abundant resource available in both equipment and staff. These locations are what is based on the Canadian Coast Guard's available Arctic assets map as can seen in Figure 2. The states of the Port Location and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4.4 Staff Available

The variable '*Staff Available'* is interpreted as the availability of staff at allocated port location. This variable has '*Port Location'*, '*Season'*, and '*Daylight (Time*)' as parent nodes and diverges to the following node: '*Preparation Time'*.

The availability of staff responders at the port location to deploy the response equipment impacts the effectiveness of the oil spill response. The states of the '*Staff Available'* and their related probabilities can be found in Table 78 in Appendix E: OSRECA Variables' States and Probabilities.

5.4.5 Preparation Time

The variable '*Preparation Time'* is defined as the time it took to prepare and install equipment on allocated transportation method. It has '*Staff Available'* as the parent node and diverges to the following: '*Response Arrival Time to Oil Site'*. This variable is defined as the time used to prepare and install equipment on the transportation method. Based on anonymous interviews it is understood that preparation time can be affected based on the duration of time it takes for the staff to set up the allocated response equipment as well as the time it takes before receiving an official approval to interact with the oil spill. This is related to all response equipment types. The states of the *'Staff Available'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4.6 Shipping Act Law

The variable '*Shipping Act Law'* is a parent node, and it diverges to the Base Transport's Operability for Mechanical SM 1,2,3,4, Chemical SM 1,2,3, and In-Situ Burning SM 1,2,3 variables. This variable is defined as the legality of the response selected before deployment. Currently, personnel of the Canadian Coast Guard are the acting Incident Commanders, meaning they are the first people to respond based on a pollution related to oil spills (Government of Canada, 2021). As part 8 of the Canada Shipping Act of 2001, the Environmental Response program can take and monitor any measures deemed necessary to minimize or prevent pollution damage. However, based on the Arctic Waters Pollutions Prevention Act (AWPPA)(T. Canada, 2012) as well as the Fisheries Act (Government of Canada, 2019), the selected response type may cause a violation.

Depending on the type of response used it could break or delay the total response time for the responders to arrive at the oil spill site. It will be assumed that the legality of the response type may hinder in the preparation time variable. '*Shipping Act Law'* states and probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities which showcases a summary of states of the Shipping Act Law and its related probability. The probability tables used for each response sub-model can also be found there. It is important to note that there is currently work in introducing and updating the Fisheries Act based on ongoing research on the impacts of certain response types toward oil spills.

5.4.7 Temperature at Base

The variable '*Temperature at Base'* has '*Season'* and '*Daylight'* as its' parent node, and it diverges to the following node: '*Wind Speed at Base'* and '*Base Operability'*. This variable is defined as the air temperature at responders' base site.

As what is mentioned in *Section 5.3.2,* temperatures can lead to issues with the safety of the responders and create difficulty with responders completing the response task (Prevention & Response (EPPR), 2017). The states of the Temperature at Site and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.. Although the conditions and probabilities are similar to what was mentioned in spill site variables, it is important to consider that these conditions may change based on the distance between the base site and where the oil spill site is located.

5.4.8 Wind Speed at Base

The variable '*Wind Speed at Base'* has '*Season'* and '*Temperature at Site'* as its parent node, and it diverges to the following node: '*Base Operability'*. This variable is defined as the wind speed at the site where the response assets are located.

As what is mentioned in Section 5.3.5, human comfort is affected by the wind speed and can also affect how well both the equipment and its respective operator can effectively respond to oil spills. The wind speed's severity depends on the temperature. If the Arctic temperature is below -33º C then it is considered severe and may cause frostbite and skin would freeze in 30 seconds; if the temperature is between -33º C and -13º C then the severity is considered medium causing possible frost nip; and anything above -13º C may be unpleasant but contains low to no impact which is a light severity. The states of the '*Wind Speed at Base'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

Although the conditions and probabilities are similar to what was mentioned in spill site variables, it is important to consider, that these conditions may change based on the distance between the base location and where the oil spill site is located.

5.4.9 Sea Ice Conditions at Base

The variable '*Sea Ice Condition at Base'* has '*Season*' and '*Port Location'* as its parent node, and it diverges to the following node: '*Base Operability'*. Similarly, to *Section 5.3.6*, this variable is defined as the ice type and form. Sea ice can grow throughout the months of Fall and Winter, and melts throughout the Spring and Summer (Perovich et al., 2020). Each Fall, as there is less sunlight in the Arctic and air temperatures drop, new sea ice starts forming, while old ice generally survives year-round. Seasonal ice gets bigger in the Winter and then thaws in the Summer. Depending on the state of the ice conditions, can affect the types of response deployments. Although the conditions and probabilities are similar to what was mentioned in spill site variables, it is important to consider, that these conditions may change based on the where the base is located and where the oil spill site is located.

The states of the '*Sea Ice Conditions at Base'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4.10 Response Arrival Time to Oil Site

The variable '*Response Arrival Time to Oil Site*' has '*Preparation Time'*, '*Response Asset'*, *'Route Conditions on Water'*, '*Route Conditions on Air'*, and '*Route Distance to Oil Site*' as its parent node, and it diverges to the following nodes: '*Base Operability'* for each response type sub-models. This variable can be interpreted as the time it takes for responders to arrive at the oil spill site with appropriate equipment. The total time it takes for the responders to arrive at the oil spill site can affect the oil spill conditions as well as how effective the selected response equipment's operability(Fisheries and Oceans Canada, 2020; Government of Canada, 2021; L. Lu, 2021; Prevention & Response (EPPR), 2017). Anything longer than 3 days can lead to difficulty in effectively responding to the oil spills.

The states of the '*Response Arrival Time to Oil* Site' and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4.11 Route conditions on Air

The variable '*Route Conditions on Air'* is interpreted as the atmosphere conditions en route to the direction of the oil spill site. This variable has '*Visibility at Base'* and '*Wind Speed at Base'* as its' parent node and diverges to the following node: '*Response Arrival time to Oil Site'*.

The states of the variable '*Route Conditions on Air'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4.12 Route Distance to Oil Site

The variable '*Route Distance to Oil Site'* has '*Port Location'* and '*Oil Spill Location'* as its parent node and diverges to the following node: '*Response Arrival Time to Oil Site'*. This variable is interpreted as the distance from where the responders are deployed to the oil spill location.

As per what is defined by the variables based on the '*Oil Spill Location'* in Section 5.2.6, and for the Port's Location in Section 5.4.3, the '*Route Distance to Oil Site'* is considered near if the distance is around 1000 km or less, between 1000 km and 2000 km if its average, and 2000 km or more for far.

The states of the variable '*Route Distance to Oil Site'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4.13 Route Conditions on Water

The variable '*Route Conditions on Water'* is interpreted as the water conditions en route to the direction of the oil spill site. This variable has '*Wave Conditions at Base'*, '*Temperature at Base'*, and '*Sea Ice Conditions at Base'* as its parent nodes and diverges to the following node: *'Response Arrival Time to Oil Site'*.

The states of the variable '*Route Conditions on Water'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.4.14 Response Asset

The variable '*Response Asset'* is a parent node and diverges to the following node: '*Mechanical SM 1 Effectiveness', 'Mechanical SM 2 Effectiveness', 'Mechanical SM 3 Effectiveness', 'Mechanical SM 4 Effectiveness', 'Chemical Dispersion SM 1 Effectiveness', 'Chemical Dispersion SM 2 Effectiveness', 'Chemical Dispersion SM 3 Effectiveness', 'In-Situ Burning SM 1 Effectiveness', 'In-Situ Burning SM 2 Effectiveness'*, and '*In-Situ Burning SM 3 Effectiveness'*. This variable is defined as the response transportation equipment selected based on the three different response types considered for this model: mechanical recovery, in-situ burning and chemical dispersion.

The states of the variable '*Response Asset'* and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.5 Response Related Variables

This section will describe the 10 unique sub-models created for each alternative response type, within the broader response classes of mechanical recovery, chemical dispersant, and in-situ burning selected for this model. As what was previously stated, mechanical recovery is currently the main and preferred method of response in the Canadian Arctic, but the other two response types have resources available at specific locations, although not in as big quantity as mechanical recovery.

The model considers four variations of mechanical recovery : two vessels with boom, single vessel with outrigger, three vessels-of-opportunity with boom, and single vessel in ice (ITOPF, n.d.-b; Prevention & Response (EPPR), 2017). Three variations of the in-situ burning response categories are considered: vessels with fire boom, helicopter with ice containment, and helicopter with herders. Three variations of chemical dispersant response methods are distinguished: vessel application, airplane application, and helicopter application. These oil responses capabilities and limitations are based on a comparison grid use in the Circumpolar Oil Spill Response Viability Analysis Phase II (COSRVA II).

The table below showcases a glossary of the abbreviations of the names of the sub-models used for the created Bayesian Network model OSRECA.

Table 17 Acronyms and their abbreviation for the sub-model

Abbreviation	
Mech SM 1	Mechanical Response Selection Sub-Model 1: Two vessels with boom
Mech SM 2	Mechanical Response Selection Sub-Model 2: Single Vessel with Outrigger
Mech SM 3	Mechanical Response Selection Sub-Model 3: Single Vessel in Ice
Mech SM 4	Mechanical Response Selection Sub-Model 4: Three Vessels of Opportunity with boom
Chem SM 1	Chemical Response Selection Sub-Model 1: Vessel application
Chem SM 2	Chemical Response Selection Sub-Model 2: Airplane application
Chem SM 3	Chemical Response Selection Sub-Model 3: Helicopter application

In-Situ SM 1	In-Situ Burning Response Selection Sub-Model 1: Vessels with fire boom
In-Situ SM 2	In-Situ Burning Response Selection Sub-Model 2: Helicopter with ice containment
In-Situ SM 3	In-Situ Burning Response Selection Sub-Model 3: Helicopter with herders

It is important to note that as per the sub-models created, duplicate variables for each sub-model were created to add clarity when a viewer focuses on each sub-model per response type and its related links. Table 18 below presents a list of the duplicate variable per all ten sub-models or response types used for the OSRECA BN model, as well as where to find information on the definition and links connected to this variable. For all information on the probability and state of the response related variables please refer to Appendix E: OSRECA Variables' States and Probabilities., while states and information related to the duplicate variables are found in Appendix F: OSRECA Duplicate Variables' States and Probabilities.

Table 18 List of duplicate variables for each sub-model of the OSRECA BN model, and original variable reference

Sub-Model	Duplicate Variable	Original Variable	Section
Mech SM 1	Ice Coverage at Site Mech SM 1 Copy	Ice Coverage at Site	5.3.4
	Mech SM 1 Spill Size	Oil Spill Size	5.2.4
	Mech SM 1 Oil persistence	Oil Persistence	5.2.3
	Mech SM 1 Oil Position	Oil Position	5.2.5
	Mech SM 1 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	Mech SM 1 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	Mech SM 1 Temperature at Base	Temperature at Base	5.4.7
	Mech SM 1 Temperature at Site	Temperature at Site	5.3.2
	Mech SM 1 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	Mech SM 1 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site Mech SM 1	Visibility at Site	5.3.1
	Wave Conditions at Site Mech SM 1 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site Mech SM 1 Copy	Wind Speed at Site	5.3.5
Mech SM 2	Ice Coverage at Site Mech SM 2 Copy	Ice Coverage at Site	5.3.4
	Mech SM 2 Spill Size	Oil Spill Size	5.2.4
	Mech SM 2 Oil persistence	Oil Persistence	5.2.3
	Mech SM 2 Oil Position	Oil Position	5.2.5
	Mech SM 2 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	Mech SM 2 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	Mech SM 2 Temperature at Base	Temperature at Base	5.4.7
	Mech SM 2 Temperature at Site	Temperature at Site	5.3.2
	Mech SM 2 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	Mech SM 2 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site Mech SM 2	Visibility at Site	5.3.1
	Wave Conditions at Site Mech SM 2 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site Mech SM 2 Copy	Wind Speed at Site	5.3.5

Sub-Model	Duplicate Variable	Original Variable	Section
Mech SM 3	Ice Coverage at Site Mech SM 3 Copy	Ice Coverage at Site	5.3.4
	Mech SM 3 Spill Size	Oil Spill Size	5.2.4
	Mech SM 3 Oil persistence	Oil Persistence	5.2.3
	Mech SM 3 Oil Position	Oil Position	5.2.5
	Mech SM 3 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	Mech SM 3 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	Mech SM 3 Temperature at Base	Temperature at Base	5.4.7
	Mech SM 3 Temperature at Site	Temperature at Site	5.3.2
	Mech SM 3 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	Mech SM 3 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site Mech SM 3	Visibility at Site	5.3.1
	Wave Conditions at Site Mech SM 3 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site Mech SM 3 Copy	Wind Speed at Site	5.3.5
Mech SM 4	Ice Coverage at Site Mech SM 4 Copy	Ice Coverage at Site	5.3.4
	Mech SM 4 Spill Size	Oil Spill Size	5.2.4
	Mech SM 4 Oil persistence	Oil Persistence	5.2.3
	Mech SM 4 Oil Position	Oil Position	5.2.5
	Mech SM 4 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	Mech SM 4 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	Mech SM 4 Temperature at Base	Temperature at Base	5.4.7
	Mech SM 4 Temperature at Site	Temperature at Site	5.3.2
	Mech SM 4 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	Mech SM 4 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site Mech SM 4	Visibility at Site	5.3.1
	Wave Conditions at Site Mech SM 4 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site Mech SM 4 Copy	Wind Speed at Site	5.3.5

Sub-Model	Duplicate Variable	Original Variable	Section
Chem SM 1	Ice Coverage at Site Chem SM 1 Copy	Ice Coverage at Site	5.3.4
	Chem SM 1 Spill Size	Oil Spill Size	5.2.4
	Chem SM 1 Oil persistence	Oil Persistence	5.2.3
	Chem SM 1 Oil Position	Oil Position	5.2.5
	Chem SM 1 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	Chem SM 1 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	Chem SM 1 Temperature at Base	Temperature at Base	5.4.7
	Chem SM 1 Temperature at Site	Temperature at Site	5.3.2
	Chem SM 1 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	Chem SM 1 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site Chem SM 1	Visibility at Site	5.3.1
	Wave Conditions at Site Chem SM 1 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site Chem SM 1 Copy	Wind Speed at Site	5.3.5
Chem SM 2	Ice Coverage at Site Chem SM 2 Copy	Ice Coverage at Site	5.3.4
	Chem SM 2 Spill Size	Oil Spill Size	5.2.4
	Chem SM 2 Oil persistence	Oil Persistence	5.2.3
	Chem SM 2 Oil Position	Oil Position	5.2.5
	Chem SM 2 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	Chem SM 2 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	Chem SM 2 Temperature at Base	Temperature at Base	5.4.7
	Chem SM 2 Temperature at Site	Temperature at Site	5.3.2
	Chem SM 2 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	Chem SM 2 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site Chem SM 2	Visibility at Site	5.3.1
	Wave Conditions at Site Chem SM 2 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site Chem SM 2 Copy	Wind Speed at Site	5.3.5

Sub-Model	Duplicate Variable	Original Variable	Section
Chem SM 3	Ice Coverage at Site Chem SM 3 Copy	Ice Coverage at Site	5.3.4
	Chem SM 3 Spill Size	Oil Spill Size	5.2.4
	Chem SM 3 Oil persistence	Oil Persistence	5.2.3
	Chem SM 3 Oil Position	Oil Position	5.2.5
	Chem SM 3 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	Chem SM 3 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	Chem SM 3 Temperature at Base	Temperature at Base	5.4.7
	Chem SM 3 Temperature at Site	Temperature at Site	5.3.2
	Chem SM 3 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	Chem SM 3 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site Chem SM 3	Visibility at Site	5.3.1
	Wave Conditions at Site Chem SM 3 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site Chem SM 3 Copy	Wind Speed at Site	5.3.5
In-Situ SM 1	Ice Coverage at Site In-Situ SM 1 Copy	Ice Coverage at Site	5.3.4
	In-Situ SM 1 Spill Size	Oil Spill Size	5.2.4
	In-Situ SM 1 Oil persistence	Oil Persistence	5.2.3
	In-Situ SM 1 Oil Position	Oil Position	5.2.5
	In-Situ SM 1 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	In-Situ SM 1 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	In-Situ SM 1 Temperature at Base	Temperature at Base	5.4.7
	In-Situ SM 1 Temperature at Site	Temperature at Site	5.3.2
	In-Situ SM 1 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	In-Situ SM 1 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site In-Situ SM 1	Visibility at Site	5.3.1
	Wave Conditions at Site In-Situ SM 1 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site In-Situ SM 1 Copy	Wind Speed at Site	5.3.5

Sub-Model	Duplicate Variable	Original Variable	Section
In-Situ SM 2	Ice Coverage at Site In-Situ SM 2 Copy	Ice Coverage at Site	5.3.4
	In-Situ SM 2 Spill Size	Oil Spill Size	5.2.4
	In-Situ SM 2 Oil persistence	Oil Persistence	5.2.3
	In-Situ SM 2 Oil Position	Oil Position	5.2.5
	In-Situ SM 2 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	In-Situ SM 2 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	In-Situ SM 2 Temperature at Base	Temperature at Base	5.4.7
	In-Situ SM 2 Temperature at Site	Temperature at Site	5.3.2
	In-Situ SM 2 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	In-Situ SM 2 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site In-Situ SM 2	Visibility at Site	5.3.1
	Wave Conditions at Site In-Situ SM 2 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site In-Situ SM 2 Copy	Wind Speed at Site	5.3.5
In-Situ SM 3	Ice Coverage at Site In-Situ SM 3 Copy	Ice Coverage at Site	5.3.4
	In-Situ SM 3 Spill Size	Oil Spill Size	5.2.4
	In-Situ SM 3 Oil persistence	Oil Persistence	5.2.3
	In-Situ SM 3 Oil Position	Oil Position	5.2.5
	In-Situ SM 3 Response Arrival Time to Oil Site	Response Arrival Time to Oil Site	5.4.10
	In-Situ SM 3 Sea Ice Conditions at Base	Sea Ice Conditions at Base	5.4.9
	In-Situ SM 3 Temperature at Base	Temperature at Base	5.4.7
	In-Situ SM 3 Temperature at Site	Temperature at Site	5.3.2
	In-Situ SM 3 Wave Conditions at Base	Wave Conditions at Base	5.4.2
	In-Situ SM 3 Wind Speed at Base	Wind Speed at Base	5.4.8
	Visibility at Site In-Situ SM 3	Visibility at Site	5.3.1
	Wave Conditions at Site In-Situ SM 3 Copy	Wave Conditions at Site	5.3.3
	Wind Speed at Site In-Situ SM 3 Copy	Wind Speed at Site	5.3.5

5.5.1 Mechanical Response Selection Sub-Model 1: Two vessels with boom

5.5.1.1 Mech SM 1 Shipping Act

'Mechanical Sub-Model 1 Shipping Act' is a variable created in relation to the Shipping Act Law. It diverges to the following: '*Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability'*. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.1.2 Mech SM 1 Water Conditions Operability

The variable '*Mech SM 1 Water Conditions Operability'* has '*Wave Conditions at Site Mech SM 1'* and '*Ice Coverage at Site Mech SM 1'* as its parent nodes and diverges to the following node: '*Mechanical SM 1 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, two vessels with boom, is effective based on the selected water-related conditions at the oil spill site. This information is what is considered to evaluate if the water conditions operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective.

Table below showcases the state description of '*Mech SM 1Water Conditions Operability'*.

Table 19 Table of Water Conditions Operability and their corresponding description

States	Description
Low	▪ Open and calm water conditions ▪ Open Pack Ice
Medium	▪ Water wave heights are up to 1m ▪ Open to little ice around
Severe	▪ Rough waves >2m ▪ Rough ice conditions ▪ Closed pack ice

5.5.1.3 Mech SM 1 Weather Conditions Operability

The variable *Mech SM 1 Weather Conditions Operability* has *Mech SM 1 Visibility at Site, Mech SM 1 Temperature at Site, and Mech SM 1 Wind Speed at Site* as its parent nodes and diverges to the following node: Mechanical SM 1 Response Effectiveness. This variable is interpreted as how the specified response equipment, two vessels with boom, is effective based on the selected weather-related conditions at the oil spill site. This information is what is considered to evaluate if Weather Conditions Operability is Good, Medium, or Poor. Good meaning it is effective, and Poor meaning it is not effective.

The table below showcases the states description of *Mech SM 1 Weather Conditions Operability* for Mechanical Response sub-models.

Table 20 Table of states and its corresponding description for Mechanical Response sub-models

States	Description
Low	▪ Calm wind conditions ▪ High Visibility (Daylight) ▪ Air Temperature > -5 ºC
Medium	▪ Air Temperature between -5 ºC and -18 ºC ▪ Low visibility (Dark) ▪ Normal wind Conditions
Severe	▪ No visibility (Dark) ▪ Rough wind Conditions ▪ Air Temperature <-18 ºC

5.5.1.4 Mech SM 1 Base Operability

The variable Mech SM 1 Base Operability has Mech SM 1 Temperature at Base, Mech SM 1 Wind Speed at Base, Mech SM 1 Sea Ice Conditions at Base, Mech SM 1 Wave Conditions at Base as its parent nodes and diverges to the following node: Mech SM 1 Response Effectiveness. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height, and temperature.

5.5.1.5 Mech SM 1: Offshore Response Vessel & Vessel of Opportunity to Tow Boom Base Transport Operability

The variable Mech SM 1: Offshore Response Vessel & Vessel of Opportunity to Tow Boom Base Transport Operability has Mech SM 1 Response Arrival Time to Oil Site, Mech SM 1 Oil Position, and Mech SM 1 Shipping Act as its parent nodes and diverges to the following node: Mech SM 1 Response Effectiveness. This variable is interpreted as how the specified response transport equipment, offshore response vessel and vessel of opportunity, is effective based on the transportation-related variables. This information is what is considered to evaluate if the Base Transport Operability for Mech SM 1 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective.

When looking at using mechanical recovery in the Arctic and its challenges, wind conditions can affect the ability to release and retrieve parts of the equipment, and the ability to store oil (North Slope Spill Response, 2015). Sea state or water conditions in the Arctic can lead to difficulty due to high waves as it challenges the storage of the oil and the release, use, and retrieval of the equipment. Temperature can cause several parts of the equipment to freeze leading to it potentially clogging the equipment and it failing to function. Sea ice coverage conditions can affect the ability to release, use, and retrieve parts of the equipment as it may get stuck between the ice and become inefficient in its recovery process (Prevention & Response (EPPR), 2017). However, sea ice may also assist in the recovery of the oil as it creates a natural barrier to contain the oil if the ice does not overwhelm the equipment parts.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: Mech SM 1 Oil Spill Response Equipment Operability, Mech SM 1 Weather Conditions Operability, and Mech SM 1 Water Conditions Operability.

5.5.1.6 Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability

The variable '*Mech SM 1 Oil Response Equipment Operability'* has '*Mech SM 1 Oil Position', 'Mech SM 1 Oil Spill Size'*, and '*Mech SM 1 Oil Persistence'* as its' parent node and diverges to the following node: '*Mech SM 1 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, boom and high volume oleophilic skimmer, is effective based on the oil-related variables. This information is what is considered to evaluate if the '*Mech SM 1Oil Spill Response Equipment Operability'* is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective.

5.5.2 Mechanical Response Selection Sub-Model 2: Single Vessel with Outrigger

5.5.2.1 Mech SM 2 Shipping Act

'Mech SM 2 Shipping Act' is a variable created in relation to the Shipping Act Law. It diverges to the following '*Mech SM 2: Offshore response vessel Base Transport Operability'*. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.2.2 Mech SM 2 Weather Conditions Operability

The variable Weather Conditions Operability has Mech SM 2 Visibility at Site, Mech SM 2 Temperature at Site, and Mech SM 2 Wind Speed at Site as its parent nodes and diverges to the following node: Mechanical SM 2 Response Effectiveness. This variable is interpreted as how the specified response equipment, single vessel with outrigger, is effective based on the selected weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective.

5.5.2.3 Mech SM 2 Water Conditions Operability

The variable Mech SM 2 Water Conditions Operability has Wave Conditions at Site Mech SM 2 and Ice Coverage at Site Mech SM 2 as its parent nodes and diverges to the following node: Mechanical SM 1 Response Effectiveness. This variable is interpreted as how the specified response equipment, single vessel with outrigger, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective.

5.5.2.4 Mech SM 2 Base Operability

The variable '*Mech SM 2 Base Operability'* has '*Mech SM 2 Temperature at Base', 'Mech SM 2 Wind Speed at Base', 'Mech SM 2 Sea Ice Conditions at Base',* and *'Mech SM 2 Wave Conditions at Base'* as its parent nodes and diverges to the following node: '*Mech SM 2 Response Effectiveness'*. This variable groups together all variables related to oil responders and equipment set-up and provides an answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors such as water temperature, wind velocity, wave height, and temperature.

5.5.2.5 Mech SM 2: Offshore Response Vessel Base Transport Operability

The variable '*Mech SM 2: Offshore Response Vessel Base Transport Operability'* has *'Mech SM 2 Response Arrival Time to Oil Site', 'Mech SM 2 Oil Position',* and *'Mech SM 2 Shipping Act'* as its parent node and diverges to the following node: *'Mech SM 2 Response Effectiveness'*. This variable is interpreted as how the specified response transport equipment, offshore response vessel, is effective based on the transportation-related variables. This information is what is considered to evaluate if the Base Transport Operability for Mech SM 2 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: '*Mech SM 2 Oil Spill Response Equipment Operability', 'Mech SM 2 Weather Conditions Operability', and 'Mech SM 2 Water Conditions Operability'*. The table below showcases the states of '*Mech SM 2: Offshore Response Vessel'* and their related probabilities.

5.5.2.6 Mech SM 2: Boom & Weir skimmer Oil Response Equipment Operability

The variable *'Mech SM 2 Oil Response Equipment Operability'* has *'Mech SM 2 Oil Position', 'Mech SM 2 Oil Spill Size',* and *'Mech SM 2 Oil Persistence*' as its' parent node and diverges to the following node: '*Mech SM 2 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, boom & weir skimmer, is effective based on the oil-related variables. This information is what is considered to evaluate if the Oil Spill Response Equipment Operability for Mech SM 2 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective.

5.5.3 Mechanical Response Selection Sub-Model 3: Single Vessel in Ice

5.5.3.1 Mech SM 3 Water Conditions Operability

The variable *'Mech SM 3 Water Conditions Operability'* has '*Wave Conditions at Site Mech SM 3'* and *'Ice Coverage at Site Mech SM 3'* as its' parent node and diverges to the following node: '*Mechanical SM 3 Response Effectiveness*'. This variable is interpreted as how the specified response equipment, single vessel in ice, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.3.2 Mech SM 3 Weather Conditions Operability

The variable '*Mech SM 3 Weather Conditions Operability*' has '*Mech SM 3 Visibility at Site', 'Mech SM 3 Temperature at Site',* and *'Mech SM 3 Wind Speed at Site'* as its' parent node and diverges to the following node: '*Mechanical SM 3 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, single vessel in ice, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

5.5.3.3 Mech SM 3 Base Operability

The variable '*Mech SM 3 Base Operability'* has *'Mech SM 3 Temperature at Base', 'Mech SM 3 Wind Speed at Base', 'Mech SM 3 Sea Ice Conditions at Base', 'Mech SM 3 Wave Conditions at Base'* as its' parent node and diverges to the following node: *'Mech SM 3 Response Effectiveness'*. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.3.4 Mech SM 3: Vessels of Opportunity Base Transport Operability

The variable '*Mech SM 3: Vessels of Opportunity Base Transport Operability'* has '*Mech SM 3 Response Arrival Time to Oil Site'*, '*Mech SM 3 Oil Position'*, and '*Mech SM 3 Shipping Act'* as its' parent node and diverges to the following node: '*Mech SM 3 Response Effectiveness'*. This variable is interpreted as how the specified response transport equipment, vessels of opportunity, is effective based on the transportation-related variables. This information is what's considered to evaluate if the Base Transport Operability for Mech SM 3 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: '*Mech SM 3 Oil Spill Response Equipment Operability', 'Mech SM 3 Weather Conditions Operability', and 'Mech SM 3 Water Conditions Operability'.*

5.5.3.5 Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability

The variable '*Mech SM 3 Oil Response Equipment Operability'* has '*Mech SM 3 Oil Position, Mech SM 3 Oil Spill Size',* and *'Mech SM 3 Oil Persistence'* as its' parent node and diverges to the following node: '*Mech SM 3 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, boom & oleophilic skimmer, is effective based on the oil-related variables. This information is what's considered to evaluate if the Oil Spill Response Equipment Operability for Mech SM 3 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.3.6 Mech SM 3 Shipping Act

'*Mech SM 3 Shipping Act'* is a variable created in relation to the Shipping Act Law. It diverges to the following '*Mech SM 3: Vessels of opportunity Base Transport Operability'*. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.4 Mechanical Response Selection Sub-Model 4: Three Vessels of Opportunity with boom

5.5.4.1 Mech SM 4 of Shipping Act

'*Mech SM 4 Shipping Act'* is a variable created in relation to the Shipping Act Law. It diverges to the following '*Mech SM 4: Ice-class, offshore, response vessel Base Transport Operability*'. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.4.2 Mech SM 4 Weather Conditions Operability

The variable '*Mech SM 4 Weather Conditions Operability'* has '*Mech SM 4 Visibility at Site', 'Mech SM 4 Temperature at Site',* and '*Mech SM 4 Wind Speed at Site'* as its' parent node and diverges to the following node: '*Mechanical SM 4 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, three vessels of opportunity with boom, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

5.5.4.3 Mech SM 4 Water Conditions Operability

The variable '*Mech SM 4 Water Conditions Operability'* has '*Wave Conditions at Site Mech SM 4'* and '*Ice Coverage at Site Mech SM 4'* as its' parent node and diverges to the following node: '*Mechanical SM 4 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, three vessels of opportunity with boom, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.4.4 Mech SM 4 Base Operability

The variable '*Mech SM 4 Base Operability' has 'Mech SM 4 Temperature at Base', 'Mech SM 4 Wind Speed at Base', 'Mech SM 4 Sea Ice Conditions at Base',* and *'Mech SM 4 Wave Conditions at Base*' as its' parent node and diverges to the following node: '*Mech SM 4 Response Effectiveness*'. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.4.5 Mech SM 4: Ice-class, Offshore Response Vessel Base Transport Operability

The variable '*Mech SM 4: Ice-class, Offshore Response Vessel Base Transport Operability'* has '*Mech SM 4 Response Arrival Time to Oil Site', 'Mech SM 4 Oil Position*', and *'Mech SM 4 Shipping Act'* as its' parent node and diverges to the following node: '*Mech SM 4 Response Effectiveness*'. This variable is interpreted as how the specified response transport equipment, offshore response vessel, is effective based on the transportation-related variables. This information is what's considered to evaluate if the *'Base Transport Operability for Mech SM 4'* is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

Based on what was defined and what has been researched in Section 5, these aspects are what will also be considered in the other variables: '*Mech SM 4 Oil Spill Response Equipment Operability', 'Mech SM 4 Weather Conditions Operability',* and *'Mech SM 4 Water Conditions Operability'*. The table below showcases the states of *'Mech SM 4: Ice-class, Offshore Response Vessel',* and its related probability.

5.5.4.6 Mech SM 4: Skimming system Oil Response Equipment Operability

The variable '*Mech SM 4 Oil Response Equipment Operability'* has '*Mech SM 4 Oil Position', 'Mech SM 4 Oil Spill Size'*, and '*Mech SM 4 Oil Persistence'* as its' parent node and diverges to the following node: '*Mech SM 4 Response Effectiveness*'. This variable is interpreted as how the specified response equipment, skimming system, is effective based on the oil-related variables. This information is what's considered to evaluate if the '*Oil Spill Response Equipment Operability for Mech SM 4'* is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

The table below showcases the states of Oil Spill Response Equipment Operability and its related probability.

5.5.5 Chemical Response Selection Sub-Model 1: Vessel application

5.5.5.1 Chem SM 1 Shipping Act

'Chemical SM 1 Shipping Act' is a variable created in relation to the Shipping Act Law. It diverges to the following '*Chem SM 1: response vessel Base Transport Operability*'. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.5.2 Chem SM 1 Water Conditions Operability

The variable '*Chem SM 1 Water Conditions Operability'* has '*Wave Conditions at Site Chem SM 1'* and '*Ice Coverage at Site Chem SM 1'* as its' parent node and diverges to the following node: '*Chemical SM 1 Response Effectiveness*'. This variable is interpreted as how the specified response equipment, vessel application, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.5.3 Chem SM 1 Weather Conditions Operability

The variable *Weather Conditions Operability* has *'Chem SM 1 Visibility at Site', 'Chem SM 1 Temperature at Site',* and *'Chem SM 1 Wind Speed at Site'* as its' parent node and diverges to the following node: '*Chemical SM 1 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, vessel application, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

Table 21 below showcases the states description of Weather Conditions Operability for Chemical Dispersant Response sub-models.

Table 21 Table of states and its corresponding description for Mechanical Response sub-models

States	Description
Low	▪ Calm wind conditions ▪ High Visibility (Daylight) ▪ Air Temperature > -40 ºC
Medium	▪ Air Temperature between -40 ºC and -40 ºC ▪ Normal Visibility ▪ Normal Wind Conditions
Severe	▪ Low visibility (Dark) ▪ Rough wind Conditions ▪ Air Temperature <-40 ºC

5.5.5.4 Chem SM 1 Base Operability

The variable '*Chem SM 1 Base Operability'* has '*Chem SM 1 Temperature at Base', 'Chem SM 1 Wind Speed at Base', 'Chem SM 1 Sea Ice Conditions at Base', 'Chem SM 1 Wave Conditions at Base'* as its' parent node and diverges to the following node: '*Chem SM 1 Response Effectiveness'*. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.5.5 Chem SM 1: Response Vessel Base Transport Operability

The variable '*Chem SM 1: Response Vessel Base Transport Operability'* has '*Chem SM 1 Response Arrival Time to Oil Site', 'Chem SM 1 Oil Position'*, and '*Chem SM 1 Shipping Act'* as its' parent node and diverges to the following node*: 'Chem SM 1 Response Effectiveness*'. This variable is interpreted as how the specified response transport equipment, response vessel, is effective based on the transportation-related variables. This information is what's considered to evaluate if the Base Transport Operability for Chem SM 1 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

Dispersant's response effectiveness can be estimated by considering the oil properties and weather conditions at the site of the oil spill (Prevention & Response (EPPR), 2017). When solely focusing on chemical dispersion, the chemical properties of the oil spill are important or the type of oil spill so as to figure out whether the oil is dispersible or not. Once one realizes the oil spill is dispersible, aspects such as making sure that sufficient assets are available, including the chemical dispersant itself but also equipment, and trained personnel for its deployment are important to consider (Fingas, 2014; Liu & Callies, 2020; *ITOPF*, 2014). The type of dispersant used can also be impacted as too strong winds can prevent the sprayed dispersant droplets from reaching the oil.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: '*Chem SM 1 Oil Spill Response Equipment Operability', 'Chem SM 1 Weather Conditions Operability', and 'Chem SM 1 Water Conditions Operability'*.

5.5.5.6 Chem SM 1: Dispersant spray arms Oil Response Equipment Operability

The variable '*Chem SM 1 Oil Response Equipment Operability'* has '*Chem SM 1 Oil Position', 'Chem SM 1 Oil Spill Size'*, and *'Chem SM 1 Oil Persistence'* as its' parent node and diverges to the following node: '*Chem SM 1 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, dispersant spray arms, is effective based on the oil-related variables. This information is what's considered to evaluate if the Oil Spill Response Equipment Operability for Chem SM 1 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.6 Chemical Response Selection Sub-Model 2: Airplane application

5.5.6.1 Chem SM 2 Shipping Act

'Chem SM 2 Shipping Act' is a variable created in relation to the Shipping Act Law. It diverges to the following '*Chem SM 2: Multi-engine fixed-wing, aircraft, one for dispersant application, one for aerial spotting Base Transport Operability'*. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.6.2 Chem SM 2 Weather Conditions Operability

The variable '*Chem SM 2 Weather Conditions Operability'* has *'Chem SM 2 Visibility at Site', 'Chem SM 2 Temperature at Site*', and '*Chem SM 2 Wind Speed at Site'* as its' parent node and diverges to the following node: '*Chemical SM 2 Response Effectiveness*'. This variable is interpreted as how the specified response equipment, airplane application, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

5.5.6.3 Chem SM 2 Water Conditions Operability

The variable '*Chem SM 2 Water Conditions Operability'* has '*Wave Conditions at Site Chem SM 2*' and '*Ice Coverage at Site Chem SM 2'* as its' parent node and diverges to the following node: '*Chem SM 2 Response Effectiveness*'. This variable is interpreted as how the specified response equipment, airplane application, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.6.4 Chem SM 2 Base Operability

The variable *'Chem SM 2 Base Operability'* has 'Chem SM 2 Temperature at Base', '*Chem SM 2 Wind Speed at Base', 'Chem SM 2 Sea Ice Conditions at Base',* and *'Chem SM 2 Wave Conditions at Base'* as its' parent node and diverges to the following node: *'Chem SM 2 Response Effectiveness'*. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.6.5 Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant-application, one for aerial spotting Base Transport Operability

The variable '*Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant-application, one for aerial spotting Base Transport Operability'* has '*Chem SM 2 Response Arrival Time to Oil Site', 'Chem SM 2 Oil Position'*, and '*Chem SM 2 Shipping Act'* as its' parent node and diverges to the following node: '*Chem SM 2 Response Effectiveness'*. This variable is interpreted as how the specified response transport equipment, multi-engine fixed-wing aircraft, is effective based on the transportation-related variables. This information is what's considered to evaluate if the Base Transport Operability for Chem SM 2 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: '*Chem SM 2 Oil Spill Response Equipment*

Operability', '*Chem SM 2 Weather Conditions Operability'*, and '*Chem SM 2 Water Conditions Operability'*.

5.5.6.6 Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability

The variable *'Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability'* has *'Chem SM 2 Oil Position', 'Chem SM 2 Oil Spill Size'*, and '*Chem SM 2 Oil Persistence'* as its' parent node and diverges to the following node: '*Chem SM 2 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, aerial high-volume dispersant, is effective based on the oil-related variables. This information is what's considered to evaluate if the Oil Spill Response Equipment Operability for Chem SM 2 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.7 Chemical Response Selection Sub-Model 3: Helicopter application

5.5.7.1 Chem SM 3 Shipping Act

'Chemical SM 3 Shipping Act' is a variable created in relation to the Shipping Act Law. It diverges to the following '*Chem SM 3: Twin engine jet helicopter Base Transport Operability'*. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.7.2 Chem SM 3 Water Conditions Operability

The variable Chem SM 3 Water Conditions Operability has Wave Conditions at Site Chem SM 3 and Ice Coverage at Site Chem SM 3 as its' parent node and diverges to the following node: Chemical SM 3 Response Effectiveness. This variable is interpreted as how the specified response equipment, helicopter application, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.7.3 Chem SM 3 Weather Conditions Operability

The variable Weather Conditions Operability has Chem SM 3 Visibility at Site, Chem SM 3 Temperature at Site, and Chem SM 3 Wind Speed at Site as its' parent node and diverges to the following node: Chemical SM 3 Response Effectiveness. This variable is interpreted as how the specified response equipment, helicopter application, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

5.5.7.4 Chem SM 3 Base Operability

The variable Chem SM 3 Base Operability has Chem SM 3 Temperature at Base, Chem SM 3 Wind Speed at Base, Chem SM 3 Sea Ice Conditions at Base, Chem SM 3 Wave Conditions at Base as its' parent node and diverges to the following node: Chem SM 3 Response Effectiveness. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.7.5 Chem SM 3: Twin Engine Jet Helicopter Base Transport Operability

The variable Chem SM 3: Twin Engine Jet Helicopter Base Transport Operability has Chem SM 3 Response Arrival Time to Oil Site, Chem SM 3 Oil Position, and Chem SM 3 Shipping Act as its' parent node and diverges to the following node: Chem SM 3 Response Effectiveness. This variable is interpreted as how the specified response transport equipment, Twin engine jet helicopter, is effective based on the transportation-related variables. This information is what's considered to evaluate if the Base Transport Operability for Chem SM 3 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: Chem SM 3 Oil Spill Response Equipment Operability, Chem SM 3 Weather Conditions Operability, and Chem SM 3 Water Conditions Operability.

5.5.7.6 Chem SM 3: Aerial dispersant application Oil Response Equipment Operability

The variable Chem SM 3 Oil Response Equipment Operability has Chem SM 3 Oil Position, Chem SM 3 Oil Spill Size, and Chem SM 3 Oil Persistence as its' parent node and diverges to the following node: Chem SM 3 Response Effectiveness. This variable is interpreted as how the specified response equipment, aerial dispersant, is effective based on the oil-related variables. This information is what's considered to evaluate if the Oil Spill Response Equipment Operability for Chem SM 3 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.8 In-Situ Burning Response Selection Sub-Model 1: Vessels with fire boom

5.5.8.1 In-Situ Burning SM 1Shipping Act

'In-Situ Burning SM 1 Shipping Act' is a variable created in relation to the Shipping Act Law. It diverges to the following '*In-Situ Burning SM 1: vessels of opportunity Base Transport Operability*'. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.8.2 In-Situ Burning SM 1 Water Conditions Operability

The variable '*In-Situ Burning SM 1 Water Conditions Operability'* has '*Wave Conditions at Site In-Situ Burning SM 1'* and '*Ice Coverage at Site In-Situ Burning SM 1'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 1 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, vessels with fire boom, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.8.3 In-Situ Burning SM 1 Weather Conditions Operability

The variable '*In-Situ Burning SM 1 Weather Conditions Operability'* has '*In-Situ Burning SM 1 Visibility at Site', 'In-Situ Burning SM 1 Temperature at Site*', and '*In-Situ Burning SM 1 Wind Speed at Site'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 1 Response Effectiveness'.* This variable is interpreted as how the specified response equipment, vessels with fire boom, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

Table 22 below showcases the states description of Weather Conditions Operability for In-Situ Burning Response sub-models.

Table 22 Table of states and its corresponding description for In-Situ Burning Response sub-models

States	**Description**
Low	▪ Calm wind conditions ▪ High Visibility (Daylight) ▪ Air Temperature > -10 ºC
Medium	▪ Air Temperature between -10 ºC and -20 ºC ▪ Normal Visibility ▪ Normal Wind Conditions
Severe	▪ Low visibility (Dark) ▪ Rough wind Conditions ▪ Air Temperature <-20 ºC

5.5.8.4 In-Situ Burning SM 1 Base Operability

The variable '*In-Situ Burning SM 1 Base Operability'* has '*In-Situ Burning SM 1 Temperature at Base', 'In-Situ Burning SM 1 Wind Speed at Base', 'In-Situ Burning SM 1 Sea Ice Conditions at Base', 'In-Situ Burning SM 1 Wave Conditions at Base'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 1 Response Effectiveness'*.

This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.8.5 In-Situ Burning SM 1: Vessels of opportunity Base Transport Operability

The variable '*In-Situ Burning SM 1: Vessels of Opportunity Base Transport Operability'* has '*In-Situ Burning SM 1 Response Arrival Time to Oil Site*', '*In-Situ Burning SM 1 Oil Position*', and '*In-Situ Burning SM 1 Shipping Act'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 1 Response Effectiveness*'. This variable is interpreted as how the specified response transport equipment, Vessels of Opportunity, is effective based on the transportation-related variables. This information is what's considered to evaluate if the Base Transport Operability for In-Situ Burning SM 1 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

In the case for in-situ burning in the Arctic and its challenges, wind conditions can affect the ability to target where to ignite the equipment to the oil, leading to potentially harming the safety of the crew with the fire itself or the inhalation of smoke(*In Situ Burning*, 2019; *In Situ Burning*, 2019; Prevention & Response (EPPR), 2017). Sea state or wave conditions in the Arctic can lead to difficulty as high waves can prevent the containment of oil as well and lead to difficulty with releasing and retrieving parts of the equipment. With sea ice coverage, it can lead to difficulty with using the boom properly, but it may also aid as it can contain the oil naturally resulting in no need for the boom itself(Prevention & Response (EPPR), 2017).

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: '*In-Situ Burning SM 1 Oil Spill Response Equipment Operability', 'In-Situ Burning SM 1 Weather Conditions Operability'*, and '*In-Situ Burning SM 1 Water Conditions Operability'*.

5.5.8.6 In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability

The variable '*In-Situ Burning SM 1 Oil Response Equipment Operability'* has '*In-Situ Burning SM 1 Oil Position', 'In-Situ Burning SM 1 Oil Spill Size'*, and *'In-Situ Burning SM 1 Oil Persistence*' as its' parent node and diverges to the following node: '*In-Situ Burning SM 1 Response Effectiveness'.* This variable is interpreted as how the specified response equipment, fire boom & handheld gelled-fuel igniter, is effective based on the oil-related variables. This information is what's considered to evaluate if the Oil Spill Response Equipment Operability for In-Situ Burning SM 1 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

Currently, Fire Ignition are only available through the In-situ Burning response process. Appendix C: Response Variations and their limitations and E provides a more in-depth table about the response variations related to fire ignition and their limitations when responding to oil spills.

5.5.9 In-Situ Burning Response Selection Sub-Model 2: Helicopter with ice containment

5.5.9.1 In-Situ Burning SM 2 Shipping Act

In-Situ Burning Sub-Model 2 Shipping Act is a variable created in relation to the Shipping Act Law. It diverges to the following In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.9.2 In-Situ Burning SM 2 Weather Conditions Operability

The variable '*Weather Conditions Operability'* has '*In-Situ Burning SM 2 Visibility at Site', 'In-Situ Burning SM 2 Temperature at Site'*, and '*In-Situ Burning SM 2 Wind Speed at Site'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 2 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, helicopter with ice containment, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

5.5.9.3 In-Situ Burning SM 2 Water Conditions Operability

The variable '*In-Situ Burning SM 2 Water Conditions Operability'* has '*Wave Conditions at Site In-Situ Burning SM 2'* and '*Ice Coverage at Site In-Situ Burning SM 2'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 2 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, helicopter with ice containment, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.9.4 In-Situ Burning SM 2 Base Operability

The variable '*In-Situ Burning SM 2 Base Operability'* has *'In-Situ Burning SM 2 Temperature at Base', 'In-Situ Burning SM 2 Wind Speed at Base', 'In-Situ Burning SM 2 Sea Ice Conditions at Base'*, and *'In-Situ Burning SM 2 Wave Conditions at Base'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 2 Response Effectiveness'*. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.9.5 In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability

The variable '*In-Situ Burning SM 2: Twin Engine Jet Helicopter Base Transport Operability'* has '*In-Situ Burning SM 3 Response Arrival Time to Oil Site', 'In-Situ Burning SM 2 Oil Position'*, and *'Chem SM 2 Shipping Act'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 2 Response Effectiveness'*. This variable is interpreted as how the specified response transport equipment, Twin engine jet helicopter, is effective based on the transportation-related variables. This information is what's considered to evaluate if the Base Transport Operability for In-Situ Burning SM 3 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: '*In-Situ Burning SM 2 Oil Spill Response Equipment Operability', 'In-Situ Burning SM 2 Weather Conditions Operability',* and *'In-Situ Burning SM 2 Water Conditions Operability'*.

5.5.9.6 In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability

The variable '*In-Situ Burning SM 2 Oil Response Equipment Operability'* has '*In-Situ Burning SM 2 Oil Position', 'In-Situ Burning SM 2 Oil Spill Size',* and *'In-Situ Burning SM 2 Oil Persistence'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 2 Response Effectiveness*'. This variable is interpreted as how the specified response equipment, aerial ignition system, is effective based on the oil-related variables. This information is what's considered to evaluate if the Oil Spill Response Equipment Operability for In-Situ Burning SM 2 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.10 In-Situ Burning Response Selection Sub-Model 3: Helicopter with herders

5.5.10.1 In-Situ Burning SM 3 Shipping Act

'In-Situ Burning SM 3 Shipping Act' is a variable created in relation to the Shipping Act Law. It diverges to the following '*In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability'*. For more information on the definition and links connected to this variable, please refer to Section: 5.4.6 Shipping Act Law.

5.5.10.2 In-Situ Burning SM 3 Water Conditions Operability

The variable '*In-Situ Burning SM 3 Water Conditions Operability'* has '*Wave Conditions at Site In-Situ Burning SM 3*' and '*Ice Coverage at Site In-Situ Burning SM 3'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 3 Response Effectiveness*'. This variable is interpreted as how the specified response equipment, helicopter with herders, is effective based on the selected water-related conditions at the oil spill site. This information is what's considered to evaluate if Water Conditions Operability per the selected response equipment is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.5.10.3 In-Situ Burning SM 3 Weather Conditions Operability

The variable '*In-Situ Burning SM 3 Weather Conditions Operability'* has '*In-Situ Burning SM 3 Visibility at Site'*, *'In-Situ Burning SM 3 Temperature at Site',* and *'In-Situ Burning SM 3 Wind Speed at Site'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 3 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, helicopter with ice containment, is effective based on the selected Weather-related conditions at the oil spill site. This information is what's considered to evaluate if Weather Conditions Operability is Good, Medium or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected, if specified response was selected.

5.5.10.4 In-Situ Burning SM 3 Base Operability

The variable *'In-Situ Burning SM 3 Base Operability'* has '*In-Situ Burning SM 3 Temperature at Base', 'In-Situ Burning SM 3 Wind Speed at Base', 'In-Situ Burning SM 3 Sea Ice Conditions at Base',* and *'In-Situ Burning SM 3 Wave Conditions at Base'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 3 Response Effectiveness'*. This variable groups together all variables related to oil responders and equipment set-up, and answer on whether the base was functioning in a good, medium, or poor manner.

As what was previously explained throughout Section 5, oil-spill combatting type's effectiveness depends on different factors like water temperature, wind velocity, wave height and temperature.

5.5.10.5 In-Situ Burning SM 3: Twin Engine Jet Helicopter Base Transport Operability

The variable '*In-Situ Burning SM 3: Twin Engine Jet Helicopter Base Transport* Operability' has '*In-Situ Burning SM 3 Response Arrival Time to Oil Site', 'In-Situ Burning*

SM 3 Oil Position', and *'Chem SM 3 Shipping Act'* as its' parent node and diverges to the following node: '*In-Situ Burning SM 3 Response Effectiveness'*. This variable is interpreted as how the specified response transport equipment, Twin engine jet helicopter, is effective based on the transportation-related variables. This information is what's considered to evaluate if the Base Transport Operability for In-Situ Burning SM 3 is Good, Medium, or Poor. Good meaning it is effective, Medium is slightly effective, and Poor meaning it is not effective if specified response was selected.

Based on what was defined and what has been researched, these aspects are what will also be considered in the other variables: '*In-Situ Burning SM 3 Oil Spill Response Equipment Operability', 'In-Situ Burning SM 3 Weather Conditions Operability',* and *'In-Situ Burning SM 3 Water Conditions Operability'*.

5.5.10.6 In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability

The variable '*In-Situ Burning SM 3 Oil Response Equipment Operability'* has '*In-Situ Burning SM 3 Oil Position', 'In-Situ Burning SM 3 Oil Spill Size'*, and *'In-Situ Burning SM 3 Oil Persistence'* as its' parent node and diverges to the following node: *'In-Situ Burning SM 3 Response Effectiveness'*. This variable is interpreted as how the specified response equipment, aerial chemical herder and aerial ignition system, is effective based on the oil-related variables. This information is what's considered to evaluate if the Oil Spill Response Equipment Operability for In-Situ Burning SM 3 is Good or Poor. Good meaning it is effective, and Poor meaning it is not effective if specified response was selected.

5.6 Response Effectiveness

5.6.1 Mechanical SM 1 Effectiveness

The variable '*Mechanical SM 1 Effectiveness*' has '*Mech SM 1 Water Conditions Operability*', '*Mech SM 1 Weather Conditions Operability*', '*Mech SM 1 Base Operability*', '*Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability*', and '*Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability*' as its' parent node and diverges to the following node: '*Mechanical Response Equipment Effectiveness*'. This variable is defined as whether the selected response type, two vessels with boom, was effective in its clean up of the oil spill or not.

The states of the duplicate variable '*Mech SM 1 Effectiveness*' and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.2 Mechanical SM 2 Effectiveness

The variable '*Mechanical SM 2 Effectiveness*' has '*Mech SM 2 Weather Conditions Operability*', '*Mech SM 2 Water Conditions Operability*', '*Mech SM 2 Base Operability*', '*Mech SM 2: Offshore response vessel Base Transport Operability*', and '*Mech SM 2: Boom & Weir skimmer Oil Response Equipment Operability*' as its' parent node and diverges to the following node: '*Mechanical Response Equipment Effectiveness*'. This variable is defined as whether the selected response type, single vessel with outrigger, was effective in its clean up of the oil spill or not.

The states of the duplicate variable '*Mech SM 2 Effectiveness*' and their related probabilities can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.3 Mechanical SM 3 Effectiveness

The variable '*Mechanical SM 3 Effectiveness*' has '*Mech SM 3 Water Conditions Operability*', '*Mech SM 3 Weather Conditions Operability*', '*Mech SM 3 Base Operability*', '*Mech SM 3: Vessels of opportunity Base Transport Operability*', and '*Mech*

SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability' as its' parent node and diverges to the following node: '*Mechanical Response Equipment Effectiveness*'. This variable is defined as whether the selected response type, single vessel in ice, was effective in its clean up of the oil spill or not.

The states of the duplicate variable '*Mech SM 3 Effective*ness' and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.4 Mechanical SM 4 Effectiveness

The variable '*Mechanical SM 4 Effectiveness'* has '*Mech SM 4 Weather Conditions Operability', 'Mech SM 4 Water Conditions Operability', 'Mech SM 4 Base Operability', 'Mech SM 4: Ice-class, offshore response vessel Base Transport Operability'*, and '*Mech SM 4: Skimming system Oil Response Equipment Operability'* as its' parent node and diverges to the following node: Mechanical Response Equipment Effectiveness. This variable is defined as whether the selected response type, three vessels of opportunity with boom, was effective in its clean up of the oil spill or not. Section 6: Bayesian Network Model Assessment introduces the strength of evidence and a sensitivity analysis based on the model that was implemented.

The states of the duplicate variable '*Mech SM 4 Effective*ness' and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.5 Chemical Dispersion SM 1 Effectiveness

The variable '*Chemical Dispersion SM 1 Effectiveness'* has '*Chem SM 1 Water Conditions Operability', 'Chem SM 1 Weather Conditions Operability', 'Chem SM 1 Base Operability', 'Chem SM 1: Dispersant spray arms Oil Response Equipment Operability'*, and '*Chem SM 1: response vessel Base Transport Operability*' as its' parent node and diverges to the following node: Chemical Response Equipment Effectiveness. This variable is defined as whether the selected response type, vessel application, was effective in its clean up of the oil spill or not.

The duplicate variable '*Chemical SM 1 Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.6 Chemical Dispersion SM 2 Effectiveness

The variable '*Chemical Dispersion SM 2 Effectiveness'* has '*Chem SM 2 Weather Conditions Operability', 'Chem SM 2 Water Conditions Operability', 'Chem SM 2 Base Operability', 'Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant application, one for aerial spotting Base Transport Operability'*, and '*Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability'* as its' parent node and diverges to the following node: '*Chemical Response Equipment Effectiveness'*. This variable is defined as whether the selected response type, airplane application, was effective in its clean up of the oil spill or not.

The states of the duplicate variable *'Chemical SM 2 Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.7 Chemical Dispersion SM 3 Effectiveness

The variable '*Chemical Dispersion SM 3 Effectiveness'* has '*Chem SM 3 Water Conditions Operability*', '*Chem SM 3 Weather Conditions Operability', 'Chem SM 3 Base Operability', 'Chem SM 3: Twin engine jet helicopter Base Transport Operability', 'Chem SM 3: Aerial dispersant application Oil Response Equipment Operability'* as its' parent node and diverges to the following node: Chemical Response Equipment Effectiveness. This variable is defined as whether the selected response type, helicopter application, was effective in its clean up of the oil spill or not.

The states of the duplicate variable *'Chemical SM 3 Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.8 In-Situ Burning SM 1 Effectiveness

The variable *'In-Situ Burning SM 1 Effectiveness'* has '*In-Situ Burning SM 1 Water Conditions Operability*', '*In-Situ Burning SM 1 Weather Conditions Operability', 'In-Situ Burning SM 1 Base Operability', 'In-Situ Burning SM 1: Vessels of Opportunity Base Transport Operability'*, and '*In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability*' as its' parent node and diverges to the following node: '*In-Situ Burning Response Equipment Effectiveness*'. This variable is defined as whether the selected response type, vessels with fire boom, was effective in its clean up of the oil spill or not.

The states of the duplicate variable *'In-Situ Burning SM 1 Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.9 In-Situ Burning SM 2 Effectiveness

The variable '*In-Situ Burning SM 2 Effectiveness'* has '*In-Situ Burning SM 2 Weather Conditions Operability', 'In-Situ Burning SM 2 Water Conditions Operability', 'In-Situ Burning SM 2 Base Operability', 'In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability',* and *'In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability'* as its' parent node and diverges to the following node: *'In-Situ Burning Response Equipment Effectiveness'.* This variable is defined as whether the selected response type, helicopter with ice containment, was effective in its clean up of the oil spill or not.

The states of the duplicate variable *'In-Situ Burning SM 2 Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.10 In-Situ Burning SM 3 Effectiveness

The variable '*In-Situ Burning SM 3 Effectiveness'* has '*In-Situ Burning SM 3 Water Conditions Operability'*, '*In-Situ Burning SM 3 Weather Conditions Operability'*, '*In-Situ Burning SM 3 Base Operability'*, '*In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability'*, and '*In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability'* and diverges to the following node: '*In-Situ Burning Response Equipment Effectiveness*'. This variable is defined as whether the selected response type, helicopter with herders, was effective in its clean up of the oil spill or not.

The states of the duplicate variable *'In-Situ Burning SM 3 Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.11 Mechanical Response Equipment Effectiveness

The variable '*Mechanical Response Equipment Effectiveness'* has '*Mechanical SM 1 Effectiveness', 'Mechanical SM 2 Effectiveness', 'Mechanical SM 3 Effectiveness'*, and *'Mechanical SM 4 Effectiveness'* as its' parent node and diverges to the following node: '*Overall Response Equipment Effectiveness'*. This variable is interpreted as the overall effectiveness of the Mechanical Response sub-model effectiveness.

The states of '*Mechanical Response Equipment Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.12 Chemical Response Equipment Effectiveness

The variable '*Chemical Response Equipment Effectiveness'* has '*Chemical SM 1 Effectiveness', 'Chemical SM 2 Effectiveness'*, and '*Chemical SM 3 Effectiveness*' as its' parent node and diverges to the following node: '*Overall Response Equipment Effectiveness'*. This variable is interpreted as the overall effectiveness of the Chemical Response sub-model effectiveness.

The states of '*Chemical Response Equipment Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.6.13 In-Situ Burning Response Equipment Effectiveness

The variable '*In-Situ Burning Response Equipment Effectiveness'* has *'In-Situ Burning SM 1 Effectiveness', 'In-Situ Burning SM 2 Effectiveness'*, and '*In-Situ Burning SM 3 Effectiveness'* as its' parent node and diverges to the following node: '*Overall Response Equipment Effectiveness'*. This variable is interpreted as the overall effectiveness of the In-Situ Burning Response sub-model effectiveness.

The states of '*In-Situ Burning Response Equipment Effectiveness'* Effectiveness and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

5.7 Overall Response Effectiveness

After using the different operability variables to investigate the effectiveness of the ten different sub-models per the three different responses selected: *In-situ Burning, Chemical Dispersion, and Mechanical Recovery*, the over response effectiveness was evaluated. The variable *'Overall Response Effectiveness'* variable *has* '*Mechanical Response Equipment Effectiveness', 'Chemical Response Equipment Effectiveness', 'In-Situ Burning Response Equipment Effectiveness'* as its' parent node and is the final destination for the model. This variable is interpreted as what will give one guidance in seeing if a selected response type was effective in its clean up of the oil spill or not. Section 6: Bayesian Network Model Assessment will introduce the evidence and a sensitivity analysis based on the model that was implemented.

The states of *'Overall Response Effectiveness'* and its related probability can be found in a table in Appendix E: OSRECA Variables' States and Probabilities.

Section 6: Bayesian Network Model Assessment

6.1 SoE & Sensitivity Analysis

Based on various research articles, the Strength of Evidence or SoE is considered an important inclusion in the oil spill risk analysis for the model(Goerlandt et al., 2017; Goerlandt & Reniers, 2016; L. Lu et al., 2019, 2020). A method suggested by (Goerlandt & Reniers, 2016)) is applied in performing the SoE of the created Bayesian Network Model OSRECA.

Providing a strength of evidence is important in risk analysis, as it helps raise caution about the results as required in uncertainty-based risk perspectives and can help guide future research relating to this model. This strength of evidence can also aid in supporting the use of the model, as it provides insights in the plausibility of the results provided in the results section. Table 23 below shows the definition or classification of the SoE assessment for different evidence types.

Table 23 SoE Classification

Strength of Evidence							
Main Item	**Model Aspect**	**Data**		**Model**		**Judgement**	**Assumption**
Sub-Item	Variable Structure States Parameterization	Quality	Amount	Empirical Validation	Theoretical Viability	NA	NA
Classification	**Low**			**Medium**	**High**		

With the model created, the framework and method developed as per Section 4 are applied, and the critical factors are identified by combining the sensitivity analysis and Strength of Evidence assessment, as suggested in Goerlandt and Montewka (2013) and applied in Lu et al. (2021). Table 25 presents a Strength of Evidence table assessment of the established Bayesian Network model, with the colour legend table related to the SoE right above it.

Table 24 Colour Legend Related to Strength of Evidence Table

Not Relevant	**Low**	**Medium**	**High**

Table 25 Strength of Evidence table assessment of the established Bayesian Network model

Section		Content	Section	Data		Model		Jud.	Ass.	SoE
				Q	A	EV	TV			
5.1	**Season & Time**	**Season**	5.1.1							
		Daylight (Time)	5.1.2							
5.2	**Oil-related variables**	**Oil Type**	5.2.1							
		Oil Viscosity	5.2.2							
		Oil Persistence	5.2.3							
		Oil Spill Size	5.2.4							
		Oil Spill Position	5.2.5							
		Oil Spill Location	5.2.6							
5.3	**Spill Site Variables**	**Visibility at Site**	5.3.1							
		Temperature at Site	5.3.2							
		Wave Conditions at Site	5.3.3							
		Ice Coverage at Site	5.3.4							
		Wind Speed at Site	5.3.5							
		Sea Ice Conditions at Site	5.3.6							
5.4	**Base Related Variables**	**Visibility at Base**	5.4.1							
		Wave Conditions at Base	5.4.2							
		Port Location	5.4.3							
		Staff Available	5.4.4							
		Preparation Time	5.4.5							
		Shipping Act Law	5.4.6							
		Temperature at Base	5.4.7							
		Wind Speed at Base	5.4.8							
		Sea Ice Conditions at Base	5.4.9							
		Response Arrival Time to Oil Site	5.4.10							
		Route conditions for Air	5.4.11							
		Route Distance to Oil Site	5.4.12							
		Route Conditions on Water	5.4.13							
		Response Asset	5.4.14							

5.5	Response Related Variables	Mechanical Response Selection SubModels	Mechanical SM 1: Two vessels with boom	Mech SM 1 ShippingAct	5.5.1.1
				Visibility at Site Mech Copy	5.5
				Wind Speed at Site Mech Copy	5.5
				Wave Conditions at_Site Mech Copy	5.5
				Temperature at Site Mech Copy	5.5
				Ice Coverage at Site Mech Copy	5.5
				Mech SM1 Water Conditions Operability	5.5.1.2
				Mech SM1 Weather Conditons Operability	5.5.1.3
				Mech SM1 Oil Position	5.5
				Mech SM 1 Spill Size	5.5
				Mech SM1 Base Operability	5.5.1.4
				Mech SM1 Temperature At Base	5.5
				Mech SM1 Wind Speed At Base	5.5
				Mech SM1 Sea Ice Conditions At Base	5.5
				Mech SM1 Wave Conditions At Base	5.5
				Mech SM1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	5.5.1.5
				Mech SM1 Response Arrival Time to Oil Site	5.5
				Mech SM 1 Oil persistence	5.5
				Mech SM1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	5.5.1.6
				Copy of Mechanical SM 1 Effectiveness	5.6.1
			Mechanical SM 2: Single Vessel with Outrigger	Mech SM 2 Shipping Act	5.5.2.1
				Mech SM 2 Weather Conditons Operability	5.5.2.2
				Mech SM 2 Water Conditions Operability	5.5.2.3
				SM 2 Visibility at Site Mech Copy	5.5
				SM 2 Wind Speed at Site Mech Copy	5.5
				SM 2 Wave Conditions at_Site Mech Copy	5.5
				SM 2 Temperature at Site Mech Copy	5.5
				SM 2 Ice Coverage at Site Mech Copy	5.5
				Mech SM2 Oil Position	5.5
				Mech SM 2 Spill Size	5.5
				Mech SM2 Base Operability	5.5.2.4
				Mech SM2 Temperature At Base	5.5
				Mech SM2 Wind Speed At Base	5.5
				Mech SM2 Sea Ice Conditions At Base	5.5
				Mech SM2 Wave Conditions At Base	5.5
				Mech SM2: Offshore response vessel Base Transport Operability	5.5.2.5
				Mech SM2 Response Arrival Time to Oil Site	5.5
				Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	5.5.2.6
				Mech SM 2 Oil persistence	5.5
				Copy of Mechanical SM 2 Effectiveness	5.6.2
			Mechanical SM 3: Single Vessel in Ice	SM 3 Visibility at Site Mech Copy	5.5
				SM 3 Wind Speed at Site Mech Copy	5.5
				SM 3 Wave Conditions at_Site Mech Copy	5.5
				SM 3 Temperature at Site Mech Copy	5.5
				SM 3 Ice Coverage at Site Mech Copy	5.5
				Mech SM3 Water Conditions Operability	5.5.3.1
				Mech SM3 Weather Conditions Operability	5.5.3.2
				Mech SM 3 Oil Position	5.5
				Copy (2) of Mech SM 1 Spill Size	5.5
				SM3 Base Operability	5.5.3.3
				Mech SM3 Temperature At Base	5.5
				Mech SM3 Wind Speed At Base	5.5
				Mech SM3 Sea Ice Conditions At Base	5.5
				Mech SM3 Wave Conditions At Base	5.5
				Mech SM3 : Vessels of opportunity Base Transport Operability	5.5.3.4
				Mech SM3 Response Arrival Time to Oil Site	5.5
				Mech SM3: Boom & Oleophilic skimmer Oil Response Equipment Operability	5.5.3.5
				Mech SM 3 Oil persistence	5.5
				SM 3 ShippingAct	5.5.3.6
				Copy of Mechanical SM 3 Effectiveness	5.6.3
			Mechanical SM 4: Three Vessels of Oppurtunity with boom	SM 4 of ShippingAct	5.5.4.1
				SM 4 Visibility at Site Mech Copy	5,5
				SM 4Wind Speed at Site Mech Copy	5,5
				Sm 4 Wave Conditions at_Site Mech Copy	5,5
				SM 4 Temperature at Site Mech Copy	5,5
				SM4 Ice Coverage at Site Mech Copy	5,5
				Mech SM 4 Weather Conditons Operability	5.5.4.2
				Mech SM 4 Water Conditions Operability	5.5.4.3
				Mech SM 4 Oil Position	5.5
				Copy (3) of Mech SM 1 Spill Size	5.5
				Mech SM4 Base Operability	5.5.4.4
				Mech SM4Temperature At Base	5.5
				Mech SM4 Wind Speed At Base	5.5
				Mech SM4 Sea Ice Conditions At Base	5.5
				Mech SM4 Wave Conditions At Base	5.5
				Mech SM4: Ice-class, offshore.response vessel Base Transport Operability	5.5.4.5
				Mech SM4 Response Arrival Time to Oil Site	5.5
				Mech SM 4: Skimming system Oil Response Equipment Operability	5.5.4.6
				Mech SM 4 Oil persistence	5.5
				Copy of Mechanical SM 4 Effectiveness	5.6.4

5.5	Response Related Variables	Chemical Response Selection SubModels	Chemical SM 1: Vessel application	Chemical SM 1 Effectiveness	5.6.5
				Chem ShippingAct	5.5.5.1
				Chem SM 1 Visibility at Site Copy	5.5
				Chem SM 1 Wind Speed at Site Copy	5.5
				Chem SM 1 Wave Conditions at Site Copy	5.5
				Chem SM 1Temperature at Site Copy	5.5
				Chem SM 1 Ice Coverage at Site Copy	5.5
				Chem SM1 Water Conditions Operability	5.5.5.2
				Chem SM1 Weather Conditons Operability	5.5.5.3
				Chem SM1 Oil Position	5.5
				Chem SM 1 Spill Size	5.5
				ChemSM1 Base Operability	5.5.5.4
				Chem SM1 Temperature At Base	5.5
				Chem SM1 Wind Speed At Base	5.5
				Chem SM1 Sea Ice Conditions At Base	5.5
				Chem SM1 Wave Conditions At Base	5.5
				Chem SM1: response vessel Base Transport Operability	5.5.5.5
				Chem SM1 Response Arrival Time to Oil Site	5.5
				Chem SM 1 Oil persistence	5.5
				Chem SM1: Dispersant spray arms Oil Response Equipment Operability	5.5.5.6
			Chemical SM 2: Airplance application	Chem SM2 ShippingAct	5.5.6.1
				Chemical SM 2 Effectiveness	5.6.6
				Chem Sm2 Weather Conditons Operability	5.5.6.2
				Chem SM2 Water Conditions Operability	5.5.6.3
				Chem SM 2 Visibility at Site Copy	5.5
				Chem SM 2 Wind Speed at Site Copy	5.5
				Chem SM 2 Wave Conditions at Site Copy	5.5
				Chem SM 2 Temperature at Site Copy	5.5
				Chem SM 2 Ice Coverage at Site Copy	5.5
				Chem SM2 Oil Position	5.5
				Chem SM 1 Spill Size	5.5
				Chem SM2 Base Operability	5.5.6.4
				Chem SM2 Temperature At Base	5.5
				Chem SM2 Wind Speed At Base	5.5
				Chem SM2 Sea Ice Conditions At Base	5.5
				Chem SM2 Wave Conditions At Base	5.5
				Chem SM2: Multi-engine fixed-wing.aircraft, one for dispersant.application, one for aerial spotting Base Transport Operability	5.5.6.5
				Chem SM2 Response Arrival Time to Oil Site	5.5
				Chem SM2: Aerial high volume dispersant Oil Response Equipment Operability	5.5.6.6
				Chem SM2 persistence	5.5
			Chemical SM 3: Helicopter application	Chem SM 3 ShippingAct	5.5.7.1
				Chemical SM 3 Effectiveness	5.6.7
				SM 3 Visibility at Site Chem Copy	5.5
				SM 3 Wind Speed at Site Chem Copy	5.5
				SM 3 Wave Conditions at_Site Chem Copy	5.5
				SM 3 Temperature at Site Chem Copy	5.5
				SM 3 Ice Coverage at Site Chem Copy	5.5
				Chem SM3 Water Conditions Operability	5.5.7.2
				Chem SM3 Weather Conditions Operability	5.5.7.3
				Chem SM3 Oil Position	5.5
				Chem SM 3 Spill Size	5.5
				Chem SM3 Base Operability	5.5.7.4
				Copy of Mech SM3 Temperature At Base	5.5
				Chem SM3 Wind Speed At Base	5.5
				Copy of Mech SM3 Sea Ice Conditions At Base	5.5
				Chem SM3 Wave Conditions At Base	5.5
				Chem SM3: Twin engine jet helicopter Base Transport Operability	5.5.7.5
				Chem SM3 Response Arrival Time to Oil Site	5.5
				Chem SM3: Aerial dispersant application Oil Response Equipment Operability	5.5.7.6
				Chem SM 3 Oil persistence	5.5

5.5	Response Related Variables	InSitu Burning Selection SubModels	In-situ Burning SM 1: Vessels with fire boom	InSitu Burning SM 1 Effectiveness	5.6.8
				InSitu Burning ShippingAct	5.5.8.1
				InSitu Burning Visibility at Site Copy	5.5
				InSitu Burning Wind Speed at Site Copy	5.5
				InSitu Burning Wave Conditions at Site Copy	5.5
				InSitu Burning Temperature at Site Copy	5.5
				InSitu Burning Ice Coverage at Site Copy	5.5
				InSitu Burning SM1 Water Conditions Operability	5.5.8.2
				InSitu Burning SM1 Weather Conditons Operability	5.5.8.3
				InSitu Burning SM1 Oil Position	5.5
				Insitu Burning SM 1 Spill Size	5.5
				InSitu Burning SM1 Base Operability	5.5.8.4
				InSitu Burning SM1 Temperature At Base	5.5
				InSitu Burning SM1 Wind Speed At Base	5.5
				InSitu Burning SM1 Sea Ice Conditions At Base	5.5
				InSitu Burning SM1 Wave Conditions At Base	5.5
				InSitu Burning SM1: vessels of opportunity Base Transport Operability	5.5.8.5
				InSitu Burning SM1 Response Arrival Time to Oil Site	5.5
				InSitu Burning SM 1 Oil persistence	5.5
				InSitu Burning SM1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	5.5.8.6
			In-situ Burning SM 2: Helicopter with ice containment	InSitu Burning SM2 ShippingAct	5.5.9.1
				InSitu Burning SM 2 Effectiveness	5.6.9
				InSitu Burning Sm2 Weather Conditons Operability	5.5.9.2
				InSitu Burning SM2 Water Conditions Operability	5.5.9.3
				InSitu Burning SM 2 Visibility at Site Copy	5.5
				InSitu Burning SM 2 Wind Speed at Site Copy	5.5
				InSitu Burning SM 2 Wave Conditions at Site Copy	5.5
				InSitu Burning SM 2 Temperature at Site Copy	5.5
				InSitu Burning SM 2 Ice Coverage at Site Copy	5.5
				InSitu Burning SM2 Oil Position	5.5
				InSitu Burning SM 2 Spill Size	5.5
				InSitu Burning SM2 Base Operability	5.5.9.4
				InSitu Burning SM2 Temperature At Base	5.5
				InSitu Burning SM2 Wind Speed At Base	5.5
				InSitu Burning SM2 Sea Ice Conditions At Base	5.5
				InSitu Burning SM2 Wave Conditions At Base	5.5
				InSitu Burning SM2: Twin engine jet helicopter Base Transport Operability	5.5.9.5
				InSitu Burning SM2 Response Arrival Time to Oil Site	5.5
				InSitu Burning SM2: Aerial ignition system Oil Response Equipment Operability	5.5.9.6
				InSitu Burning SM 2 Oil persistence	5.5
			In-situ Burning SM 3: Helicopter with herders	InSitu Burning ShippingAct	5.5.10.1
				InSitu Burning SM 3 Effectiveness	5.6.10
				InSitu Burning SM 3 Visibility at Site Copy	5.5
				InSitu Burning SM 3 Wind Speed at Site Copy	5.5
				InSitu Burning SM 3 Wave Conditions at Site Copy	5.5
				InSitu Burning SM 3 Temperature at Site Copy	5.5
				InSitu Burning SM 3 Ice Coverage at Site Copy	5.5
				InSitu Burning SM3 Water Conditions Operability	5.5.10.2
				InSitu Burning SM3 Weather Conditions Operability	5.5.10.3
				InSitu Burning SM3 Oil Position	5.5
				InSitu Burning SM 3 Spill Size	5.5
				InSitu Burning SM3 Base Operability	5.5.10.4
				InSitu Burning SM3 Temperature At Base	5.5
				InSitu Burning SM3 Wind Speed At Base	5.5
				InSitu Burning SM3 Sea Ice Conditions At Base	5.5
				InSitu Burning SM3 Wave Conditions At Base	5.5
				InSitu Burning SM3: Twin engine jet helicopter Base Transport Operability	5.5.10.5
				InSitu Burning SM3 Response Arrival Time to Oil Site	5.5
				InSitu Burning SM3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	5.5.10.6
				InSitu Burning SM 3 Oil persistence	5.5

5.6	**Response Effectiveness**		**Mechanical SM 1 Effectiveness**	5.6.1							
			Mechanical SM 2 Effectiveness	5.6.2							
			Mechanical SM 3 Effectiveness	5.6.3							
			Mechanical SM 4 Effectiveness	5.6.4							
			Chemical Dispersion SM 1 Effectiveness	5.6.5							
			Chemical Dispersion SM 2 Effectiveness	5.6.6							
			Chemical Dispersion SM 3 Effectiveness	5.6.7							
			Insitu Burning SM 1 Effectiveness	5.6.8							
			Insitu Burning SM 2 Effectiveness	5.6.9							
			Insitu Burning SM 3 Effectiveness	5.6.10							
			Mechanical Response Equipment Effectiveness	5.6.11							
			Chemical Response Equipment Effectiveness	5.6.12							
			InSitu Burning Response Equipment Effectiveness	5.6.13							
5.7	**Overall Response Effectiveness**		**Overall Response Effectivness**	5.7							

With a sensitivity analysis, one can analyze what matters in the decision problem and construct a requisite decision model(Fenton & Neil, 2018). A one-way sensitivity analysis(Singto et al., 2020) is used for the created Bayesian Network model with the following target nodes: Mechanical SM 1 Effectiveness, Mechanical SM 2 Effectiveness, Mechanical SM 3 Effectiveness, Mechanical SM 4 Effectiveness, Chemical SM 1 Effectiveness, Chemical SM 2 Effectiveness, Chemical SM 3 Effectiveness, In-Situ SM 1 Effectiveness, In-Situ SM 2 Effectiveness, and In-Situ SM 3 Effectiveness. Figure 28 below shows the results of applying the sensitivity analysis, where the change in the colouring of the network indicates where the sensitive parameters are.

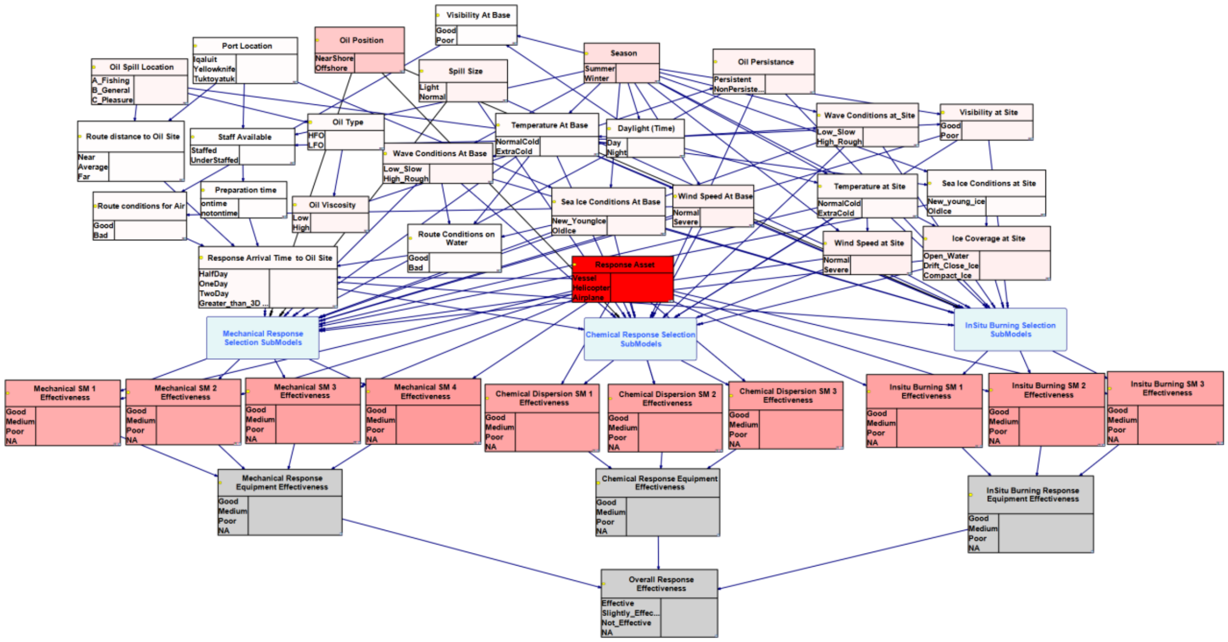

Figure 28 Sensitivity Analysis based on the selected target nodes

The sensitivity analysis results show that the following red variables are important and are the most sensitive ones based on the target node Overall Response Effectiveness. In contrast, the grey coloured presents a sensitivity value of 0 and is determined qualitatively.

Based on what is qualitatively shown, some of *the Oil-Related variables* (highlighted in grey), the variable '*Season"* (highlighted in green), and the variable' *Response Asset*' (highlighted in orange) have the highest influence on the results of the model. Interestingly, some of the *Oil-Related* variables and *'Season'* are considered the most effective, as hypothetically, the farther away the variable is from the target node, the lesser the effect the variable may cause. This model shows otherwise, which shows the significance of the analysis.

For further details about the sensitivity analysis based on the duplicate variables for the selected sub-model target nodes, please refer to Appendix F.

6.2 Criticality Analysis

Another form of assessment is to create a Criticality Matrix to look more into the combined sensitivity and strength of evidence of the effectiveness of each sub-model response type (10 in total). As there are duplicate variables, both response effectiveness' and its duplicate variable will be set as targets for each sub-model. The S-value is the outputted average sensitivity as presented by the GeNie software. This analysis can help give an overview of which variables are critical to the OSRECA BN model and which variables can be considered insignificant. Variables with a low Strength of Evidence and a high sensitivity value are more important than ones with a high Strength of Evidence and a low sensitivity value (Goerlandt & Islam, 2021). This can indicate that any slight change with the low Strength of Evidence and a high sensitivity value variables have more significant impacts on the model results, while variables with high Strength of Evidence and a low sensitivity value have small effects.

6.2.1 Mechanical Recovery Response Criticality Matrixes

Table 26 shows the results of the sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables and showing the average sensitivity values, with *'Mechanical Sub-model 1 Response Effectiveness'* and its respective duplicate variable set as the target nodes. Referring to the table with the variable definitions, results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are in Figure 29.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Wave Conditions at Site Mech SM 1', 'Mech SM 1 Oil Position',* and '*Season.'* While the variable '*Visibility at Site Mech SM 1'* is also a very sensitive value, its SoE is low and so it is less important in context of the risk analysis.

Table 26 Top 10 most sensitive values for Mechanical Response Sub-model 1 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.095
V2	Wave Conditions at Site Mech SM 1	0.017
V3	Mech SM 1 Oil Position	0.017
V4	Visibility at Site Mech SM 1	0.012
V5	Season	0.011
V6	Mech SM 1 Oil Persistence	0.009
V7	Mech SM 1 Sea Ice Conditions at Base	0.008
V8	Oil Viscosity	0.007
V9	Oil Spill Location	0.007
V10	Mech SM 1: Boom & High Volume Oleophilic Skimmer Oil Response Equipment Operability	0.006

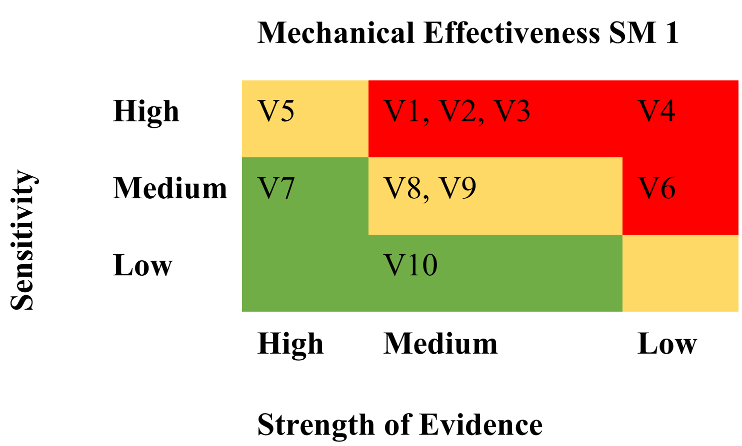

Figure 29 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes Mechanical Response effectiveness SM 1 and its duplicate

Table 27 shows the results of the sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables and showing the average sensitivity values, with *'Mechanical Sub-model 2 Response Effectiveness'* and its respective duplicate variable set as the target nodes. Referring to the table with the variable definitions, results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are shown in Figure 30.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Oil Position',* and '*Season.'* While the variable '*Visibility at Site Mech SM 2'* is also a very sensitive value, its SoE is low and so is less important in the risk analysis.

Table 27 Top 10 most sensitive values for Mechanical Response Sub-model 2 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.095
V2	Season	0.028
V3	Oil Position	0.014
V4	Mech SM 2 Visibility at Site	0.013
V5	Mech SM 2 Wave Conditions at Site	0.009
V6	Mech SM 2 Ice Coverage at Site	0.007
V7	Mech SM 2 Spill Size	0.007
V8	Mech SM 2 Temperature at Base	0.006
V9	Mech SM 2 Water Conditions Operability	0.006
V10	Mech SM 2: Boom & Weir skimmer Oil Response Equipment Operability	0.005

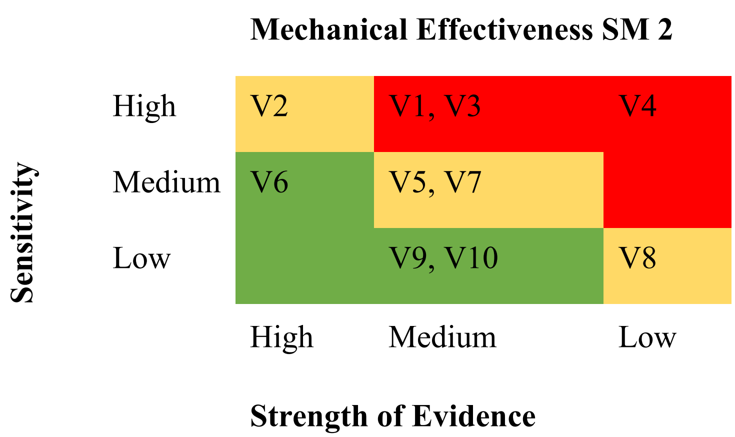

Figure 30 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes Mechanical Response effectiveness SM 2 and its duplicate. Refer to Table 27 for variable definition

Table 28 shows the results of the sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables and showing the average sensitivity values, with *'Mechanical Sub-model 3 Response Effectiveness'* and its respective duplicate variable set as the target nodes. Referring to the table with the variable definitions, the results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are shown in Figure 31.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Oil Position,' 'Mech SM 3 Sea Ice Conditions at Base,'* and '*Season.'* While the variable '*Mech SM 3 Visibility at Site'* is also a very sensitive value, its SoE is low and so is less important.

Table 28 Top 10 most sensitive values for Mechanical Response Sub-model 3 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.095
V2	Oil Position	0.036
V3	Season	0.021
V4	Mech SM 3 Visibility at Site	0.016
V5	Mech SM 3 Sea Ice Conditions at Base	0.013
V6	Mech SM 3 Wind Speed at Site	0.009
V7	Mech SM 3 Ice Coverage at Site	0.009
V8	Mech SM 3 Wave Conditions at Base	0.006
V9	Mech SM 3 Water Conditions Operability	0.005
V10	Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	0.005

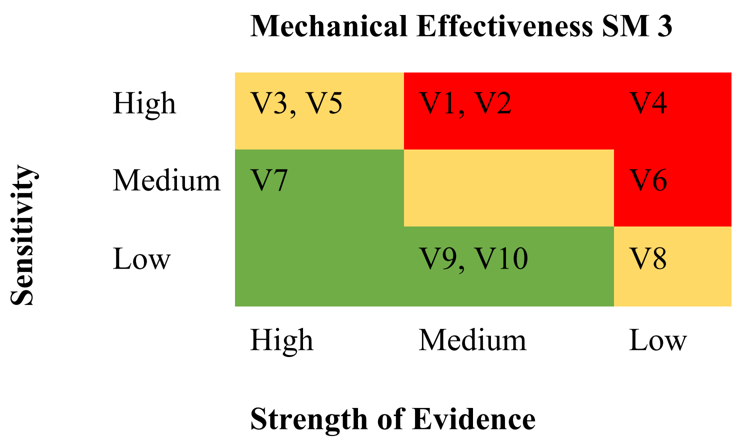

Figure 31 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes Mechanical Response effectiveness SM 3 and its duplicate. Refer to Table 28 for variable definition

Table 29 shows the results of the sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables and showing the average values, with *'Mechanical Sub-model 4 Response Effectiveness'* and its respective duplicate variable set as the target nodes. Referring to the table with the variable definitions, results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are shown in Figure 32.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Oil Position,' 'Mech SM 4 Sea Ice Conditions at Base', 'Spill Size,'* and '*Season.'* While the variable '*Mech SM 4 Visibility at Site'* is also a very sensitive value, its SoE is low and so is less important.

Table 29 Top 10 most sensitive values for Mechanical Response Sub-model 4 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.095
V2	Oil Position	0.063
V3	Season	0.029
V4	Mech SM 4 Sea Ice Conditions at Base	0.019
V5	Spill Size	0.013
V6	Mech SM 4 Visibility at Site	0.012
V7	Wave Conditions at Site	0.009
V8	Mech SM 4 Wind Speed at Base	0.006
V9	Mech SM 4 Water Conditions Operability	0.006
V10	Mech SM 4 Shipping Act	0.006

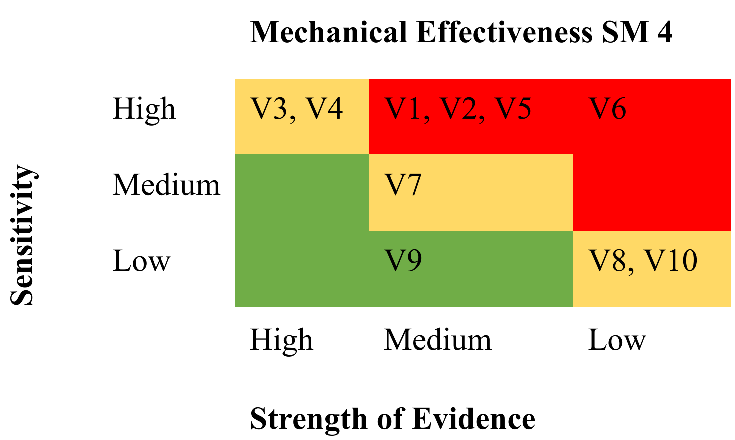

Figure 32 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes Mechanical Response effectiveness SM 4 and its duplicate. Refer to Table 29 for variable definition

6.2.2 Chemical Dispersant Response Criticality Matrixes

Table 30 shows the results of the sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables and showing the average sensitivity values, with *'Chemical Dispersant Sub-model 1 Response Effectiveness'* and its respective duplicate variable set as the target nodes. Referring to the table with the variable definitions, the results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are shown in Figure 33.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Chem SM 1 Wave Conditions at Site',* and '*Season.'* While the variables '*Chem SM 1 Visibility at Site', 'Chem SM 1 Wave Conditions at Base',* and *'Chem SM 1 Wind Speed at Base'* are also very sensitive, their SoE ratings are low and so are less important.

Table 30 Top 10 most sensitive values for Chemical Dispersant Response Sub-model 1 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.096
V2	Chem SM 1 Wave Conditions at Site	0.02
V3	Chem SM 1 Wave Conditions at Base	0.018
V4	Chem SM 1 Visibility at Site	0.012
V5	Chem SM 1 Wind Speed at Base	0.011
V6	Season	0.01
V7	Oil Position	0.007
V8	Chem SM 1 Shipping Act	0.007
V9	Chem SM 1 Water Conditions Operability	0.006
V10	Chem SM 1 Oil Spill Location	0.005

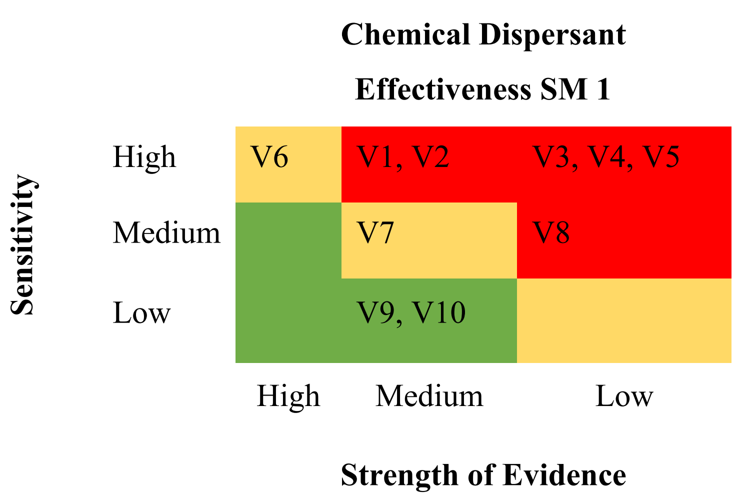

Figure 33 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes Chemical Dispersant effectiveness SM 1 and its duplicate

Table 31 shows the results of the average sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables, with *'Chemical Dispersant Sub-model 2 Response Effectiveness'* and its respective duplicate variable set as the target node. Referring to the table with the variable definitions, the results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are in Figure 34.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Chem SM 1 Wave Conditions at Site',' Chem SM 2 Sea Ice Conditions at Base ',* and '*Season.'* While the variables *'Chem SM 2 Visibility at Site,* and *'Chem SM 2 Shipping Act'* are also very sensitive, their SoE ratings are low and so are less important.

Table 31 Top 10 most sensitive values for Chemical Dispersant Response Sub-model 2 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.097
V2	Season	0.035
V3	Chem SM 2 Visibility at Site	0.019
V4	Chem SM 2 Sea Ice Conditions at Base	0.018
V5	Chem SM 2 Wave Conditions at Site	0.018
V6	Chem SM 2 Shipping Act	0.012
V7	Chem SM 2 Response Arrival Time to Oil Site	0.008
V8	Chem SM 2 Water Conditions Operability	0.007
V9	Oil Position	0.007
V10	Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	0.005

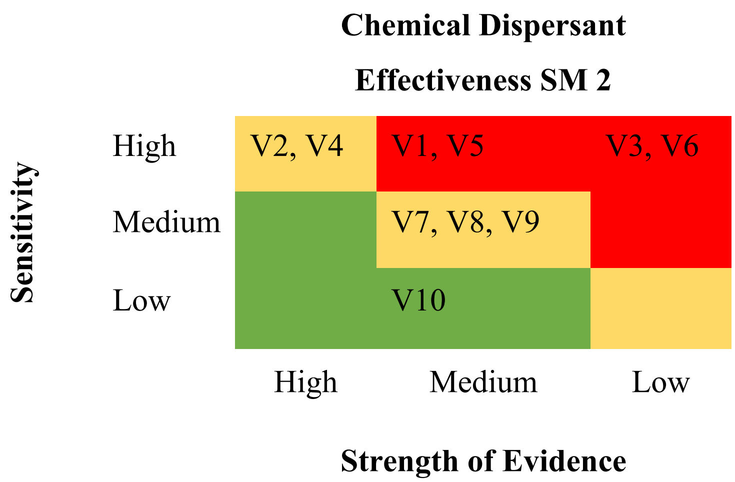

Figure 34 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes Chemical Dispersant effectiveness SM 2 and its duplicate

Table 32 shows the results of the average sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables, with *'Chemical Dispersant Sub-model 3 Response Effectiveness'* and its respective duplicate variable set as the target node. Referring to the table with the variable definitions, the results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are in Figure 35.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Oil Position," Chem SM 2 Sea Ice Conditions at Base ',* and '*Season.'* The variables *'Chem SM 3 Visibility at Site* and *'Chem SM 3 Shipping Act'* are also very sensitive, their SoE ratings are low and so are less important.

Table 32 Top 10 most sensitive values for Chemical Dispersant Response Sub-model 3 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.097
V2	Season	0.03
V3	Oil Position	0.029
V4	Chem SM 3 Sea Ice Conditions at Base	0.017
V5	Chem SM 3 Shipping Act	0.012
V6	Visibility at Site	0.01
V7	Chem SM 3 Response Arrival Time to Oil Site	0.007
V8	Chem SM 3 Wave Conditions at Base	0.006
V9	Chem SM 3 Temperature at Site Chem Copy	0.006
V10	Chem SM 3 Water Conditions Operability	0.005

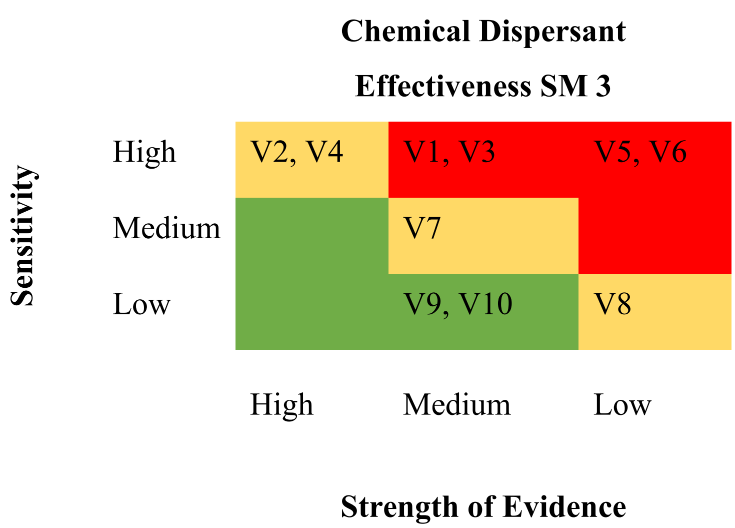

Figure 35 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes Chemical Dispersant effectiveness SM 3 and its duplicate

6.2.3 In-Situ Burning Response Criticality Matrixes

Table 33 shows the results of the average sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables, with *'In-Situ Burning Sub-model 1 Response Effectiveness'* and its respective duplicate variable set as the target node. Referring to the table with the variable definitions, the results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are in Figure 36.

The results indicate that the following variables affect the model results the most: *'Response Asset', and In-Situ Burning SM 1 Sea Ice Conditions at Base'*. The variables '*In-Situ Burning SM 1 Wind Speed at Base'* and *'In-Situ Burning SM 1 Wind Speed at Site'* are also very sensitive, their SoE ratings are low, and so are less important.

Table 33 Top 10 most sensitive values for In-Situ Burning Response Sub-model 1 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.096
V2	In-Situ Burning SM 1 Sea Ice Conditions at Base	0.013
V3	In-Situ Burning SM 1 Wind Speed at Base	0.012
V4	In-Situ Burning SM 1 Wind Speed at Site	0.01
V5	In-Situ Burning SM 1Wave Conditions at Site	0.009
V6	Oil Position	0.007
V7	In-Situ Burning SM 1 Ice Coverage at Site	0.007
V8	In-Situ Burning SM 1 Shipping Act	0.007
V9	In-Situ Burning SM 1 Water Conditions Operability	0.006
V10	In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	0.005

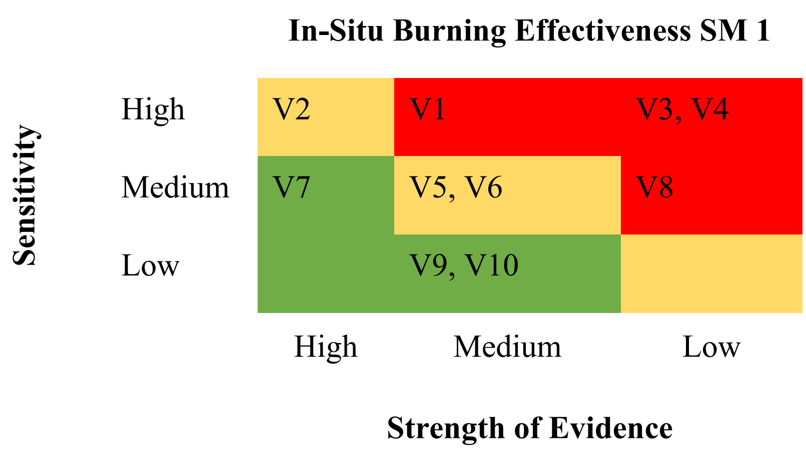

Figure 36 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes In-Situ Burning effectiveness SM 1 and its duplicate

Table 34 shows the results of the average sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables, with *'In-Situ Burning Sub-model 2 Response Effectiveness'* and its respective duplicate variable set as the target node. Referring to the table with the variable definitions, the results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are in Figure 37.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Oil Position,'* and '*In-Situ Burning SM 2 Temperature at Site'*. The variable' *In-Situ Burning SM 2 Visibility at Site'* is also has a high sensitivity value, its SoE rating is low and so is less important.

Table 34 Top 10 most sensitive values for In-Situ Burning Response Sub-model 2 of OSRECA model

Top 10	Variable Name	S-value
V1	Response Asset	0.095
V2	Oil Position	0.029
V3	In-Situ Burning SM 2 Temperature at Site	0.013
V4	In-Situ Burning SM 2 Visibility at Site	0.01
V5	In-Situ Burning SM 2 Wave Conditions at Site	0.009
V6	In-Situ Burning SM 2 Wind Speed at Base	0.009
V7	In-Situ Burning SM 2 Wind Speed at Site	0.007
V8	In-Situ Burning SM 2 Ice Coverage at Site	0.006
V9	In-Situ Burning SM 2 Water Conditions Operability	0.005
V10	In-Situ Burning SM 2 Weather Conditions Operability	0.004

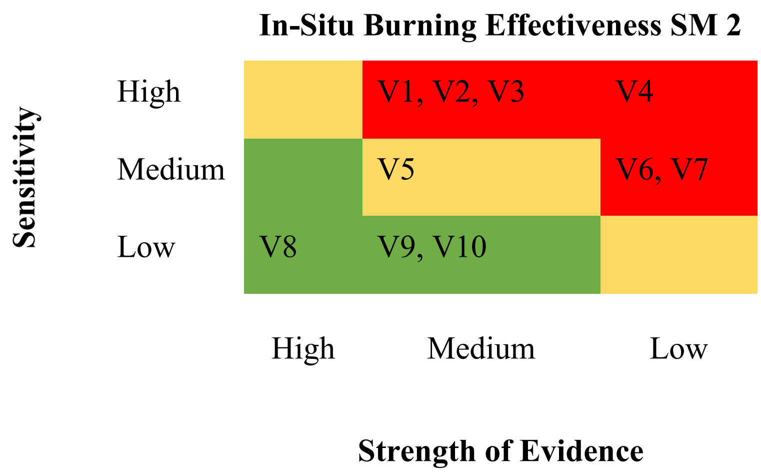

Figure 37 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes In-Situ Burning effectiveness SM 2 and its duplicate

Table 35 shows the results of the average sensitivity analysis on the OSRECA BN model limited to the top 10 most sensitive variables, with *'In-Situ Burning Sub-model 3 Response Effectiveness'* and its respective duplicate variable set as the target node. Referring to the table with the variable definitions, the results of the variable criticality assessment, which combines the average sensitivity and Strength of Evidence ratings, are in Figure 38.

The results indicate that the following variables affect the model results the most: *'Response Asset,' 'Season,'* and '*In-Situ Burning SM 3 Ice Coverage at Site'*. The variables '*In-Situ Burning SM 3 Visibility at Site'* and *'In-Situ Burning SM 3 Wind Speed at Site'* are also very sensitive. However, their SoE ratings are low, and so are less important.

Table 35 Top 10 most sensitive values for In-Situ Burning Response Sub-model 3 of OSRECA model

Top 10	**Variable Name**	**S-value**
V1	Response Asset	0.096
V2	Season	0.021
V3	In-Situ Burning SM 3 Wind Speed at Site	0.013
V4	In-Situ Burning SM 3 Ice Coverage at Site	0.011
V5	In-Situ Burning SM 3 Visibility at Site	0.011
V6	In-Situ Burning SM 3 Wind Speed at Base	0.008
V7	In-Situ Burning SM 3 Water Conditions Operability	0.006
V8	Oil Position	0.006
V9	In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	0.005

V10	In-Situ Burning SM 3 Response Arrival Time to Oil Site	0.005

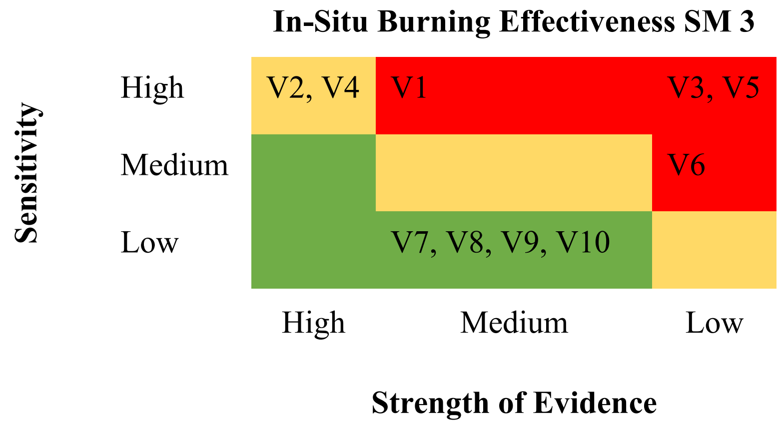

Figure 38 Results of the criticality assessment based on parameters sensitivity analysis and strength of evidence assessment of target nodes In-Situ Burning effectiveness SM 3 and its duplicate

Overall, looking over all ten sub-models shows that the variable' *Response Asset'* for all sub-models affects the BN model the most. This is reasonable as selecting what asset to use will affect whether the response sub-model is applicable. For example, a significant number of variables are associated with medium or low Strength of Evidence, which signifies that more evidence needs to be found, especially with the variables that significantly affect the OSRECA BN model's results.

Based on the above criticality analysis for each sub-model, along with the validation tests and sensitivity analysis found in Section 6.1, the model provides reasoning in a consistent way, but the evidence provided is not strong enough to give firm answers from considering the OSRECA model alone. Even though the evidence is relatively weak in some regards, it can guide and provide suggestions in hypothetical scenarios.

Section 7: Scenario Results

To get insights on the response effectiveness of the different response types in the Canadian Arctic, the created Bayesian Network model OSRECA is applied by setting specific scenarios. This is done by inputting the conditions so the model can provide insights into the response effectiveness. This section will focus on the scenarios and the output and give answers to the model's capability. Sections 7.1, 7.2 and 7.3 will showcase different scenarios that will be tested based on the three different response assets: Vessel, Helicopter, and Airplane.

The following tables and figures below showcase the three unique scenario conditions used for each response asset.

Figure 39 Location of Scenario 1

Table 36 Inputted Conditions for Scenario 1

Variable Name	Inputted Condition
Port Location	Tuktoyatuk
Oil Position	Nearshore
Season	Summer
Oil Spill Location	C_Pleasure
Spill Size	Normal
Response Arrival Time to Oil Site	Half Day
Oil Type	HFO
Staff Available	Staffed
Daylight	Night

Figure 40 Location of Scenario 2

Table 37 Inputted Conditions for Scenario 2

Variable Name	Inputted Condition
Port Location	Iqaluit
Oil Position	Offshore
Season	Summer
Oil Spill Location	A_Fishing
Spill Size	Normal
Response Arrival Time to Oil Site	Half Day
Oil Type	HFO
Staff Available	Staffed
Daylight	Day

Figure 41 Location of Scenario 3

Table 38 Inputted Conditions for Scenario 3

Variable Name	Inputted Condition (based on available states)
Port Location	Iqaluit
Oil Position	Offshore
Season	Summer
Oil Spill Location	C_Pleasure
Spill Size	Normal
Response Arrival Time to Oil Site	One Day
Oil Type	HFO
Staff Available	Staffed
Daylight (Time)	Night

To help visualize the results of the effectiveness of the Response Equipment types vessel, helicopter, and airplane for each Scenario, a colour legend related to the effectiveness of selected response types is created as shown in Table 39. If the results are defined as unknown, this means that the OSRECA BN model output results do not showcase a definite answer on whether the response type is good, medium or poor. If the results are defined as Poor, this means that the model output results showcase that the response type is not effective. If the results are defined as Medium, this means that the model output results showcase that the response type is moderately effective. Finally, If the results are defined as Good, this means that the model output results showcase that the response type is effective.

Table 39 Colour Legend Related Effectiveness of selected Response Types

Unknown	Poor	Medium	Good

7.1 Vessel Scenarios

Table 40 Results of Effectiveness of Response Equipment Vessel for each Scenario

Scenarios for Vessel	Oil Response Type									
	Mechanical				Chemical			In-Situ		
	SM 1	SM 2	SM 3	SM 4	SM 1	SM 2	SM 3	SM 1	SM 2	SM 3
1						NA	NA		NA	NA
2						NA	NA		NA	NA
3						NA	NA		NA	NA

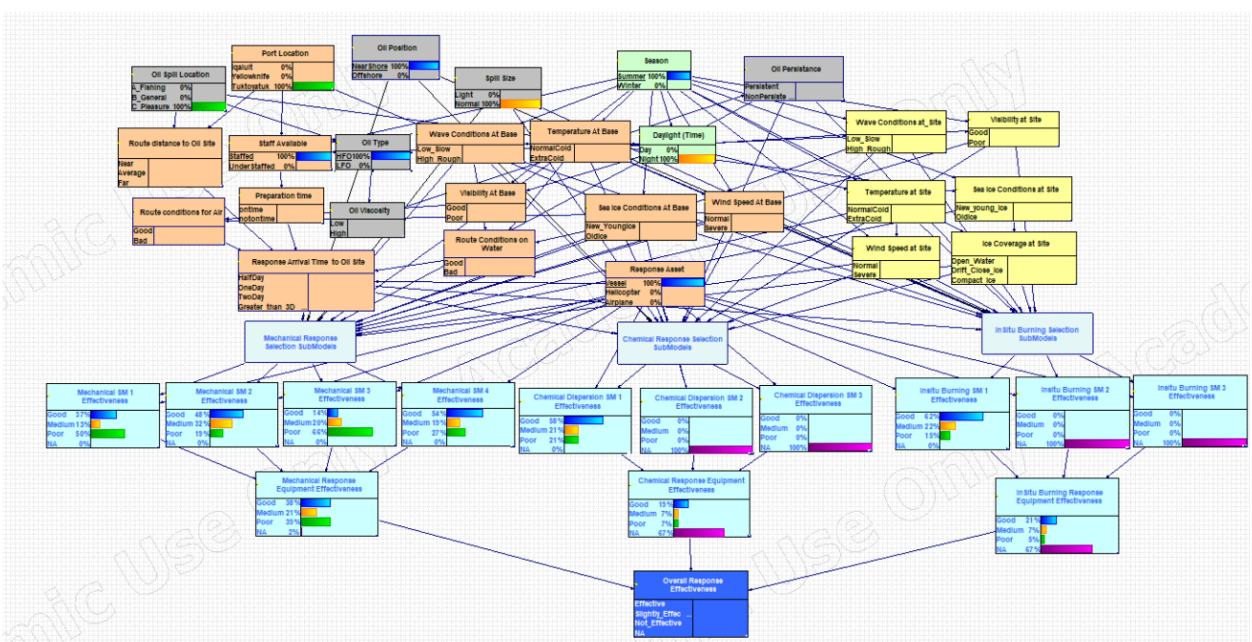

Figure 42 Result for Scenario 1 for Response Asset Vessel

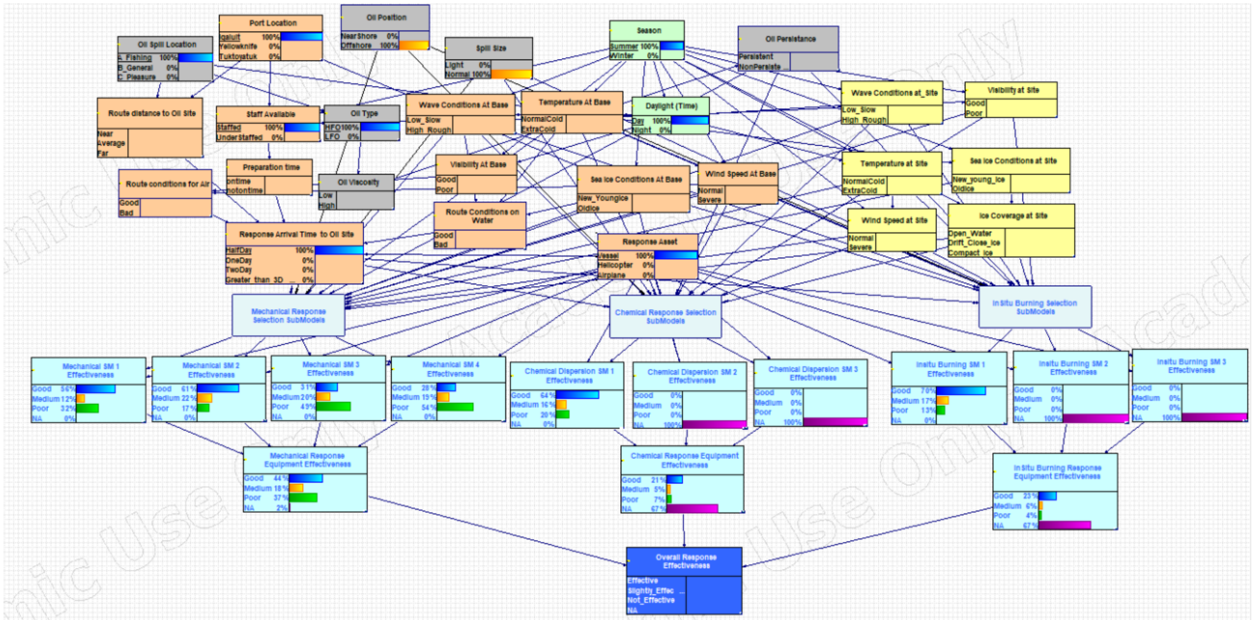

Figure 43 Result for Scenario 2 for Response Asset Vessel

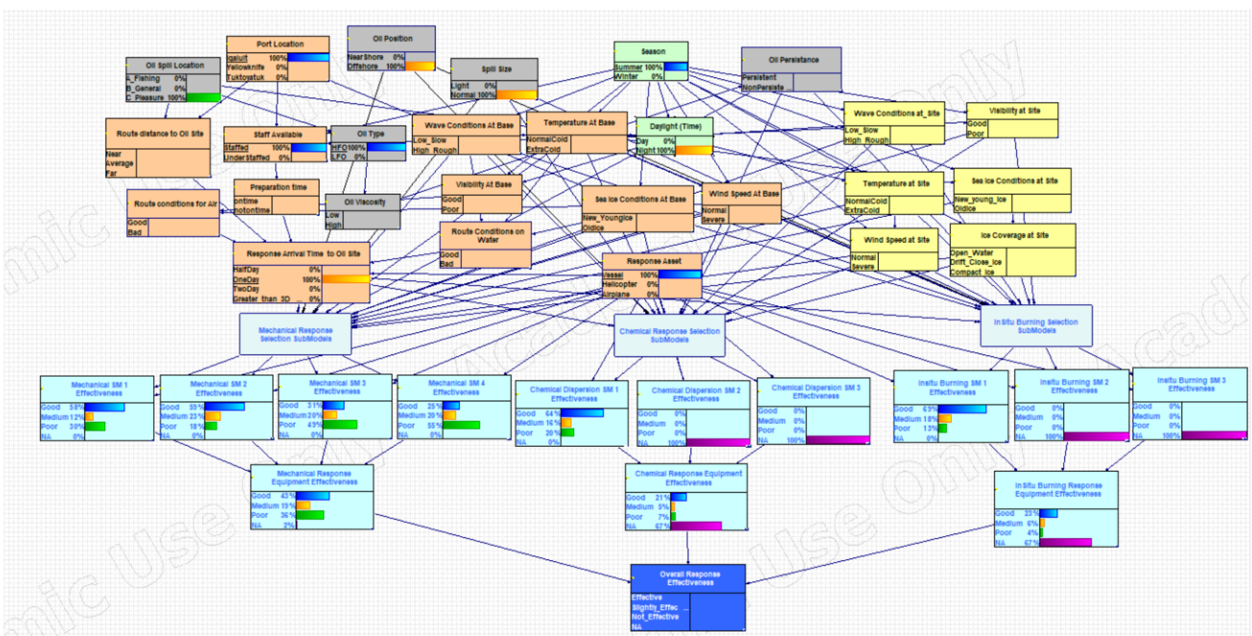

Figure 44 Result for Scenario 3 for Response Asset Vessel

7.2 Helicopter Scenarios

Table 41 Results of Effectiveness of Response Equipment Helicopter for each Scenario

Scenarios for Helicopter	Oil Response Type									
	Mechanical				Chemical			In-Situ		
	SM 1	SM 2	SM 3	SM 4	SM 1	SM 2	SM 3	SM 1	SM 2	SM 3
1	NA	NA	NA	NA	NA	NA		NA		
2	NA	NA	NA	NA	NA	NA		NA		
3	NA	NA	NA	NA	NA	NA		NA		

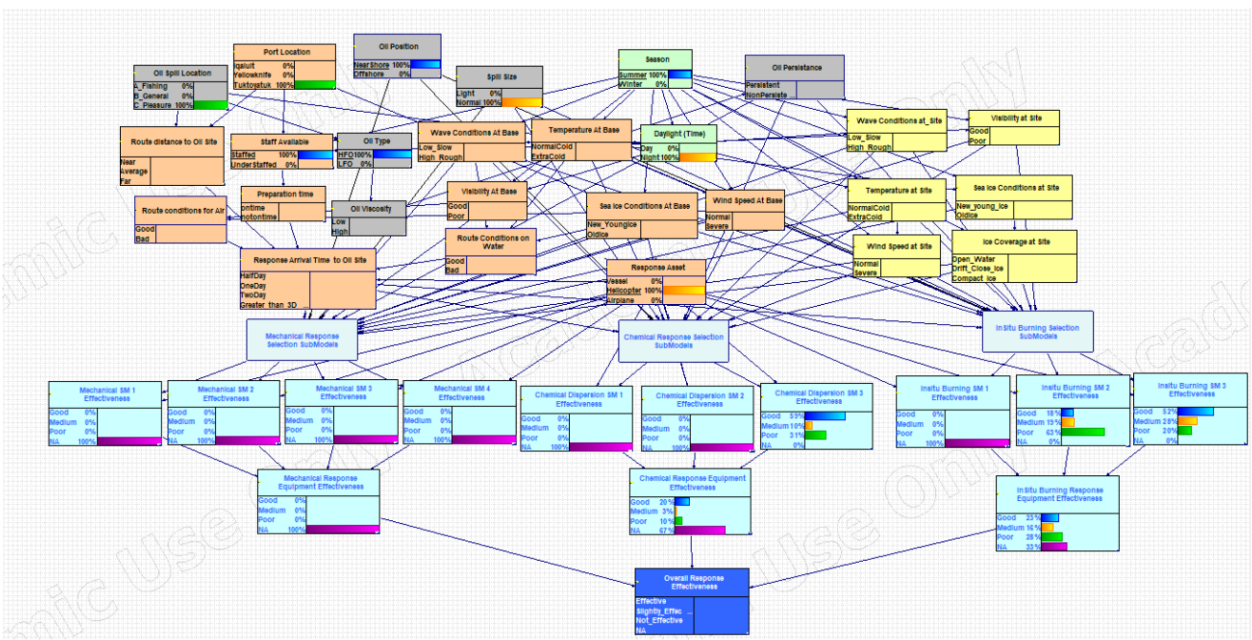

Figure 45 Result for Scenario 1 for Response Asset Helicopter

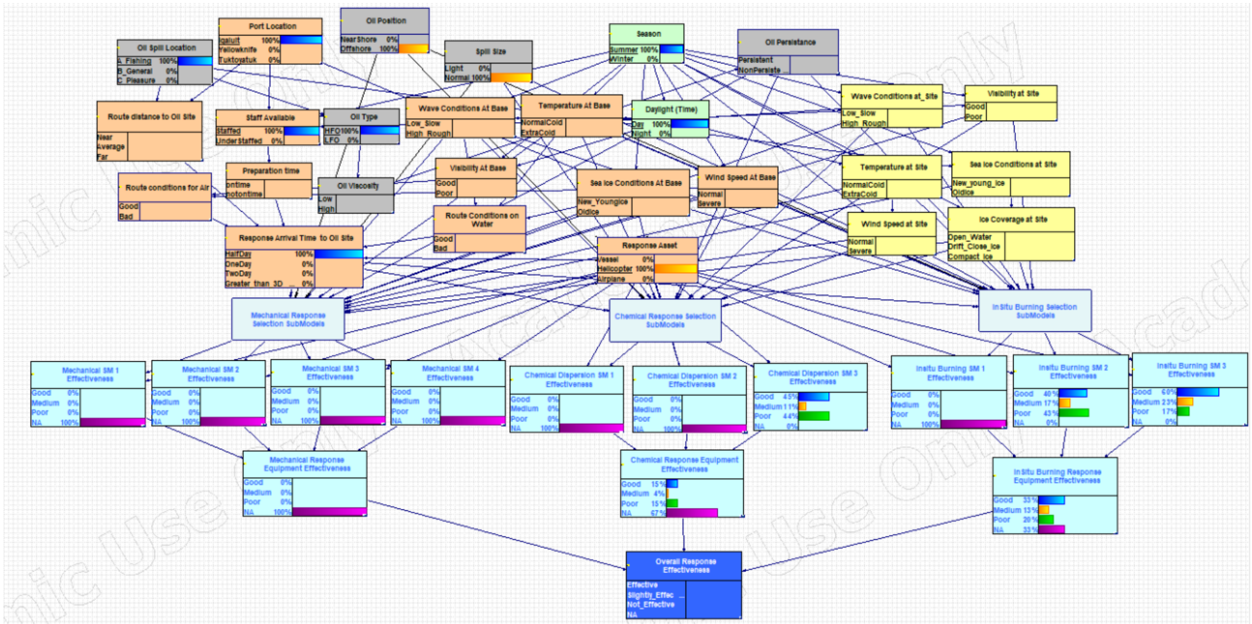

Figure 46 Result for Scenario 2 for Response Asset Helicopter

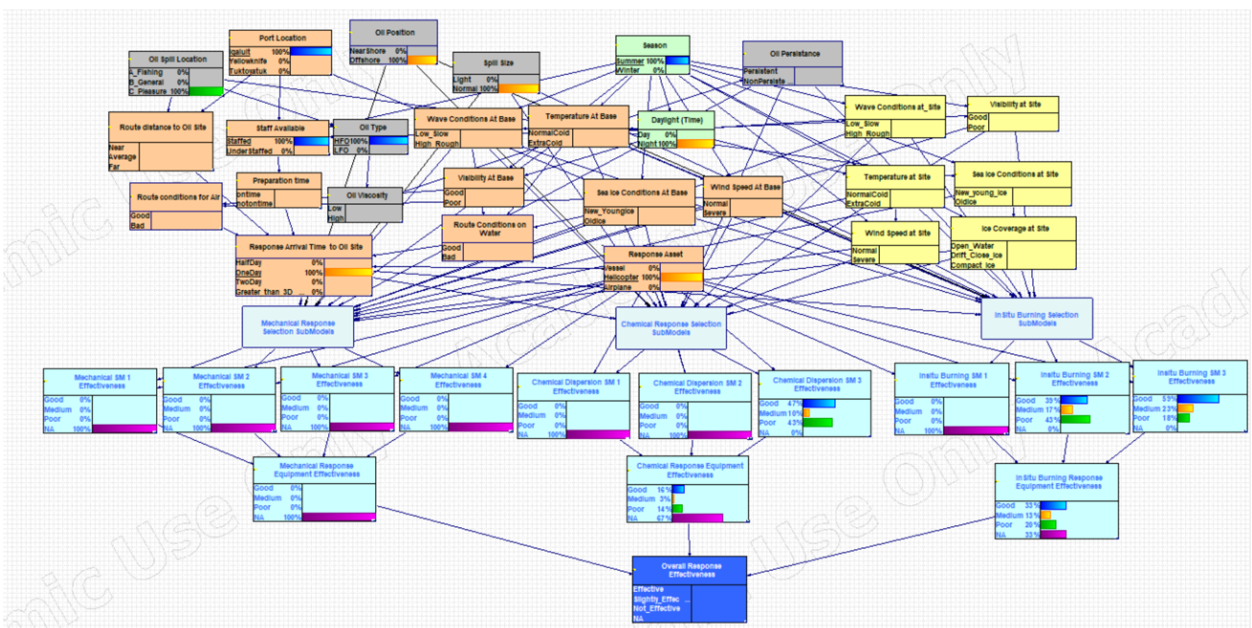

Figure 47 Result for Scenario 3 for Response Asset Helicopter

7.3 Airplane Scenarios

Table 42 Results of Effectiveness of Response Equipment Airplane for each Scenario

Scenarios for Airplane	Oil Response Type									
	Mechanical				Chemical			In-Situ		
	SM 1	SM 2	SM 3	SM 4	SM 1	SM 2	SM 3	SM 1	SM 2	SM 3
1	NA	NA	NA	NA	NA		NA	NA	NA	NA
2	NA	NA	NA	NA	NA		NA	NA	NA	NA
3	NA	NA	NA	NA	NA		NA	NA	NA	NA

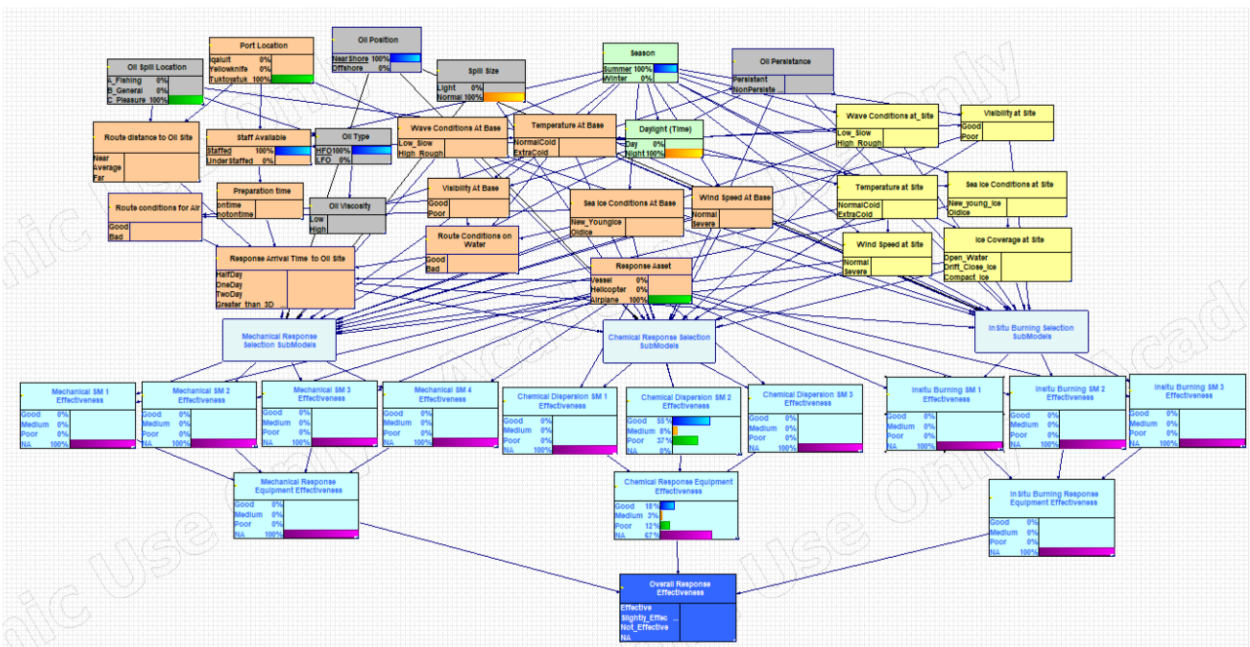

Figure 48 Results for Scenario 1 for Response Asset Airplane

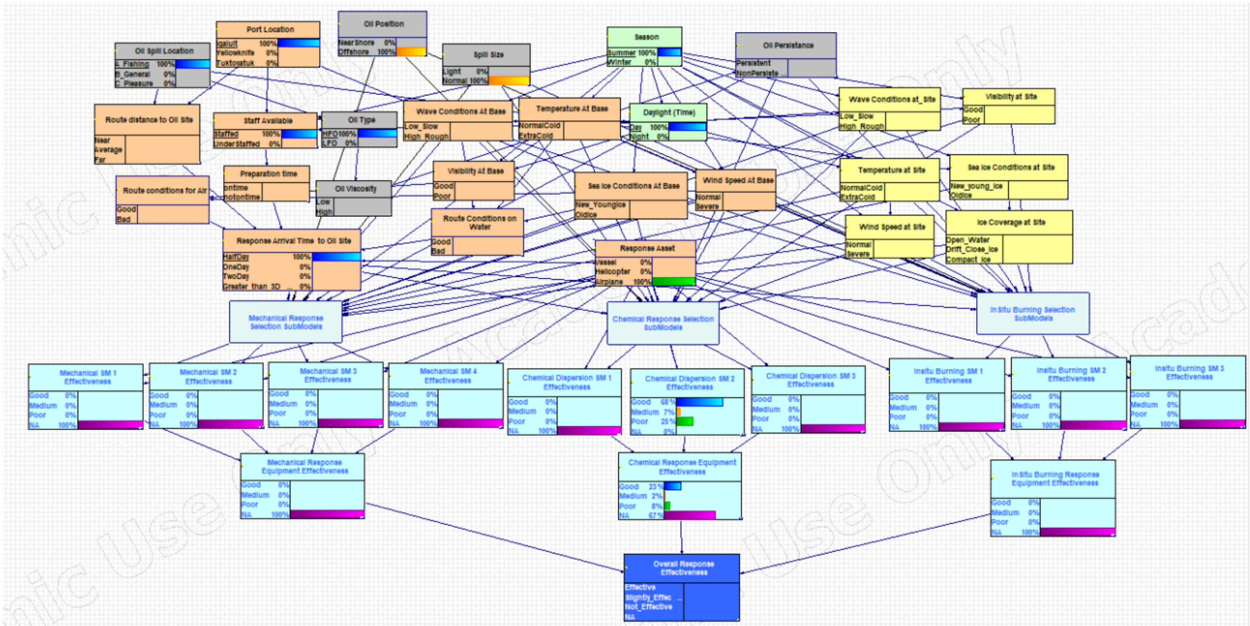

Figure 49 Results for Scenario 2 for Response Asset Airplane

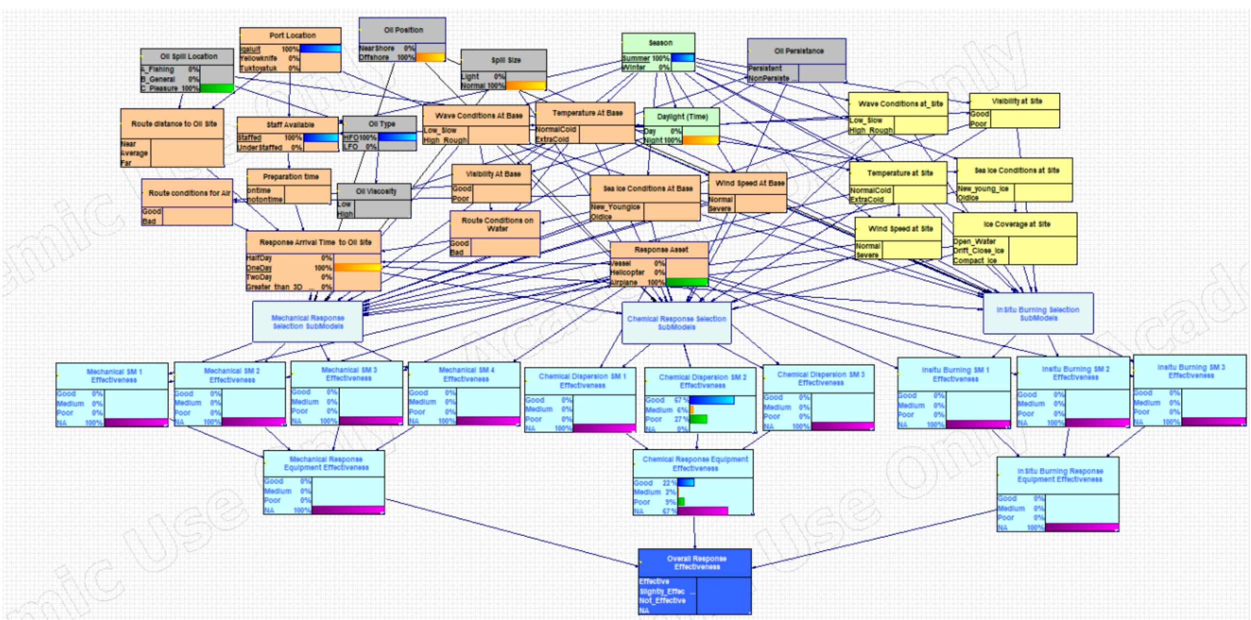

Figure 50 Results for Scenario 3 for Response Asset Airplane

Section 8: Discussion

The OSRECA BN model created considers four variations of mechanical recovery : two vessels with boom, single vessel with outrigger, three vessels-of-opportunity with boom, and single vessel in ice (ITOPF, n.d.-b; Prevention & Response (EPPR), 2017). Three variations of the in-situ burning response categories are considered: vessels with fire boom, helicopter with ice containment, and helicopter with herders. Three variations of chemical dispersant response methods are distinguished: vessel application, airplane application, and helicopter application.

To get insights on the response effectiveness of the different response types in the Canadian Arctic, the created Bayesian Network model OSRECA is applied by setting specific scenarios. This is done by inputting the conditions so the model can provide insights into the response effectiveness. As per the scenario results, vessels are shown to be the best in relation to the overall effectiveness of oil spill response. However, using helicopters or airplanes as an asset can have a better response effectiveness compared to selecting vessels if selected under specific conditions as shown in Section 7.

A one-way sensitivity analysis was also used to analyze what matters in the model (Fenton & Neil, 2018). Based on what was qualitatively shown in Section 6.1, some of *the Oil-Related variables*, the variable '*Season"*, and the variable '*Response Asset*' have the highest influence on the results of the model. Interestingly, some of the *Oil-Related* variables and *'Season'* are considered the most effective, as hypothetically, the farther away the variable is from the target node, the lesser the effect the variable may cause. This model shows otherwise, which shows the significance of the analysis, and more investigation is needed.

With the OSRECA model created, it provides guidance as different scenarios are assessed. With a sensitivity and strength of evidence, a criticality analysis was able to be applied. When focusing on the criticality analysis to look more into the combined sensitivity and strength of evidence of the effectiveness of each sub-model response type (10 in total) overall, it shows that the variable '*Response Asset'* for all sub-models affects the BN model the most. This is reasonable as selecting what asset to use will affect whether the response sub-model is applicable. For example, a significant number of variables, such as the variables '*In-Situ Burning SM 1 Wind Speed at Base'* and *'In-Situ Burning SM 1 Wind Speed at Site'* are associated with medium or low Strength of Evidence but are highly sensitive. This signifies that more evidence needs to be found, especially with the variables that significantly affect the OSRECA BN model's results.

Although simplified to reduce the complexity of actual response scenarios, and to account for the limited evidence regarding certain aspects of the created model, the Bayesian Network model still showcases important connections and relationships between the various input conditions describing the context of an oil spill. For instance, connecting the conditions of where and when an accident may take place are considered, accounting for specific weather and sea conditions for the 10 different oil combatting processes. This provides unprecedented insights in the overall system's effectiveness.

This OSRECA BN model illustrates that it can be beneficial in supporting oil spill risk analysis or suggesting pollution preparedness and response risk management and related decision-making.

One must also consider and acknowledge the limitations of this model. The created OSRECA BN model only considers high-level context descriptions and does not address details of specific local situations that could happen in the Arctic. Furthermore, the potential ensuing negative environmental, socio-economic, or cultural impacts of the oil spills are left out of the scope for the current purposes. However, in actual response operations, such contextual conditions can be very important considerations when planning a response. With Mechanical Recovery being the main and preferred response method used in the Canadian Arctic, it is highly likely that vessels will continue to be the main method of transportation compared to air transportation as what is presented with the scenario results, but it was also presented that there is opportunity that using an aircraft can be better than a vessel.

In light of the SoE, validation tests, and criticality analysis, there are still shortcomings in the developed OSRECA BN. This is in part due to the complexity of real-world systems, with the multiple interactions between elements in the system, and considering how complex systems work and fail (Dekker, 2019). It has been argued that complex systems can never be fully specified, not only because they are complex, but because they are dynamic (Dekker, 2019). The OSRECA BN model would need to be updated by adding more accurate states within a variable.

Focusing on the strength of evidence, there are also various limitations to note. First, only a small sample of participants were interviewed in this study to obtain expert judgements where data or information is lacking. This limits the generalizability of the results. Additionally, the inclusion criteria for selecting experts were quite broad, which may affect the validity of the probability estimates for individual variables. Additionally, individuals were interviewed only at one point in time. Their responses may therefore not be representative of their future perspectives, nor may the probabilities and states be representative of future conditions such as environmental changes and in case for instance the legal context of spill response operations changes. For example, individuals for the creation of the OSRECA BN model have 3 rounds of interviews, but can also be interviewed in six months time to see if any of their opinions or information about the Canadian Arctic or with oil spill response equipment have been updated.

While the creation of this OSRECA BN advances the state of knowledge on spill response effectiveness, there are several directions for future research and development related to this model. These include issues such as what can be done to improve the model, how the model can be used in future developments for spill response planning, and how the model can be integrated with other models, for instance with marine ecosystem impacts. Due to such changes, the OSRECA BN model would need to be updated to represent reality more accurately based on the complexity of this topic.

This model was already created and partially validated with the aid of anonymous expert elicitation from various professionals and researchers (as described in Section 4), but it is recommended to conduct more interviews. Models quantify the probabilities through expert judgment and elicitation (Parviainen et al., 2021). As experts were interviewed at one point in time, future research may consider a longitudinal study to see whether there are potential changes in individual perspectives and attitudes over this subject matter (Laine et al., 2021). Similarly, conducting more interviews will increase the validity and accuracy of the model based on broader knowledge and receiving input from various other professionals and researchers related to Bayesian Network models or oil spill response effectiveness in the Canadian Arctic. One direction to improve the model in such expert interviews could focus on using the framework proposed by Pitchforth & Mengersen (2013), which discusses possible questions to consider regarding a model's validity. The following questions can be considered in more elaborate validation processes:

- Can it be established that the BN model fits within an appropriate context in the literature read?
- Are the parameters of each node similar to what the experts would expect?
- Does the model structure (the number of nodes, node labels and arcs between them) look the same as the experts and/or literature predict?
- Do the parameters of the input nodes and CPT reflect all the known possibilities from expert knowledge and domain literature?
- Are the parameters of nodes that have analogues in comparison models assigned similar conditional probabilities?
- Is the model behaviour predictive of the behaviour of the system being modelled?

Various changes in the system under study can lead to a need to modify the proposed model. These include for instance new technologies for spill response, changes in context conditions for the marine environment due to climate change, and changes to the risks associated with the marine activities in Canadian Arctic waters. Furthermore, there are multiple domains where legislation can lead to changes in the risk profile as well. A recent example is on the future ban on heavy fuel oils in the Canadian Arctic, originating from the decision made at the IMO, going into effect on July 2024 (T. Canada, 2022). Due to such changes, the OSRECA BN model would need to be updated to represent reality more accurately.

Another manner in which the model can be further elaborated concerns the ability to combine different response types such as chemical dispersants followed by mechanical recovery or vice versa, and to investigate if this improves response effectiveness compared with individual response techniques. Additionally, the BN model can be extended to account for additional aspects of the risk profile, for instance looking into harm to humans, the coastal communities, and the marine ecosystem.

Section 9: Conclusion

This thesis aimed to develop a Bayesian Network (BN) model of 10 different oil spill response options available for Canadian Arctic environments, focusing on a high-level assessment of the effectiveness of these response types based on relevant contextual conditions. This model is intended for strategic purposes. A Bayesian Network Model is used to aid in the intricacy of oil spill responses by identifying and developing scenarios for planning and seeking to understand vulnerability to potential spill responses. This proposed technique will guide in the analysis of various oil spill response equipment effectiveness. To aid in the model's accuracy and validity, expert's opinions (both from research and/or responders) were inputted to help achieve this.

After the OSRECA model was developed using an iterative process, multiple oil spill scenarios have been applied to give insights in the effectiveness of using specified oil spill response types in the Canadian Arctic. Ten unique sub-models were created for the three main response types: Mechanical Recovery, Chemical Dispersant, and In-Situ Burning. The OSRECA BN model includes a total of 242 variables, with over 700 states, providing a high-level yet comprehensive view on the response system and its effectiveness under a range of possible contextual scenarios.

Based on the overall criticality analysis for each sub-model as shown in Section 6.2, along with selected validation tests and sensitivity analyses described in Section 6.1, the model enables reasoning about spill response effectiveness in a consistent way. However, the available evidence underlying the model construction and parameterization is not strong enough to give very firm answers about the response effectiveness. Nevertheless, the model can be used to obtain high-level insights in the overall oil spill response effectiveness in the Canadian Arctic, and to discern trends and patterns.

The oil spill combatting process in the Canadian Arctic warrants further investigation, as the presented model is based on relatively weak evidence in some areas, given that the possible risks to the pristine marine environment are very high and that some oil transport is unavoidable to serve Arctic communities. Hence, it is recommended to continue investigations to aid in finding the most effective oil combatting process in particular scenarios and for planning response of the entire system. As Mechanical Recovery continues to be the main and preferred response method used in the Canadian Arctic, it is highly likely that vessels will continue to be the main response asset compared to air transportation. However, this model can provide high-level insights in a strategic planning sense over the possibility of using other response types.

Although simplified to reduce the complexity of actual response scenarios, and to account for the limited evidence regarding certain aspects of the created model, the Bayesian Network model still showcases important connections and relationships between the various input conditions describing the context of an oil spill. For instance, connecting the conditions of where and when an accident may take place are considered, accounting for specific weather and sea conditions for the 10 different oil combatting processes. This provides unprecedented insights in the overall system's effectiveness.

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Appendix A: Full Strength of Evidence Assessment

Section	Model	Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification
Season & Time	Variable	**Season**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links based on expert judgement.
	States	(Summer, Winter)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).
	Parametirization	see probability table							Uniform distribution assumed.
	Variable	**Daylight (Time)**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links based on expert judgement.
	States	(Day, Night)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).
	Parametirization	see probability table							Probability table based on daylight data related to Arctic.
Oil-related variables	Variable	**Oil Type**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links judged based on reported tables and description as well as author's internal judgement
	States	(HFO,LFO)							States selected based on reported dataset (Prevention & Response (EPPR), 2017) and authour's internal judgement.
	Parametirization	see probability table							Probability based on environment and oil spill response planning tool and anonymous experts judgement.
	Variable	**Oil Viscosity**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links based on expert judgement.
	States	(Low,High)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).
	Parametirization	see probability table							Uniform distribution assumed.
	Variable	**Oil Persistence**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links based on expert judgement.
	States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related dataset.
	Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oils.
	Variable	**Oil Spill Size**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links based on expert judgement.
	States	(Light, Normal)							States provided by anoynmouse expert's opinion.
	Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oil spills.
	Variable	**Oil Spill Position**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links based on expert judgement.
	States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR), 2017), authour's internal judgement, and anonymous expert's opinion.
	Parametirization	see probability table							Probability based on author's internal judgement.
	Variable	**Oil Spill Location**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.
	Structure	Please see Figure 14							Links based on expert judgement.
	States	(A_Fishing, B_General, C_Pleasure)							States are selected based on author's judgement and areas provided by shipping trends data (Dawson et al., 2017; ESPG, n.d.; Kochanowicz et al., 2020).
	Parametirization	see probability table							Probability based on author's internal judgement.

Section	Model	Content	Data		Model		Judgement	Assumption	Justification	SoE
			Quality	Amount	EV	TV				
Spill Site Variables	Variable	**Visibility at Site**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
	States	(Good, Poor)							States provided by authour's internal judgement.	
	Parametirization	see probability table							Uniform distribution assumed.	
	Variable	**Temperature at Site**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
	States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).	
	Parametirization	see probability table							Probability based on author's internal judgement.	
	Variable	**Wave Conditions at Site**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
	States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
	Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
	Variable	**Ice Coverage at Site**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
	States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
	Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
	Variable	**Wind Speed at Site**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
	States	(Normal, Severe)							States provided by authour's internal judgement.	
	Parametirization	see probability table							Probability based on author's internal judgement.	
	Variable	**Sea Ice Conditions at Site**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
	States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
	Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	

Section	Model	Content	Quality	Amount	EV	TV	ment	tion	Justification	SoE
Base Related Variables	Variable	**Visibility at Base**							Probability based on environment and oil spill response planning tool and anonymous experts judgement.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(Good, Poor)							States provided by authour's internal judgement.	
	Parametrization	see probability table							Probability based on author's internal judgement and on Arctic weather conditions data report.	
	Variable	**Wave Conditions at Base**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Port Location**							Parameter based on anoynmous expert's opinion and Arctic Responder Base Report (Canada, 2021).	
	Structure	Please see Figure 14							Links based on expert judgement.	
	States	(Iqaluit, Yellowknife, Tuktoyatuk)							States provided by anonymous expert's judgement.	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Staff Available**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(Staffed, Understaffed)							States provided by authour's internal judgement.	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Preparation Time**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(OnTime, NotOnTime)							States provided by authour's internal judgement.	
	Parametrization	see probability table							Links based on expert judgement.	
	Variable	**Shipping Act Law**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement.	
	States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Temperature at Base**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Wind Speed at Base**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(Normal, Severe)							States provided by authour's internal judgement.	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Sea Ice Conditions at Base**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
	Structure	Please see Figure 14							Links based on expert judgement and assumption	
	States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's opinion.	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
	Variable	**Route conditions for Air**							Parameter based on author's internal judgement	
	Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal judgement.	
	States	(Good, Bad)							States provided by authors's judgement and based on anonymous expert's judgement.	
	Parametrization	see probability table							Probability table based on author's assumption.	
	Variable	**Route Distance to Oil Site**							Parameter based on author's internal judgement	
	Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal judgement.	
	States	(Near, Average, Far)							States provided by authors's judgement and based on anonymous expert's judgement.	
	Parametrization	see probability table							Probability table based on author's assumption.	
	Variable	**Route Conditions on Water**							Parameter based on author's internal judgement	
	Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal judgement.	
	States	(Good, Bad)							States provided by authors's judgement and based on anonymous expert's judgement.	
	Parametrization	see probability table							Probability table based on author's assumption.	
	Variable	**Response Asset**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Vessel, Helicopter, Airplane)							States provided as representative according to available responses (Prevention & Response (EPPR), 2017).	
	Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	

Section	Model		Content	Data		Model		Judgem ent	Assum ption	Justification	SoE
				Quality	Amount	EV	TV				
Mechanical Response Selection SubModels	**Mechanical SM 1: Two vessels with boom**	Variable	**Mech SM1 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM1 ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM1 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**Mech SM1 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM1 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM1 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM1 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM1 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM1 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM1 Spill Size**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							based on what has been accessed about oil spills.	
		Variable	**Mech SM1 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM1 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM1 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM1 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM1 Oil Position**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR),	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM1 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM1 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM1 Oil persistence**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							based on what has been accessed about oils.	
		Variable	**Mech SM1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							assumption.	

Section		Model	Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification	SoE
Mechanical Response Selection SubModels	Mechanical SM 2: Single Vessel with Outrigger	Variable	**Mech SM2 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM2 ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM2 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**Mech SM2 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM2 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM2 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM2 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM2 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM2 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM2 Spill Size**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							based on what has been accessed about oil spills.	
		Variable	**Mech SM2 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM2 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM2 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM2 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM2 Oil Position**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR),	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM2 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM2 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM2 Oil persistence**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							based on what has been accessed about oils.	
		Variable	**Mech SM2: Offshore response vessel Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							assumption.	

Section		Model	Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification	SoE
Mechanical Response Selection SubModels	**Mechanical SM 3: Single Vessel in Ice**	Variable	**Mech SM3 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM3 ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM3 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**Mech SM3 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM3 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM3 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM3 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM3 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM3 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM3 Spill Size**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							based on what has been accessed about oil spills.	
		Variable	**Mech SM3 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM3 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM3 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM3 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM3 Oil Position**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR),	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM3 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM3: Boom & Oleophilic skimmer Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM3 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM3 Oil persistence**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							based on what has been accessed about oils.	
		Variable	**Mech SM3 : Vessels of opportunity Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							assumption.	

Section		Model	Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification	SoE
Mechanical Response Selection SubModels	**Mechanical SM 4: Three Vessels of Oppurtunity with boom**	Variable	**Mech SM4 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM4 ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM4 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**Mech SM4 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM4 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM4 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM4 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions	
		Variable	**Mech SM4 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM4 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM4 Spill Size**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							based on what has been accessed about oil spills.	
		Variable	**Mech SM4 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM4 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM4 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM4 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM4 Oil Position**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR),	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Mech SM4 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM 4: Skimming system Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Mech SM4 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Mech SM4 Oil persistence**							Parameter based on environment and oil spill response planning tool and	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							based on what has been accessed about oils.	
		Variable	**Mech SM4: Ice-class, offshore.response vessel Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							assumption.	

Section		Model	Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification	SoE
Chemical Response Selection SubModels	**Chemical SM 1: Vessel application**	Variable	**Chemical SM 1 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM 1 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**Chem SM 1 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM 1 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**Chem SM 1Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM 1 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**Chem SM1 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM1 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM 1 Spill Size**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oil spills.	
		Variable	**ChemSM1 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM1 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM1 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM1 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM1 Oil Position**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR), 2017), authour's internal judgement, and anonymous expert's opinion.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM1 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM1: response vessel Base Transport Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM1 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's opinion.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM 1 Oil persistence**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oils.	
		Variable	**Chem SM1: Dispersant spray arms Oil Response Equipment Operability**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017) and author's judgement	
		Parametirization	see probability table							assumption.	

Section		Model	Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification	SoE
Chemical Response Selection SubModels	Chemical SM 2: Airplance application	Variable	**Chemical SM 2 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM2 ShippingAct**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM 2 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**Chem SM 2 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM 2 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**Chem SM 2 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM 2 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**Chem SM 2 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM 2 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM 2 Spill Size**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oil spills.	
		Variable	**ChemSM 2 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM2 Temperature At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM2 Wind Speed At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM2 Sea Ice Conditions At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM2 Oil Position**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR), 2017), authour's internal judgement, and anonymous expert's opinion.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM2 Wave Conditions At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM2: Aerial high volume dispersant Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM2 Response Arrival Time to Oil Site**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's opinion.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM 2 Oil persistence**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oils.	
		Variable	**Chem SM2: Multi-engine fixed-wing.aircraft, one for dispersant.application, one for aerial spotting Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017) and author's judgement	
		Parametirization	see probability table							assumption.	

Section		Model	Content	Data		Model		Judgement	Assumption	Justification	SoE
				Quality	Amount	EV	TV				
Chemical Response Selection SubModels	**Chemical SM 3: Helicopter application**	Variable	**Chemical SM3 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM3 ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM3 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**Chem SM3 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM3 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**Chem SM3 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM3 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**Chem SM3 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM3 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM3 Spill Size**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oil spills.	
		Variable	**ChemSM3 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM3 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM3 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM3 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM3 Oil Position**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR), 2017), authour's internal judgement, and anonymous expert's opinion.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**Chem SM3 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM3: Aerial dispersant application Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**Chem SM3 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's opinion.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**Chem SM3 Oil persistence**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oils.	
		Variable	**Chem SM3: Twin engine jet helicopter Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017) and author's judgement	
		Parametirization	see probability table							assumption.	

Section	Model		Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification	SoE
InSitu Burning Selection SubModels	In-situ Burning SM 1: Vessels with fire boom	Variable	**In-Situ SM1 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametrization	see probability table							expressions.	
		Variable	**In-Situ SM1 ShippingAct**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM1 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametrization	see probability table							Uniform distribution assumed.	
		Variable	**In-Situ SM1 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametrization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM1 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametrization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**In-Situ SM1 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).	
		Parametrization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM1 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametrization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**In-Situ SM1 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametrization	see probability table							expressions.	
		Variable	**In-Situ SM1 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametrization	see probability table							expressions.	
		Variable	**In-Situ SM1 Spill Size**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoymouse expert's opinion.	
		Parametrization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oil spills.	
		Variable	**In-Situ SM1 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametrization	see probability table							expressions.	
		Variable	**In-Situ SM1 Temperature At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM1 Wind Speed At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM1 Sea Ice Conditions At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM1 Oil Position**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR), 2017), authour's internal judgement, and anonymous expert's opinion.	
		Parametrization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM1 Wave Conditions At Base**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**InSitu Burning SM1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametrization	see probability table							expressions.	
		Variable	**In-Situ SM1 Response Arrival Time to Oil Site**							Parameter based on anonymous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's opinion.	
		Parametrization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM1 Oil persistence**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametrization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oils.	
		Variable	**InSitu Burning SM1: vessels of opportunity Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017) and author's judgement	
		Parametrization	see probability table							assumption.	

Section		Model	Content	Data		Model		Judgement	Assumption	Justification	SoE
				Quality	Amount	EV	TV				
InSitu Burning Selection SubModels	**In-situ Burning SM 2: Helicopter with ice containment**	Variable	**In-Situ SM2 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM2 ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM2 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**In-Situ SM2 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM2 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**In-Situ SM2 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM2 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**In-Situ SM2 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM2 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM2 Spill Size**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oil spills.	
		Variable	**In-Situ SM2 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM2 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM2 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM2 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM2 Oil Position**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR), 2017), authour's internal judgement, and anonymous expert's opinion.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM2 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**InSitu Burning SM2: Aerial ignition system Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM2 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's opinion.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM2 Oil persistence**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oils.	
		Variable	**InSitu Burning SM2: Twin engine jet helicopter Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017) and author's judgement	
		Parametirization	see probability table							assumption.	

Section		Model	Content	Data		Model		Judgem ent	Assum ption	Justification	SoE
				Quality	Amount	EV	TV				
InSitu Burning Selection SubModels	**In-situ Burning SM 3: Helicopter with herders**	Variable	**In-Situ SM3 Effectiveness**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor, NA)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM3 ShippingAct**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Illegal,Legal)							States provided by anonymous expert's judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM3 Visibility at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Good,Poor)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Uniform distribution assumed.	
		Variable	**In-Situ SM3 Wind Speed at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM3 Wave Conditions at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**In-Situ SM3 Temperature at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement and Arctic related dataset(Climate & Weather Averages in Canadian Arctic Archipelago, Nunavut, Canada, n.d.; The Arctic Summer, n.d.; Thompson & Wallace, 1998).	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM3 Ice Coverage at Site Copy**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgment and Arctic weather data.	
		States	(Open_Water, Drift_Close_Ice, Compact_Ice)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability based on author's internal judgement and on sea ice conditions data report.	
		Variable	**In-Situ SM3 Water Conditions Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM3 Weather Conditons Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Low, Medium, Severe)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM3 Spill Size**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Light, Normal)							States provided by anoynmouse expert's opinion.	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oil spills.	
		Variable	**In-Situ SM3 Base Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM3 Temperature At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(NormalCold, ExtraCold)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM3 Wind Speed At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Normal, Severe)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM3 Sea Ice Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(New_young_ice, OldIce)							States based on found data on Arctic Conditions and report (Arctic Response Technology | Oil Spill Preparedness |, n.d.; Bobylev & Miles, 2020; Perovich et al., 2020; Prevention & Response (EPPR), 2017)	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM3 Oil Position**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Nearshore, Offshore)							States selected based on reported dataset (Prevention & Response (EPPR), 2017), authour's internal judgement, and anonymous expert's opinion.	
		Parametirization	see probability table							Probability based on author's internal judgement.	
		Variable	**In-Situ SM3 Wave Conditions At Base**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(Low-Slow, High-Rough)							States provided by authour's internal judgement.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**InSitu Burning SM3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability**							Parameter based on author's internal judgement.	
		Structure	Please see Figure 14							Links based on author's internal judgement	
		States	(Good, Medium, Poor)							States are selected based on author's judgement	
		Parametirization	see probability table							expressions.	
		Variable	**In-Situ SM3 Response Arrival Time to Oil Site**							Parameter based on anoynmous expert's opinion.	
		Structure	Please see Figure 14							Links based on expert judgement and assumption	
		States	(HalfDay, OneDay, TwoDay, Greater_than_3Days)							States provided by authors's judgement and based on anonymous expert's opinion.	
		Parametirization	see probability table							Probability table based on anoymouse expert's judgement.	
		Variable	**In-Situ SM3 Oil persistence**							Parameter based on environment and oil spill response planning tool and anonymous experts judgement.	
		Structure	Please see Figure 14							Links based on expert judgement.	
		States	(Persistent, NonPersistent)							States provided by authour's internal judgement and oil spill related	
		Parametirization	see probability table							Probability tables based on author's internal judgement and assumption based on what has been accessed about oils.	
		Variable	**InSitu Burning SM3: Twin engine jet helicopter Base Transport Operability**							Parameter based on EPPR Response Viability analysis, previous related oil spill models, and anonyomus expert's judgement.	
		Structure	Please see Figure 14							Links based on oil spill response type relationships and auhtor's internal	
		States	(Good, Poor)							States provoided by reported data (Prevention & Response (EPPR), 2017) and author's judgement	
		Parametirization	see probability table							assumption.	

Section	Model	Content	Data Quality	Data Amount	Model EV	Model TV	Judgement	Assumption	Justification	SoE
Operability Variables	Variable	**Chemical Response Equipment Effectivness**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Good, Medium, Poor)							States are selected based on author's judgement	
	Parametirization	see probability table							Based similarly to the minimum principle and the output formulated	
	Variable	**In-Situ Burning Response Equipment Effectivness**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Good, Medium, Poor)							States are selected based on author's judgement	
	Parametirization	see probability table							Based similarly to the minimum principle and the output formulated	
	Variable	**Mechanical Response Equipment Effectivness**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Good, Medium, Poor)							States are selected based on author's judgement	
	Parametirization	see probability table							Based similarly to the minimum principle and the output formulated	
	Variable	**Base Transport Operability**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Good, Medium, Poor)							States are selected based on author's judgement	
	Parametirization	see probability table							Based similarly to the minimum principle and the output formulated	
	Variable	**Base Operability**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Good, Medium, Poor)							States are selected based on author's judgement	
	Parametirization	see probability table							Based similarly to the minimum principle and the output formulated	
	Variable	**Oil Spill Response Equipment Operability**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Good, Medium, Poor)							States are selected based on author's judgement	
	Parametirization	see probability table							Based similarly to the minimum principle and the output formulated	
	Variable	**Weather Conditions Operability**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Low, Medium, Severe)							States are selected based on author's judgement	
	Parametirization	see probability table							Based similarly to the minimum principle and the output formulated	
	Variable	**Water Conditions Operability**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Low, Medium, Severe)							States are selected based on author's judgement	
	Parametirization	see probability table							expressions.	
Overall Response Effectiveness	Variable	**Overall Response Effectivness**							Parameter based on author's internal judgement.	
	Structure	Please see Figure 14							Links based on author's internal judgement	
	States	(Effective,Slightly_Effective, Not_Effective, NA)							States are selected based on author's judgement	
	Parametrization	see probability table							expressions.	
		Not Relevant	Low		Medium		High			

Appendix B: Sample Consent Form

Consent Form

Project title: Project Shipping Accident Oil Spill Consequences and Response Effectiveness in Arctic Marine Environments

Lead researcher: Talah Al Sharkawi, MaSc student, talah.shark@dal.ca

Student Supervisor: Dr. Floris Goerlandt, Assistant Professor,floris.goerlandt@dal.ca

Funding provided by: Marine Environment Observation Prediction and Response (MEOPAR) Network of Centers of Excellence

If you have received this email then you are invited to take part in a research study being conducted by, Talah Al Sharkawi who is a MASc student at Dalhousie University. Choosing whether or not to take part in this research is entirely your choice. There will be no impact on your employment if you decide not to participate in this research, and you will be "expert protected". The information below tells you about what is involved in the research, what you will be asked to do and about any benefit, risk, inconvenience or discomfort that you might experience.

If you choose to participate in this research, you will be interviewed by the lead researcher on a teams/zoom call. The interview should take approximately 1 – 2 hours and would have 2-3 sessions. With your consent, the data will be recorded. You are not required to show your face during the call. If in any way you are not comfortable to be recorded, then another arrangement will be made where we will not record the call, but the lead researcher will be taking down notes. It is noted that this may take longer since the interviewer may ask for several reiterations to you (the interviewee).

This research pertains to the effectiveness of oil spill recovery through its operability based on inputted conditions. Effectiveness is based on how efficient the operability of the equipment in the cleanup process of an oil spill is. The model will hopefully provide information so as to culminate all the responses and would output a ranked result criterion so as to optimize the most effective recovery method based on the inputted variables and uncertainties. It is known that oil spills are one of the key man-made disasters to our ecosystem, and the longer it takes to clean up, the greater the negative consequences.

Ideally, by creating a Bayesian Network sub-model for recovery response effectiveness for oil spills, some parts of the negative consequences can hopefully be negated.

Participating in this research may not benefit you, but it will greatly aid in our research in clarifying the effectiveness of this model. There are no known risks for participating in this research beyond being bored or fatigued. You will be offered breaks between activities to reduce these risks.

Your participation in this research will be known only to me and member of MEOPAR. The information that you provide to us will be kept confidential. Only the lead researcher will have access to this information. All your identifying information (such as your name and contact information) will be securely stored separately from your research information During the study, all electronic records will be kept secure in an encrypted file on the researcher's password-protected computer. All paper records will be kept secure in a locked filing cabinet located in the researcher's office.

This research will only report group results and not individual results. This means that you will not be identified in any way in the reports.

We are happy to talk with you about any questions or concerns you may have about your participation in this research study. Please contact Talah (at 902 430-4564 talah.shark@dal.ca) [or Dr. Floris Goerlandt (at floris.goerlandt@dal.ca)] at any time with questions, comments, or concerns about the research study

If you have any ethical concerns about your participation in this research, you may also contact Research Ethics, Dalhousie University at (902) 494-3423, or email: ethics@dal.ca (and reference REB file: 2021-5454).

Appendix C: Response Variations and their limitations

The following tables below presents The oil responses capabilities and limitations were based on what was presented by a comparison grid on a Circumpolar Oil Spill Response Viability Analysis Report as well as the information of conditions in the Arctic Circle are provided several ITOPF articles(*In-Situ Burning*, 2022; ITOPF, n.d.-b; North Slope Spill Response, 2015; Prevention & Response (EPPR), 2017).

Table 43 Mechanical Recovery variation Two vessel with booms response limitations.(Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 11	11	18	≥ 18
Wind wave height m	≤ 1.8	1.8	3.0	≥ 3.0
Sea ice coverage %	≤ 10	10	30	≥ 30
Air temperature °C	≥ -5	-5	-18	≤ -18
Wind chill temp. °C	≥ -31.7	-31.7	-37.2	≤ -37.2
Structural icing cm/hr	< 0.7	0.7	2.0	> 2.0
Light conditions (day/dark)	Daylight	Darkness		
Horizontal visibility km	≥ 0.9	0.9	0.2	≤ 0.2
Vertical visibility m	≥ 152	152	10	≤10

Table 44 Mechanical recovery variation Single vessel with outrigger response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 11	11	17	≥ 17
Wind wave height m	≤ 0.9	0.9	2.0	≥ 2.0
Sea ice coverage %	≤ 10	10	30	≥ 30
Air temperature °C	≥ -5	-5	-18	≤ -18
Wind chill temp. °C	≥ -31.7	-31.7	-37.2	≤ -37.2
Structural icing cm/hr	< 0.7	0.7	2.0	> 2.0
Light conditions (day/dark)	Daylight	Darkness		
Horizontal visibility km	≥ 0.9	0.9	0.2	≤ 0.2
Vertical visibility m	≥ 152	152	10	≤10

Table 45 Mechanical recovery variation Three vessels-of-opportunity with Boom response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 11	11	15	≥ 15
Wind wave height m	≤ 0.6	0.6	1.0	≥ 1.0
Sea ice coverage %	≤ 10	10	20	≥ 20
Air temperature ºC	≥ -5	-5	-18	≤ -18
Wind chill temp. ºC	≥ -31.7	-31.7	-37.2	≤ -37.2
Structural icing cm/hr	< 0.7	0.7	2.0	> 2.0
Light conditions (day/dark)	Daylight	Darkness		
Horizontal visibility km	≥ 0.9	0.9	0.2	≤ 0.2
Vertical visibility m	≥ 152	152	10	≤10

Table 46 Mechanical recovery variation Single vessel in ice response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 15	15	25	≥ 25
Wind wave height m	Assumed not limiting for this system.			
Sea ice coverage %	≥ 90	90	70	< 70
Air temperature ºC	Assumed not limiting for this system.			
Wind chill temp. ºC	Assumed not limiting for this system.			
Structural icing cm/hr	< 0.7	0.7	2.0	> 2.0
Light conditions (day/dark)	Daylight	Darkness		
Horizontal visibility km	≥ 0.9	0.9	0.2	≤ 0.2
Vertical visibility m	≥ 152	152	10	≤10

Table 47 Chemical Dispersants variation Vessel application response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 11	11	20	≥ 20
Wind wave height m	≤ 2.7	2.7	5.0	≥ 5.0
Sea ice coverage %	≤ 10	10	70	≥ 70
Air temperature ºC	Assumed not limiting for this system.			
Wind chill temp. ºC	≥ -31.7	-31.7	-37.2	≤ -37.2
Structural icing cm/hr	< 0.7	0.7	2.0	> 2.0
Light conditions (day/dark)	Daylight	Darkness		
Horizontal visibility km	≥ 0.9	0.9	0.2	≤ 0.2
Vertical visibility m	≥ 152	152	10	≤10

Table 48 Chemical Dispersants variation Airplane Application response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 13	13	15	≥ 15
Wind wave height m	< 3	3	5	> 5
Sea ice coverage %	≤ 10	10	30	≥ 30
Air temperature ºC	*Assumed not limiting for this system.*			
Wind chill temp. ºC	*Assumed not limiting for aerial systems.*			
Structural icing cm/hr	*Assumed not limiting for aerial systems.*			
Light conditions (day/dark)	Daylight			Darkness
Horizontal visibility km	≥ 5.6	5.6	1.9	< 1.9
Vertical visibility m	≥ 1524	1524	305	≤ 305

Table 49 Chemical Dispersants variation Helicopter Application response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 11	11	15	≥ 15
Wind wave height m	< 3	3	5	> 5
Sea ice coverage %	≤ 10	10	50	≥ 50
Air temperature ºC	> -40	-40	-40	≤ -40
Wind chill temp. ºC	Assumed not limiting for aerial systems.			
Structural icing cm/hr	Assumed not limiting for aerial systems.			
Light conditions (day/dark)	Daylight			Darkness
Horizontal visibility km	≥ 1.9	1.9	0.7	< 0.7
Vertical visibility m	≥ 305	305	152	≤ 152

Table 50 In-situ burning variation Vessels with fire boom response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 5	5	10	≥ 10
Wind wave height m	≤ 1.0	1.0	2.0	≥ 2.0
Sea ice coverage %	≤ 10	10	30	≥ 30
Air temperature ºC	Assumed not limiting for this system.			
Wind chill temp. ºC	≥ -31.7	-31.7	-37.2	≤ -37.2
Structural icing cm/hr	< 0.7	0.7	2.0	> 2.0
Light conditions (day/dark)	Daylight	Darkness		
Horizontal visibility km	≥ 0.9	0.9	0.2	≤ 0.2
Vertical visibility m	≥ 152	152	10	≤10

Table 51 In-situ burning variation Helicopter with ice containment response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 5	5	10	≥ 10
Wind wave height m	≤ 0.9	0.9	2.0	≥ 2.0
Sea ice coverage %	70 ≤ G ≤ 90	60 ≤ Y < 70	90 < Y ≤ 95	60 > R > 95
Air temperature ºC	> -40	-40	-40	≤ -40
Wind chill temp. ºC	Assumed not limiting for aerial systems.			
Structural icing cm/hr	Assumed not limiting for aerial systems.			
Light conditions (day/dark)	Daylight			Darkness
Horizontal visibility km	≥ 1.9	1.9	0.7	< 0.7
Vertical visibility m	≥ 305	305	152	≤ 152

Table 52 In-situ burning variation Helicopter with herders' response limitations (Prevention & Response (EPPR), 2017)

SYSTEM LIMITS – METRIC	FAVOURABLE	MARGINAL		NOT FAVOURABLE
	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary
Wind m/s	≤ 4	4	6	≥ 6
Wind wave height m	No limit applied; information not yet available for this developing system.			
Sea ice coverage %	≤ 30	30	60	≥ 60
Air temperature ºC	> -20			≤ -20
Wind chill temp. ºC	Assumed not limiting for aerial systems.			
Structural icing cm/hr	Assumed not limiting for aerial systems.			
Light conditions (day/dark)	Daylight			Darkness
Horizontal visibility km	≥ 1.9	1.9	0.7	< 0.7
Vertical visibility m	≥ 305	305	152	≤ 152

Appendix D: Tables Description of Bayesian Network Model's States

Table 53 Table of Water Conditions Operability and their corresponding description

States	Description
Low	▪ Open and calm water conditions ▪ Open Pack Ice
Medium	▪ Water wave heights are up to 1m ▪ Open to little ice around
Severe	▪ Rough waves >2m ▪ Rough ice conditions ▪ Closed pack ice

Table 54 Table of Weather Conditions Operability and their corresponding description for Mechanical Sub-models

States	Description
Low	▪ Calm wind conditions ▪ High Visibility (Daylight) ▪ Air Temperature > -5 ºC
Medium	▪ Air Temperature between -5 ºC and -18 ºC ▪ Low visibility (Dark) ▪ Normal wind Conditions
Severe	▪ No visibility (Dark) ▪ Rough wind Conditions ▪ Air Temperature <-18 ºC

Table 55 Table of Weather Conditions Operability and their corresponding description for Chemical Sub-models

States	Description
Low	▪ Calm wind conditions ▪ High Visibility (Daylight) ▪ Air Temperature > -40 ºC
Medium	▪ Air Temperature between -40 ºC and -40 ºC ▪ Normal Visibility ▪ Normal Wind Conditions
Severe	▪ Low visibility (Dark) ▪ Rough wind Conditions ▪ Air Temperature <-40 ºC

Table 56 Table of Weather Conditions Operability and their corresponding description for In-Situ Burning Sub-models

States	Description
Low	▪ Calm wind conditions ▪ High Visibility (Daylight) ▪ Air Temperature > -10 ºC
Medium	▪ Air Temperature between -10 ºC and -20 ºC ▪ Normal Visibility ▪ Normal Wind Conditions

Severe	▪ Low visibility (Dark) ▪ Rough wind Conditions ▪ Air Temperature <-20 ºC

Table 57 Table identifying what condition are more suited based on the skimmer type (L. Lu, 2021; Prevention & Response (EPPR), 2017)

		Best Suited Conditions
Skimmer Type	High Volume Skimmer	•The skimmer is suited for > 2m rough seas. •Is suited more for daylight but is alright during darkness.
	Weir Skimmer	•The skimmer system is suited for waves up to 1m. •Is suited more for daylight but is alright during darkness.
	Oleophilic Skimmer	•The skimmer system is suited for waves up to 1m. •Is suited more for daylight but is alright during darkness.
	High Ice Skimmer	•The skimmer system is suited for high ice concentrations or very compacted ice. •Is suited more for daylight, but is alright during darkness
	No Skimmer	NA

Chemical Dispersant Responses are the only response type with a chemical dispersant that can be used. Appendix C: Response Variations and their limitationsprovides a more in-depth table about the dispersant response variations and their limitations when responding to oil spills.

The table below showcases the states of Dispersant Applicant Selected and its related probability followed by another table identifying what condition are more suited based on the dispersant type.

Table 58 Table identifying what condition are more suited based on the boom type (L. Lu, 2021; Prevention & Response (EPPR), 2017)

	Response Transportation	Best Suited Conditions
Dispersant	Dispersant	The system can be used in a range of ice conditions as long as resources and equipment are fully equipped. Is suited ideally for daylight but is alright during the dark.
	No Dispersant	NA

Table 59 Table identifying what condition are more suited based on the Fire Ignition selected (L. Lu, 2021; Prevention & Response (EPPR), 2017)

	Response Selected	Best Suited Conditions
Fire Ignition	Ignition	Is suited ideally for daylight and is not ideal in the dark.

	No_Ignition	NA

Boom Types can be used by either Mechanical Recovery or In-Situ Burning response method. Appendix C: Response Variations and their limitationsprovides a more in-depth table about the response variations related to boom types and their limitations when responding to oil spills.

Table 60 Table identifying what condition are more suited based on the boom type (L. Lu, 2021; Prevention & Response (EPPR), 2017)

		Best Suited Conditions
Boom Type	Boom	The boom is suited for > 2m rough seas Is suited more for daylight but is alright during darkness.
	Fire Boom	System suited for open water conditions and very open pack ice Is suited more for daylight but is alright during darkness.
	No Boom	NA

The table below showcases the potential effects of using an aircraft or a vessel in the Arctic Ocean. In hindsight, though the table shows that they are mostly similar, based on what one can see there are more possible harmful effects when using a vessel as compared to aircraft, therefore introducing the possibility using aircraft for responding by chemical or in-situ burning.

Table 61 Potential effects of using an aircraft or a vessel in the Arctic Ocean (Prevention & Response (EPPR), 2017).

Vessel	Aircraft
Wind conditions can affect the safety of the crew working and the ability to stop the vessel	Wind conditions can affect the safety of the crew working and the ability to even have the aircraft lift off.
Sea state or wave conditions can also affect the safety of the crew working and the ability to stop or drive the vessel.	Sea state or wave conditions can specifically impact low-flying helicopters.
Temperature can lead with issues with the vessels as harsh temperatures may ice the vessel itself. As well temperature can lead to difficulty with workers completing their response task as it could be too cold to work.	Temperature can lead with issues with the aircraft as harsh temperatures may ice the aircraft itself
Sea ice coverage and ice state conditions can affect with the safety of the vessel itself as well as functioning the vessel to start or stop.	Visibility conditions can also affect the safety of the aircraft and may lead to potential collisions. Visibility can also affect completing the mission as a whole.
Visibility conditions can also affect the safety of the vessels and may lead to potential collisions due to a reduced ability to navigate safely.	Daylight conditions can affect completing the response task based on its visibility for the aircraft driver.
Daylight conditions can affect completing the response task.	

Appendix E: OSRECA Variables' States and Probabilities

Spill Site Related Variables' States and Probabilities

Table 62 States of Visibility at Site per Season

Season	Summer		Winter	
Daylight (Time)	Day	Night	Day	Night
Good	0.3	0.3	0.9	0.8
Poor	0.7	0.7	0.1	0.2

The table below showcases the states of the '*Temperature at Site*' and their related probabilities.

Table 63 States of Temperature at Site per Season

Season	Summer		Winter	
Daylight (Time)	Day	Night	Day	Night
Normal Cold	1	1	0.2	0
Extra Cold	0	0	0.8	1

The table below showcases the states of the '*Wave Conditions at Site*' and their related probabilities.

Table 64 States of Wave Conditions at Site per Season

Season	Summer		Winter	
Daylight (Time)	Day	Night	Day	Night
Low Slow	0.6	0.5	0.8	0.9
High Rough	0.4	0.5	0.2	0.1

Table 65 showcases the states of the '*Ice Coverage at Site*' and the related probabilities.

Table 65 States of Ice Coverage at Site per Season

Sea Ice Conditions	New Young Ice		Old Ice	
Season	Summer	Winter	Summer	Winter
Open Water	0.7	0.3	0	0
Drift Close Ice	0.3	0.7	0.5	0.3
Compact Ice	0	0	0.5	0.7

The table below showcases the states of the '*Ice Coverage at Site*' and their related probabilities.

Table 66 States of Wind Speed at Site per Season

Season	**Summer**		**Winter**	
Temperature at Base	**Normal Cold**	**Extra Cold**	**Normal Cold**	**Extra Cold**
Normal	0.5	0.8	0.5	0.9
Severe	0.5	0.2	0.5	0.1

Table 67 below showcases the states of the '*Sea Ice Conditions at Site*' and their related probabilities.

Table 67 States of Sea Ice Conditions at Site

Season	**Summer**			**Winter**		
Oil Spill Location	**Fishing**	**General**	**Pleasure**	**Fishing**	**General**	**Pleasure**
New ice	0	0	0	0.45	0.45	0.4
Young Ice	0.9	0.9	0.9	0.45	0.45	0.4
Old Ice	0.1	0.1	0.1	0.1	0.1	0.2

Base Related Variables' States and Probabilities

The table below showcases the states of the '*Visibility at Base'* and their related probabilities.

Table 68 States of the Visibility at Base per Season per Daylight (Time)

Season	**Summer**		**Winter**	
Daylight(Time)	**Day**	**Night**	**Day**	**Night**
Good	0.3	0.3	0.9	0.8
Poor	0.7	0.7	0.1	0.2

The table below showcases the states of the *Wave Conditions at Base* and its related probability.

Table 69 States of Wave Conditions at Base per Season and Daylight

Season	**Summer**		**Winter**	
Daylight (Time)	**Day**	**Night**	**Day**	**Night**
Low Slow	0.6	0.5	0.8	0.9
High Rough	0.4	0.5	0.2	0.1

The table below showcases the states of the *Port Location* and their related probabilities.

Table 70 States of Port Location

Port Location	**Probability**
Iqaluit	0.2
Yellowknife	0.6
Tuktoyaktuk	0.2

The table below showcases the states of the *'Staff Available'* and its related probability.

Table 71 States of Preparation Time

Staff Available	**Staffed**	**Understaffed**
On time	1	0
Not On Time	0	1

Table 72 below showcases a summary of states of the *Shipping Act Law* and its related probability

Table 72 States of Shipping Act Law per Response Type

Shipping Act	**Response Selected**	**Mechanical Recovery**	**Chemical Dispersion**	**In-Situ Burning**
	Illegal/Delay	0	1	0
	Legal	1	0	1

The table below showcases the states of the *Temperature at Site* and their related probabilities.

Table 73 States of Temperature at Base per Season and Daylight

Season	Summer		Winter	
Daylight (Time)	**Day**	**Night**	**Day**	**Night**
Normal Cold	1	1	0.2	0
Extra Cold	0	0	0.8	1

The table below showcases the states of the '*Wind Speed at Base'* and their related probabilities.

Table 74 States of Wind Speed at Base per Season and Temperature

Season	Summer		Winter	
Temperature at Base	**Normal Cold**	**Extra Cold**	**Normal Cold**	**Extra Cold**
Normal	0.5	0.5	0.8	0.9
Severe	0.5	0.5	0.2	0.1

The table below showcases the states of the '*Sea Ice Conditions at Base'* and their related probabilities.

Table 75 States of Sea Ice Conditions per Season and Port Location

Season	Summer			Winter		
Port Location	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**
New Young Ice	0.9	0.8	0.8	0.9	0.9	0.8
Old Ice	0.1	0.2	0.2	0.1	0.1	0.2

The table below showcases the states of the variable '*Route Conditions on Air'* and their related probabilities.

Table 76 States & Probability of Route Conditions on Air

Visibility at Base	Good		Poor	
Wind Speed at Base	Normal	Severe	Normal	Severe
Good	1	0.5	0.5	0
Bad	0	0.5	0.5	1

The table below showcases the states of the variable 'Response Asset' and their related probabilities.

Table 77 States & Probability of variable Response Asset

Response Asset	
Vessel	0.3333
Helicopter	0.3333
Airplane	0.3333

The table below showcases the states of the '*Staff Available'* and their related probabilities.

Table 78 States of Staff Available per Port Location, Daylight (Time) and Season

Season	**Summer**					
Daylight (Time)	**Day**			**Night**		
Port Location	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**
Staffed	0.8	0.9	0.8	0.5	0.5	0.5
Understaffed	0.2	0.1	0.2	0.5	0.5	0.5
Season	**Winter**					
Daylight (Time)	**Day**			**Night**		
Port Location	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**
Staffed	0.5	0.5	0.5	0.6	0.7	0.6
Understaffed	0.5	0.5	0.5	0.4	0.3	0.4

The table below showcases the states of '*Route Distance to Oil Site'* and their related probabilities.

Table 79 States & Probability of Route Distance to Oil Site

Oil Spill Location	**A Fishing**			**B General**			**C Pleasure**		
Port Location	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**	**Iqaluit**	**Yellowknife**	**Tuktoyaktuk**
Near	0.5	0	0	0.5	0.4	0	0	0.5	0.5
Average	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5
Far	0	0.5	0.5	0	0	0.5	0.5	0	0

The table below showcases the states of the '*Response Arrival Time to Oil* Site' and their related probabilities.

Table 80 States of Response Arrival Time to Oil Site and its related probabilities for Response Asset Vessel

Response Asset	**Vessel**							
Route Distance to Oil Site	**Near**							
Preparation Time	**On Time**				**Not On Time**			
Route Conditions on Water	**Good**		**Bad**		**Good**		**Bad**	
Route Conditions on Air	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**
Half Day	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
One Day	0.25	0.25	0.25	0.25	0.5	0.5	0.5	0.5
Two Day	0.25	0.25	0.25	0.25	0	0	0	0
Greater than 3 Days	0	0	0	0	0	0	0	0

Response Asset	**Vessel**							
Route Distance to Oil Site	**Average**							
Preparation Time	**On Time**				**Not On Time**			
Route Conditions on Water	**Good**		**Bad**		**Good**		**Bad**	
Route Conditions on Air	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**
Half Day	0.5	0.5	0.25	0.25	0.5	0.5	0.5	0.5
One Day	0.5	0.5	0.25	0.25	0.25	0.25	0.25	0.25
Two Day	0	0	0.25	0.25	0.25	0.25	0.25	0.25
Greater than 3 Days	0	0	0.25	0.25	0	0	0	0

Response Asset	**Vessel**							
Route Distance to Oil Site	**Far**							
Preparation Time	**On Time**				**Not On Time**			
Route Conditions on Water	**Good**		**Bad**		**Good**		**Bad**	
Route Conditions on Air	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**
Half Day	0	0	0	0	0	0	0	0
One Day	0.5	0.5	0.5	0.25	0.25	0.25	0	0
Two Day	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Greater than 3 Days	0	0	0	0.25	0.25	0.25	0.5	0.5

Table 81 States of Response Arrival Time to Oil Site and its related probabilities for Response Asset Helicopter

Response Asset	Helicopter							
Route Distance to Oil Site	Near							
Preparation Time	On Time				Not On Time			
Route Conditions on Water	Good		Bad		Good		Bad	
Route Conditions on Air	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Half Day	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
One Day	0.25	0.25	0.25	0.25	0.5	0.5	0.5	0.5
Two Day	0.25	0.25	0.25	0.25	0	0	0	0
Greater than 3 Days	0	0	0	0	0	0	0	0

Response Asset	Helicopter							
Route Distance to Oil Site	Average							
Preparation Time	On Time				Not On Time			
Route Conditions on Water	Good		Bad		Good		Bad	
Route Conditions on Air	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Half Day	0.5	0	0	0.25	0.5	0	0	0.25
One Day	0.25	0.25	0.5	0.25	0.25	0.25	0.5	0.25
Two Day	0.25	0.5	0.5	0.25	0.25	0.5	0.5	0.25
Greater than 3 Days	0	0.25	0	0.25	0	0.25	0	0.25

Response Asset	Helicopter							
Route Distance to Oil Site	Far							
Preparation Time	On Time				Not On Time			
Route Conditions on Water	Good		Bad		Good		Bad	
Route Conditions on Air	Good	Bad	Good	Bad	Good	Bad	Good	Bad
Half Day	0.5	0	0	0	0.5	0	0	0
One Day	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Two Day	0	0.5	0.5	0.25	0	0.5	0.5	0.25
Greater than 3 Days	0	0	0	0.25	0	0	0	0.25

Table 82 States of Response Arrival Time to Oil Site and its related probabilities for Response Asset Airplane

Response Asset	**Airplane**							
Route Distance to Oil Site	**Near**							
Preparation Time	**On Time**				**Not On Time**			
Route Conditions on Water	**Good**		**Bad**		**Good**		**Bad**	
Route Conditions on Air	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**
Half Day	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
One Day	0.25	0.25	0.25	0.25	0.5	0.5	0.5	0.5
Two Day	0.25	0.25	0.25	0.25	0	0	0	0
Greater than 3 Days	0	0	0	0	0	0	0	0

Response Asset	**Airplane**							
Route Distance to Oil Site	**Average**							
Preparation Time	**On Time**				**Not On Time**			
Route Conditions on Water	**Good**		**Bad**		**Good**		**Bad**	
Route Conditions on Air	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**
Half Day	0.5	0	0	0.25	0.5	0	0	0.25
One Day	0.25	0.25	0.5	0.25	0.25	0.25	0.5	0.25
Two Day	0.25	0.5	0.5	0.25	0.25	0.5	0.5	0.25
Greater than 3 Days	0	0.25	0	0.25	0	0.25	0	0.25

Response Asset	**Airplane**							
Route Distance to Oil Site	**Far**							
Preparation Time	**On Time**				**Not On Time**			
Route Conditions on Water	**Good**		**Bad**		**Good**		**Bad**	
Route Conditions on Air	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**	**Good**	**Bad**
Half Day	0.5	0	0	0	0.5	0	0	0
One Day	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Two Day	0	0.5	0.5	0.25	0	0.5	0.5	0.25
Greater than 3 Days	0	0	0	0.25	0	0	0	0.25

Table 83 below showcases the states of the variable '*Route Conditions on Water'* and their related probabilities.

Table 83 States & Probability of Route Conditions on Water

Wave Conditions at Base	**Low Slow**				**High Rough**			
Temperature at Base	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Sea Ice Conditions at Base	**New Younge Ice**	**Old Ice**	**New Younge Ice**	**Old Ice**	**New Younge Ice**	**Old Ice**	**New Younge Ice**	**Old Ice**
Good	0.8	0.8	0.8	0.8	0.5	0.4	0.8	0.8
Bad	0.2	0.2	0.2	0.2	0.5	0.6	0.2	0.2

Response Related Variables' States and Probabilities

The table shown below shows the '*Mech SM 1 Shipping Act Law'* table and its probability.

Table 84 Probability & State of Shipping Act Law for Mechanical Response Selection Sub-Model 1

Shipping Act	
Illegal	0
Legal	1

The table below showcases the states of '*Mech SM 1Water Conditions Operability'* and its related probabilities respectively.

Table 85 Probability and State of Variable Mech SM 1 Water Conditions Operability

Wave Conditions at Site Mech SM 1	Low Slow			High Rough		
Ice Coverage at Site Mech SM 1	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	0	1	0	1	0	0
Medium	0	0	0	0	0	0
Poor	1	0	1	0	1	1

The table *Mech SM 1 Weather Conditions Operability* below showcases the states and its related probabilities.

Table 86 Probability & State of Mech SM 1 Weather Conditions Operability

Visibility at Site Mech SM 1	Good				Poor			
Temperature at Site Mech SM 1	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Wind Speed at Site Mech SM 1	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0.5	0.5	0.5	0	0	0	0
Medium	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0	0	0	0.5	0.5	0.5	0.5

The table below showcases the states of *Mech SM 1 Base Operability* and their related probabilities.

Table 87 Probability & States of Mech SM 1 Base Operability

Mech SM 1 Temperature at Base	Normal Cold	
Mech SM 1 Wind Speed at Base	**High Rough**	**Old Rough**

Mech SM 1 Sea Ice Conditions at Base	New Younge Ice		Old Ice		New Younge Ice		Old Ice	
Mech SM 1 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0.8	0.8	0.8	0	0.8	0.8	0.8	0
Medium	0.2	0.2	0.2	0.5	0.2	0.2	0.2	0.5
Poor	0	0	0	0.5	0	0	0	0.5

Mech SM 1 Temperature at Base	Extra Cold							
Mech SM 1 Wind Speed at Base	**High Rough**				**Old Rough**			
Mech SM 1 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Mech SM 1 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0.5	0.8	0	0.5	0.5	0.8	0	0
Medium	0.5	0.2	0.5	0.5	0.5	0.2	0.5	0.5
Poor	0	0	0.5	0	0	0	0.5	0.5

The table below showcases the states of *Mech SM 1: Offshore Response Vessel & Vessel of Opportunity* and their related probabilities.

Table 88 States & Probability of the variable In-Situ Burning SM 1: Offshore Response Vessel & Vessel of Opportunity Base Transport Operability

Mech SM 1 Response Arrival Time to Oil Site	Half Day				One Day			
Mech SM 1 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
Mech SM 1 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**
Good	0	0	1	1	0	0	1	1
Medium	0	0	0	0	0	0	0	0
Poor	1	1	0	0	1	1	0	0

Mech SM 1 Response Arrival Time to Oil Site	Two Day		Greater than 3 Day	
Mech SM 1 Oil Position	**Nearshore**	**Offshore**	**Nearshore**	**Offshore**

Mech SM 1 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0	0	0.5	0.5	0	0	0.5	1
Medium	0	0	0.5	0.5	0	0	0.5	0
Poor	1	1	0	0	1	1	0	0

The table below showcases the states of '*Mech SM 1 Oil Spill Response Equipment Operability'* and their related probabilities.

Table 89 Probability & State of Variable Mech SM 1 Oil Response Equipment Operability

Mech SM 1 Oil Position	Nearshore				Offshore			
Mech SM 1 Spill Size	**Light**		**Normal**		**Light**		**Normal**	
Mech SM 1 Oil Persistence	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**
Good	0.5	0	0.5	0	1	1	0.5	0.5
Poor	0.5	1	0.5	1	0	0	0.5	0.5

The table shown below shows the '*Mech SM 2 Shipping Act Law'* table and its probabilities.

Table 90 Probability & State of Shipping Act Law for Mechanical Response Selection Sub-Model 2

Shipping Act	
Illegal	0
Legal	1

The table below showcases the states of *Mech SM 2 Weather Conditions Operability* and their related probabilities.

Table 91 Probability & State of Mech SM 2 Weather Conditions Operability

Visibility at Site Mech SM 2	Good				Poor			
Temperature at Site Mech SM 2	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Wind Speed at Site Mech SM 2	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**

Good	1	0.5	0.5	0.5	0	0	0	0
Medium	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0	0	0	0.5	0.5	0.5	0.5

The table below showcases the states of *Mech SM 2 Water Conditions Operability* and their related probabilities.

Table 92 Probability and State of Variable Mech SM 2 Water Conditions Operability

Wave Conditions at Site Mech SM 2	**Low Slow**			**High Rough**		
Ice Coverage at Site Mech SM 2	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	1	0.5	1	0.5	0	0
Medium	0	0.5	0	0.5	0	0
Poor	0	0	0	0	1	1

The table below showcases the states of '*Mech SM 2 Base Operability'* and their related probabilities.

Table 93 Probability & States of Mech SM 2 Base Operability

Mech SM 2 Temperature at Base	**Normal Cold**							
Mech SM 2 Wind Speed at Base	**High Rough**				**Old Rough**			
Mech SM 2 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Mech SM 2 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0.5	0.5	0.5	0.5	0	0	0	0
Medium	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0	0	0	0.5	0.5	0.5	0.5

Mech SM 2 Temperature at Base	**Extra Cold**							
Mech SM 2 Wind Speed at Base	**High Rough**				**Old Rough**			
Mech SM 2 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Mech SM 2 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0.8	0.8	0	0	0.8	0.8	0.5	0
Medium	0.2	0.2	0.5	0.5	0.2	0.2	0.5	0.5

Poor	0	0	0.5	0.5	0	0	0	0.5

The table below showcases the states of '*Mech SM 2: Offshore Response Vessel'* and their related probabilities.

Table 94 States & Probability of the variable In-Situ Burning SM 2: Offshore Response Vessel Base Transport Operability

Mech SM 2 Response Arrival Time to Oil Site	Half Day				One Day			
Mech SM 2 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Mech SM 2 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0.5	0.5	1	1	0.5	0.5	1	1
Medium	0.5	0.5	0	0	0.5	0.5	0	0
Poor	0	0	0	0	0	0	0	0

Mech SM 2 Response Arrival Time to Oil Site	Two Day				Greater than 3 Day			
Mech SM 2 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Mech SM 2 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0.5	0.5	0.5	0.5	0	0.5	0.5	1
Medium	0.5	0.5	0.5	0.5	0	0.5	0.5	0
Poor	0	0	0	0	1	0	0	0

The table below showcases the states of *'Mech SM 2 Oil Response Equipment Operability'* and their related probabilities.

Table 95 Probability & State of Variable Mech SM 2 Oil Response Equipment Operability

Mech SM 2 Oil Position	Nearshore		Offshore	
Mech SM 2 Spill Size	Light	Normal	Light	Normal

Mech SM 2 Oil Persistence	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent
Good	1	0.5	0.5	0.5	1	1	0.5	0.5
Poor	0	0.5	0.5	0.5	0	0	0.5	0.5

The table below showcases the states of '*Water Conditions Operability for Mech SM 3'* and its related probability.

Table 96 Probability and State of Variable Mech SM 3 Water Conditions Operability

Wave Conditions at Site Mech SM 3	Low Slow			High Rough		
Ice Coverage at Site Mech SM 3	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	0	0.5	0.5	0	0.5	1
Medium	0	0.5	0.5	0	0.5	0
Poor	1	0	0	1	0	0

The tables below showcases the states of '*Mech SM 3 Weather Conditions Operability'* and its related probability.

Table 97 Probability & State of Mech SM 3 Weather Conditions Operability

Visibility at Site Mech SM 3	Good				Poor			
Temperature at Site Mech SM 3	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Wind Speed at Site Mech SM 3	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0.5	1	0	0	0	0	0
Medium	0	0.5	0	0.5	0.5	0.5	0.5	0.5
Poor	0	0	0	0.5	0.5	0.5	0.5	0.5

The table below showcases the states of '*Mech SM 3 Base Operability'* and its related probability.

Table 98 Probability & States of Mech SM 3 Base Operability

Mech SM 3 Temperature at Base	Normal Cold			
Mech SM 3 Wind Speed at Base	**High Rough**		**Old Rough**	
Mech SM 3 Sea Ice Conditions at Base	**New Younge Ice**	**Old Ice**	**New Younge Ice**	**Old Ice**

Mech SM 3 Wave Conditions at Base	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	0	0	1	1	0	0.5	1	1
Medium	0.5	0.5	0	0	0.5	0.5	0	0
Poor	0.5	0.5	0	0	0.5	0	0	0

Mech SM 3 Temperature at Base	Extra Cold							
Mech SM 3 Wind Speed at Base	**High Rough**				**Old Rough**			
Mech SM 3 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Mech SM 3 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0	0.5	0.5	0.5	0	0.5	0.5	0.5
Medium	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0.5	0	0	0	0.5	0	0	0

The table below showcases the states of *'Mech SM 3: Offshore Response Vessel'* and its related probability.

Table 99 States & Probability of the variable In-Situ Burning SM 3: Vessels of Opportunity Base Transport Operability

Mech SM 3 Response Arrival Time to Oil Site	Half Day				One Day			
Mech SM 3 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
Mech SM 3 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**
Good	0	0	1	1	0	0	1	1
Medium	0	0	0	0	0	0	0	0
Poor	1	1	0	0	1	1	0	0

Mech SM 3 Response Arrival Time to Oil Site	Two Day				Greater than 3 Day			
Mech SM 3 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
Mech SM 3 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**

Good	0	0	0.5	0.5	0	0	0.5	1
Medium	0	0	0.5	0.5	0	0	0.5	0
Poor	1	1	0	0	1	1	0	0

Table 99 below showcases the states of '*Mech SM 3 Oil Response Equipment Operability'* and its related probability.

Table 100 Probability & State of Variable Mech SM 3 Oil Response Equipment Operability

Mech SM 3 Oil Position	**Nearshore**				**Offshore**			
Mech SM 3 Spill Size	**Light**		**Normal**		**Light**		**Normal**	
Mech SM 3 Oil Persistence	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**
Good	0	0	0	0	1	0.5	0.5	0.5
Poor	1	1	1	1	0	0.5	0.5	0.5

The table shown below shows the '*Mech SM 3 Shipping Act Law'* table and its probability.

Table 101 Probability & State of Shipping Act Law for Mechanical Response Selection Sub-Model 3

Shipping Act	
Illegal	0
Legal	1

The table shown below shows the '*Mech SM 4 Shipping Act Law'* table and its probability.

Table 102 Probability & State of Shipping Act Law for Mechanical Response Selection Sub-Model 4

Shipping Act	
Illegal	0
Legal	1

The table below showcases the states of *'Mech SM 4 Weather Conditions Operability'* and its related probability.

Table 103 Probability & State of Mech SM 4 Weather Conditions Operability

Visibility at Site Mech SM 4	**Good**				**Poor**			
Temperature at Site Mech SM 4	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Wind Speed at Site Mech SM 4	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0.5	0.5	0.5	0	0	0	0
Medium	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0	0	0	0.5	0.5	0.5	0.5

Table 103 below showcases the states of Water Conditions Operability for Mech SM 4 and its related probability.

Table 104 Probability and State of Variable Mech SM 4 Water Conditions Operability

Wave Conditions at Site Mech SM 4	**Low Slow**			**High Rough**		
Ice Coverage at Site Mech SM 4	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	1	1	0	0	0	0
Medium	0	0	0	0.5	0.5	0
Poor	0	0	1	0.5	0.5	1

Table 104 below showcases the states of '*Mech SM 4 Base Operability'* and its related probability.

Table 105 Probability & States of Mech SM 4 Base Operability

Mech SM 4 Temperature at Base	**Normal Cold**							
Mech SM 4 Wind Speed at Base	**High Rough**				**Old Rough**			
Mech SM 4 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Mech SM 4 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0.5	0	0	0.5	0.5	0	0
Medium	0	0.5	0	0	0.5	0.5	0	0
Poor	0	0	1	1	0	0	1	1

Mech SM 4 Temperature at Base	**Extra Cold**

Mech SM 4 Wind Speed at Base	High Rough				Old Rough			
Mech SM 4 Sea Ice Conditions at Base	New Younge Ice		Old Ice		New Younge Ice		Old Ice	
Mech SM 4 Wave Conditions at Base	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	1	0.5	0	0	0.5	0	0	0
Medium	0	0.5	0	0	0.5	0	0	0
Poor	0	0	1	1	0	1	1	1

The table below showcases the states of *'Mech SM 4: Ice-class, Offshore Response Vessel'*, and its related probability.

Table 106 States & Probability of the variable In-Situ Burning SM 4: Offshore Response Vessel Base Transport Operability

Mech SM 4 Response Arrival Time to Oil Site	Half Day				One Day			
Mech SM 4 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Mech SM 4 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	1	1	0	0	1	1	0	0
Medium	0	0	0	0	0	0	0	0
Poor	0	0	1	1	0	0	1	1

Mech SM 4 Response Arrival Time to Oil Site	Two Day				Greater than 3 Day			
Mech SM 4 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Mech SM 4 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0.5	1	0	0	0	0.5	0	0
Medium	0.5	0	0	0	0.5	0.5	0	0
Poor	0	0	1	1	0.5	0	1	1

The table below showcases the states of '*Mech SM 4 Oil Response Equipment Operability'* and its related probability.

Table 107 Probability & State of Variable Mech SM 4 Oil Response Equipment Operability

Mech SM 4 Oil Position	**Nearshore**				**Offshore**			
Mech SM 4 Spill Size	**Light**		**Normal**		**Light**		**Normal**	
Mech SM 4 Oil Persistence	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**
Good	1	0.5	0.5	0.5	0	0	0	0
Poor	0	0.5	0.5	0.5	1	1	1	1

The table shown below shows the *'Chem SM 1 Shipping Act Law*' table and its probability.

Table 108 Probability & State of Shipping Act Law for Chemical Response Selection Sub-Model 1

Shipping Act	
Illegal	1
Legal	0

The table below showcases the states of '*Water Conditions Operability for Chem SM 1'* and its related probability.

Table 109 Probability and State of Variable Chem SM 1 Water Conditions Operability

Wave Conditions at Site Chem SM 1	**Low Slow**			**High Rough**		
Ice Coverage at Site Chem SM 1	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	1	1	1	0	0	0
Medium	0	0	0	0.5	0.5	0
Poor	0	0	0	0.5	0.5	1

Table 109 showcases the states and its related probability of *Chem SM 1 Weather Conditions Operability*

Table 110 Probability & State of Chem SM 1 Weather Conditions Operability

Visibility at Site Chem SM 1	**Good**	**Poor**

Temperature at Site Chem SM 1	Normal Cold		Extra Cold		Normal Cold		Extra Cold	
Wind Speed at Site Chem SM 1	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0.5	0.5	0	0	0	0	0
Medium	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0	0	0.5	0.5	0.5	0.5	0.5

The table below showcases the states of '*Chem SM 1 Base Operability'* and its related probability.

Table 111 Probability & States of Chem SM 2 Base Operability

Chem SM 1 Temperature at Base	Normal Cold							
Chem SM 1 Wind Speed at Base	**High Rough**				**Old Rough**			
Chem SM 1 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Chem SM 1 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0	1	0	1	0	1	0.5	1
Medium	0	0	0	0	0.5	0	0.5	0
Poor	1	0	1	0	0.5	0	0	0

Chem SM 1 Temperature at Base	Extra Cold							
Chem SM 1 Wind Speed at Base	**High Rough**				**Old Rough**			
Chem SM 1 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Chem SM 1 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0	1	0	1	0.5	1	0.5	1
Medium	0	0	0	0	0.5	0	0.5	0
Poor	1	0	1	0	0	0	0	0

The table below showcases the states of '*Chem SM 1: Response Vessel Base Transport Operability'* and its related probability.

Table 112 States & Probability of the variable Chem SM 1: Response Vessel Base Transport Operability

Chem SM 1 Response	Half Day	One Day

Arrival Time to Oil Site								
Chem SM 1 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Chem SM 1 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	1	1	1	1	0.5	1	1	1
Medium	0	0	0	0	0.5	0	0	0
Poor	0	0	0	0	0	0	0	0

Chem SM 1 Response Arrival Time to Oil Site	Two Day				Greather than 3 Day			
Chem SM 1 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Chem SM 1 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0.5	0.5	0.5	0.5	0	0	0	0
Medium	0.5	0.5	0.5	0.5	0	0	0	0
Poor	0	0	0	0	1	1	1	1

The table below showcases the states of '*Chem SM 1 Oil Spill Response Equipment Operability'* and its related probability.

Table 113 Probability & State of Variable Chem SM 1 Oil Response Equipment Operability

Chem SM 1 Oil Position	Nearshore				Offshore			
Chem SM 1 Spill Size	Light		Normal		Light		Normal	
Chem SM 1 Oil Persistence	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent
Good	1	0.5	1	1	1	1	1	1
Poor	0	0.5	0	0	0	0	0	0

The table shown below shows the Chem SM 2 Shipping Act Law table and its probability.

Table 114 Probability & State of Shipping Act Law for Chemical Response Selection Sub-Model 2

Shipping Act	
Illegal	1

Legal	0

The table below showcases the states of '*Chem SM 2 Weather Conditions Operability'* and its related probability.

Table 115 Probability & State of Chem SM 2 Weather Conditions Operability

Visibility at Site Chem SM 2	**Good**				**Poor**			
Temperature at Site Chem SM 2	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Wind Speed at Site Chem SM 2	**Norma l**	**Sever e**	**Norma l**	**Sever e**	**Norma l**	**Sever e**	**Norma l**	**Sever e**
Good	1	0.5	0.5	0	0	0	0	0
Medium	0	0.5	0.5	0.5	0	0	0	0
Poor	0	0	0	0.5	1	1	1	1

The table below showcases the states of '*Water Conditions Operability for Chem SM 2'* and its related probability.

Table 116 Probability and State of Variable Chem SM 2 Water Conditions Operability

Wave Conditions at Site Chem SM 2	**Low Slow**			**High Rough**		
Ice Coverage at Site Chem SM 2	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	1	1	0	0	0	0
Medium	0	0	0	0	0	0
Poor	0	0	1	1	1	1

The table below showcases the states of '*Chem SM 2 Base Operability'* and its related probability.

Table 117 Probability & States of Chem SM 2 Base Operability

Chem SM 2 Temperature at Base	**Normal Cold**							
Chem SM 2 Wind Speed at Base	**High Rough**				**Old Rough**			
Chem SM 2 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Chem SM 2 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**

Good	0.5	1	0	0	0.5	1	0	0
Medium	0.5	0	0	0	0.5	0	0	0
Poor	0	0	1	1	0	0	1	1

Chem SM 2 Temperature at Base	**Extra Cold**							
Chem SM 2 Wind Speed at Base	**High Rough**				**Old Rough**			
Chem SM 2 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
Chem SM 2 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0.5	0.5	0	0	0.5	1	0	0
Medium	0.5	0.5	0	0	0.5	0	0	0
Poor	0	0	1	1	0	0	1	1

The table below showcases the states of '*Chem SM 2: Multi-engine fixed-wing aircraft Base Transport Operability'* and its related probability.

Table 118 States & Probability of the variable Chem SM 2: Multi-engine fixed-wing aircraft Base Transport Operability

Chem SM 2 Response Arrival Time to Oil Site	**Half Day**				**One Day**			
Chem SM 2 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
Chem SM 2 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**
Good	1	1	1	1	0.5	1	1	1
Medium	0	0	0	0	0.5	0	0	0
Poor	0	0	0	0	0	0	0	0

Chem SM 2 Response Arrival Time to Oil Site	**Two Day**				**Greater than 3 Day**			
Chem SM 2 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
Chem SM 2 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**
Good	0	0.5	0	0	0	0	0	0

Medium	0	0.5	0	0	0	0	0	0
Poor	1	0	1	1	1	1	1	1

The table below showcases the states '*Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability'* and its related probability.

Table 119 Probability & State of Variable Chem SM 2 Oil Response Equipment Operability

Chem SM 2 Oil Position	**Nearshore**				**Offshore**			
Chem SM 2 Spill Size	**Light**		**Normal**		**Light**		**Normal**	
Chem SM 2 Oil Persistence	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**
Good	1	0.5	1	1	1	1	1	1
Poor	0	0.5	0	0	0	0	0	0

The table shown below shows the '*Chem SM 3 Shipping Act Law'* table and its probability.

Table 120 Probability & State of Shipping Act Law for Chemical Response Selection Sub-Model 3

Shipping Act	
Illegal	1
Legal	0

The table below showcases the states of *Chem SM 3 Water Conditions Operability* and its related probability.

Table 121 Probability and State of Variable Chem SM 3 Water Conditions Operability

Wave Conditions at Site Chem SM 3	**Low Slow**			**High Rough**		
Ice Coverage at Site Chem SM 3	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	1	0.5	0.5	1	0	0
Medium	0	0.5	0.5	0	0.5	0.5
Poor	0	0	0	0	0.5	0.5

The table below showcases the states of *Chem SM 3 Weather Conditions Operability* and its related probability.

Table 122 Probability & State of Chem SM 3 Weather Conditions Operability

Visibility at Site Chem SM 3	Good				Poor			
Temperature at Site Chem SM 3	Normal Cold		Extra Cold		Normal Cold		Extra Cold	
Wind Speed at Site Chem SM 3	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	1	0.5	0.5	0	0	0	0	0
Medium	0	0.5	0.5	0.5	0	0	0	0
Poor	0	0	0	0.5	1	1	1	1

The table below showcases the states of '*Chem SM 3 Base Operability'* and its related probability.

Table 123 Probability & States of Chem SM 3 Base Operability

Chem SM 3 Temperature at Base	Normal Cold							
Chem SM 3 Wind Speed at Base	High Rough				Old Rough			
Chem SM 3 Sea Ice Conditions at Base	New Younge Ice		Old Ice		New Younge Ice		Old Ice	
Chem SM 3 Wave Conditions at Base	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	0	1	0	0	0.5	1	0	0
Medium	0.5	0	0	0	0.5	0	0	0
Poor	0.5	0	1	1	0	0	1	1

Chem SM 3 Temperature at Base	Extra Cold							
Chem SM 3 Wind Speed at Base	High Rough				Old Rough			
Chem SM 3 Sea Ice Conditions at Base	New Younge Ice		Old Ice		New Younge Ice		Old Ice	
Chem SM 3 Wave Conditions at Base	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	0.5	1	0	0	0.5	1	0	0
Medium	0.5	0	0	0	0.5	0	0	0
Poor	0	0	1	1	0	0	1	1

The table below showcases the states of '*Chem SM 3: Twin Engine Jet Helicopter Base Transport Operability'* and its related probability.

Table 124 States & Probability of the variable Chem SM 3: Twin engine jet helicopter Base Transport Operability

Chem SM 3 Response Arrival Time to Oil Site	Half Day				One Day			
Chem SM 3 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Chem SM 3 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	1	1	0	0	1	1	0	0
Medium	0	0	0	0	0	0	0	0
Poor	0	0	1	1	0	0	1	1

Chem SM 3 Response Arrival Time to Oil Site	Two Day				Greather than 3 Day			
Chem SM 3 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
Chem SM 3 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0	1	0	0	0	0.5	0	0
Medium	0	0	0	0	0.5	0.5	0	0
Poor	1	0	1	1	0.5	0	1	1

The table below showcases the states of Oil Spill Response Equipment Operability and its related probability.

Table 125 Probability & State of Variable Chem SM 3 Oil Response Equipment Operability

Chem SM 3 Oil Position	Nearshore				Offshore			
Chem SM 3 Spill Size	Light		Normal		Light		Normal	
Chem SM 3 Oil Persistence	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent
Good	1	1	1	0.5	0	0	0	0
Poor	0	0	0	0.5	1	1	1	1

The table shown below shows the '*In-Situ Burning SM 1 Shipping Act'* Law table and its probability.

Table 126 Probability & State of Shipping Act Law for In-Situ Burning Response Selection Sub-Model 1

Shipping Act

Illegal	1
Legal	0

The table below showcases the states of '*Water Conditions Operability for In-Situ Burning SM 1'* and its related probability.

Table 127 Probability and State of Variable In-Situ Burning SM 1 Water Conditions Operability

Wave Conditions at Site In-Situ Burning SM 1	**Low Slow**			**High Rough**		
Ice Coverage at Site In-Situ Burning SM 1	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	1	1	0	0.5	0.5	0
Medium	0	0	0	0.5	0.5	0
Poor	0	0	1	0	0	1

Table 22 below showcases the states description of Weather Conditions Operability for In-Situ Burning Response sub-models and Table 127 showcases the states and its related probability.

Table 128 Probability & State of In-Situ Burning SM 1 Weather Conditions Operability

Visibility at Site In-Situ Burning SM 1	**Good**				**Poor**			
Temperature at Site In-Situ Burning SM 1	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Wind Speed at Site In-Situ Burning SM 1	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0	0.5	0	0.5	0	0	0.5
Medium	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0.5	0	0.5	0	0.5	0.5	0

The table below showcases the states of '*In-Situ Burning SM 1 Base Operability'* and its related probability.

Table 129 Probability & States of In-Situ Burning SM 1 Base Operability

In-Situ Burning SM 1 Temperature at Base	Normal Cold							
In-Situ Burning SM 1 Wind Speed at Base	Low Slow				High Rough			
In-Situ Burning SM 1 Sea Ice Conditions at Base	New Younge Ice		Old Ice		New Younge Ice		Old Ice	
In-Situ Burning SM 1 Wave Conditions at Base	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	0	1	0	0	0	1	0	0
Medium	0.5	0	0	0	0.5	0	0	0
Poor	0.5	0	1	1	0.5	0	1	1

In-Situ Burning SM 1 Temperature at Base	Extra Cold							
In-Situ Burning SM 1 Wind Speed at Base	Low Slow				High Rough			
In-Situ Burning SM 1 Sea Ice Conditions at Base	New Younge Ice		Old Ice		New Younge Ice		Old Ice	
In-Situ Burning SM 1 Wave Conditions at Base	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	0	0.5	0	0	1	1	0	0
Medium	0.5	0.5	0	0	0	0	0	0
Poor	0.5	0	1	1	0	0	1	1

The table below showcases the states of '*In-Situ Burning SM 1: Vessels of Opportunity Base Transport Operability'* and its related probability.

Table 130 States & Probability of the variable In-Situ Burning SM 1: Vessels of Opportunity Base Transport Operability

In-Situ Burning SM 1 Response Arrival Time to Oil Site	Half Day				One Day			
In-Situ Burning SM 1 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
In-Situ Burning SM 1 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	1	1	1	1	0.5	1	1	1

Medium	0	0	0	0	0.5	0	0	0
Poor	0	0	0	0	0	0	0	0

In-Situ Burning SM 1 Response Arrival Time to Oil Site	**Two Day**				**Greather than 3 Day**			
In-Situ Burning SM 1 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
In-Situ Burning SM 1 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**
Good	0.5	0.5	0.5	0.5	0	0	0	0
Medium	0.5	0.5	0.5	0.5	0	0	0	0
Poor	0	0	0	0	1	1	1	1

The table below showcases the states of '*In-Situ Burning SM 1 Oil Response Equipment Operability'* and its related probability.

Table 131 Probability & State of Variable In-Situ Burning *SM 1 Oil Response Equipment Operability*

In-Situ Burning SM 1 Oil Position	**Nearshore**				**Offshore**			
In-Situ Burning SM 1 Spill Size	**Light**		**Normal**		**Light**		**Normal**	
In-Situ Burning SM 1 Oil Persistence	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**	**Persistent**	**Non-persistent**
Good	1	0.5	1	1	1	1	1	1
Poor	0	0.5	0	0	0	0	0	0

The table below showcases the states of '*In-Situ Burning SM 2 Weather Conditions Operability'* and its related probability.

Table 132 Probability & State of In-Situ Burning SM 2 Weather Conditions Operability

Visibility at Site In-Situ Burning SM 2	**Good**	**Poor**

Temperature at Site In-Situ Burning SM 2	Normal Cold		Extra Cold		Normal Cold		Extra Cold	
Wind Speed at Site In-Situ Burning SM 2	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0.5	0	0	0.5	0	0	0
Medium	0	0.5	0.5	0.5	0.5	0	0	0
Poor	0	0	0.5	0.5	0	1	1	1

The table below showcases the states of '*Water Conditions Operability for In-Situ Burning SM 2'* and its related probability.

Table 133 Probability and State of Variable In-Situ Burning SM 2 Water Conditions Operability

Wave Conditions at Site In-Situ Burning SM 2	Low Slow			High Rough		
Ice Coverage at Site In-Situ Burning SM 2	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	0.5	1	0	0.5	0	0
Medium	0.5	0	0.5	0.5	0.5	0.5
Poor	0	0	0.5	0	0.5	0.5

The table shown below shows the '*In-Situ Burning SM 2 Shipping Act Law*' table and its probability.

Table 134 Probability & State of Shipping Act Law for In-Situ Burning Response Selection Sub-Model 2

Shipping Act	
Illegal	1
Legal	0

The table below showcases the states of '*In-Situ Burning SM 2 Base Operability'* and its related probability.

Table 135 Probability & States of In-Situ Burning SM 2 Base Operability

In-Situ Burning SM 2 Temperature at Base	Normal Cold			
In-Situ Burning SM 2 Wind Speed at Base	**Low Slow**		**High Rough**	
In-Situ Burning SM 2 Sea Ice Conditions at Base	**New Younge Ice**	**Old Ice**	**New Younge Ice**	**Old Ice**

In-Situ Burning SM 2 Wave Conditions at Base	Normal	Severe	Normal	Severe	Normal	Severe	Normal	Severe
Good	0	0	0.5	0	0	0	0	0
Medium	0.5	0	0.5	0.5	0.5	0	0.5	0.5
Poor	0.5	1	0	0.5	0.5	1	0.5	0.5

In-Situ Burning SM 2 Temperature at Base	Extra Cold							
In-Situ Burning SM 2 Wind Speed at Base	**Low Slow**				**High Rough**			
In-Situ Burning SM 2 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
In-Situ Burning SM 2 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0	0	0	0	0	0	0	0
Medium	0.5	0	0.5	0.5	0.5	0	0.5	0.5
Poor	0.5	1	0.5	0.5	0.5	1	0.5	0.5

The table below showcases the states of '*In-Situ Burning SM 2: Twin Engine Jet Helicopter Base Transport Operability'* and its related probability.

Table 136 States & Probability of the variable In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability

In-Situ Burning SM 2 Response Arrival Time to Oil Site	Half Day				One Day			
In-Situ Burning SM 2 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
In-Situ Burning SM 2 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**
Good	0	0	1	1	0	0	1	1
Medium	0	0	0	0	0	0	0	0
Poor	1	1	0	0	1	1	0	0

In-Situ Burning SM 2 Response Arrival Time to Oil Site	Two Day				Greater than 3 Day			
In-Situ Burning SM 2 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
In-Situ Burning SM 2 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0	0	0	0.5	0	0	0	0
Medium	0	0	0	0.5	0	0	0	0
Poor	1	1	1	0	1	1	1	1

The table below showcases the states of '*In-Situ Burning SM 2 Oil Response Equipment Operability'* and its related probability.

Table 137 Probability & State of Variable In-Situ Burning *SM 2 Oil Response Equipment Operability*

In-Situ Burning SM 2 Oil Position	Nearshore				Offshore			
In-Situ Burning SM 2 Spill Size	Light		Normal		Light		Normal	
In-Situ Burning SM 2 Oil Persistence	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent
Good	0	0	0	0	1	0.5	1	1
Poor	1	1	1	1	0	0.5	0	0

The table shown below shows the '*In-Situ Burning SM 3 Shipping Act Law*' table and its probability.

Table 138 Probability & State of Shipping Act Law for In-Situ Burning Response Selection Sub-Model 3

Shipping Act	
Illegal	1
Legal	0

The table below showcases the states of '*In-Situ Burning SM 3 Water Conditions Operability'* and its related probability.

Table 139 Probability and State of Variable In-Situ Burning SM 3 Water Conditions Operability

Wave Conditions at Site In-Situ Burning SM 3	**Low Slow**			**High Rough**		
Ice Coverage at Site In-Situ Burning SM 3	**Open Water**	**Drift Close**	**Compact Ice**	**Open Water**	**Drift Close**	**Compact Ice**
Good	0.5	1	0	0	1	0
Medium	0.5	0	0	0.5	0	0
Poor	0	0	1	0.5	0	1

The table below showcases the states of '*In-Situ Burning SM 3 Weather Conditions Operabilit*y' and its related probability.

Table 140 Probability & State of In-Situ Burning SM 1 Weather Conditions Operability

Visibility at Site In-Situ Burning SM 3	**Good**				**Poor**			
Temperature at Site In-Situ Burning SM 3	**Normal Cold**		**Extra Cold**		**Normal Cold**		**Extra Cold**	
Wind Speed at Site In-Situ Burning SM 3	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	1	0	0.5	0	0.5	0	0	0
Medium	0	0.5	0.5	0.5	0.5	0	0	0
Poor	0	0.5	0	0.5	0	1	1	1

The table below showcases the states of '*In-Situ Burning SM 3 Base Operability'* and its related probability.

Table 141 Probability & States of In-Situ Burning SM 3 Base Operability

In-Situ Burning SM 3 Temperature at Base	**Normal Cold**	
In-Situ Burning SM 3 Wind Speed at Base	**Low Slow**	**High Rough**

In-Situ Burning SM 3 Sea Ice Conditions at Base	New Younge Ice		Old Ice		New Younge Ice		Old Ice	
In-Situ Burning SM 3 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0.5	0	0.5	0	0.5	0	0.5	0
Medium	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0.5	0	0.5	0	0.5	0	0.5

In-Situ Burning SM 3 Temperature at Base	Extra Cold							
In-Situ Burning SM 3 Wind Speed at Base	**Low Slow**				**High Rough**			
In-Situ Burning SM 3 Sea Ice Conditions at Base	**New Younge Ice**		**Old Ice**		**New Younge Ice**		**Old Ice**	
In-Situ Burning SM 3 Wave Conditions at Base	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**	**Normal**	**Severe**
Good	0.5	0	0	0	0	0	0	0
Medium	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poor	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5

The table below showcases the states of '*In-Situ Burning SM 3: Twin Engine Jet Helicopter Base Transport'* and its related probability.

Table 142 States & Probability of the variable In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability

In-Situ Burning SM 3 Response Arrival Time to Oil Site	Half Day				One Day			
In-Situ Burning SM 3 Oil Position	**Nearshore**		**Offshore**		**Nearshore**		**Offshore**	
In-Situ Burning SM 3 Shipping Act	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**	**Illegal**	**Legal**
Good	1	1	1	1	0.5	1	1	1
Medium	0	0	0	0	0.5	0	0	0
Poor	0	0	0	0	0	0	0	0

In-Situ Burning SM 3 Response	Two Day	Greater than 3 Day

Arrival Time to Oil Site								
In-Situ Burning SM 3 Oil Position	Nearshore		Offshore		Nearshore		Offshore	
In-Situ Burning SM 3 Shipping Act	Illegal	Legal	Illegal	Legal	Illegal	Legal	Illegal	Legal
Good	0.5	0.5	0.5	0.5	0	0	0	0
Medium	0.5	0.5	0.5	0.5	0	0	0	0
Poor	0	0	0	0	1	1	1	1

The table below showcases the states of '*In-Situ Burning SM 3 Oil Response Equipment Operability'* and its related probability.

Table 143 Probability & State of Variable In-Situ Burning *SM 3 Oil Response Equipment Operability*

In-Situ Burning SM 3 Oil Position	Nearshore				Offshore			
In-Situ Burning SM 3 Spill Size	Light		Normal		Light		Normal	
In-Situ Burning SM 3 Oil Persistence	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent
Good	1	0.5	1	1	1	1	1	1
Poor	0	0.5	0	0	0	0	0	0

Response Effectiveness Variables' States and Probabilities

The tables below showcase the states of the duplicate variable '*Mech SM 1 Effectiveness'* and their related probabilities.

Table 144 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Good', Mech SM 1 Water Conditions Operability is 'Good'

Mech SM 1 Base Operability	**Good**					
Mech SM 1 Water Conditions Operability	**Good**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Good**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 1 Base Operability	**Good**					
Mech SM 1 Water Conditions Operability	**Good**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Medium**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 1 Base Operability	**Good**					
Mech SM 1 Water Conditions Operability	**Good**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Poor**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4

Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 145 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Good', Mech SM 1 Water Conditions Operability is 'Medium'

Mech SM 1 Base Operability	**Good**					
Mech SM 1 Water Conditions Operability	**Medium**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Good**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

Mech SM 1 Base Operability	**Good**					
Mech SM 1 Water Conditions Operability	**Medium**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Medium**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

Mech SM 1 Base Operability	**Good**
Mech SM 1 Water Conditions Operability	**Medium**

Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Poor					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 146 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Good', Mech SM 1 Water Conditions Operability is 'Poor'

Mech SM 1 Base Operability	Good					
Mech SM 1 Water Conditions Operability	Poor					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Good					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 1 Base Operability	Good					
Mech SM 1 Water Conditions Operability	Poor					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Medium					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 1 Base Operability	Good					
Mech SM 1 Water Conditions Operability	Poor					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Poor					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 147 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Medium', Mech SM 1 Water Conditions Operability is 'Good'

Mech SM 1 Base Operability	Medium					
Mech SM 1 Water Conditions Operability	Good					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Good					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 1 Base Operability	Good					
Mech SM 1 Water Conditions Operability	Medium					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Medium					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4

Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 1 Base Operability	**Medium**					
Mech SM 1 Water Conditions Operability	**Good**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Poor**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 148 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Medium', Mech SM 1 Water Conditions Operability is 'Medium'

Mech SM 1 Base Operability	**Medium**					
Mech SM 1 Water Conditions Operability	**Medium**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Good**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 1 Base Operability	**Medium**					
Mech SM 1 Water Conditions Operability	**Medium**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Medium**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	

Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

Mech SM 1 Base Operability	Medium					
Mech SM 1 Water Conditions Operability	Medium					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Poor					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 149 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Medium', Mech SM 1 Water Conditions Operability is 'Poor'

Mech SM 1 Base Operability	Medium					
Mech SM 1 Water Conditions Operability	Poor					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Good					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

Mech SM 1 Base Operability	Medium
Mech SM 1 Water Conditions Operability	Poor

Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Medium					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 1 Base Operability	Medium					
Mech SM 1 Water Conditions Operability	Poor					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Poor					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 150 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Poor' and Mech SM 1 Water Conditions Operability is 'Good'

Mech SM 1 Base Operability	Poor					
Mech SM 1 Water Conditions Operability	Good					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Good					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 1 Base Operability	**Poor**					
Mech SM 1 Water Conditions Operability	**Good**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Medium**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 1 Base Operability	**Poor**					
Mech SM 1 Water Conditions Operability	**Good**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Poor**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 151 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Poor' and Mech SM 1 Water Conditions Operability is 'Medium'

Mech SM 1 Base Operability	**Poor**					
Mech SM 1 Water Conditions Operability	**Medium**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Good**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2

Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 1 Base Operability	**Poor**					
Mech SM 1 Water Conditions Operability	**Medium**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Medium**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 1 Base Operability	**Poor**					
Mech SM 1 Water Conditions Operability	**Medium**					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Poor**					
Mech SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 152 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM 1 Base Operability is 'Poor' and Mech SM 1 Water Conditions Operability is 'Poor'

Mech SM 1 Base Operability	**Poor**		
Mech SM 1 Water Conditions Operability	**Poor**		
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	**Good**		
Mech SM 1 Weather Conditions Operability	**Good**	**Medium**	**Poor**

Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM 1 Base Operability	Poor					
Mech SM 1 Water Conditions Operability	Poor					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Medium					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM 1 Base Operability	Poor					
Mech SM 1 Water Conditions Operability	Poor					
Mech SM 1: Offshore response vessel & vessel of opportunity to tow boom Base Transport Operability	Poor					
Mech SM 1 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 1: Boom & High volume oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of '*Mechanical SM 1 Effectiveness'* and its related probability.

Table 153 Probability & State of Variable Mechanical SM 1 Effectiveness

Response Asset	**Vessel**		
Mechanical SM 1 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	**Helicopter**		
Mechanical SM 1 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	**Airplane**		
Mechanical SM 1 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable '*Mech SM 2 Effectiveness'* and their related probabilities.

Table 154 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Good', Mech SM 2Water Conditions Operability is 'Good'

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Good**					
Mech SM2: Offshore response vessel Base Transport Operability	**Good**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0

Poor	0	0.2	0	0.2	0.2	0.4

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Good**					
Mech SM2: Offshore response vessel Base Transport Operability	**Medium**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Good**					
Mech SM2: Offshore response vessel Base Transport Operability	**Poor**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 155 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Good', Mech SM 2 Water Conditions Operability is 'Medium'

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Medium**					
Mech SM2: Offshore response vessel Base Transport Operability	**Good**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Medium**					
Mech SM2: Offshore response vessel Base Transport Operability	**Medium**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**

Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Medium**					
Mech SM2: Offshore response vessel Base Transport Operability	**Poor**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 156 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Good', Mech SM 2 Water Conditions Operability is 'Poor'

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Poor**					
Mech SM2: Offshore response vessel Base Transport Operability	**Good**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM2 Base Operability	**Good**					
Mech SM2 Water Conditions Operability	**Poor**					
Mech SM2: Offshore response vessel Base Transport Operability	**Medium**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM2 Base Operability	**Good**
Mech SM2 Water Conditions Operability	**Poor**
Mech SM2: Offshore response vessel Base Transport Operability	**Poor**

Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 157 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Medium', Mech SM 2 Water Conditions Operability is 'Good'

Mech SM2 Base Operability	Medium					
Mech SM2 Water Conditions Operability	Good					
Mech SM2: Offshore response vessel Base Transport Operability	Good					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM2 Base Operability	Good					
Mech SM2 Water Conditions Operability	Medium					
Mech SM2: Offshore response vessel Base Transport Operability	Medium					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM2 Base Operability	Medium					
Mech SM2 Water Conditions Operability	Good					
Mech SM2: Offshore response vessel Base Transport Operability	Poor					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 158 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Medium', Mech SM 2 Water Conditions Operability is 'Medium'

Mech SM2 Base Operability	Medium					
Mech SM2 Water Conditions Operability	Medium					
Mech SM2: Offshore response vessel Base Transport Operability	Good					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM2 Base Operability	Medium					
Mech SM2 Water Conditions Operability	Medium					
Mech SM2: Offshore response vessel Base Transport Operability	Medium					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

Mech SM2 Base Operability	Medium					
Mech SM2 Water Conditions Operability	Medium					
Mech SM2: Offshore response vessel Base Transport Operability	Poor					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 159 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Medium', Mech SM 2 Water Conditions Operability is 'Poor'

Mech SM2 Base Operability	Medium					
Mech SM2 Water Conditions Operability	Poor					
Mech SM2: Offshore response vessel Base Transport Operability	Good					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2

Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

Mech SM2 Base Operability	**Medium**					
Mech SM2 Water Conditions Operability	**Poor**					
Mech SM2: Offshore response vessel Base Transport Operability	**Medium**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM2 Base Operability	**Medium**					
Mech SM2 Water Conditions Operability	**Poor**					
Mech SM2: Offshore response vessel Base Transport Operability	**Poor**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 160 Probability & State of Variable Mech SM 1 Effectiveness when Mech SM1 Base Operability is 'Poor' and Mech SM1 Water Conditions Operability is 'Good'

Mech SM2 Base Operability	**Poor**					
Mech SM2 Water Conditions Operability	**Good**					
Mech SM2: Offshore response vessel Base Transport Operability	**Good**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM2 Base Operability	**Poor**					
Mech SM2 Water Conditions Operability	**Good**					
Mech SM2: Offshore response vessel Base Transport Operability	**Medium**					
Mech SM2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	

Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM2 Base Operability	Poor					
Mech SM2 Water Conditions Operability	Good					
Mech SM2: Offshore response vessel Base Transport Operability	Poor					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 161 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Poor' and Mech SM 2 Water Conditions Operability is 'Medium'

Mech SM2 Base Operability	Poor					
Mech SM2 Water Conditions Operability	Medium					
Mech SM2: Offshore response vessel Base Transport Operability	Good					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM2 Base Operability	Poor					
Mech SM2 Water Conditions Operability	Medium					
Mech SM2: Offshore response vessel Base Transport Operability	Medium					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM2 Base Operability	Poor
Mech SM2 Water Conditions Operability	Medium

Mech SM2: Offshore response vessel Base Transport Operability	Poor					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 162 Probability & State of Variable Mech SM 2 Effectiveness when Mech SM 2 Base Operability is 'Poor' and Mech SM 2 Water Conditions Operability is 'Poor'

Mech SM2 Base Operability	Poor					
Mech SM2 Water Conditions Operability	Poor					
Mech SM2: Offshore response vessel Base Transport Operability	Good					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM2 Base Operability	Poor					
Mech SM2 Water Conditions Operability	Poor					
Mech SM2: Offshore response vessel Base Transport Operability	Medium					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM2 Base Operability	Poor					
Mech SM2 Water Conditions Operability	Poor					
Mech SM2: Offshore response vessel Base Transport Operability	Poor					
Mech SM2 Weather Conditions Operability	Good		Medium		Poor	
Mech SM2: Boom & Weir skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of '*Mechanical SM 2 Effectiveness'* and its related probability.

Table 163 Probability & State of Variable Mechanical SM 2 Effectiveness

Response Asset	**Vessel**		
Mechanical SM 2 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	**Helicopter**		
Mechanical SM 2 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	**Airplane**		
Mechanical SM 2 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable '*Mech SM 3 Effective*ness' and its related probability.

Table 164 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Good', Mech SM 3 Water Conditions Operability is 'Good'

Mech SM 3 Base Operability	**Good**
Mech SM 3 Water Conditions Operability	**Good**

Mech SM 3: Vessels of opportunity Base Transport Operability	Good					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 3 Base Operability	Good					
Mech SM 3 Water Conditions Operability	Good					
Mech SM 3: Vessels of opportunity Base Transport Operability	Medium					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 3 Base Operability	Good					
Mech SM 3 Water Conditions Operability	Good					
Mech SM 3: Vessels of opportunity Base Transport Operability	Poor					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 165 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Good', Mech SM 3 Water Conditions Operability is 'Medium'

Mech SM 3 Base Operability	**Good**					
Mech SM 3 Water Conditions Operability	**Medium**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Good**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

Mech SM 3 Base Operability	**Good**					
Mech SM 3 Water Conditions Operability	**Medium**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Medium**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

Mech SM 3 Base Operability	**Good**					
Mech SM 3 Water Conditions Operability	**Medium**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Poor**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2

Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 166 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Good', Mech SM 3 Water Conditions Operability is 'Poor'

Mech SM 3 Base Operability	**Good**					
Mech SM 3 Water Conditions Operability	**Poor**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Good**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 3 Base Operability	**Good**					
Mech SM 3 Water Conditions Operability	**Poor**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Medium**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 3 Base Operability	**Good**					
Mech SM 3 Water Conditions Operability	**Poor**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Poor**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	

Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 167 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Medium', Mech SM 3 Water Conditions Operability is 'Good'

Mech SM 3 Base Operability	Medium					
Mech SM 3 Water Conditions Operability	Good					
Mech SM 3: Vessels of opportunity Base Transport Operability	Good					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 3 Base Operability	Good					
Mech SM 3 Water Conditions Operability	Medium					
Mech SM 3: Vessels of opportunity Base Transport Operability	Medium					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 3 Base Operability	Medium
Mech SM 3 Water Conditions Operability	Good

Mech SM 3: Vessels of opportunity Base Transport Operability	Poor					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 168 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Medium', Mech SM 3 Water Conditions Operability is 'Medium'

Mech SM 3 Base Operability	Medium					
Mech SM 3 Water Conditions Operability	Medium					
Mech SM 3: Vessels of opportunity Base Transport Operability	Good					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 3 Base Operability	Medium					
Mech SM 3 Water Conditions Operability	Medium					
Mech SM 3: Vessels of opportunity Base Transport Operability	Medium					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

Mech SM 3 Base Operability	Medium					
Mech SM 3 Water Conditions Operability	Medium					
Mech SM 3: Vessels of opportunity Base Transport Operability	Poor					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 169 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Medium', Mech SM 3 Water Conditions Operability is 'Poor'

Mech SM 3 Base Operability	Medium					
Mech SM 3 Water Conditions Operability	Poor					
Mech SM 3: Vessels of opportunity Base Transport Operability	Good					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

Mech SM 3 Base Operability	Medium					
Mech SM 3 Water Conditions Operability	Poor					
Mech SM 3: Vessels of opportunity Base Transport Operability	Medium					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0

Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 3 Base Operability	**Medium**					
Mech SM 3 Water Conditions Operability	**Poor**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Poor**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 170 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Poor' and Mech SM 3 Water Conditions Operability is 'Good'

Mech SM 3 Base Operability	**Poor**					
Mech SM 3 Water Conditions Operability	**Good**					
Mech SM 3: Vessels of opportunity Base Transport Operability	**Good**					
Mech SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 3 Base Operability	**Poor**		
Mech SM 3 Water Conditions Operability	**Good**		
Mech SM 3: Vessels of opportunity Base Transport Operability	**Medium**		
Mech SM 3 Weather Conditions Operability	**Good**	**Medium**	**Poor**

Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 3 Base Operability	Poor					
Mech SM 3 Water Conditions Operability	Good					
Mech SM 3: Vessels of opportunity Base Transport Operability	Poor					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 171 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Poor' and Mech SM 3 Water Conditions Operability is 'Medium'

Mech SM 3 Base Operability	Poor					
Mech SM 3 Water Conditions Operability	Medium					
Mech SM 3: Vessels of opportunity Base Transport Operability	Good					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 3 Base Operability	Poor
Mech SM 3 Water Conditions Operability	Medium

Mech SM 3: Vessels of opportunity Base Transport Operability	Medium					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 3 Base Operability	Poor					
Mech SM 3 Water Conditions Operability	Medium					
Mech SM 3: Vessels of opportunity Base Transport Operability	Poor					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 172 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Poor' and Mech SM 3 Water Conditions Operability is 'Poor'

Mech SM 3 Base Operability	Poor					
Mech SM 3 Water Conditions Operability	Poor					
Mech SM 3: Vessels of opportunity Base Transport Operability	Good					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM 3 Base Operability	Poor					
Mech SM 3 Water Conditions Operability	Poor					
Mech SM 3: Vessels of opportunity Base Transport Operability	Medium					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM 3 Base Operability	Poor					
Mech SM 3 Water Conditions Operability	Poor					
Mech SM 3: Vessels of opportunity Base Transport Operability	Poor					
Mech SM 3 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 3: Boom & Oleophilic skimmer Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of '*Mechanical SM 3 Effectiveness'* and its related probability.

Table 173 Probability & State of Variable Mechanical SM 3 Effectiveness

Response Asset	Vessel		
Mechanical SM 3 Effectiveness Copy	Good	Medium	Poor
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	Helicopter		
Mechanical SM 3 Effectiveness Copy	Good	Medium	Poor
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	Airplane		
Mechanical SM 3 Effectiveness Copy	Good	Medium	Poor
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable '*Mech SM 4 Effective*ness' and its related probability.

Table 174 Probability & State of Variable Mech SM 3 Effectiveness when Mech SM 3 Base Operability is 'Good', Mech SM 3 Water Conditions Operability is 'Good'

Mech SM 4 Base Operability	Good					
Mech SM 4 Water Conditions Operability	Good					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Good					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 4 Base Operability	Good
Mech SM 4 Water Conditions Operability	Good

Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Medium					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 4 Base Operability	Good					
Mech SM 4 Water Conditions Operability	Good					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Poor					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 175 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Good', Mech SM 4 Water Conditions Operability is 'Medium'

Mech SM 4 Base Operability	Good					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Good					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

Mech SM 4 Base Operability	Good					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Medium					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

Mech SM 4 Base Operability	Good					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Poor					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 176 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Good', Mech SM 4 Water Conditions Operability is 'Poor'

Mech SM 4 Base Operability	Good					
Mech SM 4 Water Conditions Operability	Poor					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Good					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0

Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 4 Base Operability	**Good**					
Mech SM 4 Water Conditions Operability	**Poor**					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Medium**					
Mech SM 4 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 4: Skimming system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 4 Base Operability	**Good**					
Mech SM 4 Water Conditions Operability	**Poor**					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Poor**					
Mech SM 4 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 4: Skimming system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 177 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Medium', Mech SM 4 Water Conditions Operability is 'Good'

Mech SM 4 Base Operability	**Medium**		
Mech SM 4 Water Conditions Operability	**Good**		
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Good**		
Mech SM 4 Weather Conditions Operability	**Good**	**Medium**	**Poor**

Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 4 Base Operability	Good					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Medium					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 4 Base Operability	Medium					
Mech SM 4 Water Conditions Operability	Good					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Poor					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 178 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Medium', Mech SM 4 Water Conditions Operability is 'Medium'

Mech SM 4 Base Operability	Medium
Mech SM 4 Water Conditions Operability	Medium

Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Good					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Mech SM 4 Base Operability	Medium					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Medium					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

Mech SM 4 Base Operability	Medium					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Poor					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 179 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Medium', Mech SM 4 Water Conditions Operability is 'Poor'

Mech SM 4 Base Operability	**Medium**					
Mech SM 4 Water Conditions Operability	**Poor**					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Good**					
Mech SM 4 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 4: Skimming system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

Mech SM 4 Base Operability	**Medium**					
Mech SM 4 Water Conditions Operability	**Poor**					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Medium**					
Mech SM 4 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 4: Skimming system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 4 Base Operability	**Medium**					
Mech SM 4 Water Conditions Operability	**Poor**					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Poor**					
Mech SM 4 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 4: Skimming system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0

Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 180 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Poor' and Mech SM 4 Water Conditions Operability is 'Good'

Mech SM 4 Base Operability	**Poor**					
Mech SM 4 Water Conditions Operability	**Good**					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Good**					
Mech SM 4 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 4: Skimming system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 4 Base Operability	**Poor**					
Mech SM 4 Water Conditions Operability	**Good**					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Medium**					
Mech SM 4 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Mech SM 4: Skimming system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 4 Base Operability	**Poor**		
Mech SM 4 Water Conditions Operability	**Good**		
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	**Poor**		
Mech SM 4 Weather Conditions Operability	**Good**	**Medium**	**Poor**

Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 181 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Poor' and Mech SM 4 Water Conditions Operability is 'Medium'

Mech SM 4 Base Operability	Poor					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Good					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 4 Base Operability	Poor					
Mech SM 4 Water Conditions Operability	Medium					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Medium					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Mech SM 4 Base Operability	Poor
Mech SM 4 Water Conditions Operability	Medium

Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Poor					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 182 Probability & State of Variable Mech SM 4 Effectiveness when Mech SM 4 Base Operability is 'Poor' and Mech SM 4 Water Conditions Operability is 'Poor'

Mech SM 4 Base Operability	Poor					
Mech SM 4 Water Conditions Operability	Poor					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Good					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM 4 Base Operability	Poor					
Mech SM 4 Water Conditions Operability	Poor					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Medium					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Mech SM 4 Base Operability	Poor					
Mech SM 4 Water Conditions Operability	Poor					
Mech SM 4: Ice-class, offshore response vessel Base Transport Operability	Poor					
Mech SM 4 Weather Conditions Operability	Good		Medium		Poor	
Mech SM 4: Skimming system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of '*Mechanical SM 4 Effectiveness'* and its related probability.

Table 183 Probability & State of Variable Mechanical SM 4 Effectiveness

Response Asset	Vessel		
Mechanical SM 4 Effectiveness Copy	Good	Medium	Poor
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	Helicopter		
Mechanical SM 4 Effectiveness Copy	Good	Medium	Poor
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	Airplane		
Mechanical SM 4 Effectiveness Copy	Good	Medium	Poor
Good	0	0	0

Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable '*Chemical SM 1 Effectiveness'* and its related probability.

Table 184 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Good', Chem SM 1 Water Conditions Operability is 'Good'

Chem SM 1 Base Operability	**Good**					
Chem SM 1 Water Conditions Operability	**Good**					
Chem SM 1: response vessel Base Transport Operability	**Good**					
Chem SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 1 Base Operability	**Good**					
Chem SM 1 Water Conditions Operability	**Good**					
Chem SM 1: response vessel Base Transport Operability	**Medium**					
Chem SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 1 Base Operability	**Good**
Chem SM 1 Water Conditions Operability	**Good**

Chem SM 1: response vessel Base Transport Operability	Poor					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 185 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Good', Chem SM 1 Water Conditions Operability is 'Medium'

Chem SM 1 Base Operability	Good					
Chem SM 1 Water Conditions Operability	Medium					
Chem SM 1: response vessel Base Transport Operability	Good					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

Chem SM 1 Base Operability	Good					
Chem SM 1 Water Conditions Operability	Medium					
Chem SM 1: response vessel Base Transport Operability	Medium					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

Chem SM 1 Base Operability	Good					
Chem SM 1 Water Conditions Operability	Medium					
Chem SM 1: response vessel Base Transport Operability	Poor					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 186 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Good', Chem SM 1 Water Conditions Operability is 'Poor'

Chem SM 1 Base Operability	Good					
Chem SM 1 Water Conditions Operability	Poor					
Chem SM 1: response vessel Base Transport Operability	Good					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 1 Base Operability	Good					
Chem SM 1 Water Conditions Operability	Poor					
Chem SM 1: response vessel Base Transport Operability	Medium					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2

Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 1 Base Operability	**Good**					
Chem SM 1 Water Conditions Operability	**Poor**					
Chem SM 1: response vessel Base Transport Operability	**Poor**					
Chem SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 187 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Medium', Chem SM 1 Water Conditions Operability is 'Good'

Chem SM 1 Base Operability	**Medium**					
Chem SM 1 Water Conditions Operability	**Good**					
Chem SM 1: response vessel Base Transport Operability	**Good**					
Chem SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 1 Base Operability	**Good**		
Chem SM 1 Water Conditions Operability	**Medium**		
Chem SM 1: response vessel Base Transport Operability	**Medium**		
Chem SM 1 Weather Conditions Operability	**Good**	**Medium**	**Poor**

Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 1 Base Operability	Medium					
Chem SM 1 Water Conditions Operability	Good					
Chem SM 1: response vessel Base Transport Operability	Poor					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 188 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Medium', Chem SM 1 Water Conditions Operability is 'Medium'

Chem SM 1 Base Operability	Medium					
Chem SM 1 Water Conditions Operability	Medium					
Chem SM 1: response vessel Base Transport Operability	Good					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 1 Base Operability	Medium
Chem SM 1 Water Conditions Operability	Medium

Chem SM 1: response vessel Base Transport Operability	Medium					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

Chem SM 1 Base Operability	Medium					
Chem SM 1 Water Conditions Operability	Medium					
Chem SM 1: response vessel Base Transport Operability	Poor					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 189 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Medium', Chem SM 1 Water Conditions Operability is 'Poor'

Chem SM 1 Base Operability	Medium					
Chem SM 1 Water Conditions Operability	Poor					
Chem SM 1: response vessel Base Transport Operability	Good					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

Chem SM 1 Base Operability	Medium					
Chem SM 1 Water Conditions Operability	Poor					
Chem SM 1: response vessel Base Transport Operability	Medium					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 1 Base Operability	Medium					
Chem SM 1 Water Conditions Operability	Poor					
Chem SM 1: response vessel Base Transport Operability	Poor					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 190 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Poor' and Chem SM 1 Water Conditions Operability is 'Good'

Chem SM 1 Base Operability	Poor					
Chem SM 1 Water Conditions Operability	Good					
Chem SM 1: response vessel Base Transport Operability	Good					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4

Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 1 Base Operability	**Poor**					
Chem SM 1 Water Conditions Operability	**Good**					
Chem SM 1: response vessel Base Transport Operability	**Medium**					
Chem SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 1 Base Operability	**Poor**					
Chem SM 1 Water Conditions Operability	**Good**					
Chem SM 1: response vessel Base Transport Operability	**Poor**					
Chem SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 191 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Poor' and Chem SM 1 Water Conditions Operability is 'Medium'

Chem SM 1 Base Operability	**Poor**		
Chem SM 1 Water Conditions Operability	**Medium**		
Chem SM 1: response vessel Base Transport Operability	**Good**		
Chem SM 1 Weather Conditions Operability	**Good**	**Medium**	**Poor**

Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 1 Base Operability	Poor					
Chem SM 1 Water Conditions Operability	Medium					
Chem SM 1: response vessel Base Transport Operability	Medium					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 1 Base Operability	Poor					
Chem SM 1 Water Conditions Operability	Medium					
Chem SM 1: response vessel Base Transport Operability	Poor					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 192 Probability & State of Variable Copy of Chemical SM 1 Effectiveness when Chem SM 1 Base Operability is 'Poor' and Chem SM 4 Water Conditions Operability is 'Poor'

Chem SM 1 Base Operability	Poor
Chem SM 1 Water Conditions Operability	Poor

Chem SM 1: response vessel Base Transport Operability	Good					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Chem SM 1 Base Operability	Poor					
Chem SM 1 Water Conditions Operability	Poor					
Chem SM 1: response vessel Base Transport Operability	Medium					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Chem SM 1 Base Operability	Poor					
Chem SM 1 Water Conditions Operability	Poor					
Chem SM 1: response vessel Base Transport Operability	Poor					
Chem SM 1 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 1: Dispersant spray arms Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of '*Chemical SM 1 Effectiveness'* and its related probability.

Table 193 Probability & State of Variable Chemical Dispersion SM 1 Effectiveness

Response Asset	**Vessel**		
Chemical Dispersion SM 1 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	**Helicopter**		
Chemical Dispersion SM 1 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	**Airplane**		
Chemical Dispersion SM 1 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable *'Chemical SM 2 Effectiveness'* and its related probability.

Table 194 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Good', Chem SM 2 Water Conditions Operability is 'Good'

Chem SM 2 Base Operability	**Good**
Chem SM 2 Water Conditions Operability	**Good**

Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Good**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 2 Base Operability	**Good**					
Chem SM 2 Water Conditions Operability	**Good**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Medium**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 2 Base Operability	**Good**					
Chem SM 2 Water Conditions Operability	**Good**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Poor**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4

Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 195 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Good', Chem SM 2 Water Conditions Operability is 'Medium'

Chem SM 2 Base Operability	**Good**					
Chem SM 2 Water Conditions Operability	**Medium**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Good**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

Chem SM 2 Base Operability	**Good**					
Chem SM 2 Water Conditions Operability	**Medium**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Medium**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

Chem SM 2 Base Operability	**Good**
Chem SM 2 Water Conditions Operability	**Medium**

Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Poor					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 196 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Good', Chem SM 2 Water Conditions Operability is 'Poor'

Chem SM 2 Base Operability	Good					
Chem SM 2 Water Conditions Operability	Poor					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Good					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 2 Base Operability	Good					
Chem SM 2 Water Conditions Operability	Poor					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Medium					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor

Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 2 Base Operability	**Good**					
Chem SM 2 Water Conditions Operability	**Poor**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Poor**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 197 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Medium', Chem SM 2 Water Conditions Operability is 'Good'

Chem SM 2 Base Operability	**Medium**					
Chem SM 2 Water Conditions Operability	**Good**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Good**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 2 Base Operability	**Good**
Chem SM 2 Water Conditions Operability	**Medium**

Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Medium					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 2 Base Operability	Medium					
Chem SM 2 Water Conditions Operability	Good					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Poor					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 198 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Medium', Chem SM 2 Water Conditions Operability is 'Medium'

Chem SM 2 Base Operability	Medium					
Chem SM 2 Water Conditions Operability	Medium					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Good					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor

Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 2 Base Operability	**Medium**					
Chem SM 2 Water Conditions Operability	**Medium**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Medium**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

Chem SM 2 Base Operability	**Medium**					
Chem SM 2 Water Conditions Operability	**Medium**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Poor**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 199 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Medium', Chem SM 2 Water Conditions Operability is 'Poor'

Chem SM 2 Base Operability	**Medium**
Chem SM 2 Water Conditions Operability	**Poor**

Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Good					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

Chem SM 2 Base Operability	Medium					
Chem SM 2 Water Conditions Operability	Poor					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Medium					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 2 Base Operability	Medium					
Chem SM 2 Water Conditions Operability	Poor					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Poor					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2

Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 200 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Poor' and Chem SM 2 Water Conditions Operability is 'Good'

Chem SM 2 Base Operability	**Poor**					
Chem SM 2 Water Conditions Operability	**Good**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Good**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 2 Base Operability	**Poor**					
Chem SM 2 Water Conditions Operability	**Good**					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Medium**					
Chem SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 2 Base Operability	**Poor**
Chem SM 2 Water Conditions Operability	**Good**
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	**Poor**

Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 201 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Poor' and Chem SM 2 Water Conditions Operability is 'Medium'

Chem SM 2 Base Operability	Poor					
Chem SM 2 Water Conditions Operability	Medium					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Good					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 2 Base Operability	Poor					
Chem SM 2 Water Conditions Operability	Medium					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Medium					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 2 Base Operability	Poor					
Chem SM 2 Water Conditions Operability	Medium					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Poor					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 202 Probability & State of Variable Copy of Chemical SM 2 Effectiveness when Chem SM 2 Base Operability is 'Poor' and Chem SM 2 Water Conditions Operability is 'Poor'

Chem SM 2 Base Operability	Poor					
Chem SM 2 Water Conditions Operability	Poor					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Good					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Chem SM 2 Base Operability	Poor		
Chem SM 2 Water Conditions Operability	Poor		
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Medium		
Chem SM 2 Weather Conditions Operability	Good	Medium	Poor

Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Chem SM 2 Base Operability	Poor					
Chem SM 2 Water Conditions Operability	Poor					
Chem SM 2: Multi-engine fixed-wing aircraft, one for dispersant, application, one for aerial spotting Base Transport Operability	Poor					
Chem SM 2 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 2: Aerial high volume dispersant Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of the variable *'Chem SM 2 Effectiveness'* and its related probability.

Table 203 Probability & State of Variable Chemical Dispersion SM 2 Effectiveness

Response Asset	Vessel		
Chemical Dispersion SM 2 Effectiveness Copy	Good	Medium	Poor
Good	0	0	0
Medium	0	0	0
Poor	0	0	0

NA	1	1	1

Response Asset	**Helicopter**		
Chemical Dispersion SM 2 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	**Airplane**		
Chemical Dispersion SM 2 Effectiveness	**Good**	**Medium**	**Poor**
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

The tables below showcase the states of the duplicate variable *'Chemical SM 3 Effectiveness'* and its related probability.

Table 204 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Good', Chem SM 3 Water Conditions Operability is 'Good'

Chem SM 3 Base Operability	**Good**					
Chem SM 3 Water Conditions Operability	**Good**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Good**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 3 Base Operability	Good					
Chem SM 3 Water Conditions Operability	Good					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 3 Base Operability	Good					
Chem SM 3 Water Conditions Operability	Good					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 205 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Good', Chem SM 3 Water Conditions Operability is 'Medium'

Chem SM 3 Base Operability	Good					
Chem SM 3 Water Conditions Operability	Medium					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Good					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor

Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

Chem SM 3 Base Operability	**Good**					
Chem SM 3 Water Conditions Operability	**Medium**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Medium**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

Chem SM 3 Base Operability	**Good**					
Chem SM 3 Water Conditions Operability	**Medium**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Poor**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 206 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is ‘Good’, Chem SM 3 Water Conditions Operability is ‘Poor’

Chem SM 3 Base Operability	**Good**
Chem SM 3 Water Conditions Operability	**Poor**
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Good**

Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 3 Base Operability	Good					
Chem SM 3 Water Conditions Operability	Poor					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 3 Base Operability	Good					
Chem SM 3 Water Conditions Operability	Poor					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 207 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Medium', Chem SM 3 Water Conditions Operability is 'Good'

Chem SM 3 Base Operability	Medium

Chem SM 3 Water Conditions Operability	Good					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Good					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 3 Base Operability	Good					
Chem SM 3 Water Conditions Operability	Medium					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 3 Base Operability	Medium					
Chem SM 3 Water Conditions Operability	Good					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 208 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Medium', Chem SM 3 Water Conditions Operability is 'Medium'

Chem SM 3 Base Operability	**Medium**					
Chem SM 3 Water Conditions Operability	**Medium**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Good**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

Chem SM 3 Base Operability	**Medium**					
Chem SM 3 Water Conditions Operability	**Medium**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Medium**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

Chem SM 3 Base Operability	**Medium**		
Chem SM 3 Water Conditions Operability	**Medium**		
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Poor**		
Chem SM 3 Weather Conditions Operability	**Good**	**Medium**	**Poor**

Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 209 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Medium', Chem SM 3 Water Conditions Operability is 'Poor'

Chem SM 3 Base Operability	Medium					
Chem SM 3 Water Conditions Operability	Poor					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Good					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

Chem SM 3 Base Operability	Medium					
Chem SM 3 Water Conditions Operability	Poor					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 3 Base Operability	Medium
Chem SM 3 Water Conditions Operability	Poor

Chem SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 210 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Poor' and Chem SM 3 Water Conditions Operability is 'Good'

Chem SM 3 Base Operability	Poor					
Chem SM 3 Water Conditions Operability	Good					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Good					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 3 Base Operability	Poor					
Chem SM 3 Water Conditions Operability	Good					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 3 Base Operability	Poor					
Chem SM 3 Water Conditions Operability	Good					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 211 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Poor' and Chem SM 3 Water Conditions Operability is 'Medium'

Chem SM 3 Base Operability	Poor					
Chem SM 3 Water Conditions Operability	Medium					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Good					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 3 Base Operability	Poor					
Chem SM 3 Water Conditions Operability	Medium					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor

Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Chem SM 3 Base Operability	**Poor**					
Chem SM 3 Water Conditions Operability	**Medium**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Poor**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 212 Probability & State of Variable Copy of Chemical SM 3 Effectiveness when Chem SM 3 Base Operability is 'Poor' and Chem SM 3 Water Conditions Operability is 'Poor'

Chem SM 3 Base Operability	**Poor**					
Chem SM 3 Water Conditions Operability	**Poor**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Good**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Chem SM 3 Base Operability	**Poor**					
Chem SM 3 Water Conditions Operability	**Poor**					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	**Medium**					
Chem SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	

Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Chem SM 3 Base Operability	Poor					
Chem SM 3 Water Conditions Operability	Poor					
Chem SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
Chem SM 3 Weather Conditions Operability	Good		Medium		Poor	
Chem SM 3: Aerial dispersant application Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of '*Chemical SM 3 Effectiveness'* and its related probability.

Table 213 Probability & State of Variable Chemical Dispersion SM 3 Effectiveness

Response Asset	Vessel		
Chemical Dispersion SM 3 Effectiveness Copy	Good	Medium	Poor
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	Helicopter		
Chemical Dispersion SM 3 Effectiveness	Good	Medium	Poor
Good	1	0	0
Medium	0	1	0

Poor	0	0	1
NA	0	0	0

Response Asset	**Airplane**		
Chemical Dispersion SM 3 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable *'In-Situ Burning SM 1 Effectiveness'* and its related probability.

Table 214 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Good', In-Situ SM 1 Water Conditions Operability is 'Good'

In-Situ Burning SM 1 Base Operability	**Good**					
In-Situ Burning SM 1 Water Conditions Operability	**Good**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Good**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 1 Base Operability	**Good**					
In-Situ Burning SM 1 Water Conditions Operability	**Good**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Medium**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**

Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 1 Base Operability	**Good**					
In-Situ Burning SM 1 Water Conditions Operability	**Good**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Poor**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 215 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Good', In-Situ SM 1 Water Conditions Operability is 'Medium'

In-Situ Burning SM 1 Base Operability	**Good**					
In-Situ Burning SM 1 Water Conditions Operability	**Medium**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Good**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

In-Situ Burning SM 1 Base Operability	**Good**
In-Situ Burning SM 1 Water Conditions Operability	**Medium**
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Medium**

In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

In-Situ Burning SM 1 Base Operability	Good					
In-Situ Burning SM 1 Water Conditions Operability	Medium					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Poor					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 216 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Good', In-Situ SM 1 Water Conditions Operability is 'Poor'

In-Situ Burning SM 1 Base Operability	Good					
In-Situ Burning SM 1 Water Conditions Operability	Poor					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Good					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 1 Base Operability	Good

In-Situ Burning SM 1 Water Conditions Operability	Poor					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Medium					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 1 Base Operability	Good					
In-Situ Burning SM 1 Water Conditions Operability	Poor					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Poor					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 217 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Medium', In-Situ SM 1 Water Conditions Operability is 'Good'

In-Situ Burning SM 1 Base Operability	Medium					
In-Situ Burning SM 1 Water Conditions Operability	Good					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Good					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2

Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 1 Base Operability	**Good**					
In-Situ Burning SM 1 Water Conditions Operability	**Medium**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Medium**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 1 Base Operability	**Medium**					
In-Situ Burning SM 1 Water Conditions Operability	**Good**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Poor**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 218 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Medium', In-Situ SM 1 Water Conditions Operability is 'Medium'

In-Situ Burning SM 1 Base Operability	**Medium**		
In-Situ Burning SM 1 Water Conditions Operability	**Medium**		
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Good**		
In-Situ Burning SM 1 Weather Conditions Operability	**Good**	**Medium**	**Poor**

In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 1 Base Operability	Medium					
In-Situ Burning SM 1 Water Conditions Operability	Medium					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Medium					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

In-Situ Burning SM 1 Base Operability	Medium					
In-Situ Burning SM 1 Water Conditions Operability	Medium					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Poor					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 219 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 In-Situ Operability is 'Medium', In-Situ SM 1 Water Conditions Operability is 'Poor'

In-Situ Burning SM 1 Base Operability	Medium
In-Situ Burning SM 1 Water Conditions Operability	Poor

In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Good					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

In-Situ Burning SM 1 Base Operability	Medium					
In-Situ Burning SM 1 Water Conditions Operability	Poor					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Medium					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 1 Base Operability	Medium					
In-Situ Burning SM 1 Water Conditions Operability	Poor					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Poor					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 220 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Poor' and In-Situ SM 1 Water Conditions Operability is 'Good'

In-Situ Burning SM 1 Base Operability	**Poor**					
In-Situ Burning SM 1 Water Conditions Operability	**Good**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Good**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 1 Base Operability	**Poor**					
In-Situ Burning SM 1 Water Conditions Operability	**Good**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Medium**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 1 Base Operability	**Poor**					
In-Situ Burning SM 1 Water Conditions Operability	**Good**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Poor**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2

Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 221 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Poor' and In-Situ SM 1 Water Conditions Operability is 'Medium'

In-Situ Burning SM 1 Base Operability	**Poor**					
In-Situ Burning SM 1 Water Conditions Operability	**Medium**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Good**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 1 Base Operability	**Poor**					
In-Situ Burning SM 1 Water Conditions Operability	**Medium**					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Medium**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 1 Base Operability	**Poor**		
In-Situ Burning SM 1 Water Conditions Operability	**Medium**		
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Poor**		
In-Situ Burning SM 1 Weather Conditions Operability	**Good**	**Medium**	**Poor**

In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 222 Probability & State of Variable Copy of In-Situ Burning SM 1 Effectiveness when In-Situ SM 1 Base Operability is 'Poor' and In-Situ SM 1 Water Conditions Operability is 'Poor'

In-Situ Burning SM 1 Base Operability	Poor					
In-Situ Burning SM 1 Water Conditions Operability	Poor					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Good					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

In-Situ Burning SM 1 Base Operability	Poor					
In-Situ Burning SM 1 Water Conditions Operability	Poor					
In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	Medium					
In-Situ Burning SM 1 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

In-Situ Burning SM 1 Base Operability	Poor
In-Situ Burning SM 1 Water Conditions Operability	Poor

In-Situ Burning SM 1: vessels of opportunity Base Transport Operability	**Poor**					
In-Situ Burning SM 1 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 1: Fire Boom & Handheld gelled-fuel igniter Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of *'In-Situ Burning SM 1 Effectiveness'* and its related probability.

Table 223 Probability & State of Variable In-Situ Burning SM 1 Effectiveness

Response Asset	**Vessel**		
In-Situ Burning SM 1 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	**Helicopter**		
In-Situ Burning SM 1 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	**Airplane**		
In-Situ Burning SM 1 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable *'In-Situ Burning SM 2 Effectiveness'* and its related probability.

Table 224 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Good', In-Situ SM 2 Water Conditions Operability is 'Good'

In-Situ Burning SM 2 Base Operability	**Good**					
In-Situ Burning SM 2 Water Conditions Operability	**Good**					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Good**					
In-Situ Burning SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 2 Base Operability	**Good**					
In-Situ Burning SM 2 Water Conditions Operability	**Good**					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Medium**					
In-Situ Burning SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 2 Base Operability	**Good**
In-Situ Burning SM 2 Water Conditions Operability	**Good**
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Poor**

In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 225 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Good', In-Situ SM 2 Water Conditions Operability is 'Medium'

In-Situ Burning SM 2 Base Operability	Good					
In-Situ Burning SM 2 Water Conditions Operability	Medium					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

In-Situ Burning SM 2 Base Operability	Good					
In-Situ Burning SM 2 Water Conditions Operability	Medium					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

In-Situ Burning SM 2 Base Operability	Good

In-Situ Burning SM 2 Water Conditions Operability	Medium					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 226 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Good', In-Situ SM 2 Water Conditions Operability is 'Poor'

In-Situ Burning SM 2 Base Operability	Good					
In-Situ Burning SM 2 Water Conditions Operability	Poor					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 2 Base Operability	Good					
In-Situ Burning SM 2 Water Conditions Operability	Poor					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2

Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 2 Base Operability	**Good**					
In-Situ Burning SM 2 Water Conditions Operability	**Poor**					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Poor**					
In-Situ Burning SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 227 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Medium', In-Situ SM 2 Water Conditions Operability is 'Good'

In-Situ Burning SM 2 Base Operability	**Medium**					
In-Situ Burning SM 2 Water Conditions Operability	**Good**					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Good**					
In-Situ Burning SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 2 Base Operability	**Good**		
In-Situ Burning SM 2 Water Conditions Operability	**Medium**		
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Medium**		
In-Situ Burning SM 2 Weather Conditions Operability	**Good**	**Medium**	**Poor**

In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 2 Base Operability	Medium					
In-Situ Burning SM 2 Water Conditions Operability	Good					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 228 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Medium', In-Situ SM 2 Water Conditions Operability is 'Medium'

In-Situ Burning SM 2 Base Operability	Medium					
In-Situ Burning SM 2 Water Conditions Operability	Medium					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 2 Base Operability	Medium
In-Situ Burning SM 2 Water Conditions Operability	Medium

In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

In-Situ Burning SM 2 Base Operability	Medium					
In-Situ Burning SM 2 Water Conditions Operability	Medium					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 229 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when Chem SM 2 In-Situ Operability is 'Medium', In-Situ SM 2 Water Conditions Operability is 'Poor'

In-Situ Burning SM 2 Base Operability	Medium					
In-Situ Burning SM 2 Water Conditions Operability	Poor					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

In-Situ Burning SM 2 Base Operability	Medium					
In-Situ Burning SM 2 Water Conditions Operability	Poor					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 2 Base Operability	Medium					
In-Situ Burning SM 2 Water Conditions Operability	Poor					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 230 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Poor' and In-Situ SM 2 Water Conditions Operability is 'Good'

In-Situ Burning SM 2 Base Operability	Poor					
In-Situ Burning SM 2 Water Conditions Operability	Good					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4

Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 2 Base Operability	**Poor**					
In-Situ Burning SM 2 Water Conditions Operability	**Good**					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Medium**					
In-Situ Burning SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 2 Base Operability	**Poor**					
In-Situ Burning SM 2 Water Conditions Operability	**Good**					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Poor**					
In-Situ Burning SM 2 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 231 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Poor' and In-Situ SM 2 Water Conditions Operability is 'Medium'

In-Situ Burning SM 2 Base Operability	**Poor**		
In-Situ Burning SM 2 Water Conditions Operability	**Medium**		
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	**Good**		
In-Situ Burning SM 2 Weather Conditions Operability	**Good**	**Medium**	**Poor**

In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 2 Base Operability	Poor					
In-Situ Burning SM 2 Water Conditions Operability	Medium					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 2 Base Operability	Poor					
In-Situ Burning SM 2 Water Conditions Operability	Medium					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 232 Probability & State of Variable Copy of In-Situ Burning SM 2 Effectiveness when In-Situ SM 2 Base Operability is 'Poor' and In-Situ SM 2 Water Conditions Operability is 'Poor'

In-Situ Burning SM 2 Base Operability	Poor
In-Situ Burning SM 2 Water Conditions Operability	Poor

In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

In-Situ Burning SM 2 Base Operability	Poor					
In-Situ Burning SM 2 Water Conditions Operability	Poor					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

In-Situ Burning SM 2 Base Operability	Poor					
In-Situ Burning SM 2 Water Conditions Operability	Poor					
In-Situ Burning SM 2: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 2 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 2: Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of '*In-Situ Burning SM 2 Effectiveness'* and its related probability.

Table 233 Probability & State of Variable In-Situ Burning SM 2 Effectiveness

Response Asset	**Vessel**		
In-Situ Burning SM 2 Effectiveness Copy	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	**Helicopter**		
In-Situ Burning SM 2 Effectiveness	**Good**	**Medium**	**Poor**
Good	1	0	0
Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	**Airplane**		
In-Situ Burning SM 2 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of the duplicate variable *'In-Situ Burning SM 3 Effectiveness'* and its related probability.

Table 234 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Good', In-Situ SM 3 Water Conditions Operability is 'Good'

In-Situ Burning SM 3 Base Operability	**Good**
In-Situ Burning SM 3 Water Conditions Operability	**Good**

In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	1	0.8	0.8	0.6	0.8	0.6
Medium	0	0	0.2	0.2	0	0
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 3 Base Operability	Good					
In-Situ Burning SM 3 Water Conditions Operability	Good					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 3 Base Operability	Good					
In-Situ Burning SM 3 Water Conditions Operability	Good					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0

Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 235 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Good', In-Situ SM 3 Water Conditions Operability is 'Medium'

In-Situ Burning SM 3 Base Operability	**Good**					
In-Situ Burning SM 3 Water Conditions Operability	**Medium**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Good**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.5	0.6	0.6	0.6	0.4
Medium	0.2	0.5	0.4	0.2	0.2	0.2
Poor	0	0	0	0.2	0.2	0.4

In-Situ Burning SM 3 Base Operability	**Good**					
In-Situ Burning SM 3 Water Conditions Operability	**Medium**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Medium**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.6	0.5	0.5	0	0
Medium	0.4	0.2	0.5	0.5	0.5	0.5
Poor	0	0.2	0	0	0.5	0.5

In-Situ Burning SM 3 Base Operability	**Good**
In-Situ Burning SM 3 Water Conditions Operability	**Medium**
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Poor**

In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 236 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Good', In-SItu SM 3 Water Conditions Operability is 'Poor'

In-Situ Burning SM 3 Base Operability	Good					
In-Situ Burning SM 3 Water Conditions Operability	Poor					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 3 Base Operability	Good					
In-Situ Burning SM 3 Water Conditions Operability	Poor					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2

Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 3 Base Operability	**Good**					
In-Situ Burning SM 3 Water Conditions Operability	**Poor**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Poor**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 237 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Medium', In-SItu SM 3 Water Conditions Operability is 'Good'

In-Situ Burning SM 3 Base Operability	**Medium**					
In-Situ Burning SM 3 Water Conditions Operability	**Good**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Good**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.6	0.6	0.4
Medium	0.2	0.2	0.4	0.2	0.2	0.2
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 3 Base Operability	**Good**
In-Situ Burning SM 3 Water Conditions Operability	**Medium**
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Medium**

In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.4	0.2
Medium	0.4	0.2	0.6	0.6	0.4	0.4
Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 3 Base Operability	Medium					
In-Situ Burning SM 3 Water Conditions Operability	Good					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.2	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.6	0.6

Table 238 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Medium', In-SItu SM 3 Water Conditions Operability is 'Medium'

In-Situ Burning SM 3 Base Operability	Medium					
In-Situ Burning SM 3 Water Conditions Operability	Medium					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.6	0.4	0.2	0.2	0.2
Medium	0.4	0.2	0.6	0.6	0.6	0.4

Poor	0	0.2	0	0.2	0.2	0.4

In-Situ Burning SM 3 Base Operability	**Medium**					
In-Situ Burning SM 3 Water Conditions Operability	**Medium**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Medium**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.6	0.6	0.8	0.2	0.6	0.6
Poor	0	0.2	0	0.8	0.2	0.4

In-Situ Burning SM 3 Base Operability	**Medium**					
In-Situ Burning SM 3 Water Conditions Operability	**Medium**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Poor**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

Table 239 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when Chem SM 3 In-Situ Operability is 'Medium', In-Situ SM 3 Water Conditions Operability is 'Poor'

In-Situ Burning SM 3 Base Operability	**Medium**
In-Situ Burning SM 3 Water Conditions Operability	**Poor**
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Good**

In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.2	0	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.4	0.6	0.4	0.6

In-Situ Burning SM 3 Base Operability	Medium					
In-Situ Burning SM 3 Water Conditions Operability	Poor					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 3 Base Operability	Medium					
In-Situ Burning SM 3 Water Conditions Operability	Poor					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 240 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Poor' and In-Situ SM 3 Water Conditions Operability is 'Good'

In-Situ Burning SM 3 Base Operability	**Poor**					
In-Situ Burning SM 3 Water Conditions Operability	**Good**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Good**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.8	0.6	0.6	0.4	0.6	0.4
Medium	0	0	0.2	0.2	0	0
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 3 Base Operability	**Poor**					
In-Situ Burning SM 3 Water Conditions Operability	**Good**					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Medium**					
In-Situ Burning SM 3 Weather Conditions Operability	**Good**		**Medium**		**Poor**	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	**Good**	**Poor**	**Good**	**Poor**	**Good**	**Poor**
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 3 Base Operability	**Poor**		
In-Situ Burning SM 3 Water Conditions Operability	**Good**		
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	**Poor**		
In-Situ Burning SM 3 Weather Conditions Operability	**Good**	**Medium**	**Poor**

In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 241 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Poor' and In-Situ SM 3 Water Conditions Operability is 'Medium'

In-Situ Burning SM 3 Base Operability	Poor					
In-Situ Burning SM 3 Water Conditions Operability	Medium					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 3 Base Operability	Poor					
In-Situ Burning SM 3 Water Conditions Operability	Medium					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.4	0.4	0.6	0.6	0.4	0.4
Poor	0.2	0.4	0.2	0.4	0.4	0.6

In-Situ Burning SM 3 Base Operability	Poor					
In-Situ Burning SM 3 Water Conditions Operability	Medium					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

Table 242 Probability & State of Variable Copy of In-Situ Burning SM 3 Effectiveness when In-Situ SM 3 Base Operability is 'Poor' and In-Situ SM 3 Water Conditions Operability is 'Poor'

In-Situ Burning SM 3 Base Operability	Poor					
In-Situ Burning SM 3 Water Conditions Operability	Poor					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Good					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.6	0.4	0.4	0.2	0.4	0.2
Medium	0	0	0.2	0.2	0	0
Poor	0.4	0.6	0.4	0.6	0.6	0.8

In-Situ Burning SM 3 Base Operability	Poor					
In-Situ Burning SM 3 Water Conditions Operability	Poor					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Medium					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	

In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0.2	0.2	0.4	0.4	0.2	0.2
Poor	0.4	0.6	0.4	0.6	0.6	0.8

In-Situ Burning SM 3 Base Operability	Poor					
In-Situ Burning SM 3 Water Conditions Operability	Poor					
In-Situ Burning SM 3: Twin engine jet helicopter Base Transport Operability	Poor					
In-Situ Burning SM 3 Weather Conditions Operability	Good		Medium		Poor	
In-Situ Burning SM 3: Aerial Chemical Herder & Aerial ignition system Oil Response Equipment Operability	Good	Poor	Good	Poor	Good	Poor
Good	0.4	0.2	0.2	0	0.2	0
Medium	0	0	0.2	0.2	0	0
Poor	0.6	0.8	0.6	0.8	0.8	1

The tables below showcase the states of *'In-Situ Burning SM 3 Effectiveness'* and its related probability.

Table 243 Probability & State of Variable In-Situ Burning SM 3 Effectiveness

Response Asset	Vessel		
In-Situ Burning SM 3 Effectiveness Copy	Good	Medium	Poor
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

Response Asset	Helicopter		
In-Situ Burning SM 3 Effectiveness	Good	Medium	Poor
Good	1	0	0

Medium	0	1	0
Poor	0	0	1
NA	0	0	0

Response Asset	**Airplane**		
In-Situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**
Good	0	0	0
Medium	0	0	0
Poor	0	0	0
NA	1	1	1

The tables below showcase the states of '*Mechanical Response Equipment Effectiveness'* and its related probability.

Table 244 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Good' and Mechanical Recovery SM 2 Response Effectiveness is 'Good'

Mechanical Recovery SM 1 Effectiveness	**Good**							
Mechanical Recovery SM 2 Effectiveness	**Good**							
Mechanical Recovery SM 3 Effectiveness	**Good**				**Medium**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	1	0.75	0.75	0.75	0.75	0.5	0.5	0.5
Medium	0	0.25	0	0	0.25	0.5	0.25	0.25
Poor	0	0	0.25	0	0	0	0.25	0
NA	0	0	0	0.25	0	0	0	0.25

Mechanical Recovery SM 1 Effectiveness	**Good**

Mechanical Recovery SM 2 Effectiveness	Good							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.75	0.5	0.5	0.5	0.75	0.5	0.5	0.5
Medium	0	0.25	0	0	0	0.25	0	0
Poor	0.25	0.25	0.5	0.25	0	0	0.25	0
NA	0	0	0	0.25	0.25	0.25	0.25	0.5

Table 245 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Good' and Mechanical Recovery SM 2 Response Effectiveness is 'Medium'

Mechanical Recovery SM 1 Effectiveness	Good							
Mechanical Recovery SM 2 Effectiveness	Medium							
Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.75	0.5	0.5	0.5	0.5	0.25	0.25	0.25
Medium	0.25	0.5	0.25	0.25	0.5	0.75	0.5	0.5
Poor	0	0	0.25	0	0	0	0.25	0
NA	0	0	0	0.25	0	0	0	0.25

Mechanical Recovery SM 1 Effectiveness	Good

Mechanical Recovery SM 2 Effectiveness	Medium							
Mechanical Recovery SM 3 Effectiveness	**Poor**				**NA**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.5	0.25	0.25	0.25	0.5	0.25	0.25	0.25
Medium	0.25	0.5	0.25	0.25	0.25	0.5	0.25	0.25
Poor	0.25	0.25	0.5	0.25	0	0	0.25	0
NA	0	0	0	0.25	0.25	0.25	0.25	0.5

Table 246 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Good' and Mechanical Recovery SM 2 Response Effectiveness is 'Poor'

Mechanical Recovery SM 1 Effectiveness	Good							
Mechanical Recovery SM 2 Effectiveness	**Poor**							
Mechanical Recovery SM 3 Effectiveness	**Good**				**Medium**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.75	0.5	0.5	0.5	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0.25	0.5	0.25	0.25
Poor	0.25	0.25	0.5	0.25	0.25	0.25	0.5	0.25
NA	0	0	0	0.25	0	0	0	0.25

Mechanical Recovery SM 1 Effectiveness	Good

Mechanical Recovery SM 2 Effectiveness	Poor							
Mechanical Recovery SM 3 Effectiveness	**Poor**				**NA**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.5	0.25	0.25	0	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0	0.25	0	0
Poor	0.5	0.5	0.75	0.75	0.25	0.25	0.5	0.25
NA	0	0	0	0.25	0.25	0.25	0.25	0.5

Table 247 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Good' and Mechanical Recovery SM 2 Response Effectiveness is 'NA'

Mechanical Recovery SM 1 Effectiveness	Good							
Mechanical Recovery SM 2 Effectiveness	**NA**							
Mechanical Recovery SM 3 Effectiveness	**Good**				**Medium**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.75	0.5	0.5	0.5	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0.25	0.5	0.25	0.25
Poor	0	0	0.25	0	0	0	0.25	0
NA	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.5

Mechanical Recovery SM 1 Effectiveness	Good

Mechanical Recovery SM 2 Effectiveness	NA							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0.25	0.25	0.25	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0	0.25	0	0
Poor	0.25	0.25	0.5	0.25	0	0	0.25	0
NA	0.25	0.25	0.25	0.5	0.5	0.5	0.5	0.75

Table 248 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Medium' and Mechanical Recovery SM 2 Response Effectiveness is 'Good'

Mechanical Recovery SM 1 Effectiveness	Medium							
Mechanical Recovery SM 2 Effectiveness	Good							
Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.75	0.5	0.5	0.5	0.5	0.25	0.25	0.25
Medium	0.25	0.5	0.25	0.25	0.5	0.75	0.5	0.5
Poor	0	0	0.25	0	0	0	0.25	0
NA	0	0	0	0.25	0	0	0	0.25

Mechanical Recovery SM 1 Effectiveness	Medium

Mechanical Recovery SM 2 Effectiveness	Good							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0.25	0.25	0.25	0.5	0.25	0.25	0.25
Medium	0.25	0.5	0.25	0.25	0.25	0.5	0.25	0.25
Poor	0.25	0.25	0.5	0.25	0	0	0.25	0
NA	0	0	0	0.25	0.25	0.25	0.25	0.5

Table 249 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Medium' and Mechanical Recovery SM 2 Response Effectiveness is 'Medium'

Mechanical Recovery SM 1 Effectiveness	Medium							
Mechanical Recovery SM 2 Effectiveness	Medium							
Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0	0	0	0.25	0	0	0
Medium	0.5	0	0	0	0.75	0	0	0
Poor	0	1	1	0	0	1	1	0
NA	0	0	0	1	0	0	0	1

Mechanical Recovery SM 1 Effectiveness	Medium

Mechanical Recovery SM 2 Effectiveness	**Medium**							
Mechanical Recovery SM 3 Effectiveness	**Poor**				**NA**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.25	0	0	0	0.25	0	0	0
Medium	0.5	0	0	0	0.5	0	0	0
Poor	0.25	1	1	0	0	0	0	0
NA	0	0	0	1	0.25	1	1	1

Table 250 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Medium' and Mechanical Recovery SM 2 Response Effectiveness is 'Poor'

Mechanical Recovery SM 1 Effectiveness	**Medium**							
Mechanical Recovery SM 2 Effectiveness	**Poor**							
Mechanical Recovery SM 3 Effectiveness	**Good**				**Medium**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.5	0	0	0	0.25	0	0	0
Medium	0.25	0	0	0	0.5	0	0	0
Poor	0.25	1	1	0	0.25	1	1	0

NA	0	0	0	1	0	0	0	1

Mechanical Recovery SM 1 Effectiveness	**Medium**							
Mechanical Recovery SM 2 Effectiveness	**Poor**							
Mechanical Recovery SM 3 Effectiveness	**Poor**				**NA**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.25	0	0	0	0.25	0	0	0
Medium	0.25	0	0	0	0.25	0	0	0
Poor	0.5	1	1	0	0.25	0	0	0
NA	0	0	0	1	0.25	1	1	1

Table 251 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Medium' and Mechanical Recovery SM 2 Response Effectiveness is 'NA'

Mechanical Recovery SM 1 Effectiveness	**Medium**	
Mechanical Recovery SM 2 Effectiveness	**NA**	
Mechanical Recovery SM 3 Effectiveness	**Good**	**Medium**

Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0.25	0.25	0	0.25	0.25	0.25	0
Medium	0.25	0.25	0.25	0	0.5	0.25	0.25	0
Poor	0	0.25	0.25	0	0	0.25	0.25	0
NA	0.25	0.25	0.25	1	0.25	0.25	0.25	1

Mechanical Recovery SM 1 Effectiveness	Medium							
Mechanical Recovery SM 2 Effectiveness	NA							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.25	0.25	0.25	0	0.25	0	0	0
Medium	0.25	0.25	0.25	0	0.25	0	0	0
Poor	0.25	0.25	0.25	0	0	0	0	0
NA	0.25	0.25	0.25	1	0.5	1	1	1

Table 252 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Poor' and Mechanical Recovery SM 2 Response Effectiveness is 'Good'

Mechanical Recovery SM 1 Effectiveness	Poor
Mechanical Recovery SM 2 Effectiveness	Good

Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.75	0.5	0.5	0.5	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0.25	0.5	0.25	0.25
Poor	0.25	0.25	0.5	0.25	0.25	0.25	0.5	0.25
NA	0	0	0	0.25	0	0	0	0.25

Mechanical Recovery SM 1 Effectiveness	Poor							
Mechanical Recovery SM 2 Effectiveness	**Good**							
Mechanical Recovery SM 3 Effectiveness	**Poor**				**NA**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.5	0.25	0.25	0	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0	0.25	0	0
Poor	0.5	0.5	0.75	0.75	0.25	0.25	0.5	0.25
NA	0	0	0	0.25	0.25	0.25	0.25	0.5

Table 253 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Poor' and Mechanical Recovery SM 2 Response Effectiveness is 'Medium'

Mechanical Recovery SM 1 Effectiveness	Poor
Mechanical Recovery SM 2 Effectiveness	**Medium**

Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.5	0	0	0	0.25	0	0	0
Medium	0.25	0	0	0	0.5	0	0	0
Poor	0.25	1	1	0	0.25	1	1	0
NA	0	0	0	1	0	0	0	1

Mechanical Recovery SM 1 Effectiveness	Poor							
Mechanical Recovery SM 2 Effectiveness	**Medium**							
Mechanical Recovery SM 3 Effectiveness	**Poor**				**NA**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.25	0	0	0	0.25	0	0	0
Medium	0.25	0	0	0	0.25	0	0	0
Poor	0.5	1	1	0	0.25	0	0	0
NA	0	0	0	1	0.25	1	1	1

Table 254 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Poor' and Mechanical Recovery SM 2 Response Effectiveness is 'Poor'

Mechanical Recovery SM 1 Effectiveness	Poor
Mechanical Recovery SM 2 Effectiveness	**Poor**

Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0	0	0	0.25	0	0	0
Medium	0	0	0	0	0.25	0	0	0
Poor	0.5	1	1	0	0.5	1	1	0
NA	0	0	0	1	0	0	0	1

Mechanical Recovery SM 1 Effectiveness	Poor							
Mechanical Recovery SM 2 Effectiveness	Poor							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.25	0	0	0	0	0	0	0
Medium	0	0	0	0	0	0	0	0
Poor	0.75	1	1	0	0.75	0	0	0
NA	0	0	0	1	0.25	1	1	1

Table 255 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'Poor' and Mechanical Recovery SM 2 Response Effectiveness is 'NA'

Mechanical Recovery SM 1 Effectiveness	Poor

Mechanical Recovery SM 2 Effectiveness	NA							
Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0.25	0.25	0	0.25	0	0	0
Medium	0	0.25	0.25	0	0.25	0	0	0
Poor	0.25	0.25	0.25	0	0.25	0	0	0
NA	0.25	0.25	0.25	1	0.25	1	1	1

Mechanical Recovery SM 1 Effectiveness	Poor							
Mechanical Recovery SM 2 Effectiveness	NA							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.25	0	0	0	0.25	0.25	0.25	0.25
Medium	0	0	0	0	0	0.25	0.25	0.25
Poor	0.5	0	0	0	0.25	0.25	0.25	0.25
NA	0.25	1	1	1	0.5	0.25	0.25	0.25

Table 256 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'NA' and Mechanical Recovery SM 2 Response Effectiveness is 'Good'

Mechanical Recovery SM 1 Effectiveness	NA
Mechanical Recovery SM 2 Effectiveness	Good

Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.75	0.5	0.5	0.5	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0.25	0.5	0.25	0.25
Poor	0	0	0.25	0	0	0	0.25	0
NA	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.5

Mechanical Recovery SM 1 Effectiveness	NA							
Mechanical Recovery SM 2 Effectiveness	**Good**							
Mechanical Recovery SM 3 Effectiveness	**Poor**				**NA**			
Mechanical Recovery SM 4 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.5	0.25	0.25	0.25	0.5	0.25	0.25	0.25
Medium	0	0.25	0	0	0	0.25	0	0
Poor	0.25	0.25	0.5	0.25	0	0	0.25	0
NA	0.25	0.25	0.25	0.5	0.5	0.5	0.5	0.75

Table 257 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'NA' and Mechanical Recovery SM 2 Response Effectiveness is 'Medium'

Mechanical Recovery SM 1 Effectiveness	Good
Mechanical Recovery SM 2 Effectiveness	**Medium**

Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0.25	0.25	0.25	0.25	0	0	0
Medium	0.25	0.5	0.25	0.25	0.5	0.75	0.5	0.5
Poor	0	0	0.25	0	0	0	0.25	0
NA	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.5

Mechanical Recovery SM 1 Effectiveness	NA							
Mechanical Recovery SM 2 Effectiveness	Medium							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.25	0	0	0	0.25	0	0	0
Medium	0.25	0.5	0.25	0.25	0.25	0.5	0.25	0.25
Poor	0.25	0.25	0.5	0.25	0	0	0.25	0
NA	0.25	0.25	0.25	0.5	0.5	0.5	0.5	0.75

Table 258 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'NA' and Mechanical Recovery SM 2 Response Effectiveness is 'Poor'

Mechanical Recovery SM 1 Effectiveness	NA
Mechanical Recovery SM 2 Effectiveness	Poor

Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0.25	0.25	0.25	0.25	0	0	0
Medium	0	0.25	0	0	0.25	0.5	0.25	0.25
Poor	0.25	0.25	0.5	0.25	0.25	0.25	0.5	0.25
NA	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.5

Mechanical Recovery SM 1 Effectiveness	NA							
Mechanical Recovery SM 2 Effectiveness	Poor							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.25	0	0	0	0.25	0	0	0
Medium	0	0.25	0	0	0	0.25	0	0
Poor	0.5	0.5	0.75	0.5	0.25	0.25	0.5	0.25
NA	0.25	0.25	0.25	0.5	0.5	0.5	0.5	0.75

Table 259 Probability & State of Variable Mechanical Response Equipment Effectiveness when Mechanical Recovery SM 1 Response Effectiveness is 'NA' and Mechanical Recovery SM 2 Response Effectiveness is 'NA'

Mechanical Recovery SM 1 Effectiveness	NA
Mechanical Recovery SM 2 Effectiveness	NA

Mechanical Recovery SM 3 Effectiveness	Good				Medium			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.5	0.25	0.25	0.25	0.25	0	0	0
Medium	0	0.25	0	0	0.25	0.5	0.25	0.25
Poor	0	0	0.25	0	0	0	0.25	0
NA	0.5	0.5	0.5	0.75	0.5	0.5	0.5	0.75

Mechanical Recovery SM 1 Effectiveness	NA							
Mechanical Recovery SM 2 Effectiveness	NA							
Mechanical Recovery SM 3 Effectiveness	Poor				NA			
Mechanical Recovery SM 4 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.25	0	0	0	0.25	0	0	0
Medium	0	0.25	0	0	0	0.25	0	0
Poor	0.25	0.25	0.5	0.25	0	0	0.25	0
NA	0.5	0.5	0.5	0.75	0.75	0.75	0.75	1

Table 260 Probability & State of Variable Chemical Response Equipment Effectiveness when Chemical Dispersant SM 1 Response Effectiveness is 'Good'

Chemical Dispersant SM 1 Response Effectiveness	Good	
Chemical Dispersant SM 2 Response Effectiveness	Good	Medium

Chemical Dispersant SM 3 Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	1	0.667	0.667	0.667	0.667	0.333	0.333	0.333
Medium	0	0.333	0	0	0.333	0.667	0.333	0.333
Poor	0	0	0.333	0	0	0	0.333	0
NA	0	0	0	0.333	0	0	0	0.333

The tables below showcase the states of '*Chemical Dispersant Response Equipment Effectiveness'* Effectiveness and its related probability.

Chemical Dispersant SM 1 Response Effectiveness	**Good**							
Chemical Dispersant SM 2 Response Effectiveness	**Poor**				**NA**			
Chemical Dispersant SM 3 Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.667	0.333	0.333	0.333	0.667	0.333	0.333	0.333
Medium	0	0.333	0	0	0	0.333	0	0
Poor	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 261 Probability & State of Variable Chemical Response Equipment Effectiveness when Chemical Dispersant SM 1 Response Effectiveness is 'Medium'

Chemical Dispersant SM 1 Response Effectiveness	**Medium**							
Chemical Dispersant SM 2 Response Effectiveness	**Good**				**Medium**			
Chemical Dispersant SM 3 Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.667	0.333	0.333	0.333	0.333	0	0	0

Medium	0.333	0.667	0.333	0.333	0.667	1	0.667	0.667
Poor	0	0	0.333	0	0	0	0.333	0
NA	0	0	0	0.333	0	0	0	0.333

Chemical Dispersant SM 1 Response Effectiveness	**Medium**							
Chemical Dispersant SM 2 Response Effectiveness	**Poor**				**NA**			
Chemical Dispersant SM 3 Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.333	0	0	0	0.333	0	0	0
Medium	0.333	0.667	0.333	0.333	0.333	0.667	0.333	0.333
Poor	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 262 Probability & State of Variable Chemical Response Equipment Effectiveness when Chemical Dispersant SM 1 Response Effectiveness is 'Poor'

Chemical Dispersant SM 1 Response Effectiveness	**Poor**							
Chemical Dispersant SM 2 Response Effectiveness	**Good**				**Medium**			
Chemical Dispersant SM 3 Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.667	0.333	0.333	0.333	0.333	0	0	0
Medium	0	0.333	0	0	0.333	0.667	0.333	0.333
Poor	0.333	0.333	0.667	0.333	0.333	0.333	0.667	0.333
NA	0	0	0	0.333	0	0	0	0.333

Chemical Dispersant SM 1 Response Effectiveness	Poor							
Chemical Dispersant SM 2 Response Effectiveness	Poor				NA			
Chemical Dispersant SM 3 Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.333	0	0	0	0.333	0	0	0
Medium	0	0.333	0	0	0	0.333	0	0
Poor	0.667	0.667	1	0.667	0.333	0.333	0.667	0.333
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 263 Probability & State of Variable Chemical Response Equipment Effectiveness when Chemical Dispersant SM 1 Response Effectiveness is 'NA'

Chemical Dispersant SM 1 Response Effectiveness	NA							
Chemical Dispersant SM 2 Response Effectiveness	Good				Medium			
Chemical Dispersant SM 3 Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.667	0.333	0.333	0.333	0.333	0	0	0
Medium	0	0.333	0	0	0.333	0.667	0.333	0.333
Poor	0	0	0.333	0	0	0	0.333	0
NA	0.333	0.333	0.333	0.667	0.333	0.333	0.333	0.667

Chemical Dispersant SM 1 Response Effectiveness	NA							
Chemical Dispersant SM 2 Response Effectiveness	Poor				NA			
Chemical Dispersant SM 3 Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA

Good	0.333	0	0	0	0.333	0	0	0
Medium	0	0.333	0	0	0	0.333	0	0
Poor	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0.333	0.333	0.333	0.667	0.667	0.667	0.667	1

The tables below showcase the states of '*In-Situ Burning Response Equipment Effectiveness'* Effectiveness and its related probability.

Table 264 Probability & State of Variable In-Situ Burning Response Equipment Effectiveness when In-Situ Burning SM 1Effectivness is 'Good'

In-situ Burning SM 1 Effectiveness	**Good**							
In-situ Burning SM 2 Effectiveness	**Good**				**Medium**			
In-situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	1.000	0.667	0.667	0.667	0.667	0.333	0.333	0.333
Medium	0	0.333	0	0	0.333	0.667	0.333	0.333
Poor	0	0	0.333	0	0	0	0.333	0
NA	0	0	0	0.333	0	0	0	0.333

In-situ Burning SM 1 Effectiveness	**Good**							
In-situ Burning SM 2 Effectiveness	**Poor**				**NA**			
In-situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.667	0.333	0.333	0.333	0.667	0.333	0.333	0.333
Medium	0	0.333	0	0	0	0.333	0	0
Poor	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 265 Probability & State of Variable In-Situ Burning Response Equipment Effectiveness when In-Situ Burning SM 1 Effectiveness is 'Medium'

In-situ Burning SM 1 Effectiveness	**Medium**							
In-situ Burning SM 2 Effectiveness	**Good**				**Medium**			
In-situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.667	0.333	0.333	0.333	0.333	0	0	0
Medium	0.333	0.667	0.333	0.333	0.667	1.000	0.667	0.667
Poor	0	0	0.333	0	0	0	0.333	0
NA	0	0	0	0.333	0	0	0	0.333

In-situ Burning SM 1 Effectiveness	**Medium**							
In-situ Burning SM 2 Effectiveness	**Poor**				**NA**			
In-situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.333	0	0	0	0.333	0	0	0
Medium	0.333	0.667	0.333	0.333	0.333	0.667	0.333	0.333
Poor	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 266 Probability & State of Variable In-Situ Burning Response Equipment Effectiveness when In-Situ Burning SM 1 Effectiveness is 'Poor'

In-situ Burning SM 1 Effectiveness	**Poor**							
In-situ Burning SM 2 Effectiveness	**Good**				**Medium**			
In-situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.667	0.333	0.333	0.333	0.333	0	0	0

Medium	0	0.333	0	0	0.333	0.667	0.333	0.333
Poor	0.333	0.333	0.667	0.333	0.333	0.333	0.667	0.333
NA	0	0	0	0.333	0	0	0	0.333

In-situ Burning SM 1 Effectiveness	**Poor**							
In-situ Burning SM 2 Effectiveness	**Poor**				**NA**			
In-situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.333	0	0	0	0.333	0	0	0
Medium	0	0.333	0	0	0	0.333	0	0
Poor	0.667	0.667	1.000	0.667	0.333	0.333	0.667	0.333
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 267 Probability & State of Variable In-Situ Burning Response Equipment Effectiveness when In-Situ Burning SM 1 Effectiveness is 'NA'

In-situ Burning SM 1 Effectiveness	**NA**							
In-situ Burning SM 2 Effectiveness	**Good**				**Medium**			
In-situ Burning SM 3 Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Good	0.667	0.333	0.333	0.333	0.333	0	0	0
Medium	0	0.333	0	0	0.333	0.667	0.333	0.333
Poor	0	0	0.333	0	0	0	0.333	0
NA	0.333	0.333	0.333	0.667	0.333	0.333	0.333	0.667

In-situ Burning SM 1 Effectiveness	**NA**	
In-situ Burning SM 2 Effectiveness	**Poor**	**NA**

In-situ Burning SM 3 Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Good	0.333	0	0	0	0.333	0	0	0
Medium	0	0.333	0	0	0	0.333	0	0
Poor	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0.333	0.333	0.333	0.667	0.667	0.667	0.667	1

Overall Response Effectiveness Variable States and Probabilities

The following tables below showcase the states of *'Overall Response Effectiveness'* and its related probability.

Table 268 Probability & State of Variable of Overall Response Effectiveness when Mechanical Response Effectiveness is 'Good'

Mechanical Response Effectiveness	**Good**							
Chemical Response Effectiveness	**Good**				**Medium**			
In-Situ Burning Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Effective	1	0.667	.67	.67	.67	.333	.333	0.333
Slightly Effective	0	0.333	0	0	0.33333	.67	.333	0.333
Not Effective	0	0	.333	0	0	0	.333	0
NA	0	0	0	.333	0	0	0	0.333

Mechanical Response Effectiveness	**Good**							
Chemical Response Effectiveness	**Poor**				**NA**			
In-Situ Burning Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Effective	0.667	0.333	0.333	0.333	0.667	0.333	0.333	0.333
Slightly Effective	0	0.333	0	0	0	0.333	0	0
Not Effective	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 269 Probability & State of Variable of Overall Response Effectiveness when Mechanical Response Effectiveness is 'Medium'

Mechanical Response Effectiveness	**Medium**							
Chemical Response Effectiveness	**Good**				**Medium**			
In-Situ Burning Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Effective	0.667	0.333	0.333	0.333	0.333	0	0	0
Slightly Effective	0.333	0.667	0.333	0.333	0.667	1.000	0.667	0.667
Not Effective	0	0	0.333	0	0	0	0.333	0
NA	0	0	0	0.333	0	0	0	0.333

Mechanical Response Effectiveness	**Medium**

Chemical Response Effectiveness	Poor				NA			
In-Situ Burning Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Effective	0.333	0	0	0	0.333	0	0	0
Slightly Effective	0.333	0.667	0.333	0.333	0.333	0.667	0.333	0.333
Not Effective	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 270 Probability & State of Variable of Overall Response Effectiveness when Mechanical Response Effectiveness is 'Poor'

Mechanical Response Effectiveness	Poor							
Chemical Response Effectiveness	Good				Medium			
In-Situ Burning Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Effective	0.667	0.333	0.333	0.333	0.333	0	0	0
Slightly Effective	0	0.333	0	0	0.333	0.667	0.333	0.333
Not Effective	0.333	0.333	0.667	0.333	0.333	0.333	0.667	0.333
NA	0	0	0	0.333	0	0	0	0.333

Mechanical Response Effectiveness	Poor							
Chemical Response Effectiveness	Poor				NA			
In-Situ Burning Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Effective	0.333	0	0	0	0.333	0	0	0
Slightly Effective	0	0.333	0	0	0	0.333	0	0
Not Effective	0.667	0.667	1.000	0.667	0.333	0.333	0.667	0.333
NA	0	0	0	0.333	0.333	0.333	0.333	0.667

Table 271 Probability & State of Variable of Overall Response Effectiveness when Mechanical Response Effectiveness is 'NA'

Mechanical Response Effectiveness	NA							
Chemical Response Effectiveness	Good				Medium			
In-Situ Burning Response Effectiveness	Good	Medium	Poor	NA	Good	Medium	Poor	NA
Effective	0.667	0.333	0.333	0.333	0.333	0	0	0
Slightly Effective	0	0.333	0	0	0.333	0.667	0.333	0.333
Not Effective	0	0	0.333	0	0	0	0.333	0
NA	0.333	0.333	0.333	0.667	0.333	0.333	0.333	0.667

Mechanical Response Effectiveness	**NA**							
Chemical Response Effectiveness	**Poor**				**NA**			
In-Situ Burning Response Effectiveness	**Good**	**Medium**	**Poor**	**NA**	**Good**	**Medium**	**Poor**	**NA**
Effective	0.333	0	0	0	0.333	0	0	0
Slightly Effective	0	0.333	0	0	0	0.333	0	0
Not Effective	0.333	0.333	0.667	0.333	0	0	0.333	0
NA	0.333	0.333	0.333	0.667	0.667	0.667	0.667	1.000

Appendix F: OSRECA Duplicate Variables' States and Probability

Table 272 Probability & State of Duplicate Variable Visibility at Site for Mech SM 1, SM 2, SM 3, & SM 4

Visibility at Site	Good	Poor
Good	1	0
Poor	0	1

Table 273 Probability & State of Duplicate Variable Wind Speed at Site Mech SM 1, SM 2, SM 3, & SM 4

Wind Speed at Site	Normal	Severe
Normal	1	0
Severe	0	1

Table 274 Probability & State of Duplicate Variable Wave Conditions at Site Mech SM 1, SM 2, SM 3, & SM 4

Wave Conditions at Site	Low Slow	High Rough
Low Slow	1	0
High Rough	0	1

Table 275 Probability & State of Duplicate Variable Temperature at Site Mech SM 1, SM 2, SM 3, & SM 4

Temperature at Site	Normal Cold	Extra Cold
Normal Cold	1	0
Extra Cold	0	1

Table 276 Probability & State of Duplicate Variable Ice Coverage at Site Mech SM 1, SM 2, SM 3, & SM 4

Ice Coverage at Site	Open Water	Drift Close Ice	Compact Ice
Open Water	1	0	0
Drift Close Ice	0	1	0
Compact Ice	0	0	1

Table 277 Probability & State of Duplicate Variable Oil Position Mech SM 1, SM 2, SM 3, & SM 4

Oil Position	Nearshore	Offshore
Nearshore	1	0
Offshore	0	1

Table 278 Probability & State of Duplicate Variable Oil Spill Size Mech SM 1, SM 2, SM 3, & SM 4

Spill Size	Light	Normal
Light	1	0
Normal	0	1

Table 279 Probability & State of Duplicate Variable Temperature at Base Mech SM 1, SM 2, SM 3, & SM 4

Temperature at Base	Normal Cold	Extra Cold
Normal Cold	1	0
Extra Cold	0	1

Table 280 Probability & State of Duplicate Variable Wind Speed at Base Mech SM 1, SM 2, SM 3, & SM 4

Wind Speed at Base	Normal	Severe
Normal	1	0
Severe	0	1

Table 281 Probability & State of Duplicate Variable Sea Ice Conditions at Base Mech SM 1, SM 2, SM 3, & SM 4

Sea Ice Conditions at Base	New Young Ice	Old Ice
New Young Ice	1	0
Old Ice	0	1

Table 282 Probability & State of Duplicate Variable Wave Conditions at Base Mech SM 1, SM 2, SM 3, & SM 4

Wave Conditions at Base	Low Slow	High Rough
Low Slow	1	0
High Rough	0	1

Table 283 Probability & State of Duplicate Variable Mech SM 1, SM 2, SM 3, & SM 4 Response Arrival Time to Oil Site

Oil Persistence	Half Day	One Day	Two Day	Greater than 3 Days
Half Day	1	0	0	0
One Day	0	1	0	0
Two Day	0	0	1	0
Greater than 3 Days	0	0	0	1

Table 284 Probability & State of Duplicate Variable Mech SM 1, SM 2, SM 3, & SM 4Oil Persistence

Oil Persistence	Persistent	Not Persistent
Persistent	1	0
Not Persistent	0	1