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NUNAVUT IMPACT REVIEW BOARD

NUNAVUMI AVATILIKIYIN KATIMAYIN

NIRB Application for Screening #125103

Iqaluit Marine Infrastructure - Deep Sea Port

Application Type:	New
Project Type:	Infrastructure
Application Date:	4/6/2017 6:22:31 PM
Period of operation:	from 2018-06-01 to 2020-10-01
Proposed Authorization:	from 2018-06-01 to 2020-10-01
Project Proponent:	Paul Mulak Government of Nunavut PO Box 1000, Stn 620 Iqaluit Nunavut X0A 0H0 Canada Phone Number:: 8679755414, Fax Number:: 8679755457

DETAILS

Non-technical project proposal description

English: Project Summary The Government of Nunavut (GN), through Community and Government Services (CGS) on behalf of the Department of Economic Development and Transportation (EDT), plans to build a deep sea port (DSP) for the City of Iqaluit (the Project). Funding for the Project is available through the New Canada Build Fund and the GN. The Project The proposed location for the DSP is opposite the south end of Polaris Reef in Koojesse Inlet, northwest of the existing fuel resupply facility at Inuit Head and south of the existing causeway and parking area. There are no other commercial or residential developments in the area. The Project includes a deep sea wharf, a sealift cargo laydown area and landing ramp for barges, a new fuel receiving manifold, a new road connecting Akilliq Road to the DSP, and space to relocate mobile site offices that are now at the sealift beach. During construction, there will be blasting of rock to provide fill for the laydown area and shoreline protection material, dredging of soft marine sediments, and Disposal at Sea of the sediments to build the wharf on solid bedrock. Six options were considered for the location of the DSP. The current project site was selected as the best option because of its good land and vessel access, geotechnical conditions, and the ability for sealift and fuel deliveries to continue uninterrupted during the construction. Benefits to Iqaluit Residents The DSP will have significant benefits to the community by improving the safety and efficiency of fuel and sealift deliveries. The DSP will relocate sealift activities away from the tidal flats near the City and separate the activities of industrial vessels, such as tugs and barges, from hunters, fishermen and other small boat users. This will improve the safety of small boat users in the bay. The new wharf and ramp will provide all-tide access for general cargo vessels and lightering barges. Current activities at the sealift beach are limited to a few hours a day around high tide. The DSP will provide 24 hour access for sealift carriers to offload cargo. The new 4 hectare laydown area will almost double the current laydown area available for managing cargo, while double-handling of cargo will be eliminated as cargo will be placed directly on the wharf using the vessel’s cranes. The DSP will also have a new fuel manifold that will eliminate the need to routinely use floating fuel hoses, thus reducing the risk of fuel spills into water, and allowing for safer and more efficient fuel receipt. Construction Construction is planned to start in summer 2018 with the arrival of the first sealift and continue through 2019 and 2020. It will take place mostly during the open water months. The DSP will start operating in 2021. Potable water, sanitary and solid waste disposal, and fuel will be provided by City services. The primary fuel required for marine and land-based equipment will be diesel. Refuelling of equipment will be done in designated fuelling areas or using portable containment. The marine fleet will refuel at sea from bunker tanks. Construction equipment is expected to include drill rigs, excavators, rock transport trucks, front end loaders, compactors, dozers and graders, cranes and forklifts and other equipment. A marine derrick, dump/material scows, small workboats and tugboats will also be needed. Approximately 30 workers will be needed for construction. Non-local workers will stay in local accommodations. Construction equipment will arrive on the sealift and workers and consumables will arrive by scheduled flights, and charter flights will be used if needed. A Construction Environmental Management Plan (CEMP) will provide mitigation and monitoring commitments for the construction phase of the Project. Operations Discussions are ongoing between EDT and the City Mayor and Council regarding the operation and maintenance of the DSP. This includes the potential use of the DSP ramp by commercial and recreational boaters. Any future commercial development of the DSP will be permitted separately and therefore, the Project is only concerned with existing levels of activity. Inuit Qaujimajatuqangit Inuit Qaujimajatuqangit (IQ) has been gathered on the local site conditions, harvesting, travel routes and water/ice access and considered in the design and planning of the Iqaluit DSP and SCH projects through Hunters and Trappers Association (HTA) meetings, elder interviews, and a Boaters' Working Group. Community Engagement Program There has been consultation with the community, including hunters, fishers, residents, City Mayor and Council, HTA, Qikiqtani Inuit Association, the Boater's Working Group, sealift and fuel carriers, and others since October 2015. Meetings, interviews, workshops and open houses were used to share information and receive comments, concerns and suggestions about the Project both in English and Inuktitut, as well as in written French and Inuinnaqtun. The feedback has been considered within the design of the DSP, construction planning, and the development of the management plans. Consultation will continue during the construction of the Project.

French: Sommaire du projet Le gouvernement du Nunavut (GN), par l'entremise des Services communautaires et gouvernementaux (CGS) et au nom du ministère du Développement économique et Transports (EDT), prévoit construire un port en eau profonde (DSP) pour la ville d'Iqaluit (le Projet). Le financement du Projet est assuré par le Fonds Chantiers Canada et le GN. Le Projet Il a été proposé que le DSP soit construit à l'extrémité sud du récif Polaris dans le bras de mer Koojesse, au nord-ouest de l'installation de réapprovisionnement en carburant d'Inuit Head et au sud du pont-jetée et de l'aire de stationnement existants. Il n'y a pas d'autres projets commerciaux ou résidentiels dans cette zone. Le Projet comprend un quai en eau profonde, une aire de dépôt des marchandises sur pont maritime et une rampe de débarquement pour les barges, un nouveau collecteur de carburant, une nouvelle route reliant Akilliq Road au DSP et de l'espace pour déménager les bureaux du site mobile qui sont maintenant sur la plage du pont maritime. Durant la construction, des masses rocheuses seront dynamitées afin de fournir des matériaux de remblayage pour l'aire de dépôts et de protection pour le littoral, des sédiments marins mous seront dragués et des sédiments seront immergés en mer de manière à pouvoir construire le quai sur un substratum rocheux solide. Six options ont été envisagées en ce qui a trait à l'emplacement du DSP. Le site actuel du projet est considéré comme étant le plus approprié en raison de la nature du sol, de son accès privilégié pour les navires, de ses conditions géotechniques et de sa capacité à accueillir un pont maritime et des livraisons de carburant de manière ininterrompue tout au long de la construction. Avantages pour les résidents d'Iqaluit Le DSP procurera des avantages importants à la communauté en améliorant la sécurité et l'efficacité des livraisons de carburant et destinées au pont maritime. Le DSP déménagera les activités du pont maritime à l'écart des replats de marée près de la ville et permettra de séparer les activités des navires industriels, notamment des remorqueurs et des barges, de celles impliquant des chasseurs, pêcheurs et autres usagers de bateaux de plaisance. Cela améliorera la sécurité des plaisanciers dans la baie. Le quai et la rampe nouvellement construits seront accessibles aux navires de charge de type ordinaire et aux barges allègues quel que soit le niveau de la marée. Les activités courantes à la plage du pont maritime sont limitées à quelques heures par jour lorsque la marée est haute. Le DSP fournira un accès 24 heures par jour aux transporteurs du pont maritime pour leur permettre de décharger leurs marchandises en tout temps. La superficie de la nouvelle aire de 4 hectares de dépôt destinée à la gestion des marchandises va presque doubler et les cargaisons n'auront plus à être manipulées deux fois puisqu'elles seront directement placées sur le quai à l'aide des grues des navires. Le DSP disposera aussi d'un nouveau collecteur de carburant qui éliminera le besoin de systématiquement recourir à des boyaux de carburant flottants. Ce nouvel équipement permettra d'atténuer les risques de déversement de carburant dans l'eau et assurera un réapprovisionnement plus sûr et plus efficace de ce combustible. Construction Le début des travaux de construction est prévu pour l'été 2018 avec la mise en place du premier pont maritime. Ils se poursuivront jusqu'en 2020. Ceux-ci se dérouleront principalement durant les mois où les activités maritimes battent leur plein. Le DSP sera prêt à fonctionner en 2021. L'eau potable, l'élimination des déchets solides et sanitaires de même que le carburant seront fournis par les services de la ville. Le diesel sera le principal carburant utilisé pour l'équipement maritime et terrestre. Le ravitaillement de l'équipement s'effectuera dans des zones désignées ou au moyen de conteneurs portables. La flotte maritime se ravitaillera en mer à partir de soutes à combustible. L'équipement de construction devrait comprendre des installations de forage, des excavatrices, des camions de transport de pierres, des camions à chargement frontal, des compacteurs, des bouteurs et des niveleuses, des grues, des chariots élévateurs et autres. Un derrick maritime, un chaland à clapets et à matériaux, des petites chaloupes et des bateaux remorqueurs seront aussi requis. Une trentaine de travailleurs seront mis à contribution dans le cadre de ces travaux de construction. Les travailleurs provenant de l'extérieur seront hébergés dans des établissements locaux. L'équipement de construction arrivera par le pont maritime. Les travailleurs et les matières consommables seront transportés sur des vols réguliers. Des avions nolisés seront utilisés au besoin. Un plan de gestion environnemental des travaux de construction (CEMP) fournira des mesures d'atténuation et de surveillance à respecter pendant la phase de construction du Projet. Opérations Des discussions sont engagées entre le ministère du Développement économique et des Transports, la mairesse et le conseil municipal concernant le fonctionnement et l'entretien du DSP. Celles-ci portent notamment sur l'utilisation potentielle de la rampe de mise à l'eau du DSP pour la navigation commerciale et de plaisance. Toute autre exploitation commerciale future du DSP devra faire l'objet d'une autorisation distincte. Le Projet ne concerne donc que les niveaux d'activité existants. Inuit Qaujimajatuqangit De l'information en concordance avec les connaissances traditionnelles des Inuits (Inuit Qaujimajatuqangit, IQ) a été recueillie sur les conditions du site local, l'exploitation des ressources fauniques, les itinéraires de voyage et l'accès à l'eau et aux surfaces glacées. Des membres de l'association des chasseurs et des trappeurs (HTA), des Anciens et un groupe de travail composé de plaisanciers ont fourni ces commentaires qui ont été pris en compte lors de l'élaboration et la planification des projets du DSP d'Iqaluit et du port pour petits bateaux (SCH). Programme d'engagement communautaire Une consultation se tient depuis 2015 auprès de membres de la communauté, incluant des chasseurs, pêcheurs et résidents, la mairesse et le conseil municipal, l'association des chasseurs et des trappeurs (HTA), la Qikiqtani Inuit Association, le groupe de travail composé de plaisanciers, des transporteurs de carburant et de ponts maritimes et d'autres intervenants. Des réunions, entrevues, ateliers et portes ouvertes se sont tenus dans le but de partager de l'information ainsi que d'entendre les préoccupations, suggestions et commentaires à l'égard du Projet. Ces échanges se sont faits en anglais et en inuktitut, de même qu'en français et en Inuinnaqtun écrits. Les propos échangés ont été pris en considération lors de la conception du DSP; de la construction, la planification et l'élaboration des plans de gestion. Cette consultation se poursuivra durant la phase de construction du Projet.

Inuktitut: ᐱᓕᕆᐊᑦᓴᐅᑉ ᓇᐃᓈᖅᓯᒪᓂᖓ ᓄᓇᕗᑦ ᒐᕙᒪᖓ (GN), ᓄᓇᓕᓐᓂ ᒐᕙᒪᒃᑯᓐᓂᓪᓗ ᐱᔨᑦᓯᕋᖅᑎᒃᑯᑦ (CGS) ᑭᒡᒐᖅᑐᐃᓪᓗᑎ ᐱᕙᓪᓕᐊᔪᓕᕆᔨᒃᑯᓐᓂ ᐃᖏᕐᕋᔪᓕᕆᔨᒃᑯᓐᓂᓪᓗ (EDT), ᐸᕐᓇᓯᒪᕗᑦ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᑦᓴᒥᑦ ᓴᓇᒍᒪᓪᓗᑎ (DSP) ᓄᓇᓕᐸᐅᔭᖓᓐᓂ ᐃᖃᓗᓐᓂ (ᐱᓕᕆᐊᑦᓴᖅ). ᑮᓇᐅᔭᑦ ᐊᑐᐃᓐᓇᐅᑎᑕᐅᔪᑦ ᐱᓕᕆᐊᑦᓴᒧᑦ ᑕᕝᕗᓇ ᓄᑖᒥ ᑲᓇᑕᓕᐅᕐᓂᕐᒧᑦ ᑮᓇᐅᔭᖅᑎᒍᑦ ᐊᒻᒪᓗ ᓄᓇᕗᑦ ᒐᕙᒪᒃᑯᖏᑎᒍᑦ. ᐱᓕᕆᐊᑦᓴᖅ ᐃᓂᖓ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᑦᓴᖅ ᑖᕙᓃᑦᑐᖅ ᐊᑭᑦᑎᐊᖓᓂ ᓂᒥᖅᐸᓯᐊᓂ ᐸᓕᐊᕆᔅ ᐃᒃᑲᕐᕆᖓᓂ ᑰᔨᔨ ᑲᖏᖅᑐᐊᓂ, ᐅᐊᓐᓇᑉᐸᓯᐊᓂ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᒥ ᐅᖅᓱᕐᕕᐅᔫᒥ ᐃᓄᐃᑦ ᓄᕗᐊᓂ ᐊᒻᒪ ᓂᒋᕝᕙᓯᐊᓂ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᒥ ᓄᕗᑯᑖᒥ ᓄᓇᓯᐅᑎᒃᑯᕕᒻᒥᓪᓗ. ᒫᓐᓇᐅᔪᖅ ᓇᒻᒥᓂᕆᔭᐅᔪᓂ ᐃᓪᓗᓂᓪᓘᓐᓃᑦ ᓴᓇᔪᒃᑲᖅᐸᓪᓕᐊᕐᒥᑦᑐᖅ ᑖᕙᓂ ᐃᓂᐅᔪᒥ. ᐱᓕᕆᐊᑦᓴᖅ ᐃᓚᖃᖅᑐᖅ ᐃᑎᔪᒥ ᑐᓚᑦᑕᕐᕕᑦᓴᒥ, ᐅᒥᐊᕐᔪᐊᒃᑯᑦ ᐅᓯᔭᐅᔪᓂ ᐃᓂᑦᓴᓇᔭᐅᓂᐊᖅᑐᒥ ᐊᒻᒪ ᐅᓯᑲᑦᑕᐅᑎᓄᑦ ᑐᓚᑦᑕᕐᕕᐅᒪᖅᑐᓂ, ᓄᑖᒥ ᐅᖅᓱᕐᕕᒻᒥᑦ, ᓄᑖᒥ ᐊᖅᑯᑎᒥ ᐊᑭᓪᓕᖅ ᐊᑐᓇᐊᕐᒪ ᑲᔪᓯᓂᐊᕐᒪᑦ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᒻᒧᑦ, ᐃᓂᑦᓴᖃᕐᒥᓗᓂᓗ ᐅᒥᐊᔪᐊᓕᕆᔨᒃᑯᑦ ᐊᓪᓚᕕᐅᖏᑦ ᓈᑕᐅᒪᑦᓴᐅᔪᑦ ᑕᐅᓇᓂ ᐅᒥᐊᔪᐊᒃᑯᑦ ᐅᓯᔭᐅᕙᓪᓕᐊᔪᓂ ᐃᓂᖃᖅᑐᑦ ᓯᔾᔭᒥ. ᓴᓪᓕᐊᓕᖅᑲᑕ, ᖁᖅᑎᑦᓯᖃᑦᑕᓛᖅᑐᑦ ᐅᔭᕋᕐᓂᒃ ᐃᓂᑦᓴᓕᐅᕈᒪᒍᑦ ᐅᓯᔭᐅᕙᓪᓕᐊᔪᑦ ᐃᓂᑦᓴᖏᓐᓄᑦ ᓯᔾᔭᕙᓗᓪᓗ ᓴᐳᔾᔨᒍᑕᐅᓂᐊᖅᑐᓂ, ᐊᕿᑦᑐᓂ ᑕᕆᐅᕐᒦᑦᑐᓂ ᐅᔭᕋᓂ ᖃᐃᖅᑭᖅᓴᐃᓗᑎ, ᐊᕿᓐᓂᖅᓴᐃᓪᓗ ᐲᔭᖅᑕᐅᓗᑎ ᑐᓚᑦᑕᕐᕕᑦ ᓯᑎᔪᒥ ᑐᙵᕕᖃᓕᖅᖢᑦ. ᐱᖓᓱᔪᖅᑐᓃᑦ ᓇᓂᕿᕈᑎᑦᓴᓂᑦ ᐃᓯᒪᖅᓴᖅᓯᐅᖅᑳᔪᑦ ᐃᓂᑦᓴᓇᓚᒐᖅᑕᖅᓯᓂ ᑖᓯᒫ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᑦᓴᒧᑦ. ᐱᓕᕆᐊᑦᓴᒧᑦ ᐃᓂᑦᓴᖅ ᓂᕈᐊᖅᑕᐅᔪᖅ ᐱᐅᓂᖅᐹᖑᓪᓗᓂ ᓄᓇᑦᓯᐊᓇᓂᖅᓴᐅᒐᓂ ᐅᒥᐊᔪᐊᓄᓪᓗ ᐅᐸᒪᑦᓴᐅᑦᓯᐊᕐᓂᖓᓄᑦ, ᐃᓂᑦᓴᐅᑦᓯᐊᕐᐊᐅᓂᖓᓄᑦ ᓄᓇᖓ, ᐅᒥᐊᔪᐊᒃᑯᑦ ᐅᓯᔭᐅᔪᑦ ᐅᖅᓱᐊᓗᑦᓴᓂᓪᓗ ᓂᐅᖃᐃᑉᓯᐊᕐᓯᐊᕐᕕᑖᓗᓂ ᐅᓚᕕᑕᐅᕐᒥᓪᓗ ᓴᓇᔭᐅᕙᓪᓕᐊᑎᓪᓗᒍ. ᐃᑲᔫᑎᖃᕐᓂᖓ ᐃᖃᓗᒻᒥᐅᓄᑦ ᐃᑎᔪᒥ ᑕᕆᐊᕐᒥ ᑐᓚᑦᑕᕐᕕᒃ ᐃᑲᔫᑎᖃᓪᓚᕆᓛᖅᑐᖅ ᓄᓇᓕᐸᐅᔭᕐᒧᑦ ᐊᑦᑕᕐᓇᙱᓐᓂᖅᓴᐅᓕᖅᑎᑦᓯᓗᓂ ᑲᔪᓯᑦᓯᐊᑎᑦᓯᓗᓂ ᐅᖅᓱᐊᓗᐃᑦ ᐱᖑᑎᓂᓪᓗ ᐅᓯᔭᐅᔪᑦ. ᐃᑎᔪᒥ ᑕᕆᐊᕐᒥ ᑐᓚᑦᑕᕐᕕᒃ ᐊᔭᐅᕐᓂᖅᓴᐅᓕᖅᑎᑦᓯᓛᖅᑐᖅ ᐅᒥᐊᔪᐊᒃᑯᑦ ᐅᓯᔭᐅᕙᓪᓕᐊᔪᓂ ᓯᔾᔭᒥ ᑐᓚᑦᑕᕐᕕᖓᓐᓂ ᐃᑎᔪᒥ ᑕᕆᐊᕐᒥ ᑐᓚᑦᑕᕐᕕᒃ ᐃᓂᑦᓴᖃᕐᒪᑦ ᐅᒥᐊᔪᐊᓄᑦ ᐅᓯᔭᐅᕙᓪᓕᐊᔪᓂ ᐊᓯᖏᓐᓂᓪᓗ ᐅᒥᐊᓄᑦ ᓯᓚᑦᑐᖅᓴᐅᑎᑦᓯᓗᓂ ᐊᓯᔾᔨᖅᑕᐅᓂᐊᖅᑐᖅ ᐅᒥᐊᔪᐊᓕᕆᔨᒃᑯᑦ ᐊᓪᓚᕕᖏᑦ.

ᐃᓂᑦᓴᖅ: ᑐᓚᑦᑕᕐᕕᒃ ᓴᓇᔭᐅᓂᐊᖅᑐᖅ ᐃᓂᑦᓴᖅ ᓂᕈᐊᖅᑕᐅᔪᖅ ᐱᐅᓂᖅᐹᖑᓪᓗᓂ.

ᐃᓂᑦᓴᓚᒃᑲᓐᓂᖅᑐᒥ ᑐᓚᑦᑕᕐᕕᖕᒥ ᓴᓇᔭᐅᓂᐊᖅᑐᖅ ᐱᒋᐊᕐᓗᓂ 2018-ᒥ ᓯᕗᓪᓕᖅᐹᒥᑦ ᐅᓯᔭᐅᔪᑦ ᐅᒥᐊᔪᐊᒃᑯᑦ ᑎᑭᐅᑎᔭᐅᓗᑎ ᑲᔪᓯᓐᓇᖅᖢᑎᒃ 2019-ᒥ ᐊᒻᒪ 2020-ᒥ. ᓴᓇᔪᓂᖅᓴᐅᓛᖅᑐᖅ ᓯᑯᓯᒪᙱᑎᓪᓗᒍ. ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᒃ ᐊᐅᓚᓂᖃᓛᖅᑐᖅ 2021-ᒥ. ᐃᒥᖅᑕᖅᑕᐅᓯᒪᔪᑦ ᐃᒥᑦ, ᓴᓂᑦ ᑮᓈᓗᐃᓪᓗ, ᐅᖅᓱᐊᓗᓪᓗ ᐱᔨᑦᓯᕋᖅᑕᐅᓛᖅᑐᑦ ᓄᓇᓕᐸᐅᔭᒃᑯᑦ ᐱᔨᑦᓯᕈᑎᒥᓐᓂᒃ. ᐅᖅᓱᐊᓗᒃ ᐊᑐᖅᑕᐅᓛᖅᑐᖅ ᑕᕆᐅᒥᑦᑐᓄᑦ ᓄᓇᒥᑦᑐᓄᓪᓗ ᐱᓇᓱᐊᕈᑎᓄᑦ ᐃᓚᒋᔭᐅᑎᑕᐅᓛᖅᑐᖅ. ᐱᓇᓱᐊᕈᑏᑦ ᐅᖅᓱᖅᑕᐅᑎᓪᓗᒋᑦ ᑕᓕᒫᓄᑦ ᐃᓂᖏᓐᓂᒃ ᐅᖅᓱᐃᕝᕕᒋᔭᐅᓛᖅᑐᑦ ᐅᓐᓂᐅᓐᓂᑦ ᐊᕐᕕᑐᐊᖅᑕᐅᓛᖅᑐᑦ.
ᐅᖅᓱᖅᑕᐅᑎᓪᓗᒋᑦ ᑕᓕᒫᓂᑦ ᐃᓂᖏᓐᓂᒃ ᐃᓂᑦᓴᒃᑕᐅᓛᖅᑐᑦ ᐅᓯᔭᐅᔪᓄᑦ ᐊᑐᐃᓐᓇᐅᑎᑦᓯᓂᖅ ᑯᐃᔭᐅᑎᒋᔭᐅᓗᑎ. ᑕᓇᐅᖅᓯᑦᑐᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐅᖅᓱᖅᓴᐃᓯᓂ. ᓴᓇᕈᑏᑦ ᐱᒍᑏᑦ ᑖᒃᑯᐊᖑᔪᖅᑐᑦ ᓂᐅᖅᑰᑏᑦ, ᐅᔭᕋᓐᓂᒃ ᐲᔭᐃᔪᑎᑦ, ᐅᔭᕋᓐᓂᒃ ᐅᓯᔪᓐᓇᖅᑐᑦ ᓄᓇᓯᐅᑎᓂ, ᐳᐊᕆᔭᐅᑎᓂ, ᓯᑎᓪᓕᓴᐅᑎᓂ, ᖃᐃᖅᑲᖅᓴᐅᑎᓂ, ᑭᕕᑦᔪᑎᓂ ᐊᒻᒪ ᐳᑐᓪᓗᓂ ᑭᕕᑦᔪᑎᓂ ᐊᓯᖏᓪᓗ ᐱᒍᑎᓂ. ᐃᒫᓂᑦᑐᓂ ᑭᕕᑦᔪᑎ, ᓯᐅᕋᒥ/ᐅᔭᕋᓂ ᐅᓯᑲᑦᑕᐅᑦ, ᐅᒥᐊᕋᐃᑦ ᐅᓯᑲᑦᑕᐅᑎᕋᐃᓪᓗ ᐊᑐᖅᑕᐅᒥᐊᖅᑲᐃᕐᒥᔪᑦ. 30-ᖏᓐᓂᐸᓗᑦᑐᓂ ᐃᖅᑲᓇᐃᔭᖅᑎᖃᓇᐊᖅᑲᐃᖅᑐᑦ ᓴᓇᔭᐅᕙᓪᓕᐊᓕᖅᑲᑦ. ᐃᖃᓗᒻᒥᐅᑕᐅᖏᑦᑐᑦ ᓂᐅᕈᐊᑦ ᐃᖅᑲᓇᐃᔭᓇᐊᖅᓯᒪᔪᑦ ᑐᔪᕐᒥᕕᓐᓂᑎᑕᐅᓛᖅᑐᑦ. ᓴᓇᔭᐅᓛᕐᓂᖓᓄᑦ ᐱᒍᑎᑦᓴᑦ ᐅᒥᐊᔪᐊᒃᑯᑦ ᑎᑭᑎᑕᐅᓛᖅᑐᑦ ᐃᖅᑲᓇᐃᔭᖅᑏᑦ ᐊᓯᖏᓪᓗ ᐱᒍᑎᖓᓚᐃᑦ ᖃᖓᑕᔫᒃᑯᑦ ᐃᓕᑉᐳᑦ ᑎᑭᑎᑦᓯᕙᓪᓗᑎᑦᑕᐅᖅ ᑕᐃᒪᐃᒻᒥᐊᖅᑲᑕ. ᓴᓇᔭᐅᓂᖓᓄᑦ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐊᐅᓚᑦᓯᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᒥ (ᓴᓇᔭᐅᓂᖓᓄᑦ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐊᐅᓚᑦᓯᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᒥ) ᐊᑦᓱᐊᓗᒃᑎᑦᓯᑦᑕᐃᓕᒪᒍᑕᐅᓛᖅᑐᖅ ᖃᐅᔨᓴᕐᑕᐅᑦᓯᐊᕐᓗᓂᓗ ᓴᓇᔭᐅᕙᓪᓕᐊᓂᖓᓄᑦ ᐱᓕᕆᐊᑦᓴᐅᔪᖅ. ᐊᐅᓚᔪᑎᑦ ᐅᖃᖃᑎᒌᖕᓂᖅᑐᑦ

ᑖᒃᑯᐊ ᐱᕙᓪᓕᐊᔪᓕᕆᔾᔪᑎᒃᑯᑦ ᐃᖅᑭᑦᑐᖁᓕᕆᔾᔪᑎᒃᑯᓪᓗ ᐊᒻᒪ ᓄᓇᓕᑉᐸᐅᔭᒃᑯᑦ ᒪᐃᔭᖓ ᑲᑎᒪᔨᖏᓪᓗ ᐱᔾᔪᑎᒋᓪᓗᒍ ᐊᐅᓚᓂᕆᔫᑉᑕᖓᑦ ᑲᒪᒋᔭᐅᓂᕆᔫᑉᑕᖓᓗ ᑖᒃᓯᒪ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᒃ. ᑕᒪᓐᓇ ᐃᓚᖅᑲᕐᒥᔪᑉ ᐊᑐᑉᑕᐅᑐᐃᓐᓇᕆᐊᖅᑳᓂᖓ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᒃ ᓂᐅᕖᑦᓯᖅᑳᑎᐅᔪᓄᑦ ᐅᒥᐊᑉᑐᑐᐃᓐᓇᕈᒪᔪᓄᓪᓗ. ᓯᕗᓂᑦᓯᒥᑦ ᓂᐅᕖᑦᓯᖅᑳᑏᑦ ᐱᕙᓪᓕᐊᑎᑦᓯᒍᒪᓂᖏᑦ ᑖᑦᓯᒥᖓ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᒻᒥᑦ ᐱᔪᓐᓇᐅᑎᖃᑉᑎᑕᐅᒐᔅᑐᑉ ᐃᓛᒃᑰᖓᔪᒥᒃ ᑕᐃᒪᐃᓐᓂᖓᓄᓪᓗ ᐱᓕᕆᐊᑦᓯᑉ ᐃᓱᒫᓗᑎᖃᑐᐃᓐᓇᑉᑐᑉ ᒫᓐᓇᐅᔪᑉ ᑭᓯᒨᑦ ᐊᑐᑉᑕᐅᒐᔭᕐᒪᖖᑉ. ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖃᖏᑦ (IQ) ᓄᐊᑕᐅᓯᒪᔪᑦ ᐃᓂᑦᓴᐅᑉ ᖃᓄᐃᓕᖓᓂᕆᔭᖓᓄᑦ, ᐊᖑᓇᓱᓐᓂᕆᔭᐅᔪᓄᑦ, ᐃᖅᑭᑫᕕᐅᖃᑦᑕᕐᓂᖓᓄᑦ ᐊᒻᒪ ᐃᒪᐅᑉ/ᓯᔫᑉ ᐊᑐᖅᑕᐅᓂᖓᓄᑦ ᐊᒻᒪ ᐃᓱᒪᒋᔭᐅᖃᓯᐅᔾᔭᐅᓯᒪᔪᖅ ᓴᓇᒪᓂᖓ ᐋᖅᑭᒋᐊᕿᓐᕐᒪᖕᒫᖅ ᐃᓂᑦᓴᐅᓪᓗ ᖃᓄᐃᓕᖓᓂᕙᑦᑕᖓ ᓄᐊᑕᐅᔪᔪᑦ ᓴᓇᒪᓂᖓᓄᑦ ᐸᕐᓇᕙᓪᓕᐊᑎᓪᓗᒥᓗ ᐃᖃᓗᓐᓂ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᑦᓴᒧᑦ ᐊᒻᒪ ᐅᒥᐊᕐᓄᑦ ᑐᓚᑦᑕᕐᕕᒃ ᐱᓕᕆᐊᑦᓴᓄᑦ ᑕᐃᑰᓇ ᐆᒪᔪᓐᓂᐊᖅᑎᒃᑯᑦ ᑲᑐᔾᔨᖃᑎᒌᒃᑯᕐᒥᑎᒍᑦ (HTA) ᑲᑎᒪᖅᑲᑎᒥᓪᓗᒥᑦ, ᐃᓐᓇᕐᓂᒃ ᐊᐱᖅᓱᖅᑐᑎᒃ, ᐊᒻᒪ ᐅᒥᐊᖅᑐᖅᑏᑦ ᐱᓕᕆᖃᑎᒌᑦᑐᓄᑦ ᑲᑐᔾᔨᖃᑎᒌᑎᒍᑦ. ᓄᓇᓕᐅᑉ ᐃᓚᐅᑎᑕᐅᓂᖓ ᐱᓕᕆᐊᕐᒍᔪᒪᔪᒧᑦ ᐅᖃᖅᑎᖅᑳᖅᓯᒪᔪᑦ ᓄᓇᓕᒻᒥᐅᓂᑦ, ᐃᓚᒥᓪᓗᒥᑦ ᐊᖑᓇᓱᑦᑏᑦ, ᐃᖃᓪᓕᐊᖅᑏᑦ, ᐃᖃᓗᒻᒥᐅᑦ, ᓄᓇᓕᑉᐸᐅᔭᒃᑯᑦ ᒪᐃᔭᖓ ᑲᑎᒪᔨᕐᒥᓪᓗ, ᐆᒪᔪᕐᓂᐊᖅᑎᒃᑯᑦ ᑲᑐᔾᔨᖃᑎᒌᒃᑯᕐᒥᑦ, ᕿᑭᖅᑕᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᒃᑯᕐᒥᑦ, ᐊᒻᒪ ᐅᒥᐊᖅᑐᖅᑏᑦ ᐱᓕᕆᖃᑎᒌᑦᑐᓄᑦ ᑲᑐᔾᔨᖃᑎᒌᑎᒍᑦ, ᐅᒥᐊᕐᔪᐊᒃᑯᑦ ᐅᓯᖃᑦᑕᖅᑐᖅ ᐅᖅᓱᐊᓗᓐᓂᓪᓗ ᐅᓯᖃᑦᑕᖅᑐᑦ, ᐊᓯᕐᒥᓪᓗ ᑕᐃᒪᙵᓂ ᐅᑐᐱᓇ 2015-ᒥᓂ. ᑲᑎᒪᓃᑦ, ᐊᐱᖅᓱᖅᓃᑦ, ᑐᑭᓯᒋᐊᖅᑎᑦᓯᓃᑦ ᐊᒻᒪ ᑐᙳᓴᐃᓃᑦ ᐊᑐᖅᑕᐅᔪᑦ ᑐᓴᐅᒪᑎᑦᓯᓂᕐᒧᑦ ᐅᖃᐅᓯᑦᓴᓂᓪᓗ ᓄᐊᑦᑎᓪᓗᑎ, ᐃᓱᒫᓘᑎᓂᓪᓗ ᖃᓄᐃᓕᐅᕆᐊᑭᑎᑦᓴᓂᓪᓗ ᐱᓕᕆᐊᑦᓴᒧᑦ ᖃᓪᓗᓈᑎᑐᑦ ᐃᓄᒃᑎᑐᓪᓗ, ᑎᑎᖅᑲᑎᒍᓪᓗ ᐅᐃᑬᑎᑐᑦ ᐊᒻᒪ ᐃᓄᐃᓐᓇᖅᑐᓐ. ᑐᓴᖅᑎᑕᐅᓂᕐᒥᑦ ᐃᓱᒪᒋᔭᐅᖃᓯᐅᔾᔭᐅᓚᐅᖅᑐᑦ ᓴᓇᒪᓂᖓᓄᑦ ᑖᑦᓯᒪ ᐃᑎᔪᒥ ᑕᕆᐅᕐᒥ ᑐᓚᑦᑕᕐᕕᑦᓴᒧᑦ, ᓴᓇᔭᐅᕙᓪᓕᐊᓂᖓᓄᑦ ᐸᕐᓇᐃᑎᓪᓗᒥᑦ, ᐋᖅᑭᑦᓱᐃᑎᓪᓗᒥᓪᓗ ᐊᐅᓚᑦᓯᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᑦᓴᖅᒥᓐᓂᒃ. ᐅᖃᖅᑲᑎᖃᐃᓐᓇᕐᓂᐊᖅᑐᑦ ᓴᓇᔭᐅᕙᓪᓕᐊᑎᓪᓗᒍ ᑖᓐᓇ ᐱᓕᕆᐊᑦᓴᖅ.

Personnel

Personnel on site: 30
Days on site: 350
Total Person days: 10500
Period of operation: from 2018-06-01 to 2118-06-01
Proposed term of operation: from 2018-06-01 to 2020-10-01

Activities

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Project Site	Dredging	Commissioners	Ocean	None	5km
Project Site	Offshore Infrastructure (port, break water, dock)	Commissioners	N/A	N/A	N/A
Project Site	Marine Based Activities	Commissioners	N/A	N/A	N/A
Project Site	Access Road	Commissioners	N/A	N/A	N/A

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Iqaluit		Amaruq Hunters and Trappers Association	2015-10-01
Iqaluit		Amaruq Hunters and Trappers Association	2016-06-16
Iqaluit		City of Iqaluit, Major Madeline Redfern, CAO Muhamud Hassan and HTO members	2016-06-16
Iqaluit		Environment and Climate Change Canada	2016-07-04
Iqaluit		Amaruq Hunters and Trappers Association	2016-09-20
Iqaluit		City of Iqaluit (Mayor and Council)	2016-09-27
Iqaluit		Amaruq Hunters and Trappers Association	2016-11-30
Iqaluit		Community Open House	2017-02-27
Iqaluit		Amaruq Hunters and Trappers Association	2017-03-02
Iqaluit		Baffin Fisheries	2017-03-03
Iqaluit		Amaruq Hunters and Trappers Association	2017-04-03
Iqaluit		City of Iqaluit (Chief Administrative Officer and Departments)	2016-09-20
Iqaluit		City of Iqaluit (Chief Administrative Officer and Departments)	2016-11-28
Iqaluit		City of Iqaluit (Chief Administrative Officer and Departments)	2017-03-02
Iqaluit		Baffin Region Chamber of Commerce and Iqaluit Chamber of Commerce	2016-11-30
Iqaluit		Arctic College Environmental Technology Program	2016-10-16
Iqaluit		Arctic College Environmental Technology Program	2016-10-19
Iqaluit		Arctic College Environmental Technology Program	2016-12-01
Iqaluit		Regulators - ongoing	2016-08-01
Iqaluit		Woodward, General Manager	2016-09-22
Iqaluit		Petronav, General Manager	2016-10-06
Iqaluit		Desgagnes / Nunavut Sealink and Supply (NSSI) General Manager	2016-10-07
Iqaluit		Nunavut Eastern Arctic Shipping (NEAS) General Manager	2016-10-07
Iqaluit		Woodward, General Manager	2016-10-16
Iqaluit		R.L. Hanson, General Manager	2016-12-01
Iqaluit		Nunavut Tunngavik Incorporated (NTI)	2017-01-12
Iqaluit		Transarctik / Desgagnes, Superintendent - Cargo and Navigation	2017-01-13
Iqaluit		Community Open House	2017-03-02
Iqaluit		Nunavut Tunngavik Incorporated	2017-03-03
Iqaluit		Qikitani Inuit Association	2017-03-03
Iqaluit		Nunavut Eastern Arctic Shipping	2017-03-20
Iqaluit		R.L. Hanson	2017-05-03
Iqaluit		Qiktani Inuit Association	2017-05-03
Iqaluit		Community Open House	2017-05-03
Iqaluit		Quark Expeditions, Product Director	2017-05-25

Authorizations

Indicate the areas in which the project is located

South Baffin

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Fisheries and Oceans Canada	Request for Review. An Authorization under the Fisheries Act may be required.	Not Yet Applied		
Transport Canada	Notice of Works/Approval	Not Yet Applied		
Government of Nunavut, Department of Culture, Language, Elders, and Youth	Class 2 Permit - Mitigation	Applied, Decision Pending	2017-03-31	
Indigenous and Northern Affairs Canada	Transfer of Federal Land (i.e. Transfer of Care and Control) - Seabed	Not Yet Applied		
Natural Resources Canada	Authorization of Explosives and/or Magazine License Application	Not Yet Applied		

Material Use

Equipment to be used (including drills, pumps, aircraft, vehicles, etc)

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Drills	2-3	5 tons	Quarrying
Excavators	5-6	30 to 40 ton	Quarrying, handling amour stone, excavating
Rock Trucks	3-4	35 ton articulating	Hauling quarried rock
Transport Trucks	1-2	Heavy duty (off road capable) tractor and trailer, 40 ton	Moving materials and equipment onsite and offsite
Front end loader	2-3	966 to 988, with various attachments (forks, buckets, etc.)	Loading rock and moving cargo/equipment
Compactor	1	20 ton	Compacting road surfacing
Dozer	1	D8, with ripper	Leveling placed rock and road surfaces
Grader	1	140	Road maintenance, final surface grading
Spud barge/derrick	1	20m x 50 m deck w/ 150t crane	Dredging, sheet pile installation, moving/lifting materials and equipment
Dump scows	2-3	500 cubic metre	Dredging and disposal at sea
Tugs	1-2	1,000 - 1,500 horsepower	Mobilization and floating equipment movement
Work boats	2-3	Varies, 50 to 500 horsepower	Floating equipment movement
Pickup truck	5	Crew cab, 3/4 ton	Crew and supplies movement
Mini-bus	1	15 passenger	Daily crew mobilization from hotel/accommodation to project site
Fuel/service truck	1	10 ton	Daily refueling and servicing of major mobile equipment, fueled from GN/PPD dispensers in Iqaluit
Water truck	1	10 ton	Construction and Miscellaneous water
Telehandler/forklift	1-2	5-10 ton	Moving materials and equipment
Rough terrain crane	1	40 ton	Lifting materials

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Diesel	fuel	1	5000000	5000000	Liters	Mobile equipment; remote generators and heaters
Gasoline	fuel	1	50000	50000	Liters	Small work boats, small generators and ATVs
Propane	fuel	20	110	2200	Lbs	Heaters
Lubricants and oils	hazardous	10	200	2000	Liters	Maintenance of mobile equipment
hazardous	hazardous	20	140	2800	Cubic ft	Welding and cutting of steel
hazardous	hazardous	25	1	25	Gallons	Painting wharf hardware and miscellaneous components
Explosives	hazardous	1	440925	440925	Lbs	Quarrying
Lubricants and oils	hazardous	10	20	200	Liters	Maintenance of mobile equipment

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
5	Truck delivery	Existing water supply infrastructure

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Offshore Infrastructure (port, break water, dock)	Combustible wastes	20 tons	City Landfill	N/A
Offshore Infrastructure (port, break water, dock)	Hazardous waste	2000 litres	Sealed drums or lined bags	Disposed of in accordance with regulatory procedures
Offshore Infrastructure (port, break water, dock)	Non-Combustible wastes	5 tons	City Landfill	N/A
Quarry/Borrow pit	Overburden (organic soil, waste material, tailings)	Negligible	On-site or City Landfill	N/A

Environmental Impacts:

Impacts have been identified, assessed and categorized as per NIRB requirements for the DSP and DAS Study Areas, including both construction and operation phases. Any new commercial use of the DSP will be addressed through separate permitting processes. Impacts during operations are assessed in comparison to existing conditions. Where there was an interaction between the construction activity and the environmental component, a potential environmental impact was identified, which were then assessed using the baseline data and information collected on the environmental components and experience, scientific literature and engineering documentation. Where an impact was identified, mitigation measures were determined. Mitigation measures can include avoidance, minimisation, restoration and offsetting. Mitigation measures were implemented through changes in engineering design, construction planning and additional specific measures.

Details Part 2

Project General Information

1.1.1 Project Overview A deep sea port development for Iqaluit has been envisioned since the 1970s, with several studies conducted in support of design for an improved facility in Iqaluit (Aarluk, 2005; LPS Avia, 2001; Public Works Canada Water Region, 1980; The Mariport Group Ltd., 2008, 2009; WorleyParsons, 2010). The Government of Nunavut (GN), through Economic Development and Transportation (EDT), is developing a new Deep Sea Port (DSP) on the western coastline of Koojesse Inlet (the Project). The construction of the project will be managed by Community and Government Services (CGS) on behalf of EDT. The Project is located approximately 750 m south of the existing causeway (known locally as the old causeway) and 350 m north of the existing fuel resupply manifold on Innuit Head (63.7219939°, -68.5205444°). The Project will improve the reliability, functionality and capacity of transport and the existing delivery of dry cargo and fuel supply. Further, by segregating small craft activities from sealift operations, the Project is expected to increase the efficiency and safety of sealift activities while also reducing its effect on other activities. A schematic design has been prepared to form the basis for this application. The design accounted for the site specific environmental conditions, distance from the existing sealift area, and existing marine uses. The permanent components of the Project include a deep sea wharf structure (fixed wharf), a wharf causeway, a sealift laydown area (laydown area), an auxiliary sealift ramp (sealift ramp) for occasional sealift lightering, a new fuel receiving manifold on the wharf structure, and a new access road segment connecting Akilliq Road to the DSP. The general layout of the DSP is presented in Figure 1 1. An overview of the Project including the DSP site within Koojesse Inlet as well as other main features of the area is presented in Figure 1 2. Construction is anticipated to be completed within three years from the planned start of construction in summer 2018, concluding in late fall 2020. The constriction phase of the project will be managed by CGS. The DSP is expected to be fully operable in 2021. During construction, the Project will use the existing scheduled sealift deliveries and scheduled flights, with the potential for use of charter flights when additional cargo capacity is required. Potable water, sanitary and solid waste disposal, and fuel supply are expected to be provided by the City. Approximately 30 workers will be required for construction. Non-local workers are expected to stay in local accommodations. Operation and maintenance of the Project will be the responsibility of EDT. The development of a Small Craft Harbour (SCH) at the municipal breakwater and improvements to the existing causeway are also planned. These are covered by a separate Nunavut Impact Review Board (NIRB) Screening application (NIRB, 2017a; NIRB File No. 17XN022). 1.1.2 Benefits to the City of Iqaluit, Residents, Businesses and Northerners As the capital city of Nunavut, Iqaluit is a transportation, resource distribution and service hub for the Territory and thus most Northerners depend on the efficient throughput of goods and services from here. Sealift delivery services are critical for the communities in Nunavut in the resupply of fuel, goods and materials. The DSP will improve the safety and efficiency of these activities, thus providing a significant benefit to the community. There is currently no accessible wharf for sealift ships to berth in Iqaluit. Due to the large tidal range in Iqaluit there are extensive tidal flats that make access to Iqaluit challenging. It is necessary, for ships to anchor at an exposed location offshore in the upper reaches of Frobisher Bay where the water is deep enough. The cargo is unloaded onto barges and moved by tug boats to land at the tidal flats at the head of Koojesse Inlet, beyond the municipal breakwater near to the airport runway (the Sealift Beach). Access is only possible around high tide. As a result, the unloading of cargo is a relatively slow and inefficient process, which has safety and environmental implications and risks damaging cargo due to operating around the rising and falling tide. Current sealift unloading is shown in Photo 1 1. The Project will relocate sealift activities away from the tidal flats segregating industrial marine activities from hunters, fishers, outfitters, and recreational boaters who are the primary users of this area. In limiting potential interactions between sealift barges and tugs and small craft vessels, the safety of marine users will be improved. The Project will also significantly improve access for dry cargo sealift activities through a combination of the deep sea wharf and sealift ramp that will provide all-tide access for general cargo vessels and lightering barges. Current activities at the Sealift Beach are limited to a few hours a day around high tide but the Project will provide 24 hour availability for sealift carriers to offload cargo, increasing throughput of cargo. The large 4 hectare (ha) laydown area will almost double the current laydown area available for managing cargo, while double-handling of cargo will be eliminated as cargo will be placed directly on the wharf using the vessel's cranes. The proposed design also includes a new fuel manifold that will eliminate the need to routinely use floating fuel hoses, thus reducing the risk of fuel spills into water, and allowing for safer and more efficient fuel transfer. 1.1.3 Project Alternatives 1.1.3.1 Location The City, with funding from EDT, through the GN, completed a Strategic Plan for the Iqaluit DSP Project in 2005 (Aarluk, 2005). EDT initiated a further more comprehensive study in 2010 (WorleyParsons, 2010) that included a review of several potential DSP sites to determine which was the most suitable. Parameters for the evaluation included: Vessel access and exposure. Upland access. Cargo handling efficiency. Disruptions to existing dry cargo and fuel handling infrastructure. Geotechnical considerations (based on the minimal information available at the time). The study considered six options along the western shoreline of Koojesse Inlet. The current layout, with the exception of the configuration of the laydown area, is based on the preferred layout from WorleyParsons (2010). During the schematic design of the Project, two alternates were reviewed for the laydown area as follows: 1. Primary laydown at the base of the wharf causeway with a secondary laydown area near Akilliq Road. 2. Consolidated laydown at the base of the wharf causeway. The consolidated laydown was selected as the preferred option as it will: a. Increase upland cargo handling efficiency by reducing cycle times for mobile equipment moving cargo onto and off the wharf. b. Reduce haul distances for cut-fill operations during construction. c. Be designed so as to not to interfere with the alignment of the existing fuel line. d. Reduce fill requirements and infilling of intertidal zones. e. Reduce overall Project footprint. 1.1.4 Project Schedule Design, consultation and permitting of the Project commenced in September 2016 with initial baseline studies for the environmental and geotechnical programs. Construction is expected to begin in the summer of 2018 with completion projected to be in the fall of 2020, for start of port operations in the summer of 2021, assuming all permits are in place. Table 1 1 outlines the anticipated schedule. As a construction contractor (the Contractor) will not be chosen until spring 2018, the exact methodology and timing of the construction works is subject to change. The expected sequence of the construction is provided based on experience with similar projects.

DFO Operational Statement (OS) Conformity

Transportation

The majority of the materials and equipment required for the construction of the Project will arrive on the annual sealift provided by Nunavut Eastern Arctic Shipping (NEAS) and Nunavut Sealink and Supply Inc. (NSSI). Dry sealift cargo is currently brought ashore by lightering barge and offloaded with front end loaders at the Sealift Beach at the north end of Koojesse Inlet. From the Sealift Beach, cargo will be transported to the DSP site along Akilliq Road. Properties along Akilliq Road are generally zoned industrial/commercial and this route does not pass through any significant residential areas. At the start of construction there will not be sufficient space at the DSP site for a contractor's yard (construction yard). Although exact details are not yet known as the Contractor has not been selected, it is anticipated that the Contractor will need to rent or arrange for the use of suitably zoned industrial property somewhere near the DSP along Akilliq Road. The Contractor will use the construction yard to store construction materials and equipment for the duration of the Project or until such time as there is sufficient space at the Project site. Figure 1 3 presents the existing Sealift Beach and the route along Akilliq Road to the DSP site. The Project will require marine based equipment to undertake dredging operations and wharf construction. The marine fleet will be towed from southern Canada at the start of construction (summer 2018), and towed back at the end of the marine works. Dredged material (up to 64,000 m3) will be transported to and disposed at an approved DAS site. Construction personnel and miscellaneous consumables will arrive in Iqaluit through the Iqaluit Airport (YFB). YFB is a significant hub in the Canadian Arctic with scheduled passenger and cargo flights to several southern airports. Given the volume of flights between Iqaluit and the south, it is not anticipated that the Project will have a significant impact on airport operations or flight availability. Similar to sealift cargo, cargo arriving by air will be transported along Akilliq Road to the DSP site or the construction yard (see Figure 1 3). Following completion of the Project, all sealift cargo arriving in Iqaluit will be offloaded at the newly constructed DSP with dry cargo stored in the laydown area. The dry cargo will then need to be transported to Iqaluit by truck.

Camp Site

Construction personnel are anticipated to be housed locally and will be shuttled to and from the DSP site using crew vans or busses on a daily basis.

Equipment

The list of anticipated construction equipment, including size and proposed use, required for the construction of the Project is provided in Table 1 3. Sample photos of key equipment are provided in Photo 1 2. Equipment for managing cargo at the DSP during operations will be provided by either the sealift carriers or a local operator. Environmental management associated with this equipment will also be the local operator's responsibility and is not covered within the Project.

Water

Water for construction use will be obtained from the existing water supply infrastructure in Iqaluit. It is anticipated that water will be delivered by the City trucked water service, local contracted water truck, or contractor's own water truck. There is no plan to draw water direct from surface water of groundwater. Estimated water use during construction is 5 m3 per day, for a total over construction of approximately 350 days, excluding water use by construction personnel while off-site (at hotel/accommodations in Iqaluit). Water is anticipated to be needed for the following uses: Dust control on the DSP site and site access   Drinking water and sanitary facilities Earthworks (for compaction if necessary) Equipment wash-down During operation of the DSP water requirements are expected to be similar to the water demand at the Sealift Beach, which is low. Water will be sourced for specific activities, including sealift, from the municipal supply by the operators of those activities.

Waste Water (Grey water, Sewage, Other)

Excluding wastewater generated by construction personnel while off-site (at hotel/accommodations in Iqaluit) construction will not produce significant waste water. Anticipated total wastewater production for the Project is expected to be approximately 1,800 m3, including both sewage (human waste) from on-site sanitary facilities and grey water (NPC, 2017a). Wastewater will be managed through holding tanks in the on-site sanitary facilities and lunch room and will be transported by either the City's sewage truck or the contractors own sewage truck and disposed of in the City's existing sewage lagoon. During operation of the DSP the only permanent infrastructure will be the mobile site offices that will be relocated from the Sealift Beach and therefore wastewater generation will be very low and similar to that at the Sealift Beach. Any wastewater generated will be managed in holding tanks and trucked to the municipal system.

Fuel

For the construction of the Project it is anticipated that the Contractor will use existing fuel infrastructure in Iqaluit for supply and storage. Fuel will be drawn from the City's fuel storage tanks on an as-needed basis using the Contractor's fuel truck. Refuelling of mobile equipment will take place in designated fuelling areas within the construction yard and laydown area, once constructed, or at the mobile equipment's location on the Project site. The marine fleet will be refuelled from bunker tanks on the marine derrick. If necessary during the course of construction, the bunker tanks will be refuelled using a floating hose from an onshore tanker truck at high tide. Propane fuel may also be necessary for portable heaters. Propane will be delivered on the annual sealift and stored in the construction yard, secured in metal cylinders racks in a designated storage area. Estimated fuel consumption for the construction of the Project is presented in Table 1 5. The DSP will be the main fuel handling facility for the annual sealift and will involve the construction of new fuel handling infrastructure. The new facility will include a fuel receipt manifold with pig receiver behind the fixed wharf. The manifold will be equipped with appropriate containment measures including drip trays at connection and sample points. A new fuel line running along the south side of the facility will connect the manifold to the existing fuel line that runs to Innuit Head. The new fuel line will be appropriately delineated and barricaded for protection from mobile equipment. Fuel operations at the DSP will not require the use of floating hoses as is required at the current manifold on Innuit Head. Tankers will berth at the wharf and use an overland hose between the vessel and the manifold. Fuel throughput will not change from current due to the construction of the DSP.

Chemicals and Hazardous Materials

Anticipated chemical or hazardous materials required for the construction of the DSP are presented in the Material Use section. During operation of the DSP, handling of chemicals and hazardous materials will be managed by one of the sealift carriers with support of a local operator as required. All Chemicals and Hazardous Materials storage at the DSP is expected to be temporary during cargo transfer with no permanent storage facilities within the laydown area. Operational management, including spill prevention and response for the DSP, will build on what is already in place for the Sealift Beach and the existing fuel resupply facility and will be defined within the Operational and Environmental Management Plan (OEMP) that is discussed in Section 7.4. It is understood that the Canadian Coast Guard (CCG) has spill response equipment at the Sealift Beach and similar equipment will be stored at the DSP. Sealift vessels and tankers using the DSP have Shipboard Oil Pollution Emergency Plans as per International Maritime Organization (IMO) requirements. A review of the Northwest Territories Hazardous Materials Spill Database, which also covers Nunavut, showed that there have only been two very small oil spills associated with these activities since the creation of the database; a 10 L fuel spill at Iqaluit beach in 2000 and 2 L of hydraulic oil at Iqaluit anchorage in 2006 (Northwest Territories, 2017).

Workforce and Human Resources/Socio-Economic Impacts

Approximately 30 workers will be required throughout construction. Approximately 350 work days are required to complete the Project. The workforce will be comprised of skilled and semi-skilled labour as follows: heavy equipment operators; crane operator; welder; marine deckhand; tug operator; mechanic; electrician; and general labourers. Work rotations are presently unknown and will be determined by the Contractor. Accommodations for non-local workers will be provided by existing hotel and short term apartment rentals during construction. A construction camp will not be required. During construction, the Project will utilize the existing scheduled sealift deliveries for mobilization of equipment and will use available flights to move the workforce to and from Iqaluit. The Project will comply with the newly revised GN's Nunavummi Nangminiqaqtunik Ikajuuti (NNI) Policy (April 1, 2017) (NNI, 2017) and aims to maximize participation of Inuit labour and Inuit owned businesses on the Project. The Project will also comply with all training requirements under the NNI Policy and offer necessary training to maximize Inuit participation in the Project. The Project has provided local Inuit with employment and training opportunities as wildlife monitors and field technicians since the initiation of the environmental baseline and geotechnical data collection in 2016. Further, the Project has provided presentations and field training opportunities on geotechnical drilling and engineering design to Arctic College Environmental Technology students. The Project anticipates that the community will see further economic benefits and training opportunities with the hiring of local labour. In addition, there will be secondary economic benefits for the local workforce through the Project's expenditures in the hotels and businesses.

Public Involvement/Traditional Knowledge

2.1 Objectives CGS and EDT have taken an integrated approach to consultation on the Iqaluit Marine Infrastructure Projects to ensure that development will serve the needs of the community including Nunavut Inuit, hunters, fishers, recreational users, residents, and cargo and fuel delivery vessels while staying within the allocated funding from the Governments of Canada and Nunavut. The integrated approach serves to solicit and consider feedback, recommendations and information from the community and businesses who utilize Iqaluit's marine infrastructure, including the municipal breakwater and causeway, and those that will depend on the DSP for timely, safe and effective delivery of goods. The Project's robust consultation program is based on the following objectives: Support the Project through planning and design to execution and construction. Identify all potentially affected and interested parties as early as possible. Identify project effects and mitigation measures, including input to Project design and management plan procedures. Integrate community values, interests and goals into engineering design of the marine infrastructure. Establish and maintain a positive relationship with Nunavut Inuit, residents, community groups, and others based on mutual respect. Ensure local knowledge and Inuit Qaujimajatuqangit (IQ) is considered and incorporated in Project design, assessment, and management planning. Provide timely and relevant information pertaining to the nature and scope of the Project, permitting process and engineering design. Provide meaningful opportunities for Nunavut Inuit, City Mayor and Council, community members and stakeholders to review the proposed Project, ask questions, and provide input into its planning and design. The design and implementation of the consultation program has also been guided by the following Inuit societal values (ISV) and principles of IQ as set out by the GN (Government of Nunavut, 2013a): Inuuqatigiitsiarniq (respecting others, relationships and caring for people). Tunnganarniq (fostering good spirit by being open, welcoming and inclusive). Pijitsirniq (serving and providing for family or community, or both). Aajiiqatigiinniq (decision making through discussion and consensus). Pilimmaksarniq or Pijariuqsarniq (development of skills through practice, effort and action). Piliriqatigiinniq or Ikajuqtigiinniq (working together for a common cause). Qanuqtuurniq (being innovative and resourceful). Avatittinnik Kamatsiarniq (respect and care for the land, animals and the environment). 2.2 Communities, Groups and Organizations The following community, groups, and organizations have been identified as potentially being affected by the Project: City of Iqaluit – Mayor and Council City of Iqaluit Departments – Planning and Development, Economic Development, Engineering and Sustainability, Public Works and Emergency Services Amaruq Hunters and Trappers Association (HTA) Residents of Iqaluit (general public) Local and regional businesses GN Departments – Culture and Heritage, PPD, Fire Marshal Dry cargo and fuel carriers – Woodward, Petronav, NEAS, Transarctik / Desgagnés, Nunavut Sealink and Supply, R.L. Hanson Baffinland Fisheries and Artic Fishery Alliance Outfitters 2.3 Regulatory Authorities, Boards and Inuit Association Consultation The Project team has engaged with relevant RAs) from the federal, territorial, and municipal governments; Inuit Boards; and the regional Inuit Association. Engagement with these organizations is essential for ensuring compliance with all relevant legislation, policies and procedures. The following agencies and boards have received Project overviews and updates since the Project received funding in September 2016: Nunavut Tunngavik Incorporated (NTI) City of Iqaluit Planning and Development Qikiqtani Inuit Association (QIA) GN Culture and Heritage NPC DFO NIRB INAC NWB ECCC Nunavut Research Institute (NRI) TC GN Department of Environment NRCan CCG 2.4 Overview of Consultation Program The consultation program was designed to ensure that hunters, fishers, residents, sealift and fuel carriers, and other community groups/organizations were consulted utilizing a variety of methods and materials. This included formal and informal meetings, semi-structured interviews, workshops, and public open houses. The materials used included presentations, pamphlets, community notices, non-technical project summaries, engineering design drawings and maps that were written in English and Inuktitut. Community notices were provided in English, Inuktitut, Inuinnaqtun and French. Table 2 1 outlines the key groups engaged as well as the method and dates of engagement. A detailed list of all consultation events and feedback received to date is provided in the DSP Marine Infrastructure Consultation Log (Advisian, 2017c), as summarized in Section 7.5. 2.5 Concerns Expressed in Consultation and Strategies to Address Table 2 2 provides a summary of the concerns expressed by the community during consultation to date and a summary of the strategies employed to address the topics raised during consultation. As mentioned above, a detailed list of all consultation events and feedback received to date is provided in the Iqaluit Marine Infrastructure Consultation Log (Advisian, 2017c), as summarized in Section 7.5. 2.6 Future Consultation CGS and EDT will continue to engage with the City leadership and administration, City Planning and Development, community members, QIA and HTA. Additionally, and as per the recommendation from QIA, CGS and EDT will engage with the CLARC, as required. CGS and EDT will provide Project updates to the City Mayor and Council and continue to build on the positive and constructive relationship they have built with the community. Specifically, CGS and EDT will continue to work with the community and engage with the City, QIA, HTA, cargo and fuel operators and residents on the following items, as required: Engineering design. Permits, approvals and licenses. Archaeology and cultural heritage sites. Construction schedule and sequencing of activities. Sealift operation and fuel delivery schedule. Blasting safety and Contractor community relations including a grievance process. GN's Petroleum Products Division regarding maintaining fuel line operation and safety during construction. Akilliq

Road and Causeway parking and access. Marine traffic and navigation. Contractor environmental and traffic management plans. Use of City's services. Employment and training opportunities. Operations and maintenance plan including maintenance of the ramps and facilities. Consultation will be ongoing throughout the life of the Project. Further consultation may be undertaken specific to the regulatory permitting processes. In particular, consultation may be required by TC under the NPA and with DFO, if a FAA and associated Habitat Offsetting are required. This consultation is expected to include QIA and HTA. Further, to facilitate mitigation of impacts to known archaeology sites, consultation with QIA and HTA will occur as directed by Culture and Heritage. This consultation is planned to occur over the summer of 2017. Once the tender process is initiated for construction and the Contractor is engaged to construct the DSP, engagement with the community, QIA, HTA, City, hospital, Royal Canadian Mounted Police (RCMP), CCG, outfitters, sealift operators and cruise ship operators will take place. This will include timing and methodology of construction activities and traffic management as well as emergency services and security of the construction site, equipment and material storage. Additionally, the Contractor will work with the community to maximize local labour force and business opportunities. 2.7 Traditional Knowledge Inuit traditional knowledge or (IQ has been an essential component in the Project's design, decision-making and environmental screening processes. To date, IQ has been shared with the Project team during: One Project meeting with the HTA in September 2016. One key elder meeting in November 2016. Two design workshops with the HTA in November 2016 and March 2017. Two meetings held with the boaters' working group (BWG) in April and May 2017. The BWG was formed to provide input on the SCH project. The first meeting in September 2016 concentrated on updating the HTA on the proposed SCH and DSP projects and on gaining an understanding from HTA members of land use in the development areas and current conditions and locations for accessing water and ice in Iqaluit. With the aid of an interpreter and maps/concept drawings, an open dialogue between HTA members and our team occurred during this meeting, allowing feedback and local knowledge from the most active users to be obtained. IQ information was noted and marked on maps during discussions on topics such as: wind direction and strength, seasonal changes to ice, water and ice access, and current boat traffic and ramp use. Design workshops conducted with the HTA (November 2016 and March 2017) and with the BWG (April 2017 and May 2017) focused more on obtaining feedback from hunters, fishers, outfitters, and recreational boaters on the conceptual designs for the SCH Project. However, feedback received during these meetings also contributed to the team's knowledge and understanding of sea and access conditions, harvesting areas, and the presence of marine mammals in and around the DSP site. This information was significant and considered in Project design and the development of mitigation measures. With the aid of an interpreter and maps/concept drawings, the collaborative workshops allowed HTA members and local boaters to share their ideas, needs, and concerns directly with the lead engineer and team members designing the DSP and SCH Projects. During discussions, IQ and local information were noted and marked on maps on topics such as: fishing areas, disposal at sea, water and ice access, use of the existing causeway, construction schedule, potential navigational hazards, and archaeological/cultural sites. In an effort to better understand the potential interactions between harvesting rights and Project activities, a meeting was also held with a key elder in November 2016 that identified harvest locations and access points in and around the Project site in relation to land use activities. The elder interviewed is recognized in the community as being especially knowledgeable about fish, marine mammals, and travel routes and is a current and active hunter. Harvesting and use locations were marked on a map and later digitized. The IQ findings are based on a small number of interviews and workshops and readily available literature, and are not intended to represent the full intensity and extent of Inuit use and occupancy in the area. However, considering the scope of the Project, and in understanding the potential effects due to the construction and operation of the proposed facility, the land use findings have been sufficient. IQ was integrated into the various disciplines' baseline studies where applicable and considered directly during the development of the concept design for the DSP and mitigation measures. Further detailed discussion concerning IQ can be found in the Terrestrial and Human Environment Baseline Report (Advisian, 2017g) and the Marine Baseline Report (Advisian, 2017b). Consultation with the QIA and HTA is on-going and will continue throughout the design and construction phases of the Project.

SECTION A: Roads/Trails: Project Information

SECTION A: Roads/Trails: All-Weather Road/Access Trail

An access road will be constructed to access the laydown area from the end of Akilliq Road. To reduce rock requirements, the southern third of the road will generally follow the topography of the area. The middle third of the road will require bridging of a small inlet using rock fill. Given the coarse nature of the rock fill, the inlet is still expected to drain to the ocean through the road fill. Specifics regarding drainage will be reviewed further during design development. The northern third of the road will require cutting a bench into the bedrock similar to the laydown area. The access road will be finished with a crushed granular road surfacing material and appropriate vehicle barricades.

SECTION D: Offshore Infrastructure: Facility

3.1.1.1 Site Selection The DSP is located on the western bank of Koojesse Inlet, approximately 750 m south of the existing causeway and 350 m north of the existing fuel resupply facility on Innuit Head. This location was identified by WorleyParsons (2010) as Option 4: South Polaris Reef as the preferred location because it provided a good balance between land and sea access and maintained the existing fuel infrastructure at Innuit Head. See Photo 3 1 for an annotated aerial photo of the DSP site. Additional photos of the DSP site are provided in Photo 3 2 and Photo 3 3. 3.1.1.2 Studies and Field Investigations The following previous studies and field investigations have been completed for a DSP in Iqaluit: Subsurface Investigation – Frobisher Bay Dock Study (Geocon Ltd., 1975) General Cargo Marine Terminal Frobisher Bay Northwest Territories (NWT) (1980) Strategic Plan for Iqaluit Deepwater Port Project (Aarluk, 2005) Final Report – Iqaluit Port Survey (Sub-bottom profiling),(Fugro Jacques Geosurvey Inc., 2010) Geotechnical Desk Study – Proposed Marine Development – Iqaluit (Stantec Consulting Ltd., 2010) Nearshore Fish & Fish Habitat Assessments Related to Marine Structure Development (Nunami Stantec, 2010) Iqaluit Port Development (WorleyParsons, 2010) Bathymetry and Topography as follows: Canadian Hydrographic Service (CHS) field sheets 1200542, 1200543, and 1200544 (Latest update 2004) Iqaluit Upland Baseplan (Provided by the City, August 28, 2009) Kudlik Construction supplemental survey, October/November 2009 Advisian has undertaken or is currently undertaking the following studies and field investigations in support of the design and permitting of the DSP: Geotechnical Investigations (completed): Geotechnical Field Investigation, including assessments for Acid Rock Drainage (ARD) and Metal Leaching (ML) potential within the quarry (Advisian, in Progress) Baseline Investigations (completed): Iqaluit Port Development – Fall 2015 Environmental Baseline Program – (WorleyParsons, 2015) Permit applications for 2016/2017 Baseline Studies 2016/2017 Baseline Studies and Assessments (2017b, 2017g) • Marine field studies including sediment quality, water quality, fish, fish habitat, and marine mammals • Vegetation • Wildlife and marine and migratory bird habitat assessment • Archaeology Sediment Sampling and Analysis Plan (Advisian, 2017h) Marine and Coastal Engineering (completed): Iqaluit – Marine Facilities Schematic Design – Iqaluit Marine Infrastructure Project (Advisian, 2017f) Marine field studies including metocean investigations (completed) Sediment plume modelling, in support of DAS permitting (Advisian, 2017d) 3.1.1.4 Facility Life Given the constant needs for resupply of dry cargo and fuel to Iqaluit by sealift, the DSP is expected to be a permanent facility in Iqaluit with a realistic lifespan of 100+ years. Individual components of the facilities will generally be designed on the basis of a 50 year service life, with the exception of the fender system which will be designed on the basis of a 25 year service life. Maintenance and renewal will be required to allow for the continued operation of the DSP over its lifespan.

SECTION D: Offshore Infrastructure: Facility Construction

The following section provides an overview of the design layout (see Figure 1 1), anticipated construction methodologies, and operations of the DSP components. The design and construction methods presented are commonly used and industry standard. No new technologies are involved. 3.1.2.1 Laydown Area and Sealift Ramp Layout A laydown area will be constructed near the fixed wharf for laydown of cargo after unloading from the vessel and room for storage and/or parking. The laydown area will be approximately 4 ha in size (compared to existing 2.5 ha at the Sealift Beach) and is expected to have a finished elevation of 13 m above Chart Datum (CD). The sealift ramp is conceptually set at 30 m wide such that if can accommodate two sealift barges simultaneously. Feedback from the carriers indicates that a ramp wider than 30 m is desirable; this will be reviewed further during the design development phase of the Project. Construction The laydown area and sealift ramp will be a rock cut-fill operation into the exposed bedrock shoreline onshore of the fixed wharf. Details of the drilling and blasting activities are provided in Section 3.1.2.6. Fill areas of the laydown area and the sealift ramp will be constructed largely from general fill material from the laydown area cut. The entire surface, including the laydown area and the sealift ramp will be finished with a crushed granular road surfacing. The size of the laydown area may be reduced or increased in size depending on the balance of rock cut and fill. As the fill areas are to be constructed with core material, they are expected to be relatively free draining and should not require specific drainage structures. Parts of the laydown area that are constructed over blasted bedrock will likely require drainage structures such as ditches. Specific drainage structures will be finalized during the design development phase of the Project to prevent pooling of surface water. 3.1.2.2 Fixed Wharf Layout The fixed wharf is located approximately 150 m seaward of the south end of the laydown area. The fixed wharf is designed to accommodate both the dry cargo and tanker sealift fleet throughout the entire tidal range. The proposed fixed wharf has the following configuration: Wharf Overall Length: 90 m Wharf Breasting Face Length: 70 m Water Depth Alongside: Minimum 9 m Top of deck elevation: 14 m CD Fenders will be provided along the face of the berth for berthing and mooring purposes. The typical vessel draft for the cargo and fuel resupply vessels is between 6 m and 8 m. Several dry cargo re-supply vessels, have listed drafts of greater than 8 m but typically, dry cargo vessels will be well under their fully loaded draft. A minimum depth alongside of 9 m has been chosen for the Schematic Design. Initial comments from Desgagnés have confirmed that a depth alongside of 9 m at low low water level (LLWL) is sufficient for the NSSI fleet to access throughout the tide cycle. The final elevation of the deck will consider the following criteria: Cargo handling limitations at loaded condition, low tide. The ship's crew may find it difficult to clear the edge of the deck with cargo using ship's gear. Wave exposure and acceptable overtopping criteria. Minor overtopping of the structure during certain tide and wave conditions may be acceptable and pose little risk to operations and safety. Much of the existing marine infrastructure in Iqaluit is built relatively close to high high water level (HHWL) and would likely become inundated during an extreme high tide. Base pressures on the foundation. Iqaluit has a significant tide range that requires a very tall wharf structure which will result in very high foundation pressures. Sea level rise; note that relative sea level rise for Iqaluit is expected to be negligible over the design life of the structure. Construction The wharf structure will consist of three 27.5 m diameter circular cells with intermediate arc cells. The construction of the fixed wharf will require the installation of approximately 700 flat web sheet piles. All pile driving is expected to be undertaken using hydraulic vibratory pile driving hammers over a period of approximately 45 days. Following the installation of the piles, the cells and an area approximately 36 m wide behind the fixed wharf will be backfilled with a coarse crushed general fill. The fixed wharf and back-up area behind it will be finished with a granular road surfacing. Typical wharf hardware including mooring bollards, ladders, fenders, and a bullrail, with a removable handrail, around the wharf will be provided. No allowance for a shore based access gangway has been allowed for. In general the design vessels are equipped with gangways located at the bridge or forward which should allow the gangways to land on the wharf deck under some tidal conditions. Two fixed navigation lights will be provided on the wharf, one on either end, to aid in navigation and berthing/deberthing activities. The wharf configuration may require relocating one or more existing navigation buoys near the new wharf location. This will be agreed with the CCG and TC once the exact location of the fixed wharf is finalized during the design development phase. 3.1.2.3 Wharf Causeway Layout The wharf causeway will provide vehicle access to and from the wharf as well as a utility corridor for the fuel line and other utilities. The roadway allowance is currently set at 9 m wide; this should provide sufficient clearance for two-way truck traffic but would only allow for single direction traffic of forklifts carrying containers. The wharf causeway will be widened to 36 m wide at the fixed wharf to provide a turning area for vehicles to support the sealift activities. Construction The wharf causeway core material will be general fill, sourced from the rock cut operation of the laydown area and will be finished with a crushed granular road surfacing. Open edges of the wharf causeway will be fitted with appropriate vehicle barricades. 3.1.2.4 Shore Moorings Layout Two shore moorings will be constructed for the head and stern lines of the sealift vessels. The north shore mooring is in the laydown area south of the sealift ramp. The south shore mooring is located on the north shore of Innuit Head. Shore moorings will be equipped with standing lines between the shore mooring and bollards on the fixed wharf such that lines do not need to be pulled all the way to shore for every vessel. The mooring on Innuit Head will be located at a sufficient height such that when a vessel is not at the fixed wharf, the standing line will be taught and out of the water. This will permit small craft to sail through the channel separating Innuit Head from Baffin Island during high tide. Construction The north shore mooring is expected to be a precast concrete or other gravity type structure embedded in the laydown area fill. The south shore mooring is located on Innuit Head which is generally exposed bedrock. As such, the south shore mooring is expected to be a rock anchored structure. 3.1.2.5 Slope and Scour Protection Slope protection will be provided along all exposed rock fill structures. Given that the core material for the rock structures is a run of quarry material, slope protection is large diameter riprap laid directly on the core material to protect the structure from wave and ice action. A larger riprap is envisioned for the south side of the fixed wharf and wharf causeway due to the greater southerly exposure. A granular scour protection mattress will be provided at the toe of the wharf to protect against scour and provide stability for the wharf structure. 3.1.2.6 Cut and Fill Activities The construction of the DSP will require the blasting of approximately 300,000 m3 of bedrock, over an area of approximately 3 ha. Blasting is necessary to produce the laydown area which is a large cut-fill operation as well as portions of the access road. Materials produced from those cut-fill operations will be used to produce the rock for construction of the DSP and the SCH Projects. The proposed cut area is limited to the laydown area and access road (Figure 1 1); the exact size and configuration of the area to be blasted may vary depending on final rock requirements. Planned cut and fill activities are as follows: Drilling and blasting. Sorting and stockpiling blasted rock to produce general fill and riprap. Crushing, screening and stockpiling of general fill to produce various crushed granular products. An assessment of ARD and ML was conducted on rock samples and a summary of results is presented in Section 4.1.2. 3.1.2.7 Dredging Preliminary geotechnical findings indicate that the DSP site will require dredging to remove a layer of weak overburden materials prior to installation of the wharf, to ensure base pressures under the wharf and overall stability of the wharf do not exceed the capacity of the seabed. Based on the geophysical surveys completed in 2010 (WorleyParsons, 2010), an initial allowance was made for a 5 m deep dredge under the fixed wharf for a total volume of approximately 64,000 m3. The dredging requirements, including lateral extent and depth, will be finalized during detailed design. As a Contractor for the works has not yet been selected, the exact dredging methodology is not finalized. Based on the volume of dredging required and the location of the work, it is expected that conventional mechanical equipment such as a clamshell bucket will be used. Material will be dredged from the seabed, raised to the surface and placed onto a split scow for DAS (see Section 3.1.2.7 for DAS logistical plans; see Section 4.1.9 for environmental summary). 3.1.2.10 Ancillary Services Fuel Receiving Infrastructure Fuel handling equipment will consist of a pipeline connected to the existing fuel line and running along the south side of the laydown area and wharf causeway; the fuel manifold will be located behind the fixed wharf area so as to not interfere with dry cargo operations. The pipeline and manifold will be isolated from mobile equipment traffic with appropriate fixed barriers. The Contractor will be required to drain the existing fuel line prior to undertaking blasting works for the laydown area due to the proximity of the fuel line. Electrical and Lighting Power will be provided for the following: General area lighting for the fixed wharf, laydown area, sealift ramp and the access road. Navigation lighting on the fixed wharf. Instrumentation and controls for fuel handling, if required. General power outlets. Office buildings. Depending on available funding, consideration will be given to providing for the following future power demands. Laydown area reefer plugs. Seawater pump. A seawater pump is currently not a part of the planned scope of work and will be considered under separate regulatory applications if it occurs. Dock Offices The existing sealift and security offices located at the Sealift Beach are proposed to be relocated to the laydown area for operations. Private operators (e.g. NEAS, NSSI) will be responsible for relocating their own offices, although a space within the laydown area will be designated for their use. A photo of the offices at the existing Sealift Beach is shown in Photo 3 4. 3.1.2.11 Materials and Quantities The construction of the DSP is expected to require the following main construction materials: Rock, produced from the laydown area and access road cuts: 400,000 m3. Steel sheet pile, 1,600 tonnes. Marine fenders, foam filled. Precast concrete mooring foundations. Standing mooring lines. Wharf hardware, including mooring bollards, ladders, fenders, and a bullrail with a removable handrail. Fuel line components including steel pipe, prefabricated steel pipe rack and manifold supports, precast concrete footings, valves, and fittings. Electrical components including cables, junction boxes and enclosures, wiring devices, lights and light poles.

SECTION D: Offshore Infrastructure: Facility Operation

The DSP will be operated during the open-water season, generally mid-July to mid-October, for the annual sealift of dry cargo and fuel. Typically, Iqaluit receives four vessels calls for fuel by one carrier (Woodward Oil) and 10 to 15 vessel calls for dry cargo by two carriers (NEAS and NSSI). The existing facilities at the Sealift Beach are not expected to be used for sealift activities following construction of the DSP. The existing fuel manifold on Innuit Head is expected to remain as a back-up to provide redundancy in the event of issues with the manifold at the DSP. Exact operations of the DSP will be defined by EDT as the owner. The following sections outline expected facility operations based on the current design and layout of the facility. An OEMP will be prepared and further information is provided in Section 7.4. 3.2.1 Vessels During operations, vessels calling at the DSP are expected to approach from the south and will berth portside under their own power alongside the fixed wharf. On departure, vessels will de-berth under their own power, turn seaward of the fixed wharf, and depart to the south. 3.2.2 Dry Cargo For vessels using the fixed wharf, dry cargo will be offloaded from the sealift vessels, using ships cranes, onto the wharf deck. Mobile equipment will be used to shuttle the cargo from the fixed wharf to the laydown area where it will be stored and prepared for distribution to end users in Iqaluit. Similarly, retrograde cargo will be delivered to the laydown area from the community and stored until ready to be shipped. Mobile equipment will move the cargo to the fixed wharf where it will be loaded onto the vessel with the ship's crane. Although Iqaluit does not currently have a mobile harbour crane, the design of the fixed wharf will include provisions for a mobile harbour crane to load/unload vessels should there be a need for this type of equipment in the future. The sealift ramp constructed near the fixed wharf will provide additional sealift capabilities when multiple vessels are in Iqaluit attempting to offload or load cargo. Due to the southern location of Iqaluit and its longer open-water season than the more northern communities, it is often the first and last stop for many sealift vessels serving multiple communities in a single voyage and may include vessel calls for retrograde cargo only. As a result, it receives a high number of vessel calls relative to the actual cargo delivered and there is a high possibility that cargo and/or tanker vessels will overlap. The sealift ramp will provide an alternative to the fixed wharf for unloading/loading sealift cargo. 3.2.3 Ancillary Services 3.2.3.1 Fuel The DSP will be equipped with a new fuel manifold and is intended to be the main facility for receiving the annual resupply of fuel. Shore based hoses, possibly mounted on wheeled trolleys, will be used to connect the manifold to the vessel. On completion of fuel transfer, the fuel hose between the vessel and the manifold will be drained, similar to current floating hose operations at Innuit Head. The existing fuel manifold at Innuit Head will remain in place for redundancy. 3.2.3.2 Fire Protection Fire protection for operations, supplied as part of the Project, will be provided by a series of discreet fire protection stations, including wheeled extinguishers, located throughout the DSP site and as approved by the territorial Fire Marshal and the City Fire Chief. 3.2.4 Maintenance Periodic inspections and maintenance of the facility will be required in order to achieve the specified design life. Anticipated maintenance may include the following: Regular comprehensive inspections, both above and below water. Replacement of anodes for corrosion resistance, if supplied. Regular re-grading and compaction of gravel driving surfaces, including the fixed wharf surfacing, laydown area, and approach roads. Occasional repair of riprap slopes from ice action. Annual repair of ramp surfaces. Clearing of boulders on tidal ramps. Replacement of fenders or fender components. Sounding surveys and/or sweeping to check for boulders where vessel underkeel clearance can be an issue at low tide. 3.2.5 Access Road access to the facility from land will be via Akilliq Road and the newly constructed access road. Marine access will be via the fixed wharf or the sealift ramp.

SECTION D: Offshore Infrastructure: Facility Vessel Use in Offshore Infrastructure

SECTION H: Marine Based Activities: Disposal at Sea

The main carriers have been contacted to discuss vessel handling at the proposed facility. Desgagnés Transarctik (vessel operator for NSSI) has suggested that the dock position relative to Polaris Reef will limit ship lengths to 160 m to 170 m length overall (LOA). With the exception of the ship Anna Desgagnés at 175 m, which is reaching the end of its economic life and is slated for replacement, all current sealift vessels operated by NEAS, NSSI, and Woodward Oil (contracted fuel carrier) fit within these suggested limits. Tanker sizes in the Canadian fleet tend to be limited by what is tradeable in the south, and generally vessels over 20,000 dead weight tons (dwt) are not. Thus the size of tankers is expected to remain as is, unless a charter vessel is brought in.

Description of Existing Environment: Physical Environment

4.1.1.1 Designated Areas No National Parks, National Wildlife Areas, or Migratory Bird Sanctuaries occur in or near the Study Areas (ECCC, 2016a); however, four Territorial Parks occur in proximity to Iqaluit and the DSP Study Area: Sylvia Grinnell, Quammaarviit, Katannilik, and Taqaiqsirvik Territorial Parks. Sylvia Grinnell Territorial Park (known as Iqaluit Kuunga in Inuktitut) is about 2 km from the DSP Study Area. This park protects low, rocky tundra and sedge meadow habitats along the river and heath tundra on nearby slopes. Quammaarviit Territorial Park is a tiny rocky island located just over one kilometer from the DSP Study Area in Peterhead Inlet. This park protects valuable archaeological artefacts and structures. Katannilik Territorial Park is located between the village of Kimmirut and the southern shore of Frobisher Bay, about 45 km southwest of the Study Area. In addition the Taqaiqsirvik Territorial Park campground is located near Kimmirut. The park is centred on the Soper Heritage River and protects distinct landscapes and vegetation communities (Nunavut Department of Environment, 2008). The DSP Study Area does not occur within any Important Bird Area (IBA, IBA Canada, 2016), Key Bird and Habitat Sites (Environment Canada, 2014; NPC, 2016b), or Ecologically or Biologically Significant Marine Areas (EBSA, Convention on Biological Diversity, 2017; DFO, 2011). Such areas do occur in the region but are >100 km from the DSP Study Area near the mouth of Frobisher Bay. The Meta Incognita Peninsula is a Wildlife Area of Special Interest, due to its importance as a nesting area for gyrfalcon and peregrine falcon (Nunami Stantec, 2012). It is 32,914 km2 in size and includes the Study Area and much of Frobisher Bay, Sylvia Grinnell Territorial Park, and Iqaluit. Figures showing the location of the designated areas described are provided within the Terrestrial and Human Environmental Baseline Report (Advisian, 2017g). 4.1.2 Geological Site Conditions The DSP Study Area is situated over the Pre-Cambrian rock of the Canadian Shield (Geological Survey of Canada, 2012), comprising granulite facies granitoids (de Kemp et al., 2006). Within Koojesse Inlet, the tidal flats were formed proglacially and the surface veneer is characterized by a mixture of fine silty sand with coarser sand and pebble clasts, with varying density and groupings of boulders (Hatcher et al., 2014). Within the intertidal area there are numerous cobbles and boulders on the ground surface, and zones of bedrock exposed at surface level also occur. The surface veneer is predominantly sand sized particles with shell fragments to gravel size with fine grained organic material also encountered. Ten shallow test pits ranging in depth from refusal to 0.40 m depth below ground surface were hand dug during October, 2016. Sand, sandy gravel and clayey silt was the predominant material encountered. The shoreline region is characterized by generally massive to blocky bedrock (Photo 3 2). Observations along this area of outcrop showed variable granitoid type rocks, predominantly feldspar and quartz rich. Variable textures within this outcropping bedrock occur, with some zones having more of a metamorphic or gneissic texture (foliation fabric) and other zones having a massive texture (interlocked crystals). Minor zones of shearing and mafic dykes associated with these zones were also observed. The cobbles, boulders and exposed bedrock had an estimated field strength ranging from mainly very strong to extremely strong. Small zones of estimated weaker strength rock were associated with minor zones of shearing, where weathering of the rock had occurred. The geotechnical investigation confirmed that there is no serpentinite, argillite, or soapstone (as per the definition of carving stone within the Nunavut Agreement). During consultation with the HTA it was confirmed that carving stone is not collected in the DSP Study Area and that the bedrock is granite, which is not typically used for carving and is abundant. As assessment of ARD and ML potential was conducted on rock samples representative of the major rock types identified within the proposed rock source area for the Project. Static ARD/ML testing results indicated low long-term potential for acid generation and metal release to rock materials from the proposed rock cut locations. Methods and results (include lab analysis) are provided within the Terrestrial and Human Environment Baseline Report (Advisian, 2017g). 4.1.3 Surface Features The surface features within the DSP Study Area are comprised of two prominent bedrock exposures that extend seaward from the shoreline, creating a small embayment (Photo 3 1). Within this embayment area, there are minor wave cut platforms with sloping cliff faces coincident with rock defects. The shoreline is characterized by whale-back outcrops, generally massive to blocky and inferred to be smoothed by glacial processes. Sub-vertical to vertical cliffs and ravines traverse the area associated with variations in the rock type and structural features. A review of aerial imagery identified dominant surface joint sets trending northeast/southwest and north northwest/south southeast, and some of these may have been exacerbated by freeze and thaw. From the shoreline the surface extends seaward across low gradient tidal flats towards the deeper channels of the inlet. Boulders and cobbles are present along the tidal flats and boulder movement studies have indicated that in a single ice season boulders with a diameter of 0.5 m were moved more than 30 m (Hatcher et al., 2014). Additionally, no significant erosion or deposition was observed by sidescan surveys within Koojesse Inlet (Hatcher et al., 2014). A review of available aerial imagery did not identify any evidence of thermokarsts or standing water in the proposed DSP Study Area. No features were observed in the ground surface that may be derived from ice lenses such as cracks. The DSP Study Area shows nothing that would be characterized as an esker or kame. 4.1.4 Ground Stability and Permafrost Iqaluit is in the Continuous Permafrost Zone; ground that remains at or below 0°C for at least two consecutive years (Tarnocai and Bockheim, 2011). The ground may consist of one or more of the following: soil, rock, ice or organic material. The permafrost of Baffin Island uplands has been estimated to be 400 to 700 m thick (Aarluk, 2012) with a surface active layer that can vary widely from less than 1 m in wet soils to greater than 5 m in rock outcrop. However, permafrost conditions in Iqaluit, such as ice-rich soils, are highly variable spatially and with depth (LeBlanc et al., 2015). A generalized map (that does not show localized changes in permafrost) doesn’t indicate any ice rich permafrost in the DSP Study Area (Government of Nunavut, 2013b). The shoreline and the rock cut areas are bedrock that are not affected by freezing temperatures. The geotechnical investigations undertaken in September and October, 2016 focused on soil conditions in the intertidal areas by hand digging shallow test pits on the tidal flats. Boreholes drilled for the SCH Project gave no indication of permafrost in boreholes drilled up to 10 m deep. Additional drilling and sampling was conducted recently in 2017 to evaluate soil and rock conditions. The results will be reported in the Geotechnical Site Investigation Report (Advisian, in Progress). 4.1.5 Hydrology The DSP Study Area is located within the Frobisher Bay Watershed. This watershed is located in the southeastern corner of Baffin Island and drains into Frobisher Bay. It lies between East Bluff (the southeastern extreme of Baffin Island on the Meta Incognita Peninsula), at the southern entrance to Frobisher Bay and an unnamed point on Hall Peninsula (at the northern entrance to Frobisher Bay) (NWB, 2014). There are no major freshwater waterbodies identified within or in the vicinity of the DSP Study Area. There are a number of small ponds occurring northwest of the DSP Study Area (Figure 4 1). Surface water drains into the marine environment within the DSP. 4.1.6 Air Quality To determine baseline air quality for the area, previous air quality monitoring data collected in the City was reviewed. Air quality was monitored between June 14 and September 22, 2014 to investigate potential environmental and public health risks associated with a landfill fire in Iqaluit (Health Canada, 2014). Particulate matter (PM2.5), ozone (O3), nitrogen dioxide (NO2), sulphur dioxide (SO2), carbon monoxide (CO), PM2.5-associated metals, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), dioxins/furans, and polychlorinated biphenyl (PCBs), were measured (Health Canada, 2014). Although health standards don’t apply to ambient air quality, these measurements can be compared to Nunavut air quality standards (Government of Nunavut, 2011). The concentrations measured by Health Canada were over different averaging period than those defined by Nunavut Air Quality Standards (Government of Nunavut, 2011). Therefore concentrations were compared to all averaging periods. Concentrations of PM2.5, O3, NO2, SO2, and CO were below any of the Nunavut air quality standards (Table 4 1) SO2 was at levels below the detection limit for the methods used. PM2.5 concentrations did peak for hourly concentrations to 85 µg/m3 but this was below levels observed for natural forest fires (e.g. 170 µg/m3) (Health Canada, 2014). 4.1.7 Noise Noise data specific to the DSP Study Area was not available. However, noise levels are presumed to be low as there are no major industrial operations near the DSP Study Area. Noise measurements at remote locations in Northern Canada carried out within baseline studies for various projects including Snap Lake (De Beers, 2002) and Diavik (Diavik, 1998) were reviewed. At Snap Lake, hourly equivalent sound level (Leq) was 29.9 dBA and noise level reported for the Diavik Project ranged from 25 to 40 dBA. As part of the baseline studies for the Baffinland Project Environmental Assessment, mean 24-hour Leq ranged from 24 to 30 dBA (RWDI Air Inc., 2008). These results are typical of remote areas with natural background noise such as wind. Near the DSP Study Area, noise would also be generated from the existing fuel resupply facility at Innuit Head and automobiles and ATVs/snowmobiles using the causeway. Therefore the background noise level in Iqaluit are expected to be at the upper end of the range (25 to 40 dBA) recorded for these other projects but is not expected to be higher for extended periods of time. The City also recently enacted Noise by-law #599 (City of Iqaluit, 2015b) that restricts construction activities overnight (11:00 pm to 7:00 am). The by-law does not include any restriction on noise levels. 4.1.8 Climate Conditions Iqaluit is located within the Northern Arctic Ecozone and is one of the coldest and driest landscapes in Canada (Ecological Stratification Working Group, (ESWG, 1995)). Climate is very cold and dry. Snow falls in all months of the year and persists on the ground for at least 10 months (September to June). Mean daily temperature is -9.3o C (Standard Deviation: ±3.7oC) over the year, but ranges from -26.9oC in January to 8.2o C in July (Government of Canada, 2016). Mean daily minimum and maximum temperatures in January are -30.9oC and -22.8oC respectively (Government of Canada, 2016). In July, mean daily minimum is 4.1oC and mean daily maximum is 12.3oC (Government of Canada, 2016). The freezing index for Iqaluit is approximately 6,500 degree days and the thawing index is approximately 1,000 degree days (Boyd, 1976). Average relative humidity is 76.7% and is slightly higher during the spring, summer, and fall (May to September) compared to the winter (December to February). Mean annual precipitation is 403.7 mm. Mean monthly precipitation ranges from 18.7 mm in February to 69.5 mm in August (Government of Canada, 2016). Precipitation mostly falls as snow (229.3 cm) with only 197.2 mm falling as rain (Government of Canada, 2016). On average, snow depth over the course of the year is 14 cm but ranges from 31 cm in April to being clear of snow during the summer (July to September) (Government of Canada, 2016). The nearest wind station to the DSP is the ECCC station at YFB (Climate ID 2402590) approximately 3.0 km northwest of the DSP site. During the open-water season, the most frequent winds are from the east-southeast through to south-southeast sectors (30.7% of the time), followed by winds from the northwest and north-northwest 25.0% of the time. The more severe storms (≥60 kph) come from both the northwest and southeast. Winds are calm (<10 kph) 40.9% of the time, during the open water season. The maximum recorded wind speed during the mid-July to mid-October season was 104.0 kph from the northwest. On average, the Project site has approximately 15 hours of light (including civil twilight) (National Research Council of Canada, 2017). The Project site experiences 24 hours of light from the end of May to the end of July (National Research Council of Canada, 2017). The least amount of sunlight occurs near the December solstice with approximately seven hours of light (National Research Council of Canada, 2017). 4.1.9 Marine Sediment and Water Quality Sediments nearshore are comprised predominantly of sands, giving way to silts and clays with increase in water depth and distance from shore. Sediments in the intertidal areas of the DSP Study Area consist of greater than 90% sand and gravel, decreasing to between 50% and 60% sand, with minimal gravel, in the subtidal areas. Sediments within the DAS Study Area consisted of predominantly silts and clays (~70%). Metal concentrations measured in sediments at the DAS Study Area and DSP Study Area are below Canadian Council of Ministers of the Environment (CCME) guidelines and DAS Regulations criteria (collectively referred to as Regulatory Guidelines). Elevated concentrations of arsenic, in comparison to CCME guidelines (CCME, 1999), are evident at the DAS Study Area. Due to the lack of anthropogenic influence at the DAS Study Area, these concentrations are believed to be natural, in line with other studies completed in the region (Baffinland Iron Mines Corporation, 2010 cited in Nunavut General Monitoring Plan (NGMP (2012)); Stewart and Lockhart, 2005; Wolfden Resources, 2006). PAH concentrations were below Regulatory Guidelines at both the DSP and DAS Study Areas. Water quality in Koojesse Inlet and Frobisher Bay appears to be typical of the region. The physicochemical properties of the water column are characterized as neutral pH, brackish, hard and clear (Advisian, 2017b; NGMP, 2012). In summer, nutrient concentrations tend to be higher in deeper water compared to the surface (Advisian, 2017b; Knight Piésold, 2010 cited in NGMP (2012)). Dissolved metal concentrations are generally comparable to total concentrations, indicating metals are not typically bound to solids. There are no apparent trends in metal concentration with depth or location. All metals were below respective long term CCME water quality guidelines for the protection of marine species (CCME, 1999). Detailed information regarding the sediment and water quality field surveys, including methods and laboratory analysis, is provided in the Marine Baseline Report (Advisian, 2017b). 4.1.10 Coastal Morphology and Bathymetry Exposed bedrock is present landward of the HHWL along the coastline of the DSP Study Area. The upland area has a maximum elevation of approximately 35 m and slopes downward at an average approximate slope of 25% to around elevation 4 m. The intertidal zone below elevation 4 m is gradually sloping at around 3% to 5% to create a tidal flat which extends 130 m to 150 m offshore of the high water mark HHWL. The tidal flat in the location of the proposed DSP site is generally exposed bedrock with areas of soft sediments with cobble/boulders. Offshore of elevation 0 m the seabed begins to slope more steeply at around 20 to 25%. Water sufficient for the design vessels is approximately 250 m offshore of the HHWL. Photos of the DSP site were presented in

Photo 3 2 and Photo 3 3. 4.1.11 Tides Tides in Frobisher Bay are semidiurnal, with two high and two low tides in a lunar day (24.84 hrs) (Hsiao, 1992). The spring and neap tidal ranges are 11.3 m and 7.8 m respectively (CHS, 2016). Typical currents in Koojesse Inlet are 1 m/s at the ocean surface, and decrease with depth (Hatcher et al., 2014). Drogued drifters were deployed in Koojesse Inlet in September 2016 to support hydrodynamic and sediment dispersion modelling (Advisian, 2017d). The results of this survey were consistent with the results of (Hatcher et al., 2014) for surface current speeds.

Description of Existing Environment: Biological Environment

4.2.1 Vegetation (Terrestrial) Most of Nunavut, including the DSP Study Area is located within the Tundra Biome and the Northern Arctic Ecozone (ESWG, 1995). The Northern Arctic Ecozone is among the largest Arctic ecosystems in the world and is divided into a number of ecoregions. The Project occurs within the Ecoregion 28 – Meta Incognita Peninsula. The dominant vegetation communities are herbaceous and lichen communities. Lichen communities are typical in rocky areas and occur within the DSP Study Area. Vegetative cover is greater on wetter and sheltered sites within the DSP Study Area and taller shrub species occur in warmer microsites with wet sites dominated by sedges and willow species. Approximately 200 species of flowering plants occur within Nunavut, north of the tree line (Aarluk, 2012). Vegetation field surveys were conducted from September 19 to 21, 2016. An ecological land classification (ELC) survey was completed to identify the vegetation communities in the terrestrial portion of the DSP Study Area. Field studies also included a species inventory and non-vascular plant assessment. During the ELC survey six vegetation communities were identified as follows: Upland Bedrock Outcrop – Shallow Soils (UB-SS) Upland Shoreline Cliff (USC) Upland Shoreline (US) Upland Dwarf Shrub (UDS) Wetland Dwarf Shrub (WDS) Disturbed (DIS) Vegetation communities in the DSP Study Area are characterized as a mosaic dominated by bedrock with interspersed vegetated areas (Photo 3 2). The bedrock areas are vegetated almost exclusively by non-vascular lichen species. Vascular plant species occur in sheltered breaks in the bedrock and flatter areas where soils have accumulated allowing for plant establishment. Soils are typically thin sands and gravels, with isolated areas with thicker deposits. During the field assessment a total of 108 vegetation species were observed, including eight shrub, four graminoid, 20 forb and 76 non-vascular species. The most common vascular species identified were black crowberry (Empetrum nigrum L. ssp. Nigrum), willow species, dwarf fireweed (Chamerion latifolium L) and moss campion (Silene acaulis [L.] Jacq.). Nine plants were identified as having traditional uses within the Iqaluit area by Inuit Field Technicians, however the DSP Study Area is not used for traditional purposes such as berry picking, or harvesting plant materials for medicinal purposes. 4.2.2 Wildlife (including Habitat and Migratory Patterns) The terrestrial portion of the DSP Study Area is natural and has some habitat value. In particular, the rocky outcrop and cliff areas provide cover and security habitat and the intertidal provides foraging opportunities. However, the majority of the terrain is comprised of bedrock; thus vegetation cover is sparse and low, reducing its attractiveness as forage or cover for species that depend on vegetation. The habitat assessment and field reconnaissance survey from September 19 to 21, 2016 resulted in no confirmed observations of wildlife in the DSP Study Area. However, several wildlife features were observed suggesting past use by terrestrial wildlife. A small burrow (<12 cm), was located at the base of a small cliff in the USC community. Given the size, it was suspected to belong to an ermine (Mustela erminea). A short distance away was a foot-hold trap anchored into rock. Although not actively set, Inuit Field Technicians explained that it was placed for fox. In the west end of the DSP Study Area was the UDS vegetation community that contained relatively deep, friable soil. Here a large den complex with multiple entrances and associated diggings was located. Given the size and characteristics, the den was suspected of belonging to a fox (Arctic fox: Alopex lagopus or red fox: Vulpes vulpes). Aside from the dens, numerous cast avian pellets were found in the DSP Study Area and animal remains were observed at the base of the USC community. Although remains were not identified to species level, it is likely they were lemmings (e.g. brown lemming: Lemnus trimucronatus or Perry land collared lemming: Dicrostonyx groenlandicus). Given the habitat available (primarily bedrock), Perry land collared lemmings are more likely to inhabit the DSP Study Area, as they are typically more abundant on dry rocky tundra versus brown lemmings, that tend to be more abundant on damp tundra dominated by grasses, sedges and mosses (Sale, 2006). Arctic hare (Lepis arctos) also has the potential to occur in the DSP Study Area as they commonly inhabit elevated, dry, and gravel slopes that support sparse but diverse vegetation communities (Parker, 1977). However, Arctic hare are typically found in willow-dominated communities where forage opportunities are present (Klein and Bay, 1994). The DSP Study Area is within the range of Arctic wolves (Canis lupus arctos). They have large home ranges, are wide-ranging, and follow migratory caribou (McLoughlin et al., 2004; Sale, 2006); consequently they are unlikely to occur in the DSP Study Area. 4.2.3 Migratory and Marine Birds (including Habitat and Migratory Patterns) 4.2.3.1 DSP Study Area Bird presence was sparse during the vegetation mapping and habitat assessment. The assessment occurred in late-September at a time when most birds have initiated migration (Cornell Lab of Ornithology, 2016b) so this was expected. Common ravens (Corvus corax) and unidentified gulls were observed during vegetation surveys. The USC community contained numerous instances of whitewash, abundant pellets and animal remains, suggesting the possibility of a falcon eyrie (Booms et al., 2008; White et al., 2002) or common raven roost (Boarman and Heinrich, 1999). IQ revealed that historically this area is used as common raven roost. Ravens and gulls are known to congregate in the vicinity of the landfill on Akilliq Road, located approximately 500 m north of the DSP Study Area. The area around Iqaluit has been identified as a Wildlife Area of Special interest for gyrfalcons (Falco rusticolus) and peregrine falcons (F. peregrinus). However, the presence of a raven colony in this area reduces the nesting potential for other bird species. Common ravens are known to gather in 'crowds' when feeding and to show interspecific aggression to other predatory birds (Boarman and Heinrich, 1999). Consequently, the cliff is likely to be unattractive for falcons. In addition to the raven roost, IQ interviews also revealed that snow buntings are known to inhabit the DSP Study Area in March and April. Habitat in the DSP Study Area is natural and holds some value for birds. The USC community likely holds the highest value in terms of habitat, evidenced by numerous pellets, whitewash, and animal remains. The remaining terrain is predominately comprised of bedrock, reducing its attractiveness as nesting and cover habitat for species that depend on vegetation. Fifty-five species have historical occurrences or ranges that overlap the DSP Study Area. Of those species, 14 have some potential to nest based on the available habitat. Another 10 species of birds could potentially nest, but the likelihood is considered low. Given the sparse vegetation and bedrock, species likely to nest within the DSP Study Area are those that nest on the ground with very little vegetation cover or on the cliff face. Consequently, the species likely to nest here include: common raven, horned lark (Eremophila alpestris), northern wheatear (Oenanthe oenanthes) and snow bunting (Plectrophenax nivalis). According to ECCC, the nesting season for Iqaluit (N10: Arctic Plains and Mountains, Bird Conservation Region 3) is between mid-May and mid-August (ECCC, 2016b). Thus, migratory birds will have migrated from the DSP Study Area outside this period. It should be noted that these are estimated dates and that the exact timing can vary according to the species, climate, elevation, habitat type, micro-sites or timing of spring (ECCC, 2016b). The timing could vary by up to ten days. In addition, there is a nest building phase which generally occurs two weeks prior (ECCC, 2016b). Although few birds were observed within the terrestrial portion of the DSP Study Area, several large congregations (each >500 individuals) of marine birds were observed approximately 1 km from shore in Koojesse Inlet. These birds were congregated around some rocky islands at low tide. Inuit field technicians informed the ecologist they were foraging on sculpin (Family: Cottoidea). It is clear this nearshore environment near the DSP Study area offers valuable foraging habitat. However, nesting habitat for these marine birds is largely unsuitable. Many marine birds nest in large colonies on remote, precipitous cliffs and remote islands that are inaccessible to predators (Cornell Lab of Ornithology, 2016a, 2016b). Although the majority of marine birds are unlikely to be breeding in the DSP Study Area, 21 species could potentially use inter-tidal and nearshore habitats for foraging (Advisian, 2017b). Given most marine birds are also migratory, it is expected many will only use this area for short periods of time to forage following breeding and on-route during migration. King eider (Somateria spectabilis), common eider (S.mollissima), long-tailed duck (Clangula hyemalis), and black guillemot (Cepphus grille) have potential to forage in nearshore environments over-winter. However, these species are dependent on ice-free areas to access food; thus occur at the floe-edge (Gilchrist and Robertson, 2000). Given that freeze-up near Iqaluit is generally complete by November and lasts until break-up initiates in June (Advisian, 2017b), the over-wintering species that forage in nearshore environments are unlikely to occur at this time in Koojesse Inlet. 4.2.3.2 DAS Study Area No marine bird surveys were conducted in the DAS Study Area. The DAS site is approximately 1.5 km from Cairn Island, the nearest possible nesting site (see Figure 3 1). The recommended setback distance from coastlines with known concentrations of nesting seabirds and waterfowl/seaducks is 1 km and 500 m respectively (Environment Canada, 2014). The importance of the DAS site as foraging habitat for marine birds is low. Depth during towed surveys was approximately 100 m. This is deeper than the maximum dive depth of some of the deepest diving marine birds (Cornell Lab of Ornithology, 2016a, e.g. long-tailed duck). Similarly, abundance, biomass, and species richness for prey species were lower than other surveyed sites. During the towed survey, visibility at the DAS site was poor due to a dense layer of flocculent algae, likely reducing the value of this area for pursuit divers. 4.2.4 Marine Fish Habitat (including Marine Vegetation) 4.2.4.1 DSP Study Area Intertidal surveys were conducted at low tide, and the subtidal seabed survey was conducted with a towed video camera. The details of survey methodology are provided in Advisian (2017b). The intertidal survey consisted of five perpendicular to shore transects conducted in the fall of 2015. The subtidal survey was conducted in the fall of 2015 and 2016 and consisted of eight transects which were parallel and perpendicular to shore. The substrates observed within the DSP Study Area were largely hard substrates (bedrock, boulder, cobble) in the intertidal, transitioning to soft substrates with scattered boulders in the subtidal zone. The area of bedrock was delineated during the Geotechnical Program that occurred in October 2015. A DSP habitat map (see Figure 4 2) has been prepared categorizing the area based on substrate and marine vegetation. Abundance and distribution of seaweed in the high to mid intertidal areas was low, which is characteristic of Arctic environments (Stephenson, 1954), due to the presence of ice, which continually scours the substrate during freeze-up, iced, and break-up periods. Typically, the ice scour also influences the shallow subtidal waters, where the daily tidal fluctuations will similarly scour the substrate. Two tide pools were observed within the DSP Study Area where biomass (not necessarily diversity) was higher than in the surrounding intertidal areas. Seaweed species observed included filamentous brown algae and rockweed (Fucus distichus). In the mid to low intertidal areas, substrate transitions to soft substrate (sand, mud) with scattered boulders and gravel. The presence of boulders decreases with water depth. In the lower intertidal, there is a noticeable increase in the density of rockweed (50 to 80%), with low densities of sugar wrack kelp (Saccharina latissima) and sieve kelp (Agarum clathratum. 5 to 10%) also observed. As observed from the towed video surveys, the subtidal substrate transitions to soft sediments (sand) with scattered and clustered boulders. Within the subtidal, these hard substrates were typically associated with moderate to abundant seaweed coverage (30 to 70%), which were primarily sugar wrack kelp, sieve kelp and ribbon kelp (Alaria marginata). The extent to which seaweeds provide three dimensional habitat for marine organisms has not been well studied in the Arctic, however, it is an established concept in temperate and tropical environments (Brown et al., 2011; Cristie et al., 2003; Warfe et al., 2008; Wikstrom and Kautsky, 2007). Włodarska-Kowalczuk et al. (2009) hypothesize that holdfasts of larger kelps provide refuge for organisms, such as amphipods, from ice scour events. It is likely that established seaweed beds are important for a variety of life stages of marine species occurring in the coastal waters of Koojesse Inlet, specifically as outlined in Section 4.2.5 for Arctic char (Salvelinus alpinus) and Arctic cod (Boreogadus saida), and for their prey. Furthermore, they are significant primary producers, and thus play an important role in a short open-water season (Glud et al., 2002). Seaweeds are not harvested by residents of Iqaluit, however Black et al. (2008) state that Arctic suction kelp is used as a general health remedy in a study that targeted medicinal plants with IQ. 4.2.4.2 DAS Study Area A seabed survey, which consisted of a single transect approximately 340 m in length through the DAS Study Area, was undertaken in September 2016 (Advisian, 2017b). Substrate characteristics within the DAS Study Area were soft sediments, which primarily consisted of silt. There was no seaweed observed or any other features which would provide structurally complex fish habitats. 4.2.5 Marine Fish (Including Migration/Spawning) 4.2.5.1 DSP Study Area The coastal marine environment fronting the DSP Study Area is being used by migratory species such as Arctic char and Arctic cod. Arctic char are an important subsistence and commercial fishery species in Nunavut, who have both a lacustrine and amphidromous life history. Arctic char live primarily in fresh water, and migrate to the ocean for a short summer migration (~20 to 45 days) (Bégout Anras et al., 1999; Klemetsen et al., 2003). Myers (1949) referred to this migration as amphidromous, as anadromous by definition refers to species who spend the majority of their lives in marine waters. For familiarity of terms, the term anadromous is used, while recognizing this important distinction. The primary purpose of the summer seaward migration is to increase energy reserves and during migration they may double their body mass (Jørgensen et al., 1997). It is generally accepted that Arctic char migrating through Koojesse Inlet are from the Sylvia Grinnell River (SGR) and potentially from the Armshow Rvier, where a research collaboration is underway between DFO and the HTA. The current program initiated in the open-water season of 2015 and is set conclude in 2019 (DFO, 2017). Spares et al. (2012) conducted an acoustic telemetry study in Frobisher Bay on Arctic char migrating from the SGR and Armshow River (24 km southwest of Iqaluit), which showed that Arctic char are migrating through the DSP Study Area. The eastward migration of the SGR fish stock is supported by the mark-recapture efforts of Vangerwen-Toyne et al. (2013). Spares et al. (2012) found that Arctic char spent the majority of time in less than 3 m of water and hypothesized this to be a strategy to optimize prey and temperature regimes. However, frequent diving behaviour into deeper waters (~10 m) also occurred, which was assumed to be motivated by food availability. Prey of Arctic char included fish (capelin, northern sand lance), crustaceans (mysids, amphipods, and decapods), polychaetes, and insects (Guiguer et al., 2002; Johnson, 1989; Moore and Moore, 1974; Rikardsen and Elliot, 2000). Spares et al. (2012) found that the most common prey for this species in Koojesse Inlet were amphipods. Amphipods were observed in the intertidal areas of the DSP Study Area during the 2015 Marine field survey, with higher densities noted in the tide pools. Arctic char spawn in freshwater in September and October over a gravel substrate, where eggs incubate under the ice for approximately six months, and spend their early life history in freshwater (DFO, 2014). The SGR is approximately 3 km west of Iqaluit. Based on research and IQ, the SGR Arctic char migration (Gallagher and Dick, 2010) and associated fishing (IQ workshop) begins in late June. Residents of the City fish for Arctic char along most available coastline areas, which include areas within the DSP Study Area (Figure 4 3). Seine nets are the preferred fishing gear along the coastline of the DSP Study Area (IQ Workshop: March 2017), however, along the east shore of Peterhead Inlet some angling may occur (Gallagher and Dick, 2010). It is thought that Arctic char can be caught in numerous locations along the coast, and the DSP Study Area is not being targeted as a high density area for Arctic char (IQ Workshop: March 2017). Spares et al. (2012) concluded that SGR Arctic char do not migrate far from their natal river. From other studies in Nunavut, Arctic char prefer migrating along coastlines as opposed to across water bodies (Moore et al., 2016; Moore, 1975), and are typically found within 30 km from natal rivers (Bégout Anras et al., 1999). The SGR fishery is co-managed by the HTA, the NWMB, Nunavut Tunngavik Inc., and DFO (Gallagher and Dick, 2010) and it is for recreational and subsistence purposes only. There are no exploratory commercial fisheries occurring at this time. The commercial fishery for Arctic char from the SGR has been closed since the late 1960s, with the current fishery being exclusive to subsistence and recreational fishing (DFO, 2013). Arctic char fisheries are managed on the assumption that each river system supports a discrete fish stock(Kristofferson et al., 1984). Research is underway to study the SGR stock through the DFO-HTA SGR collaboration. Arctic cod (Boreogadus saida) are a pelagic marine species that are believed to be the single most important species in the trophic link between plankton, marine birds and marine mammals in the Arctic ecosystem (Welch et al., 1992). This species is exclusively marine, and the extent of their migratory behaviours are not fully understood, with the exception of a pre-spawning late summer migration to coastal waters (FAO, 2017). They are known to be concentrated at floe edges prior to break-up (Bradstreet, 1982; Gradinger and Bluhm, 2004). The floe edge in Frobisher Bay is located at the Frobisher Bay polynya (> 180 km southeast of the DSP Study Area). Arctic cod have the potential to be using the coastal waters of the DSP Study Area during the open-water season; however, they are likely to be more transient in nature than Arctic char. A large school of Arctic cod was observed immediately northeast of the DSP Study Area during the 2015 Marine field survey (Advisian, 2017b) (see Figure 4 2). Arctic cod are harvested for subsistence purposes, although not to the same extent as Arctic char, and the degree of their importance is more variable between communities. This species is considered to be inferior to Arctic char as indicated by the following quote, "The cod's poor diet and high water content leads to poorer tasting meat and shorter preservation (Hurubise, 2016; p43, pers comm July 13 2015). While the primary effort for subsistence fishing targets Arctic char, Arctic cod are also harvested by Iqaluit residents. Fishing for Arctic cod begins following break-up. IQ has not yet identified any fishing outside of the summer months. For the most part, Arctic cod are harvested similarly to Arctic cod using gillnets. However, Arctic cod are targeted in specific locations, such as the stretch of water southeast of the DSP Study Area between Inuit Head and Long Island. Benthic species, such as the truncate soft shell clam (Mya truncata), have the potential to be present in the subtidal zone of the DSP Study Area. However, the substrate within the intertidal of the DSP Study Area would not support this species (hard substrate), and there were no observations of bivalves during the subtidal seabed survey. There is no commercial fishery for this species in Koojesse Inlet. The soft shell clam is likely harvested as a subsistence fishery in intertidal areas but not in the subtidal. 4.2.5.2 DAS Study Area During the towed camera survey at the DAS site macro fauna observed included brittle stars and occasionally feather stars. Generally, the most prevalent species phylum observed from benthic infauna surveys (grab samples) were polychaetes followed by molluscs. 4.2.6 Marine Mammals (Including Habitat and Migratory Patterns) Frobisher Bay is within the range of 12 species of marine mammals, as listed in Table 4 2. The temporal presence in the Arctic is also presented in Table 4 2. An Arctic Resident is a species that resides in the Arctic year-round, however may migrate or disperse within Arctic waters; a seasonal visitor predictably resides within the Arctic region for a portion of the year, most typically during the open-water season; while an occasional visitor has a northern limit of the species distribution overlapping with the Arctic, but usually occupies other ecological habitats. These species are rarely encountered in the Arctic. The scientific literature, including the results of previous IQ studies provides information on marine mammals over the larger area of Frobisher Bay. For the purposes of this Project, the limits of Frobisher Bay were considered to be at the floe edge of the Frobisher Bay polynya near the Countess of Warwick Island. This boundary is in excess of 180 km southeast of Iqaluit. The frequency has been estimated and presented in Table 4 2. Further details can be found in the Marine Baseline Report (Advisian, 2017b). There is limited information to specifically target the presence of these marine mammal species in Koojesse Inlet, and therefore in the DSP Study Area. However, personal communications with several HTA members provided the following site specific details in April 2017 for occurrences of marine mammals in Koojesse Inlet. Harp seals and ringed seals are known to occur in Koojesse Inlet. While beluga whales are rarely observed (perhaps once a season), they can be seen in Koojesse Inlet if chasing prey (e.g. Arctic cod) or being chased by predators (e.g. killer whales). Killer whales are rarely observed in Koojesse Inlet, so Koojesse Inlet is possibly a predator refuge for the prey species. Narwhal while not historically abundant in Koojesse Inlet are becoming more common, thus this species is potentially adapting its biogeographic range in this area. Bowhead whales do not occur in Koojesse Inlet as the waters are considered too shallow, however they are known to migrate into Frobisher Bay during the open-water season (Nielson et al., 2015). Walrus are also considered to be a very rare occurrence in Koojesse Inlet. For species with sufficient information, an estimated rating for the frequency of occurrence in Koojesse Inlet is presented in Table 4 2. A frequency rating of 1 is regularly and predictably present, 2 is likely to be present but the frequency is not predictable, 3 is occasionally present, and 4 is rarely observed. Justification for the frequency categories is also provided under supporting information. The time of year that a species could occur in the DSP Study Area is also provided in Table 4 2. With the exception of two pinniped species (ringed and bearded seals) which, based on their life histories, could be present year-round. Other marine mammal species could be present during the open-water season. 4.2.7 Species at Risk A summary of the vegetation, wildlife, marine and migratory birds and marine mammals that are designated under the International Union for Conservation of Nature (IUCN), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species at Risk Act (SARA) are listed in Table 4 3. Probability of occurrence within the DSP or DAS Study Areas is also presented. 4.2.7.1 Vegetation There are two rare plant species – including one vascular (i.e., trees, shrubs, herbs and graminoids) species and one non-vascular plant (i.e., moss, liverworts and lichens) species – with potential to occur in the terrestrial portion of the DSP Study Area (Species at Risk Public Registry, 2016) as follows: Porsild's Bryum (Haplodontium macrocarpum), which was listed as Threatened under COSEWIC and Schedule 1 under SARA. Blanket-leaved willow (Salix silicicola Raup), which was listed as Special Concern under COSEWIC, Schedule 1 under SARA (Species at Risk Public Registry, 2016). No occurrences of either species were observed during the field visit. There was no suitable habitat for these species identified within the terrestrial portion of the DSP Study Area (Advisian, 2017g). 4.2.7.2 Wildlife Barren-ground caribou (Rangifer tarandus groenlandicus), polar bear (Ursus maritimus), and wolverine (Gulo gulo) are all species at risk. Each of these species either has a range that overlaps with or has historical occurrences near the DSP Study Area. Barren-ground caribou are listed by COSEWIC as Threatened, but not yet listed under SARA (Species at Risk Public Registry, 2016). Polar bears and wolverines are listed by COSEWIC as Special Concern and are listed on Schedule 1 under SARA (Species at Risk Public Registry, 2016). Given polar bears and wolverines are listed as Special Concern and barren-ground caribou have not yet been placed on Schedule 1 of the SARA, critical habitat has not yet been identified for these species. Larger species are unlikely to occupy the DSP Study Area. Barren-ground caribou have traditionally been observed near Iqaluit (Priest and Usher, 2004) but in recent years have declined (Jenkins et al., 2012). Given that caribou have been absent from the Iqaluit area since the 1990's and are unlikely to be migrating through the area, the likelihood of caribou occurring in the DSP Study Area is very low. Although polar bears have been observed in Iqaluit as recently as summers 2015 and 2016 (CBC, 2015a, 2015c, 2015d, 2016), polar bear sightings appear to be infrequent, if not rare. Polar bears spend the majority of their time on sea-ice hunting ringed seals (Pusa hispida). During winter, female polar bears excavate maternal dens in snow-drifts in coastal areas. Important polar bear denning habitat is located at the mouth of Frobisher Bay (NPC, 2016a) over 100 km from the DSP Study Area. Polar bear occurrence in the DSP Study Area during summer will likely depend on the availability of food resources, including the management of waste. Wolverine is a wide-ranging species that occurs at low densities (COSEWIC, 2003; Sale, 2006). Generally nomadic, this species covers large ground as it searches for food. In the Arctic, wolverines occur in a variety of tundra communities. Habitat is likely determined more by prey availability (e.g. rodents, hare, and ungulate carcasses) rather than vegetation (COSEWIC, 2003). Maternity dens usually occur under snow-covered rocks such as talus boulders and along eskers, caves, or snow tunnels (COSEWIC, 2003; Sale, 2006). Generally, these reproductive dens are isolated. As such, although wolverines have potential to occur within the DSP Study Area (albeit very low), they likely only wander through and are unlikely to construct maternal dens given the proximity of the Project to Iqaluit and human activity. 4.2.7.3 Migratory and Marine Birds Two avian species at risk have potential to occur within the DSP Study Area: harlequin duck (Histrionicus histionicus) and peregrine falcon. Harlequin duck may also occur in the DAS Study Area. Both harlequin ducks and peregrine falcons are Species listed by COSEWIC (2016) as Special Concern and listed under Schedule 1 of SARA (Species at Risk Public Registry, 2016). Given these species are currently listed as Special Concern, critical habitat has not yet been identified. Harlequin ducks breed in shallow, fast-flowing streams and rivers that have large concentrations of aquatic prey and adjacent shelter for nesting (Robertson and Goudie, 1999). Nests are typically located on the ground near water on stream islands, 100 m from river edges, and up to 30- 40 m above water at the mouths of gorges and ravines (Robertson and Goudie, 1999). This type of habitat does not exist in proximity to the DSP Study Area. Moreover, the mouth of the nearest river (Sylvia Grinnell River) is approximately 3 km away. Consequently, the likelihood of this species occupying the DSP Study Area during the summer breeding season is low. Although considered a species at risk, peregrine falcons have shown continuing recovery of their population since the 1970's and are near historical numbers (COSEWIC, 2007). Habitat capable of supporting this species (cliffs with open gulfs of air) occurs within the DSP Study Area. Although the USC community near the proposed cut and fill area supports an apparent common raven roost, it is possible this habitat could support a nesting peregrine falcon. Peregrine falcons will also nest on artificial buildings and nest boxes (COSEWIC, 2007); thus this species could nest on DSP infrastructure if sufficient nesting platforms are available. Peregrine falcons have adapted to urban environments and rarely experience enough disturbances to cause breeding failure (COSEWIC, 2007). However, nest disturbance has been reported during construction and maintenance activities and excessive visitation (COSEWIC, 2007). 4.2.7.4 Marine Mammals None of the identified marine mammal species are currently listed under SARA. However, the conservation statuses designated by COSEWIC and the IUCN are provided in Table 4 3.

Description of Existing Environment: Socio-economic Environment

The proposed Project is located on land situated on Koojesse Inlet in Frobisher Bay at the south end of Polaris Reef within the municipality of Iqaluit. Iqaluit became a city in 2001 following the establishment of Nunavut as a Territory. The nearest other communities with a population greater than 1,000 people are Cape Dorset approximately 395 km to the northwest and Pangnirtung approximately 300 km to the northeast. These communities are linked by air or sea travel only. There are no commercial or residential developments within the DSP Study Area. 4.3.1 Archaeological and Cultural Historic Sites A desktop review of archaeological resources and available IQ was completed with the goal of determining archaeological resource potential of the DSP Study Area. A Nunavut Archaeological Site Data Licence Request was submitted on September 26, 2016 for archaeological data from Culture and Heritage for information on previously recorded sites within 10 km of the Project. Available relevant archaeological reports and studies and published academic articles were also reviewed. The data collected during the desktop review and literature review was used to inform the field studies completed for the Project. The AIA for the Project was conducted between September 28 and October 1, 2016 under Nunavut Archaeology Class II Permit 2016-038A. The field survey included all the lands that may be impacted onshore and resulted in 12 sites being recorded. These include three stone features sites, (KkDn-44, -45 and -52) with multiple features (including stone circles, caches, and cairns), four stone cache sites (KkDn-46, -47, -48 and -49), two stone circle sites (KkDn-51 and -53), one lithic scatter (KkDn-50), and two modern land use sites. All fieldwork was completed by professional archaeologists with assistance from three Iqaluit community members. The results of the Archaeology program are being discussed with the Culture and Heritage and a mitigation plan will be formulated. The mitigation plan will be for sites KkDn-44, 45, 46, 47, 48, 52 and 53 as sites KkDn-50 and 51 fall outside the Project footprint, and the Project footprint was modified to avoid KkDn-49. A review of the database of significant palaeontological sites maintained by the Canadian Museum of Nature on behalf of the Territory of Nunavut did not reveal any previously identified palaeontological sites within the DSP Study Area. Based on a review of the geology of the Project site, impacts to significant unrecorded paleontological sites are not anticipated. 4.3.2 Population, Education and Employment According to the 2016 Census, the population of Iqaluit is 7,740, which represents an increase of 15.5% from 2011 (Statistics Canada, 2017). Compared to the territorial average of 12.7% and the national average of 5.0%, this indicates that the City is growing quickly (Statistics Canada, 2017). According to 2011 census data, the total aboriginal population was 4,110 individuals, including 3,895 Inuit or 58.1% of the City's population (Statistics Canada, 2012). The Inuit population of Iqaluit is characterized by a younger population than the average across Canada, but is comparable to remote communities across North Baffin. According to the 2011 National Housing Survey, of the total population 15 years and over, 17.0% were high school graduates (or equivalents); 6.9% held apprenticeship or trades certificates; and 20.4% had graduated from a University with a bachelor level degree or higher (Statistics Canada, 2013). According to 2011 Census data, the unemployment rate in Iqaluit was 9.2% and participation was 78.7% (Statistics Canada, 2012). These rates were not disaggregated further by cultural groups. However, according to Statistics Canada 's 2015 Annual Labour Force Update, Inuit were less likely than non-Inuit to be in the labour force, with an employment rate of 44.9% for Inuit compared to 86.0% for non-Inuit (Statistics Canada, 2016). Iqaluit enjoys a fairly diverse economy. As the government centre and territorial capital of Nunavut, government is the dominant employer and public administration jobs occupy 43.5% of the workforce in Iqaluit (Statistics Canada, 2013). The traditional subsistence economy remains important in Iqaluit, albeit less so when compared to the smaller, more northern communities on Baffin Island (Baffinland Iron Mines Corporation, 2012). Many households still engage in subsistence activities at least part time (City of Iqaluit, 2015a). A more thorough discussion of population, education, and employment is provided in Advisian (2017g). 4.3.3 Land and Resource Use 4.3.3.1 Harvesting Land use information in and around the DSP Study Area obtained during the HTA design workshops and discussions with local hunters has been provided in Figure 4 3. Traditional subsistence activities such as hunting, fishing, trapping and gathering remain important in Iqaluit. However, information obtained from the HTA indicated that subsistence harvesting occurring within the City is limited and mainly involves fishing along the shoreline (Figure 4 3). Arctic char is an important species for subsistence and commercial fishing in Iqaluit. The HTA stated that typically hunters do not harvest bivalves in Koojesse Inlet because they are concerned about contamination from the wastewater treatment plant discharge and it would be a rare occurrence to see anyone harvesting clams in the area anymore (HTA Member pers. comm. March 2017). The availability of traditionally harvested foods (country food) is crucial in that it lowers the demand for imported food which is very costly and typically less nutritious. Additionally, the harvesting, preparation, and distribution of meat and skins provide important opportunities to maintain and enhance Inuit culture. Food security is a challenge for many in Iqaluit and to address this, the City provides funding for food security programs through the GN's Community Cluster Funding Program. There is also a community freezer purchased in November 2016 by the HTA that provides hunters free storage for their harvests. 4.3.3.2 Access and Navigation The proposed DSP site is not located in an area used by small craft boaters to access water. Small craft access to Koojesse Inlet is predominately from the municipal breakwater and existing causeway (Photo 4 1). According to the HTA and local outfitters, approximately 60 to 70% of users have boat trailers. Hunters without boat trailers depend on the high tides to access the water, mostly at the municipal breakwater. For boat owners with trailers, the existing causeway is used as an alternative to the municipal breakwater for launching and take-out and provides some parking space for trucks with boat trailers (SSG pers. comm. November 2016). The road to the existing causeway, however, is unpaved and is in disrepair in places which can affect access by vehicles with trailers (SSG pers. comm. November 2016; SSG pers. comm. September 2016). Accessing the ice in Iqaluit is, at times, considered challenging by local hunters who have to adapt their routes and access due to changing ice conditions. Winter and spring access routes at the municipal breakwater and the existing causeway are provided in Figure 4 3. The existing causeway is a busy access point with an estimated 200 snowmobiles accessing from there some days in a typical season (HTA Member pers. comm. November 2016). During early summer it is very busy at the existing causeway because of the overlap of spring to summer access (qamutik, snowmobiles, and boats) (HTA Member pers. comm. November 2016). Improvements to the existing causeway are covered in the SCH project NIRB Screening application (NIRB, 2017a; NIRB File No. 17XN022). 4.3.3.3 Tourism The DSP site is not currently used for tourism related activities. There are several outfitting companies operating out of the City that offer boating, snowmobiling, kite skiing, hunting, dog sledding and river raft trips at the Katannilik Park (situated between Iqaluit and Kimmirut). In the summertime there are many scenic places to go hiking, fishing, camping and berry picking, such as Sylvia Grinnell Park, the Road to Nowhere, and the seaside trail to Apex. The Qaummaarviit Territorial Historic Park offers a unique opportunity to see archaeological artifacts and learn about Thule culture. Iqaluit's Spring Festival, Toonik Tyme, is held every April and showcases traditional Inuit games and activities such as iglu building and seal skinning combined with musical performances, scavenger hunts, ice golf, and snowmobile races. According to the Community Economic Development Plan (City of Iqaluit, 2015a), almost 10,000 visitors pass through the doors of the Iqaluit Unikkaarvik Visitors Centre on a yearly basis. Despite increased traffic of tourist cruise ships in the region around Baffin Island, only five cruise ship calls were expected over the cruising season in 2016 bringing an expected total of 671 visitors to the City (Government of Nunavut, 2016). Cruise ship passengers are usually tendered to shore at the municipal breakwater by zodiac boats (which provides easy walking access to the City) or at the existing causeway. 4.3.4 Local and Regional Traffic Patterns Iqaluit is a transportation and resource distribution hub that provides access to smaller communities through the connection of the international airport and the sealift delivery services (Chris West pers. comm. November 2016). YFB is owned by the GN and is currently undergoing major improvements including the construction of a new terminal building. First Air operates daily flights from Ottawa and Montreal to Iqaluit. Canadian North operates a daily flight from Ottawa to Iqaluit. Both airlines also offer service from Yellowknife to Iqaluit, via Rankin Inlet. Sealift is a vital link for all communities in Nunavut allowing residents to obtain their annual re-supply of goods and materials needed throughout the year. Sealift ships travel from several southern Canadian Ports with a variety of goods ranging from housewares, non-perishable items, construction materials, vehicles, and heavy equipment. Current providers of sealift carriage and associated services include: NSSI, NEAS and Northern Transportation Company Limited (NTCL). In 2016 there were 13 ship calls by two dry cargo carriers. These ranged from two to 10 days in duration, for a total of 72 ship days (Jean-Pierre Lehnert pers. comm. November 2016). There is currently no accessible wharf for sealift ships to berth in Iqaluit. Ships are forced to anchor at an exposed location offshore in the upper reaches of Frobisher Bay and unload their cargo onto barges moved by tug boats that can only deliver to the landing area during high tide. The tug boats and barges are then met by forklift trucks in the shallower water and landing area. The ships generally provide their own barges and tugs to support lightering. However, some shipping lines leave one or two barges in Iqaluit for the duration of the shipping season. Cargo barges are landed at the landing beach adjacent to the airport runway where shipping companies offload cargo at the high watermark. A local contractor is responsible for storing the cargo within the beach laydown area and distributing the cargo within the town site. At the start of each sealift season, the tidal portion of the beach must be cleared of boulders and cobbles deposited by the shifting ice floes during the breakup period. Some years, the beach is reportedly so severely choked with ice that barge lightering is not possible and vessels are turned back causing delays of essential cargo (HTA Member pers. comm. November 2016). In 2009, a structural steel beam was reported to have accidentally been dropped into the sea during a lightering operation. This caused a delay in construction of a building in Iqaluit until the following year, when the component could be replaced. In the fall of 2015, construction of the $40 million Aquatic Centre in Iqaluit was delayed by three weeks after heavy ice in Frobisher Bay slowed down sealift delivery resulting in crews working overtime past the construction season deadline (Northern News Services, 2016). Fuel is supplied by coastal tanker under contract to Woodward Oil, which transfers fuel by floating hoses deployed by the ship's crew after the ship has been secured and once weather conditions are favourable. The City Public Works department is responsible for road maintenance including street signs, culverts, and walkways. The majority of roads in Iqaluit are paved with secondary roads constructed of gravel. Roads accommodate two lanes of traffic and typically do not have sidewalks or pathways. Iqaluit currently has no public transportation, although there is taxi service widely available throughout the City. 4.3.5 Community Health and Wellness Health facilities and services in Iqaluit include a general hospital, public health facility, family practice clinic and non-contracted rehabilitative treatment, provided through the Timimut Ikajuksivik Centre. The Qikiqtani General Hospital is currently the only acute care facility in Nunavut and provides a range of in-and out-patient hospital services including 24-hour emergency services, in-patient care (including obstetrics, pediatrics and palliative care), surgical services, laboratory services, diagnostic imaging and respiratory therapy. Although community health and wellness is supported by public health programs and medical facilities, it is also intrinsically related to a sense of familial and cultural cohesion. Traditional activities such as hunting, fishing, trapping, gathering plus the associated activities of drying, fermenting and preserving food and preparing skins strongly contributes to the community's sense of shared cultural values and beliefs. Many residents in Iqaluit still practice and depend on harvesting activities to provide for their families. A more thorough discussion of community health and wellness in Iqaluit is provided in Advisian (2017g). 4.3.6 Community Infrastructure and Services According to the Nunavut Housing Corporation's Annual Report for 2015-2016, Iqaluit's current housing stock is at 35% to 40%, indicating a critical need for housing (Nunavut Housing Corporation, 2016). There are four well equipped hotels and a handful of Bed and Breakfasts and short term rentals available for visitors to Iqaluit. Municipal services for water and sewage are provided by either the utilidor system or trucked service. The municipal water source is Lake Geraldine which is located approximately 1.5 km northeast from the city centre. Given that the Lake Geraldine watershed has an estimated volume of water to support a population of 8,300 people, the City identified Niaqunguk River as a supplementary source. Construction of the Niaqunguk River water intake has been delayed by approximately two years, but plans are still underway. To protect the community water sources, the City designated Lake Geraldine and Niaqunguk River watersheds as Watershed Protection Areas (City of Iqaluit, 2014). The City's sewage treatment facility and back up sewage lagoon are located at the end of the airport strip along West 40 approximately 0.6 km from the city centre. The treatment facility provides primary treatment utilizing screens and filters to remove solids, before the water is released into Koojesse Inlet (City of Iqaluit, 2014). The City is in the process of upgrading the primary wastewater treatment facilities to secondary treatment, which is required in the City's water licence. The City's solid waste landfill is located approximately 2.5 km from the city centre at the West 40 Landfill. Solid waste from residential and commercial locations is picked up several times a week and transported to the landfill. In January of 2014, the City Council adopted a Solid Waste Management Plan (City of Iqaluit, 2013) that included a new solid waste management site and program including compost, bulk recycling, reuse centre, hazardous waste management program, and a public education program (City of Iqaluit, 2015a). In 2014, the landfill was noted as at capacity however, it continues to operate and the Sustainable Community Plan indicates that historic waste sites located in the community need remediation (City of Iqaluit, 2014). Electricity in the City is provided through diesel generators by the Qulliq Energy Corporation (QEC), a territorial corporation 100% owned by the GN. All electricity needs in Nunavut are met by imported fossil fuel supplies. Energy for heat in Iqaluit is produced by the two diesel power plants, the primary plant is located near Lake Geraldine and the secondary plant is located on Federal Road. The diesel tank farm is on West 40 which receives fuel from the sealift. Heating fuel for homes and buildings is the responsibility of PPD of CGS, with the distribution and inventory management outsourced to Uqsuq Corporation. The Department of Emergency and Protective Services (Emergency and Protective Services) includes fire protection, ambulance service and communication / dispatch units. The department has 18 full-time firefighters / emergency medical responders, six dispatchers and 15 volunteer firefighters and is led by a chief and deputy chief (City of Iqaluit, 2017). The RCMP provides services including crime protection and public safety, emergency preparedness, and policing services. According to a City Councillors' briefing, provided by Sergeant Dave Combden on July 26, 2016, the Iqaluit detachment would benefit from more officers to deal with increased needs in the City. There are a variety of providers offering television, radio, internet, and phone services. The local newspaper is Nunatsiaq News.

Identification of Impacts and Proposed Mitigation Measures

Please refer to attached PSIR document

Cumulative Effects

All Project impacts previously described are expected to be negative and mitigatable, or positive. The past, present and reasonably foreseeable projects which have the potential to interact with the Project have been identified to be included within this Cumulative Effects Assessment. Two projects (see Figure 6 1) were considered to have the potential to interact with the construction of the DSP, which are bulleted below: SCH Project (NIRB, 2017a; NIRB File No. 17XN022) Iqaluit Airport Improvement Project (the YFB Project) (NIRB, 2017b; NIRB File No. 17XN006) 6.1 SCH Project The SCH Project is located 2 km northeast (5 km by road) of the Project and will be under construction simultaneously with construction of the DSP (Figure 6 1). The permanent components of the SCH Project include an extension of the existing breakwater, a boat launching ramp, improved and augmented parking/storage area at the municipal breakwater and improvements to the existing causeway. The SCH Project will improve access to water and functionality of boating activities to reduce the congestion, safety and environmental risks associated with the current use of the municipal breakwater. The SCH Project is designed to serve small boat users such as recreational users, hunters and fishers, subsistence harvesters, outfitters and cruise ship tenders. The SCH Project is summarized in Advisian (2017e). 6.2 Iqaluit Airport Improvement Project The YFB Project is located approximately 2.5 km northeast (3 km by road) of the Project and will consist of the construction of a new runway approach lighting system for the airport (Figure 6 1). The YFB Project includes construction of a breakwater to extend the lighting system by 450 m to the south east into Koojesse Inlet. The YFB Project is being proposed because the current lighting system for the airport has reached the end of its lifespan, does not meet existing standards and is difficult to maintain. The YFB Project is summarized in WSP (2016). There is a potential positive cumulative effect from the projects occurring simultaneously as the YFB Project may be able to use rock from the DSP, should there be excess. 6.3 Construction and Operational Effects The following construction and operational effects have the potential to overlap with the projects described above to result in cumulative effects: Sediment disturbance due to in-water construction. Serious harm to fish and fish habitat during construction. Underwater noise effects on fish and marine mammals during construction. Effects of traffic and dust during construction and operations. Noise effects of blasting on the community during construction. Adequate construction workforce, accommodation, health services and other community services during construction. Interference with marine access and navigation during construction and operations. Sediment disturbance due to in-water construction Dredging is the main Project activity that could result in sediment resuspension. Any sediment plume from the DSP is expected to be localized and not to interact with the SCH construction that is approximately 2 km away. There may be some excavation at the SCH but this is expected to be out of water. Given the SCH Project will be undertaken by the same contractor it is also unlikely dredging would occur simultaneously and, based on the distance between the projects, there is not expected to be any overlap between sediment plumes. The YFB Project does not involve dredging therefore there will be no cumulative interaction with that project. Serious harm to fish and fish habitat The SCH Project and the YFB Project are within the intertidal zone within areas of low productivity where Arctic char are unlikely to forage. Across the three projects, intertidal and subtidal hard substrates will be constructed which will provide foraging habitat and potentially predation refuge. A RFR will be submitted to DFO to confirm serious harm to fish due to the construction of the SCH and the DSP. Should an FAA be required, an Offset Plan will be developed in collaboration with the HTA and DFO. Serious harm and offsetting will be considered cumulatively across the two projects. Therefore there is no significant adverse cumulative effect on fish habitat. INAC state that the development of coastal infrastructure such as the construction of docks and causeways is unlikely to have a permanently negative effect on Arctic char (INAC, 2012), as they can swim past the area. The SCH and YFB Projects are both in intertidal areas. Underwater noise effects on fish and marine mammals The majority of construction for the YFB Project and the SCH Project will be out of water. These Projects do not require pile driving or in-water blasting. Therefore cumulative effects of underwater noise are not expected to be significant. Effects of traffic and dust Given that the DSP Project will utilize the blasted rock from the DSP access road and laydown construction, the distance for rock haul is very short, does not use public roads and will not overlap with YFB or SCH truck traffic. The only potential for cumulative effects is during mobilization, and the delivery of cargo will be coordinated such that the community is not inconvenienced. As described in Section 5.3.3.1, there will be ongoing consultation with the HTA and BWG to ensure that DSP and SCH Project construction vehicles and equipment do not obstruct traffic or ice access/launching at the existing causeway. During operations, the existing causeway and DSP will share Akilliq Road for access. The expansion of the parking area at the causeway should help to avoid any congestion. There is no operational traffic for the YFB Project. GN and the City will be working together on operational planning for the DSP and SCH projects and traffic management will be included in the OEMP. Noise effects of blasting on the community The DSP and SCH Projects will use the same contractor and neighbouring rock cut areas therefore there will not be simultaneous blasting for the two projects. The volume of rock required for the SCH is very small in comparison to the DSP and hence the cumulative effect of the two projects is not much greater than the effect of the DSP alone. The source of rock for the YFB Project is not yet defined and therefore it is difficult to assess its cumulative effect. The YFB Project has committed to restricted blasting hours, and GN will work with the City to define appropriate timing restrictions for blasting across the three projects. Adequate construction workforce, accommodation, health services and other community services The workforce of 30 for the Project will be shared with the SCH Project. The YFB Project only requires an additional 20 workers. As indicated in Section 5.3.6, accommodation for non-local workers can be provided by hotels, bed and breakfasts and short term rentals and it is not expected to impede on accommodation the community depends on. In addition, the Project will have a dedicated fuel truck for meeting Project fuel requirements which will be shared with the SCH Project. It is unknown where the YFP Project will receive its fuel supply. However continued consultation with the City, YFP Project team and PPD will be undertaken to ensure sufficient supply of fuel is available. Interference with marine access and navigation DSP construction is outside of the primary navigation routes into the Sealift Beach and municipal wharf and will not interfere with access to the existing causeway. The marine construction, including transportation of dredgeate to the DAS site, does not overlap with construction for the YFB and SCH projects, both of which will be predominantly constructed from land. Once operational, there will be greater segregation of sealift vessels from the recreational boaters that will be using the SCH and causeway. Access and navigation will be improved by the DSP and SCH projects and therefore there is a positive impact. Discussions are underway with TC and all projects will go through the NPA process. With mitigation measures implemented, there will be no cumulative effects from the three projects. 6.4 Assessment of Transboundary Effects Potential project impacts identified in Section 5 are localized to within less than 10 km and are avoided or mitigated with the measures described. The closest territorial, provincial or international boundary to the Study Areas is the boundary with Quebec 270 km to the south west. The only activities that could be transboundary are transportation, including shipping. Transportation for additional equipment required for construction will be by existing scheduled sealift deliveries and scheduled flights will be used to move personnel to and from Iqaluit, as required. The operation of the DSP also does not include any additional shipping. Therefore transboundary impacts are not expected from the Project.

Impacts

Identification of Environmental Impacts

	PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Construction																									
Dredging		-	-	-	-	M	-	-	-	M	-	M	M		-	M	M	M	-		M	-	-	-	-
Access Road		-	M	M	-	M	-	-	-	M	-	M	M		M	M	M	-	-		M	-	-	-	-
Offshore Infrastructure (port, break water, dock)		-	-	-	-	M	-	-	-	M	-	M	M		-	M	M	M	-		P	-	-	-	-
Marine Based Activities		-	-	-	-	M	-	-	-	M	-	M	M		-	M	M	M	-		M	-	-	-	-
Operation																									
Dredging		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-
Access Road		-	-	-	-	-	-	-	-	-	-	M	M		M	M	M	-	-		M	-	-	-	-
Offshore Infrastructure (port, break water, dock)		-	-	-	-	-	-	-	-	-	-	-	-		-	M	M	M	M		P	-	-	-	-
Marine Based Activities		-	-	-	-	-	-	-	-	-	-	M	M		-	M	M	M	-		M	-	-	-	-
Decommissioning																									
-		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-

(P = Positive, N = Negative and non-mitigatable, M = Negative and mitigatable, U = Unknown)

Project Map