# 31 Navigable Waters

This chapter provides an overview of the potential effects on navigable waterways by the KSM Project (the Project). The two main areas involved in the Project are separated by approximately 23 km—the Mine Site to the southeast, and the Processing and Tailing Management Area (PTMA) to the northwest. Navigation was identified as a Valued Component (VC) by Transport Canada during the review phase of the approved Application Information Requirements (AIR; BC EAO 2011) document.

The regional navigable waters setting is described, followed by an overview of the legal framework regulating navigation and a summary of the baseline studies that were conducted to assess potentially navigable waterways. A screening level assessment of waterways against the Minor Works and Waters (*Navigable Waters Protection Act*) Order (MWWO; 2009) is provided to determine whether a stream may be considered technically navigable. A scoping exercise is then undertaken to identify two environmental effects associated with navigation: safety (i.e., an indirect effect safe navigation), and access (i.e., an indirect effect on the ability of Aboriginal and other user groups to access navigable waters for traditional [e.g., fishing, hunting, and trapping], commercial, and/or recreational [e.g., river rafting] purposes). Mitigation to reduce the potential for residual effects on navigation is discussed, and a significance determination on residual effects is presented, and used to support a cumulative effects assessment.

## 31.1 Navigable Waters Regional Setting

### 31.1.1 Physical Navigation Setting

The KSM Project is located within the Boundary Ranges of the Coast Mountains physiographic region in northwestern British Columbia (BC). The Project region has rugged terrain characterized by steep glacial topography and alpine to sub-alpine climates with high annual snowfall and precipitation. The Project area is also surrounded by terrain covered in glaciers and ice fields which inhibit navigational access. The climatic and physical characteristics of the region also results in hydrologic regimes marked by dynamic streams with high runoff and streamflow values and high seasonal variability (for a more detailed overview of the hydrologic regime in the Project area, refer to Chapter 13). The Project Mine Site is situated within the Unuk River watershed, interacting with several of its tributaries including Sulphuret, Gingras, Ted Morris, Mitchell, and McTagg creeks. The Unuk River flows west from the Project region into Alaska and discharges into Burroughs Bay. The PTMA is located within the Bell-Irving River watershed, which includes tributaries and Teigen and Treaty creeks. The terrain within these watersheds ranges in elevation from under 240 m at the confluence of Sulphurets Creek with the Unuk River, to over 2,300 m at the peak of the Unuk Finger, 8 km away. Further detail, including maps, of the waterways in and around the Project footprint is provided in Section 31.3.

The general Project area is bounded by several river systems that lie well outside the Project footprint: the Stikine River to the north (over 100 km away, with its tributary, the Iskut River, roughly 50 km away), the Nass River (about 100 km away from the Project) to the east and south (into which the Bell-Irving River flows), and the Skeena River even further east and south (roughly 150 km from the Project). Bowser Lake and the Bowser River, southeast of the Project footprint (about 20 to 30 km away), are also part of the Bell-Irving watershed. Use of streams and rivers within these regional watersheds for navigation purposes (i.e., traditional, commercial, and/or recreational) has historically been, and still is, limited because of the remoteness and ruggedness of the terrain as well as due to glaciation. Glacial barriers to aqueous travel were significantly greater in historic times, as glaciers in Western Canada have been retreating from past extents since the 19th century (Moore et al. 2009). For example, the Mitchell Glacier has retreated approximately one kilometre laterally and several hundred metres vertically since 1991 (Appendix 4-C; Tetra Tech-Wardrop 2012).

The historical use of waterways within the Project footprint and the surrounding region provides a means of demonstrating whether waterways have public utility for navigational purposes under Common Law (Section 31.2.1). Towards this end, a review of navigational use in the greater Project region has been conducted and is outlined below.

### 31.1.2 Commercial/Recreational Navigation Setting

Regarding the use of waterways in northern BC for transport and transport, MacDonald and Cover (1987) have reported, "Of all the northern coast rivers from Telegraph Creek in the north to Kemano in the south, only a handful, such as the Nass and the Skeena are navigable for even a part of their length, because of the steep gradient of their channels. The Skeena and the Nass have problems of spring flooding, other seasonal flash flooding and winter freeze up that put limits on their usefulness as well as for canoe travel. Overland trails and trails along the riverbanks, provided a much more reliable system for the transport of trade items."

Historical accounts of early commercial (mining and exploration) activity in the regional area of the Project indicate prospectors used the downstream portions of the Unuk River for travel, but there are no records of navigation in the immediate Project footprint. The difficulty of transportation in the Project area has long been thought to be an impediment to the establishment of large-scale mining operations. Claims along the north side of Treaty Creek had to be accessed via foot trails from Meziadin Lake and the Nass River Valley. Prospectors staging from Alaska travelled by flat-bottomed river boats to travel up the navigable portion of lower Unuk River. Beyond that point, a series of trails and cable crossings were used to access the claims further up the Unuk River (BC 1936).

Currently, six commercial operators within the regional area provide seasonal guided river rafting opportunities that are accessible from Highway 37 near the Bell-Irving River on an irregular basis. Additionally, the Unuk River is used once a year (in June) for commercial rafting adventures, and is accessible from the Eskay Creek Mine road or from Alaska.

### 31.1.3 Aboriginal Navigation Setting

Traditional knowledge and use of river networks as transportation corridors and for subsistence activities is documented in northwest BC by Aboriginal groups such as Nisga'a Nation, Tlingit, Tahltan, Gitxsan, Gitanyow, Gitsegukla, and wilp Skii km Lax Ha, as described below. River and tributary systems were used in addition to numerous trails for travel and transport.

Before 1958 and the establishment of major modern access routes, the most important travel routes for Nisga'a were along waterways and along major and minor foot trails that connected major settlements, as well as fishing and hunting camps (Marsden, Seguin Anderson, and Nyce 2002). A major trail in Nisga'a territory is the *Genim Sgeenix* ("Northward Trail"), called the "Grease Trail" by Europeans. This was a major trading route running from Gitlax'aws (55°18'20"N, 129°04'00"W, east of the Nass and above Gitlaxt'aamiks [New Aiyansh] north of present-day Terrace) north to Gitanyow (55°16'00"N, 128°04'00"W, on Kitwanga River south of Kitwancool Lake). MacDonald (1989) describes the "Grease Trail" as passing through Gitlaxt'aamiks and heading northeast to the Cranberry Junction, then veering south to Kitwancool Lake and continuing on to the Skeena River. The southern part of the trail at Gitlax'aws is a Nisga'a landmark, which served as a main transportation corridor for Nisga'a Nation to travel north to trade oolichan grease. Inland nations, such as the Gitxsan and the Gitanyow, would also use the *Genim Sgeenix*, particularly on their way to and from the seasonal oolichan fishing sites at the mouth of the Nass River (Sterritt et al. 1998). The Grease Trails were traversed on foot as recently as the late 1800s (People of 'Ksan 1980; Daly 2005). The Kitwancool Grease Trail remains intact in the Cranberry and Kitwanga Valleys (AMEC 2011). Barbeau and Beynon (1950) made note of a trail that ran from the head of Observatory Inlet, near the current town of Alice Arm, to the grease trail at Gitlaxt'aamiks on the Nass River. These Grease Trails were used in all seasons, with snowshoes used in the winter and canoes used on accessible routes during ice-free times. As delineated above, there is no reported use of Grease Trails in the Project area.

According to Nisga'a Lisims Government (NLG), the Nass River "courses through the heart of Nisga'a life and culture." It provides a transportation corridor and contains spawning grounds for wild salmon, steelhead, and oolichan. Protection of the Nass River watershed is of great importance to NLG "to ensure a healthy, productive aquatic ecosystem" for present and future generations. (Nisga'a Tribal Council, Fiegehen, and Rose 1993; Nisga'a Language and Culture Program 2002; NLG n.d.) As mentioned above, this river is also outside of the Project area and not reasonably anticipated to have its navigation affected by the Project.

In both pre- and post-contact times, the Skeena River (also out of the range of potential effects on navigation of the Project) was used for transportation of goods and people between the coast and the interior. Canoes were used in the Skeena River, in smaller rivers, and in lakes; in later times, steamers travelled the waters up to Hazelton (far southeast of the Project). Once the rivers froze, they could be walked upon. However, trails beside the rivers or overland provided the most reliable routes between seasons. For instance, a major segment of the Skeena River Trail ran from Usk to Hazelton, passing through Gitwangak (MacDonald 1989).

With the arrival of non-Aboriginals, new means of transportation were introduced along the Skeena such as horses and steamships. The steamships carried freight and passengers up and down the coast, and they could go part way up the Skeena (Ksen). The first steamships could not pass through the Kitselas Canyon, so canoes were the only means of freight handling and shipping goods from Port Essington to Hazelton. As First Nations boosted transport prices, eventually steam ships capable of passing Kitselas Canyon were brought in; however, in 1912 the use of steamships diminished when the railroad was extended from the coast to Hazelton.

Although the river boats, and later the train, had brought “modern” ways to the area, local transport was still quite old-fashioned. For instance, after acquiring wagons from trading posts, trails were cleared into wider roads for the wagons (Kitsegukla Band 1979).

Travel through Tahltan territories was typically done on foot, with snowshoes used in winter (Teit 1956; MacLachlan 1981). Tahltan travel along water routes was uncommon except for river crossings, though sturdy dugout canoes were brought up the Stikine River, well outside of the Project area, by Tlingit traders (MacLachlan 1981). Goods were transported on one’s back using trumplines (a type of strap-support), or were carried by pack dog.

Foot trails, rather than navigating via waterway, that were (or still are) used by the Tahltan are recorded throughout the Stikine watershed, as well as along the Ningunsaw, Snowbank, and Teigen drainages (Sterritt et al. 1998; THREAT 2009). Historically, the south bank of the Iskut River was used seasonally as a transportation corridor, providing access to higher-value fishing and hunting habitat further upstream. Travel through this area likely tended to occur predominately in late winter or early spring when snow was compact and ease of travel was increased. This transportation route is generally referred to as the Iskut River Trail, and it was traditionally used by the Tahltan to access coastal marine resources such as oolichan, seaweed, and shellfish (THREAT 2010). Several major trails, including the Telegraph Creek Trail, the Hyland Post Trail, and the Glenora to Dease Lake Trail, are interspersed with smaller, seasonal trails (Emmons 1911). In 1928, a major trading and packing trail from Glenora and Telegraph Creek to Dease Lake was converted into a road, making it possible to bring in and use motorized vehicles.

The Stikine Trail was one of the major routes from the Nass River to the Stikine River. From the Nass River, it ran north along the Bell-Irving River, Iskut River, then west through Raspberry Pass to Mess Creek, and then north to the Stikine River (MacDonald and Cove 1987). It is likely that this trail intersected a number of other trails travelling west to the coast and east inland. Portions of Highway 37 and the historic Dominion Yukon Telegraph Line likely followed segments of the Stikine Trail.

The Fort Dionysus Branch Trail was a branch of the Stikine Trail to Fort Dionysus (later named Wrangell) in Alaska. It is described as being the shortest route to Wrangell from the Stikine Trail (MacDonald and Cove 1987). This branch trail diverged from the Stikine Trail at Bowser Lake and then ran along the north side of Bowser Lake to the Lower Iskut River. Its exact route is not described, but this trail may have run north through Scott Pass, along Treaty Creek, and through the Teigen and Unuk lakes area to the Iskut River. This route does intersect with the Project area; however, it is a foot trail and does not involve navigation.

In a 1980 interview with Patti Smith, Jessie (Lumm) Sterritt describes travel from Prince Rupert to Stewart by boat, and then hiking to Bowser Lake and Awiijii (at the Oweegee Creek/Skowill Creek confluence on the east side of the Bell-Irving River which is located between Bell II and the Bell-Irving Bridge for the Project), which took a total of two weeks. The switch from boat to hiking inland indicates that navigation along waterways in the Project area past Stewart was not possible. Travel was expedited in the winter with snowshoes. Travel from Bowser Lake to

Stewart was done by foot over the glacier, which was fraught with danger, and Sterritt describes several near misses with family members almost falling into crevasses or off cliffs (Rescan 2009).

Gerry Gunanoot, David Gunanoot's nephew, described another land travel route to Stewart from Hanna Ridge, which passed along Hanna Ridge; up to the top of Meziadin Lake along a glacier bed; and then travelled about 14 miles (22.53 km) toward Stewart, as far as the road ran from Stewart in the winter months (Delgamuukw v. The Queen 1988). This trail also appears to have been documented by Beynon in 1953, who says "[t]he trappers who trap Meziadin Lake, even those from Kitwancool, travel by water to the head of Observatory Arm and then go up over the glacier. It is only a few days travel; the other way around is much longer" (Barbeau 1910-1969). Fred Johnson also makes mention of this trail (Barbeau and Beynon 1950).

Interviews conducted for the Project on May 27, 2013 provided the following information on Skii km Lax Ha travel and transport activities in and around the Project footprint (D. Simpson, pers. comm. 2013). In the recent past, the Skii km Lax Ha would occasionally use canoes (and later boats) in the summer along lakes and larger rivers (particularly Bowser Lake, Bowser River, and the lower portion of Bell-Irving River near its confluence with the Nass) to hunt bear and moose that foraged near the banks. The use of boats would occur mainly in the spring when water levels were high from the freshet. At all other times of the year, river travel would have been limited because of the low water levels. Other creeks in their territory were too small to navigate. The upper Bell-Irving River could never be navigated because it was too braided and marshy. Rather, the Skii km Lax Ha would use rafts to cross the upper Bell-Irving River where it was shallow, particularly when crossing over from the mouth of Treaty Creek to Oweegee Creek, or vice versa, during resource harvesting excursions. In the winter, when the rivers froze, the Skii km Lax Ha would be able to cross the rivers unimpeded. In recent years, however, the rivers no longer freeze up completely in the winter, making travel more difficult (D. Simpson pers. comm. 2013).

## 31.2 Regulatory Framework

In Canada there is a public right to navigation which exists under Common Law. This right can only be restricted by an Act of Parliament, such as the *Navigable Waters Protection Act* (NWPA; 1985), which requires approval for any "works" that may affect navigation on "navigable waters." The NWPA was subject to amendments in the *Jobs and Growth Act* (2012) which received Royal Assent on December 14, 2012. These amendments are not in force yet and are not likely to come into effect until 2014. The first amendment consists of replacing the name of the NWPA by the *Navigation Protection Act* (NPA; 2012). Policy guidance on the implementation of the NPA has not been provided by Transport Canada with respect to projects that may require authorizations under the NWPA, but that will not be subject to the provisions of the NPA.

Under the NWPA, a work is defined as the following which may interfere with navigation: "any man-made structure, device or thing" (e.g., bridges, dams, or docks), any "dumping of fill," or any "excavation of materials from the bed of any navigable water" (NWPA 1985). The NWPA and other applicable legislation, policy, standards, and guidelines to navigable waters in Canada are presented in Table 31.2-1.

# Table 31.2-1. Navigable Waters Legislation, Policy, Standards and Guidelines

| Name | Year | Type | Level of Government | Description |
|---|---|---|---|---|
| *Canadian Environmental Assessment Act* | 1992 | Act | National | Section 5(d) of the Act requires a federal environmental assessment of a Project before a federal authority issues a permit or licence, grants an approval, or takes any other action for the purpose of enabling a project to be carried out in whole or in part. An approval under Section 5(1)(a) of the NWPA is prescribed in the Law List Regulations under the Act. |
| *Navigable Waters Protection Act* (NWPA)[1] | 1985 | Act | National | Section 5 of the Act requires that “no work shall be built or placed in, on, over, under, through or across any navigable water without the Minister’s prior approval of the work, its site and the plans for it.” |
| Navigable Waters Protection Program (NWPP) | | Program | National | Department of Transport Canada which reviews and approves all works which interact with navigable waters. Ensures that works are performed in accordance with the legislation. |
| MWWO | 2009 | Order | National | Pursuant to Section 13(1) of the NWPA, the MWWO identifies classes of works and minor navigable waters that do not require an approval under the NWPA. |
| MWWO Section 4 (Winter Crossings) | 2009 | Policy | National | Section 4 of the MWWO establishes a class of works related to winter crossings including terms and conditions to be followed prior to breakup to ensure subsequent navigation. |
| MWWO Section 5 (Aerial Cables Brochure) | 2009 | Policy | National | Section 5 of the MWWO establishes a class of works related to aerial cables. Policy outlines the criteria for this designation and associated conditions imposed during construction. |
| MWWO Section 8 (Intake Pipes Brochure) | 2009 | Policy | National | Section 8 of the MWWO establishes a class of works related to intake pipes. Policy outlines the criteria for this designation and associated conditions imposed during construction. |
| MWWO Section 10 (Temporary Works Brochure) | 2009 | Policy | National | Section 10 of the MWWO and the supporting brochure outline specific standards and criteria under which Transport Canada considers temporary work projects to be ‘minor’ and not requiring an application for approval. |
| CAN/CSA S6-06 Canadian Highway Bridge Design Code | 2006 | Standard / Code | National | This Code applies to the design, evaluation, and structural rehabilitation design of fixed and movable highway bridges in Canada. This Code also covers the design of retaining walls, barriers, and highway accessory supports of a structural nature, e.g., lighting poles and sign support structures. This Code does not specify requirements related to mountainous terrain effects (e.g., avalanches). For structures that can be subject to such effects, specialists need to be retained to review and advise on the design and to ensure that the applicable requirements of other codes are met. |

**(continued)**

## Table 31.2-1. Navigable Waters Legislation, Policy, Standards and Guidelines (completed)

| Name | Year | Type | Level of Government | Description |
|---|---|---|---|---|
| Bridge Standards and Procedures Manual. V1. Supplement to CHBDC S6-06 | 2007 | Manual | Provincial | The BC Ministry of Transportation Supplement to CAN/CSA S6-06 is to be read and utilized in conjunction with the CAN/CSA S6-06 Canadian Highway Bridge Design Code. Included are referenced bridge design code clauses where; additional text is provided that supplements the design clause, changes are noted that either delete or modify text, or additional commentary is provided for the reference of the designer. |
| Forest Service Bridge Design and Construction Manual | 1999 | Manual | Provincial | Ministry of Forests and Range manual for the design and construction of forest service bridges. |

### 31.2.1 Definition of Navigable Waters

The NWPA states that “navigable water” includes “a canal and any other body of water created or altered as a result of the construction of any work” (1985). In Canada, the definition of a navigable water has also been developed by jurisprudence applicable under Common Law. For the purposes of this navigable waters effects assessment, the case law interpretation of navigability outlined below will be used in part—along with the technical interpretation under the MWWO (2009) elaborated on in Section 31.1.2—to determine the nature and extent of the navigation effects on waterways affected by Project components.

Generally, if any type of floating vessel for transportation, recreation, or commerce is able to pass over a body of water, the water would be considered as navigable (Transport Canada 2009). The determination of navigability is further supported by the “Coleman principles,” as summarized by the 2011 Ontario Superior Court of Justice citing Simpson v. Ontario (2011):

1. A stream, to be navigable in law, must be navigable in fact. That is, it must be capable in its natural state of being traversed by large or small craft of some sort—as large as steam vessels and as small as canoes, skiffs, and rafts drawing less than one foot of water.
2. "Navigable" also means "floatable" in the sense that the river or stream is used or is capable of use to float logs, log-rafts and booms.
3. A river or stream may be navigable over part of its course and not navigable over other parts.
4. To be navigable in law, a river or stream need not in fact be used for navigation so long as realistically it is capable of being so used.
5. According to the *Civil Code of Quebec*, the river or stream must be capable of navigation in furtherance of trade and commerce. The test according to the law of Québec is thus navigability for commercial purposes, as “every river is not equally useful” (Girouard 1906).

6. The underlying concept of navigability in law is that the river or stream is a public aqueous highway used or capable of use by the public.
7. Navigation need not be continuous but may fluctuate seasonally.
8. Interruptions to navigation, such as rapids, on an otherwise navigable stream which may, by improvements such as canals, be readily circumvented, do not render the river or stream non-navigable in law at those points.
9. A stream not navigable in its natural state may become so as a result of artificial improvements."

The Coleman principles have been upheld and further defined in other case law, including by Justice Doherty (1989) in Canoe Ontario v. Julian Reed, who accepted the conclusions reached in the Coleman case and further clarified that:

> *In essence, the test of navigability developed in Canada is one of public utility. If a waterway has real or potential practical value to the public as a means of travel or transport from one point of public access to another point of public access, the waterway is considered navigable...navigability should depend on public utility. If the waterway serves, or is capable of serving, a legitimate public interest in that it is, or can be, regularly and profitably used by the public for some socially beneficial activity, then, assuming the waterway runs from one point of public access to another point of public access, it must be regarded as navigable land as within the public domain* (Doherty 1989).

### 31.2.2 Minor Works and Waters (*Navigable Waters Protection Act*) Order

The Navigable Waters Protection Division of Transport Canada is responsible under the NWPA to ensure unimpeded navigation along any watercourses or waterbodies considered navigable. The NWPA protects the public right to navigate and ensures that any interference created by a project does not alter the navigability of the waterway, and that the rights of other waterway users are respected. Approvals under section 5(1) of the NWPA are issued by the Minister of Transportation, Infrastructure and Communities. Section 5.1(1) of the NWPA provides that "a work may be built or placed in, on, over, under, through or across any navigable water…if the work falls within a class of works, or the navigable water falls within a class of navigable waters, established by regulation or under section 13 of the NWPA" (1985). Classes of works and classes of navigable waters (i.e., waters that have physical characteristics that limit any realistic navigability) may be exempt from the approval requirement if the criteria in the MWWO (2009) are met.

Classes of works that may be exempt from approvals include docks and boathouses, winter crossings, aerial cables, submarine cables, pipeline crossings, water intakes, dredging, and temporary works. Brochures for each of these classes of works are available that outline specific standards and criteria under which Transport Canada will consider the work to be minor, and are based on the contents of the MWWO (Transport Canada 2009a-e). For the purposes of this chapter, classes of works that warrant analysis against the MWWO are aerial cables, temporary works, and water intakes.

Under the MWWO, the following classes of waters are exempted from a section 5(1) approval: minor navigable waters, artificial irrigation channels and drainage ditches, and private lakes. Minor navigable waters will be included in the scope of this assessment.

#### 31.2.2.1 Minor Navigable Waters

Transport Canada has established five navigable water characteristics to be used in determining whether or not a waterway meets the technical definition of a minor navigable water: average depth, average width, channel slope, sinuosity ratio, and frequency of natural obstacles (Transport Canada 2010). If a section (defined as a 200-m continuous stretch) of navigable water is classified as minor, an application for approval under the NWPA is not required for any work on that section. Therefore, for the purposes of the Project's navigable waters effects assessment, if a waterway is deemed to be a minor water, it will be scoped out of the assessment as not requiring an application.

<u>Average depth and width:</u> For the purposes of meeting the criteria of a minor navigable water, measurements of both depth and width must be referenced to the high-water level, which is the point at which a navigable water begins to overflow its natural banks (not the width of the flood plain). The average depth and width are established by calculating the respective depths and widths along the reference 200-m section of the navigable water. In order to calculate this "average," three or more measurements along the navigable water are required: at the subject (works) site in the middle of the section, at 100 m± upstream, and at 100 m± downstream (Transport Canada 2010).

<u>Channel slope:</u> This relates to the velocity of a navigable water, and refers to the differential elevation of the water surface from the upstream end of the centre line of the navigable waters to the downstream end of that line (the line defining the lowest points along the length of the bed). The vertical fall over the 200 m section (centred on the project site) divided by the total length of the section yields the slope (Transport Canada 2010).

<u>Sinuosity ratio</u>: For a vessel to be able to travel across a navigable water, the full length of the vessel must be able to fit within the banks of a bend, which can be measured through sinuosity. The sinuosity ratio of a navigable water is the ratio of the length of the centre line of the navigable waters to the length of a straight line that starts and ends at the same points as the centre line (Transport Canada 2010).

<u>Natural obstacle</u>: This is a natural physical obstruction in navigable waters that prevents vessel passage, and would require portaging to be able to continue passage. Natural obstacles could include a beaver dam, a deadfall, a steep drop, or thick vegetation, but do not include man-made structures such as bridges or dams. To determine whether a 200-m section of navigable water can be considered to be a minor navigable water, at least one of the natural obstacles must be upstream of a project (at the section midpoint), and another must be downstream (Transport Canada 2010).

To determine whether a waterbody section affected by KSM Project works can be considered a minor navigable water, the measured channel characteristics can sometimes on their own be sufficient to classify a navigable waters section as minor; other times the characteristics will have to be combined to make the determination. Depth and width are the two characteristics that are sufficient on their own to determine whether a waterway section is minor.

If *either* the average depth is less than 0.30 m of a waterway channel measured at the high water level, *or* if the average width is less than 1.20 m of the channel measured at the high-water level, then the navigable water section may be considered a minor navigable water and approval under the NWPA is not required.

If the average width over a 200 m long section of a channel is 1.20 m or more but not more than 3.00 m *and* one of the following four conditions are also true, the waterway may be considered a minor navigable water and an application for approval under the NWPA is not required.

1. Average depth of the navigable water measured at the high-water level is 0.60 m or less.
2. The slope is greater than 4%.
3. The sinuosity ratio is greater than 2.
4. There are three or more natural obstacles.

If the average width through a 200-m long section of a channel is greater than 3.00 m, the waterway cannot be considered a minor navigable water and an approval under the NWPA is required (Transport Canada 2010). Baseline data was collected on the above criteria for potentially navigable waterways for the Project. Classes of water that fall below these identified thresholds will not be subject to an effects assessment as they will be considered a minor navigable water.

### 31.2.3 Land Use Planning Objectives

Land use planning in the vicinity of the Project is dictated mainly by two regional scale land and resource management plans: the Cassiar-Iskut Stikine Land and Resource Management Plan (CIS LRMP; BC ILMB 2000) and the Nass South Sustainable Resource Management Plan (SRMP; BC MRLNRO 2012). These two land use plans are further discussed in Chapter 23, and illustrated in Figure 23.1-2.

The CIS LRMP, developed with the support of the Tahltan joint councils, encompasses an area of 5.2 million hectares in northwestern BC and overlaps the western portion of the Project region, including the Mine Site. The Nass South SRMP was developed in partnership with Nisga'a Nation, the Gitanyow First Nation, local stakeholders, and government agencies (BC MRLNRO 2012). The Nass South SRMP overlaps with a southern portion of the Project region, as well as with some of the land over the Mitchell-Treaty Twinned Tunnels.

Both plans are broadly concerned with defining and providing a framework for implementing regional land and resource management objectives that balance environmental, economic, social, and cultural concerns. The plans deal with multiple, potential uses that range from the protection of biodiversity and various ecosystem functions to traditional cultural activities and contemporary recreational uses, to timber supply management and mineral development.

For navigable waters, the focus of the CIS LRMP is the management of visual quality of the land (i.e., viewscapes) from the vantage point of navigable sections of the Unuk River, rather than on navigation itself (BC ILMB 2000). The Nass South SRMP makes no mention of "navigation" or "navigable waters" in the June 2012 version of the Plan (BC MRLNRO 2012).

## 31.3 Baseline Studies

To support an effects assessment on navigability, Transport Canada recommends following a three-point test that answers the following questions: 1) is there a work that affects a waterway; 2) is the waterway navigable; and 3) is there an effect from the work on the navigability of the waterway. The baseline study area and methods used to address the first two questions are described below and summarized in Section 31.5, and the third question comprises the main portion of the navigable waters effects assessment in Sections 31.5 to 31.10.

### 31.3.1 Navigable Waters Baseline Study Area

The KSM Project area considered for the navigable waters assessment includes locations in the Mine Site and the PTMA where Project works may affect navigability for waterways within the Unuk and Bell-Irving watersh0eds. Figure 31.3-1 provides an overview of the Project infrastructure, watersheds, rivers, and creeks in the Project area that form the boundaries of the navigable waters baseline study area.

The Project Mine Site, which includes the Coulter Creek access road (CCAR), is situated within the Unuk River watershed (which drains an area of approximately 5,789 $km^2$ (1,899 $km^2$ in Canada)). Several tributaries within the Mine Site flow into Sulphurets Creek, which flows into the Unuk River; these include Mitchell, Gingras, Ted Morris, and McTagg creeks. The PTMA, which includes the Treaty Creek access road (TCAR), is situated within the Bell-Irving River watershed. The Bell-Irving River discharges into the Nass River (with a drainage area of approximately 5,394 $km^2$), which then flows into the Pacific Ocean at the Portland Inlet. As well as affecting the Bell-Irving River itself, the PTMA and TCAR will affect different reaches of South Teigen and North Treaty creeks, which are tributaries to the Bell-Irving River.

### 31.3.2 Methods

#### 31.3.2.1 Identifying Works

To identify works, a GIS scoping process was carried out to determine the potential for interactions for all Project components for each phase that had the potential to be in, on, under, through, or across a waterway; the results are shown in Table 1, Appendix 31-A. Components were then reviewed against the criteria and standards identified in the MWWO (2009; see Appendix 31-A, Table 2), and supplemental brochure policies for aerial cables, temporary works, and water intakes.

#### 31.3.2.2 Determining if a Waterway is a Minor Navigable Water

Waterways affected by a Project work identified in Table 1 were assessed from 2008 to 2012 to enable a comparison against the MWWO (2009), to determine whether the affected waterways are considered technically navigable. The baseline study sampling effort assessed 237 stream sites along access roads (e.g., the CCAR, TCAR, and the Temporary Frank Mackie Glacier access route), as well as representative sites within the Mine Site, detailed assessments in the PTMA (e.g., the Tailing Management Facility [TMF]), and streams potentially affected by fish habitat compensation works.

Basic physical criteria were collected, including bankfull width (maximum width measured at the high-water level, excluding the floodplain), bankfull depth (maximum high-water level), and gradient. Representative photographs were also collected for numerous unnamed waterbodies, Unuk River, Coulter Creek, Gingras Creek, Mitchell Creek, McTagg Creek, Sulphurets Creek, Ted Morris Creek, North Treaty Creek, South Teigen Creek, and the Bell-Irving River. Most sites were photographed from at least two angles at the proposed road crossing site, usually upstream and downstream from the crossing location. Due to technical issues in the field, photographs for a few sites do not exist; therefore, resulting assessments are based on field descriptions of the habitat. For waterbodies to be eliminated due to the Water Storage dam (WSD), Mitchell and McTagg Rock Storage Facilities (RSFs) and other Mine Site infrastructure, representative sample sites were selected. Generally, these were high gradient areas (> 40% gradient) predominantly along the portion of the CCAR between Mitchell Creek and Unuk River and the TCAR from the North Treaty Creek fork up to the Treaty Ore reparation Complex.

Stream data was evaluated using a two-step screening process against the MWWO (Section 31.1.2) to identify: 1) waterbodies which meet the MWWO criteria (i.e., are considered minor waters, and so are not considered technically navigable); and 2) waterbodies that exceed the MWWO criteria (i.e., are considered technically navigable).

## 31.3.3 Baseline Study Results

### 31.3.3.1 Project Works Affecting Waterbodies

Project components with the potential to affect navigable waterways (and as identified in Table 1, Appendix 31-A) include:

- Culverts and bridge crossings associated with access roads (i.e., CCAR, TCAR, the Temporary Frank Mackie Glacier access route), and associated facilities (e.g., borrow areas, waste areas, log landings);
- Mine Site components (i.e., the Mitchell, Sulphurets, and Kerr pits; the Mitchell and McTagg RSFs; Mitchell Ore Preparation Complex; WSD; the Water Storage Facility [WSF]; water diversions; power plants; penstocks; and mine site roads);
- PTMA components (i.e., the Treaty Ore Preparation Complex, TMF [e.g., north/central/south ponds, seepage dams, diversion infrastructure, and PTMA access roads]); and
- fish habitat compensation works (i.e., intake pipes). Based on a comparison of the engineering data available for Project works against the MWWO criteria and policies, only the Temporary Frank Mackie Glacier access route crossings were determined to be minor in nature, and were scoped out of the assessment (see Table 2, Appendix 31-A).

PROJECT # 0196301-0029-002 GIS No. KSM-11-074 June 12, 2013

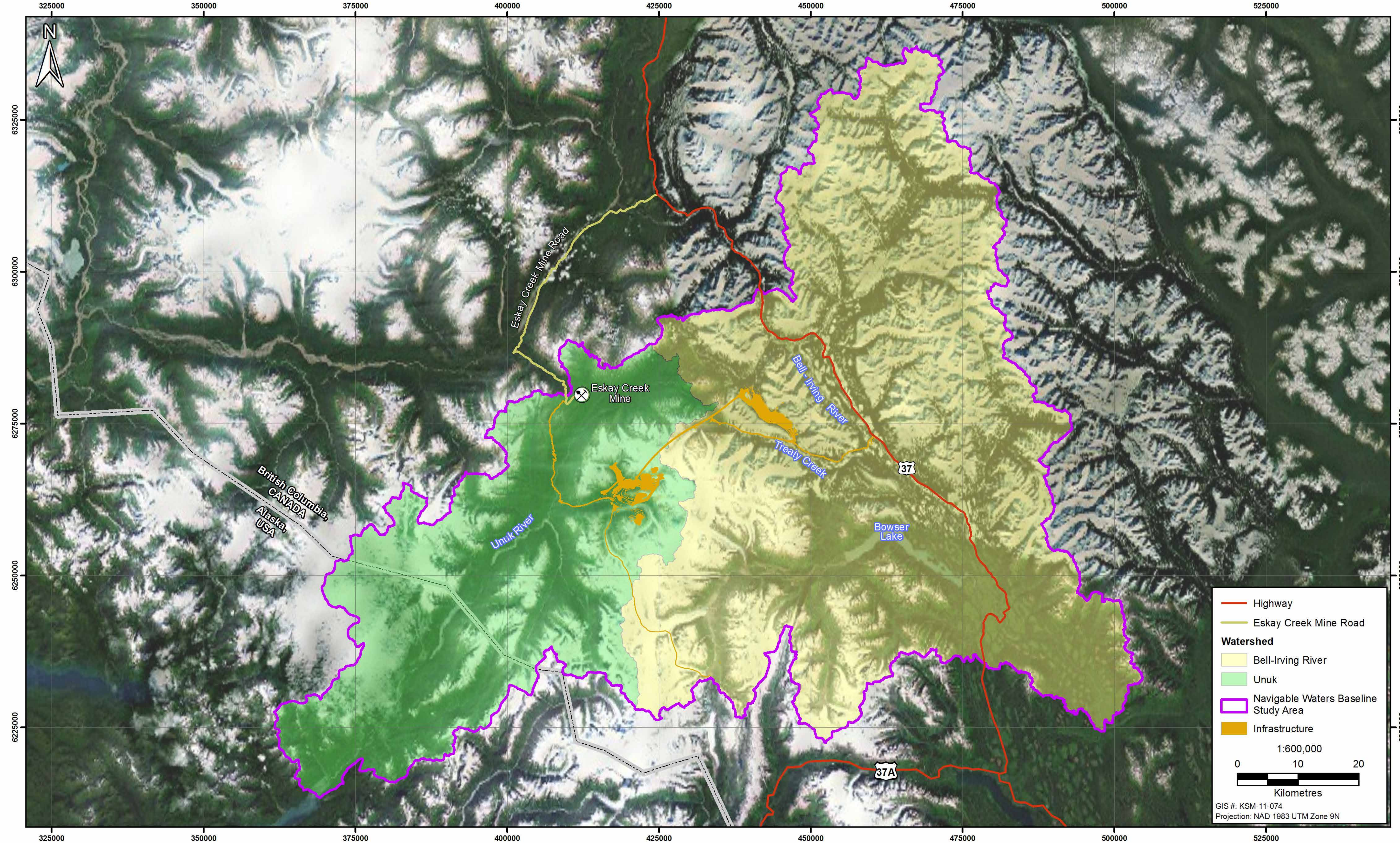


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Figure 31.3-1

KSM Navigable Waters Baseline Study Area

#### 31.3.3.2 Navigability Determination

Results of the MWWO data screening exercise are shown in Appendix 31-A, Table 2. In total, 237 waterbodies were assessed using the MWWO criteria. A total of 195 were determined to fit the criteria of minor waters, leaving 41 waterbodies to be carried through into the effects assessment. Stream characteristics for these 41 sites are compiled within tables presented in the following sections, including bankfull width, bankfull depth, gradient, and fish-bearing status. Detailed habitat and photographic information are provided in Appendix 31-B. Table 31.3-1 provides a summary of all the streams determined as technically navigable through baseline studies, including those waterways that have been included as navigable using a conservative approach.

##### *31.3.3.2.1 Coulter Creek Access Road*

As identified in Appendix 31-A, Table 2, the CCAR has 58 waterbody crossings (i.e., culverts and bridges). Baseline studies indicate that nine of these crossings affecting nine different waterways (five unnamed waterbodies, Coulter Creek, Unuk River, Gingras Creek, and Mitchell Creek) do not fit the criteria for minor works or waters (Figure 31.3-2). These crossings are summarized in Table 31.3-1, and photographs are shown in Appendix 31-B. Two crossings on unnamed waterbodies (sites 5542 and 5007) have an average depth less than 0.6 m, although the MWWO (2009) width criteria are exceeded. The photographs shown in Appendix 31-B for sites 2061, 2063, 5007, 5005, and 5542 indicate that natural stream characteristics related to presence of natural obstacles, and in some cases slope, prevent navigability for at least some parts of the year. Regardless, a conservative approach to the interpretation of technically navigable will be applied for this effects assessment, and all nine stream crossings will be carried forward into the effects assessment.

##### *31.3.3.2.2 Mine Site*

Sampling in the Mine Site was conducted at four representative stream sites along the Sulphurets, Mitchell (site 5538 already discussed above for the CCAR), Ted Morris and McTagg creeks; all of these are tributaries to the Unuk River.

Portions of Mitchell and McTagg creeks will be eliminated or diverted to allow for the construction of Project works associated with the Mitchell, Sulphurets, and Kerr pits; Mitchell and McTagg RSFs; the McTagg Twinned Diversion Tunnels (MTDT); the Mitchell Diversion Tunnels (MDT); the WSF; sludge management facilities; the Sulphurets Laydown Area; Kerr infrastructure (e.g., rope conveyor); and the explosives manufacturing facility. Bridge crossings over access roads within the Mine Site will affect Sulphurets, Mitchell, McTagg, and Ted Morris creeks. The Project works associated with the Upper Sulphurets Power Plant and the McTagg Power Plant also may affect Sulphurets and McTagg creeks by altering flow conditions.

Locations of representative stream sites are presented in Figure 31.3-2; stream characteristic details for the sites are presented in Table 31.3-1. Project component ID numbers in Table 31.3-1 derive from Table 1 and sampling site numbers come from Table 2 respectively in Appendix 31-A. Detailed habitat and photographic information for sampling sites is provided in Appendix 31-B. All affected stream crossing sites exceed MWWO (2009) criteria and no other stream characteristics (i.e., physical barriers, slope, or sinuosity) were identified in the photographic record as presenting an impediment to navigability. Effects on navigation from the interaction of Mine Site Project works with all four streams will be carried forward in the effects assessment.

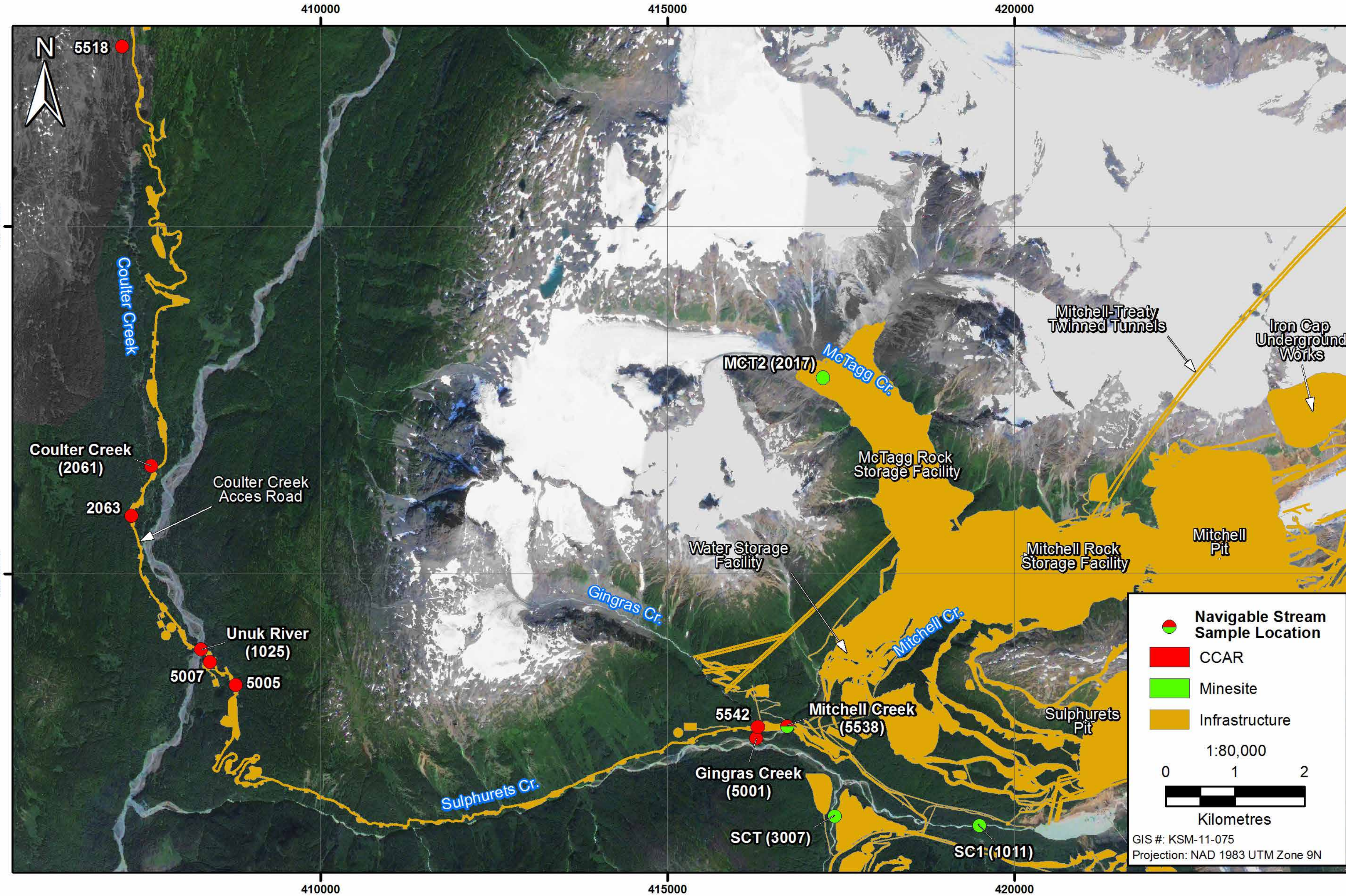


Figure 31.3-2

# Coulter Creek Access Road and Mine Site Navigable Stream Crossing Locations

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## Table 31.3-1. Characteristics of Navigable Streams Affected by Project Works

| Project Area | Sampling Site No. | Waterway Name | Stream Class | Easting | Northing | Stream Characteristics: BF Channel Width (m) | BF Channel Depth (m) | Mean Gradient (%) | Sinuosity Ratio | Obstacles (> 3) | Component ID No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coulter Creek Access Road | 5542 | unnamed | S5 | 416300 | 6262790 | 8.9 | 0.4 | 5.5 | - | N | 16 |
| | 5005 | unnamed | S5 | 408777 | 6263395 | 8.7 | - | 40 | - | N | 16 |
| | 5518 | unnamed | S2 | 407137 | 6272593 | 6.8 | 1.4 | 3 | - | N | 21 |
| | 2061 | Coulter Creek | S2 | 407561 | 6266553 | 16.0 | 0.6 | 1.5 | - | N | 23 |
| | 2063 | unnamed | S2 | 407277 | 6265832 | 12.7 | - | 3.5 | - | N | 24 |
| | 1025 | Unuk River | S1 | 408275 | 6263910 | 71.0 | 1.9 | 1 | - | N | 26 |
| | 5007 | unnamed | S2 | 408404 | 6263727 | 7.7 | 0.4 | 0.75 | - | N | 27 |
| | 5001 | Gingras Creek | S2 | 416275 | 6262627 | 17.2 | 5.5 | 1.2 | - | N | 29 |
| | 5538 | Mitchell Creek | S5 | 416725 | 6262799 | 8.7 | - | 3.5 | - | N | 30 |
| Mine Site | 5538 | Mitchell Creek | S5 | 416725 | 6262799 | 8.7 | - | 3.5 | - | N | 30, 76, 96, 183, 191, 192, 201, 205 |
| | 2017 (MCT2) | McTagg Creek | S5 | 417236 | 6267821 | 10 | - | 10 | - | N | 36, 38, 44, 68 |
| | 1011 (SC1) | Sulphurets Creek | S5 | 419491 | 6261371 | 17 | 1.16 | 17 | - | N | 178, 255 |
| | 3007 (SCT) | Ted Morris Creek | S5 | 417405 | 6261506 | 21.8 | 2 | 21.8 | - | N | 254 |
| PTMA | TR1 | North Treaty Creek | S2 | 447414 | 6272871 | 5.50 | 0.40 | 5.8 | - | N | 415, 420, 428, 429 |
| | TR2 | North Treaty Creek | S2 | 446613 | 6274403 | 6.07 | 0.65 | 2.0 | - | N | 401, 415, 420 |
| | 1060 | unnamed | S3 | 445377 | 6275619 | 3.6 | 0.6 | 2.0 | - | N | 399, 401, 415 |
| | 1010 | unnamed | S2 | 441404 | 6278345 | 6.2 | 0.5 | 10.0 | - | N | 363, 365 |
| | 1012 | unnamed | S3 | 441490 | 6277921 | 3.6 | 0.4 | 11.8 | - | N | 363, 365 |
| | 1016 | unnamed | S3 | 441773 | 6277585 | 3.5 | 0.4 | 15.5 | - | N | 363, 365 |
| | 1017 | unnamed | S3 | 441928 | 6277672 | 3.5 | - | 2.0 | - | N | 363, 365 |

(continued)

## Table 31.3-1. Characteristics of Navigable Streams Affected by Project Works (completed)

| Project Area | Sampling Site No. | Waterway Name | Stream Class | Easting | Northing | Stream Characteristics: BF Channel Width (m) | BF Channel Depth (m) | Mean Gradient (%) | Sinuosity Ratio | Obstacles (> 3) | Component ID No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PTMA (*cont'd*) | 1018 | unnamed | S4 | 441949 | 6277567 | 1.5 | - | 0.0 | - | N | 363, 365 |
| | 1110 | unnamed | S2 | 440727 | 6279725 | 5.3 | - | 2.0 | - | N | 353, 355, 360 |
| | T4 | Teigen Creek | S2 | 440415 | 6280904 | 6.7 | 1.0 | 2.8 | - | N | 353, 355, 358, 359, 360, 361, 365 |
| | T5 | Teigen Creek | S2 | 441628 | 6278058 | 6.4 | 0.8 | 1.0 | - | N | 388, 389, 365 |
| | T6 | Teigen Creek | S2 | 442625 | 6276430 | 5.1 | 0.5 | 5.0 | - | N | 393, 398 |
| | T7 | Teigen Creek | S2 | 443585 | 6276059 | 6.0 | 0.3 | - | - | N | 393, 398 |
| | T8 | Teigen Creek | S2 | 443796 | 6276204 | 8.0 | 0.7 | 6.0 | - | N | 397, 415 |
| Treaty Creek Access Road | 143 | unnamed | S5 | 439255 | 6273662 | 5.0 | 0.4 | 35.0 | - | N | 438 |
| | 141-2 | unnamed | S5 | 439755 | 6273556 | 8.0 | 6.0 | 31.0 | - | N | 438 |
| | 243 | unnamed | S3 | 443508 | 6272703 | 4.2 | 0.5 | 18.0 | - | N | 438 |
| | 139 | unnamed | S5 | 443781 | 6272747 | 3.2 | 0.7 | 36.0 | - | N | 438 |
| | 210 | unnamed | S3 | 455190 | 6269430 | 4.0 | - | 16.0 | - | N | 434, 438 |
| | 4011 | N. Treaty Creek | S2 | 447556 | 6271912 | 8.9 | 1.1 | 2.7 | - | N | 434, 438, 451 |
| | 114 | unnamed | S2 | 448987 | 6270402 | 15.5 | 0.6 | 20.0 | - | N | 434, 438, 446 |
| | 244 | unnamed | S2 | 452180 | 6269610 | 5.5 | 1.2 | 18.0 | - | N | 434, 438, 448 |
| | 100 | unnamed | S1 | 457091 | 6270729 | 63.3 | 3.0 | 19.0 | - | N | 434, 438, 450 |
| | 4004 | Bell-Irving River | S1 | 460039 | 6272653 | 70.0 | - | 0.5 | - | N | 434, 438, 451 |
| | 107 | unnamed | S5 | 433793 | 6275602 | 5.7 | 0.4 | 34.0 | - | N | 434, 438, 449 |
| Fish Habitat Compensation | TC1 | Teigen Creek | S1 | 439735 | 6283407 | 35.0 | 1.3 | 1.0 | - | N | intake pipe |
| | GC1 | Glacier Creek | S2 | 460250 | 6272800 | 10.0 | 0.5 | 3.0 | - | N | intake pipe |
| | - | N. Treaty Creek | S2 | 448500 | 6271000 | 8.9 | 1.1 | 2.7 | - | N | intake pipe |
| | - | Taft Creek | S1 | 473400 | 6261300 | 60+ | - | 1.0 | - | N | intake pipe |

**Notes:**
**Dashes indicate data not available or not applicable**
**Stream classes S1 to S4 indicate sites are fish-bearing, S5 and S6 are non-fish bearing**
**Stream classes indicate bankfull width: S1 > 20 m, S2 > 5 m – 20 m, S3 1.5 – 5 m, S4 < 1.5 m, S5 > 3 m, S6 < 3 m**

#### *31.3.3.2.3 Treaty Creek Access Road*

The TCAR has 90 waterbody crossings requiring works (i.e., bridges, culverts, and overhead transmission lines). Eleven of these crossings (affecting nine unnamed waterbodies, North Treaty Creek, and the Bell-Irving River; Figure 31.3-3) do not fit the criteria for minor works or waters; these crossings are listed in Table 31.3-1, and photographs are shown in Appendix 31-B. Four crossings on unnamed waterbodies (sites 107, 114, 143, and 243) have an average depth less than 0.6 m, although the MWWO width criteria are exceeded. The photographs shown in Appendix 31-B for sites 107, 139, 141, and 243 indicate that natural stream characteristics related to presence of natural obstacles, and in some cases sinuosity, prevent navigability for at least some parts of the year. Applying a conservative approach to the effects assessment, all 11 stream crossings will be carried forward into the effects assessment.

#### *31.3.3.2.4 Streams within the Processing and Tailing Management Area*

There are 75 stream reaches affected by the PTMA, 14 of which do not fit the criteria for classification as minor waters. These 14 stream reaches represent unnamed South Teigen watershed tributaries and mainstem, and unnamed North Treaty Creek watershed tributaries and mainstem—all of which are tributaries to the Bell-Irving River.

Streams in the TMF footprint will be completely eliminated by TMF components, which include seepage ponds; collection dams; and starter dams for the North, Centre, and South cells. Locations of these stream crossings are presented in Figure 31.3-3, while details for each stream are presented in Table 31.3-1. Detailed habitat and photographic information is provided in Appendix 31-B. Seven waterbodies (sites Treaty 1, 1060, 1010, 1012, 1016, Teigen 6 and 7) have an average depth less than 0.6 m, although all of these streams are greater than 3 m bankfull width. The photographs shown in Appendix 31-B for sites 1010, 1012, 1016 and 1060 indicate that natural stream characteristics related to presence of natural obstacles prevent navigability. Applying a conservative approach, all 14 stream reaches will be carried forward into the effects assessment.

#### *31.3.3.2.5 Streams Potentially Affected by Fish Habitat Compensation Works*

Fish habitat compensation plans are currently conceptual; however, four technically feasible site designs have been identified: Teigen Creek, Glacier Creek, Treaty Creek, and Taft Creek (Figure 31.3-4). The only part of fish habitat compensation which may potentially serve as a work are intake pipes to supplement water flow to the habitat compensation sites. These intake pipes are not confirmed works as they will only be required if ground water and surface water run off to the habitat is not sufficient for design requirements.

All of the creeks exceed 3 m bankfull width, although Glacier Creek has a bankfull depth less than 0.6 m; no other stream characteristics (i.e., physical barriers, slope, or sinuosity) were identified in the photographic record as presenting an impediment to navigability. Details for these four creeks are presented in Table 31.3-1. Applying a conservative approach, effects from the interaction of the intake pipes with the four streams will be carried forward in the effects assessment.

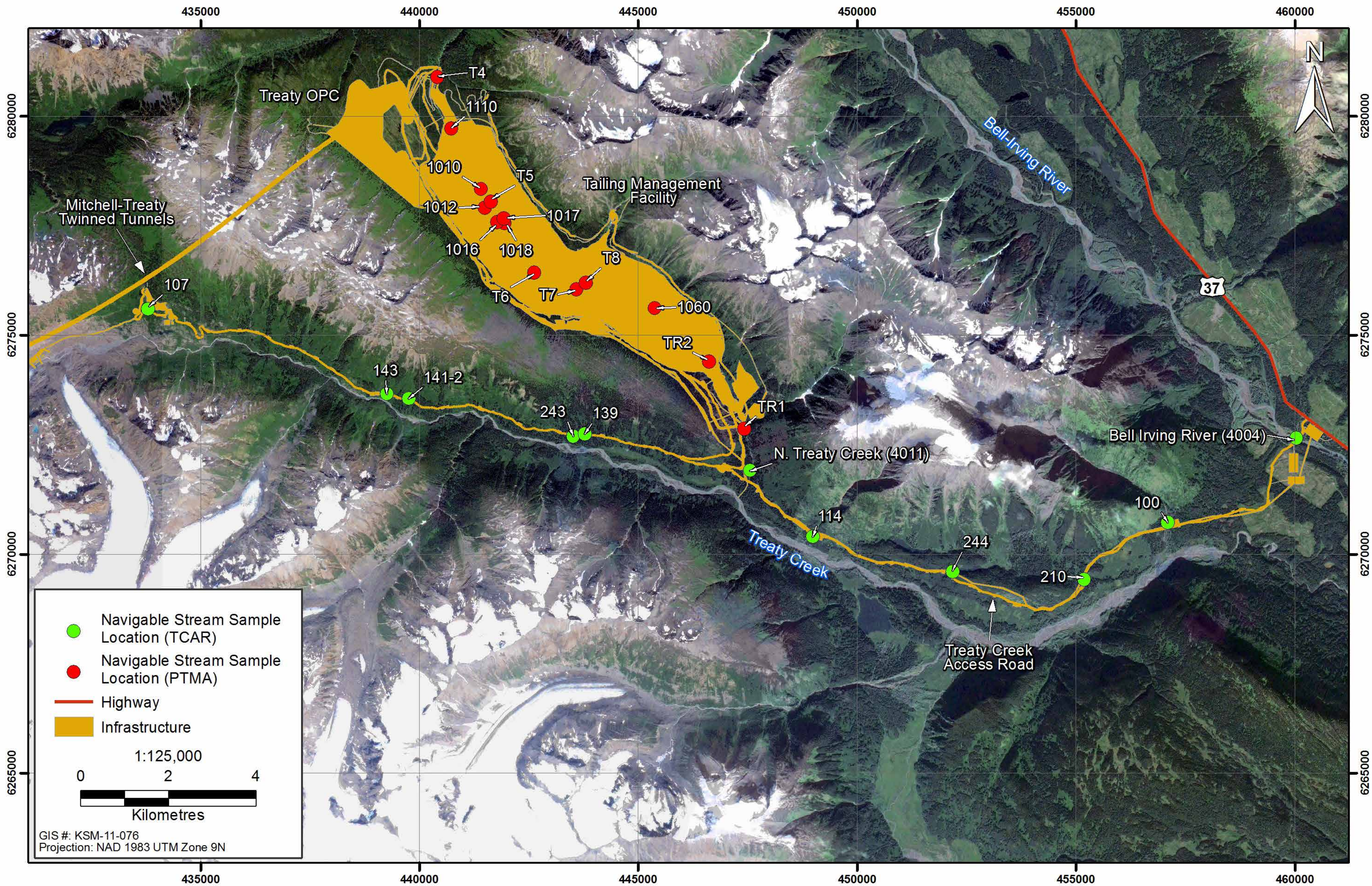


Figure 31.3-3

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# Processing and Tailing Management Area and Treaty Creek Access Road Navigable Stream Crossing Locations

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PROJECT # 0196301-0029-002 GIS No. KSM-11-077 June 12, 2013

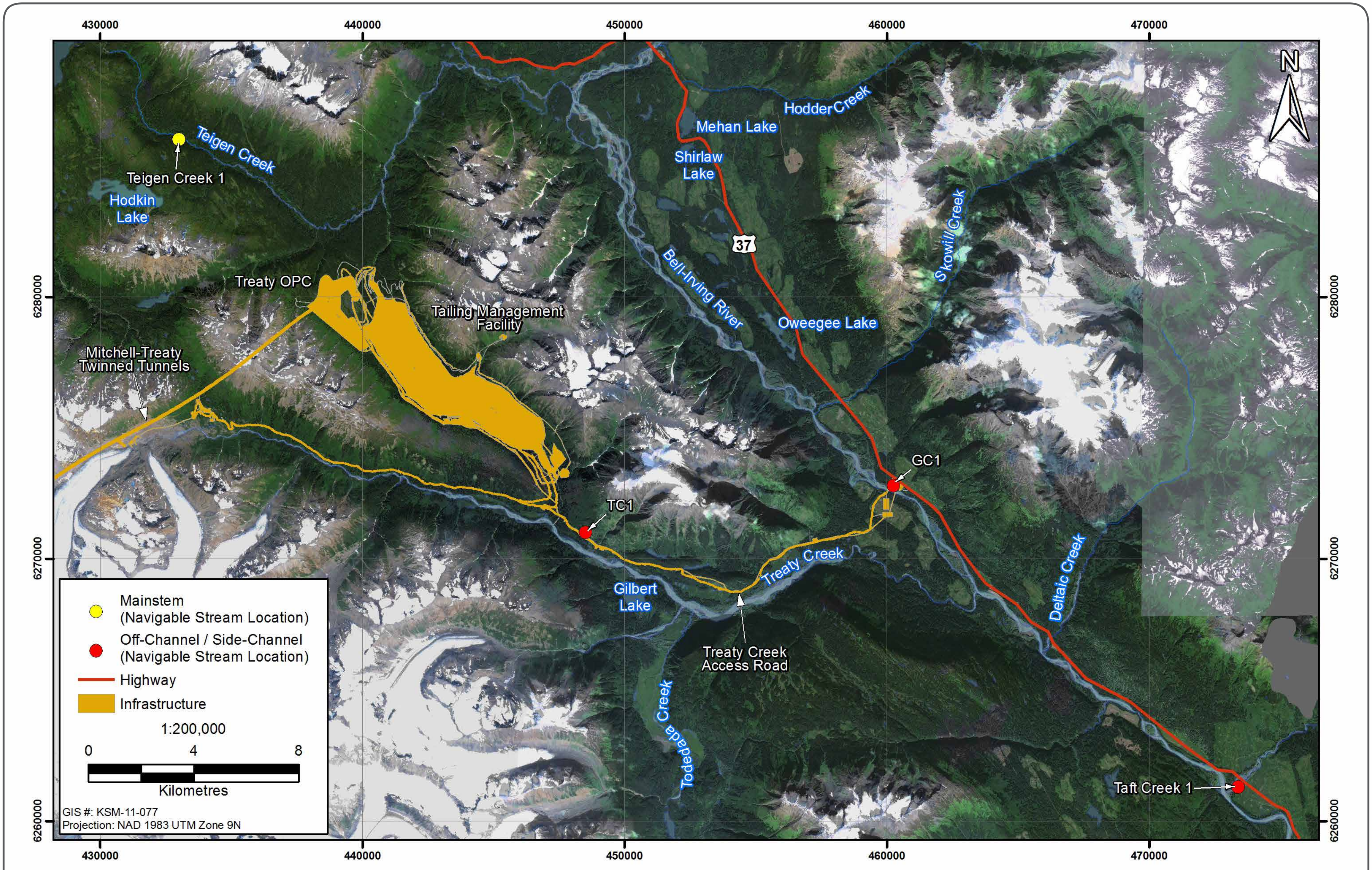


Figure 31.3-4

Figure 31.3-4

# Navigable Streams Potentially Affected by Proposed Fish Habitat Compensation Works

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#### 31.3.3.3 Summary

Stream sites which interacted with Project works were assessed against the MWWO (2009) criteria. A total of 237 sites were assessed, resulting in a total of 41 navigable waters which did not fit the criteria for classification as minor waters. These 41 stream sites (9 for CCAR, 3 for the Mine Site (in addition to site 5538 for Mitchell Creek, already counted in the total for the CCAR), 11 for TCAR, 14 for the PTMA, and 4 for fish habitat compensation works will be carried forward into the effects assessment. Project works associated with the Temporary Frank Mackie Glacier access route were identified as minor and scoped out of the effects assessment.

# 31.4 Assessment Boundaries

## 31.4.1 Spatial Boundaries

The regional study area (RSA) for the navigable waters effects assessment is the same as the baseline study area shown in Figure 31.3-1, with only navigation within watersheds affected by the KSM Project considered in this effects assessment.

The local study area (LSA) for the navigable waters effects assessment, shown in Figure 31.4-1, is based on all Project works which have the potential to interact with navigable waters (Tables 1 and 2, Appendix 31-A). The spatial LSA extent of this assessment includes the Mine Site, PTMA, all access roads (TCAR, CCAR), and transmission lines (aerial works). All waterways bisected by Project works, including 100-m upstream and 100-m downstream of the works, are contained within the boundaries of the LSA. Because the location of the proposed fish habitat compensation sites are not yet confirmed, these sites are not contained within the shown boundaries of the LSA; however, they are included in the effects assessment.

## 31.4.2 Temporal Boundaries

For the purposes of this assessment, potential effects to navigable waters will be assessed during all Project phases:

- construction phase – 5 years;
- operation phase – 51.5 year life of the mine;
- closure – 3 years; and
- post-closure – 250 years.

# 31.5 Valued Components

The identification of candidate VCs and selection of final VCs was undertaken to support the development of the AIR document for the KSM Project (BC EAO 2011). The following information sources and considerations were also taken into account: comments received from Aboriginal groups during consultation activities in the pre-Application phase of environmental assessment (EA) process; comments received from members of the EA working group when reviewing the AIR document; fish and aquatic baseline studies; Project footprint data; technical studies and engineering documents; legislative and policy based requirements; land use resource management plans; the Comprehensive Study Scope of Assessment issued by federal authorities (May 2010); the potential for a VC to interact cumulatively with another human activity or project; a review of available information (e.g., past mining EA projects where navigation was considered a VC); and best professional judgement.

PROJECT # 0196301-0029-002 GIS No. KSM-11-078_T June 12, 2013

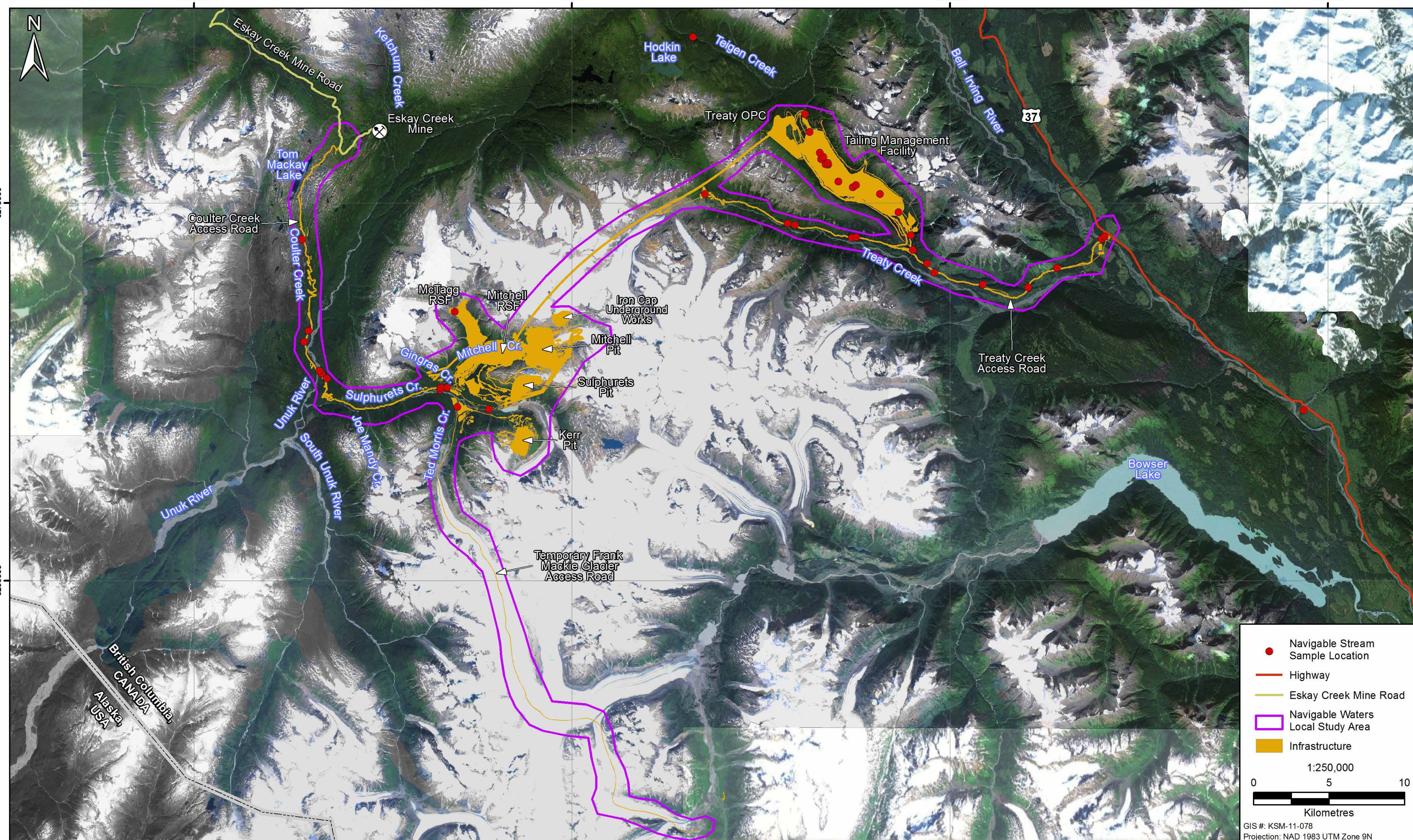


Figure 31.4-1

# Navigable Waters Local Study Area

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### 31.5.1 Valued Components Included in Assessment

As shown in Table 31.5-1, navigation was selected as a land use VC for assessment in the KSM Application for an Environmental Assessment Certificate and Environmental Impact Statement (Application/EIS).

## Table 31.5-1. Identification and Rationale for Selecting Navigable Waters as a Valued Component

| Subgroup | Valued Component | Identified by* | | | | Rationale for Inclusion |
|---|---|---|---|---|---|---|
| | | AG | G | P/S | O | |
| Human (Social) - Land Use | Navigable waters | | X | X | X | Safe navigation may be affected by Project works with the potential to cause an indirect environmental effect on health and socio-economic conditions under the *Canadian Environmental Assessment Act* (1992).<br>Reduced access to navigable waters is a potential effect of the loss of streams from Project activities/works, which may indirectly affect the ability of recreational and commercial land users, and Aboriginal groups' rights to practise recreational and traditional activities (fishing, hunting, and trapping). |

***AG = Aboriginal Group; G = Government; P/S = Public/Stakeholder; O = Other/professional expertise.**

There are several government sources (labelled "G" in Table 31.5-1) that have indicated that navigable waters should be considered a VC in the Application/EIS effects assessment. Navigable waters was identified in the AIR as a federal government requirement to assess the "potential effects on navigability of waterbodies that may be affected" by the Project (BC EAO 2011). Navigable waters was selected as a VC under the topic of Land Use (Chapter 23) per AIR requirements. Transport Canada also identified navigable waters as a VC to be considered in the Application/EIS, pursuant to the *Canadian Environmental Assessment Act* (1992), as the need to obtain approval under the NWPA (1985) is identified as a Law List Regulations trigger, requiring a federal EA.

Under Canadian common law, navigation is also considered a public right (Section 31.1), so Table 31.5-1 lists navigable waters as a VC identified by the public (P/S) interest.

"AG" is not checked in Table 31.5-1 as Nisga'a Nation and other First Nations did not express, during general consultations, concern regarding Project effects on navigation of freshwater systems in the area of the Project. Nisga'a Nation did indicate interest and use of waters for navigation downstream of the Project in the Nass River; however, navigation in the Nass River and its main tributaries will not be affected by the Project. When asked about navigation, the Skii km Lax Ha (who have the most overlap in their asserted traditional territory with the waterways directly affected by the Project) did not indicate concern on effects to navigation. The Skii km Lax Ha's description of historic navigation in the Project footprint, as described in Section 31.1, indicated that travel or transport through lands intersecting with the Project footprint was done largely via foot rather than water, supporting other desk-based study research that the area underlain by the Project footprint is largely unnavigable due to its rugged alpine and sub-alpine terrain.

### 31.5.2 Valued Components Excluded from Assessment

There are no VCs applicable to navigable waters that have been excluded from this assessment.

## 31.6 Scoping of Potential Effects on Navigable Waters

The KSM Project may affect navigability characteristics within and downstream of Project components and works. Potential effects on navigation by the Project have been raised during EA Working Group meetings by government, and have been identified through baseline research (including a review of case law and stakeholder interviews), and technical expertise/professional judgment (Section 31.3). Two potential indirect effects on navigable waterways within the Unuk and Bell-Irving River watersheds from the construction of Project mine infrastructure and related physical activities have been identified: effects on safe navigation and effects on access to navigable waters and related land use.

Regarding potential navigable waters effects on safety from the KSM Project, pursuant to the *Canadian Environmental Assessment Act* (1992), indirect environmental effects of a project on health and socio-economic conditions must be evaluated in the federal EA. In Bowen v. Canada (1998), the Federal Court found that "aspects of safety," referring to people's safety while navigating, are to be considered as indirect environmental effects on health and socio-economic conditions. For instance, in-stream Project works that may present additional hazards in a navigable water to boaters must be assessed.

Regarding Project effects on access, as elaborated on by Justice Doherty (Section 31.2.1), the test of navigability is that of public utility to use a waterway for some socially beneficial activity from one point of public access to another point of public access (Doherty 1989), implying access rights. Project works that block or eliminate waterways with real or potential travel or transport value may therefore also affect the ability of the public to access navigable waters for traditional Aboriginal, recreational, or commercial activities, thereby affecting land use. For instance, a project that alters the ability of Aboriginal groups to use navigable waterways may result in effects on their ability to access traditional lands and resources to carry out subsistence activities such as fishing, hunting, and trapping.

For all Project phases, Table 31.6-1 identifies which works may cause a potential safety or access effect on waterways deemed navigable using the conservative method applied in Section 31.3. For instance, impediments on the ability to navigate safely may be caused by Project works for bridge and transmission line crossings, and water intake/outflow locations. The total or partial elimination of a navigable waterway (i.e., through the construction of the TMF, WSD, and RSFs) may cause access effects. Per the conservative method employed in Section 31.3 to compare affected waterways to the MWWO (2009), 41 navigable waters sampling sites were carried forward. As such, for all Project phases, indirect effects on navigability (i.e., safety and access) are assessed for nine stream crossings along the CCAR, three[1] creeks in the Mine Site, 11 sites along the TCAR and Treaty Creek transmission line corridor, 14 sites in the PTMA, and 4 sites potentially affected by works associated with fish habitat compensation plans.

[1] As noted in Section 31.3.3.3, to avoid double counting, Mitchell Creek is not listed with the other three Mine Site creeks (McTagg, Sulphurets, and Gringras), although it is also included in the Mine Site assessment.

## Table 31.6-1.  Potential Indirect Effects of Project Works on Navigable Waters

| Project Region | Project Area | Project Works ID No. | Sampling Site No. | Project Work | Waterway | Construction | | Operation | | Closure | | Post-closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Safety | Access | Safety | Access | Safety | Access | Safety | Access |
| Coulter Creek | CCAR | 16 | 5542, 5005 | culverts | Unnamed | X | X | X | | X | | X | X |
| Access Road | | 21 | 5518 | Bridge crossing (C043) | Unnamed | X | X | | | | | X | X |
| (CCAR) | | 23 | 2061 | Bridge crossing (C006) | Coulter Creek | X | X | | | | | X | X |
| | | 24 | 2063 | Bridge crossing (C024) | Unnamed | X | X | | | | | X | X |
| | | 26 | 1025 | Bridge crossing (C010) | Unuk River | X | X | | | | | X | X |
| | | 27 | 5007 | Bridge crossing (C042) | Unnamed | X | X | | | | | X | X |
| | | 29 | 5001 | Bridge crossing (C011) | Gingras Creek | X | X | | | | | X | X |
| | | 30 | 5538 | Bridge crossing (C007) | Mitchell Creek | X | X | | | | | X | X |
| Mine Site | McTagg Rock Storage Facility (RSF) | 35 | 2017 (MCT2) | McTagg Access Road | McTagg Creek | X | X | X | X | | | | |
| | | 36 | 2017 (MCT2) | McTagg Creek Bridge Crossing | McTagg Creek | X | X | X | X | | | | |
| | | 38 | 2017 (MCT2) | McTagg RSF | McTagg Creek | | | X | X | X | X | | |
| | | 40 | 2017 (MCT2) | West McTagg operation channel - south | McTagg Creek | | | X | X | | | | |
| | | 41 | 2017 (MCT2) | West McTagg closure channel | McTagg Creek | | | | | X | X | | |
| | | 42 | 2017 (MCT2) | West McTagg access road | McTagg Creek | | | X | X | X | | X | |
| | | 43 | 2017 (MCT2) | East McTagg closure channel and access road | McTagg Creek | | | | | X | X | | |
| | | 44 | 2017 (MCT2) | North McTagg Diversion Channel | McTagg Creek | | | | X | | X | | X |
| | McTagg Twinned Diversion Tunnels | 46 | 5001 | McTagg phase 3 flood outlet | Gingras Creek | | | | X | | | | X |
| | | 47 | 5001 | McTaggg phase 2 flood outlet | Gingras Creek | | | | X | | | | |
| | | 48 | 5001 | McTagg phase 1 flood outlet | Gingras Creek | | X | | | | | | |
| | | 53 | 5001 | McTagg Twinned Diversion Tunnels | Gingras Creek | | X | | X | | X | | X |
| | | 54 | 5001 | Phase 3 West McTagg Inlet | Gingras Creek | | | | X | | X | | X |
| | | 55 | MCT2 (2017) | Phase 3 West McTagg dam | McTagg Creek | | | | X | | X | | X |
| | | 57 | MCT2 (2017) | Phase 3 East McTagg inlet | McTagg Creek | | | | X | | X | | X |
| | | 58 | MCT2 (2017) | Phase 3 East McTagg dam | McTagg Creek | | | | X | | X | | X |
| | | 59 | MCT2 (2017) | Phase 3 East McTagg dam spillway | McTagg Creek | | | | X | | X | | X |
| | | 60 | MCT2 (2017) | Phase 2 McTagg inlet | McTagg Creek | | | | X | | | | |
| | | 61 | MCT2 (2017) | Phase 2 McTagg dam | McTagg Creek | | | | X | | | | |
| | | 62 | MCT2 (2017) | Phase 2 McTagg dam spillway | McTagg Creek | | X | | X | | | | |
| | | 63 | MCT2 (2017) | Phase 1 McTagg dam | McTagg Creek | | X | | X | | | | |
| | | 64 | MCT2 (2017) | Phase 1 McTagg inlet | McTagg Creek | | X | | X | | | | |
| | McTagg Power Plant | 68 | 2017 (MCT2) | McTagg Power Plant | McTagg Creek | | | X | X | X | X | X | X |
| | Mitchell Rock Storage Facility (RSF) | 69 | 5538 | North Slope pipeline | Mitchell Creek | X | X | | | | | | |
| | | 70 | 5538 | North Slope pipeline access road | Mitchell Creek | X | X | | | | | | |
| | | 72 | 5538 | North Slope collection ditch | Mitchell Creek | | | | X | | X | | X |
| | | 73 | 5538 | North Slope diversion buried pipeline | Mitchell Creek | | X | | X | | | | |
| | | 74 | 5538 | North Slope diversion ditch access road | Mitchell Creek | X | X | | | | | | |
| | | 75 | 5538 | Mitchell North closure channel | Mitchell Creek | | | | | | X | | X |
| | | 76 | 5538 | Upper Mitchell Creek bridge | Mitchell Creek | X | X | X | X | | | | |
| | | 77 | MCT2 (2017) | Mitchell RSF landbridge | McTagg Creek | | | X | X | | | | |
| | | 83 | 5538 | TWT 6 - diversion ditch | Mitchell Creek | | X | | | | | | |
| | | 85 | 5538 | TWT 6 - buried pipeline | Mitchell Creek | | X | | | | | | |
| | | 92 | 5538 | Sulphurets waste conveyor 3 | Mitchell Creek | | | | X | | | | |
| | | 94 | 5538 | Sulphurets waste conveyor 1 | Mitchell Creek | | | | X | | | | |
| | | 96 | 5538 | Mitchell RSF | Mitchell Creek | | X | | X | | X | | |
| | | 98 | 5538 | Mitchell Valley Drainage Tunnel | Mitchell Creek | | | | X | | X | | |
| | | 459 | 5538 | Mitchell North Closure Channel Access Road | Mitchell Creek | | | | | X | X | X | X |
| | | 460 | 5538 | Mitchell Ore Stockpile Feed Conveyor | Mitchell Creek | | | | X | | | | |
| | Mitchell Ore Preparation Complex | 104 | 5538 | Mitchell OPC | Mitchell Creek | | X | | X | | X | | |
| | | 108 | 5538 | Clsoure substation | Mitchell Creek | | X | | | | | | |
| | | 109 | 5538 | 25 kV transmission lines | Mitchell Creek | X | X | X | X | X | X | X | X |
| | | 113 | 5538 | Mitchell OPC snow storage | Mitchell Creek | | | | X | | | | |

(continued)

## Table 31.6-1. Potential Indirect Effects of Project Works on Navigable Waters (continued)

| Project Region | Project Area | Project Works ID No. | Sampling Site No. | Project Work | Waterway | Construction | | Operation | | Closure | | Post-closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Safety | Access | Safety | Access | Safety | Access | Safety | Access |
| Mine Site (cont'd) | Mitchell Pit | 126 | 5538 | Mitchell Pit north wall dewatering adits | Mitchell Creek | | | | X | | X | | |
| | | 127 | 5538 | Mitchell Pit haul road | Mitchell Creek | | | | X | | X | | |
| | | 128 | 5538 | Mitchell Pit closure dam | Mitchell Creek | | | | | | X | | X |
| | | 129 | 5538 | Mitchell Pit closure dam spillway | Mitchell Creek | | | | | | X | | X |
| | | 130 | 5538 | Mitchell Pit Lake discharge pipe | Mitchell Creek | | | | | | X | | X |
| | | 131 | 5538 | Mitchell Pit pre-production ore stockpile | Mitchell Creek | | X | | | | | | |
| | | 132 | 5538 | Mitchell Pit | Mitchell Creek | | X | | X | | X | | |
| | | 134 | 5538 | Mitchell Pit North diversion ditch | Mitchell Creek | | | | X | | X | | |
| | | 135 | 5538 | Mitchell Pit East diversion ditch | Mitchell Creek | | | | X | | X | | |
| | Mitchell Block Cave Mine | 138 | 5538 | Mitchell surface disturbance | Mitchell Creek | | | | X | | X | | X |
| | Mitchell Diversion Tunnels | 146 | 5538 | Mitchell diversion contact water ditch | Mitchell Creek | | X | | | | | | |
| | | 154 | 5538 | Mitchell flood overflow drainage tunnel | Mitchell Creek | | X | | X | | X | | X |
| | | 155 | 5538 | Mitchell Diversion access road | Mitchell Creek | X | X | | | | | | |
| | | 174 | 5538 | Mitchell Diversion outlet access road | Mitchell Creek | X | X | | X | | X | X | X |
| | Upper Sulphurets Power Plant | 177 | SC1 (1011) | upper Sulphurets Power Plant access road | Sulphurets Creek | X | X | | X | | X | | X |
| | | 178 | SC1 (1011) | upper Sulphurets Power Plant | Sulphurets Creek | X | | X | | X | | X | |
| | Water Storage Facility (WSF) | 180 | 5538 | WSF bypass buried pipeline | Mitchell Creek | X | | | | | | | |
| | | 181 | 5538 | WSF snow storage | Mitchell Creek | | | | X | | X | | |
| | | 183 | 5538 | water storage pond | Mitchell Creek | X | X | | X | | X | | X |
| | | 188 | 5538 | WSF Diversion Tunnel | Mitchell Creek | | X | | X | | X | | X |
| | | 190 | 5538 | WSF Construction Access Road | Mitchell Creek | X | X | | | | | | |
| | | 191 | 5538 | WSF construction cofferdams | Mitchell Creek | X | X | | X | | X | | X |
| | | 192 | 5538 | Water Storage Dam (WSD) | Mitchell Creek | X | X | | X | | X | | X |
| | | 199 | 5538 | WSF Pipeline | Mitchell Creek | | X | | X | | X | | X |
| | | 201 | 5538 | WSF seepage dam | Mitchell Creek | X | X | | X | | X | | X |
| | | 202 | 5538 | WSF Seepage collection pond | Mitchell Creek | | X | | X | | X | | X |
| | | 205 | 5538 | temporary construction bridge | Mitchell Creek | X | X | | | | | | |
| | Sludge Management | 220 | 5538 | sludge storage | Mitchell Creek | | | | | | X | | X |
| | Sulphurets Laydown Area | 221 | SC1 (1011) | Sulphurets Access Road | Sulphurets Creek | X | X | | | X | X | | |
| | | 225 | SC1 (1011) | Sulphurets Collection Ditch | Sulphurets Creek | | X | | X | | | | |
| | Kerr Rope Conveyor | 240 | SC1 (1011) | Kerr Rope Conveyor | Sulphurets Creek | | | X | X | X | X | | |
| | Kerr Pit | 242 | SC1 (1011) | Kerr Pit Access Road | Sulphurets Creek | | | X | X | X | X | | X |
| | | 243 | SC1 (1011) | Kerr Pit snow storage | Sulphurets Creek | | | | X | | X | | |
| | | 245 | SC1 (1011) | Kerr Pit | Sulphurets Creek | | | | X | | X | | |
| | | 248 | SC1 (1011) | Kerr Pit dewatering pipeline | Sulphurets Creek | | | X | X | | | | |
| | Sulphurets Pit | 237 | SC1 (1011) | Sulphurets Pit drainage pipeline to selenium treatment | Sulphurets Creek | | | X | X | | | | |
| | | 238 | SC1 (1011) | Sulphurets Pit drainage pipeline to WSF | Sulphurets Creek | X | X | | | | | | |
| | Explosives Manufacturing Facility | 254 | SCT (3007) | Sulphurets Valley Access Road (Ted Morris Bridge) | Ted Morris Creek | X | X | | | X | X | | |
| | | 255 | SC1 (1011) | Sulphurets bridge | Sulphurets Creek | X | X | | | | | | |
| | | 258 | SCT (3007) | closure cover borrow and till storage areas | Ted Morris Creek | | X | | X | | X | | |
| | | 260 | SCT (3007) | explosives access road | Ted Morris Creek | X | X | | | X | X | | |
| | | 461 | SCT (3007) | Till Storage Access Road | Ted Morris Creek | X | X | | | X | X | | |
| Processing and Tailing Management Area (PTMA) | North Cell Tailing Management Facility | 348 | T4 | North cell till stockpile | Teigen Creek reach 4 | | X | | X | | X | | |
| | | 351 | T4 | TWT 9 - sediment control pond | Teigen Creek reach 4 | | X | | X | | X | | |
| | | 352 | T4 | TWT 9 - pipeline | Teigen Creek reach 4 | X | X | | | X | X | | |
| | | 353 | T4 | North Cell seepage collection dam | Teigen Creek reach 4; unnamed | X | X | | X | | X | | X |
| | | 354 | T4, 1110 | North cell seepage collection dam spillway | Teigen Creek reach 4, unnamed | X | X | | X | | X | | X |
| | | 355 | T4, 1110 | North Cell seepage collection pond | Teigen Creek reach 4, unnamed | | X | | X | | X | | X |
| | | 358 | T4 | North Cell starter dam | Teigen Creek reach 4 | X | X | | | | | | |
| | | 359 | T4 | North Dam construction pipeline and cofferdam | Teigen Creek reach 4 | X | X | | | X | X | | |
| | | 360 | T4, 1110 | North Cell dam | Teigen Creek reach 4, unnamed | X | X | X | X | | X | X | X |
| | | 361 | T4 | North Cell borrow area | Teigen Creek reach 4 | | X | | | | | | |
| | | 362 | 1010, 1012 | North cell quarry | Unnamed x 2 | | X | | | | | | |

(continued)

## Table 31.6-1. Potential Indirect Effects of Project Works on Navigable Waters (completed)

| Project Region | Project Area | Project Works ID No. | Sampling Site No. | Project Work | Waterway | Construction | | Operation | | Closure | | Post-closure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Safety | Access | Safety | Access | Safety | Access | Safety | Access |
| Processing and Tailing Management Area (PTMA) (cont'd) | North Cell Tailing Management Facility | 363 | 1010, 1012, 1016, 1017, 1018 | North Cell Waste Pile | Unnamed x 5 | | X | | | | | | |
| | | 365 | T4, T5, 1010, 1012, 1016, 1017, 1018 | North Cell | Teigen Creek reach 4 & 5, Unnamed x 5 | | | X | X | | X | | X |
| | | 366 | T4, T5, 1012 | North cell closure pond | Teigen creek reach 4 and 5, unnamed | | | X | X | X | X | | |
| | | 368 | T4, T5 | gravel beach cover | Teigen Creek reach 4 and 5 | | | | X | | X | | X |
| | East Catchment Diversion | 372 | T4 | Each catchment diversion tunnel portal access road | Teigen Creek reach 4 | X | X | | | | | | |
| | Centre Cell Tailing Management Facility | 388 | T5 | Splitter starter dam | Teigen Creek reach 5 | X | X | | | | | | |
| | | 389 | T5 | Splitter dam construction pipeline and cofferdam | Teigen Creek reach 5 | X | X | | | | | | |
| | | 392 | T6 | reclaim barges (x 2) | Teigen Creek reach 6 | | | X | | X | | X | |
| | | 393 | T6, T7 | Saddle starter dam | Teigen Creek reach 6 & 7 | X | X | | | | | | |
| | | 394 | TR1 | Saddle dam construction diversion | North Treaty Creek reach 1 | X | X | | | | | | |
| | | 395 | TR2 | Saddle dam construction southern diversion | North Treaty Creek reach 2 | X | X | | | | | | |
| | | 396 | TR2 | saddle dam construction diversion access road | North Treaty Creek reach 2 | X | X | | | | | | |
| | | 397 | T8 | Saddle seepage dam construction access road | Teigen Creek reach 8 | X | X | | | | | | |
| | | 398 | T6, T7 | Saddle dam | Teigen Creek reach 6 & 7 | X | X | | X | X | X | | X |
| | | 399 | 1060 | Saddle seepage collection pond | Unnamed | X | X | | X | X | X | | |
| | | 400 | 1060 | saddle seepage collection dam spillway | unnamed | X | X | | X | X | X | | |
| | | 401 | TR2 | Saddle seepage collection dam | N. Treaty Creek reach 2 | X | X | | X | X | X | | |
| | | 404 | TR2 | TWT 14 - pipeline | N. Treaty Creek reach 2 | X | X | X | X | | | | |
| | | 407 | T4, T5 | post-closure gravel beach cover | Teigen Creek reach 4 and 5 | | | | | | | | X |
| | | 408 | T5 | post-closure cell | Teigen Creek reach 5 | | | | | | | | X |
| | South Cell Tailing Management Facility | 409 | TR2 | southeast service road | North Treaty Creek reach 2 | X | X | | | | | X | X |
| | | 410 | TR2 | southeast diversion ditch | North Treaty Creek reach 2 | X | X | | | | | X | X |
| | | 415 | T8, TR1, TR2, 1060 | South Cell | Teigen Creek reach 8, North Treaty Creek reaches 1& 2, Unnamed | X | X | X | X | | | | |
| | | 418 | TR2 | gravel beach cover | North Treaty Creek reach 2 | | | | | | X | | X |
| | | 420 | TR1, TR2 | southeast dam | N. Treaty Creek reach 1& 2 | | | X | X | X | X | | X |
| | | 421 | TR1, TR2 | southeast starter dam | N. Treaty Creek reach 1& 2 | | | X | X | | | | |
| | | 422 | TR1 | southeast dam diversion ditch | North Treaty Creek reach 1 | | | X | X | | X | | X |
| | | 423 | TR1 | south cell seepage reclaim pipeline | North Treaty Creek reach 1 | | | X | X | | | | |
| | | 424 | TR1 | south cell borrow area | North Treaty Creek reach 1 | | | X | X | | | | |
| | | 425 | TR1 | TWT 15 - sediment control structure | N. Treaty Creek reach 1 | | | X | X | | | | |
| | | 427 | TR1 | Treaty Creek closure spillway | N. Treaty Creek reach 1 | | | | | X | X | | X |
| | | 428 | TR1 | southeast seepage collection dam | N. Treaty Creek reach 1 | | | X | X | X | X | | X |
| | | 429 | TR1 | southeast seepage collection pond | N. Treaty Creek reach 1 | | | X | X | | X | | X |
| Treaty Creek Access Road (TCAR) | TCAR | 438 | 143, 141-2, 210, 243, 139 | Treaty Creek access road (TCAR) (culvert) | Unnamed | X | X | | | | X | | X |
| | | 434 | 210 | TCAR culvert; TC Transmission Line | Unnamed | X | X | | | | | | |
| | | 445 | 4011 | North Treaty Creek bridge (R045) (TCAR), Treaty Creek Transmission Line | N. Treaty Creek | X | X | | | | | | |
| | | 446 | 114 | creek crossing R037 (TCAR), Treaty Creek Transmission Line | Unnamed | X | X | | | | | | |
| | | 449 | 244 | creek crossing R036 (TCAR), Treaty Creek Transmission Line | Unnamed | X | X | | | | | | |
| | | 449 | 107 | creek crossing R035 (TCAR), Treaty Creek Transmission Line | Unnamed | X | X | | | | | | |
| | | 451 | 4004 | Bridge crossing (R033), Treaty Creek Transmission Line | Bell-Irving River | X | X | | | | | | |
| | | 466 | 100 | Creek crossing R034a | unnamed | X | X | | | | | | |
| | | 467 | 100 | Creek crossing R034b | unnamed | X | X | | | | | | |
| Fish Habitat Compensation Areas | Fish Habitat Compensation Works | 470 | TEC4 | intake pipe | Teigen Creek | X | X | X | | X | | X | |
| | | 471 | GC1 | intake pipe | Glacier Creek | X | X | X | | X | | X | |
| | | 472 | - | intake pipe | Treaty Creek | X | X | X | | X | | X | |
| | | 473 | - | intake pipe | Taft Creek | X | X | X | | X | | X | |

**Notes:**

**X = the project component is active during that project phase with the potential to cause an effect on safety or access.**

### 31.6.1 Construction

Project construction will involve development activities, including bridge and transmission line construction. As a result, access to navigable watercourses could be restricted while infrastructure is installed. Effects on the ability to safely navigate while construction is on-going may also occur due to the presence of in-stream obstacles. Some components will also be decommissioned during the construction phase (such as the Temporary Construction Bridge, ID# 205 in Appendix 31-A Table 1). While decommissioning activities are occurring during this phase, this may also affect the ability to navigate safely.

### 31.6.2 Operation

Project operations may potentially impact safe navigation due to the presence of in-stream obstacles, overhead power lines, or altered flow conditions due to Power Plant outflows and fish habitat compensation intake pipes. Access to navigable waters during the operation phase of the Project will be limited because of the partial or complete elimination of a number of streams in the Mine Site and in the PTMA. Some components will also be decommissioned during the construction phase (such as ID# 205 [McTagg bridge] and ID# 76 [Upper Mitchell bridge] in Appendix 31-A, Table 1). Safe navigation may also be affected while decommissioning activities are occurring.

### 31.6.3 Closure

Project closure will involve decommissioning of some bridges (i.e., ID# 254 [Sulphurets Valley Access Road bridge over Ted Morris Creek] in Appendix 31-A, Table 1). As a result, access to navigable watercourses while infrastructure is removed could be restricted. Effects on the ability to safely navigate while decommissioning activities are ongoing may also occur due to the presence of in-stream obstacles.

### 31.6.4 Post-closure

The continued presence of some Project works during post-closure—such as the Power Plant outflows and fish habitat compensation intake pipes—may potentially impact safe navigation due to the presence of in-stream obstacles or altered flow conditions. Other permanent works (e.g., the WSF) may lead to the permanent effects on access due to eliminated streams. Some bridges will also involve decommissioning and reclamation activities during the post-closure phase, such as ID #26 (Unuk Bridge in Appendix 31-A Table 1) and other CCAR bridges, which may temporarily affect safe navigation while these activities are ongoing.

## 31.7 Potential for Residual Effects on Navigable Waters and Mitigation

Table 31.6-1 identifies Project works that may potentially cause indirect effects on safety and accessibility relating to navigation. Works include access roads (i.e., CCAR, TCAR), the Treaty Creek transmission line, the TMF (including various dams, ponds, pipelines and roads), pits, RSFs, WSF, the McTagg and Upper Sulphurets power plants in the Mine Site, and fish habitat compensation works. Effects on navigation—whether on safety or access—from Project works manifest as a result of the type of interaction of a particular work with a waterway. Multiple works may combine with each other, and in some cases Transport Canada may deem related works as one work, as per section 3(1), Related Works (NWPA 1985).

In general, indirect effects on safe navigation from a project's works may occur as a result of:

- linear works (i.e., bridges and overhead power lines) that may pose navigational hazards depending on overhead clearance (Project power lines will cross waterways at the same locations as road crossing structures and will be evaluated as part of the road crossing assessment);
- in-stream works such as water intake/outflow pipes, culverts, dams, or bridge supports may pose navigational hazards if they act as partial or complete obstacles (the latter also impeding travel) or reduce waterbody width;
- intake/outflow pipes and diversion dams may increase navigational hazards depending on how they may alter flow conditions from natural background levels; and
- in-stream diversions and dams on Sulphurets and McTagg creeks (which will support the operation of the power plants in the Mine Site) may either increase or decrease annual, low, or peak flow conditions upstream or downstream at various phases of the Project's lifecycle, also causing potential effects on the ability of a user to navigate safely.

Indirect effects from a project's works leading to potential indirect effects on access to navigable waters may occur as a result of:

- works that lead to the elimination of waterways that consequently block access to previously accessible reaches; and
- works (i.e., dams and culverts) that obstruct passage along a waterway (this is a conservative assumption as it is unknown at this time whether portage around obstructions would be possible or not).

Access effects will occur to navigable waters both at the Mine Site (i.e., by the WSF, McTagg and Mitchell RSFs) and the PTMA (i.e., by the TMF), where works will eliminate or obstruct some waterways that were found to be technically navigable under the MWWO (2009) in Section 31.3. For some works the access effects to a navigable water will be temporary in length, occurring only during the construction and decommissioning activities.

## 31.7.1 Accessibility to Safe Navigable Waters

### 31.7.1.1 Safety: In-stream Works

In-stream works which may affect safety while boating on navigable waters include culverts, bridge or transmission line supports, as well as intake and outflow pipes. Some works, while not impeding safety once built (i.e., clear-span bridges), may cause temporary safety effects during construction and decommissioning activities.

Regarding overhead navigation safety for bridges and aerial cables, standards are set in the CAN/CSA-S6-06 Canadian Highway Bridge Design Code (CSA 2006) design specifications, which have been followed for the Project. Supplemental to this standard, the provincial supplementary Bridge Standards and Procedures Manual specifies the following for soffit (lowest part of the underside of bridges) clearance:

> *Unless otherwise approved, the clearance between the soffit and the Q200 design flood elevation shall not be less than 1.5 m for bridges; and not less than 0.5 m on low-volume road bridges for the Q100 flood elevation….For small watercourses capable of carrying only canoes, kayaks and other small craft a clearance of 1.7 m above the 100-year flood level is usually considered to be adequate. For small watercourses less clearance may be considered by Transport Canada if cost and road design factors are affected significantly. Transport Canada, having authority of works over or in Navigable Waters, can require other clearance requirements… Clearances shall be increased for crossings subject to ice flows, debris flows and debris torrents* (BC Ministry of Transportation 2007).

Clear-span bridges minimize effects on fish and aquatic habitat (though they have more effects on riparian habitat), as they are no more than two lanes wide and have no structures placed on the streambed or banks below the high water level (HWL; DFO 2007)[2]. Due to their lack of in-stream works, clear-span bridges are also preferred for navigational purposes as they minimize in-stream safety hazards. The cross-sections in the engineering drawings in Appendix 31-C depict the present water level at the time of measurement for bridge design as well as the Q100 flow event level.

##### *31.7.1.1.1 Coulter Creek Access Road*

The CCAR will be built during the construction phase and will connect to the existing Eskay Creek Mine road, to provide access to mine development activities at the Project Mine Site. The road will be 35-km long with 58 crossings of streams, with nine works over waterways that are considered technically navigable under the MWWO (2009; Table 31.6-1; Appendix 31-A, Table 2; Appendix 31-B). CCAR and its related structures will be decommissioned and reclaimed during post-closure, as access to the Project during this phase will only be via the TCAR. The exception to this is the Mitchell Creek bridge (ID 30, site 5538), which will be permanent. However, since this bridge will be clear-span (Appendix 31-C), it is not anticipated to have safety effects except for during its construction, and these will be mitigated per Transport Canada direction.

No intake or outflow pipes, dams, diversions, or transmission lines are proposed along the CCAR. Two stream crossings (sampling sites 5542 and 5005, unnamed creeks in Table 31.6-1)

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[2] Fisheries and Oceans Canada interprets the HWL as being the visible high water mark where a waterbody's regular flow variation leaves a physical mark for up to a one in five (1:5) year flood interval (DFO 2007), which is the same as the "bankfull" width used in baseline studies (Section 31.3.2). This HWL is considered to be the typical high flow condition faced during navigation. Note though that the engineering drawings in Appendix 31-C depict the Q100 (1:100 year) flow event level, which is the level that engineering standards require overhead clearance for bridges per CSA S6-2006; these conditions would rarely be encountered during navigation.

along the CCAR have been designed to use culverts, which would pose safety hazards were these creeks used for navigation. While baseline studies conservatively indicate that these creeks are technically navigable as they do not fit the criteria for minor waters under the MWWO (2009), photographs (Appendix 31-B) indicate the presence of numerous obstacles and high gradients (over 40% for sampling site 5005) which currently limit their potential for navigation. These creeks are also not publically accessible, nor will they be with the development of the CCAR, as this will be a private use road. It is therefore unlikely that these creeks serve any current or potential public utility for navigation under the Common Law interpretation of navigability (Section 31.2.1).

The other seven crossings along the CCAR will use bridges on the Unuk River, Coulter Creek, Gingras Creek, Mitchell Creek, as well as three unnamed creeks (sampling sites 1025, 2061, 5001, 5538, 2063, 5007, and 5518 respectively from Tables 31.3-1 and 31.6-1). Baseline measurements found that the widest crossing is 71 m (bankfull) across the Unuk River, whereas all other stream crossings range from 6.8 to 17.2 m. All bridges have been designed in accordance with CAN/CSA-S6-06 Canadian Highway Bridge Design Code (CSA 2006) and the Forest Services Bridge Design and Construction Manual (Ministry of Forests and Range 1999), as reported on in the engineering drawings provided in Appendix 31-C. Bridge engineering drawings also report parameters pertaining to navigation safety, such as estimated flow and the clearance of bridge soffits over the Q100 elevation.

Although the results of the MWWO (2009) screening indicate these nine stream crossings meet the technical definition of navigability, as discussed in Section 31.3.3.2.1, photographs (Appendix 31-B) and physical data for crossings at sample sites 2061, 2063, and 5007 (all of which are unnamed creeks) indicate the presence of numerous obstacles which currently limit their practical use as navigable waterways (see Appendix 31-B). Additionally, under the Common Law interpretation of navigability (Section 31.2.1), the rugged and remote terrain as well as the absence of any public access route to or from streams in this area further negates the potential use of any of these streams (except the Unuk River) as an aqueous highway. This is confirmed by the results of baseline studies (including land and resources use) and consultation which suggest that user groups and Aboriginal groups have not used these waterways affected by CCAR components for navigation (see Section 31.1; *Non-traditional Land Use Baseline Report*, Appendix 23-A; First Nations Interests, Chapter 30; Nisga'a Nation Interests, Chapter 29). Therefore, applying the Coleman principles, all eight creeks affected by the CCAR (except for the Unuk River) are considered to not reasonably be of public utility for navigation from one point of public access to another. Consequently, none of these streams are considered navigable, so no residual indirect effects of the Project on access to a navigable water, or on safety while navigating, are anticipated for these eight streams (sites 5542, 5005, 5518, 2061, 2063, 5007, 5001, and 5538).

In contrast, due to its physical characteristics, the Unuk River was deemed technically navigable under the MWWO (2009) in Section 31.3. In addition the Unuk River is also considered navigable using the Common Law interpretation as demonstrated by its public use (Section 31.2.1). For instance, according to baseline studies, the Unuk River is used on occasion for guided freshwater rafting (see *Non-traditional Land Use Baseline Report*, Appendix 23-A).

The Explorer's League holds a commercial recreation licence which it uses to offer a yearly rafting trip, typically in June, for up to 20 individuals.

Potential residual effects to safe navigation in the Unuk River as a result of the Project are most likely to occur during temporary bridge installation activities in the construction phase, and during temporary bridge decommissioning activities in post-closure. The Construction Management Plan (Chapter 26.2) provides methods to reduce or eliminate impacts during placement of the bridge structures, such as appropriate warning devices such as signage and access restrictions (see Mitigation, Section 31.7.1.4). Similarly, the Closure and Reclamation Plan (Chapter 27) and the Traffic and Access Management Plan (Section 26.25) in Chapter 26 list the means of mitigating any potential effects to safety during bridge decommissioning during post-closure. During operations and closure, under normal flow conditions (depicted in Appendix 31-C) there are no residual effects on navigational safety anticipated for the three-span Unuk River bridge as the mid-bridge support structures are above the usual water line. This bridge also has a 2.1-m clearance above the Q100 design level high water mark (depicted in Appendix 31-C), which would not pose overhead hazards for the small vessels typically used in these waters. During higher flow conditions, up to and including the Q100 flow event, there may be obstructions to navigation within the channel from the middle bridge supports. These obstructions are anticipated to present negligible to low effects on safety depending on flow conditions. Transport Canada will provide direction on mitigation measures, such as the use of warning signs.

#### *31.7.1.1.2 Mine Site*

Mine site bridges have been designed in accordance with CAN/CSA-S6-06 Canadian Highway Bridge Design Code (2006) and the Forest Services Bridge Design and Construction Manual (Ministry of Forests and Range 1999), as reported on in the engineering drawings provided in Appendix 31-C. Two permanent and three temporary bridges are planned for the Mine Site (Tables 1 and 2, Appendix 31-A; Table 31.6-1), all of which will be built during the construction phase. The Construction Management Plan (Chapter 26.2) discusses methods, such as putting up warning signage, to reduce or eliminate effects during placement of the works for all these bridges.

The two permanent bridges at the Mine Site will be Ted Morris Creek bridge (ID 254, site SCT [3007]) and Sulphurets Creek bridge (ID 255, site SC1 [1011]). Potential effects on safe navigation are most likely to occur during construction for these two bridges, as well as during the partial reclamation of the Ted Morris Creek bridge, which is scheduled to occur during the closure phase. The three temporary bridges planned in the Mine Site cross Mitchell Creek (ID 76 [upper Mitchell] and 205, site 5538) and McTagg Creek (ID 36, site MCT2 [2017]). All will be built during construction; one (ID 205) will also be decommissioned during construction, and the other two will be decommissioned during operation. As is the case with bridge construction, any effects of decommissioning will be mitigated per direction from Transport Canada. Possible mitigation measures are listed in Chapter 27 Closure and Reclamation.

All Mine Site bridge crossings are located in a remote area with limited potential for navigational use. The rugged terrain, as well as the absence of any public access to or from these streams, hinders the potential use of these streams as aqueous highways from one point of public access to another point of public access (see Section 31.2.1). Data for crossings do not reveal any physical obstacles within the waterways; however, the absence of fish in these streams (see Chapter 15) is an indicator for the presence of natural barriers elsewhere along creeks (such as the one on Sulphurets Creek) that could impede navigation. The absence of fish along these waterways is also likely to diminish the utility in navigating these streams for hunting and fishing purposes as the presence of wildlife along non-fish bearing streams is typically lower. This effect is supported by baseline studies and consultation which indicate that no Nisga'a Nation, First Nation, or other groups have been using these waters for navigation (Non-traditional Land Use, Appendix 23-A; First Nations Interests, Chapter 30; Nisga'a Nation Interests, Chapter 29). Therefore, under the Common Law interpretation of navigability (Section 31.2.1), due to the inability of the public to access these streams and their lack of public utility, none of the streams affected by Project works in the Mine Site are considered navigable. With no use of these waterways, no residual effects to safe navigation from bridges are anticipated in the Mine Site area.

##### *31.7.1.1.3 Treaty Creek Access Road and Transmission Line*

The TCAR will provide permanent Project access from Highway 37 to the PTMA. After being built in the construction phase, the TCAR will continue to be used through to post-closure as it will not be decommissioned like the CCAR. The TCAR will leave Highway 37 approximately 19 km south of Bell II, cross the Bell-Irving River, and follow the north side of the Treaty Creek Valley for approximately 17 km (i.e., the TCAR does not cross Treaty Creek). After a junction at this point, the North Treaty lower road will turn north and follow the west side of the North Treaty Creek Valley for approximately 12 km to the Treaty Ore Preparation Complex. After the same junction, the Treaty Saddle road will head east for 15 km to provide access to the Saddle portal area of the Mitchell-Treaty Twinned Tunnels. The transmission line parallels the TCAR until the junction where it will then run parallel to the Treaty Saddle road.

The TCAR will cross 90 streams, 11 of which baseline studies indicate have been deemed technically navigable in Section 31.3, applying a conservative approach of the MWWO (2009; Appendix 31-A, Table 2; Table 31.6-1, and Appendix 31-B). A total of 7 streams will be crossed with bridges (sample site 100 is representative of an additional un-sampled stream with a bridge crossing), while 5 streams are designed to use culverts. The transmission line will cross 7 streams at the same location as bridge crossings[3].

Five unnamed stream crossings along the TCAR (sites 143, 141-2, 243, 139, and 210) are designed for culverts, which may pose safety hazards were these creeks used for navigation. These waterways are generally very steep, with slope gradients ranging from 16 to 36%, and photographs indicate numerous physical obstacles which prevent reasonable navigable use (see Appendix 31-B) despite being deemed technically navigable through a conservative application of the MWWO (2009) criteria in Section 31.3. Although the main stem of Treaty Creek itself might be accessible by boat from the Bell-Irving River, none of these minor tributaries to Treaty Creek are considered to be generally accessible or of utility to the public. With respect to bridge crossings, baseline data and photographs (Appendix 31-B) indicate

[3] Note that, as shown in Appendix 31-A, Table 2, there are 8 bridge crossings, but one (R034) is duplicate.

obstacles and high gradients ranging from 18 to 34% for unnamed creek crossings 114, 244, 107, and 100 which would prevent the navigable use of these waterbodies. In contrast, data and photographs for North Treaty Creek (4011) indicate that this waterway is technically navigable (Appendix 31-B) under the MWWO (2009). It is not anticipated that the clear-span bridge over North Treaty Creek (Appendix 31-C) would pose safety obstacles and related effects to any potential navigation in this creek except temporary effects during its construction, which could be mitigated per Transport Canada direction.

Baseline studies did not reveal any hunting, trapping, fishing, or other seasonal cabin along the TCAR which could indicate potential navigational use along these streams. In support of this, no Nisga'a Nation, First Nation, or other groups indicated these waterways as being of public utility for navigation (Section 31.1; *Non-traditional Land Use Baseline Report*, Appendix 23-A; First Nations Interests, Chapter 30; Nisga'a Nation Interests, Chapter 29). For instance, as indicated in Section 31.1, the Skii km Lax Ha reportedly use the lower part of Bell-Irving River, but the upper portions are considered too braided and marshy to be used for navigation, though rafts would sometimes be used for crossings such as from the mouth of Treaty Creek on the Bell-Irving to Oweegee Creek. The remote and difficult terrain surrounding North Treaty Creek and the five unnamed creeks, as well as the absence of any public access route to or from these waterways, further negates their potential use for navigation as defined by the Coleman principles under Common Law (Section 31.2.1). With no demonstrated public use of these waterways as aqueous highways, and the pre-existing natural impediments to navigation, no residual effects on navigation related to safety or access for culvert or bridge works on waterways affected by the TCAR are anticipated.

The width, slope, and accessibility from Highway 37, and the known commercial, recreational, and traditional harvesting activities along the Bell-Irving River (sample site 4044) to the north of the TCAR indicate that this waterbody is potentially used for navigation (Non-traditional Land Use Baseline, Appendix 23-A; First Nations Interests, Chapter 30). Potential effects to safe navigation as a result of the Bell-Irving River bridge are predicted to be limited to construction as the TCAR and all related crossings will be maintained through the post-closure phase. The Construction Management Plan (Chapter 26.2) provides methods to reduce or eliminate impacts during placement of all structures (see Mitigation, Section 31.7.1.4). During operations and closure, under normal flow conditions (depicted in Appendix 31-C) there are no residual effects on navigational safety anticipated for the three-span Bell-Irving River bridge as the mid-bridge support structures are above the usual water line. This bridge also has a 3-m clearance above the Q100 design level high water mark (depicted in Appendix 31-C), which would not pose overhead hazards for the small vessels typically used in these waters. During higher flow conditions, up to and including the Q100 flow event, there may be obstructions to navigation within the channel from the middle bridge supports. These obstructions are anticipated to present negligible to low effects on safety depending on flow conditions. Transport Canada will provide direction on mitigation measures, such as the use of warning signs.

In addition to bridges, Project transmission lines have also been designed in accordance with CSA, Transport Canada, and Fisheries and Oceans Canada standards. For example the aerial crossing of the transmission line over the Bell-Irving River (as is over 15 m in width) will follow the CSA C22.3 No. Table 2, and TP 14596 DFO operational statements, as well as Transport Canada AGA – 6.0 Obstruction Marking and Lighting, Clause 6.7 Suspended Cable Span Markings (Chapter 4, Appendix 4-AJ, 287 KV Treaty Creek Transmission Line). As shown in the Appendix 31-C drawing of the proposed transmission line profile along the Bell-Irving River (which has demonstrated public utility for navigation), there will be 23 m of overhead clearance of the line (on top of a 15 m line sag allowance), which actually exceeds the 15 m minimum allowance. Therefore, aside from potential temporary effects during construction which would be mitigated per Transport Canada direction, no effects to safety are anticipated for the transmission line to the Project.

#### *31.7.1.1.4 Processing and Tailing Management Area*

Safe navigation of waterways is not assessed for the PTMA, as proposed infrastructure will eliminate any potentially navigable streams within this area (see Section 31.7.1.2). While elimination of waterways will affect access to potentially navigable waters, no residual effects to safe navigation are anticipated in the PTMA as any potential minor effects on safety where access is blocked to affected waterways would be mitigated per direction from Transport Canada.

#### *31.7.1.1.5 Fish Habitat Compensation Works*

Fish habitat compensation plans are currently preliminary, with design details available for four potential sites (Appendix 31-A, Table 2; Table 31.6-1; Appendix 31-B). All four sites are designed to create off-channel habitat through the creation of a series of ponds. As shown in Figure 31.3-4, these sites are located on Teigen Creek (Teigen Creek 1), Glacier Creek (GC1), Treaty Creek (TC1), and Taft Creek (Taft Creek 1). These designs may require intake pipes in the main channels of Teigen, Glacier, North Treaty, and Taft Creeks to supplement ground and surface water flow to the ponds. Intake pipes as currently designed (Appendix 31-C) do not fit the criteria for minor works due to the proposed size of the pipes. Therefore, pipes may represent obstacles in the channel that may affect the ability to safely navigate the waterway. Intake pipes would be installed during the construction phase and would remain in place in perpetuity.

As described in the conservative application of the MWWO (2009) in Section 31.3, baseline data and photographic evidence indicate that each of the four waterways affected by intake pipes for fish habitat compensation are considered technically navigable. The Glacier Creek and Taft Creek sites are the most publically accessible due to their proximity to Highway 37 and the Bell-Irving River (Figure 31.3-4). Consultation with the Skii km Lax Ha has indicated that the Bell-Irving River becomes braided and not easily navigated in this area; however, potential effects on these creeks will be considered, using a conservative approach. Were these creeks used for navigation, the proposed 16-inch intake pipes may represent an obstacle that could affect safe navigation. Mitigation of some impacts could be achieved through design which would place pipes on the channel bed and provide warning signage in order to direct any potential boaters safely around the obstacle. The quantity of water withdrawal from these intake pipes will be determined during the Project design stage. Permitting requirements limit withdrawals to less than 10% of surface-water flow to avoid potential adverse effects to navigation. The remote terrain, as well as the absence of any public access route to or from the sites at Teigen and North Treaty creeks, limits their public utility for navigation. Confirming this observation, no Nisga'a Nation, First Nation, or other groups identified these waterways as being of public utility for navigation (*Non-traditional Land Use Baseline Report*, Appendix 23-A; First Nations Interests, Chapter 30; Nisga'a Nation Interests, Chapter 29). Consequently, neither of these two streams is considered navigable under Common Law (Section 31.2.1).

### 31.7.1.2 Accessibility: Loss of a Navigable Water

Loss of navigable waters occurs as a result of the elimination of a stream or stream reaches due to the presence of Project infrastructure or significant diversion of water flows. Waterbodies will be completely or partially eliminated at both the Mine Site and PTMA.

#### *31.7.1.2.1 Mine Site*

The construction and installation of components associated with the McTagg and Mitchell RSFs and the WSF will result in-stream flow diversions and elimination of reaches along McTagg and Mitchell creeks (Appendix 31-A, Table 2; Table 31.6-1; Appendix 31-B). Certain components will be developed during the construction phase, while other diversion channels along McTagg Creek will be constructed in stages throughout the life of the Project. Effects on these reaches will be permanent.

In the Mine Site, the MTDT and MDT will route a majority of the non-contact runoff and glacial meltwater around mining components (e.g., Mitchell pit and the Mitchell/McTagg RSFs). As indicated in Section 31.7.1.1.2, McTagg Creek (MCT2 2017) and Mitchell Creek (5538) are located in a remote area with limited historical and future potential for navigational use. As per the Coleman principles and related case law clarifications on navigability (see Section 31.2.1), all the Mine Site creeks are not bounded by points that are publically accessible, which prevents their current and potential use as aqueous highways for travel or transport. Supporting this interpretation, no Nisga'a Nation, First Nation, or other groups indicated that these areas are of public utility for navigational activities (Non-traditional Land Use, Appendix 23-A; First Nations Interests, Chapter 30). Therefore, these creeks are considered not navigable under Common Law, so no residual indirect access effects from waterway losses are predicted within the Mine Site.

#### *31.7.1.2.2 Processing and Tailing Management Area*

The development of the TMF, including cells, dams, and seepage ponds, will be constructed in phases throughout the life of the Project. Effects from the diversion of water will begin in the construction phase. TMF works will cause permanent loss of several reaches of, and tributaries to, South Teigen and North Treaty creeks.

In total, 14 waterways which do not fit the conservatively applied criteria for minor waters under the MWWO (2009) in Section 31.3, will be eliminated as a result of the TMF and related infrastructure (Appendix 31-A, Table 2; Table 31.6-1; Appendix 31-B). Of these, six crossings on unnamed waterbodies (Teigen 6, Teigen 7, 1010, 1012, 1016, and N. Treaty 1) have an average depth less than 0.5 m which could hinder navigation. The photographs and data shown in Appendix 31-B for sites Teigen 7, 1012, 1016, and 1060 indicate that natural stream characteristics related to presence of natural obstacles and stream gradients ranging between 10 and 15.5% also prevent navigability for these reaches. Based on this data, TC might determine that these reaches are not navigable under the MWWO (2009).

Available physical baseline data for the remaining eight stream reaches in the PTMA (i.e., sites North Treaty 2 (TR2), 1060, 1017, 1018, 1110, T4, T5 and T8) indicate that these streams may also be determined as minor waters and therefore technically not navigable by TC under the MWWO (2009), though it is less likely for these reaches than the previous six. However, as with other waterways affected by the Project, all 14 PTMA creeks are also located in a remote area with no general regular public access points over land (Section 31.1). This is confirmed by consultation with the Nisga'a Nation, First Nations, and other user groups that did not indicate navigational use of these waterways (*Non-traditional Land Use Baseline Report*, Appendix 23-A; Nisga'a Nation Interests, Chapter 29; First Nations Interests, Chapter 30). The exception to this is for the Skii km Lax Ha, who indicated that they have established foot trails in the region that they use for traditional use, including through the Teigen and Treaty creek valleys, such as for harvesting activities. While this indicates that there is limited access by foot by this group along these waterways, when asked about navigation in the Project region, the Skii km Lax Ha noted that the only waters they use for navigation are the Bell-Irving River, Bowser Lake/River and Meziadin Lake, indicating that the waterways in the PTMA are generally not useful for navigation (D. Simpson, pers. comm. 2013; Section 31.1.3). Therefore, applying the Coleman principles regarding utility (Section 31.2.1), none of the waterways within the PTMA are considered to be navigable under the Common Law interpretation, and their loss is not anticipated to lead to indirect residual effects on navigational access.

#### 31.7.1.3 Effects from Changes in Flow Volumes

The Project has the potential to affect annual flow volumes by altering subcatchment areas and flow pathways and by inter-catchment water transfers (Surface Water Quantity, Chapter 13). A change in safety of and accessibility to navigable waters may result due to potential changes in flow volumes within specific waterbodies. Change in flow volumes could potentially occur as a result of Project infrastructure or stream diversions downstream of Mine Site works in Sulphurets, McTagg, Mitchell, and Gingras creeks and the Unuk River, and downstream of PTMA works in North Treaty, Treaty and Teigen creeks, and the Bell-Irving River. Change in flow volumes for waterways within the PTMA which would be eliminated as a result of Project development were not assessed.

##### *31.7.1.3.1 Mine Site*

In the Mine Site, the MTDT and MDT will route a majority of the non-contact runoff and glacial meltwater around the mining pits and RSFs. Secondary surface diversion channels will route runoff from local catchments. During the first 30 years of operation while the Mitchell deposit is undergoing open-pit mining, the MDT are provided to divert Mitchell Glacier meltwater to Sulphurets and Gingras creeks. This stage is further subdivided to a start-up phase in the first 10 years of operation when the Mitchell RSF is in operation; a period between 10 to 25 years of operation when the McTagg RSF is constructed; and a transition period between 26 to 30 years of operation. In the next period, Year 30 to 51.5, two additional Mitchell Glacier diversion tunnels will be constructed and enter service in Year 30 when block caving commences.

<u>McTagg Creek</u>

Project components which may affect annual flow volumes within McTagg Creek include the MTDT, which will be built up progressively to support the development of the McTagg RSF, as well as by components to support the operation of the McTagg Power Plant. The McTagg RSF will be developed during operation and will essentially eliminate the original McTagg Creek waterway. Consequently, the McTagg Power Plant is not predicted to physically affect navigability in McTagg Creek, as this waterbody will be eliminated. Non-contact surface water from McTagg Creek will be diverted to the WSF and Gingras Creek beginning in the operation phase. Annual flow volumes for McTagg Creek are presented in Appendix 13-A (*Surface Water Hydrology Assessment Report*).

Mitchell Creek

The MDT will be developed during the construction phase. During operation the MDT will divert Mitchell Glacier meltwater in the creek's upper reaches to Sulphurets and Gingras creeks, as well as to the WSF. As a result, annual flow volumes in Mitchell Creek are predicted to decrease as reported in Chapter 13, Surface Water Quantity, Table 13.7-3. Flow volumes are projected to be reduced by almost 62% over baseline conditions during construction and initial years of operation (Years 0 to 10) as a result of non-contact water diversion around the Project site. Flow reductions will decrease to 50% in years 26 to 30 of operation, changing again to a reduction of about 62% during closure. The post-closure annual flow reduction from the baseline is predicted to be about 54%.

Gingras Creek

Non-contact surface water that will be routed via diversion tunnels from both Mitchell and McTagg creeks to facilitate the development of the Mitchell and McTagg RSFs and the WSF will affect Gingras Creek. Water will begin to be routed permanently into Gingras Creek approximately 1 km from its confluence with Sulphurets Creek during construction. As a result, annual flow volumes within Gingras Creek and downstream of these diversion tunnels are predicted to increase as reported on in Chapter 13, Surface Water Quantity, Table 13.7-3. Flow is projected to increase: by over 364% during construction and the initial part of operation (Year 0 to 10), by approximately 262% between Year 10 to 30, and by about 275% during closure and post-closure. This predicted increase in water flow may improve technical navigability along Gingras Creek downstream of the diversion tunnels (though this creek is not considered to be bounded by points of general public access making it considered not navigable under Common Law).

Sulphurets Creek

Changes in flow volumes within Sulphurets Creek are predicted as a result of Project components such as diversions (to support the operation of the Sulphurets Power Plant). Similar changes in flow are also predicted for Mitchell, McTagg, and Gingras creeks, which feed into Sulphurets Creek. Importantly, although changes will occur to these three Sulphurets tributaries as a result of surface water diversions, all non-contact water originating from these waterbodies will continue to be discharged into Sulphurets Creek; however, most of the water will be supplied via Gingras Creek.

While flows are predicted to increase from about 2 to 23% in the upper reaches of Sulphurets at SC1, farther downstream, effects to flow become negligible. Flow volume changes are projected to: decrease by less than 1% during the operation and post-closure phases; and negligibly increase during Year 1 to 10 by 0.5% for the two downstream sampling locations in Sulphurets Creek (SC2 and SC3; Chapter 13, Surface Water Quantity, Table 13.7-3). During the closure phase, when flows are diverted to fill the Mitchell Pit (i.e., between years 51to 56), the anticipated decreases in annual flow volumes during this period are about 9 and 8% for SC2 and SC3, respectively. This decrease falls within the natural month to month range of flow variation for Sulphurets Creek and is not anticipated to affect its navigability. Finally, no effect to flow volumes is anticipated as a result of the works to support the Power Plant as any surface water diverted for this component will be re-discharged directly back into the creek. As such, Sulphurets Creek (which may be physically navigable but is not considered publically accessible for navigation purposes) is not predicted to experience adverse effects to potential navigation downstream of the Mine Site.

Unuk River

There are no Project works which intersect directly with the Unuk River that directly could affect flow volumes. However, flow volumes may be affected as a result of Project-related changes to flow volumes on tributaries within the Unuk River's upstream environment, including McTagg, Mitchell, Gingras, and Sulphurets creeks. Project effects on annual flow volumes in the Unuk River, as reported in Chapter 13, Surface Water Quantity, Table 13.7-5, are significantly less than those on affected Mine Site waterways. The effects are negligible during construction, operation, and post-closure, ranging from 0.0% to less than 0.3% compared to baseline volumes during these phases. During the closure phase, a change of 1.74 $m^3/s$ in annual flow volumes is anticipated due to water diversions for the flooding of the Mitchell Pit. This equates to a maximum decrease of 3.5% in water flow volumes at UR1, diminishing to 1.7% at UR2 (Chapter 13, Surface Water Quantity, Table 13.7-5), which falls within the natural month to month flow distribution for the Unuk River. No residual effects to navigation on the Unuk River are predicted as a result of this change in flow volumes.

Conclusion: Mine Site

As indicated in Section 31.7.1.1, Mitchell, McTagg, Gingras, and Sulphurets creeks are located in a remote area with limited potential for navigational use. The lack of public access points for use of any of these creeks as aqueous highways, as defined by the Coleman principles and subsequent case law clarifications (Section 31.2.1), does not support the definition of navigability applicable to these creeks under Common Law. McTagg, Mitchell, and Gingras creeks are also located in areas with restricted public access during construction, operation and closure, further hindering the future potential for navigation. In support of this interpretation of navigability, no Nisga'a Nation, First Nation, or other groups indicated these creeks as being of public utility (Section 31.1; Non-traditional Land Use, Appendix 23-A; First Nations Interests, Chapter 30). With no demonstrated historical or future public navigational use of these waterways, no residual effects to navigational access or safety are predicted as a result of any change in water flow within Mine Site waterways. In addition, no residual indirect effects on safety or access are predicted from changes in flows to the Unuk River, as these flows are anticipated to be negligible and within the normal background variation. Processing and Tailing Management Area Downstream Environment

South Teigen and Teigen Creeks

The development of the TMF and water diversion infrastructure is predicted to reduce water flows in South Teigen and Teigen creeks, as reported in Chapter 13, Surface Water Quantity,

Table 13.7-2. A maximum annual flow reduction during operation up to Year 45 of about 27% occurs at South Teigen immediately below the TMF (STE2). During the same time, the decrease in flow volume becomes less pronounced (19%) at the confluence of Teigen and South Teigen creeks (STE3), and even less pronounced (5%) on Teigen Creek (TEC2). During closure, the South Teigen STE2 and STE3 site flow differences are negligible at -.5% and 0.1% respectively, becoming more pronounced (at about -7% and -4% respectively) in post-closure. Further downstream in Teigen Creek, the post-closure flow effects of the Project diminish to a 1% flow reduction.

North Treaty and Treaty Creeks

Similar to the effects on the Teigen Creek system, the effect on annual flow volumes at downstream locations of Treaty Creek is less than those of upstream sites, as reported on in Chapter 13, Surface Water Quantity, Table 13.7-2. For example, the maximum change in flow volume projected across all Project phases is about a 75% reduction in annual flow, and is seen at North Treaty creek (NTR1A) during closure (Years 51.5 to 56). This effect diminishes downstream to -30% at NTR2 (at the confluence of North Treaty and Treaty creeks) and 0.5% at Treaty Creek (TRC2). During the construction and operation phases, annual flow volumes on North Treaty Creek (NTR2) are projected to be -4% during Year 0 to 24, -23% during Year 25 to 30 and 45 to 51.5, and 10% during Year 30 to 45. During this same time the change in flow downstream at TRC2 is projected to range from -1.5 to 1.2%. The post-closure effect on Treaty Creek (TRC2) is predicted to be a 0.1% reduction in annual flow. These change in flows predicted for the Treaty Creek mainstem are considered to be negligible compared to background variation.

Bell-Irving River

There are no Project works which could directly affect flow volumes within the Bell-Irving River, as it is downstream of the PTMA. However, flow volumes may be affected as a result of Project-related changes to flow volumes on tributaries within the upstream environment, including Teigen and Treaty creeks. Effects of the Project on annual flow volumes at Bell-Irving River sites are reported on in Chapter 13, Surface Water Quantity, Table 13.7-4. Flow changes in this river are significantly less than those localized upstream in Teigen and Treaty creeks. Reductions in annual flow volumes at Bell-Irving River sites downstream of Teigen (BIR1B) and Treaty (BIR2) creeks are projected at 0.4 and 0.2%, respectively, during both construction and operation. Negligible flow changes are predicted during closure of 0% and an increase of 0.1% for BIR1B and BIR2, respectively. During the post-closure phase, the effects continue to be negligible (less than 0.1 % reduction in flow volume) at both locations. Hence, no indirect navigation safety or access residual effects on the Bell-Irving River are predicted as a result of Project effects on flow volumes in affected upstream waterways.

Conclusion: Processing and Tailing Management Area

The maximum effects to annual flow on Teigen and Treaty mainstem creeks are about -5 and 2%, respectively, for all Project phases. These changes fall well within the monthly flow distribution for these waterbodies and are not anticipated to adversely affect navigational access or safety in these waterways. More pronounced flow effects are projected for upstream reaches in North Treaty and South Teigen creeks; however, available baseline data for the PTMA waterways suggest that these may be technically navigable under the MWWO (2009). Both

North Treaty and South Teigen creeks, however, are located in a remote area with no public utility to reasonably use them as aqueous highways for travel or transport from one area of public access to another. In support of this interpretation of navigability, no Nisga'a Nation, First Nation, or other groups—including the Skii km Lax Ha who have foot trails in the area (Section 31.7.1.2.2)—indicated these creeks as being of utility for navigation (Section 31.1; Non-traditional Land Use, Appendix 23-A; Nisga'a Nation Interests, Chapter 29; First Nations Interests, Chapter 30). As such, neither of these streams meets the criteria for navigability under Common Law (see Section 31.1.2). Consequently, no residual effects to navigable waters are predicted as a result in changes to flow volume within the downstream environment of the PTMA. Although the Bell-Irving River is demonstrably navigable to a degree, changes in flow are anticipated to be negligible and therefore are not anticipated to lead to indirect effects on safety or access to navigation.

##### *31.7.1.3.2 Fish Habitat Compensation Sites*

The quantity of water withdrawal from the intake pipes will be determined during the Project design stage. Permitting requirements limit withdrawals to less than 10% of surface water flow to avoid potential adverse effects to fish and navigation. Therefore, no residual effects on safety or access to navigation are predicted for any of the Fish Habitat Compensation locations, as any changes to flow will be within the range of natural stream flow fluctuation.

#### 31.7.1.4 Mitigation to Improve Accessibility to Safe Navigable Waters

Project mitigation measures to minimize any potential adverse indirect effects on navigational safety or access are planned prior to Project commencement through engineering design and during the life of the Project through management practices (e.g., control and/or reduction techniques such as temporary access restrictions and signage).

All Project bridges, including the three-span Unuk and Bell-Irving bridges, will be built to CAN/CSA-S6-06 (CSA 2006) standards and the Forest Services Bridge Design and Construction Manual (Ministry of Forests and Range 1999), which incorporate design criteria such as minimum overhead clearance to ensure navigational safety. In addition, most of the Project bridges will be clear-span (as illustrated in Appendix 31-C drawings), and will therefore not have any in-stream works that may pose potential safety hazards to navigation. The Project has also been designed to minimize the effects on stream flow and waterways in general in the selection of the TMF site from other alternative locations (Chapter 33).

Safe access may be temporarily limited to waterbodies affected by Project works during their construction or decommissioning. Most waterbodies crossed by access roads are not expected to be determined navigable by Transport Canada due to physical characteristics (e.g., high slope and natural obstacles), or under the Common Law interpretation of navigability based on no to low accessibility of the waterway and related public utility. Mitigation of temporary construction effects is provided by the Construction Management Plan (Chapter 26.2), such as follows Transport Canada standards to ensure safe navigation. Construction designs for major Project bridges are shown in Appendix 31-C. Typical bridge designs for other crossings are shown in Appendix 15-R (*KSM Project: Fish Habitat Compensation Plan* [Rescan 2012]). Some waterway crossings that were conservatively deemed technically navigable based on

MWWO (2009) screening criteria are currently planned to be crossed via culverts. However, no adverse residual safety or access effects are anticipated for these reaches as they have been deemed to have numerous obstacles, high stream gradients, or are situated in inaccessible locations of no to low public utility. Nevertheless, if mitigation is deemed required for these waterways by Transport Canada, it will be implemented as part of the Project.

Three transmission line crossings do not fit the criteria for minor works, as the waterbodies are greater than 15 m bankfull width; however, these crossings have all been designed to ensure no impediment to navigation (Section 31.7.1.1.3, Appendix 31-C figures). This includes sufficient height of cables above the high water mark and avoiding placement of towers or poles within the water. Construction of the power line will also follow the Fisheries and Oceans Canada operational statement for overhead lines, primarily designed to protect in-stream fish habitat, so adherence to the statement will also mitigate potential navigation effects. Potential effects on access are also mitigated through the implementation of regulations under the NWPA (1985) that guide construction and activities to ensure navigability is maintained.

A general design drawing of the intake pipes is also shown in Appendix 31-C. If the placement of intake or outflow pipes (used to support components such as power plants and fish habitat compensation) presents an impediment to navigation in affected waterways, mitigation will be provided by further Project design refinements and the Construction Management Plan (Chapter 26.2). These measures will prevent and control access to navigational hazards by following best management practices and industry standards, such as those provided by Transport Canada. After mitigation is implemented, potential minor residual effects to safety may remain for any of the four affected reaches deemed navigable by Transport Canada.

Project construction will include the development of works that will eliminate certain waterways. Mitigation for this effect has been provided by the design of the Mine Site infrastructure and PTMA to affect as few waterbodies as possible. The elimination of a waterway may lead to loss of access to land use by recreational, commercial, or Aboriginal groups, but only if the waterway has reasonably demonstrated to be navigable technically by Transport Canada, or shown to be of public utility as a means of travel or transport from one point of public access to another (Section 31.2.1). As described in Section 31.7.1.2, the waterways that will be lost as results of the Project are not publically accessible and do not have demonstrated public utility for navigation, and many have physical characteristics that also minimize their navigability. It is therefore anticipated that these waterways are not navigable, and that their loss will not lead to indirect effects on access to navigation and related land use, and that mitigation will not be required for potential access effects.

A variety of diversion, collection, and water treatment structures will be required to manage surface water on the KSM Project site. Mitchell Glacier diversion works will divert non-contact water from underneath the glacier by sub-glacial inlets into diversion tunnels for discharge into Sulphurets Creek. McTagg diversion works will divert non-contact water to Gingras Creek. Diversion channels in the Mine Site route non-contact water to either the MDT or MTDT, or to Mitchell Creek downstream of the WTP. Extensive mitigation to avoid changes to surface water quantity was included in the design for the Project, as presented in the Water Management Plan (Section 26.17). For instance, to reduce water losses within the diversion channels, rock-based sections of the diversions will be shotcreted or paved with an asphalt liner, where necessary. Within the PTMA, non-contact diversion ditches on both valley walls will direct flow north into Teigen Creek via South Teigen Creek; the diversions are designed to supplement flows potentially altered as a result of the TMF. During post-closure, drainage patterns will be re-established to pre-mining configurations. All diversion channels, except for local diversions around seepage ponds, will be removed.

#### 31.7.1.5 Potential for Residual Effects

Six residual effects on navigation for the Project anticipated following mitigation (Table 31.7-1) are: four temporary indirect safety and access effects on the Bell-Irving and Unuk rivers, and two indirect safety effects from intake pipes on Taft and Glacier creeks (if deemed navigable by Transport Canada).

Navigation on the Unuk River will be affected by building (during construction) and decommissioning (post-closure) activities of the CCAR Bridge, associated with temporary access restrictions and safety obstacles at the site. The bridge may also create residual safety effects during infrequent periods of high flow, during which mid-bridge supports would act as in-stream works and obstacles. These residual effects are most likely to be experienced by river rafters with the Explorers League—the single identified commercial recreation user—and any other potential future users, but these safety effects are unlikely as most rafting would be done during warm months with lower flows. No other commercial, recreational, or subsistence user groups were identified during baseline studies as being potentially affected by these temporary residual effects.

Construction of the TCAR Bridge Crossing over the Bell-Irving River is expected to create similar residual effects on navigation related to access and safety as the Unuk River bridge. However, as this crossing will be permanent it will not have temporary effects during decommissioning. Recreational and commercial anglers along the Bell-Irving River, Aboriginal users, and other potential commercial users may be adversely affected by any temporary changes in navigation at this crossing.

Finally, water intake pipes on Glacier and Taft creek designed for the Fish Habitat Compensation may potentially result in residual indirect safety effects on navigation due to the creation of obstacles within these waterways by the intake pipes. How pronounced these residual effects will be depends on which, if any, of these waterways will be deemed navigable by Transport Canada. Although considered navigable under the MWWO (2009), there are no known current commercial, recreational, or Aboriginal individuals or groups who use these streams for navigation, and their physical characteristics and accessibility also preclude their public utility for navigation.

## 31.8 Significance of Residual Effects for Navigable Waters

Residual effects of the Project are characterized in terms of magnitude, geographic extent, duration, frequency, reversibility, context, probability, and confidence in order to assess the significance of residual effects on navigable waters. Significance of residual effects was determined using the definition and logic in Table 31.8-1 as well as professional judgement. A detailed description of the effects assessment methodology, logic, variables, and significance criteria are provided in Chapter 5 of the Application/EIS.

## Table 31.7-1. Residual Effects on Navigability

| VC | Timing of Effect | Project Area(s) | Component(s) | Description of Effect due to Component(s) | Type of Project Mitigation | Potential Residual Effect | Description of Residuals |
|---|---|---|---|---|---|---|---|
| *Effects on Access* | | | | | | | |
| Navigable Waters | Construction, Post-closure | CCAR | CCAR Bridge Crossing over the Unuk River | Construction activities related to installation of bridge may temporarily restrict access on the Unuk River. Decommissioning of bridge during post-closure may temporarily restrict access to the Unuk River. | Temporary Access Restrictions, Engineering design, Management Practices, Monitoring and Adaptive Management | Yes | *Temporary reduction in ability to access and use a section of the Unuk River during specific periods of these phases.* |
| Navigable Waters | Construction | TCAR | TCAR Bridge Crossing over the Bell-Irving River | Construction activities related to installation of bridge may temporarily restrict access on the Bell-Irving River. | Temporary Access Restrictions, Engineering design, Management Practices, Monitoring and Adaptive Management | Yes | *Temporary reduction in ability to access and use a section of the Bell-Irving River during specific periods of construction.* |
| *Effects on Safe Navigation* | | | | | | | |
| Navigable Waters | Construction, Post-closure | CCAR | CCAR Bridge Crossing over the Unuk River | Construction activities related to installation of bridge may temporarily affect safe navigation on the Unuk River at the crossing. Decommissioning of bridge during post-closure may temporarily affect safe navigation. | Temporary Access Restrictions, Engineering design, Management Practices, Monitoring and Adaptive Management | Yes | *Temporary reduction in ability to safely access and use a section of the Unuk River during specific periods of these phases.* |
| Navigable Waters | Construction | TCAR | TCAR Bridge Crossing over the Bell-Irving River | Construction activities related to installation of bridge may temporarily affect safe navigation on the Bell-Irving River at the crossing. | Temporary Access Restrictions, Engineering design, Management Practices, Monitoring and Adaptive Management | Yes | *Temporary reduction in ability to safely access and use a section of the Bell-Irving River during specific periods of construction.* |
| Navigable Waters | Construction, Operation, Closure, Post-closure | Fish Habitat Compensation Sites | Glacier Creek and Taft Creek water intake pipes | Intake pipes would represent an obstacle in the channel and may affect the ability to safely navigate the waterbody. | Temporary Access Restrictions, Engineering design, Management Practices, Monitoring and Adaptive Management | Yes | *Intake pipes would continue to act as an obstacle in the channel which may affect safe navigation.* |

All residual effects of the Project on navigation are described in Table 31.8-2. Six potential residual adverse effects have been identified: two relate to temporary reduced navigation safety at bridge crossings for the Unuk and Bell-Irving rivers during specific Project phases, two relate to temporary access restrictions to navigable waters for these same waterways, and two relate to potentially reduced navigation safety from intake pipes to support Fish Habitat Compensation sites throughout all Project phases for Taft and Glacier Creeks if deemed navigable by Transport Canada.

Residual effects of the Project on the Unuk and Bell-Irving rivers are predicted during the construction and post-closure phases as follows: 1) temporary restrictions on access to navigation along sections of the Unuk River during bridge construction and decommissioning, 2) temporary reduction in safe navigation along sections of the Unuk River due to bridge construction and decommissioning, 3) temporary restrictions on access to navigation along sections of the Bell-Irving River due to bridge construction, and 4) a temporary reduction in safe navigation along sections of the Bell-Irving River due to bridge construction. Potential residual effects on safety are also associated with the fish habitat compensation intake pipes, in particular if Glacier and Taft creeks are determined to be navigable by Transport Canada.

#### 31.8.1.1 Safe Navigation

Project infrastructure, notably bridges, will reduce or alter safe navigation on portions of the Unuk and Bell-Irving rivers. This effect would occur in the early periods of construction for both rivers, as well as during decommissioning activities at post-closure for the Unuk River bridge crossing. Water intake pipes in Glacier and Taft creeks are expected to create an obstacle that may reduce or alter safe navigation. This effect would occur during construction, operation, and closure.

During construction and closure along the Unuk River, the effect on safe navigation is assessed to be negligible in magnitude due to the very limited seasonal use of the river by a single commercial rafting operator. The effect is local in extent as it is limited to the footprint of the bridge crossing, and of short duration with sporadic frequency due to the brief temporal nature of bridge construction. Temporary effects are predicted to be reversible in the short-term. The effect is similar for construction on the Bell-Irving River, though ranked low in magnitude due to the Bell-Irving River being more publically accessible for navigation purposes.

The effect on safe navigation of Glacier Creek and Taft Creek is considered negligible, as the intake pipes will not substantially impede the flow of water or crafts, and local in extent as it is limited to the site of the intake pipes. The effect will extend into the far future (permanent) and be of continuous frequency as it will persist through the Project's construction, operation, closure, and post-closure phases.

Each of these effects on safe navigation is predicted to have a high probability of occurrence, with a high level of confidence in the assessment for all phases. The residual indirect adverse effects of the Project navigational safety are predicted to be **not significant (minor)** for all phases.

## Table 31.8-1. Definitions of Significance Criteria for Residual Effects on Navigation

| **Timing** What phase of the Project is the effect associated with? | **Magnitude** (negligible, low, medium, high) | **Geographic Extent** (local, landscape, regional, beyond regional) | **Duration** (short-term, medium-term, long-term, far future) | **Frequency** (once, sporadic, regular, continuous) | **Reversibility** (reversible short-term, reversible long-term, or irreversible) | **Context** (ecological resilience and/or unique attributes) (low, neutral, high) | **Probability** (low, medium, high) | **Confidence** (low, medium, high) | **Significance** (Not Significant: minor, moderate; Significant: major) | **Follow-Up Monitoring** (Not required, required) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Construction** | **Negligible.** There is no detectable change from baseline conditions on navigable waters. | **Local.** The effect is limited to the project footprint. | **Short term**. The effect lasts approximately 1 year or less. | **Once.** The effect occurs once during any phase of the project. | **Reversible short-term:** An effect that can be reversed relatively quickly. | **Low**. The valued component is considered to have little to no unique attributes and/or there is high resilience to imposed stresses. | **Low.** An effect is unlikely but could occur. | **Low** (< 50% confidence). The cause-effect relationship between the project and its interaction with the environment is poorly understood; data for the project area may be incomplete; uncertainty associated with synergistic and/or additive interactions between environmental effects may exist. High degree of uncertainty. | **Not Significant (minor).** Residual effects have no or low magnitude, local geographical extent, short or medium-term duration, and occur intermittently, if at all. There is a high level of confidence in the conclusions. The effects on the VC (at a population or species level) are indistinguishable from background conditions (i.e., occur within the range of natural variation as influenced by physical, chemical, and biological processes). Land use management objectives will be met. Follow-up monitoring is optional. | **(Not required, required)** |
| **Operations** | **Low.** The magnitude of effect on navigable waters differs from the average value for baseline conditions. | **Landscape.** An effect extends beyond the project footprint to a broader watershed area. | **Medium term.** The effect lasts from 1 – 11 years. | **Sporadic.** The effect occurs at sporadic or intermittent, intervals during any phase of the project. | **Reversible long-term:** An effect that can be reversed after many years. | **Neutral.** The valued component is considered to have some unique attributes, and/or there is neutral (moderate) resilience to imposed stresses. | **Medium.** An effect is likely but may not occur. | **Medium.** (50 – 80% confidence): The cause-effect relationship between the project and its interaction with the environment is not fully understood, or data for the project area is incomplete: moderate degree of uncertainty. | **Not Significant (moderate).** Residual effects have medium magnitude, local, landscape or regional geographic extent, are short-term to chronic (i.e., may persist into the far future), and occur at all frequencies. Residual effects on VCs are distinguishable at the population, community, and/or ecosystem level. Ability of meeting land use management objectives may be impaired. Confidence in the conclusions is medium or low. The probability of the effect occurring is low or medium. Follow-up monitoring of these effects may be required. | **(Not required, required)** |
| **Closure** | **Medium.** The magnitude of effect on navigable waters differs from the average value for baseline conditions and approaches the limits of natural variation, but below or equal to a guideline or threshold value. | **Regional.** The effect extends across the Regional Study Area. | **Long term.** The effect lasts between 12 and 70 years. | **Regular.** The effect occurs on a regular basis during, any phase of the project. | **Irreversible.** The effect cannot be reversed. | **High.** The valued component is considered to be unique, and/or there is low resilience to imposed stresses. | **High**. An effect is highly likely to occur. | **High**. There is greater than 80% confidence in understanding the cause-effect relationship between the project and its interaction with the environment, and all necessary data is available for the project area. There is a low degree of uncertainty. | **Significant (Major).** Residual effects have high magnitude, regional or beyond regional geographic extent, are chronic (i.e., persist into the far future), and occur at all frequencies. Residual effects on VCs are consequential (i.e., structural and functional changes in populations, communities and ecosystems are predicted). Ability to meet land use management objectives is impaired. Probability of the effect occurring is medium or high. Confidence in the conclusions can be high, medium, or low. Follow-up monitoring is required. | **Required** |
| **Post-Closure** | **High.** The magnitude of effect on navigable waters is predicted to differ from baseline conditions and exceed guideline or threshold values so that there will be a detectable change beyond the range of natural variation (i.e., change of state from baseline conditions). | **Beyond Regional**: The effect extends possibly across or beyond the province. | **Far Future: The** effect lasts more than 70 years. | **Continuous.** An effect occurs constantly during any phase of the Project. | | | | | | |

## Table 31.8-2. Summary of Residual Effects on Navigability

| Description of Residual Effect | Project Component (s) | Timing of Effect | Magnitude | Extent | Duration | Frequency | Reversibility | Context | Likelihood of Effects | | Significance Determination | Follow-up Monitoring |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Probability | Confidence Level | | |
| *Temporary reduction in ability to access and use a section of the Unuk River during specific periods of these phases.* | CCAR Unuk River Bridge Crossing | Construction, Post-closure | Negligible | Local | short | Sporadic | Reversible short-term | Neutral | High | High | Not Significant (Minor) | Not Required |
| *Temporary reduction in ability to access and use a section of the Bell-Irving River during specific periods of construction.* | TCAR Bell-Irving River Bridge Crossing | Construction | Low | Local | short | Sporadic | Reversible short-term | Neutral | High | High | Not Significant (Minor) | Not Required |
| *Temporary reduction in ability to safely use a section of the Unuk River during specific periods of these phases.* | CCAR Unuk River Bridge Crossing | Construction, Post-closure | Negligible | Local | short | Sporadic | Reversible short-term | Neutral | High | High | Not Significant (Minor) | Not Required |
| *Temporary reduction in ability to safely use a section of the Bell-Irving River during specific periods of construction.* | TCAR Bell-Irving River Bridge Crossing | Construction | Low | Local | short | Sporadic | Reversible short-term | Neutral | High | High | Not Significant (Minor) | Not Required |
| *Intake pipes would continue to act as an obstacle in the channel of Taft and Glacier creeks which may affect safe navigation.* | Fish Habitat Compensation Sites | Construction, Operation, Closure, Post-closure | Negligible | Local | Far future | Continuous | Reversible short-term | Neutral | High | High | Not Significant (Minor) | Not Required |

#### 31.8.1.2 Accessibility

Project infrastructure, notably bridges, will reduce the accessibility of navigable waters at the same portions of the Unuk and Bell-Irving rivers. Similarly, this effect would occur at both rivers only in the early periods of construction, as well as at the Unuk River bridge crossing during post-closure decommissioning activities.

During construction and decommissioning/reclamation activities (during the construction and post-closure phases, respectively) along the Unuk River, the effect on accessibility is assessed to be negligible in magnitude due to the very limited seasonal recreational use. The effect is local in extent as it is limited to the footprint of the bridge crossing, and of short duration with sporadic frequency due to the brief temporal nature of bridge construction. Temporary effects are predicted to be reversible in the short-term. The effect is similar for construction on the Bell-Irving River, though low in magnitude due to the higher accessibility and potential for navigation than for the Unuk River.

The effects for all phases are predicted to have a high probability of occurrence, with a high level of confidence in the assessment for all phases. The residual indirect adverse effects of the Project on change in accessibility to navigable waters are predicted to be **not significant (minor)** for all phases.

#### 31.8.1.3 Overall Effect on Navigable Waters

Due to the temporary, minor, and non-significant residual effects of Project infrastructure on the safety and accessibility of navigation on the Unuk and Bell-Irving rivers, and potentially on Glacier and Taft creeks, the overall effect of Project infrastructure on navigable waters is assessed as **not significant (minor).**

## 31.9 Cumulative Effects Assessment for Navigable Waters

Six Project-related residual effects are anticipated for navigability: change in safety on each of the Bell-Irving and Unuk rivers as well as Glacier and Taft creeks, and change in accessibility on the Bell-Irving and Unuk rivers. These residual effects are minor and non-significant but could potentially combine with the effects of other projects and/or land uses to create cumulative effects.

### 31.9.1 Scoping of Potential Cumulative Effects

This section identifies the past, present, and/or potential and reasonably foreseeable future projects and activities that, along with the KSM Project, hold the potential to create cumulative effects on navigability on the Unuk and Bell-Irving rivers, as well as Glacier and Taft creeks.

#### 31.9.1.1 Spatial Linkages with other Projects and Human Land Use Activities

The scope of the cumulative effects analysis is limited to past, present, and reasonably foreseeable future activities whose effects hold the potential to interact spatially and temporally with the KSM Project. The identification of activities that may interact spatially with the KSM Project is based on the RSA for the navigation effects assessment. Selection of activities that hold the potential to interact temporally with the KSM Project is based on the temporal co-occurrence of potential effects. Table 31.9-1 presents projects[4] and human activities located within the navigation effects assessment RSA, and identifies those that are likely to interact with the KSM Project. Figure 31.9-1 displays the projects whose effects overlap spatially and temporally with the KSM Project.

### Table 31.9-1. Summary of Potential Linkages between KSM Project and other Human Actions Regarding Navigable Waters

| Action/Project | Past, Present and Future |
|---|---|
| *Past Projects* | |
| Eskay Creek Mine | X |
| Granduc Mine | NL |
| Johnny Mountain Mine | NL |
| Kitsault Mine (Closed) | NL |
| Snip Mine | NL |
| Sulphurets Project | X |
| Swamp Point Aggregate Mine | NL |
| *Present Projects* | |
| Forrest Kerr Hydroelectric | NL |
| Long Lake Hydroelectric | NL |
| Northwest Transmission Line | X |
| Red Chris Mine | NL |
| Wolverine Mine | NL |
| *Reasonably Foreseeable Future Projects* | |
| Arctos Anthracite Coal Project | NL |
| Bear River Gravel | NL |
| Bronson Slope Mine | NL |
| Brucejack Mine | X |
| Galore Creek Mine | NL |
| Granduc Copper Mine | NL |
| Kitsault Mine | NL |
| Kutcho Mine | NL |
| McLymont Creek Hydroelectric | NL |
| Schaft Creek Mine | NL |
| Snowfield Project | X |
| Storie Molybdenum Mine | NL |
| Turnagain Mine | NL |
| Treaty Creek Hydroelectric | X |

**(continued)**

[4] See Section 5.3 for detailed descriptions of these projects and activities.

## Table 31.9-1. Summary of Potential Linkages between KSM Project and other Human Actions Regarding Navigable Waters (completed)

| Action/Project | Past, Present and Future |
|---|---|
| *Land Use Activities* | |
| Agricultural Resources | NL |
| Fishing | X |
| Guide Outfitting | X |
| Resident and Aboriginal Harvest | X |
| Mineral and Energy Resource Exploration | NL |
| Recreation and Tourism | X |
| Timber Harvesting | NL |
| Traffic and Roads | NL |

**NL = No Linkage (no spatial and temporal overlap, or potential effects do not act in combination)**
**X = Potential spatial and temporal linkage with project or action**

Past projects which are likely to interact with the KSM Project include the:

- Eskay Creek Mine; and
- Sulphurets Project.

Current projects which are likely to interact with the KSM Project include the Northwest Transmission Line.

Reasonably foreseeable future projects which are likely to interact with the KSM Project include the:

- Brucejack Mine;
- Snowfield Project; and
- Treaty Creek Hydroelectric.

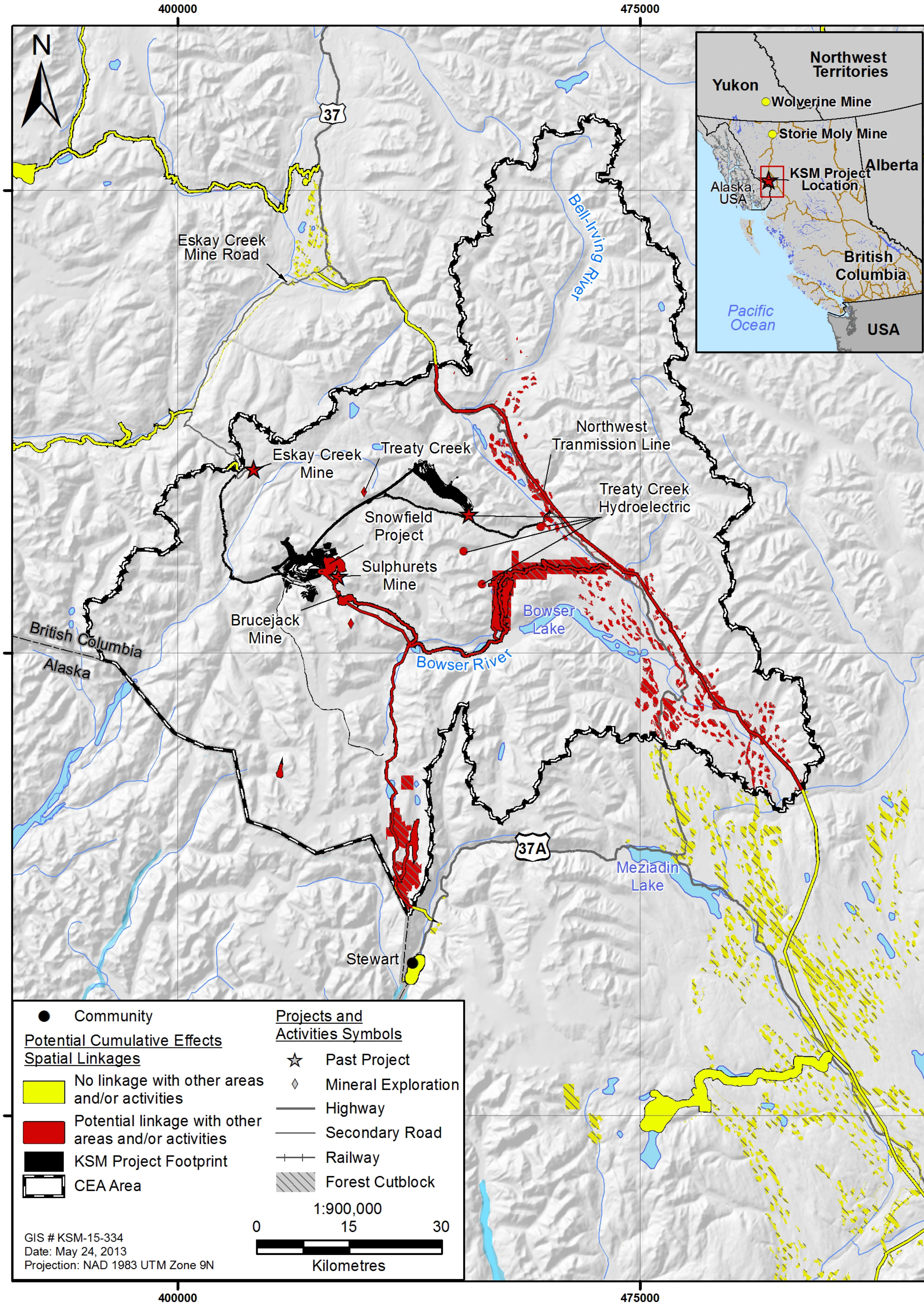
Current land use activities which are likely to interact with the KSM Project include:

- fishing;
- guide outfitting;
- harvesting by locals and Aboriginals; and
- recreation and tourism.

### 31.9.1.2 Temporal Linkages with other Projects and Human Actions

Present and reasonably foreseeable future projects and human activities with potential effects to navigability that could overlap temporally with residual effects from the KSM Project are previously listed in Section 31.9.1.1.

Table 31.9-1 summarizes the temporal linkages between the KSM Project and other projects and human activities regarding navigation.




SEABRIDGE GOLD
KSM PROJECT

## KSM Project Cumulative Effects Issue Scoping: Potential Spatial Linkages for Navigable Waters

Figure 31.9-1

Rescan
Engineers & Scientists

### 31.9.2 Cumulative Effects Assessment for Navigable Waters

The areas where Project-related residual effects and the residual effects from other projects could potentially interact with regards to navigable waters were examined. The comparison showed that other projects will not produce residual effects on safety or access regarding navigation in the local or regional study areas (Table 31.9-2).

#### 31.9.2.1 Cumulative Effects on Safe Navigation on the Unuk River

None of the considered projects involve infrastructure or components (such as towers or bridges) which could be developed on or near the Unuk River. While fishing, guide outfitting, local and Aboriginal harvest, and recreation and tourism occur on or in the vicinity of the Unuk River, none of these activities directly affect safe navigation. Consequently, no cumulative effects to safe navigation on the Unuk River are expected due to the lack of spatial overlap.

#### 31.9.2.2 Cumulative Effects on Safe Navigation on the Bell-Irving River

Of the projects considered, the Eskay Creek Mine, Sulphurets Project, the Northwest Transmission Line, Brucejack Mine, Snowfield Project, and Treaty Creek Hydroelectric hold the potential to interact with the Bell-Irving River (Table 31.9-2). However, four of these projects are unlikely to create effects to safe navigation. Roads associated with the Eskay Creek Mine and Sulphurets Project are already in place. The Northwest Transmission Line crossing will be at a height sufficient to avoid interaction. Treaty Creek Hydroelectric will likely use the same bridge as the KSM Project due to its proximity with the proposed road and bridge crossing.

The Brucejack Mine and the Snowfield Project could interact cumulatively, as these proposed developments would likely require road and bridge access from Highway 37 which would cross over the Bell-Irving River. However, construction of this bridge would not overlap temporally with the bridge-building activities of the KSM Project.

Fishing, guide outfitting, harvesting by locals and Aboriginals, and recreation and tourism occur on or in the vicinity of the Bell-Irving River and use the river for navigation, but none of these activities adversely affect safe navigation. Consequently, no cumulative effects on safe navigation on the Bell-Irving River are expected.

#### 31.9.2.3 Cumulative Effects on Safe Navigation on Glacier Creek

No other project will interact with Glacier Creek. While fishing, guide outfitting, harvesting by locals and Aboriginals, and recreation and tourism might occur on or in the vicinity of Glacier Creek, none of these activities would directly affect safe navigation. Consequently, no cumulative effects on safe navigation on Glacier Creek are anticipated.

#### 31.9.2.4 Cumulative Effects on Safe Navigation on Taft Creek

No other projects will interact with Taft Creek. While fishing, guide outfitting, local and Aboriginal harvest, and recreation and tourism might occur on or in the vicinity of Taft Creek, none of these activities would directly affect safe navigation. Consequently, no cumulative effects on safe navigation on Taft Creek are anticipated.

## Table 31.9-2. Summary of Projects and Activities with Potential to Interact Cumulatively with Project-specific Residual Effects on Navigation

| Description of KSM Residual Effect | Potential for Cumulative Effect: Relevant Projects and Activities | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Eskay Creek Mine | Sulpherets Project | NTL | Brucejack Mine | Snowfield Project | Treaty Creek Hydroelectic | Fishing | Guide Outfitting | Local and Aboriginal Harvest | Recreation and Tourism |
| *Safety* | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction |
| *Accessibility* | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction | No Interaction |

#### 31.9.2.5 Cumulative Effects on Accessibility on the Unuk River

Of Project works considered, only the Unuk River Bridge interacts with the Unuk River (Table 31.8-2). This three-span bridge will not normally affect accessibility (only potentially during brief construction and decommissioning activities), as it will be of sufficient height to allow for continued navigation.

Fishing, guide outfitting, harvesting by locals and Aboriginals, and recreation and tourism occur on or in the vicinity of the Unuk River. However, none of these activities are likely to impede navigational access along the river. Consequently, no cumulative effects on accessibility for the Unuk River are anticipated.

#### 31.9.2.6 Cumulative Effects on Accessibility to the Bell-Irving River

Of the projects considered, the Eskay Creek Mine, Sulphurets Project, Northwest Transmission Line, Brucejack Mine, Snowfield Project, and Treaty Creek Hydroelectric hold the potential to interact with the Project's bridge across the Bell-Irving River (Table 31.9-2). An existing bridge and road associated with the Eskay Creek Mine and Sulphurets Project facilitates access to the river, which is considered a beneficial effect on access. The proposed Brucejack Mine road and bridge would also facilitate access should this project be developed. While construction of the latter bridge could temporarily hinder navigation along the river crossing, this would not overlap temporally with the KSM Project.

Fishing, guide outfitting, harvesting by locals and Aboriginals, and recreation and tourism rely on seasonal access to the Bell-Irving River and do not create direct access effects on navigation. Consequently, cumulative adverse effects on the Bell-Irving River are not anticipated.

#### 31.9.2.7 Overall Cumulative Effect on Navigable Waters

No cumulative effects for safety and access to navigable waters for the Unuk and Bell-Irving rivers or Glacier and Taft creeks are expected. Consequently, no overall cumulative effects are anticipated for navigable waters.

## 31.10 Summary of Assessment of Potential Environmental Effects on Navigable Waters

The majority of streams in areas surrounding the Mine Site, PTMA, and associated access roads were conservatively deemed in Section 31.3 to be minor waters under the MWWO (2009), with 41 streams conservatively considered technically navigable when compared against the MWWO criteria. However, due to the remote and inaccessible location and physical parameters such as steep gradients from strong glacier influence within the area, the ability of these streams to be used for navigational purposes is minimal. Detailed habitat and photographic information will be reviewed by Transport Canada to confirm the navigability of these waterways (Appendix 31-B).

Several Project works were assessed as potentially affecting navigable waters, including access roads (CCAR, TCAR), diversion infrastructure, the Project transmission line along Treaty Creek, the TMF (including various dams, ponds, pipelines, and roads), works associated with fish habitat compensation projects, as well as components in the Mine Site (including the McTagg/Mitchell RSF, WSF, and works associated with the McTagg and Upper Sulphurets Power Plants).

Several streams will be diverted or eliminated to construct the various Project components, including the mining pits, TMF, WSF, and the Mitchell and McTagg RSFs. These largely sub-alpine and heavily glaciated areas have been demonstrated to be publically inaccessible and are not known to provide recreational, commercial, or subsistence value (Section 31.1). South Teigen Creek within the TMF is low gradient and could be technically suitable for navigation; however, the remote location and presence of a 2.5-m falls likely restricts recreational, commercial, or subsistence access. It is not anticipated that Transport Canada will determine any of the watercourses in these areas to be navigable.

Larger watercourses located along access roads will be crossed using bridges that follow industry standards designed to accommodate navigability (i.e., ensure no impediment to navigability that may result in safety issues) that will also provide overhead clearance during high water events (2.1 m for Unuk River and 3.0 m in Bell-Irving River over the Q100 elevation as discussed in Section 31.7). This design is consistent with direction provided by Transport Canada under the NWPA to maintain navigability (i.e., ensure no impediment to navigability that may result in safety issues).

Following mitigation measures, two rivers—the Bell-Irving and the Unuk—and two creeks—Glacier and Taft—were identified as potentially experiencing residual effects on navigation. Bridge construction and decommissioning may affect safe navigation and access to the Bell-Irving and Unuk rivers, while water intake pipes may affect safe navigation in Glacier and Taft creeks. However, all safety and access effects will be of negligible to low magnitude, local in extent, and reversible in the short term. Consequently, residual effects are considered not significant (Table 31.10-1).

Finally, no cumulative effects on navigation were found, due to a lack of spatial and temporal overlaps of other projects with the KSM Project. Human land use activities are not expected to affect safety or accessibility.

## 31.11 Conclusions

The final determination of navigability of the 41 potentially navigable streams identified in the areas surrounding the Mine Site, PTMA, and associated roads will be made by TC. It is anticipated that all of these waterways—except for the Bell-Irving and Unuk rivers—affected by Project works will not be determined to be navigable by TC, but residual effects on Glacier and Taft creeks have been conservatively kept in the assessment due to their proximity to the Bell-Irving River.

## Table 31.10-1. Summary of Assessment of Potential Environmental Effects: Navigable Waters

| Valued Component | Phase of Project | Potential Effect | Key Mitigation Measures | Significance Analysis of Project Residual Effects | Significance Analysis of Cumulative Residual Effects |
|---|---|---|---|---|---|
| Navigable Waters | Construction, Post-closure | Construction activities related to installation of bridges and overhead transmission lines may reduce access to safe, navigable waterbodies. Decommissioning of some bridges during post-closure may also temporarily restrict access to navigable waterbodies. | Construction Management Plan, Fish and Aquatic Habitat Management Plan | Not Significant (Minor) | Not Significant |
| Navigable Waters | Construction, Operations, Closure, Post-closure | Associated intake and outflow pipes may be an impediment to safe navigation. | Construction Management Plan, Fish and Aquatic Habitat Management Plan | Not Significant (Miinor) | Not Significant |

Project works with residual effects predicted on navigable waters consist of the Unuk River Bridge along CCAR, the Bell-Irving Bridge along TCAR, and water intake pipes that may potentially be used in Taft and Glacier creeks to support the planned fish habitat compensation sites. The majority of residual effects are anticipated to occur during construction when works will be built, and during post-closure when the Unuk River Bridge will be decommissioned and reclaimed. Any interruption in navigability due to construction, maintenance or decommissioning will be temporary in nature and mitigated through the use of warning signs and other measures as directed by TC. Bridges will be designed and maintained in compliance with provincial Ministry of Transport and CSA standards. No significant adverse residual environmental effects are predicted on health and socio-economic conditions (i.e., safety) of navigation, nor are they predicted on the public right to access a navigable water for recreational, commercial, or traditional subsistence activities.

No significant adverse residual access and safety effects on navigation are expected from the Project and no cumulative effects of interactions with other projects on navigable waters are anticipated.

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