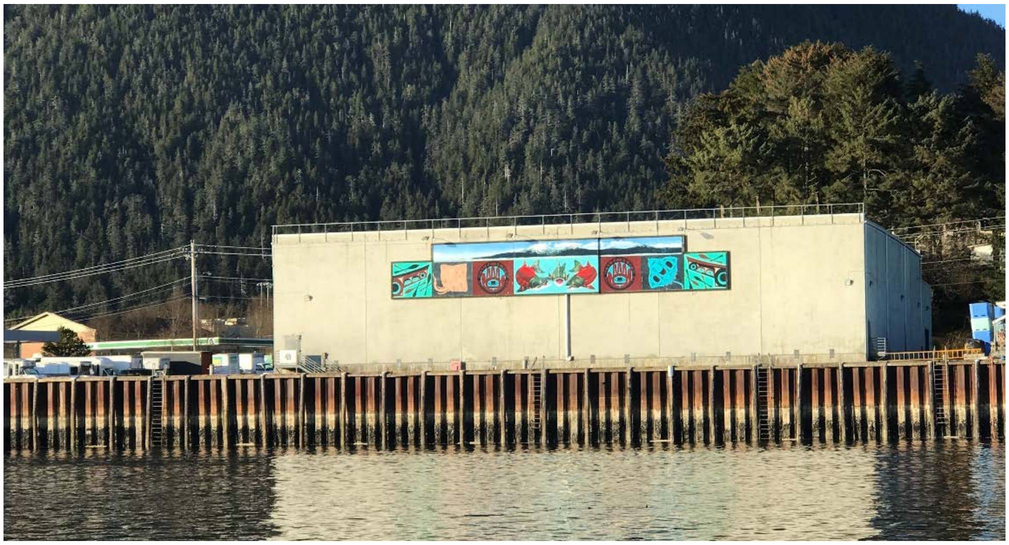
Application for BUILD Transportation Discretionary Grants

FY 2020 BUILD



Marine Service Center
Sheetpile Wall and Crane
City and Borough of Sitka

Type: Port Infrastructure Investment

Location: City and Borough of Sitka, Alaska
Alaska's at-large Congressional District
Alaska Rural Area

Amount Requested: $7.378 million

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Project Description

The Marine Services Center (MSC) seawall is approximately 44 years old and has surpassed the end of its useful design life. A 2011 report estimated that the existing structure had a remaining life of 5 years. If the seawall fails, the upland seafood cold storage facility which sits partially on the seawall will need to be condemned. The proposed project is to construct a new, similar bulkhead design located slightly seaward of the existing bulkhead, utilizing grouted anchor rods drilled through the existing fill material and into the underlying bedrock.

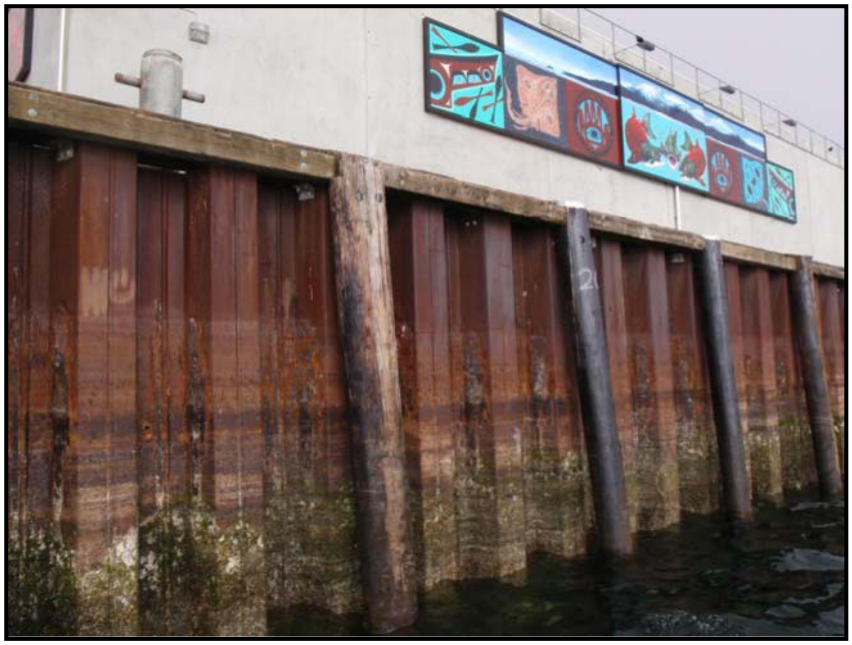

Figure 1 – Segment of Sheetpile Bulkhead Face – July 2011

Figure 2 – Splash Zone Corrosion of Sheetpile – July 2011

Transportation Challenges Addressed

The Marine Services Center at Sitka serves a variety of customers. Cruiseships, fishing vessels, trampers, sailing vessels, government vessels, and barges are all users.

It is the only dock deep enough for cruiseships available in Sitka. There are cruiseships with deeper drafts calling at Sitka, but those cruise passengers must lighter onto smaller vessels in order to get to shore. The cruiseships calling at the MSC are in the 176 – 240-foot range. Cruiseships have averaged 12 visits annually to the MSC dock and bring up to 1,200 visitors to Sitka each year. If the dock were unavailable, they too would have to anchor offshore and lighter customers or seek alternate ports of call outside of Sitka.

Fishing vessels currently deliver harvest for cold storage or processing, pick up bait and ice, and collect crew and equipment from this seawall. There are other docks in town where fishing vessels could conduct their business but there are a variety of issues with using these alternatives. Vessels will generally deliver their product to the dock that can most efficiently get the product either to the processing plan or into cold storage in the shortest amount of time. Other docks in Sitka are busy with vessels who have those established relationships. The Seafood Producers Cooperative processing plant is located adjacent to the cold storage facility at MSC. Seafood product from the plant can travel from the dock to the processing plant and then another 100 yards back to the cold storage facility in a short amount of time.

If the seawall fails, and the cold storage facility is condemned, there is insufficient cold storage space in Sitka to capture the overflow. Cold storage users suggest they would need to get 25 to 40 freezer vans to accommodate their needs.

Trampers offload about 160 tons of product per visit. Trampers have averaged 6 visits per year over the last three years with 11 visits in 2019. This is northbound freight consisting of fiber, salt, machinery, and bait. Their southbound freight consists of frozen fish. Trampers can also offload at alternate ports in Sitka though the vessel owners would need to wait for available space to do so. In addition, inbound freight would need to be transported to alternate ports for vessel retrieval. Outbound frozen fish would need to be stored in freezer vans until transport.

Storing frozen fish in freezer vans for transport adds a new dimension of difficulty to the fish processing industry. Cold storage at MSC currently allows users to accumulate enough product to ship fish that have been consolidated. Each lot is defined by fish type, quality, and size, meaning a load of chum salmon could have up to 16 different lots based on size and quality. There are five different kinds of salmon harvested in the Sitka region along with halibut, sablefish, rockfish, crab, and shrimp. Storing fish in freezer vans would not allow this option for the accumulation and consolidation, so fish would have to be shipped en masse to Seattle/Bellingham where it would then be sorted. If there is insufficient fish product to fill a particular container with the same species, quality, and size of fish, the shipper would still need to pay the same fee for that partially filled container. Storage costs could be as much as five times higher in Seattle due to minimum lot expense and the amount of fish.

Much of the harvested fish in Sitka have value added with smoking and packaging and again this product would have to compete for limited cold storage space in town. Support for the fishing industry is not the only use of the MSC dock.

The Eyak is a fishing vessel making at least weekly visits to the MSC dock to pick up mail, fuel, and groceries for outlying villages. The Eyak serves the City of Port Alexander, Armstrong Keta Hatchery, Little Port Walter NOAA Research Station, and the City of Sitka (bringing goods that would otherwise be sourced elsewhere). In the past three years, the Eyak has averaged 80 visits to the MSC annually. If the seawall were unavailable, it would be a challenging hardship for their program and would limit these outlying communities' ability to access Sitka vendors. There could also be longer periods of time between mail deliveries.

Figure 3 – F/V Eyak

History of Completed Projects

The Marine Services Center sheet pile bulkhead dock was originally constructed in 1976. The tie-back wall structure is approximately 36-ft high (from mudline) by 356-ft long along the face, with approximately 10-ft long end/return walls at each end of the bulkhead. The PZ27 sheet piles are driven approximately 10-ft to underlying bedrock, and are laterally restrained by exterior, MC8x22.8 walers located at elevations 0.0 ft (MLLW) and -10.0 ft. Each waler is connected via tie-rods to a sheet pile anchor wall approximately 70-ft behind the bulkhead face. The steel, round bar tie-rods are 2 ½-inch diameter, with ends upset to 3 ¼-inch diameter. They are spaced at 6-ft on-center, with the upper tie-rods being offset from the lower tie-rods by 3 feet. The walers and tie-rods are of ASTM A36 chemistry while the sheet piles are of ASTM A690 material. Creosote-treated timber fender piles protect the face of the bulkhead and a 12x12 timber bullrail caps the top of the wall. Steel pipe bollards and access ladders are positioned at varied spacing along the dock face.

In 1990, the CBS contracted for the design and construction of a 140-ft wide by 150-ft long cold storage building that is positioned approximately 30-ft behind the face of the bulkhead. In 1993, the CBS contracted with WS Construction Inc. to install 22 anodes along the face of the bulkhead and perform associated electrical bonding work. In November of 1999, the CBS engaged Tryck Nyman Hayes, Inc. (TNH) to perform an inspection and condition assessment of the facility which did not include an underwater inspection.

Shortly thereafter, in April of 2000, Foreshore Technologies, Inc. (FTI) performed a dive inspection. Potential readings were taken during the underwater inspection which indicated that the structure was actively corroding. Both the TNH and FTI reports noted significant corrosion existed throughout the bulkhead face sheet piles as well as at the walers and tie-rod ends. In 2002, in response to the TNH and FTI inspections, the CBS again contracted with WS Construction Inc. to install an additional 36 anodes along the face of the bulkhead, and in 2003, the CBS retained the local engineering company, Structural Solutions, to design a complete cathodic protection system for the facility.

The designed cathodic protection system was installed in 2004. Included in the construction documents were the requirements to provide electrical bonding and continuity between all steel bulkhead face elements. All tie-rod locations were required to be videotaped, and continuity was to be verified at each tie-rod location using a reference electrode.

See Sitka Marine Services Center Bulkhead Replacement - Report Update October 2011 Final.pdf

Other Transportation Infrastructure Investments

The Marine Services Center is located on Katlian Street which is a city-maintained road in downtown Sitka. An alternate facility for the seawall at the MSC is the Gary Paxton Industrial Park approximately 7.7 miles from downtown.

Detailed Statement of Work

Replacement options to consider depend on the long-range plans CBS has for the site. Due to the proximity of the existing CBS Cold Storage Building, demolition and an in-kind replacement of the existing bulkhead is not feasible. One option was to remove the bulkhead wall entirely, but this option was quickly ruled out due to the importance of this seawall to the community.

This project proposes to construct a new, similar bulkhead design located slightly seaward of the existing bulkhead, utilizing grouted anchor rods drilled through the existing fill material and into the underlying bedrock (See Figure 4). Though relatively small, the revised pier head alignment would require coordination with adjacent property owners to resolve any potential navigational issues. The rough order of magnitude estimate provides costs for an upgraded facility with superior materials and improved cathodic protection systems.

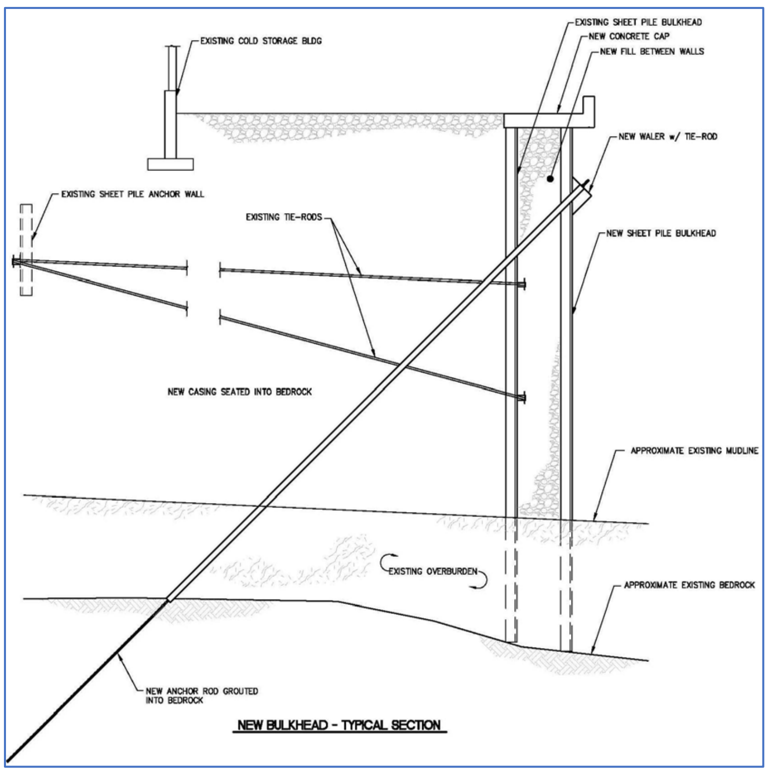

Figure 4 – Typical Replacement Bulkhead Wall Section

See Sitka Marine Services Center Bulkhead Replacement - Report Update October 2011 Final.pdf.

Project Location

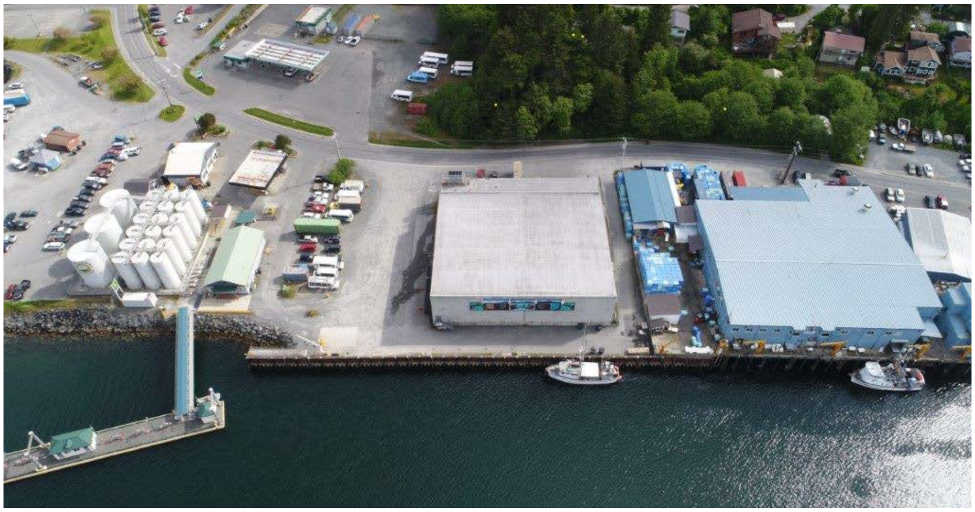

Figure 5 – Marine Service Center Cold Storage Facility and Adjacent Seafood Processing Plant

The cold storage facility is located at 600 Katlian Street in Sitka, Alaska. The waterfront parcel of land contains about 71,014 square feet. The legal description is Tract A Port Development, a portion of ATS 15. The building contains about 21,000 square feet of which about 16,500 square feet is presently operated as cold storage. The waterfront side of the cold storage property is supported by a sheet pile retaining wall. The wall is utilized as a berth for vessels. Marine vessels including small cruise ships, freighters, and fishing boats utilize the retaining wall to transfer goods, cargo, and passengers to/from vessels. Adjacent to the Northwest end of the retaining wall is a small hydraulic hoist that is available for public use.

Geographical Description

Sitka is located on the west coast of Baranof Island fronting the Pacific Ocean, on Sitka Sound. An extinct volcano, Mount Edgecumbe, rises 3,200 feet above the community. It is 95 air miles southwest of Juneau and 185 miles northwest of Ketchikan. Seattle, Washington, lies 862 air miles to the south. The CBS is located at Latitude, Longitude: 57.0583, -135.3448.

Sitka falls within the southeast maritime climate zone, characterized by cool summers, mild winters and heavy rain throughout the year. This zone lacks prolonged periods of freezing weather at low altitudes and is characterized by cloudiness and frequent fog. The combination of heavy precipitation and low temperatures at high altitudes in the coastal mountains of southern Alaska accounts for the numerous mountain glaciers. The CBS encompasses 2,874 square miles of land and 1,937.5 square miles of water.[1]

[1] State of Alaska Department of Commerce Community and Economic Development. https://dcced.maps.arcgis.com/apps/MapJournal/index.html?appid=2ded44ad6dd4456fbe353f1292e285c2#

While many communities in Alaska are listed, the City and Borough of Sitka is not on the list of Qualified Opportunity Zones as per the IRS Notice 2018-48, 2018–28 Internal Revenue Bulletin 9, July 9, 2018.

Figure 6 – Project Location in Relation to Other Sitka Infrastructure

Map of Project Location

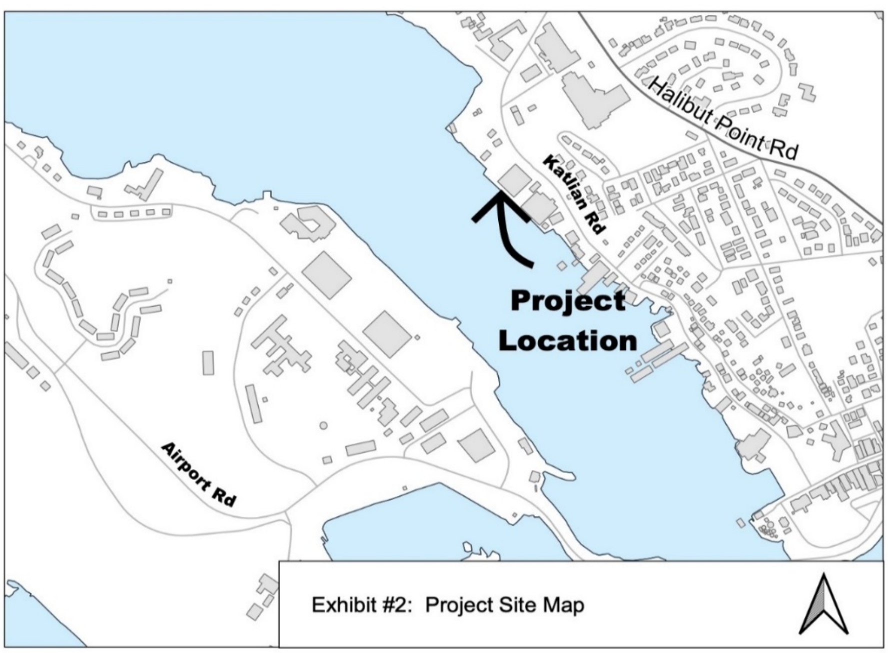

Figure 7 – Project Location in Relation to Downtown Infrastructure and Airport

Connections to Existing Infrastructure

The Marine Services Center is located in downtown Sitka. It is linked by road to several other harbors owned and operated by the CBS. The CBS operates five small boat harbors with 1,350 stalls and a seaplane base on Sitka Sound. Large cruise ships anchor in the harbor and lighter visitors to shore. The Old Sitka Dock, privately owned, is the only deep-water moorage facility in Sitka capable of accommodating large vessels. It is 7.7 miles to the Gary Paxton Industrial Park which could be an alternative for the fishers when the downtown harbors are busy. The community also has a state-owned public-use airport, the Rocky Gutierrez Airport, serving the community with daily jet service and located just west of the central business district.[2] In addition to daily jet service, several scheduled air taxis and air charters are available. There is no road access to outside communities from Sitka, but vehicles can be transported to town using the Alaska Marine Highway ferry system located six miles north of town.

Grant Funds, Sources and Uses of all Project Funding

Estimated Costs

Cost estimates for this project were obtained from the Marine Services Center Bulkhead Conditions Assessment prepared by PND Engineers in October 2011. Total project costs have been updated to today's dollars using the Anchorage Consumer Price Index and are estimated at $9,222,900.

Source of Funds

The CBS has the 20 percent match on hand and has various option to fund the match. One option is that MSC Port Wall could be funded in large part by the MSC Enterprise Fund Working Capital, in addition, as revenue generated from the Port Wall is paid to the Harbor Fund, there is justification to use Harbor Fund working capital to fund part or all of the required match for the MSC Port Wall.

Total Project Costs:	**$ 9,222,900**	**100%**
Funding Sources (Non-Federal):	**Amount:**	**Percent:**
City of Sitka (resolution attached)	$ 1,844,580	20 %
Federal BUILD Funds Requested	**$ 7,378,320**	**80%**

Documentation of Funding Commitment

Assembly meeting minutes or letter from the Municipal Administrator. Maybe both.

[2] https://en.wikipedia.org/wiki/Sitka_Rocky_Gutierrez_Airport

Budget

The following budget is based on engineering design estimates from PND in 2011 which have been updated to today's dollars using the Anchorage Consumer Price Index. Total project cost for the sheetpile wall and crane replacement is $9.2 million, approximately $7.4 million in Federal funds and $1.8 million in non-Federal funds. See Table 1.

Table 1 -Budget Cost-Share for Sheetpile Wall and Crane Replacement

Description	Amount	BUILD funds (80%)	Non-Federal Funds (20%)
Budget as to Sheetpile wall repair:			
Mobilization	$ 581,000	$ 464,800	$ 116,200
Demolition & Disposal	226,000	180,800	45,200
Sheet Pile Face Wall Galvanized	1,340,000	1,072,000	268,000
Sheet Pile End Walls Galvanized	158,000	126,400	31,600
Drilled and Grouted Tie-Rod Anchors	2,030,000	1,624,000	406,000
Steel Waler Assembly	271,000	216,800	54,200
Shot Rock Fill, Vibrocompacted	338,000	270,400	67,600
Drainage Improvements	85,000	68,000	17,000
C.I.P. Concrete Bulkhead Cap	451,000	360,800	90,200
Cathodic Protection System (Anodes)	113,000	90,400	22,600
Energy Absorbing Timber Fender System	690,000	552,000	138,000
Area Lighting	113,000	90,400	22,600
Subtotal	**$ 6,396,000**	**$ 5,116,800**	**$ 1,279,200**
Contingency @ 20%	1,279,200	1,023,360	255,840
Env permitting, final design, contract admin, inspection @ 20%	1,279,200	1,023,360	255,840
Subtotal Sheetpile Wall Repair	***$ 8,954,400***	***$ 7,163,520***	***$ 1,790,880***
Budget as to Crane replacement:			
Electro Hydraulic Telescope Boom Crane Model MCT 2230	168,500	134,800	33,700
Installation Estimate	100,000	80,000	20,000
Subtotal Crane Replacement	***$ 268,500***	***$ 214,800***	***$ 53,700***
Total Budget Sheetpile Wall and Crane	**$ 9,222,900**	**$ 7,378,320**	**$ 1,844,580**

Selection Criteria

Primary Selection Criteria includes Safety, State of Good Repair, Economic Competitiveness, Environmental Sustainability, and Quality of Life. Each of those are discussed in turn.

Safety

This project will contribute to a reduction in crashes, fatalities, and injuries as vessel owners will be able to continue functioning as they have in the past. The need to travel to alternate ports for product delivery introduces new risks as vessels compete for limited space in order to conduct their business. The addition of several hundred vehicles on Sitka roads traveling between harbors, seafood processing plants, and competing with the summer tourist traffic will undoubtedly lead to more congestion and the potential for unwanted interactions between vehicles and pedestrians. Repairing the sheetpile wall at the MSC is an important solution to ensuring the safety of people and equipment working in the fish harvesting business and the many tourists that visit Sitka annually.

State of Good Repair

This development is consistent with the Sitka Comprehensive Plan 2030 adopted May 2018. See FinalCompPlanreducedsize.pdf. Improving Sitka's marine infrastructure and providing employment and economic development are key components of this documents.

Economic Competitiveness

Replacement of the sheetpile wall and crane at the MSC will allow users to continue benefitting from this important community infrastructure. The cost of cold storage in Sitka can be a full $0.05 a pound less than cold storage in the Pacific Northwest. The ability for seafood processors to consolidate product at Sitka prior to shipment to customers is also of extreme value as processors would need to lease additional cold storage space in order to fill containers for shipping. In addition, the MSC is centrally located in Sitka so that vessels like the F/V Eyak can stop at one location to receive multiple shipping orders going to neighboring villages.

Environmental Sustainability

The existing seawall is more than 40 years old and in imminent danger of failure. Replacing the seawall prior to failure will protect the environment from the damage that will result from this old structure falling in the water. The construction plan calls for constructing a new bulkhead to the seaward side of the existing structure. This approach will allow for visual inspection of the deteriorated seawall and removal of environmentally damaging material.

There are no wetlands affected by this construction project.

Quality of Life

The MSC and associated uplands infrastructure are important components to the Sitka fishing industry. Maintaining this infrastructure allows Sitkans to continue to work where they live and maintain active community ties.

There are no fiber or broadband deployments envisioned for this project.

Secondary Selection Criteria include Innovation and Partnership and are discussed further here.

Innovative Technologies, Project Delivery, and Financing

The technologies recommended here are similar to the previous design of the seawall. There are no innovative approaches being discussed at this time. However, once a Request for Proposal is issued, the CBS would entertain innovative ideas to enhance usability and project component longevity improvements.

CBS does not expect to finance any portion of this project at this time. Sitka's Economic Development funds are enough to cover the 20 percent match. CBS has sufficient cash flow to proceed with the project and accept reimbursement of funds when available.

Partnership

A project partnership is not envisioned at this time. However, this project will benefit the seafood processing facilities in Sitka, the fishing industry harvesters, the cruise ships and their passengers, and barge operations in the area.

Environmental Risk Review

Project Schedule

The construction calls for an 18-month schedule. This will allow completion of the project in advance of the next fishing season.

Table 2 – Sheetpile Wall and Crane Replacement Schedule

Overall Task	Date
Grant award	Sep-20
Final Design & Permitting	Sep-21
Mobilization	Dec-21
Demolition/Disposal	Feb-22
Sheetpile installation	Apr-22
Rock fill	Oct-22
Lighting & Crane installation	Dec-22
Final inspection	Jan-22
Grant closeout	Feb-22

Approvals and Permits

The CBS plans to engage agencies for approvals and permits quickly once grant funds have been authorized. A listing of environmental and operational permits required include:

1. USACE – Section 10 and Section 404 Authorizations
2. ADFG Fish Habitat Permit
3. ADEC Stormwater Treatment & Runoff Design Review
4. ADEC Water & Sewer Utilities
5. ADEC MSGP Operational SWPPP for Boatyards
6. Local Building Permits

NEPA Compliance

The CBS fully intends to meet the requirements of NEPA for this project including public meetings once they are allowed. Other forms of gathering public input may be required depending on timing and conditions of the COVID-19 environment. Construction scheduling will include windows of time when construction will be interrupted to account for fish migration and other marine interactions.

Risk and Mitigation Strategies

Risks to this project include site specific conditions, scheduling, funding, and project management. It is anticipated that construction of a new sheetpile wall seaward of the existing structure will limit any unforeseen site-specific conditions that warrant special treatment. The COVID-19 environment is on ongoing risk that will be managed in accordance with CDC and State recommendations and may impact schedule.

Benefit Cost Analysis

The following assumptions form the basis of the benefit/cost analysis. These assumptions have been vetted with the CBS harbormaster, users of the cold storage facility, the director of the Sitka Economic Development Association, and vessel owners operating in the area.

Assumptions

- The seawall at the Marine Services Center is in danger of imminent failure.
- The crane used at the MSC is more than 20 years old. The hoist can lift full loads but a larger (knuckle boom) crane would better serve the fishing fleet.
- Once the seawall fails, the cold storage facility will be condemned and unusable as the building partially sits on the seawall.
- The cold storage facility receives between 10 million (low case) and 16 million (high case) pounds of fish product annually.
- There is insufficient cold storage available in Sitka to replace the Marine Services Center 21,000 square foot facility.
- The ability to consolidate product is an important component for keeping costs down in the export of frozen fish.

Users of the MSC seawall engage in the following primary activity:

Table 3 -MSC Seawall Users

Users	Cold Storage	Commodity over wall	Crane/hoist
Sitka Sound Seafoods (SSS)	yes	Bait	yes
Seafood Producers Cooperative (SPC)	yes	Fiber, salt, machinery, bait, ice, and inbound/outbound fish	yes
Eyak (supplies to outlying villages)	no	Fuel, groceries, mail, outbound fishfood for hatchery	yes
Cruiseships	no	Passengers	no
Coast Guard	no	Crew changes, supplies	no
Fishing Vessels	yes	Fish, bait, ice, and supplies	yes

There are two primary tenants of the cold storage facility, both seafood processors. Seafood processors in Sitka reveal that they move between 5 and 8 million pounds of product annually. The cold storage facility allows seafood processors to consolidate product by species, size, and quality. Without the cold storage facility, product must be shipped out to Pacific Northwest facilities and sorting/consolidation would take place there.

We examine two future scenarios for this evaluation, a low case of 10 million pounds of product and a high case of 16 million pounds of product. See the economics appendix for further detail on the changed conditions when the seawall fails.

Present Value Costs

Initial cost estimates are $9.2 million spread over a 2-year construction season. Periodic maintenance for the facility is assumed at 1 percent of initial construction cost every five years over the 20-year period of analysis.

Table 4 – Sheetpile Wall and Crane Replacement Cost Estimate – Select Years

Year	Construction	Periodic Maintenance	Total Cost	NPV Factor	Net Present Value
2021	$ 4,477,200		$4,477,200	0.93458	$ 4,184,299
2022	$ 4,745,700		$4,745,700	0.87344	$ 4,145,078
2027		$ 92,229	$ 92,229	0.62275	$ 57,436
2032		$ 92,229	$ 92,229	0.44401	$ 40,951
2037		$ 92,229	$ 92,229	0.31657	$ 29,197
Totals	**$ 9,222,900**	**$ 276,687**	**$9,499,587**		**$ 8,456,961**
Total Construction Cost and Maintenance					**$ 8,456,961**
Less Residual Value after 20 years					$ 2,004,467
Present Value of Sheetpile Wall and Crane Replacement					**$ 6,452,494**

Present Value Benefits

Benefit calculations for this evaluation include avoided travel costs, avoided product transportation costs, opportunity costs of time, and emissions avoided. The economics appendix describes these in more detail. The present value of benefits for the low case scenario are $6.5 million over the 20-year period of analysis. See Table 5.

Table 5 – Low Case Scenario Benefit Calculations – Select Years

Year	Avoided Travel	Add'l Transport Costs	OCT	Emissions Avoided	Total	NPV Factor	Net Present Value
2022	$50,092	$593,753	$5,629	$7,926	$655,626	0.87344	$572,649
2026	$50,092	$593,753	$5,629	$7,926	$655,626	0.66634	$436,871
2031	$50,092	$593,753	$5,629	$7,930	$655,629	0.47509	$311,485
2036	$50,092	$593,753	$5,629	$7,930	$655,629	0.33873	$222,084
2041	$50,092	$593,753	$5,629	$7,930	$655,629	0.24151	$158,343
Totals	**$1,001,842**	**$11,875,050**	**$112,573**	**$158,564**	**$13,112,548**		**$6,491,327**

The present value of benefits for the high case scenario are $10 million over the 20-year period of analysis. See Table 6.

Table 6 – High Case Scenario Benefit Calculations – Select Years

Year	Avoided Travel	Add'l Transport Costs	OCT	Emissions Avoided	Total	NPV Factor	Net Present Value
2022	$50,092	$950,004	$5,629	$7,926	$1,011,877	0.87344	$883,813
2026	$50,092	$950,004	$5,629	$7,926	$1,011,877	0.66634	$674,256
2031	$50,092	$950,004	$5,629	$7,930	$1,011,880	0.47509	$480,737
2036	$50,092	$950,004	$5,629	$7,930	$1,011,880	0.33873	$342,759
2041	$50,092	$950,004	$5,629	$7,930	$1,011,880	0.24151	$244,382
Totals	**$1,001,842**	**$19,000,080**	**$112,573**	**$158,564**	**$20,237,578**		**$10,018,555**

BCR

Replacement of the MSC seawall and installation of a new crane has positive benefit to cost ratios of 1.01 and 1.56 for the low and high case scenarios, respectively. Net benefits are $56,398 for the low case scenario and $3.6 million for the high case scenario. See Table 7.

Table 7 – Benefit to Cost Ratios for the Low and High Case Scenarios

Summary of Calculations	Low Case	High Case
Benefit calculations - 2020 $$		
Vessel avoided travel	$495,959	$495,959
Additional Transport Cost	$5,878,713	$9,405,940
Opportunity Cost of time	$55,729	$55,729
Emissions reduced	$78,491	$78,491
PV Benefits summary	**$6,508,892**	**$10,036,120**
Cost Calculations - 2020 $$		
PV Cost of Project	$8,456,961	
Less residual value	$2,004,467	
Effective cost (PV)	$6,452,494	
PV Net benefits (benefits - costs)	**$56,398**	**$3,566,061**
Benefit/cost ratio (benefits/costs)	**1.01**	**1.56**

Additional Considerations

The rural community of Sitka, Alaska is heavily dependent on a working waterfront. Sitka has the largest fleet of vessels and harbor system in the state and is 4th in the state and 11th in the nation in value of fish landings. The loss of the Marine Services Center seawall and crane will affect cruise ships, fishing vessels, barges, and government vessels. The ability to retain this important asset for the community cannot be understated.

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Appendix

Benefit-Cost Analysis for the Marine Service Center Sheetpile Wall and Crane Replacement

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May 2020

Introduction

The Marine Service Center bulkhead wall is in danger of imminent failure. A 2011 PND report states that the wall had perhaps another five years of useful life. The City and Borough of Sitka wishes to replace this more than 40-year old seawall because if the seawall fails the upland cold storage facility which sits partially on the wall will need to be condemned.

The Marine Services Center at Sitka serves a variety of customers. Cruiseships, fishing vessels, trampers, sailing vessels, government vessels, and barges can all use it. Many of these vessels can find workarounds using other harbors in Sitka though overcrowding conditions will get worse as a result. Table 8 describes some of the seawall users, whether they need cold storage or the crane, and the commodity typically coming over the seawall.

Table 8 -MSC Seawall Users

Users	Cold Storage	Commodity over wall	Crane/hoist
Sitka Sound Seafoods (SSS)	yes	Bait	yes
Seafood Producers Cooperative (SPC)	yes	Fiber, salt, machinery, bait, ice, and inbound/outbound fish	yes
Eyak (supplies to outlying villages)	no	Fuel, groceries, mail, outbound fishfood for hatchery	yes
Cruiseships	no	Passengers	no
Coast Guard	no	Crew changes, supplies	no
Fishing Vessels	yes	Fish, bait, ice, and supplies	yes

Transportation Cost Differential

Fish harvest arrives at the cold storage facility from the various seafood processing plants in Sitka. It is estimated that freezer vans can be used to supplement the loss of the cold storage facility once it is condemned. The cost of using freezer vans will be much higher and will put additional strain on the City's electrical system. Estimates of that additional cost are not included in this assessment but could be substantial.

The additional costs estimated in this analysis derive from the lack of capability to consolidate product using the Sitka cold storage facility. If product is put into freezer vans for transport, there will not be the capability to consolidate in advance of transport. Consolidation is a necessary function of the fish harvest as lots of fish are purchased by fish type, quality, and size. So, a load of chum salmon, for instance, could have 16 different lots based on the fish's quality and size. The inability to consolidate product at Sitka means that all product is shipped to the Pacific Northwest, either Seattle or Bellingham, and consolidation must take place there. The challenge then becomes one of filling each cold storage container with the same lots of fish.

Partial lots mean that the shipper must pay for the entire container, even if only partially full. The cost of additional cold storage space has not been conducted for this analysis.

The cost of cold storage in Sitka is about $0.043 per pound. The cost of cold storage space on a per pound basis is higher in the Pacific Northwest by about $0.05 per pound.

Cold storage users reveal that 72.22 percent of their product gets shipped directly to customers once they have been able to consolidate. Shippers give a discount to their customers for these through rates of about $0.01 per pound of product. So, the product can be consolidated in Sitka, put in a van for the customer, and then shipped directly to places like Japan without having to stopover in Pacific Northwest. The inability to consolidate in Sitka adds this additional cost to transport the product.

Equation 1 demonstrates the calculation for these additional transportation costs.

Equation 1: $$TCD_{(year)} = [FP_{(year)} \times P \times CD] + [(1-P) \times (CD + TR)]$$

Where: $TCD_{(year)}$ is the value of the transportation cost differential for cold storage in a particular year

$FP_{(year)}$ is the pounds of frozen product for the given year

P is the percent of product shipped straight through to customer

CD is the cost differential between Sitka and Pacific Northwest cold storage facilities

TR is the through rate differential for product which must now travel to PNW prior to shipping on to customer

The amount of product moving through the cold storage facility fluctuates from year to year given harvest success, regulatory environment, and sometimes weather and abilities of the fishing fleet. For this reason, this benefit analysis uses a low and high calculation to account for those fluctuations over time.

Table 9 -Additional Transportation Costs Associated with Frozen Fish Product – Low and High Case

	Low Case	High Case
Year	**Add'l Transport Costs**	**Add'l Transport Costs**
2022	$ 593,753	$ 950,004
2023	$ 593,753	$ 950,004
2024	$ 593,753	$ 950,004
2025	$ 593,753	$ 950,004
2026	$ 593,753	$ 950,004
2027	$ 593,753	$ 950,004
2028	$ 593,753	$ 950,004
2029	$ 593,753	$ 950,004
2030	$ 593,753	$ 950,004
2031	$ 593,753	$ 950,004
2032	$ 593,753	$ 950,004
2033	$ 593,753	$ 950,004
2034	$ 593,753	$ 950,004
2035	$ 593,753	$ 950,004
2036	$ 593,753	$ 950,004
2037	$ 593,753	$ 950,004
2038	$ 593,753	$ 950,004
2039	$ 593,753	$ 950,004
2040	$ 593,753	$ 950,004
2041	$ 593,753	$ 950,004
Totals	**$ 11,875,050**	**$ 19,000,080**

Avoided Travel

The F/V Eyak provides a special service to Sitka and the surrounding villages as it delivers mail, groceries, building supplies, fuel, and other necessities. F/V Eyak made 80 trips to the MSC seawall in 2019 to complete these activities. If the MSC seawall were unavailable, deliveries would have to be made to the Gary Paxton Industrial Park dock, 7.7 miles away, and F/V Eyak would have to travel 5.3 nautical miles to reach that destination and pick up delivery items.

This benefit category estimates the number of vehicle trips and vessel trips that would have to be made as a result of the seawall failure. Mail and groceries would be delivered to the GPIP location when it is known that the Eyak will be arriving as there is no place to store product at the site. It is estimated that at least two vehicles would need to travel to GPIP for this purpose, one for the mail and one for groceries. It is further estimated that half of the annual trips would require a third vehicle to deliver fishfood or construction materials for delivery to neighboring villages.

Vessel/Vehicle Avoided Travel

The F/V Eyak made 80 trips to the MSC seawall in 2019 in order to pick up groceries, mail, fuel, fish food, and construction supplies for the outlying villages. Fish food is actually delivered to the Port Armstrong Fish Hatchery. Once the seawall fails, all of these deliveries will need to go to the Gary Paxton Industrial Park dock as this dock can support these activities. It is 7.7 miles from the MSC seawall to the GPIP dock. The USPS and the grocery stores are each expected to meet the Eyak when it arrives for transport of mail and other purchases. Using the BUILD guidance for mileage at $0.96 per mile, both the mail delivery and the grocery deliveries add $1,182.72 in additional travel costs to the Eyak's business. It is estimated that about half of Eyak's trips include fishfood for the fish hatchery and building materials for the outlying villages. Each of these trips add $591.36 annually in additional travel costs.

The F/V Eyak must travel from the MSC seawall to the GPIP dock to pick up these supplies. It is a distance of 5.3 nautical miles. Assuming a travel rate of 8.3 nautical miles per hour and a vessel hourly operating cost of $456, the round-trip cost of this additional travel is $46,544 annually. It could be expected that population growth would increase these trips over time. However, the population of Sitka and the surrounding villages has been mostly stable in recent years (in some cases declining) so the avoided travel is at a consistent rate over the 20-year period of analysis. There is no difference between the low and high case scenarios as it pertains to avoided travel for the Eyak and the supply vehicles.

Table 10 -Avoided travel benefit calculation

Avoided Travel					
Eyak Transportation Calculations	**NM**	**# of annual trips**	**Hourly Operating Costs**	**Time for round trip (hrs)**	**Added Transport Cost**
		(a)	**(b)**	**(c)**	**(a * b * c)**
Vessel mileage reason					
Difference in travel from MSC to GPIP	5.3	80	$456	1.28	$46,543.96
Vehicle mileage reason	**Miles**	**# of annual trips**	**Mileage Rate (per mile)**	**Round Trip Miles**	**Added Transport Cost**
	(a)	**(b)**	**(c)**	**(a * b * 2 = d)**	**(c * d)**
Travel from MSC to GPIP for mail delivery	7.7	80	$0.96	1,232	$1,182.72
Travel from MSC to GPIP for grocery delivery	7.7	80	$0.96	1,232	$1,182.72
Travel from seafood processing plant to GPIP with fish food	7.7	40	$0.96	616	$591.36
Travel from downtown to GPIP with construction materials	7.7	40	$0.96	616	$591.36
Value of Additional Travel for Eyak pick-ups and deliveries					**$50,092.12**

Vessel and Vehicle Emissions Avoided

"Transportation activities contribute significantly to localized air pollution, and some transportation projects offer the potential to reduce the transportation system's impact on the environment by lowering emissions of air pollutants that result from production and combustion of transportation fuels. The economic damages caused by exposure to air pollution represent externalities because their impacts are borne by society as a whole, rather than by the travelers and operators whose activities generate these. By lowering these costs, transportation projects that reduce emissions may produce environmental benefits."[3]

Once the MSC seawall fails, the F/V Eyak will need to drop off and receive product at the GPIP dock and vehicles will need to travel the additional distance to get products to the dock when the Eyak is scheduled to arrive. Mileage, nautical miles, and number of trips are the same as the avoided travel calculations.

This analysis takes a conservative approach for vessel emissions and uses the 2010 total cost per cylinder for Stoichiometric Gasoline Direct Injections[4] and assumes at least one 8-cylinder engine for the Eyak. The 2010 cost per cylinder from the National Highway Transportation Safety Administration Final Regulatory Impact Analysis was $67.00. Updating this to 2020 dollars using deflator indexes from the Bureau of Economic Analysis results in $77.55 per cylinder in emissions reduction. (Calculation: $67 * 118.676(2020$) / 102.532(2010$) = $77.55)

The value of vessel emissions due to additional travel when the MSC dock is no longer useable is $7,926 annually. This amount is consistent throughout the 20-year period of analysis as there is insufficient data to suggest that the number of trips would vary over time. See Table 11.

Equation 2: $$E_{(year)} = T_{(year)} \times H \times VE + M_{(year)} \times MT$$

Where: $E_{(year)}$ is the value of the emissions during a particular year

$T_{(year)}$ is the number of trips per year

H is hours of traveling for the given year for vessels

VE is the vessel emissions per hour

M is the miles of travel for vehicles in a given year

MT is the value of metric tons of emissions per mile traveled

The benefit/cost analysis guidance for the FY2020 BUILD grant applications provides an estimate of 0.00887 metric tons of CO_2 emissions for gas light-duty trucks which we use here for

[3] Benefit-Cost Analysis Guidance for TIGER and INFRA Applications – July 2017
[4] https://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FRIA_2017-2025.pdf

the emissions calculations. We also assume that these vehicles are getting about 10 miles to the gallon and that the speed for vehicles will average about 45 miles per hour. The value of a metric ton of CO_2 emissions is $1.00 for the years 2020 through 2030 and then rises to $2.00 for the remaining years. There is no difference between the low and high case for this benefit category.

Table 11 -Avoided Emissions

Emissions					
Eyak Transportation Calculations	**NM**	**# of annual trips**	**Time for round trip (hrs)**	**Vessel Emissions per Hour**	**Vessel Emissions**
		(a)	**(b)**	**(c)**	**(a * b * c)**
Vessel mileage reason					
Difference in travel from MSC to GPIP	5.3	80	1.28	$77.55	$7,923.12

	Miles	**# of annual trips**	**Total Miles Round Trip**	**Metric Tons of CO2 [1]**	**Vehicle Emissions**
Vehicle mileage reason	**(a)**	**(b)**	**(a * b * 2 = c)**	**(c /10 * .008887 = d)**	**(d * 1) thru 2030 then (d * 2)**
Travel from downtown to GPIP with construction materials	7.7	80	1,232	1.09	$1.09
Travel from MSC to GPIP for grocery delivery	7.7	80	1,232	1.09	$1.09
Travel from MSC to GPIP for mail delivery	7.7	40	616	0.55	$0.55
Travel from seafood processing plant to GPIP with fish food	7.7	40	616	0.55	$0.55

Emissions Calculations fro Eyak pickups and deliveries	**$7,926.40**

Notes: 1. Metric tons of CO2 assumes 10 miles to the gallon for gas and .008887 MT to the gallon per BUILD monetized values

Opportunity Cost of Time

The opportunity cost of time measures the choice of the next best alternative to the thing chosen. In this case, vessel operators must stay on their vessel during travel to alternate harbors. Vessel operators could elect to do something else with their time. For instance, being with family, visiting with friends, and enjoying all that Alaska has to offer.

The vessel operator's opportunity cost of time is based on the leisure rate for captain and two mates operating the vessel and those hourly rates were obtained from the Alaska Department of Labor and Workforce Development.[5] Total value of the opportunity cost of time for the vessel is $3,205.71.

The vehicle operator's opportunity cost of time uses the same numbers of trips and mileage as the avoided travel calculation. The hourly rate for the truck drivers is based on the values from the FY 2020 Benefit Cost Analysis Guidance from the US DOT BUILD site.[6] The hourly rate is $29.50 and we use the same time estimate as the avoided travel benefit. See Table 12. We do not increase this benefit over time as the future is unknown for the demand for additional travel to the neighboring communities.

Equation 3: $$OCT_{(year)} = C_{(year)} \times H \times W \times R_{vessel} + C_{(year)} \times T \times R_{vehicle}$$

Where: $OCT_{(year)}$ is the value of cost of time for workers on transported vessels and vehicles in a given year

$C_{(year)}$ is the number of trips for the year

H is the hours associated with travel to alternate ports

W is the number of workers in that particular position on the vessel

R_{vessel} is the wage rate from the State of Alaska Dept. of Labor and Workforce Development for May 2018 divided by 3 to determine the leisure rate

T is the travel time from MSC to GPIP dock

$R_{vehicle}$ is the wage rate for the truck driver

Total opportunity cost of time for the added travel as a result of loss of the MSC seawall is $5,628 annually. This amount remains consistent over the 20-year period of analysis as the change in vessel deliveries are not known at this time. The opportunity cost of time calculation is the same for the low and high case scenarios.

[5] http://live.laborstats.alaska.gov/wage/index.cfm?at=01&a=000000#g53

[6] https://www.transportation.gov/sites/dot.gov/files/2020-01/benefit-cost-analysis-guidance-2020_0.pdf

Table 12 -Opportunity Cost of Time

Opportunity Cost of Time					
Eyak Transportation Calculations	**Leisure Rate Captain**	**Leisure Rate Mate (2)**	**# of annual trips**	**Time for round trip (hrs)**	**Added Transport Cost**
	(a)	**(b)**	**(c)**	**(d)**	**[(a + b) * c *d]**
Vessel mileage reason					
Difference in travel from MSC to GPIP	$14.53	$16.85	80	1.28	$3,205.71
Vehicle mileage reason		**Truck Driver Hourly Value**	**# of annual trips**	**Time for round trip (hrs)**	**Added Transport Cost**
		(a)	**(b)**	**(c)**	**(a * b * c)**
Travel from MSC to GPIP for mail delivery		$29.50	80	0.34	$807.64
Travel from MSC to GPIP for grocery delivery		$29.50	80	0.34	$807.64
Travel from seafood processing plant to GPIP with fish food		$29.50	40	0.34	$403.82
Travel from downtown to GPIP with construction materials		$29.50	40	0.34	$403.82
Opportunity Cost of Time for Eyak pickups and deliveries					**$5,628.65**

Summary Benefits Calculations

The low case scenario has net present value of $6.5 million over the 20-year period of analysis using a 7 percent discount rate. The high case scenario has a net present value of $10 million for the same period. See Table 13 and Table 14.

Table 13 -Low Case Scenario Net Present Value Benefit Summary

	Low Case						
Year	Avoided Travel	Add'l Transport Costs	OCT	Emissions Avoided	Total	NPV Factor	Net Present Value
2022	$50,092	$593,753	$5,629	$7,926	$657,400	0.87344	$574,198
2023	$50,092	$593,753	$5,629	$7,926	$657,400	0.81630	$536,634
2024	$50,092	$593,753	$5,629	$7,926	$657,400	0.76290	$501,527
2025	$50,092	$593,753	$5,629	$7,926	$657,400	0.71299	$468,717
2026	$50,092	$593,753	$5,629	$7,926	$657,400	0.66634	$438,053
2027	$50,092	$593,753	$5,629	$7,926	$657,400	0.62275	$409,395
2028	$50,092	$593,753	$5,629	$7,926	$657,400	0.58201	$382,613
2029	$50,092	$593,753	$5,629	$7,926	$657,400	0.54393	$357,582
2030	$50,092	$593,753	$5,629	$7,926	$657,400	0.50835	$334,189
2031	$50,092	$593,753	$5,629	$7,930	$657,403	0.47509	$312,327
2032	$50,092	$593,753	$5,629	$7,930	$657,403	0.44401	$291,895
2033	$50,092	$593,753	$5,629	$7,930	$657,403	0.41496	$272,799
2034	$50,092	$593,753	$5,629	$7,930	$657,403	0.38782	$254,952
2035	$50,092	$593,753	$5,629	$7,930	$657,403	0.36245	$238,273
2036	$50,092	$593,753	$5,629	$7,930	$657,403	0.33873	$222,685
2037	$50,092	$593,753	$5,629	$7,930	$657,403	0.31657	$208,117
2038	$50,092	$593,753	$5,629	$7,930	$657,403	0.29586	$194,502
2039	$50,092	$593,753	$5,629	$7,930	$657,403	0.27651	$181,777
2040	$50,092	$593,753	$5,629	$7,930	$657,403	0.25842	$169,885
2041	$50,092	$593,753	$5,629	$7,930	$657,403	0.24151	$158,771
Totals	**$1,001,842**	**$11,875,050**	**$112,573**	**$158,564**	**$13,148,029**		**$6,508,892**

Table 14 -High Case Scenario Net Present Value Benefit Summary

	High Case						
Year	**Avoided Travel**	**Add'l Transport Costs**	**OCT**	**Emissions Avoided**	**Total**	**NPV Factor**	**Net Present Value**
2022	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.87344	$885,362
2023	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.81630	$827,441
2024	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.76290	$773,310
2025	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.71299	$722,719
2026	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.66634	$675,439
2027	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.62275	$631,251
2028	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.58201	$589,954
2029	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.54393	$551,359
2030	$50,092	$950,004	$5,629	$7,926	$1,013,651	0.50835	$515,289
2031	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.47509	$481,580
2032	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.44401	$450,075
2033	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.41496	$420,631
2034	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.38782	$393,113
2035	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.36245	$367,395
2036	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.33873	$343,360
2037	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.31657	$320,897
2038	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.29586	$299,904
2039	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.27651	$280,284
2040	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.25842	$261,948
2041	$50,092	$950,004	$5,629	$7,930	$1,013,654	0.24151	$244,811
Totals	**$1,001,842**	**$19,000,080**	**$112,573**	**$158,564**	**$20,273,059**		**$10,036,120**

Qualitative Considerations

Safety

This project will contribute to a reduction in crashes, fatalities, and injuries as vessel owners will be able to continue functioning as they have in the past. The need to travel to alternate ports for product delivery introduces new risks as vessels compete for limited space in order to conduct their business. The addition of several hundred vehicles on Sitka roads traveling between harbors, seafood processing plants, and competing with the summer tourist traffic will undoubtedly lead to more congestion and the potential for unwanted interactions between vehicles and pedestrians. Repairing the sheetpile wall at the MSC is an important solution to ensuring the safety of people and equipment working in the fish harvesting business and the many tourists that visit Sitka annually.

Quality of Life

The MSC and associated uplands infrastructure are important components to the Sitka fishing industry. Maintaining this infrastructure allows Sitkans to continue to work where they live and maintain active community ties.

Community Cohesiveness

The Marine Services Center provides an important stopping point for vessels needing to offload product and onload supplies and cargo. It also is an active point of disembarkation for cruise ship passengers, with almost 1,000 passengers disembarking annually. This location allows for easy access to many downtown activities for tourists.

Vessel and Infrastructure Damage

Vessel and infrastructure damage have not been qualified for this evaluation. The MSC seawall is already beyond its useful life and could fail at any time. Hopefully, that failure would not be catastrophic or involve ships moored at the location or passenger disembarking. There is the potential for vessel damages as vessels such as the Eyak must now traverse longer distances in order to complete their business.

Employment

There are three employees currently working at the MSC cold storage facility. The loss of the facility would result in the loss of these jobs.

Cost Estimates

Initial cost estimates are $9.2 million spread over a 18-month construction season. Periodic maintenance for the facility is assumed at 1 percent of initial construction cost every five years over the 20-year period of analysis. See Table 15.

Table 15 – Sheetpile Wall and Crane Replacement Cost Estimate

Description	Amount
Budget as to Sheetpile wall repair:	
Mobilization	$ 581,000
Demolition & Disposal	226,000
Sheet Pile Face Wall Galvanized	1,340,000
Sheet Pile End Walls Galvanized	158,000
Drilled and Grouted Tie-Rod Anchors	2,030,000
Steel Waler Assembly	271,000
Shot Rock Fill, Vibrocompacted	338,000
Drainage Improvements	85,000
C.I.P. Concrete Bulkhead Cap	451,000
Cathodic Protection System (Anodes)	113,000
Energy Absorbing Timber Fender System	690,000
Area Lighting	113,000
Subtotal	**$ 6,396,000**
Contingency @ 20%	1,279,200
Env permitting, final design, contract admin, inspection @ 20%	1,279,200
Subtotal Sheetpile Wall Repair	***$ 8,954,400***
Budget as to Crane replacement:	
Electro Hydraulic Telescope Boom Crane Model MCT 2230	168,500
Installation Estimate	100,000
Subtotal Crane Replacement	***$ 268,500***
Total Budget Sheetpile Wall and Crane Replacement	**$ 9,222,900**

At the end of the 20-year period of analysis, there is still value to the project components. See Table 16 for residual value calculations. Total residual value at the end of the 20-year period of analysis is $2.0 million. The expected useful life of the cathodic protection is estimated at 15 years so additional cathodic protection would be required prior to the end of the 20-year period of analysis.

The net present value of the sheetpile wall and crane replacement is $6.5 million over the 20-year period of analysis. See Table 17.

Table 16 – Sheetpile Wall and Crane Replacement Residual Value

Improvement Component	Expected useful life (years)	Residual value after 20 years
Sheetpile Wall	40	$ 1,899,500
Fill	40	$ 437,000
Cathodic Protection	15	$ (753,333)
Timber Fenders	40	$ 345,000
Area Lighting	25	$ 22,600
Crane	25	$ 53,700
Total Residual Value of improved infrastructure		**$ 2,004,467**

Table 17 – Net Present Value Sheetpile Wall and Crane Replacement

Year	Construction	Periodic Maintenance	Total Cost	NPV Factor	Net Present Value
2021	$ 4,477,200		$ 4,477,200	0.93458	$4,184,299
2022	$ 4,745,700		$ 4,745,700	0.87344	$ 4,145,078
2023			$ -	0.81630	$ -
2024			$ -	0.76290	$ -
2025			$ -	0.71299	$ -
2026			$ -	0.66634	$ -
2027		$92,229	$ 92,229	0.62275	$ 57,436
2028			$ -	0.58201	$ -
2029			$ -	0.54393	$ -
2030			$ -	0.50835	$ -
2031			$ -	0.47509	$ -
2032		$92,229	$ 92,229	0.44401	$ 40,951
2033			$ -	0.41496	$ -
2034			$ -	0.38782	$ -
2035			$ -	0.36245	$ -
2036			$ -	0.33873	$ -
2037		$92,229	$ 92,229	0.31657	$ 29,197
2038			$ -	0.29586	$ -
2039			$ -	0.27651	$ -
2040			$ -	0.25842	$ -
2041			$ -	0.24151	$ -
Totals	**$ 9,222,900**	**$276,687**	**$ 9,499,587**		**$ 8,456,961**
Total Construction Cost and Maintenance					**$ 8,456,961**
Less Residual Value after 20 years					2,004,467
Present Value of Sheetpile Wall and Crane Replacement					**$ 6,452,494**

Benefit-Cost Summary

The low case scenario for the seawall and crane replacement has $56,398 in net benefits with a benefit to cost ratio of 1.01. The high case scenario has net benefits of $3.6 million with a benefit to cost ratio of 1.56. Benefit calculations are determined using a 7 percent discount rate and a project period of analysis of 20 years.

Table 18 -Seawall and Crane Replacement Benefit to Cost Summary

Summary of Calculations	Low Case	High Case
Benefit calculations - 2020 $$		
Vessel avoided travel	$495,959	$495,959
Additional Transport Cost	$5,878,713	$9,405,940
Opportunity Cost of time	$55,729	$55,729
Emissions reduced	$78,491	$78,491
PV Benefits summary	**$6,508,892**	**$10,036,120**
Cost Calculations - 2020 $$		
PV Cost of Project	$8,456,961	
Less residual value	$2,004,467	
Effective cost (PV)	$6,452,494	
PV Net benefits (benefits - costs)	**$56,398**	**$3,583,626**
Benefit/cost ratio (benefits/costs)	**1.01**	**1.56**