



Fisheries and Oceans
Canada

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TERMS OF REFERENCE

LANCASTER SOUND - SMALL CRAFT HARBOUR FEASIBILITY STUDIES

F2470-180025

JULY 2018

Department of Fisheries & Oceans

Small Craft Harbours Branch



Canada



TABLE OF CONTENTS:

1	PROJECT DESCRIPTION.....	1
1.1	GENERAL	1
1.2	BACKGROUND INFORMATION.....	1
1.3	SUMMARY OF DESIGN WORK	3
1.4	SUMMARY OF SERVICES AND QUALIFICATIONS	4
1.5	SCHEDULE	5
1.6	COST	6
1.7	EXISTING DOCUMENTATION.....	6
1.8	CODES, ACTS, STANDARDS, REGULATIONS	6
2	REQUIRED SERVICES	8
2.1	GENERAL REQUIREMENTS	8
2.2	PRE-DESIGN SERVICE	8
2.3	DESIGN CONCEPT ANALYSIS AND COSTING.....	10
3	PROJECT ADMINISTRATION.....	11
3.1	GENERAL REQUIREMENTS	11
3.2	MEETINGS.....	12
4	APPENDICES.....	13
4.1	APPENDIX A - HARBOUR SITE PLANS.....	13
4.2	APPENDIX B – GENERAL PROCEDURES & STANDARDS FOR PROFESSIONAL & DESIGN SERVICES.....	13



1 PROJECT DESCRIPTION

1.1 General

1.1.1 Purpose

1.1.1.1 The Department of Fisheries & Oceans Canada (DFO), Small Craft Harbours (SCH) requires the services of a civil engineering firm with the knowledge of construction of marine infrastructure in the Arctic environment, acting as prime Consultant together with a multi-disciplinary team of sub-consultants for the provision of service required for this project.

1.1.2 PWGSC General Procedures and Standards Document (GP&S)

1.1.2.1 The Terms of Reference (TOR) document must be used in conjunction with the Public Services and Procurement Canada (PSPC) General Procedures and Standards Document (GP&S), as the two documents are complimentary.

1.1.2.2 The TOR describes project-specific requirements, services and deliverables while the GP&S document outlines with minimum standards and procedures common to all projects.

1.1.2.3 In the case of a conflict between the two documents, the requirements of the TOR override the GP&S Document

1.1.3 Project Information

Project Title:	Lancaster Sound – Small Craft Harbour Feasibility Studies
Project Location:	Arctic Bay, NU Clyde River, NU Grise Fiord, NU Resolute Bay, NU
Project Number:	F2470-180025
Contracting Authority:	Public Services and Procurement Canada
Project Authority:	Fisheries and Oceans Canada, Small Craft Harbours Branch

1.2 Background Information

1.2.1 Departmental Need

1.2.1.1 Fisheries and Oceans Canada, Small Craft Harbours requires a consultant to undertake feasibility studies for the potential construction of small craft harbours at four locations in Nunavut: Arctic Bay, Clyde River, Grise Fiord and Resolute Bay.

1.2.1.2 The marine infrastructure shall be designed to support safe access to the land and sea in the context of rapid environmental changes in the Arctic and in support of community fish harvesting and marine mammal harvest.



1.2.1.3 These harbours will also be designed to support the developing inshore and offshore commercial fisheries, ensuring that local fishing operations have access to safe harbours and landing facilities.

1.2.2 Existing Conditions

1.2.2.1 Arctic Bay, NU

1.2.2.1.1 The site is located in the Hamlet of Arctic Bay in the northern part of the Borden Peninsula on Baffin Island. Arctic Bay is accessible by scheduled airline service from Iqaluit, Nunavut. The community is supplied via sealift at various times during the shipping season.

1.2.2.1.2 The harbour site consists of a small rubble mound breakwater and gravel shoreline.

1.2.2.1.3 One location is being considered for the construction of a small craft harbour as shown on the site plan in Appendix A.

1.2.2.2 Clyde River, NU

1.2.2.2.1 The site is located in the Hamlet of Clyde River on the shore of Baffin Island's Patricia Bay, off Clyde Inlet, an arm of the Davis Strait. Clyde River is accessible by scheduled airline service from Iqaluit, Nunavut. The community is supplied via sealift at various times during the shipping season.

1.2.2.2.2 The harbour site consists of a small rubble mound breakwater and gravel shoreline.

1.2.2.2.3 One location is being considered for the construction of a small craft harbour as shown on the site plan in Appendix A.

1.2.2.3 Grise Fiord, NU

1.2.2.3.1 The site is located in the Hamlet of Grise Fiord on the southern shore of Ellesmere Island, overlooking Jones Sound. Grise Fiord is only accessible by small plane from Resolute Bay. The community is supplied via sealift at various times during the shipping season.

1.2.2.3.2 There is no existing harbour infrastructure.

1.2.2.3.3 Two locations are being considered for the construction of a small craft harbour as shown on the site plan in Appendix A. One location is at the western end of the community in a small bay, and the other is on the eastern end of the community located in front of the community freezer.

1.2.2.4 Resolute Bay, NU

1.2.2.4.1 The site is located in the Hamlet of Resolute Bay at the northern end of Resolute Bay on Cornwallis Island. Resolute Bay is accessible by scheduled



airline service from Iqaluit, Nunavut. The community is supplied via sealift at various times during the shipping season.

1.2.2.4.2 There is no existing harbour infrastructure.

1.2.2.4.3 Two locations are being considered for the construction of a small craft harbour as shown on the site plan in Appendix A. One location is at the western shore of Resolute Bay around a small gravel breakwater, and the other is on the north eastern shore of Resolute Bay, closer to the community.

1.2.3 Geology and Terrain

1.2.3.1 All of the site locations are located above the tree line and within the permafrost zone of Canada. The region generally consists of glacially scoured igneous/metamorphic terrain.

1.2.4 Constraints and Challenges

1.2.4.1 The site locations are all located in remote communities in Nunavut. The Consultant is required to be familiar with the logistical constraints imposed by these remote locations.

1.2.4.2 The Consultant will be required to become familiar with the project site and obtain local information as required.

1.2.4.3 The remote locations for some of these harbours mean that equipment and materials are not readily available. Consider life cycle costs when selecting materials and equipment, including not only the cost of construction but also the costs associated with doing maintenance on infrastructure in remote locations.

1.2.4.4 Maximize reliability of design by specifying simple, durable, and robust materials and equipment that DFO can easily maintain using by persons with moderate technical skills working in remote locations.

1.3 Summary of Design Work

1.3.1 Design Objectives

1.3.1.1 The objective of this project is to provide a stand-alone feasibility study for each of the four communities identified. The final report shall include Class 'D' estimates for the construction of the conceptual designs and estimated annual maintenance cost and frequency of dredging (if required).

1.3.1.2 The consultant shall develop layouts for small craft facilities at each of the four sites.

1.3.1.3 Design concepts shall be consistent with the DFO Harbour Accommodations Guidelines, Version 1.2 updated in 2015. This document will be provided to the successful Consultant after contract award.

1.3.1.4 Each conceptual design shall include the following elements:

1.3.1.4.1 Design of a new fixed wharf for a design vessel that has a length of 28.53m, breadth of 7.77m, depth of 5.3m and net tonnage of 199.38 tonnes (similar to



the Arctic Fisheries Alliance vessels Suvak and Kiviuq 1). The fixed wharf shall be accessible to the design vessel at low tide conditions.

1.3.1.4.2 Design of breakwater(s) to ensure that wave agitation within the harbour does not exceed the design criteria outlined in the DFO Harbour Accommodation Guidelines, Version 1.2. A wave agitation study shall be undertaken to verify that each of the recommended design options meets this criteria.

1.3.1.4.3 Accommodation for small craft vessels ranging in length from 6 metres to 9 metres and a draft of 1.5m, either via a floating dock system or by mooring bollards depending on the preference of each community. The estimated number of small craft vessels to be accommodated at each of the harbour locations is as follows:

Arctic Bay, NU – 90 vessels
Clyde River, NU – 105 vessels
Grise Fiord, NU – 15 vessels
Resolute Bay, NU – 20 vessels

1.3.1.4.4 Design of a harbour basin and/or entrance channels with sufficient depth to support the navigation of small craft vessels and the design vessel to the fixed wharf at low tide conditions. Sedimentation analysis shall be completed to ensure that any future maintenance dredging requirements are minimized and the estimated cost and frequency of future dredging requirements shall be included in the report.

1.3.1.4.5 A plan for harbour lighting and an electrical service on the fixed wharf shall be included in the conceptual design.

1.3.1.4.6 Design of a launch ramp for small craft vessels (6 metre to 9 metres in length) within each harbour basin shall be included in the design.

1.3.2 Design Life

1.3.2.1 Infrastructure shall have a minimum service life of 50 years for all major structures.

1.3.3 Environmental Objectives

1.3.3.1 Minimizing adverse effects on the environment is a government-wide goal. At all stages of work, keep in mind the need to have projects and facilities that DFO can build and maintain in an environmentally responsible manner.

1.4 Summary of Services and Qualifications

1.4.1 General services

1.4.1.1 The prime consultant will provide a full consulting team including the following consultant services and specialties:

- Civil Engineering
- Coastal Engineering



- Fluvial Geomorphology
- Sediment Management Science
- Structural Engineering
- Electrical Engineering
- Environmental Specialist
- Surveying
- Geotechnical Engineering
- Schedule Management Specialist
- Risk Management Specialist
- Cost Estimating Specialist

1.5 Schedule

1.5.1 General

1.5.1.1 Deliver the project in accordance with the project milestone listing identified below.

Project Phase	Milestone Completion Date
• Project Plan and Schedule	October 15, 2018
• 33% Draft Report	June 12, 2019
• Community Consultation	July 17, 2019
• 66% Draft Report	September 11, 2019
• Community Consultation	October 9, 2019
• 99% Draft Report	November 13, 2019
• Final Report	December 11, 2019

1.5.1.2 Field work shall be completed not later than September 30, 2019 to ensure that the overall project schedule is maintained.

1.5.1.3 The consultant shall submit a detailed project schedule based on the critical milestones for this project and the deliverables listed in section 2.0 Required Services. This schedule will then be used to coordinate all phases of the Consultants services.

1.5.1.4 Once the Project Authority has approved the schedule, the Consultant shall complete the Services in accordance with the approved schedule.

1.5.1.5 The schedule is to be in sufficient detail to provide a reasonable basis for progress monitoring and control. The list of activities to be tracked is to be consistent with the Milestones developed and approved in the project schedule.

1.5.1.6 The Consultants schedule must provide allowance for a 5 business day technical review and comment period following its presentation of each of the major deliverables, as laid out in section 2.0 Required Services.

1.5.2 Progress Monitoring and Reporting

1.5.2.1 On a monthly basis prepare a detailed schedule update showing project status effective as of the last day of the month. The detailed schedule is to reflect the following:

1.5.2.1.1 Progress of each activity to the effective date of the report;



- 1.5.2.1.2 Estimates for progress and completion milestone dates;
 - 1.5.2.1.3 Actual start and finish dates of all activities being monitored;
 - 1.5.2.1.4 Any potential delays, and outstanding issues and concerns from the design team's point of view; and
 - 1.5.2.1.5 Proposed resolution(s) for any serious planning or scheduling issues.
- 1.5.2.2 Prior to the monthly progress meetings via telephone, submit a written monthly narrative report consistent with, and expanding on, the detailed schedule. The narrative report is to detail the work performed to date, compare actual progress to planned progress, and present updated forecasts.

1.6 Cost

1.6.1 General

- 1.6.1.1 The consultant will maintain the necessary records to confirm the work performed.
- 1.6.1.2 If at any time during the progress of the work, the Consultant considers that the cost approved in the contract will be exceeded, the Consultant shall immediately provide DFO with complete details in writing.
- 1.6.1.3 At no time shall the approved contract value be exceeded without prior written authorization from PSPC.

1.7 Existing Documentation

1.7.1 Available for the Consultant

- 1.7.1.1 Bathymetric surveys to be undertaken in the summer of 2018 for the areas identified in Appendix A will be available to the Consultant by November 2018. The Consultant will be responsible for verifying the accuracy of the information incorporated into the design.
- 1.7.1.2 Georeferenced high resolution aerial photography taken in the summer of 2018 for the areas in consideration will be available to the Consultant by November 2018. The Consultant will be responsible for verifying the accuracy of the information incorporated into the design.
- 1.7.1.3 DFO Harbour Accommodations Guidelines, Version 1.2 updated in 2015 will be provided to the successful Consultant after contract award.

1.7.2 Disclaimer

- 1.7.2.1 Reference information will be available in the language in which it is written.
- 1.7.2.2 The documentation is offered "as is" for the information of the Consultant.

1.8 Codes, Acts, Standards, Regulations

1.8.1 General



- 1.8.1.1 The Consultant must identify, analyze and design the project in accordance with the requirements of all Authorities Having Jurisdiction (AHJ) and all applicable Codes, Acts, Standards and Guidelines and Legislation.
- 1.8.1.2 The Consultant team must be fully versed with the legislation and requirements that are unique to Federal Government harbours in Canada.
- 1.8.1.3 The Consultant team must be fully versed with the legislation and requirements that are unique to Federal Government projects tendered through PSPC.
- 1.8.1.4 Although submission of permits is not part of the scope of this project, the project shall be undertaken in such a way that they are compliant with the AHJ. The AHJ on this project may include but are not limited to:
- Nunavut Planning Commissions (NPC)
 - Nunavut Impact Review Board (NIRB)
 - Fisheries and Oceans Canada (DFO)
 - Environment and Climate Change Canada (ECCC)
 - Nunavut Research Institute (NRI)
 - Nunavut Water Board (NWB)
 - Transport Canada (TC)
 - Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
 - Hamlet of Arctic Bay
 - Hamlet of Clyde River
 - Hamlet of Grise Fiord
 - Hamlet of Resolute Bay
 - Nunavut Land Claim Agreement
 - Any other authority that is triggered by NIRB/NPC review

1.8.2 Code Compliance

- 1.8.2.1 Adhere to the most recent versions of all applicable laws, regulations, codes, standards, and guidelines applicable to the work. Where these overlap, adhere to the more stringent requirements.
- 1.8.2.2 Where there is no clear “more stringent” requirement, give priority to the Federal requirement over the provincial or municipal version.

1.8.3 Health and Safety

- 1.8.3.1 Be responsible for ensuring health and safety of project team (own employees, sub-consultants, and other specialists) when working on-site.
- 1.8.3.2 Abide by all relevant Legislation, Regulations, Codes, and Standards and ensure sub-consultants and other specialists are equally compliant.
- 1.8.3.3 Assess hazards inherent in the fieldwork.
- 1.8.3.4 Provide all necessary safety training and personnel protective equipment as required to address hazards.



- 1.8.3.5 Immediately address health and safety non-compliance issues identified by the AHJ or by the Departmental Representative and provide the Departmental Representative with written report of action taken.

2 REQUIRED SERVICES

2.1 General Requirements

2.1.1 Background Information

- 2.1.1.1 The Services under a contract resulting from this TOR will include the provision of the necessary field investigations as described below.

2.1.2 Cost Management

- 2.1.2.1 Effective cost estimating and cost control is of prime importance. The construction cost estimate shall be provided in a combined unit price and lump sum format. Where possible, the civil works shall be provided in unit price format.

2.1.3 Time Management

- 2.1.3.1 Effective time control is crucial. Project schedules shall be established and monitored using current project management tools and techniques, such as Critical Path scheduling.

2.2 Pre-Design Service

2.2.1 General

- 2.2.1.1 The following pre-design investigations, assessments and studies will be included in the services provided.

2.2.2 Scope and Activities

- 2.2.2.1 The consultant shall undertake the following for each stand-alone feasibility study at each of the four site locations.
- Analysis of existing facilities and operations:
 - Existing small craft facilities
 - Fishing and hunting activities
 - Fuel re-supply
 - Cargo handling and sea-lift
 - Analysis of existing resources available in each community:
 - Fuel supply available for future construction activities
 - Available land based construction equipment for construction and maintenance
 - Available manpower for construction and maintenance
 - Analysis of existing site conditions:
 - Location
 - Temperature
 - Daylight hours
 - Rainfall



- Snow
- Wind
- Seismic
- Tides
- Water levels
- Waves
- Storm surge
- Overtopping
- Currents
- Sea ice
- Conceptual design of 3 harbour layout options including the following:
 - Develop a layout for small craft facilities, including fixed wharf, breakwater, basin/channel dredging, floating docks/mooring bollards, launch ramp, electrical, to accommodate the number of vessels identified in Section 1.3.1 above
 - Develop a small craft float / mooring concept that is suitable for the environmental conditions at the site
- Wave Climate and Agitation Study:
 - Perform a parametric wind-wave hindcast to peak significant wave height and peak wave periods, and to estimate the extreme wave heights by return period (25, 50, 100 year period)
 - Provide numerical wave modeling to provide an estimate of wave generation, propagation and transformation under select wind conditions for each of the alternatives
 - Modelling will take into consideration attenuation of wave energy due to shallow water effects.
 - Breakwater Analysis will consider the preliminary location, alignment, dimensions and options associated with the breakwater(s)
 - Estimated wave climate at the harbour entrance and harbour basin for design concepts
- Desktop geotechnical site investigation and on-site sub-bottom profiling:
 - Provide a factual summary of any existing geotechnical information gathered
 - Conduct a geophysical sub-bottom profiling survey to identify changes in bottom hardness and to recommend locations for future geotechnical drilling programs
 - Permafrost assessment
- Coastal processes and sedimentation study:
 - Characterization of sediment and identification of transport pathways
 - Numerical modeling to determine the current flow of sediments, sedimentation rates, source of sediment, siltation patterns
 - Shoreline change through historical aerial photographs if available
 - Identify the rate of littoral drift
 - Identify the rate of accretion of sediment on the proposed site
 - Assessment of how proposed structures will affect littoral drift
- Ice assessment studies:
 - Assessment of level ice thickness, mean maximum, and extreme maximum
 - Early and late break-up period
 - Ice breakup pattern within each harbour
 - Ice development and cracking patterns along the shoreline
- Quarry Investigation:
 - Investigate existing or potential quarry sites to evaluate the potential for developing both large and small crushed rock
 - Materials sampling, identification and testing, including hardness tests
 - Assess availability of materials for harbour construction



- Assessment of haul roads and bridges from quarry to harbour location
- Community consultation:
 - Feedback on harbour layout options
 - Impact of ice break-up and flushing
 - Potential for sedimentation
 - Boat sizes and number forecasts
 - Opportunities for expanding the harbour in the future at minimal cost
 - Ability to accommodate (room and board, fuel) the contractors work force
 - Mooring/float concept, including removal and reinstallation procedures (if applicable)
 - Equipment availability in the community for construction and/or maintenance
 - Assess the labour potential, including local contractors, from the local community to assist in the construction of the harbour or even to execute as the general contractor
- Biological environment and socio-economic environment assessment:
 - Traditional knowledge study
 - Fish and fish habitat assessment
 - Migratory and marine bird assessment
 - Terrestrial vegetation assessment
 - Wildlife assessment
 - Marine mammal assessment
 - Species at Risk assesment
 - Archeological and Cultural Historic Site assessment
 - Identification of permitting requirements relevant to the Authorities Having Jurisdiction
- Landform and soil studies:
 - Collect samples of soils encountered for classification testing
 - Grain size analysis and visual classification
 - Surface sediment samples and testing to meet the minimum sampling required as described in the Disposal at Sea Guidelines
- Identify any project constraints to the development and construction of a harbour, including but not limited to: permitting, local contracting capabilities, source of materials, road access, etc.
- Identification of concerns expressed in Consultation meetings and proposed strategies to address concerns

2.2.3 Deliverables

2.2.3.1 Completion dates for the deliverables listed below are identified in Section 1.5:

- Project plan and schedule
- 33% Draft Report for each harbour location
- Community Consultation
- 66 % Draft Report for each harbour location

2.2.3.2 Provide digital copies of documents for review at each stage.

2.3 Design Concept Analysis and Costing

2.3.1 General

2.3.1.1 The following shall be included in the services provided.

2.3.2 Scope and Activities



2.3.2.1 The consultant shall undertake the following for each stand-alone feasibility study at each of the four site locations:

- Options analysis of each of the three layout options
- Consultation with the local community to determine their preferred layout option and presentation of preliminary results from field investigations
- Class 'D' estimates for each design option
 - Broken down by each component in the harbour (wharf, breakwater, basin/channel dredging, floating docks/mooring bollards, launch ramp, electrical)
 - Assuming a stand-alone construction contract unconnected with any other regional harbour developments
 - Include estimate for all approvals, engineering investigations and studies required for detailed design, design work, and construction
- Class 'D' maintenance estimates for each design option (including cost and frequency of any dredging required)
- Recommendation on preferred design option with a priority on minimizing future dredging and maintenance requirements
- Recommendation on further studies required for detailed design
- Provide projected timelines for completion of approvals, engineering investigations and studies required for detailed design, design work, permitting and construction for the recommended design option

2.3.2.2 The Treasury Board (TB) cost estimate classification definition of a Class 'D' estimate is as follows:

- 2.3.2.2.1 Class 'D' (Indicative) Estimate: accurate to within 25% of eventual contract award price and to be in unit cost analysis format (such as cost per m² or other measurement unit) based upon a comprehensive list of project requirements (i.e. scope) and assumptions; the Class 'D' estimate is developed during the Conceptual Design Stage and used for the Preliminary Project Approval Document for preliminary design.

2.3.3 Deliverables

2.3.3.1 Completion dates for the deliverables listed below are identified in Section 1.5:

- Community Consultation
- 99% Draft Report for each harbour location
- Final Report for each harbour location

2.3.3.2 Provide digital copies of documents for review at each stage and 6 hard copies of the Final report along with supporting electronic documents (including .dwg files).

3 PROJECT ADMINISTRATION

3.1 General Requirements

3.1.1 General

3.1.1.1 All data collected, reports and drawings made in connection with the project become the property of DFO and must be turned over with full copyright to DFO upon completion of the contract.



3.1.2 Project Delivery

- 3.1.2.1 Deliver the project within the key milestones and according to the detailed project schedule. Ensure that each Consultant team member understands the project requirements for seamless delivery of the required services.
- 3.1.2.2 Provide a continuous risk management program; address the risks associated specifically with this project including the remoteness of the site and the logistics of completing field work in remote locations.

3.1.3 Media

- 3.1.3.1 The Consultant shall not respond to requests for project related information or questions from the media. Such inquiries shall be directed to DFO's Project Authority.

3.2 Meetings

3.2.1 Project Kick-Off Meeting

- 3.2.1.1 Project Kick off meeting will be conducted at DFO premises at 501 University Cres, Winnipeg, MB. Consultant should include the cost to travel to this meeting in their proposal.

3.2.2 Monthly Progress Meetings

- 3.2.2.1 Monthly progress meeting shall be held via telephone during the first week of each month. Consultant is to lead these meetings and provide minutes for each meeting within 48 hours of the meeting.

3.2.3 On Site Consultation Meetings

- 3.2.3.1 The consultant shall make allowance for one on site consultation meeting with each community during the Pre-Design Service phase in each of the four communities.
- 3.2.3.2 The consultant shall make allowance for one on site consultation meeting with each community during the Design Concept Analysis and Costing phase in each of the four communities.
- 3.2.3.3 The above requirements do not include the site visits required for the pre-design field investigations. The Contractor is to schedule those visits as required and advise the project authority as to when they will be in the communities. Costs for travel to undertake these investigations should be included in the contract.



4 APPENDICIES

4.1 Appendix A - Harbour Site Plans

4.2 Appendix B – General Procedures & Standards for Professional & Design Services