



RETURN BIDS TO:

RETOURNER LES SOUMISSIONS À:

Réception des soumissions - TPSGC / Bid Receiving -
PWGSC
1550, Avenue d'Estimauville
1550, D'Estimauville Avenue
Québec
Québec
G1J 0C7

**SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION**

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

**Vendor/Firm Name and Address
Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Issuing Office - Bureau de distribution
TPSGC-PWGSC
601-1550, Avenue d'Estimauville
Québec
Québec
G1J 0C7

Title - Sujet Enrochement quai St-Max.-Mt-Louis	
Solicitation No. - N° de l'invitation EE519-180590/A	Amendment No. - N° modif. 006
Client Reference No. - N° de référence du client EE519-180590	Date 2017-09-08
GETS Reference No. - N° de référence de SEAG PW-\$QCM-008-17176	
File No. - N° de dossier QCM-7-40083 (008)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2017-09-20	
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Rochette, Jean	Buyer Id - Id de l'acheteur qcm008
Telephone No. - N° de téléphone (418) 649-2834 ()	FAX No. - N° de FAX (418) 648-2209
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: Quai est de St-Maxime-du-Mont-Louis Gaspésie, Québec	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée	Delivery Offered - Livraison proposée
Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)	
Signature	Date

AMENDEMENT 006

Title: **ST-MAXIME-DU-MONT-LOUIS WHARF ENROCKMENT**

Included in the present amendment:

1. Questions and answers 12 to 20
2. Addendum no 1 (correction)

QUESTIONS AND ANSWERS:

Question 12: On page 17 of section 01 35 43 of the specification, it is stated that the machinery used to circulate in and around the watercourse must use BIODEGRADABLE oils, except trucks. Will the crane that will be used for stone placement also use biodegradable oils, as it is probably the only capable equipment that can place the stones at a maximum of 300 mm from their final position, as required by Section 35 31 25 of the Specification?

Answer 12: This requirement applies to the crane.

Question 13: On page 4 of section 35 31 25, it is mentioned that the crane must be equipped with a GPS system. Do each of the stones need to be measured individually?

Answer 13: A measurement of the coordinate shall be taken for each stone of carapace laid under water.

Question 14: Can we use crushed concrete that does not contain any reinforcement as an all-in-one?

Answer 14: It is permissible to integrate the concretes from cells 6, 7 and 8 and the Duke of Alba into the breakwater. The integration of this concrete must be carried out according to the requirements of the plans and specifications.

Question 15: Does the all-in-one have to meet the same requirements as other stone gauges or a sandstone will be accepted?

Answer 15: Sandstone is not accepted for the all-in category. The requirements in section 35 31 24 apply to all classes of stone.

Question 16: On page C01 / 15 of the plans, there is an additional excavation area for environmental exploration. To which payment item do we have to pay the expenses related to this activity? And what are the contaminated quantities at this location?

Answer 16: This work refers to the measuring station 3.18. The amount of contaminated soil to be evacuated below the 350 mm excavation would be subject to additional costs to the contract.

Question 17: When excavating and putting contaminated soil in piles, do we have to put a waterproof membrane on the pile pending the results of the analysis?

Answer 17: The requirements for this activity are mentioned in section 01 35 43 article 1.11.4 of the estimate.

Question 18: What type of membrane should we put under the temporary work platform?

Answer 18: The geotextile to be placed under the work platform is specified in section 31 32 19.16 of the specification, article 2.1.2.

Question 19: In the quotation we mention that the transport of stone can be carried out before the date of March 31, 2018. Will the temporary work platform also be made before this date?

Answer 19: The restrictions indicated in section 01 14 00 of the estimate, article 1.4.1.1 also apply to the construction of the work platform.

Question 20: What is the expected end date of the contract?

Answer 20: The Work shall completed by November 30, 2019

ADDENDUM no 1 (correction)

Notice: the following should have been included in amendment 005.

1 Section 01 45 00

ADD the attached Section 01 45 00 to the specifications.

2 Sections 01 74 25 and 35 31 24

DELETE Sections 01 74 25 et 35 31 24 du devis

INSERT the attached Sections 01 74 25 and 35 31 24 to the specifications. Please note that changes are in bold.

ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.

Part 1 General

1.1 INSPECTION

- .1 Allow Departmental Representative access to work. If part of work is in preparation at locations other than place of work, allow access to such work whenever it is in progress.
- .2 Give timely notice requesting inspection if work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of place of work.
- .3 If Contractor covers or permits to be covered work that has been designated for special tests, inspections or approvals before such is made, uncover such work, have inspections or tests satisfactorily completed and make good such work.
- .4 Departmental Representative will order part of work to be examined if work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such work and pay cost of examination and correction. If such work is found in accordance with Contract Documents, Departmental Representative will pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent inspection/testing agencies will be engaged by Departmental Representative. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform work in accordance with contract documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

- .1 Remove defective work, whether result of poor workmanship, use of defective products or damage and whether incorporated in work or not, which has been rejected by Departmental Representative as failing to conform to contract documents. Replace or re-execute in accordance with contract documents.
- .2 Make good other Contractors' work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective work or work not performed in accordance with contract documents, Owner will deduct from Contract Price difference in value between work performed and that called for by contract documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

- .1 Not used.

1.7 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as required.
- .2 Cost of tests and mix designs beyond those called for in contract documents or beyond those required by law of place of work will be appraised by Departmental Representative and may be authorized as recoverable.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 11 01 – General information.
- .2 Section 01 35 43 – Environmental protection.
- .3 Section 01 74 21 – Construction waste management and elimination.
- .4 Section 02 41 16 – Construction demolition.

1.2 REFERENCES

- .1 Documentation from the Canadian Council of Ministers of the Environment (CCME).
- .2 *Soil Protection and Contaminated Sites Rehabilitation Policy* from the Ministère du Développement durable, de l'environnement et de la Lutte contre les changements climatiques (MDDELCC), the *Action guide – Soil protection and contaminated Sites Rehabilitation* (MDDELCC, 2016) and technical sampling guides if required.

1.3 DEFINITIONS

- .1 The definition of “dry demolition materials” is as found in the *Regulation respecting solid waste* (R.R.Q., 1981, CQ-2, r.14): “non-fermentable, shredded residues free of hazardous materials, cut wood, debris and rubble, fragments of concrete, masonry and asphalt.”

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 REMOVAL OF SOLID WASTE AND DRY MATERIALS

- .1 Do not bury or burn solid waste or dry materials on the construction site.
- .2 The Contractor must hire, at their own expense, an Expert Environmental Consultant (“Environmental Consultant”) to **develop and implement** an environmental protection plan for the construction site that includes management plans for at least the following: contaminated soils, waste, construction site cleaning (before, during and after), demolition and excavation work. This environmental protection program must include but is not limited to the following:
 - .1 Method for removing contaminated above the MDDELCC’s class C criteria.
 - .2 Means of temporary storage and drying and treatment methods for water from dewatered soil, if required. The Contractor must provide plans for the storage sites and structures used for dewatering contaminated soils and processing the resulting water, if required.

- .3 Means of transportation, types of vehicle and roads used (traffic plan).
 - .4 A plan showing contaminated areas. If temporary storage or piling areas are used, the Contractor must provide location and management plans for these areas.
 - .5 The name and address of disposal sites for class C, B-C, A-B and <A contaminated soils.
 - .6 The name of the engineered landfill used to dispose of scrap from the construction site.
 - .7 Certificates of authorization issued by the MDDELCC for all disposal sites used for contaminated soils, scrap and waste. If these sites are located outside of Quebec, the Contractor must obtain authorization from the province and the disposal site and provide the letters and/or certificates of authorization to the Departmental Representative.
- .3 Do not dispose of solid waste or dry materials in streams or watercourses. Water that has been in contact with contaminated soils or waste may not be released directly onto the environment without undergoing analysis to verify that it meets the MDDELCC's disposal standards (Protection criteria for aquatic life in marine areas).
 - .4 The Contractor must remove dry materials and soil (fill) resulting from demolition. These materials are not to be reused.
 - .5 Unrecovered dry demolition materials and fill must be disposed of at sites authorized by Quebec's MDDELCC. If the disposal site is in another province, the site must be approved by that province.
 - .6 The Contractor must provide the Departmental Representative with a copy of the authorizations and permits from the owners or managers of the engineered landfills or disposal sites for contaminated soils before the Departmental Representative can allow the dry materials to be taken offsite. The MDDELCC can provide information about extant sites upon request. If the site is outside of the province, the Contractor must provide the province's authorization to receive dry materials and/or backfill if necessary. The Contractor must also provide the certificate authorizing the site to operate.
 - .7 **The wooden casing located on the bank, appearing on the plans, which is to be demolished, was characterized last June. The results showed that the wood would have been treated with chromated copper arsenate (ACC). As a result, wood must be disposed of in a site that is eligible for CCA treated wood. The volume was estimated at 5m³.**
 - .8 If the Contractor wishes to dispose of dry materials and backfill (below the MDDELCC's class A, crushed concrete) at a site other than an engineered landfill site authorized by the MDDELCC, they must obtain authorization from the municipality where the site is located and from the MDDELCC. They must provide the Departmental Representative with authorizations from the site in question (site owner), the municipality and the MDDELCC. They must do so in order to comply with municipal and provincial regulations.

To obtain the aforementioned authorizations, the Contractor must prove that they understand the environmental characteristics of their chosen disposal site. If the Contractor wishes to dispose of dry materials and/or backfill in an unevaluated (or uncertified) site of their choice, they must, at their own expense, perform a soil characterization for this site and obtain the Departmental Representative's authorization before using it.

Note: Soil characterization involves collecting and analyzing soil samples to determine their metal content (lead, copper, zinc, cadmium, chrome, arsenic, nickel, mercury), polycyclic aromatic hydrocarbons (PAHs) content and other contaminant content (Ref.: MDDELCC soil characterization guides). All environmental characterizations must comply with the regulations and methods described in the guides and sampling notebooks so that the MDDELCC can use them for environmental analysis purposes.

.9 As part of the riprapping project, the Department is also planning to decontaminate the wharf and entry cells. The goal is to reduce copper contamination of the fill on a commercial/industrial level, i.e. below MDDELCC class C.

The quality of the fill in cells (1 to 4) of the wharf was evaluated in July 2016. This evaluation found primarily copper contamination above MDDELCC class C at a depth of 500 mm. The estimated volume is 370 m³. However, there is little information on the quality of the fill below the first 500 mm. Once this layer has been removed, the Contractor, through their Environmental Consultant, must characterize the fill in each cell to determine the soil quality. A composite sample will be collected from each cell. Within 24 hours after sampling, the samples should be analyzed for C₁₀-C₅₀ and the six (6) following metals: arsenic (As), cadmium (Cd), copper (Cu), nickel (Ni), lead (Pb) and zinc (Zn). If possible, the samples should also be analyzed for PAHs within 24 hours after sampling. Another 500 mm layer should be removed from every cell containing a copper or C₁₀-C₅₀ contamination above MDDELCC class C. This procedures should be repeated for each cell until a concentration below class C is obtained or until the proportion of fine particles (sand, silt, and clay) is too low to continue analyses.

The fill in the entry is contaminated with copper above class C. According to various soil characterizations, the layer 350 mm under the concrete slab between the wharf (**chaining 0+350**) and the fence (**chaining 0+120**) is contaminated above class C **and RESC**. This layer, an estimated 700 m³ of fill, must be removed and disposed of in a site authorized by the MDDELCC or the province that is receiving the fill. Once this 350 mm layer has been removed, the Contractor, through their Environmental Consultant, must sample the surface fill every 25 metres. The samples must be analyzed for six (6) metals (As, Cd, Cu, Ni, Pb and Zn) within 24 hours. Fill contaminated with copper above class C must be excavated to a depth of 500 mm and re-sampled until the copper concentration drops below class C.

The portion of the approach to the east of the fence (chaining 0+120) up to the 0+000 chain was characterized in June 2017. A layer of variable thickness (50 to 80 mm) is found on the surface of bituminous concrete. Under this layer, the embankment is contaminated with copper. The first layer of 300 mm has contamination beyond criterion C or even superior to the RESC. Considering that the whole approach is withdrawn, it is estimated that there is a volume of nearly 150 m³ > C and even > RESC and about 150 m³ of B-C. These recent results have been added to Appendix B.

The only area affected by C₁₀-C₅₀ hydrocarbons is located in the entrance, close to where the wharf begins. It is the result of a hydrocarbon spill from a pipeline that had been left in place. Xstrata has dismantled the pipe and decontaminated the spill area between chainage 0 + 320 and 0 + 280 m, as illustrated on the plans. The bottom of the excavated area could not be characterized during work as it was located at chart datum and the tide was rising. The excavated area was filled without being characterized. As a result, the area is considered to be potentially contaminated with C₁₀-C₅₀ hydrocarbons over an area of approximately 240 m². The Contractor's Environmental Consultant must propose a sampling and process plan to determine the quality of fill in this area. The plan must be submitted to and approved by the Departmental Representative. The Contractor must take steps to avoid dispersing exposed soils during the sampling period and while awaiting analysis results. They must collect samples and have C₁₀-C₅₀ and PAH content analyzed within 24 hours. If the fill is contaminated above class C, it must be excavated to a depth of 500 mm and sent to an MDDELCC-authorized site. New samples must then be collected to determine the quality of the bottom layer of fill. If rocks are contaminated by heavy hydrocarbons ("bunker fuel" attached to the rocks), they must be removed from the area and sent to an MDDELCC-authorized site.

The soil excavated from this sector (chainage 0 + 320 and 0 + 280 m), as well as all material excavated in the water, must be dried sent to the final disposal site. The Contractor must include a soil drying pond in their plans. Soil management in these drying ponds must account for contamination levels of the excavated material. Contaminated soils and/or soils with different levels of contamination should not be mixed. Water resulting from dewatered soil must be analyzed in order to determine its contamination levels. In order to be pumped back out to sea, the water must comply with the MDDELCC's protection criteria for aquatic life in marine areas. The parameters to be analyzed are the same as those for the soil: copper in the wharf and entry cells, PAH and C₁₀-C₅₀ in the aforementioned area (chainage 0 + 320 and 0 + 280 m), suspended material fewer than 25 mg/L and any other necessary parameters. If water from dewater is contaminated above the criteria, it must be sent to a treatment facility or treated onsite before being sent out to sea in order to comply with disposal criteria.

See tables in Appendix B – Locating surveys and analytic results.

- .10 The Contractor's Environmental Consultant must account for this information when preparing their disposal plan.
- .11 The laboratory used by the Contractor must be accredited by the MDDELCC and approved by the Departmental Representative.
- .12 Soil will be managed according to their level of contamination, in compliance with the MDDELCC's *Action Guide – Soil Protection and Contaminated Sites Rehabilitation*:
 - .1 Contaminated soil, less than A
 - .2 Contaminated soil, Class A-B
 - .3 Contaminated soil, class B-C
 - .4 Contaminated soil, greater than C
- .13 Depending on the results for each of the parameters, the Contractor must collect and transport the soil to an MDDELCC authorized offsite area or disposal site.

- .14 The Contractor must provide the Departmental Representative with a copy of the analysis results, transport sheets, weight tickets, authorizations and permits from the relevant authorities.
- .15 If there is debris on the access roads, the Contractor must remove it immediately and process it according to its level of contamination as needed. If necessary, the debris must be covered with a moisture barrier and stored in a designated area that has been approved by the Departmental Representative. It must then be transported to an appropriate offsite treatment area.
- .16 At any time before, during or after the work, the Departmental Representative can take or ask the Contractor to collect soil samples from access roads and other areas that were not contaminated before work began, whether already in place or built for the project. Clean soil that may have been contaminated by the Contractor's activities must be excavated and disposed of at an MDDELCC-authorized site at no extra cost to the Department.

3.2 RECOVERABLE MATERIALS

- .1 Untreated wood in good condition, concrete, steel and stone (except for stone that is to be reused under section 02 41 16 – Construction demolition) from demolition activities are considered to be recoverable.
 - .1 Creosote-treated wood must be stored in a designated, MDDELCC-approved area.
 - .2 If creosote-treated wood needs to be stored onsite, it must be kept inside an airtight container in an area that has been pre-approved by the Departmental Representative. Creosote-treated wood must be kept inside this container, and the container must be transported to a designated, MDDELCC-approved area. The Contractor must provide the Departmental Representative with certificates of authorization issued by the MDDELCC. If the site is outside of the province, the Contractor must provide the province's authorization to receive this material alongside the disposal site's certificates of authorization, if required.
- .2 The Contractor is solely responsible for determining which materials can be recovered.
- .3 With the exception of contaminated soils, the separation of reusable materials at the source and their storage is not subject to any applicable federal or provincial laws. However, the Contractor must follow all regulations and obtain and have authorization from the municipality.
- .4 Dry, recoverable demolition materials can be removed from the site as long as the Contractor.
 - .1 Provides a written statement that the owner and operator of the site where the materials deemed recoverable by the Contractor are to be stored will indemnify and hold harmless Her Majesty in right of Canada for all claims, demands, losses, costs, damages, actions, suits or proceeding by any third party, brought or prosecuted and in any manner based upon arising out of, related to, occasioned by or attributable to the storage of these materials on this site by the Contractor, their employees, agents or subcontractors or the subsequent use of these materials;

- .2 Provides a document signed by owner and operator of the site, authorizing the Contractor to store materials that they deem recoverable on the site; and
- .3 Provides a document signed by the owner and operator of the site that indemnifies and holds harmless Her Majesty in right of Canada for all claims resulting from the deposit of materials deemed reclaimable by the Contractor or the subsequent use of said materials.

This document must:

- .1 Be in duplicate if the owner of the site is not the operator (i.e. one copy for the owner of the site and one copy for the operator of the site).
- .2 Indicate the cadastre numbers and owner name of the lots in the repository site for recoverable materials.
- .3 Contain the following paragraph:
“ _____ ” (enter the name of the company using the site or the site owner) shall indemnify and hold Her Majesty harmless from and against all claims, demands, losses, costs, damages, actions, suits or proceeding by whomever made, brought or prosecuted and in any matter based upon, arising out of, related to, occasioned by or attributable to the storage by “ _____ ” (enter the Contractor’s name), their employees, agents or sub-contractors, on the lot(s) bearing the number(s) _____ in the cadastre of _____, of materials from _____ (enter the structure to be demolished) deemed recoverable by “ _____ ” (enter the Contractor’s name), or to the subsequent use of these materials.
- .4 Provide a document duly issued by the RCM or the municipality where the site is located, authorizing the site owner and operator to use the site to store reusable material from the demolition site.
- .5 Obtain prior written approval from the Departmental Representative.

3.3 DECONTAMINATION REPORT

- .1 Once decontamination has been completed, the Contractor’s Environmental Consultant must produce a report on the decontamination operations for the site, including environmental monitoring of the construction site. This report must include but is not limited to the following:
 - Summary in French.
 - Context and project goals, summarizing the situation before decontamination.
 - List of environmental monitoring operations referring to, among others, the elements of this brief and the environmental impact assessment.
 - Section indicating the quality of the fill before operations began.
 - Daily progress reports on the work. The progress report should detail the work, environmental monitoring and characterization operations performed each day.

- A description of field work, methods, sampling program, analysis program, quality control program, sampling locations (latitude and longitude), etc..
- A location plan for the soil sampling stations (with at least the volume and number of samples required by environmental monitoring sampling guides and notebooks; this number can be raised for improved management of the fill or bottom of the excavation).
- The list of soil samples, as a table (**including sampling station coordinates, visual and olfactory description, observations, etc.**).
- For soil samples: results as a table as specified in the MDDELCC's *Action Guide – soil Protection and Contaminated Sites Rehabilitation* and referring to the *Canadian Environmental Quality Guidelines* and the CCME's commercial and industrial criteria.
- Indicators showing contaminated areas left behind, by contamination class: <A, A-B, B-C, (and >C, but in theory there should be nothing left in that class).
- Volume of contaminated soil disposed of by disposal site.
- Volume of scrap by category (stone, concrete, wood, steel, etc.) and disposal sites.
- Quality control interpretation of soil results.
- Interpret soil results according to the criteria in the MDDELCC's *Action Guide – Soil Protection and Contaminated Sites Rehabilitation*. Estimate the surface area and volume of contaminated areas left behind, by contamination class: <A, A-B, B-C, (and >C, but in theory there should be nothing left in that class).
- Conclusion.
- Photographs of the site during work.
- Work monitoring journal (with dates, description of work, volumes disposed of, samples taken, etc.).
- Photocopies of the transport sheets and weight tickets.
- Analysis certificates.
- Any other information needed to understand the report.
- In an appendix, attach the daily environmental monitoring reports (tables filled out by the worksite supervisor).

END OF SECTION

Part 1 General

1.1 SCOPE

- .1 This section covers stone production, including the Departmental Representative's acceptance process and the applicable quality control and quality assurance processes. The Contractor is responsible for quality control (QC), while the Departmental Representative is responsible for quality assurance (QA).

1.2 RELATED SECTIONS

- .1 Section 01 29 00 – PAYMENT
.2 Section 01 33 00 – DOCUMENTS AND SAMPLES TO SUBMIT
.3 Section 02 41 19 – EXCAVATION OF STONE AND DOLOSSE
.4 Section 35 31 25 – STONE PLACEMENT

1.3 REFERENCES

- .1 The latest edition of each of the standards below are part of this document, within the indicated limits.
- .1 American Society for Testing and Materials (ASTM)
- ASTM C88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - ASTM C127: Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
 - ASTM C136: Sieve Analysis of Fine and Coarse Aggregates
 - ASTM C295: Petrographic Examination of Aggregates for Concrete
 - ASTM D4992: Evaluation of Rock to be Used for Erosion Control
 - ASTM D6928: Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
 - ASTM D7012: Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures

1.4 DOCUMENTS AND SAMPLES TO SUBMIT

The following information must be submitted to the Departmental Representative in compliance with the requirements laid out in section 01 33 00 - Documents and samples to submit.

.1 Information on stone sources

The Contractor must submit the following information about all proposed stone sources within twenty (20) business days of contract award:

- .1 name and location of quarry
- .2 areas and lifts of the quarry to be worked
- .3 specific geological strata ***or facies*** to be utilized
- .4 results of all required laboratory tests (table 2) on samples that represent each of the areas and strata to be worked. These tests must have been performed specifically for this project
- .5 list of marine structures that have been built with the same stone
- .6 ***in the case of a conglomerate, the information to be provided must also specify the age of the geological formation (see table 1).***

.2 Stone materials control plan and staffing

The Contractor must submit a written stone materials control plan within twenty (20) business days of contract award. This plan must describe the means, methods and equipment to be used for production, handling, transportation and placement of the stone, as well as for the inspections and the follow-up to ensure the stone is of a satisfactory quality.

The stone materials control plan must include the names and qualifications of the supervisor and of a licensed professional geologist (or geological engineer).

.3 Pre-production stones

The Contractor must submit a set of pre-production stones within twenty-five (25) business days of contract award. These stones will be evaluated at the source by the Departmental Representative. At least 25 pre-production stones must be provided for each stone category to be produced at each source.

.4 Revision of the stone materials control plan and staffing

The Contractor must submit proposed revisions to the stone materials control plan no later than five (5) days before they plan to implement the revision. The Contractor must not implement the revision before it has been reviewed by the Departmental Representative. Proposed staff changes must also be submitted for review.

.5 Stone materials control plan reports

The Contractor must keep daily logs of all work performed as part of the approved stone materials control plan. These logs must be available for the Departmental Representative to review upon request. They must also be collated at the end of each week and submitted to the Departmental Representative weekly. Daily logs must be written by each inspector and must include the following information:

- .1 inspector name
- .2 identification of stone-handling equipment for each work phase and the names of the equipment operators who prepared the stone for inspection;
- .3 date of stone inspection
- .4 weather conditions, including temperature
- .5 date and weather conditions for the day the stone was removed from the quarry face and date and details of blasting, if applicable
- .6 ***facies*** and location (horizontal and vertical) from which the stone was extracted in the quarry
- .7 colours and characters used by the inspector for spray paint marks and the relevant code for stones which are individually sorted (versus mechanically sorted) and for any rejected stone
- .8 breakdown of the approximate quantity, by category, of stones accepted and rejected throughout the day
- .9 a summary of the reasons for rejecting the stone throughout the day
- .10 total amount of each type of stone removed to date

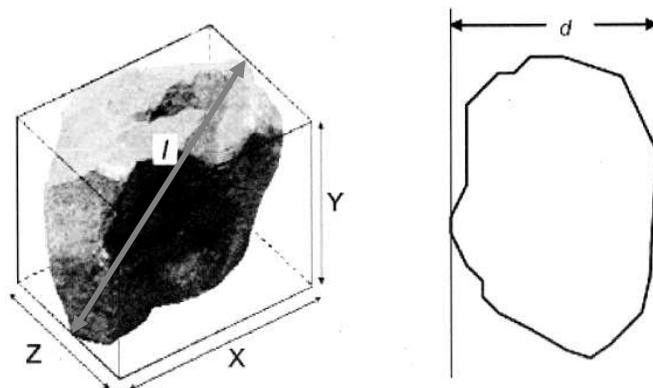
.6 Gradation tests

Submit all gradation tests results for examination, including test data sheets, calculations and a graphic presentation of the results.

1.5 TERMINOLOGY AND DEFINITIONS

.1 The terms below are defined as follows:

- .1 The term “tonne” (t) refers to the metric ton (1 t = 1,000 kg)
- .2 Dimension ratio (l/d) - ratio of the maximum length (l) to minimum thickness (d) measured between the two closest parallel lines through which the stone can pass.



- .3 **Facies 1): A category in which a rock may be classified and which is determined by one or more similar lithological characters.**
- .4 **Conglomerate 1): Detrital sedimentary rock formed of least 50% of debris of rocks larger than 2 mm by cement.**

1.6 QUALITY CONTROL STAFF

.1 General

The Contractor must provide a designated supervisor for the stone quality control process. They must also provide skilled inspectors in the quarry and at the loading point. Furthermore, the Contractor must retain a licensed professional geologist (or geological engineer) to help the supervisor as needed throughout the project. Staff must ensure that all stone that has been produced, delivered to the construction site and placed in the structure meets the requirements laid out in the plans and the specifications document.

.2 Supervisor qualifications and responsibilities

The supervisor is responsible for implementing all elements of the stone materials control plan. He must have at least two (2) years of specialized experience inspecting and evaluating armour stone for marine structures. This experience must have been obtained by evaluating the quality of stones of similar type and size to the ones used for this project. If the primary contractor obtains the stone for this project through a subcontractor, the supervisor shall not to be employed by said subcontractor.

The supervisor assumes responsibility for implementing and executing the stone materials control plan, including management, supervision and examination of inspectors' work. The inspection staff must be qualified and suitable for the work. The supervisor is responsible for replacing any inspector that does not perform their duties satisfactorily. The supervisor is also responsible for the quality of all stone.

.3 Geologist (or geological engineer) qualifications and responsibilities

The geologist (or geological engineer) must have at least three (3) years of practical experience inspecting and evaluating armour stone. They must assist the supervisor in selecting the stone sources. This includes assisting with visual and petrographic examinations (tables 1 and 2), identification of acceptable and unacceptable zones and **facies** of stone in the quarry, collecting samples for laboratory testing and choosing pre-production stones. The geologist (or geological engineer) must be retained during stone production if permanent quality control (QC) and quality assurance (QA) processes indicate that the stone is questionable or does not meet the requirements, according to the Departmental Representative's instructions.

- 1) Dictionary of geology: A. Foucault, J.-F. Raoult, 3rd edition.

.4 Inspector qualifications and responsibilities

Inspectors must have adequate training and at least one (1) year of relevant experience that allows them to competently and independently perform the following tasks under the general supervision of the supervisor.

- .1 Assist in selecting pre-production stones and evaluating stones placed in storage piles.

- .2 Keep a clear and legible daily log of their activities and observations, in a format approved by the Departmental Representative. Write daily inspection reports and submit them in a timely manner.
- .3 Visually inspect stones to ensure that they meet the quality requirements listed in this section. The inspection must focus **on the quality of stone, the presence of fractures, the geology of the stone and any other characteristics and/or anomalies** that could cause the stone to deteriorate as or after it is placed in the structure.
- .4 Clearly mark all armour stone (stone weighing 1–3 t or more) with spray paint, using a colour and symbol system that has been approved by the Departmental Representative. Unless otherwise indicated, each stone must be marked on three mutually perpendicular sides. Inspection must also involve the identification and marking of stones that do not meet the acceptability criteria in terms of size, shape and/or quality. Unacceptable stones must be spray-painted with a red X on three mutually perpendicular sides.
- .5 Measure each stone on three (3) mutually perpendicular sides and reject any stones that do not meet the dimension ratio requirements.
- .6 Ensure that all armour stone (stone weighing 1–3 t or more) is weighed individually, using the appropriate equipment. Estimate the weight of the filter stone (stone weighing 800–1,200 kg or less) using the dimensions and unit weight for that type of stone.
- .7 Maintain separate piles for each category of stone.
- .8 Ensure that rejected stones are placed in a “reject” pile or are immediately removed from the site once they are marked. Rejected stones must never be mixed with accepted stones.
- .9 Perform gradation tests so that production changes can be made to ensure that the stones meet the requirements laid out in this section.
- .10 If the stones are being transported by barge, ensure that the different categories of stone are kept separate during loading and unloading. Provide total tonnages for each category of stone for each barge before transport.
- .11 Periodically check the accuracy of gauges and other weighing devices on the equipment to ensure that they are weighing the stone accurately for gradation tests and quality control purposes.

1.7 PRE-PRODUCTION STONES

.1 Preparation

The Contractor must submit a set of pre-production stones within twenty-five (25) business days of contract award. Alongside the geologist (or geological engineer), the supervisor must choose the pre-production stones for evaluation by the Departmental Representative. These stones must be located at the source and must be arranged in rows. At least 25 pre-production stones must be provided for each category of stone to be produced at each source **and each facies**. They must be representative of each zone, geological unit, **facies and stratum of the quarry in which the stone will be produced**, as well as of the quality of stone and the sizes range for each category.

.2 Inspection of pre-production stones

The Contractor's supervisor and inspectors must accompany the Departmental Representative during the inspection the stones. The Contractor must ensure that the faces of the stones are not covered in dust or mud, and that the stones can be turned as needed to facilitate the Departmental Representative's inspection. **A sufficient distance must be provided between the stones so that they can easily be inspected visually.** The Departmental Representative will mark unacceptable stones with a red X on three mutually perpendicular sides. If twenty percent (20%) or more of the stones in a set of pre-production stones are found to be unacceptable, the Contractor must replace the unacceptable stones and have them re-inspected. If the Contractor is unable to provide a full set of acceptable pre-production stones with this second attempt, the quarry will be refused. The Contractor will then be asked to find a new stone source for approval. The Contractor will assume all costs related to the replacement of stones in the pre-production stone sets, as well as any costs related to changing quarries. No deadline extensions will be granted due to a change of quarry.

.3 Maintenance of pre-production stones as examples

Acceptable and typically unacceptable stones (as determined by the Departmental Representative) shall remain on display in the quarry so that they can be used as examples of the quality, size and shape requirements. They must remain exposed for the duration of the transportation process. The weight of each pre-production stone must be clearly indicated on the stone itself.

1.8 ACCEPTANCE OF STONE SOURCES AND STONE MATERIALS CONTROL PLAN

- .1 The Departmental Representative reserves the right to perform independent investigations and evaluations, including additional stone quality tests and thin-section petrographic examinations, to check whether the proposed sources can produce stones that meet the requirements of this document. All additional tests will be performed on stone samples that have been chosen by the Departmental Representative. Additional testing will be at the Departmental Representative's expense.
- .2 The Departmental Representative will decide whether to accept the Contractor's proposed stone sources and stone materials control plan, including staff, based on the following information:
- .1 examination of the stone sources and stone materials control plan submitted by the Contractor (see subparagraphs 1.4.1 and 1.4.2)
 - .2 inspection of pre-production stones (see paragraph 1.8)
 - .3 evaluation of information related to the requirements for stone quality (see paragraph 2.3 and tables 1 and 2), gradation tests and stone shape (see paragraph 2.4)
 - .4 examination of other laboratory test results, if applicable (see subparagraph 1.9.1)

- .3 The Departmental Representative will accept or reject the Contractor's proposed stone sources, stone materials control plan and staff within ten (10) days of inspecting the pre-production stone or receiving the latest laboratory test results, whichever is later.
 - .1 If the stone source, the stone materials control plan and staff are deemed acceptable, the Contractor may continue producing materials, as long as they are similar to the approved pre-production stones.
 - .2 If the stone materials control plan is rejected, the Contractor must prepare a new plan, including new staff if necessary. This plan must be accepted by the Departmental Representative before stone can be produced for this project. No additional payments will be made until a satisfactory plan has been submitted to the Departmental Representative. The Contractor must assume all costs related to producing a new plan. Additionally, no deadline extensions will be granted if a new plan is needed.
 - .3 If the stone sources are rejected, the Contractor is responsible for finding new sources, including performing the sampling and testing needed to obtain the Departmental Representative's approval. The Contractor is responsible for any costs resulting from a change of quarry. Additionally, no deadline extensions will be granted due to a change of quarry.
- .4 No deadline extensions will be granted for the time taken by the Departmental Representative to approve or reject the proposed sources.

1.9 QUALITY ASSURANCE

.1 General

- .1 Quality assurance (QA) activities will be performed by the Departmental Representative. Quality assurance activities are intended to provide independent observations about compliance with the requirements in this section before the stone is sent to the work site. They do not release the Contractor from their responsibilities in any way.
- .2 The Contractor must provide the necessary equipment and operators to turn and move questionable stone that needs to be re-evaluated by the Departmental Representative.
- .3 If the Departmental Representative's QA activities find that the requirements of this section are not being met, they will reject the non-compliant stones. Stones that are rejected at the source must be immediately marked with a red X on three mutually perpendicular sides, then separated and removed from the storage area. Stones rejected on the work site must be removed from the site at once. They will be excluded from measurements for payment purposes. The Contractor will bear the cost for removing rejected stones.
- .4 If, during QA activities, the Departmental Representative finds that the quality of the stone is questionable or does not meet the requirements, they may request additional samples and laboratory tests. Sample selection and testing of chosen stones must comply with the directions of the Departmental Representative (*see part 2 – subsection 2.3.3.3*). The Contractor will bear the costs of additional sampling and laboratory testing of the stones.

- .5 If the stone continues to be found non-compliant, it may be used as justification for rejecting the stone materials control plan, as described in sub-subparagraph 1.8.3.2, and/or rejecting the source of the stone, as described in sub-subparagraph 1.8.3.3.

.2 Gradation tests

- .1 For quality assurance (QA) purposes, the Departmental Representative may perform supplementary gradation tests. Gradation tests for QA purposes will be performed at intervals determined by the Departmental Representative. The Representative will choose a random sample of stone to submit for testing. If the QA gradation test or stone observation indicates that the stones do not meet the requirements, production procedures must be modified. Additional QA and QC gradation tests will be required to validate the corrective measures.
- .2 The Contractor must provide the Departmental Representative with all loaders, certified scales, equipment operators and staff needed to take samples, weigh individual stones and weigh the total sample.

Part 2 PRODUCTS

2.1 GENERAL

- .1 All stones must meet all of the requirements in this section of the specifications document. At any time during the contract, the Departmental Representative may reject materials at the source or on the work site if they do not meet the requirements. Materials that have been delivered to the work site then rejected, either from a pile or once they have been placed in the structure, must be removed at the Contractor's expense.
- .2 The stone materials control plan and QA/QC activities must be applied systematically throughout the duration of quarry and construction phases of this project.

2.2 STONE SOURCES

- .1 The Contractor is solely responsible for ensuring that the chosen quarries will produce the desired quality and quantity of stones for the project within the specified delivery schedule.
- .2 If they are unable to obtain enough acceptable stones from the original source during the contract, they may request authorization to use another source. The Contractor is responsible for any fees related to a change of quarry, including fees for sampling and testing. Additionally, no deadline extensions will be granted due to a change of quarry.
- .3 Part of the stone in the existing structure must be reused for this project. The definition of this stone can be found in section 02 41 19.

2.3 STONE QUALITY REQUIREMENTS

.1 General

All stone must be extremely resistant to bad weather, wear and disintegration due to freezing and thawing and water exposure. The stone must be of a high enough quality to ensure that the structure is able to withstand the climatic conditions in which it is going to be used. The stone must be produced from a quarry and must be angular and irregular in shape. It must be durable, ***non-friable*** and free from detrimental cracks, seams and other defects that would tend to increase deterioration from natural causes or lead to breakage during handling or placement. Inclusions of dirt, sand, clay, shale, quartz, mica, pegmatite, iron oxide, oil, nodes or veins of iron sulfide, as well as oil-stained stones and rock fines or any organic material or other deleterious material are not permitted.

.2 Additional specifications for certain stone types

.1 Sandstone:

- .1 Sandstone is NOT to be used for this project, even if it meets the other acceptability criteria.
- .2 If the Contractor is unsure whether a stone is sandstone or not, the stone must be submitted to thin-section petrographic examination (ASTM C295). The Contractor will assume the cost of this examination.

.2 Conglomerates:

- .1 In order to be accepted for this project, conglomerates must meet all of the requirements in tables 1 and 2.
- .2 Density and absorption tests must be performed ***on representative pieces of conglomerates***, that are at least 200 mm in diameter ***and*** without crushing.
- .3 Conglomerates with particles larger than 100 mm in diameter must not be used for laboratory testing (table 2).

.3 Stone sampling and testing methods

- .1 References for the testing methods are listed in section 1.3 - References.
- .2 Stone samples used for laboratory testing must be representative of ***each facies*** of each quarry that is to be used under this contract.
- .3 Sampling for laboratory tests must be performed jointly, i.e. in the presence of both the geologist (or geological engineer) hired by the Contractor and the geologist (or geological engineer) hired by the Departmental Representative. The Contractor must plan the sampling consequently.

Table 1 – Conglomerate-specific acceptance criteria

Parameters		Acceptability criteria
Matrix	Composition	Calcareous
	State	Hard and not friable
Particles	% of particles with shale texture (shale, mudstone and siltstone)	≤ 1 %
	% of terrigenous particles	≤ 5 %
	Contact particle-matrix	Particles must be welded to the matrix. Stones having a separation between the particles and the matrix are rejected.
Long-term behaviour		A geological expertise must prove that the conglomerate in the quarry has been used in an existing marine structure for at least five (5) years and has not deteriorated prematurely.
Geological age		Conglomerates from the Silurian period and later are not permitted.

2.4 STONE SHAPE AND GRADATION

- .1 Production, transportation and placement methods must be adjusted as needed to ensure that the materials meet the gradation and shape requirements.
 - .1 For gradation tests, a random sampling of stones will be chosen. Together, these stones must be at least twenty-five (25) times the average weight of the category being tested. Each stone in the sampling must be weighed individually. A grading curve for the sample will be produced from this information.
 - .2 In addition to having an even distribution of sizes, at least fifty percent (50%) of the stones by number must be larger than the median stone weight for that category.
 - .3 The stone should be angular or short oblong in shape, with a maximum dimension ratio (l/d) of 3:1. No more than ten percent (10%) of the stones by number in each category can have a dimension ratio greater than 2.5:1.
 - .4 The Contractor must generate and submit the production and pre-production gradation tests results as indicated in table 3.

Test name	Test method	Acceptance criteria
Field/Visual observation/Assessment		
Field examination ¹	ASTM D4992	Without sandstone No deleterious materials; good to excellent quality for the intended usage
Petrographic examination ²	ASTM C295	No deleterious materials; good to excellent quality for the intended usage
Weathering grade	Visual	IA - Fresh, unweathered rock IB – Faintly weathered rock (staining on major discontinuity surfaces)
Laboratory tests		
Bulk specific gravity, SSD	ASTM C127	2.65 to 2.85
Water absorption ³	ASTM C127	≤ 0.5%
Compression strength ³	ASTM D7012	≥ 100 MPa
Wear resistance Micro-Deval ⁴	ASTM D6928	≤ 15
MgSO ₄ soundness ³	ASTM C88	≤ 1.5% loss after 5 cycles
Resistance of large unconfined aggregates to freeze/thaw cycles ³	CAN/CSA A23.2-24A	≤ 5 % loss after 5 cycles
Petrographic examination ²	ASTM C295	No deleterious materials; good to excellent quality for the intended usage

Table 2 – Required stone quality tests for all stone – Test methods and acceptance criteria

Notes:

- 1 Field examination must include the preparation of a written report, which is to include a summary of the quarry and proposed development plan in compliance with standard ASTM D4992, including: general lithology; geological unit and age ***of the formation***; homogeneity of the source; stratigraphic faces; metamorphic and weathering phases; dip, strike and thickness of the bedding; proposed blasting procedure; and expected curing time.
- 2 The petrographic examination must be performed before **AND** after MgSO₄ soundness tests. It must be summarized in a written report that includes the rock's geological name, weathering state, main constituents, texture, anisotropy and porosity. This report must also identify and discuss whether the stone contains any constituents, micro-fractures and/or signs of induced stress (and therefore possible stress release – see paragraph 3.1) that may be of concern for the proposed use.
- 3 Water absorption, compression strength, MgSO₄ soundness, and freeze/thaw resistance on large unconfined aggregates tests must be performed on pieces from five (5) different stones ***of the same facies. The series of tests must be repeated if there is more than one exploitable facies.***
- 4 The wear resistance Micro-Deval test must be performed on pieces from three (3) different stones ***of the same facies. The series of tests must be repeated if there is more than one exploitable facies.***

2.5 FREQUENCY OF STONE TESTING AND INSPECTION

- .1 The minimum required frequency of stone quality tests, visual inspections and gradation tests under the Contractor’s stone materials control plan is indicated in table 3.

Table 3 – Stone quality test, visual inspection and gradation tests

Stone type	Stone quality tests	Visual inspection	Gradation tests
Armour stones (categories 1–3 t and larger)	Pre-production tests for each source and for each geological change in the quarry	Continuous	Continuous gradation verification from the stone materials control plan reports
Filter stone (categories 800–1200 kg and smaller)	Pre-production tests for each source and for each geological change in the quarry	Continuous	Sample every 3,000 tonnes for each category

Part 3 EXECUTION

3.1 STONE CURING AND WINTER QUARRYING

- .1 The Contractor must conduct curing operations on freshly quarried stone to permit it to release stored energy and moisture and demonstrate that the stone will not fracture during the energy release and drying stage. Before the stones can be inspected and approved for transport to the work site, they must be temporarily stored in a single layer at the quarry site for at least ten (10) consecutive calendar days *continuously above 0° C.*

.1 Sedimentary rock quarries

- .1 When the ambient air temperature at the quarry reaches a 24-hour average of 0 °C for three consecutive days, quarrying operations are to cease for the winter. Quarrying operations are to restart the following May 15.
- .2 Stone that has been blasted fewer than two (2) weeks before operations cease will not be accepted unless the Contractor can provide and maintain an appropriate storage area that will allow stones to be inspected once quarrying operations restart. Special storage and handling techniques must be used.
- .3 The Contractor is responsible for maintaining a production operations schedule and managing operations to ensure that they have enough of the appropriate types of stone for the project.

.2 Igneous and metamorphic rock quarries

- .1 There are no weather-related restrictions for quarrying or curing operations. However, the stone must be cured for ten (10) days after blasting, in compliance with the requirements in subparagraph 3.1.1.

3.2 QUALITY CONTROL AND QUALITY ASSURANCE DURING PRODUCTION

- .1 The Contractor must perform quality control operations throughout the stone production and placement process. Operations must comply with the requirements in this section and in section 01 45 00.
- .2 If the Departmental Representative expresses doubts about the size of particular stones or if the inspector deems it necessary, the stones must be re-weighed or re-measured.
- .3 Drop tests must be performed if the Departmental Representative expresses doubts about the quality or integrity of particular stones. Drop tests must be performed as follows:
- .1 visually inspect all sides of the stone and note/register existing cracks
- .2 lift the stone, then drop it onto a rigid surface (bedrock or stone of similar dimensions) from a height equivalent to the average diameter of the stone
- .3 visually inspect all sides of the stone for new or progressing cracks
- .4 repeat at least three times, as per the Departmental Representative's instructions
- .5 the stone will be accepted if there is no opening of existing cracks and no development of new cracks
- .4 The Contractor must be aware that inclement weather (rain, snow, ice, frost and mud) can hide defects that might have otherwise been detected. Winter conditions may prevent the required inspections from being performed before the following spring. Stones are not to be transported to the work site before they have been accepted.
- .5 Any broken or cracked stone and any stone that is outside the size requirements or that has been improperly placed within the structure must be removed and replaced by an appropriate stone. The Contractor will bear the cost of this corrective measure. Rejected materials must be removed from the work site as soon as possible. They will be excluded from measurements for payment purposes.

3.3 TRANSPORTATION AND TEMPORARY STORAGE

- .1 The Contractor is responsible for transporting and storing stones in a way that limits size segregation and prevents contamination by dirt and other materials.
- .2 The storage area for stone that has been delivered to the site but not yet placed must be submitted to the Departmental Representative for approval. Storing stones underwater is prohibited.

3.4 STONE PLACEMENT

- .1 Consult section 35 31 25 for placement requirements.

END OF SECTION 35 31 24