

Tender Form

Price Bid

Project: **Cavendish Lift Station No. 4 Reconstruction**

Location: Cavendish, Prince Edward Island

Submitted to: The Cavendish Sewer Utility
c/o Resort Municipality
7591 Cawnpore Lane
RR2 Hunter River PE.
C0A 1N0

Bidder

Legal Name: _____

Address: _____

City _____ Province _____ Postal Code _____

Bid Price

Having examined the Proposal Documents, consisting of Specifications and Drawings, to this Price Bid, and Addenda number _____ to number _____ inclusive, all as issued by Harland Engineering Services Inc. and having visited the Place of the Work; we hereby offer to enter into a contract to perform the Work required by the Bid Documents in Canadian funds, in the amount of \$ _____ which price excludes HST.

Declarations

We hereby declare that:

- (a) We agree to perform the Work and to attain Substantial Performance of the Work June 15, 2020.
- (b) No person, firm, or corporation other than the undersigned has any interest in this Bid or in the proposed Contract for which this Bid is made;
- (c) This Bid is open to acceptance for a period of thirty (30) days from the date of bid closing.

Agreement Form

- (a) A standard unit price contract, Canadian Construction Documents Committee 4 (CCDC 4), will be used.

- (b) The contract Schedule of Unit Prices will be as outlined in the tendered Unit Price Table.

Deposit

- (a) A 10 percent Tender Deposit and Contract Security are required.
- (b) The Lien holdback is fifteen percent (15%), held for sixty (60) days after Substantial Completion.

Scheduled Milestone Dates

Scheduled Completion Dates

Install 1.8m Valve Chamber and Storage Manholes

Install Pumps and Controls

Install Electrical Power and Commissioning

Landscaping and turnover to the Utility

(Completion of testing, clean-up, and turn-over to Owner by June 15,2020)

Signatures

Signed and submitted for and on behalf of:

Name of Bidder

Signature

Name of Witness

Signature of Witness

Date

| Item # | Description of Work | Unit | Quantity | Unit Price | Cost |
|--------|---|------|----------|------------|------|
| 1 | Supply and Install Duplex Sewage Pumping Station c/w Submersible Pumps, Valves, Fittings and Controls | L.S | 1 | | |
| 2 | Supply and Install Storage Manhole c/w Hatch and 300 Ø Pipe Connection | L.S | 1 | | |
| 3 | Supply and Install Valve Chamber c/w Valves and Fittings | L.S | 1 | | |
| 4 | Connect to Existing Force Main | L.S | 1 | | |
| 5 | Construct Electrical Service | L.S | 1 | | |
| 6 | Commissioning of Lift Station | L.S | 1 | | |

TENDERED AMOUNT (EXCL. HST) =

Cavendish Lift Station No. 4

Specifications

Prepared By:

HARLAND ENGINEERING SERVICES INC.

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Charlottetown, PE
C1A 4N2

(902) 368-3365
January 2020

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1.1 Codes and Standards

- .1 Perform work in accordance with the National Building Code of Canada, National Fire Code of Canada, PEI Occupational Health and Safety Act, Canada Labour Code Part II, and any other code of provincial or local application including all amendments, provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.
- .3 Unless otherwise indicated, the latest editions of referenced standards, codes and documents will apply.

1.2 Project Meetings

- .1 Attend project meetings as the need arises or as directed by the Engineer.
- .2 Meetings will be held on a bi-weekly basis at a time that is acceptable to all parties involved to ensure that work is being completed on schedule. This meeting will also be used to address any and all questions and concerns for the upcoming weeks of work.

1.3 Documents Required

- .1 Maintain at job site, one copy of Drawings and Specifications.

1.4 Permits

- .1 Contractor is to apply and pay for any necessary permits.

1.5 Existing Services

- .1 Schedule connections or required shutdown with the Cavendish Sewer Utility.
- .2 All connections or shutdowns to be undertaken by or under the supervision of the Engineer.

Where unknown services are encountered, immediately advise Engineer.
- .3 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off and record locations of maintained, re-routed and abandoned service lines.

1.6 Acceptances

- .1 Prior to the issuance of an Interim Certificate of Completion, in company with the Engineer, make a check of all work. Correct all discrepancies before final inspection and acceptance.
- .2 The Engineer will not issue a Certificate of Completion until such time that the Contractor turns over to the Engineer all specified as-builts, certificates of test and test results in hard copy.

1.7 Works Coordination

- .1 The General Contractor is responsible for coordinating the work of the various trades, where the work of such trades interfaces with each other.
- .2 The General Contractor shall convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required. Provide each trade with the plans and specs of the interfacing trade, as required, to assist them in planning and carrying out their respective work.
- .3 Shop drawing review and material ordering shall only commence after this coordination has taken place between trades and all conditions affecting the work of the interfacing trades has been made known and accounted for.
- .4 Ensure coordination and cooperation between trades in order to facilitate the general progress of the work and avoid situations of spatial interference.
- .5 Ensure that each trade provides all other trades reasonable opportunity for the completion of the work and in such a way as to prevent unnecessary delays, cutting, patching and the need to remove and replace completed work.

1.8 Setting Out the Work

- .1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.
- .2 Protect and maintain all survey/reference points.
- .3 Provide devices and qualified personnel as required to layout and construct work.
- .4 Supply all stakes and markers required for laying out work.
- .5 All work to be completed between the hours of 7:30 a.m. and 7:30 p.m.

1.9 Field Dimensions

- .1 Take all field measurements required to verify or supplement drawing dimensions. The Engineer's review of shop drawings and erection diagrams does not relieve the Contractor of this responsibility.

1.10 Record Drawings

- .1 Record tie-ins for manholes, gate valves, service boxes, lateral pipes, etc. Ties shall be referenced to permanent fixtures such as survey pins, power poles, manholes etc.
- .2 Record elevations of inverts for sewer pipe at all inflection points and elevations of top of pipe for water pipe at all inflection points.
- .3 Elevations are to be geodetic with locations of all survey monuments and other benchmarks from which elevations were derived. Elevations are to be in accordance with PEI Double Stereographic Projection, NAD83 Datum with CSR-S98 realization.

- .4 Record number of turns and direction to open for full operation of all gate valves.

End of Section

PART 1 General

1.1 Invitation

- .1 Tender Call
- .2 Quotations to be e-mailed to Brenda MacDonald at resortmunicipal@eastlink.ca and copied to Harland Engineering Services at tharland@hainc.ca.

1.2 Project Description

- .1 Cavendish Lift Station #4 upgrade consists of the following items:
 - .1 Removal of existing pumps and controls
 - .2 Replacement of existing pumps with new variable frequency drive duplex pumps
 - .3 Replacement of existing controls with new controls
 - .4 Pumps and control system based on single phase power
 - .5 Addition of 1.8m diameter manhole for pumping storage
 - .6 Addition of 1.8m valve chamber complete with access hatch
 - .7 Single Phase electrical supply to the lift station
 - .8 Commissioning of new station and operation manual
 - .9 Full operation of lift station services to be maintained throughout construction
- .2 Queries/Addenda
 - .1 Addenda may be issued during Tender period. All addenda become part of Contract Documents. Include costs in Price.
 - .2 Verbal answers are only binding when confirmed by written addenda.
- .3 Product/System Options
 - .1 Where Tender Documents stipulate a particular product, substitutions will be considered by Engineer up to 5 days before receipt of tender closing.
 - .2 When a request to substitute a product is made, Engineer may approve substitution and will issue an Addendum to known bidders, procurement services, and the Resort Municipality.
 - .3 Only substitutions approved by addendum may be included in the tender.

1.3 Bid Deposit

- .1 A 10% bid deposit in the form of a certified cheque or similar security is required with the tender.

1.4 Provisional Sum

- .1 A provisional sum may be included in the tendered price for miscellaneous items not included in the unit prices. All charges against this sum are to be direct payroll and material costs without mark-up.

1.5 Lien Holdback

- .1 A fifteen percent (15%) lien holdback is required for sixty (60) days after substantial completion.
- .2 A statutory declaration by the contractor confirming that all financial obligations relating to the work have been paid.

1.6 Site Assessment

- .1 Site Examination
 - .1 Visit project site and surrounding area before submitting Tender.
 - .2 All Bidders must visit the project site and Tender should reflect any conditions that may affect their work.

1.7 Qualifications

- .1 Subcontractors
 - .1 Owner reserves the right to reject a proposed subcontractor for reasonable cause.

1.8 Bid Submission

- .1 Bid Ineligibility
 - .1 Tenders that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, shall at discretion of Owner, be declared informal.
- .2 Submissions
 - .1 Bidders shall be solely responsible for delivery of their Tenders in manner and time prescribed.
 - .2 Submit one copy of executed offer on Tender Forms provided, signed and with corporate seal together with required security in a sealed opaque envelope, clearly identified with Bidder's name, project name and Owner's name on outside.
 - .3 Submissions are due by 12:00 PM AST (Noon) on Feb 20, 2020. Proposals received after the closing time will not be considered. Proposals must be submitted at the location set out on or before the closing time and date. The proponent is solely responsible for the delivery of its proposal to the exact location indicated in this RFP on or before the closing date and time. The Resort Municipality does not accept any responsibility for proposals delivered to any other location by the proponent or its delivery agents. Proposals submitted after the closing date and time will be rejected. The Resort Municipality's time clock will be deemed to be correct.

1.9 Supervision and Coordination

- .1 The Contractor shall be responsible for supervising and coordinating all aspects of the work.

1.10 Responsibility

- .1 The Contractor shall be responsible to be fully familiar with the complete documents and shall include in his bid those items which are named, implied, or traditionally a part of the general contract work.
- .2 The Contractor shall be responsible for maintaining and ensuring that all work is completed within the given timeline. If the contractor fails to maintain this timeline, then the contractor is responsible for any and all liquidated damages or direct costs incurred by the owner as a result of the delay.

1.11 Guarantees

- .1 The Contractor shall be required to guarantee the work of this Contract for a period of twelve months after the Owner's acceptance of work, against improper or defective materials and workmanship, and shall repair and make good at his own expense any damage to the building and contents through any of the above causes during this period. Any contract omissions and/or deficiencies reported to the Contractor within twelve months after acceptance of the work shall be made good by the Contractor at his own expense.

1.12 Rejection of Bids

- .1 The Owner reserves the right to reject any and all bids. The lowest or any tender will not necessarily be accepted.

1.13 Consultant's Interpretation

- .1 The Consultant's interpretation of plans and specifications shall be final. Should Contractor have any doubt as to interpretation, he shall refer to the Consultant for clarification before submitting his bid. No allowances or extras will be made for misinterpretation of plans and specifications by Contractor.

1.14 Permit and Regulations

- .1 All permits and fees required for the proper completion and inspection of the work herein specified will be paid for by the Contractor.
- .2 The work shall be completed to the satisfaction of the Consultant and local inspecting authorities.

1.15 Offer Acceptance/ Rejection

- .1 Duration of Offer
 - .1 Tenders shall remain open to acceptance and irrevocable for a period of thirty (30) days after the Tender closing date.
- .2 Acceptance of Offer
 - .1 Owner reserves right to accept or reject any or all offers.
 - .2 After acceptance by Engineer, will issue to successful Bidder, written Tender acceptance.

- .3 After Tender has been accepted, unsuccessful Tenders will be returned to respective Bidders with submitted Tender securities and other requested enclosures.

1.16 Taxes

- .1 The Harmonized Sales Tax (H.S.T.) is not to be included in the tender, i.e. in addition to the tendered price.

1.17 Insurance

- .1 The successful contractor to have a minimum of \$ 5,000,000.00 Comprehensive General Liability Insurance. The Government of PEI, Resort Municipality of Stanley Bridge, Hope River, Bayview, Cavendish and North Rustico, and the Cavendish Sewer Utility are to be added as an additional insured under this policy.
- .2 Automobile Liability on all vehicles owned or leased a minimum of \$ 2,000,000.00

1.18 Statutory Declaration

- .1 A statutory declaration is required certifying all contractors, suppliers, consultants and all persons employed in the work have been paid, prior to Provisional Acceptance by the Owner and the Province.
- .2 Confirmation must be received from the Worker's Compensation Board that the contractor and all parties associated are in good standing.

1.19 Bid Documents and Tender Review

- .1 A unit price contract (CCA Standard Construction Document 4) will be used.
- .2 The project is price sensitive.
- .3 Bidders are to review the tender documents and advise of any perceived or possible extras to the project, including quantities.
- .4 Immediately notify Engineer upon finding discrepancies or omissions in Tender Documents., or items requiring clarification, within a minimum of two days in advance of tender closing.
- .5 Any such items will be assessed, and Bidders advised accordingly prior to closing.

1.20 Schedule

- .1 The project is time sensitive and is to be completed by no later than June 15/20
- .2 Provide schedule as included in the attached tender form
- .3 Owner reserves the right to ensure the required completion date is met.

1.21 Transparency

- .1 The Municipality is committed to full transparency. Any document submitted to the Municipality in response to this RFP is subject to this principle and proponents should be aware that any member of the public is entitled to request a copy of the document. In response to such a request, the Municipality may disclose some or all the information of the proposal. The Municipality may, in the future, be subject to new provincial requirements creating obligations for the Municipality and its service providers when personal information is collected, used or disclosed. By submitting a proposal, the proponent agrees that the Municipality may disclose the following limited sections of the proposal without notification to the proponent: 1. Form of Proposal and 2. Proponent's fixed total cost (if applicable)

End of Section

Part 1

This project is subject to Parks Canada Conditions relative to a Preapproved Routine Impact Assessment (PRIA)

1.1 Mitigation Measurements

- .1 Schedule construction during optimum times for reducing erosion, and outside of timing windows for sensitive species to maintain compliance with the *Migratory Birds Convention Act*, *Fisheries Act* and *Species at Risk Act*.
- .2 The impact assessment officer will review a proposed project and advise the functional manager of the project as well as if and how this BMP should be applied.
- .3 Key contacts and their respective roles and responsibilities must be identified prior to work starting and communicated to all on-site workers.
- .4 People working on the project/activities must review the mitigation measures and any site specific considerations with designated Parks Canada staff before work begins.
- .5 Clearly mark the work site and restricted areas with stakes, biodegradable flagging tape or other means to minimize the disturbance footprint; remove when the project is completed.
- .6 Staging areas, material/equipment drop sites, and parking areas must be identified, including duration of use, within an existing disturbed footprint (e.g., roadway, gravel surface, previously disturbed area with high resiliency) or approved by designated Parks Canada staff.
- .7 Use existing roadways, trails, disturbed areas or other areas as approved by designated Parks Canada staff for site access, travel within the site and construction activities.
- .8 Wet down dry materials, if appropriate, and cover waste to prevent the wind from blowing dust and debris. Control dust on roads used by the on-site workers (including temporary roads).
- .9 Select equipment appropriate to the nature of work being conducted (e.g., avoid using large scale machinery when hand tools or smaller scale machinery could be used).
- .10 Heavy equipment operating on paved surfaces should be equipped with street pads; damage to paved surfaces must be restored to original conditions.
- .11 Equipment must be properly tuned, clean and free of contaminants, in good operating order, free of leaks (e.g., fuel, oil or grease), and fitted with standard air emission control devices and spark arrestors prior to arrival on site.
- .12 Refueling must take place on an impermeable fuel mat with a berm or within a container. Leaks and spills during refueling must be cleaned up and contaminated materials must be disposed of appropriately. Fuel must never be dispelled or deposited into the environment or any water body.
- .13 Any required cleaning of tools and equipment should be done off-site. If it must be on-site, it must be in an appropriate area at least 30m from a waterbody.
- .14 Gas generators must be secured to prevent movement during operation and set up on an impermeable fuel mat with a berm or within a container that can contain 110% of the volume of fuel in the generator.
- .15 All wildlife attractants must be secured (e.g., petroleum products, human food, recyclable drink containers and garbage) in wildlife-proof containers, a secure building or vehicle. When possible, keep food waste separate from construction waste and remove daily.
- .16 Contain and stabilize waste material (e.g., construction waste and materials, vegetation) at a minimum of 30m from a waterbody.
- .17 Contain wastes and transport to an approved waste landfill site outside the Parks Canada protected heritage place, unless otherwise directed; cover waste loads during

transportation. All construction materials must be removed from the site on project completion.

- .18 Burning is not permitted within the protected heritage place unless approved by Parks Canada.
- .19 If present, portable sanitary facilities must be serviced on a regular basis and accumulated waste disposed of at a sanitary waste disposal facility. The portable facilities must have sufficient capacity and be managed to ensure waste is not discharged to the receiving environment.
- .20 A Spill Response Plan should be developed prior to work starting.
- .21 Ensure that all on-site workers receive a briefing about the Spill Response Plan and are aware of the location and use of spill kits and containment devices.
- .22 The Spill Response Plan will, at minimum, include the following information:
 - .1 List of products and materials considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement, sand blasting agents, paint, solvents and hydrocarbons.
 - .2 Required equipment on site.
 - .3 Size, type and location of spill kits.
 - .4 Fuelling procedures, fuel storage.
 - .5 Spill prevention procedures (i.e., containment and storage of materials, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products in accordance with all applicable federal and provincial legislation).
 - .6 Spill response (i.e., containment, clean-up, disposal of contaminated materials, etc.).
 - .7 Spill reporting procedure.
 - .8 Up-to-date emergency response contact list including contact information for reporting spills.
- .23 Follow all applicable regulations and codes for the management and handling of hazardous waste.
 - .1 Identify and handle all toxic/hazardous materials as required under the *Canadian Environmental Protection Act*, *Transportation of Dangerous Goods Act* and *Workplace Hazardous Materials Information System*
 - .2 Dispose of contaminated materials at provincially or territorially certified disposal sites outside of Parks Canada land.
- .24 Spill containment equipment must be present on-site. A spill contingency response kit including sorbent material and berms to contain 110% of the largest possible spill related to the work must be available on site at each location of potential spills (sites where equipment is working and at re-fuelling, lubrication, and repair locations).
- .25 All spills must be contained and cleaned-up as soon as it is possible to safely do so. In the event of a major spill, all other work must stop until the spill has been adequately contained and cleaned up.
- .26 Notify the designated Parks Canada staff and the emergency contact immediately of any spill.
- .27 Contaminants must be recovered at source and disposed of according to applicable laws, policies and regulations. The site will be inspected by Parks Canada staff to ensure completion to expected standards.
- .28 All construction sites must be equipped with containers suitable for the secure, temporary storage of hazardous wastes, separated by type.
- .29 If hazardous waste or potentially contaminated material is uncovered during excavation /

- construction, work must stop and excavated materials must be secured onsite in a manner that prevents contamination of the surrounding environment, including leaching. The designated Parks Canada staff must be contacted for further direction.
- .30 All construction equipment from outside the Parks Canada protected heritage place must be washed outside the site prior to arrival to minimize risk of introducing invasive weed species. Proof that this mitigation was applied may be requested before equipment is permitted into the protected heritage place.
- .31 All soil, gravel, untreated construction lumber, erosion and sediment control products (e.g., hay, straw, mulch), or other applicable materials from outside the protected heritage place must be approved by the designated Parks Canada staff.
- .32 Organic material (e.g, topsoil, borrow and fill material, gravel) taken from the construction site will not be used in other parts of the protected heritage place unless approved by the designated Parks Canada staff.
- .33 Minimise ground disturbance and vegetation removal, when possible.
- .34 Minimise bare soil exposure (e.g., cover stockpiled material with tarps, plant native species, cover with natural mulch/ground coverings).
- .35 Stabilize and re-vegetate disturbed areas as soon as possible, ideally with native plants, soil and seed mix or otherwise approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion and vegetate the following spring.
- .36 Monitor disturbed and re-vegetated areas until the designated Parks Canada staff establishes that native vegetation is growing successfully, and invasive alien species spread is prevented.
- .37 On-site workers must be made aware of and subsequently report any incidental sightings of species at risk immediately to designated Parks Canada staff.
- .38 If active nests, dens or roosts are discovered, stop work and contact designated Parks Canada staff immediately for direction.
- .39 Cover or fence hazardous areas when left unattended to reduce the potential for wildlife injury.
- .40 Never approach or harass wildlife (e.g., feeding, baiting, luring).
- .41 If wildlife is observed at or near the work site, allow the animal(s) the opportunity to leave the work area.
- .42 Designated Parks Canada staff must be alerted immediately to any potential wildlife conflict (e.g., aggressive behaviour, persistent intrusion), distress or mortality. In the case of aggressive behaviour or persistent intrusion, stop work and evacuate the area.
- .43 On-site workers must receive any required wildlife awareness training, according to field unit policy.
- .44 As much as possible, schedule noisy activities to minimise impacts to visitors, especially around townsites, campgrounds and other high visitor use areas.
- .45 Close and mark the work site with appropriate signage while active construction, repair or maintenance is underway; consider temporary detours or reroutes as appropriate.
- .46 Secure and clearly mark unattended safety hazards (e.g., excavations, debris piles) with fencing, warning signs, area closures or combination thereof.
- .47 If closing the area is not possible, maintain a safe working distance between work activities and visitors. If traffic control is required, a flag person should manage traffic through the construction/hazard area.
- .48 Visitor access trails and roads outside the construction area must be free of construction materials, waste, machinery and equipment.
- .49 Avoid known potential cultural resources and archaeological sites.
- .50 Apply any mitigation measures that may have been previously identified by a Parks Canada archaeologist or cultural resource advisor for the immediate area of work.

- .51 If cultural resources (i.e., structural remains and/or artifact concentrations) are encountered, work must cease in the immediate area, the site secured and the designated Parks Canada staff contacted for further direction.
- .52 The designated Parks Canada staff should ensure that on-site workers receive appropriate cultural resource awareness training.

1.2

Supplementary Mitigations

- .1 Where possible, trenches occupied with existing infrastructure will be used to remove old, and install new, infrastructure and utilities.
- .2 Prior to excavation, the topmost organic layer of vegetation including as much root mass as possible will be stripped and stored adjacent to the length of the trench. After pipe removal, and the excavated material is placed back into the trench, the strips of vegetation will be placed back over the exposed area as the first step in stabilization and restoration.
- .3 Backfill and compact excavations as soon as possible. Optimize degree of compaction to minimize erosion and allow for re-vegetation.
- .4 All trenches or ditches left unattended overnight must be fenced or covered to prevent wildlife and/or visitor entrapment/injury/death.

PART 1 General

1.1 Section Includes

- .1 Shop drawings and product data.
- .2 Samples.
- .3 Certificates and transcripts.

1.2 Administrative

- .1 Submit to Engineer submittals listed for review. Submit with reasonable promptness and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.
- .10 Keep one reviewed copy of each submission on site.

1.3 Shop Drawings and Product Data

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow seven (7) days for Engineer's review of each submission.
- .4 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .5 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of any revisions other than those requested.
- .6 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.

- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .8 After Engineer's review, distribute copies.
- .9 Submit electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.
- .10 Delete information not applicable to project.
- .11 Supplement standard information to provide details applicable to project.
- .12 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

PART 2 Products

Not Used.

PART 3 Execution

Not Used.

End of Section

PART 1 General

1.1 Related Specifications

- .1 PEI Department of Transportation and Infrastructure Renewal's General Provisions and Contract Specifications for Highway Construction.

1.2 Environmental Protection

- .1 It is the Contractor's responsibility to follow all Provincial, Federal and Municipal regulations and obtain any necessary permits.

1.3 Fires

- .1 Fires and burning of rubbish on site not permitted.

1.4 Disposal of Wastes

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.5 Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements (i.e. usage of silt fence).

1.6 Site Clearing and Plant Protection

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Engineer.

1.7 Work Adjacent to Waterways

- .1 Do not operate construction equipment in waterways.

- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m of indicated spawning beds.

1.8 Pollution Control

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

PART 2 Products

Not Used.

PART 3 Execution

Not Used.

End of Section

1.1 Testing Requirements Specified Elsewhere

- .1 Requirements for inspection and testing to be carried out and paid for by the Contractor are specified under various technical Sections of the Specification.

1.2 Contractor's Related Responsibilities

- .1 The Contractor will arrange and pay for services of an independent testing firm to carry out the tests noted in Section 1.3 below.
- .2 Furnish labour and facilities to:
 - .1 Provide access to work to be inspected and tested.
 - .2 Facilitate inspections and tests.
 - .3 Make good work disturbed by inspection and test.
- .3 Notify Engineer in advance of testing operations.
- .4 Provide Engineer with two (2) sets of fully documented test reports, submitted immediately following the testing operations.

1.3 Inspection and Testing Requirements

- .1 Inspection and testing of road construction materials and compaction to meet requirements of road agreements with the Province of PEI.

End of Section

PART 1 General

1.1 Related Work

- .1 All sections of the specification.

1.2 Construction Safety Measures

- .1 Observe and enforce construction safety measures required by National Building Code Part 8, Provincial Government, Workers Compensation Board (WCB) and municipal statutes & authorities.
- .2 In event of conflict between any provisions of above authorities, the most stringent provision will apply.
- .3 Provide all necessary warning signs and barricades in locations where need exists.
- .4 The contractor agrees to indemnify and save harmless the Owner and the Owner's representation from any and all costs, charges or expenses however arising out of any breaches of the Occupational Health and Safety Act and its regulations.

1.3 Overloading

- .1 Ensure no part of Work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.4 Falsework

- .1 Design and construct falsework in accordance with CSA S269.1-M1980.

1.5 Scaffolding

- .1 Design and construct scaffolding in accordance with CSA S269.2-M1980.

1.6 Traffic Directions and Control

- .1 When carrying out work on streets, provide competent flagmen, automatic lights or both or such other methods as may be required by the responsible authority.

1.7 Confined Spaces

- .1 Provide all necessary equipment and manpower to meet Regulation 91-191 of the Occupational Health and Safety Act.

1.8 Orientation Meeting

- .1 There shall be a safety orientation meeting on site before any construction begins. The Contractor shall coordinate the date and time of the meeting.
- .2 The Contractor shall provide proof of a current safety program and shall provide proof of appropriate training for all employees involved in the project.

1.9 Unsafe Working Conditions

- .1 If the Engineer or other representative of the Owner determines that work is being carried out in a manner deemed to be unsafe, the Engineer or other representative of the Owner shall immediately notify the Contractor's site representative and all work shall cease until the issue is rectified.
- .2 If the Contractor refuses to rectify the matter, and/or work continues, the Engineer or other representative of the Owner shall immediately notify the Provincial Occupational Health and Safety Department.

End of Section

PART 1 General

1.1 Work Included

- .1 This section specifies requirement of surfaces, property, and structures damaged or disturbed by operations under this Contract. Work includes but is not limited to reinstatement of paved, gravelled and grassed surfaces; sidewalks, curbs and gutters; and ditches and culverts.

PART 2 Products

2.1 Materials

- .1 Asphaltic materials, granular material and borrow: to P.E.I. Department of Transportation and Infrastructure Renewal General Provisions and Contract Specifications for Highway Construction.
- .2 Corrugated Polyethylene Pipe and Fittings to ASTM F667, weather resistant.
- .3 Corrugated steel pipe to CAN3-G401.
- .4 Reinforced concrete pipe to CAN/CSA-A257.

PART 3 Execution

3.1 General

- .1 Reinstate all surfaces to lines, elevations and dimensions which existed prior to construction and to match abutting surfaces.
- .2 Make good all damage or disturbances to surfaces, properties and structures to a condition equal to or better than before work began, except as specified in this Section.
- .3 All grassed areas shall be reinstated as work proceeds. All ditched areas should be reshaped and sodded. If water or sewer pipe is laid under asphalt or in the shoulder of the road, the Contractor may delay reinstatement until testing has been completed.

3.2 Gravel Surfaces

- .1 Place, spread, and fine grade Class A or B gravel to specified compacted thickness for shoulders and other gravel surfaces. Compact to 100% Standard Proctor Density.

3.3 Asphalt Surfaces

- .1 Remove existing gravel to depth equal to thickness of asphalt surface to be placed.

- .2 Shape, fine grade and compact gravel surface to 100% Standard Proctor Density.
- .3 Make vertical cut to full depth of asphalt in straight lines. As required, cut back from edge of excavation or beyond to eliminate tension cracks.
- .4 Mill back 300mm on each side of area to be prepared to a depth equal to the seal coat.
- .5 Clean contact surfaces and apply tack coat prior to placing asphalt paving.
- .6 Place and compact hot-mix asphaltic concrete to the P.E.I. Department of Transportation and Infrastructure Renewal General Provisions and Contract Specifications for Highway Construction.
- .7 Roadway shall be washed or otherwise remove all soil and other construction debris deposited on the road as a result of the construction activity as needed.

3.4 Ditches

- .1 Re-establish ditches to provide drainage that existed prior to construction.
- .2 Replace any damaged culverts with pipe to match existing.

End of Section

PART 1 GENERAL

1.1 Related Specifications

- .1 PEI Department of Transportation and Infrastructure Renewal's General Provisions and Contract Specifications for Highway Construction.

1.2 References

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .4 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).

1.3 Definitions

- .1 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .3 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.
- .4 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Coarse grained soils containing more than 15 % by mass passing 0.075 mm sieve.

1.4 Waste Management and Disposal

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Ensure emptied containers are sealed and stored safely.

1.5 Protection of Existing Features

- .1 Existing buried utilities and structures:

- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing excavation Work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before removing.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
 - .7 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
- .1 Conduct, with Engineer, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair to approval of Engineer.

PART 2 PRODUCTS

2.1 Materials

- .1 Type 1 Fill: Crushed rock composed of hard, sound, durable uncoated, cubical fragments of consistent quality produced from non-sedimentary bedrock or non-sedimentary boulders, to comply with the P.E.I. Department of Transportation and Infrastructure Renewal Specification 401 – 402 Aggregate, for Class “A”.
- .2 Type 2 Fill: Crushed rock composed of hard, sound, durable, uncoated, cubical fragments of consistent quality produced from non-sedimentary bedrock or non-sedimentary boulders, to comply with the P.E.I. Department of Transportation and Infrastructure Renewal Specification 401 – 402 Aggregate, for Class “B”.
- .3 Type 3 Fill: Imported, classified as Common Fill, or material from excavation or other sources, approved by Engineer for use intended, unfrozen, free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.
- .4 Type 4 Fill: Natural sand or crushed rock screening, free from clay, shale or organic matter, to comply with P.E.I. Department of Transportation and Infrastructure Renewal Specification 402 – Bedding Sand.
- .5 Type 5 Fill: To requirements of P.E.I. Department of Transportation and Infrastructure Renewal Specification; Select Borrow as follows: Borrow shall be non-plastic and composed of clean, uncoated particles free from lumps of clay or other deleterious material with a maximum particle size of 100 mm, and a maximum of 30% of the material passing the 4.75 mm sieve shall pass the 75 µm sieve.

PART 3 EXECUTION

3.1 Site Preparation

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Where applicable, strip topsoil from within limits of excavation and stockpile as directed by Engineer, for respreading.
- .3 Sawcut pavement or concrete neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 Stripping of Topsoil

- .1 Commence topsoil stripping of areas after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Do not mix topsoil with subsoil.
- .3 Dispose of unused topsoil off site.

3.3 Stockpiling

- .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.4 Shoring, Bracing and Underpinning

- .1 Obtain permit from authority having jurisdiction for diversion of water course.
- .2 Construct temporary Works to depths, heights and locations as approved by Engineer.
- .3 During backfill operation:
 - .1 Unless otherwise as indicated or as directed by Engineer, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site as directed by Engineer.

3.5 Dewatering

- .1 Keep excavations free of water while Work is in progress.

- .2 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water in accordance with Section 01 35 43 - Environmental Protection and in manner not detrimental to public and private property, or any portion of Work completed or under construction.
- .5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

3.6 Excavation

- .1 Excavate to lines, grades, elevations and dimensions as indicated by Engineer.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 For trench excavation, unless otherwise authorized by Engineer in writing, do not excavate more than 30 m of trench in advance of installation operations.
- .5 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Engineer.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Dispose of surplus and unsuitable excavated material off site.
- .8 Do not obstruct flow of surface drainage or natural watercourses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify Engineer when bottom of excavation is reached.
- .11 Obtain Engineer approval of completed excavation.
- .12 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer.
- .13 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
- .14 Hand trim, make firm and remove loose material and debris from excavations. Where the material at the bottom of excavation is disturbed, compact foundation soil to density at least equal to the undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Engineer.

3.7 Bedding and Surround of Underground Services

- .1 Place and compact granular material for bedding and surround of underground services as indicated in Section 33 31 13 – Public Sanitary Utility Sewerage Force Mains and Section 33 11 17 – Site Water Utility Distribution Piping.
- .2 Place bedding and surround material in unfrozen condition.

3.8 Backfilling

- .1 Vibratory compaction equipment: Use Mechanical equipment.
- .2 Do not proceed with backfilling operations until Engineer has inspected and approved installations.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Engineer or:
 - .2 If approved by Engineer, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Engineer.
- .7 Place unshrinkable fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.

3.9 Restoration

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Engineer.
- .2 Replace topsoil as indicated by Engineer.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Engineer.

- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial twenty-four (24) hours.

End of Section

Part 1 General

1.1 Related Specifications

- .1 PEI Department of Transportation and Infrastructure Renewal's General Provisions and Contract Specifications for Highway Construction.

1.2 References

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131-96, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m³.
 - .6 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700kN-m/m³.
 - .7 ASTM D1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .8 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

1.3 Waste Management and Disposal

- .1 Separate and recycle waste materials.

Part 2 Products

2.1 Materials

- .1 Granular sub-base material: in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling and following requirements:

Part 3 Execution

3.1 Placing

- .1 Place granular sub-base after subgrade is inspected and approved by Engineer.
- .2 Construct granular sub-base to depth and grade in areas indicated.

- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 Compaction

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Engineer before use.
- .3 Compact to density of not less than 98% maximum dry density in accordance with ASTM D698, ASTM D1557.
- .4 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .5 Apply water as necessary during compaction to obtain specified density.
- .6 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.
- .7 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 Proof Rolling

- .1 For proof rolling use standard fully loaded tandem truck.
- .2 Obtain approval from Engineer to use non standard proof rolling equipment.
- .3 Proof roll at level in sub-base as indicated. If non standard proof rolling equipment is approved, Engineer to determine level of proof rolling.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove sub-base and subgrade material to depth and extent as directed by Engineer.

- .2 Backfill excavated subgrade with common material and compact in accordance with sub-base material and compact in accordance with this section.
- .3 Replace sub-base material and compact.
- .6 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.4 Site Tolerances

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.5 Protection

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Engineer.

End of Section

PART 1 General

1.1 Section Includes

- .1 Materials and installation for constructing new outfall structures, precast and cast-in-place manholes and catch basins.

1.2 Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for all manholes and catch basins.

PART 2 Products

2.1 Materials

- .1 Precast manhole units: to ASTM C478M, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
 - .1 Acceptable Product:
 - .1 Campbell's Concrete
 - .2 Shaw Group
 - .3 or an approved equal
- 2 Grade Rings
 - .1 A min. of 200mm of grade rings are required and a max. of 400mm is allowed. Precast grade rings are to be reinforced concrete, however grade rings less than 100mm must be recycled rubber, such as Flex-o-Ring manufactured by Highway Rubber & Safety Inc. Sloped rubber rings to be used where required to sit flush with the road surface, especially a crowned surface.
- 3. Manhole joints to be sealed using single component hydrophobic polyurethane flexible sealant/adhesive, such as XSEAL by Fernco. Rubber gaskets are not acceptable.
- 3. Frames, gratings, covers to dimensions as indicated and following requirements:
 - 1. Manhole frames and covers: minimum 115 kg per set; heavy duty municipal type for road service. Cover cast without perforations and complete with two 25 mm square lifting holes.
 - .2 Size: 550 mm clear diameter.
- .2 Granular bedding and backfill: in accordance with the following requirements:
 - .1 Crushed, screed, stone, gravel, sand.
 - .2 Type 4 fill, as defined in Section 02315.

PART 3 Execution

3.1 Excavation and Backfill

- .1 Excavate and backfill in accordance with Section 31 23 10 - Excavating Trenching and Backfilling.

3.2 Concrete Work

- .1 Position metal inserts in accordance with dimensions and details as indicated.

3.3 Installation

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Engineer and remove soft and foreign material before placing concrete base.
- .4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% maximum density to ASTM D698.
- .5 Compact granular backfill to 95% maximum density to ASTM D698.
- .6 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.
- .7 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

3.4 Leakage Test

- .1 Plug in inlet and outlet pipes with secured, braced, air plugs.
- .2 Place suction tester on top of the structure and draw a pressure of 10" Hg.
- .3 The length of time for testing will be no less than:
 - 50 seconds for structures up to and including 1250 mm.
 - 75 seconds for 1500 mm structures.
 - 90 seconds for 1800 mm structures.
- .4 The allowable vacuum drop shall not be greater than the 1" Hg over the specified time period.
- .5 If the structure fails the initial test, leaks are to be sealed using a hydrophobic polyurethane grout such as HyperFlex by Fernco.
- .6 Only grouting of seams is permitted. If grouting of interior surfaces of concrete is required, then the Engineer reserves the right to have the structure removed and replaced at no additional cost.

PART 1 General

1.1 References

- .1 CAN/CSA-A257 Series-M92, Standards for Concrete Pipe.
- .2 CAN/CSA-B182.2-95, PVC Sewer Pipe and Fittings (PSM Type).
- .3 CSA B182.11-95, Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings.

PART 2 Products

2.1 Concrete Pipe

- .1 Non-reinforced circular concrete pipe and fittings: to CAN/CSA-A257, designed for flexible rubber gasket joints.
- .2 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257, designed for flexible rubber gasket joints.

2.2 Plastic Pipe

- .1 Type PSM Polyvinyl Chloride (PVC): to CAN/CSA-B182.2.
 - .1 Standard Dimensional Ratio (SDR): 35.
 - .2 Locked-in gasket and integral bell system.

2.3 Service Connections

- .1 Type PSM Poly (Vinyl) Chloride: to CAN/CSA-B182.2.

2.4 Pipe Bedding and Surround Materials

- .1 Crushed or screened stone, gravel or sand.
- .2 Type 4 Fill as defined in Section 31 23 10 – Excavating, Trenching and Backfilling.

PART 3 Execution

3.1 Preparation

- .1 Clean and dry pipes and fittings before installation.
- .2 Obtain Engineer's approval of pipes and fittings prior to installation.

3.2 Trenching

- .1 Do trenching work in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

- .2 Do not allow contents of any sewer or sewer connection to flow into trench.
- .3 Trench alignment and depth require approval of Engineer prior to placing bedding material and pipe.

3.3 Concrete Bedding and Encasement

- .1 Position pipe on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .2 Do not backfill over concrete within 24 hours after placing.

3.4 Granular Bedding

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95 % maximum density to ASTM D 698.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.5 Installation

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Engineer.
- .2 Handle pipe using methods approved by Engineer. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipe during construction.
- .7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Pipe jointing:
 - .1 Install gaskets in accordance with manufacturer's recommendations as indicated.

- .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .3 Align pipes before joining.
- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .9 When any stoppage of work occurs, block pipes as directed by Engineer to prevent creep during down time.
- .10 Plug lifting holes with pre-fabricated plugs approved by Engineer, set in shrinkage compensating grout.
- .11 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .12 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available.
- .13 Use prefabricated saddles or field connections approved by Engineer, for connecting pipes to existing sewer pipes. Joints are to be structurally sound and watertight.

3.6 IPE Surround

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Engineer has inspected pipe joints, surround and cover pipes as indicated. Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material onto the pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D 698.

3.7 Backfill

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D 698.

3.8 Service Connections

- .1 Install pipe to manufacturer's instructions and specifications.
- .2 Maintain grade for 100 and 125mm diameter sewers at 1 vertical:50 horizontal unless directed otherwise by Engineer.
- .3 Service connections to main sewer: standard, Tee or Wye fittings, Engineer approved saddles. Do not use break-in and mortar patch-type joints.
- .4 Service connection pipe: not to extend into interior of main sewer.
- .5 Make up required horizontal and vertical bends from 45° bends or less, separated by straight section of pipe with minimum length of four pipe diameters. Use long sweep bends where applicable.
- .6 Plug service laterals with water tight caps or plugs as approved by Engineer.
- .7 Place location marker at ends of plugged or capped unconnected sewer lines.

3.9 Field Testing

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Remove foreign material from sewers and related appurtenances by flushing with water.
- .3 Carry out tests on each section of sewer between successive manholes including service connections.
- .4 Deflection Testing:
 - .1 Measure deflection by pulling a mandrel gauge through each pipe from manhole to manhole after backfilling.
 - .2 Provide mandrel gauges to measure a 5% and 7 ½ % deflection.
 - .3 Within thirty days after installation, pull a mandrel gauge measuring 5% deflection through the installed section of pipeline. If this test fails, proceed with a 7 ½ % deflection test.
 - .4 If 7 ½ % deflection test fails, locate defect and repair. Retest.
- .5 Lines to be air tested at 24 KPa minimum with the maximum pressure drop = 3.5 KPa for the pipe diameters and times indicated in the following table:

| <u>Pipe Size</u> | <u>Time</u> |
|------------------|----------------|
| 100 mm | 2 min. 32 sec. |
| 125 mm | 3 min. 25 sec. |
| 150 mm | 3 min. 50 sec. |
| 200 mm | 5 min. 6 sec. |
| 250 mm | 6 min. 22 sec. |
| 300 mm | 7 min. 39 sec. |
| 375 mm | 9 min. 35 sec. |

End of Section

Part 1 - General

- 1.1 Work Included .1 This section specifies requirements for constructing submersible sewage pumping stations. Submersible sewage pumping stations consist of a concrete wet well and a fiberglass above-ground enclosure with separate compartments to house the valving and electrical controls. Work also includes supply and installation of pumping equipment, pump controller, valves, metal fabrications and related electrical and pipework.
- 1.2 Reference Standards .1 ANSI/ASME B-16.1, Class 125, Cast Iron Pipe Flanges and Flanged Fittings.
- .2 ASTM A 36M, Carbon Structural Steel.
- .3 ASTM A 53, Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless.
- .4 ASTM A 181M, Carbon Steel Forgings for General-Purpose Piping.
- .5 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .6 CAN/CSA-C22.2 No. 108, Liquid Pumps.
- 1.3 Shop Drawings .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Indicate details of piping, valves, supports, pumps, metal fabrications, access hatches, flow meter, electrical panels, fiberglass enclosure, level control system, concrete wet well, slab hole locations and appurtenances.
- 1.4 Operating and Maintenance Data .1 Provide operating and maintenance data as follows:
- .1 System description.
- .2 Design parameters, system hydraulics, design calculations, and system curves.
- .3 Performance curves for the pumps, layout, and wiring diagrams, control system schematic, level control system schematic.
- .4 Related civil, mechanical, and electrical drawings.
- .5 Manufacturers operation instructions.
- .6 Name, address, and telephone number of equipment suppliers.
- .7 Information on guarantees and warranties.
- .8 Control Panel information.
- 1.5 Handling and Storage .1 Handle and store pumps, pipe, valves, fittings, controls and equipment in such a manner as to avoid shock and damage. Do not use chains or cables passed through pipe or equipment. Do not damage coatings of linings.

2.1 Pumps and
Equipment

- .1 Pump characteristics, flow, head and material selection: as indicated on the Project Drawings and in Specific Instructions. Pumps and Motors to be suitable for Class 1- Division 1 areas.

2.1.1 Pumps

- .1 Submersible, non-clog pumps.
- .1 Pumps to be capable of delivering flow and TDH as indicated.
- .2 Supply each unit complete with a mating, cast iron discharge connection and galvanized lifting chain and connectors approved for overhead lifting and of adequate strength to permit raising and lowering of the pump.
- .3 Pump and motor close-coupled, integral design capable of handling raw, unscreened sewage, Discharge connection elbow to be permanently installed in wet well, together with the discharge piping.
- .4 Pump to be automatically connected to discharge connection elbow when lowered into place, and easily removed for inspection and service.
- .5 Major pump components: grey cast iron, with smooth surfaces, devoid of blowholes and other irregularities.
- .6 All exposed nuts and bolts to be 316 series stainless steel construction.
- .7 Protect all surfaces coming into contact with sewage, other than stainless steel or brass, by an approved, sewage-resistant coating.
- .8 Machine all mating surfaces where watertight sealing is required and fitted with nitrile, neoprene or buna-N rubber o-rings. Accomplish sealing by metal-to-metal contact between machined surfaces.
- .9 Control compression of o-rings without the requirement of a specific torque limit. Do not use secondary sealing components, rectangular gaskets, elliptical o-rings, grease or other devices or materials.
- .10 Volute: single port, non-concentric design with smooth fluid passages, large enough at all points on the volute to pass any size solids with can pass through impeller.
- .11 Impeller ductile iron or grey cast iron, Class 30 or better, dynamically balanced, non-clog or recessed design having a long throughlet without acute turns.
 - .1 Impeller to be capable of handling solids, fibrous material, heavy sludge, and other matter found in normal sewage applications.
 - .2 Impeller vane design and passing sphere capability to be three (3) inches.
- .12 Pumps are to be Flygt or approved equal. Any approved equal is to be confirmed by addendum

2.1.2 Pump Cable

- .1 Power and/or control cable (s): SOW or SWT-A type sized to handle

electrical code requirements. Cable to be CSA approved and rated for 90 deg. C.

2.1.3 Pump Cable Entry

- .1 Cable entry design shall ensure an impermeable seal.
- .2 Cable entry to be comprised of a cylindrical elastomer grommet system or an epoxy sealed cable entry system.

2.1.4 Pump Guide Bars

- .1 Provide two vertical guide bars with each pump to ensure correct alignment of pump with automatic discharge connection.
- .2 For each pump, guide bars to be as specified on the Project Drawings and Specific Instructions, securely fixed at lower end to the discharge connection by means of corrosion proof bosses, provided.
- .3 Extend guide bars from discharge connection toward ground level to be securely fixed by a corrosion proof bracket (upper guide bar holder), anchored to the station roof.
- .4 Provide bracket with special inserts to position the guide bars rigidly, where applicable.

2.1.5 Pump Discharge Connections

- .1 Provide cast iron, automatic discharge connection for each pump to connect pump to discharge piping.
- .2 Discharge connection to be permanently fixed in position by anchor bolts attached to the bottom of the pump chamber.
- .3 Discharge connections to permit rapid and precise installation or removal of the pumps without entering pump chamber.

2.1.6 Wet Well Flushing

- .1 The Wet well is to be flushed by one of two methods:
 - .1 The station shall have one flush valve that flushes the wet well every second pump cycle. The flush valve shall be Flygt Model 4901 or approved equal.
 - .2 The Engineer may approve a mix pump as an equal if a lift pump is approved that does not permit the use of a flush valve. If approved, the flushing pump is to be operated by an operator adjustable timer in the control panel. The pump shall be complete with a system to remove and replace the pump as well as all controls and wiring to operate the pump. System for removal and mounting of pump to be approved by the Engineer.

2.1.7 Pump Motor

- .1 The pump motor: squirrel-cage induction type design, housed in a watertight chamber of maximum efficiency and durability. Design motor for continuous duty capable of sustaining a maximum of fifteen (15) starts per hour. Motor speed and electrical characteristics as indicated in Project Drawings and Specific Instructions.
- .2 Motor stator: Insulate stator winding and leads with moisture-resistant varnish capable of withstanding a temperature of 155 degrees C or the motors maximum temperature rise, whichever is greater. Dip and bake

stator three (3) times in Class F varnish.

- .3 Rotor bars and short-circuit rings to be made of aluminum. Use thermal sensors to monitor stator temperatures on all pumps. Equip stator with not less than two (2) thermal switches embedded in the end coils of the stator windings (one switch per phase to protect the motor against surcharges and high temperature). Use these in conjunction with, and supplemental to, external motor overload protection, and wired to the control panel.
- .4 Seal junction box chamber containing the terminal board from the motor by an elastomer compression grommet for pumps of 3 kW (4 hp) or more. Alternately, use of triple-sealed cable entry system does not require a seal junction box chamber.
- .5 Equip motor housing with a moisture detector to detect any leakage of water of pumpage, into the stator housing. The signals from the thermal switches and the moisture detector to be wired to the control panel.
- .6 Accomplish control of the moisture detector and the winding thermal switches by using a control/indicator relay (s) which will be installed and wired inside the control panel to stop the pump unit upon a fault signal.
- .7 Motors to be air cooled or oil cooled to manufacturers standard.

2.1.8 Motor Shaft
and Seals

- .1 Pump shaft: AISI 400 series stainless steel. Provide each pump with a tandem mechanical shaft seal system.
- .2 The upper of the tandem set of seals operates in an oil chamber. This set contains one stationary tungsten-carbide ring and one positively driven rotating carbon ring. The seals function as an independent secondary barrier between the pumped liquid and the stator housing.
- .3 The lower of the tandem set of seals shall function as the primary barrier between the pumpage and the stator housing. This set shall consist of a stationary ring and a positively driven rotating ring, both to be solid tungsten carbide, silicone carbide or carbon ceramic.

2.2 Pump Control Panel
and Electrical

- .1 Pump Control Panel is to be a solid-state microprocessor controller with a fault diagnostic system. Control panel and main power panel to conform to the Project Drawings and Specific Instructions.

2.2.1 Control Panel

- .1 The Control Panel electrical devices, components and wiring shall be housed in an Epoxy Coated Steel Enclosure. The enclosure shall be rated NEMA 4 steel painted grey. The enclosure shall be equipped with a lockable exterior hinged door using 1/4 turn latches or quick release clamps. Bolted C-clamps are not acceptable.
 - .1 The following items are to be located on the panel door so the station can be operated without opening the panel door:
 - a) pump selector switches (H/O/A) type
 - b) pump motor run lights (LED)
 - c) pump over-temperature/leak Alarm Resets

- d) operator interface console
- e) motor starter resets
- f) liquid level readout
- .2 The door shall be modified so that the Interlocked Breakers can be operated without opening the door.
- .2 The maximum voltage attached to the wiring on the backside of the door shall not exceed 120 Vac nominal.
- .3 The Control panel is to have a 100W heater with thermostat.
- .4 The Control Panel is to be Surfline or approved equal.
- 2.2.2 Backplate
 - .1 The Control Panel shall have an aluminium Backplate inside the panel. The Backplate shall be raised off the back wall of the panel. The Backplate shall hold the bulk of the electrical devices, components, and wiring. The Backplate shall have terminals for all connections external to the Control Panel with the exception that the motor starter terminals shall be used for connecting to the motor leads.
- 2.2.3 Programable Logic Controller
 - .1 Lift Station shall be equipped with Red Light visible in all directions that will identify high water alarm or pump failure alarm situation.
 - .2 Lift Station shall be signed with a message alerting public of a phone number to call to report "Red Light On".
 - .3 Lift Station shall have communication that report high water alarm and pump failure situations
 - .4 Lift Station communications shall report to operator alarm, loss of power, and loss of communication.
 - .5 Alarms shall be communicated to the operator on call 24 hours per day 7 days per week. The volume of storage can be considered when frequency of the communication verification is selected.
- 2.2.4 Operator Interface Console
 - .1 The PLC Operator Interface Console shall have the following:
 - .1 a minimum of a two-line display screen.
 - .2 PLC reset switch
 - .3 Keypad for operating and programming PLC
- 2.2.5 Pump Temperature and Moisture Leak Detection
 - .1 The Backplate shall contain a pump over-temperature relay and a moisture leak detector relay for each pump motor. These relays may be a combination relay.
- 2.2.6 Major Electrical Devices and Components
 - .1 Distribution Block - The Backplate shall contain a 120/208-Vac power distribution terminal block for receiving the incoming 120/208-Vac power. The distribution block shall be capable of receiving single-phase or three-

phase power and be suitable to handle electrical requirements for the lift station terminating a #4 AWG power supply conductor.

- .2 Control Transformer(s) - The Backplate shall contain a control transformer(s) to supply control power to the Control Panel. The transformer shall have over-current protection provided by fuses on the high voltage coil and one on the low voltage coil. The low voltage, non-fused output shall be grounded at the transformer and shall utilize white conductor as indicative of a neutral circuit.
- .3 Motor Circuit Breaker - The Backplate shall contain a Motor Circuit Breaker for each pump motor. The circuit breaker shall incorporate a transient inrush trip suppression mechanism to allow for sustained high transient inrush currents associated with energy efficient motors. The circuit breaker shall operate to provide short circuit protection and tripping on low-level electrical faults. Motor Circuit Breaker to be lock-out, tag-out design. The Motor Circuit Protector to be utilized shall be of the Cutler-Hammer HMCPE design or equivalent.
- .4 Motor Contactor Starter - The Backplate shall contain a Motor Contactor/Starter for each pump motor.
 - a) The Motor Contactor/Starter shall include standard overload protection functions and additional detection/protection functions for phase loss and phase unbalance, and ground fault protection.
 - b) The Motor Contactor/Starter shall have selectable trip class and automatic/manual reset of faults.
 - c) The individual protection functions shall be capable of being deactivated.
 - d) Heater elements shall not be utilized for overload protection.
 - e) The contactor/starter shall have a Normally-Open auxiliary contact to indicate when the contactor is closed.
 - f) The Motor Contactor/Starter shall be connected to an H-O-A switch on the panel door. The Motor Contractor/Starter faults shall be capable of being reset by push-button without opening the panel door.
 - g) The Motor Contactor/Starter to be utilized shall be of the NEMA rated, non-reversing, Cutler-Hammer, Advantage series, smart-starter design or equivalent.
 - h) Motor starter shall be sized to suit pump.

2.2.7 Standby Power/
Main Disconnect

- .1 Interlocked breakers are to be installed in the main panel. These breakers are to act as a main disconnect and as a transfer switch to connect to a mobile generator. The breakers shall be Cutler Hammer or approved equal. The panel door is to be modified to permit access to the switches without opening the panel door.
- .2 The main service entrance shall include surge suppression/ lightning arrestor.
- .3 A receptacle shall be mounted on the exterior of the fiberglass enclosure for the connection of the portable power generator. This connector shall be Meltric D60 metal inlet connector for 120/208 Volts, Part #37-68167 plus a

MA6 angle adapter and a #31-6A126 Cap.

- .4 The utility meter is to be installed on the exterior of the fiberglass enclosure.
- 2.2.8 Additional Wiring
- .1 Mount on the top of the enclosure and connect to station alarm in the panel, a flashing LED red alarm light rated for outdoor use complete with a high impact lexan vandal-proof lens.
 - .2 The Contractor is to supply and install in the panel a 15 amp, 120 volt breaker for communication equipment. 120 Volt and alarm wires shall be run to the communication area of the panel, for future use by the City.
 - .3 A 20 amp, 120 Volt receptacle, CSA 5/20R, with its own GFCI breaker shall be installed in the electrical compartment of the fiberglass enclosure.
 - .4 Provision shall be made for two spare 15 Amp 120 Volt breakers to be installed in the future.
 - .5 A breaker is to be installed in the control panel for each heater.
- 2.2.9 Accessories
- .1 Supply one spare fuse of every size and type used in the control circuitry.
- 2.2.10 Documentation
- .1 Documentation shall be provided on the Control Panel for:
 - i) Installation, configuration, and operating instructions
 - ii) Wiring schematic showing all devices and components
 - iii) Description of Control Panel functions
 - iv) Replacement parts list
 - v) Maintenance checklist
 - vi) Reduced size laminated and bound set of drawings
 - vii) Detailed Bill of Materials
 - viii) Table of all control and protection device settings
- 2.2.11 Quality Control
- .1 All electrical materials used in the assembly of the panel shall meet or exceed the requirement of this specification. Materials shall be of NEMA standard and shall be applied in strict compliance with the individual standards governing the application of these components.
 - .2 All changes that may become necessary during assembly shall be recorded on the approved for fabrication drawings and re-issued noted AS-BUILT@ and accompany the panel to site for installation. Major changes shall be submitted to the Engineer prior to implementation.
 - .3 All wires shall be megger tested prior to energizing.
 - .4 Where feasible, simulated functional tests of all the logic shall be conducted. These tests shall include the power up of all control devices and simulation of the pump control logic.
 - .5 All control and protective device settings shall be recorded on the drawings for ease of field start-up and maintenance activities.
- 2.2.12 Installation
- .1 The installation of the Control Panel and its external connection to the source of power, float switches, pump motors, alarm light, Autodialer,

communications modem and other electrical components shall comply with the National Electrical Code, local supplemental codes, and the recommendations of the Control Panel manufacturer.

- .2 All panels are to be mounted on uni-strut panel mounting system.

2.2.13 Certifications

- .1 The pump control panel shall meet or exceed the requirements as prescribed by C.S.A. C22.2 No. 14, including all standards referenced therein.
- .2 The panel shall be designed, assembled, wired and tested in a C.S.A. Certified panel shop.
- .3 The panel shall bear a valid C.S.A. Certification sticker clearly visible on the outside of the panel

2.2.14 Electrical Wiring

- .1 All electrical wiring of the pump station to be designed and supplied by the manufacturer in accordance with the Canadian Electrical Code and CSA bulletin S 2619.
- .2 Provide pump and level regulator cables in sufficient length to run directly to a junction box located below the control panel to permit removal of the pumps and level regulator cables without working in the panel. Seal conduits with a permanently flexible sealant, preventing entry of vapour or gas from the wet well. Locate seal to enable motor removal complete with electrical disconnect without disturbing the seal.
- .3 Code all wiring in the pump station by a numbering system.
- .4 All conductors in power wiring to be no less than No. 12 AWG. Control wiring conductors may be smaller in size, in accordance with the current requirements of the circuit involved and all applicable standards.
- .5 No holes in the concrete slab shall be within the electrical compartment. All wires are to be brought up through the valve compartment and through the dividing wall. Contractor to provide location of pipe and wire holes through slab with shop drawings.
- .6 The wet well and valve compartment of the enclosure are considered Class 1- Division 1 areas.

2.2.15 Inspection & Testing Prior to Shipment

- .1 Test pump proper operation at rated power supply values and for electrical and mechanical integrity prior to shipment. Pump supplier to have adequate test facilities to at least provide a single-point performance test or a complete performance curve at an accuracy of $\pm 1\%$. Check level regulators for correct operation.
- .2 Pump/motor assembly to be CSA approved as one, integral unit, as per CSA standard CAN/CSA-C22.2.108-M89, LIQUID PUMPS. Proof of this approval to be submitted by the pump manufacturer together with the approval drawings. An approval of the motor unit only shall not be acceptable.

- .3 Any equipment in the pumping station that may have been provided by another supplier shall have been tested by the original supplier.
- .4 Pump manufacturer to perform the following inspections and tests on each pump before shipment:
 - .1 Check impeller, motor rating, and electrical connections for compliance to the customer's purchase order.
 - .2 A motor and cable insulation test for moisture content and/or insulation defects.
 - .3 Prior to submergence, run the pump dry to establish mechanical integrity and free rotation.
 - .4 Run pump for 30 minutes, submerged 2m minimum depth.
 - .5 Repeat after operational test number 4, the insulation test, number 2.
 - .6 Check oil housing for any leakage of water by the lower seal.
 - .7 Inspect motor housing and junction box for any water leakage.
 - .8 Supply upon request, a written report stating that the above tests have been performed with each pump at the time of shipment.
 - .9 Seal pump cable end with a high-quality protective covering to make it impervious to moisture and/or water seepage, prior to shipping to job site and electrical installation.

2.2.16 Labels

- .1 Suitable nameplates to be permanently affixed onto the pumps, control enclosure components, and other operating components to indicate the purpose of the component or operating routine and parameters applying to the component.
- .2 All electrical equipment including the lift station pumps and control equipment are to be CSA approved and the CSA logo is to appear on the nameplates of these components.

2.3 Structure

2.3.1 Wet Well

- .1 Wet well shall be precast concrete conforming to ASTM C478M and CAN/CSA A257.4-M and in accordance with the Project Drawings, Specific Instructions and Section 33 05 14 – Manholes and Catch Basins Structures.
- .2 Floor of wet well is to be benched as indicated on the Project Drawings.
- .3 Cover of wet well is to have a sleeve installed for the lifting davit. Location to match the layout of the pumps.
- .4 The concrete top of the wet well is to be enlarged to accommodate the fibreglass enclosure. The supplier is to ensure the enlarged top is designed to withstand the cantilevered loads.
- .5 Concrete wet well to be tested for leakage/infiltration as per Section 33 05 14.
- .6 All pipe protrusions shall be sealed with a cast in gasket as per ASTM C923.

2.3.2 Access Frame

- .1 Aluminum access frame to be fabricated using an extrusion of 6351 aluminium. Cover to be fabricated using a plate of 5086 aluminum designed to withstand shear and deflect not more than 1/79 of the maximum span for minimum specified loads of 7.2 kPa uniform load of 1100 kg point load. The cover rest on a rubber gasket to be hinged along one side with a continuous aluminum hinge.
- .2 Top of the access frame to be flush, the handle recessed for padlock within the recess to lock the cover in the closed position.
- .3 Provide cover stay to allow the cover to be locked in the open position.
- .4 Each access frame to be capable of supporting the full weight of any submersible pump which can be installed through its opening.
- .5 Design access frames for embedding into the concrete top of a sewer station, extrusion to be shaped such as to provide good anchoring to the concrete. All surfaces in contact with the concrete to be bitumastic coated.
- .6 Frames to be capable of being installed side-by-side by bolting them together using standardized bolting kits.
- .7 Provide aluminum rail nuts within the extrusions, permitting an upper guide bar holder, a level regulator hanger and a chain hook to be attached without any modifications required to the frame.
- .8 Units are to include an aluminum safety grate that provides fall through protection and permits the visual inspection of the wet well and access to floats without opening grate. Grates are to have hinges that can be stayed to hold the grate open.
- .9 Access Frame and Covers to be duplex Flygt Aluminum (Safe Hatch) Access Frame or approved equal. Size of hatch to match the pumps.

2.3.3 Piping and Fittings

- .1 Interior station piping to be galvanized steel above the floor and galvanized steel or ductile iron below floor or as specified in the Project Drawings and Specific Instructions.
- .2 Connections between pipes and between pipes and fittings shall be in accordance with the Project Drawings and Specific Instructions. If the type of joint is not indicated the contractor may choose the type of joint to be used, however all joints must be restrained. Pipe connections must be in a manner that permits easy removal of piping for service or replacement.
- .3 All piping and fittings are to be securely supported and braced.
- .4 Pressure sewer exterior wall pieces to be cement-lined ductile iron. Exterior connections to PVC pressure sewer to be by mechanical joint sleeve with thrust restraints.
- .5 Check valves for each pump shall be installed in the valve section of the fiberglass enclosure. Each valve to have a throughway size equal to the pump discharge pipe size to ensure full, free-flow operation. Check Valves

shall be AVK 5092 or approved equal.

- .6 Plug Valves for each pump shall be installed in the valve section of the fiberglass enclosure. Each valve to have a throughway size equal to the pump discharge pipe size to ensure full, free-flow operation. Plug Valves shall be Keystone or approved equal.
- .7 The Air Release Valve shall be installed in the valve section of the fiberglass enclosure. Air Release Valve shall be APCO, or approved equal, with a 2-inch bronze gate valve.

2.3.4 Flow Meter

- .1 Flow meter detector portion is to be installed in the valve section of the enclosure and the converter and readout are to be installed on the backplate of the control panel. The meter shall be Toshiba LF434/LF602 or Endress+Hauser electromagnetic for sewage applications.

2.3.5 Lifting Davit

- .1 Lifting davit shall be galvanized steel designed to remove the pumps from the wet well. It shall be matched to the sleeve installed in the wet well top. Davit shall be Flygt part number 13-52 01 39 and chain hoist part number 13-43 00 06 or approved equal.

2.3.6 Enclosure

- .1 Enclosure shall be an insulated fibreglass structure with separate valve and control compartments. The construction details and layout are on the Project Drawings and Specific Instructions.
- .2 Each section shall have a 120 Volt light inside and the electrical section shall have a 120 Volt receptacle.
- .3 The valve compartment shall have a thermostat and heater.
- .4 The valve compartment is a Class 1 Division 1 environment.
- .5 The wall between the two compartments must be sealed to prevent gases from entering the control compartment.
- .6 Enclosure to be separated from access hatch far enough to permit the access hatch covers to open with the enclosure doors open.
- .7 Enclosure shall be securely fastened to the concrete wet well top slab and made weather tight. The dividing wall must be sealed to the concrete to ensure gasses cannot enter the electrical compartment.
- .8 Enclosure is to be constructed to the following specifications:
 - .1 Framing to be 2"x4" on 16" centres - pressure treated lumber
 - .2 Fasteners to be galvanized nails
 - .3 Insulation in walls and roof to be 3.5" solid R12 insulation (Expanded polystyrene)
 - .4 Inner Shell to be 1/4" plywood, 1/16" thick hand laid fiberglass (1.5 oz. / ft²) and have two coats of gelcoat. (Successful Contractor is to provide colour choices)
 - .5 Outer Shell to be 1/4" plywood, 1/8" thick hand laid fiberglass (3.0 oz. / ft²) and have two coats of gelcoat. (Successful Contractor is to provide colour choices)

- .6 Doors to have 2" thick solid insulation SM R, inner shell 1/16" thick hand laid fiberglass (1.5 oz / ft²) outer shell 1/8" thick hand laid fiberglass (3.0 oz / ft²) with two coats of gelcoat on inner and outer shells. (Successful Contractor is to provide colour choices). Hardware to be Faucher Industries or approved equal - hinged cam lock #701-0015, hinges #754-1217 and weather-stripping # 623-0138.
- .7 The enclosure specification in subsection 6 above is intended to be an indication of the quality of construction required, alternates will be considered that provide a similar quality enclosure. Bidders are to follow the process as indicated in Section 01 02 00.

Part 3 - Execution

3.1 General

- .1 Verify all layouts, dimensions, elevations and other pertinent data prior to proceeding with the work.
- .2 Back prime all metal surfaces being mounted directly against concrete surfaces with bitumastic paint with the exception of surfaces that will be grouted in.
- .3 Examine all components to be incorporated into the Work for cracks, pits, blow holes, finishes, and any other defects. Do not incorporate any defective materials into the Work. Remove any defective materials from the site immediately and replace defective materials with new materials. Inspect all materials and remove all dirt and other debris.
- .4 Install all components in strict accordance with each manufacturer's instructions, recommendations and the shop drawings for the various materials to be incorporated in the Work.
- .5 Install pumps, pipe, fitting, valves, accessories and appurtenances using skilled workers experienced in the tasks required.
- .6 Handle all components carefully taking care not to damage the surface finish on these components. Make good any damage or supply new components as appropriate.
- .7 Install isolation bushings between stainless steel anchors and other dissimilar materials.
- .8 Install stainless steel washers when installing anchors for pump discharge base elbows. Washers to have a stick-on plastic film on the side contacting the base elbows. Use stainless steel shims similarly protected when shimming base elbows.
- .9 Arrange for start-up testing and commissioning by the equipment manufacturers' representatives in presence of the Owner's representatives after the installation has been completed and is ready for start-up and commissioning.

3.2 Piping

- .1 Cut piping to length using equipment designed for the cutting of pipe within

the maximum allowable tolerance from square cut ends in accordance with manufacturers recommendations.

- .2 Install piping straight, parallel to walls and in such a manner so as to prevent straining during jointing procedures. Install galvanized pipe supports where shown or required.

3.3 Valves

- .1 Ensure that the valves are installed in the proper orientation with respect to flow direction.

3.4 Pumps and Appurtenances

- .1 Locate, align, level, adjust and install pump discharge base elbows. The pumps and discharge base elbows to be located so that the pumps can be easily removed through the openings in the lift station without requiring the removal of any station equipment. Ensure that sufficient clearance is present to permit easy pump removal when a flush valve is installed on the designated pump.

- .2 Install upper guide bar holders and guide bars in accordance with the pump and anchor manufacturer's instructions, so that the guide bars are true, plumb and in the proper location and alignment so that the pumps can be easily removed through the openings in the lift station cover.

- .3 Take particular care to protect the finish on the pumps, pipe, fittings, valves and appurtenances from scratches and other damage. Repair any damage to the surface finishes.

3.5 Accessories

- .1 Backprime the level regulator hanger with bitumastic paint and mount in the position indicated or as directed or if not shown, mount in a location where they will not be affected by flow from the inlet piping or prevent removal of the pumps, including a pump if fitted with flush valve, all in accordance with the pump and anchor manufacturer's instructions.

- .2 Backprime and mount each galvanized chain hook in the area shown and located so that the chain can be reached conveniently and such that the hook does not interfere with pump removal from the lift station. Install isolation bushings between galvanized steel and 316 stainless steel anchors. Install hooks in accordance with pump and anchor manufacturer's instructions.

- .3 Supply and install backprimed galvanized pipe supports and install with medium duty, 316 stainless steel, wedge anchors using isolation bushings all in accordance with the anchor manufacturer's instructions.

- .4 Following installation of the stainless-steel anchors that use studs instead of bolts, cut the studs off level with the top of the nut.

3.6 Testing

- .1 Prior to starting the pumps, remove the plug or cap from the pressure sewer in the manhole.
- .2 Prior to filling structure with water for testing pumps the Engineer shall inspect the installation.

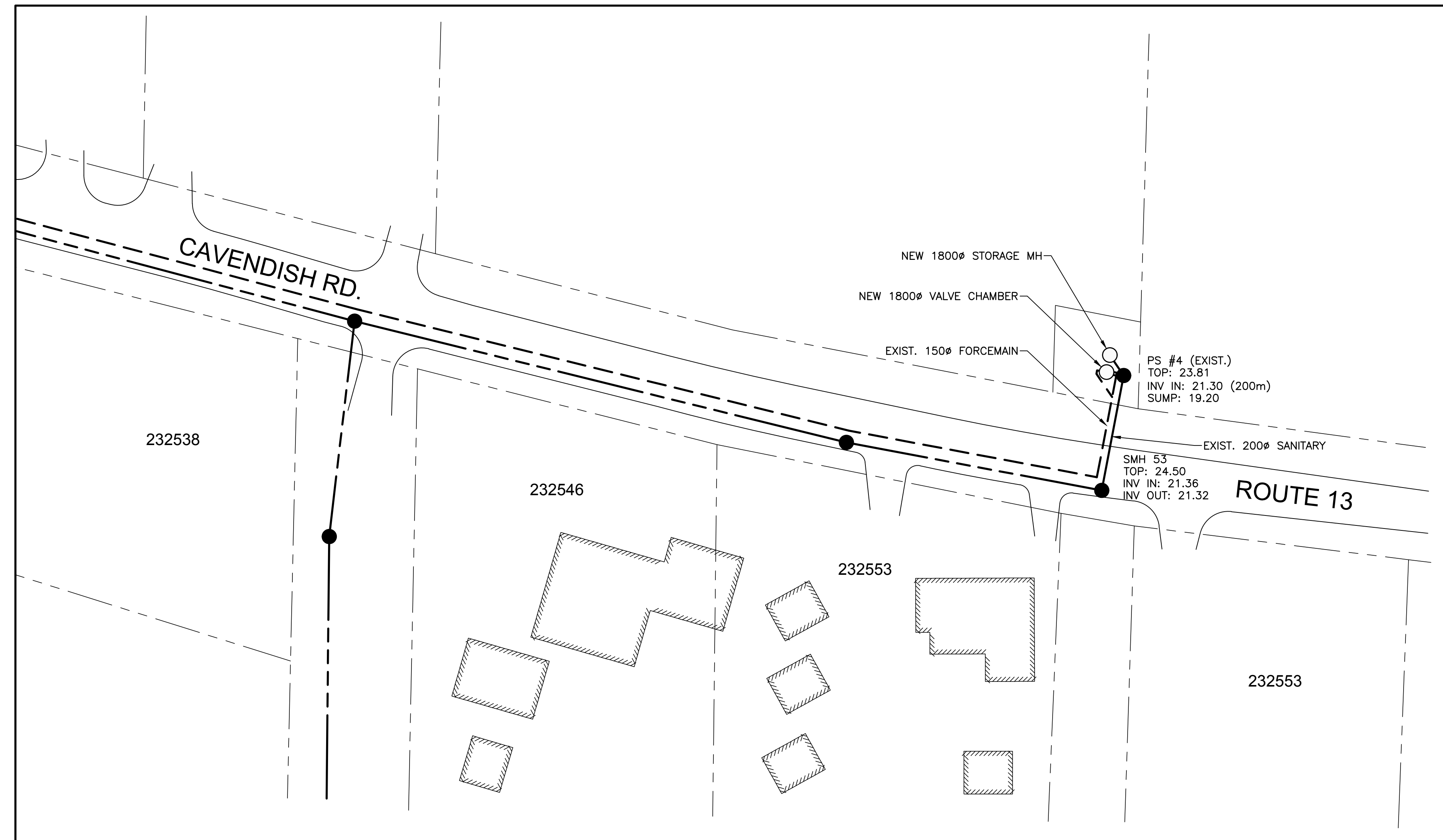
- .3 After pumps and piping have been installed, test pumps with the material they are to pump, or with water, operate and pump for a duration of time sufficient to satisfy that the complete installation has been properly installed and aligned and that the pumps run free from heating, rubbing or vibration and meet the requirements of these Specifications, and that the pumps and piping are free and clear of debris and obstructions.
- .4 Demonstrate that each pump can be easily removed from the lift station without obstruction or removal of any station equipment. Make any adjustments necessary to carry out pump removal in this manner.
- .5 Demonstrate the operation of all valves and make any adjustments necessary to permit the valves to be operated smoothly without obstruction and allow the pumps to be removed with the valves in an open or closed position.

3.7 Training

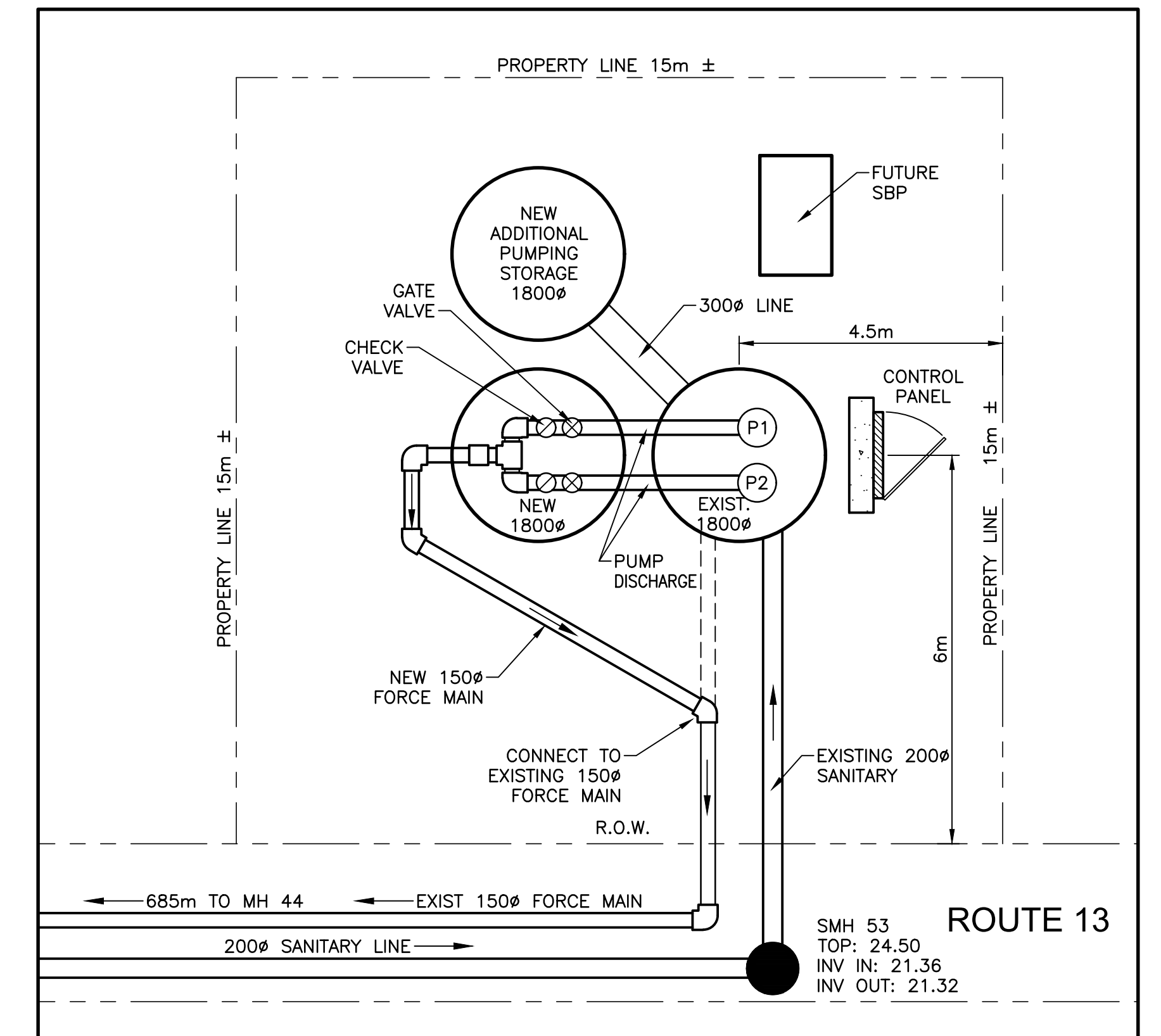
- .1 Supply on-site and classroom training in the operation of the PLC and OIC. Contractor/Supplier is to allow for 2 training sessions to permit half of staff to attend each session.

NEW LIFT STATION

Cavendish Rd. - Cavendish, PE



LOCATION PLAN
SCALE : 1:500

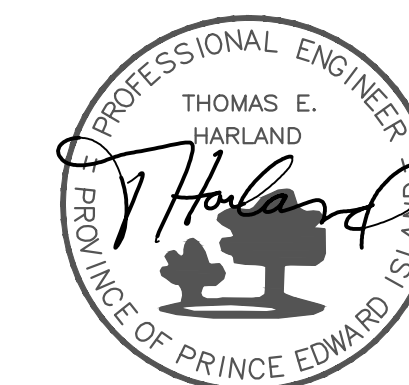


SITE PLAN SCHEMATIC
SCALE : N.T.S.

LIST OF DRAWINGS

COVER SITE PLAN & LOCATION PLAN

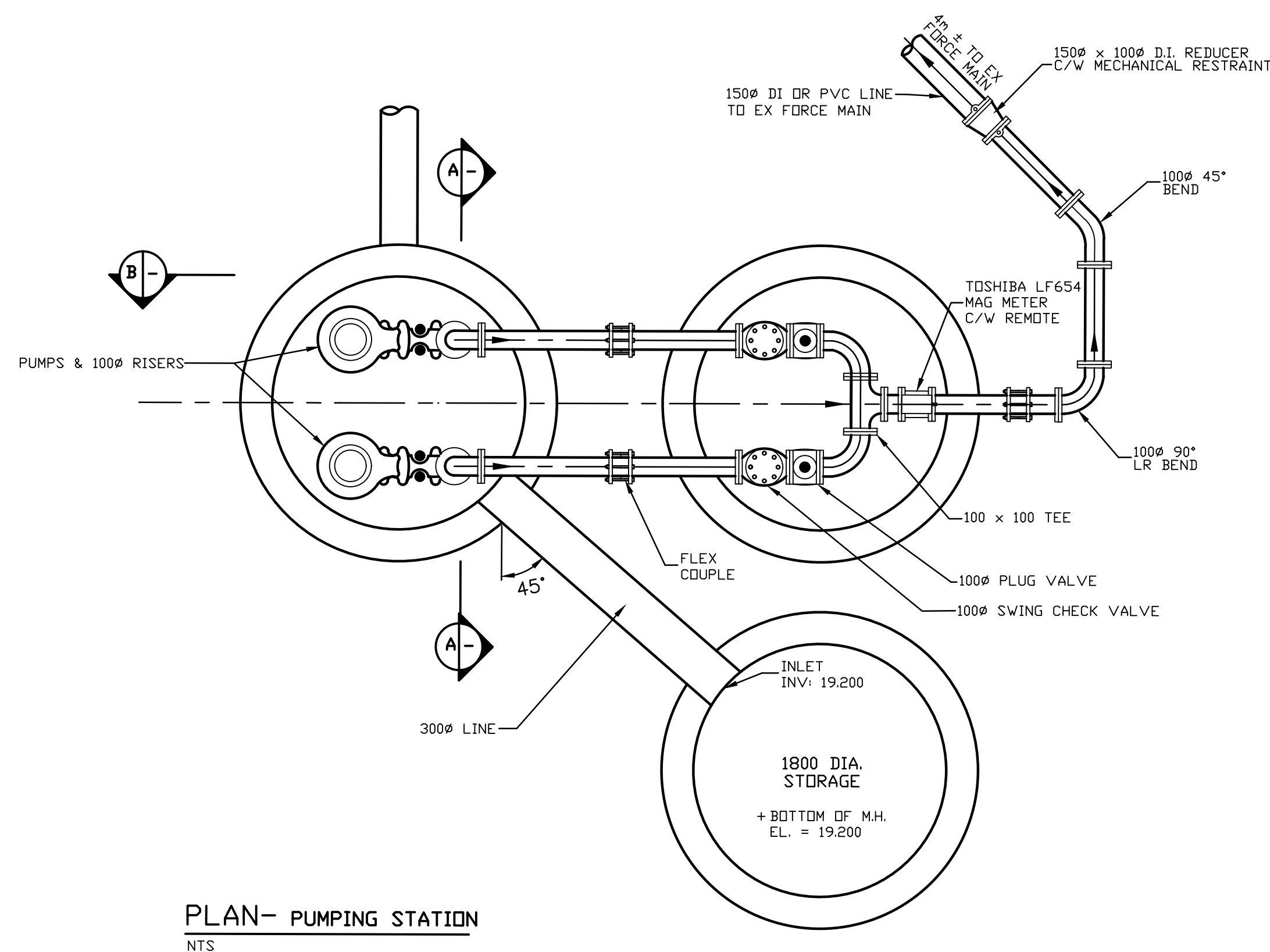
A PUMP STATION DETAILS



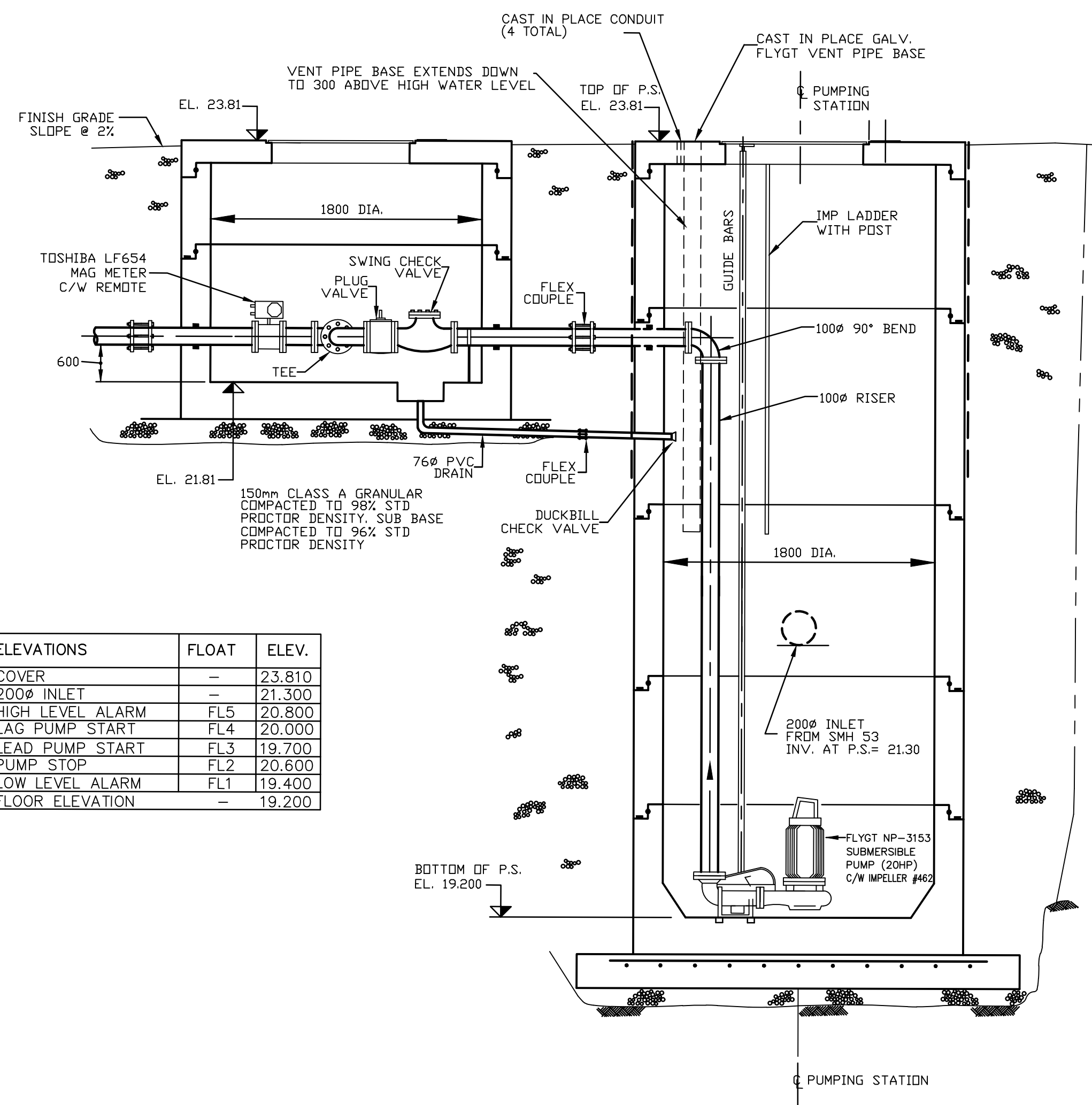
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Project no. 2019-011

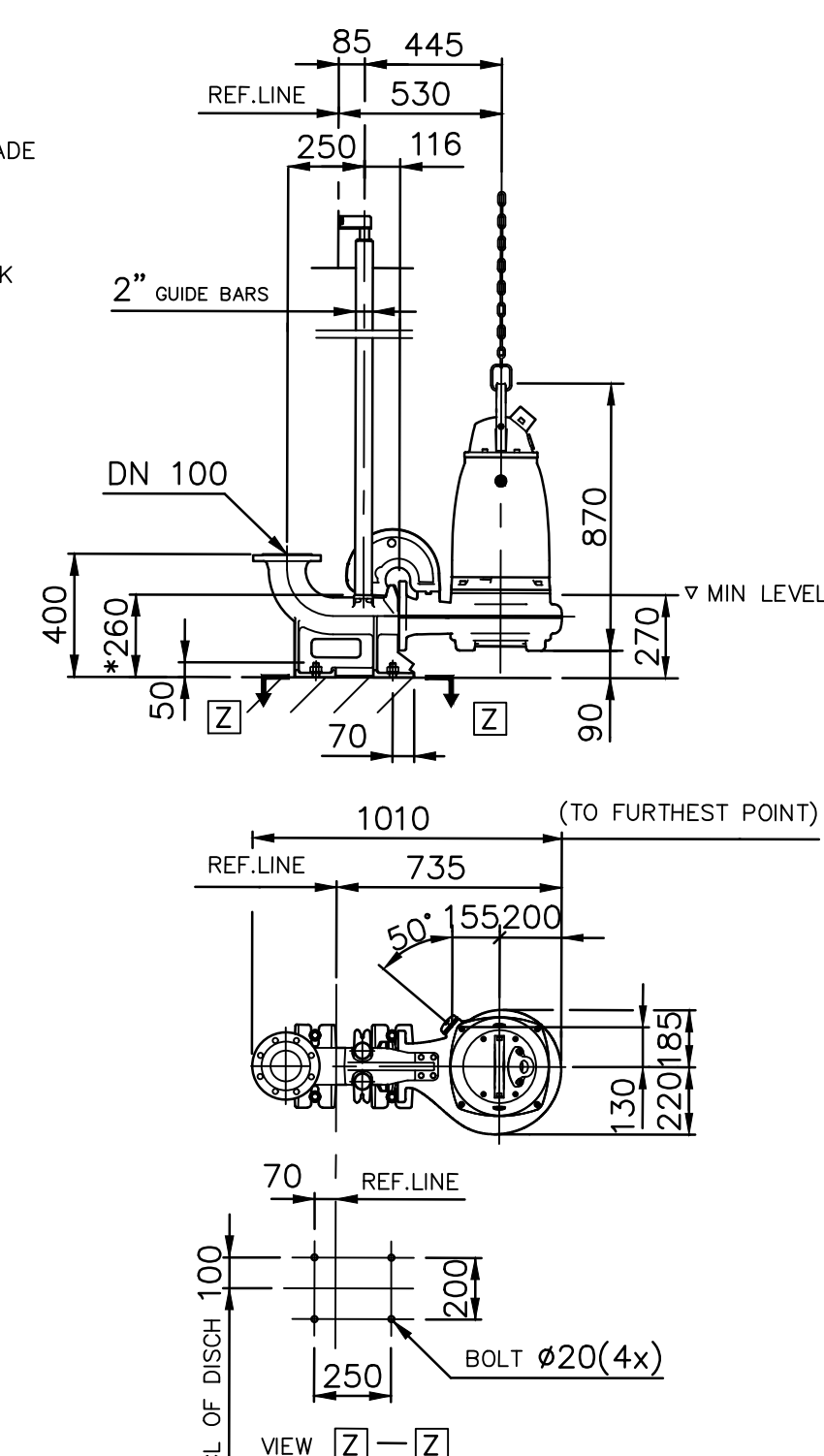
Issued for Tender: Rev. #3 December 20, 2019



PLAN- PUMPING STATION
NTS



B SECTION-PUMPING STATION
- NTS



DETAIL - FLYGT NP-3153 PUMP

- GENERAL NOTES:
1. ALL SUPPORT BRACKETS AND ANCHOR BOLTS INSTALLED IN WET WELL AND VALVE CHAMBER ARE THE BE STAINLESS STEEL.
 2. EXTERIOR SURFACES OF WET WELL AND VALVE CHAMBER ARE TO BE PROTECTED BY A BLUEKIN WATERPROOF MEMBRANE.
 3. ALL MECHANICAL COUPLINGS & EXPOSED FITTINGS/HARDWARE TO BE PROTECTED BY DENSO TAPE OVERWRAPE.
 4. CHAIN 7 ASSOCIATED HARDWARE FOR PUMPS ARE THE BE LIFT RATED.
 5. LIFT STATION SHALL VALVE CHAMBER SHALL BEAR ON MINIMUM 150 mm OF CLASS A GRAVEL. ALL FILL MATERIAL UNDER THE LIFT STATION & VALVE CHAMBER SHALL BE STRUCTURAL FILL.
 6. LIFT STATION SHALL BE EQUIPPED WITH A RED ALARM LIGHT THAT WILL INDICATE HIGH WATER ALARM OR PUMP FAILURE ALARM.
 7. LIFT STATION TO INCLUDE SIGNAGE OF EMERGENCY CONTACT IF ALARM LIGHT IS ILLUMINATED.
 8. LIFT STATION SHALL COMMUNICATE ALARM, LOSS OF POWER, AND LOSS OF COMMUNICATION TO OPERATOR ON CALL 24 HOURS PER DAY 7 DAYS PER WEEK

| | | | |
|-----------|------------------------|-----|----------|
| 6 | | | |
| 5 | | | |
| 4 | | | |
| 3 | ISSUED FOR TENDER | TEH | 12/20/19 |
| 2 | REVISED FLOAT SETTINGS | TEH | 11/21/19 |
| 1 | ISSUED FOR REVIEW | TEH | 11/08/19 |
| 0 | ISSUED FOR REVIEW | TEH | 11/01/19 |
| No. | R E V I S I O N S | By | MM/DD/YY |
| DEVELOPER | | | |

ENGINEER

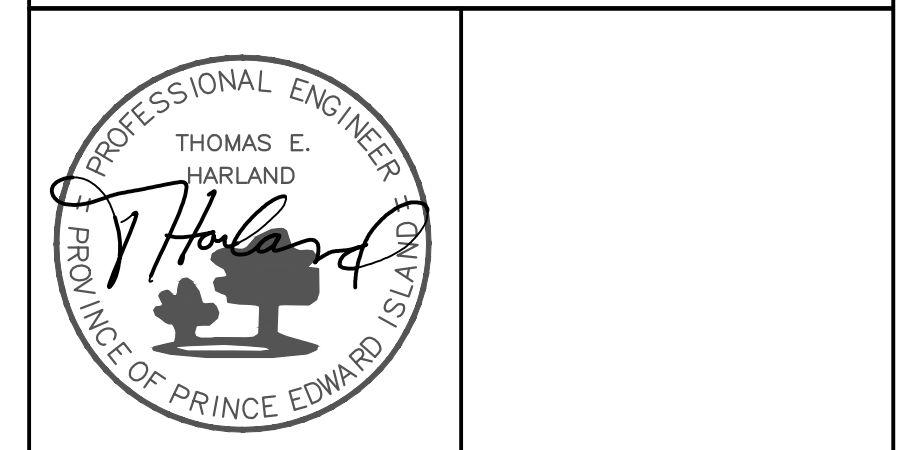
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Project Name: **CAVENDISH
LIFT STATION**

Drawing Title:

LIFT STATION DETAIL

| | | |
|------------|-------------------|--|
| Date | DECEMBER 20, 2019 | Sheet <div style="font-size: 2em; font-weight: bold; text-align: center;">A</div> |
| Scale | AS NOTED | |
| Drawn | EB | |
| Engineer | TEH | |
| Project No | 2019.011 | Rev No. 3 |