

PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Materials and installation for water mains, hydrants, valves, valve boxes, bends, including service connections.

1.2 RELATED
SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 31 23 10- Excavating, Trenching and Backfilling.
- .5 Section 03 20 00 - Concrete Reinforcing.
- .6 Section 03 30 00 - Cast-in-Place Concrete.

1.3 MEASUREMENT FOR
PAYMENT

- .1 All costs associated with this section to be included as a Fixed Price Item.
 - .1 No separate payment will be made for locating, excavation, removal, storage, and re-installation of existing items related to the relocation of the existing hydrant and water service to the wharf.
 - .2 No separate payment will be made for the costs associated with the supply and installation of all new items which are included with the Work as per the drawings. New items included in the Work are: 25 mm diameter water line, 150 mm diameter water main, curb stop, thrust blocks, hydrant marker, hose bib, pipe adapter, etc.
 - .3 No separate payment will be made for costs associated with the supply of water to occupants during prolonged service interruptions.
 - .4 No separate payment will be made for costs associated with hydrostatic testing, water sampling, flushing of lines and disposal of heavily chlorinated water.

1.4 REFERENCES

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA B300-99, Hypochlorites.
 - .2 ANSI/AWWA B301-99, Liquid Chlorine.
 - .3 ANSI/AWWA B303-00, Sodium Chlorite.
 - .4 ANSI/AWWA C104/A21.4-95, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - .5 ANSI/AWWA C105/A21.5-99, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - .6 ANSI/AWWA C111/A21.11-00, Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.
 - .7 ANSI/AWWA C110/A21.10-98, Ductile-Iron and Gray Iron Fittings, 3 inch through 48 inch (75 mm through 1200 mm), for Water.
 - .8 ANSI/AWWA C150/A21.50-02, Thickness Design of Ductile-Iron Pipe.
 - .9 ANSI/AWWA C151/A21.51-02, Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - .10 ANSI/AWWA C153/A21.53-00, Ductile-Iron Compact Fittings for Water Service.
 - .11 ANSI/AWWA C600-99, Installation of Ductile-Iron Water Mains, and Their Appurtenances.
 - .12 ANSI/AWWA C651-99, Disinfecting Water Mains.
 - .13 ANSI/AWWA C800-01, Underground Service Line Valves and Fittings (Also Included: Collected Standards for Service Line Materials).
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 307-02, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
 - .2 ASTM B 88M-99, Standard Specification for Seamless Copper Water Tube Metric.
 - .3 ASTM C 117-95, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C 136-01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM D 698-00a, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .3 American Water Works Association (AWWA)/Manual of Practice
 - .1 AWWA M17-1989, Installation, Field Testing, and Maintenance of Fire Hydrants.

1.4 REFERENCES
(Cont'd)

- .4 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.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S520-1991, Hydrants.
 - .2 CAN4-S543-1984, Internal-Lug, Quick Connect Couplings for Fire Hose.

1.5 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Inform Departmental Representative of proposed source of bedding materials and provide access for sampling at least 2 weeks prior to commencing work.
- .4 Submit manufacturer's test data and certification that pipe materials meet requirements of this section at least 2 weeks prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .5 Pipe certification to be on pipe.

1.6 CLOSEOUT
SUBMITTALS

- .1 Provide record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, hydrant details, maintenance and operating instructions in accordance with Section 01 78 00 - Closeout Submittals.
 - .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, and hydrants.

1.7 SCHEDULING OF
WORK

- .1 Schedule Work to minimize interruptions to existing services.
 - .2 Submit schedule of expected interruptions to Departmental Representative for approval and adhere to interruption schedule as approved by Departmental Representative.
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- 1.7 SCHEDULING OF WORK
(Cont'd)
- .3 Notify Director of Operations at the Town of Burin minimum of 48h in advance of interruption in service.
 - .4 Notify fire department of any planned or accidental interruption of water supply to hydrants.
 - .5 Contractor shall notify all premises to be affected by service interruption a minimum of 24 hours in advance of interruption in service.
 - .6 Advise Harbour Authority of anticipated interference with movement of traffic and service interruptions.

PART 2 - PRODUCTS

- 2.1 PIPE, JOINTS AND FITTINGS
AND FITTINGS
- .1 Ductile iron pipe: to ANSI/AWWA C151/A21.51, pressure class 350.
 - .2 Joints and fittings for ductile iron pipe.
 - .1 Joints:
 - .1 Push-on joints: to ANSI/AWWA C111/A21.11.
 - .2 Rubber gasket for mechanical pipe joints: to ANSI/AWWA C111/A21.11.
 - .3 Rubber gasket for flange pipe joints 1.6 mm thick: to ANSI/AWWA C111/A21.11.
 - .4 Bolts, nuts, hex head with washers: to ASTM A 307, heavy series.
 - .5 Ensure electrical conductivity across joints.
 - .2 Fittings:
 - .1 Mechanical joint cast iron and ductile iron fittings NPS 3 and larger: to ANSI/AWWA C110/A21.10.
 - .2 Flanged cast iron fittings NPS 3 and larger: to ANSI/AWWA C110/A21.10.
 - .3 Compact Fittings to ANSI/AWWA C153/A21.53.
 - .3 Mechanical joint restraint shall be provided using EBBA Iron Series 1100 Meaglug. Ductile iron meeting ASTM A536.

- 2.2 PIPE PROTECTION .1 Provide means of protection for iron pipe in corrosive soils in accordance with local practices and authorities having jurisdiction to ANSI/AWWA C105/A21.5.
- 2.3 VALVES AND VALVE BOXES .1 Gate valves: Existing to be removed and reinstated.
- .2 Cast iron valve boxes: Existing to be removed and reinstated.
- 2.4 SERVICE CONNECTIONS .1 Service connection pipe to be Type K Copper, annealed, or Municipex.
- .2 Municipex: For service 25 mm to 50mm diameter, Municipex tubing (crosslinked polyethylene pipe) shall be manufactured in accordance with CSA B137.5 and ASTM F876 and shall comply with NSF 14. The Pipe and resin (compound) shall be manufactured in an ISO 9001 certified production facility. The degree of cross linking for Municipex tubing shall not be less than 80% when tested in accordance to ASTM D2765 Method B.
- .3 When connecting Municipex tubing to fittings, manufacturer approved stainless steel inserts shall be used.
- .4 Tubing joints: compression type suitable for 1 MPa working pressure.
- .5 Brass corporation stops: red brass to ASTM B62-80 flared or compression type having threads to ANSI/AWWA C800.
- .6 Brass inverted key-type curb stops: red brass to ASTM B 62, compression type with drains.
- .1 Curb stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury.
- .2 Top of cast iron box marked "WATER"/"EAU".
- .7 Service Saddles: Stainless Steel
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2.4 SERVICE CONNECTIONS (Cont'd)

- .8 Tappings of ductile iron may be threaded without service clamps. Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.
- .9 Tee connections: for services above 25mm Tee connections to be fabricated of same material and to same standards as specified pipe fittings and to have ends matching pipe to which they are joined.

2.5 HYDRANTS

- .1 Hydrant: Existing to removed and reinstated as per drawings.

2.6 HYDRANT MARKER

- .1 Hydrant Marker: Supply and install as per drawing details.

2.7 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material to: Section 31 05 17 - Aggregate Materials and following requirements:
 - .1 Crushed or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117 . Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2 .
 - .3 Table

Sieve Designation	% Passing	
	Stone/Gravel	Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	100	-
19 mm	-	-
12.5 mm	65-90	100
9.5 mm	-	-
4.75 mm	35-55	80-100
2.00 mm	-	50-90
0.425 mm	10-25	10- 50
0.180 mm	-	-
0.075 mm	0- 8	0- 10

 - .2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete.

2.8 BACKFILL
MATERIAL

- .1 As indicated. Type 3, in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

2.9 PIPE
DISINFECTION

- .1 Sodium hypochlorite, Calcium hypochlorite, or Liquid chlorine to ANSI/AWWA B300 ANSI/AWWA B301 ANSI/AWWA B303 to disinfect water mains.
- .2 Undertake disinfection of water mains in accordance with ANSI/AWWA C651.

PART 3 - EXECUTION

3.1 SHUTDOWN OR
INTERUPTION OF
EXISTING WATERMAIN

- .1 Notify premises affected by watermain shutdown and give estimated duration of shutdown.
- .2 Provide temporary water supply of water via pressured supply line to all affected premises if interuption is greater than 12 hours.

3.2 DISMANTLING OF
EXISTING FIRE
HYDRANT AND WATER
SERVICE

- .1 The Contractor shall exercise care in locating, dismantling and removing the fire hydrant, valves, service lines and fittings so that they are not damaged and remain suitable for re-use. The hydrant, valves and fittings shall be transported and stored at a secure storage site, provided by the Contractor at his own expense, pending re-assembly at a new location.
- .2 Should any material, designated for re-installation, be damaged or lost by the Contractor, then the Contractor shall be charged with the costs of replacement with equivalent new material. Damaged material shall become the property of the Contractor.

3.3 PREPARATION

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
 - .1 Inspect materials for defects to approval of Departmental Representative.
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3.3 PREPARATION
(Cont'd)

- .1 (Cont'd)
- .2 Remove defective materials from site as directed by Departmental Representative.

3.4 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 10 - Excavating Trenching and Backfilling.
- .2 Trench depth to provide cover over pipe of not less than 1.8 m from finished grade.
- .3 Trench alignment and depth require Departmental Representatives approval prior to placing bedding material and pipe.

3.5 GRANULAR
BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth of 150 mm below bottom of pipe.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to at least 95% maximum density to ASTM D 698.

3.6 PIPE
INSTALLATION

- .1 Lay pipes to ANSI/AWWA C600 ANSI/AWWA C603 ANSI/AWWA M-9 M-11 and manufacturer's standard instructions and specifications. Do not use blocks except as specified.
 - .2 Join pipes in accordance with ANSI/AWWA C600 ANSI/AWWA C602 ANSI/AWWA C206 AWWA M-9 M-11 and manufacturer's recommendations.
 - .3 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
 - .4 Lay pipes on prepared bed, true to line and grade.
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3.6 PIPE
INSTALLATION
(Cont'd)

- .4 (Cont'd)
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
 - .2 Take up and replace defective pipe.
 - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
 - .5 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.
 - .6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
 - .7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
 - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
 - .8 Position and join pipes with equipment and methods approved by Departmental Representative.
 - .9 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
 - .10 Align pipes before jointing.
 - .11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .12 Avoid displacing gasket or contaminating with dirt or other foreign material.
 - .1 Remove disturbed or contaminated gaskets.
 - .2 Clean, lubricate and replace before jointing is attempted again.
 - .13 Complete each joint before laying next length of pipe.
 - .14 Minimize deflection after joint has been made.
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3.6 PIPE
INSTALLATION
(Cont'd)

- .15 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .16 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.
- .17 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .18 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .19 Do not lay pipe on frozen bedding.
- .20 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .21 Backfill remainder of trench.

3.7 VALVE
INSTALLATION

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves located in valve boxes or by means of concrete located between valve and solid ground. Bedding same as adjacent pipe. Maximum length of pipe on each end of valve shall be 1 m. Valves not to be supported by pipe.

3.8 SERVICE
CONNECTIONS

- .1 Do not install service connections until satisfactory completion of hydrostatic and leakage tests of water main.
 - .2 Construct service connections at right angles to water main unless otherwise directed.
 - .3 Tappings on ductile iron, asbestos cement or PVC-C900 pipe, may be threaded without service clamps.
 - .1 Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.
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3.8 SERVICE
 CONNECTIONS

.4 Maximum dried direct tapplings (mm) for ductile iron pipe to conform to:
 Nominal Pressure Class/Max.
 Pipe Size
 (mm)

	150	200	250	300	350
75	-	-	-	-	19
102	-	-	-	-	19
152	-	-	-	-	25
203	-	-	-	-	25
254	-	-	-	-	25
305	-	-	-	-	32
356	-	-	32	38	38
406	-	-	38	50	50
457	-	-	50	50	50
508	-	-	50	50	50
610	-	50	50	50	50
762	50	50	50	50	50

- .5 Tappings for PE pipe: PE tapping tees or multi-saddle tees.
- .6 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.
- .7 Install single and multiple tap service connections on top half of main, between 45 degrees and 90 degrees measured from apex of pipe.
- .8 Install multiple corporation stops, 30 degrees apart around circumference of pipe and minimum of 300 mm apart along pipe.
- .9 Tap main at 2:00 o'clock or 10:00 o'clock position only; not closer to joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m, whichever is greater.
- .10 Leave corporation stop valves fully open.
- .11 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
- .12 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.
- .13 Install curb stop with corporation box on services 50 mm or less in diameter.
 - .1 Equip larger services with gate valve and cast iron box.

3.8 SERVICE
CONNECTIONS
(Cont'd)

- .13 (Cont'd)
 - .2 Set box plumb over stop and adjust top flush with final grade elevation.
 - .3 Leave curb stop valves fully closed.
- .14 Place temporary location marker at ends of plugged or capped unconnected water lines.
 - .1 Each marker to consist of 38 x 89 mm stake extending from pipe end at pipe level to 600 mm above grade.
 - .2 Paint exposed portion of stake red with designation "WATER SERVICE LINE" in black.

3.9 HYDRANTS

- .1 Install hydrants at locations as indicated.
- .2 Install hydrants in accordance with AWWA M17.
- .3 Install existing gate valve and cast iron valve box on hydrant service leads as indicated.
- .4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50 mm above final grade.
- .5 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.
- .6 To provide proper draining for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5 m deep and backfill with coarse gravel or crushed stone to level 150 mm above drain holes.
- .7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.10 THRUST BLOCKS
AND RESTRAINED
JOINTS

- .1 For thrust blocks: do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated.
- .3 Keep joints and couplings free of concrete.

- 3.10 THRUST BLOCKS AND RESTRAINED JOINTS
(Cont'd)
- .4 Do not backfill over concrete within 24 hours after placing.
 - .5 For restrained joints: only use restrained joints approved by Departmental Representative.
- 3.11 HYDROSTATIC AND LEAKAGE TESTING
- .1 Do tests in accordance with ANSI/AWWA C600 C603.
 - .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
 - .3 Notify Departmental Representative at least 24 hours in advance of proposed tests.
 - .1 Perform tests in presence of Departmental Representative.
 - .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
 - .5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Engineer Consultant.
 - .6 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed as directed by Departmental Representative.
 - .7 Leave hydrants, valves, joints and fittings exposed.
 - .8 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
 - .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
 - .10 Open valves.
 - .11 Expel air from main by slowly filling main with potable water.
 - .1 Install corporation stops at high points in main where no air-vacuum release valves are installed.

3.11 HYDROSTATIC
AND LEAKAGE TESTING
(Cont'd)

- .11 (Cont'd)
 - .2 Remove stops after satisfactory completion of test and seal holes with plugs.
- .12 Fill asbestos cement pipe and concrete pipe at least 24 hours before testing to allow water absorption by pipe material.
- .13 Thoroughly examine exposed parts and correct for leakage as necessary.
- .14 Apply hydrostatic test pressure of 150% of normal operating pressure based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.
- .15 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.
- .16 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .17 Repeat hydrostatic test until defects have been corrected.
- .18 Define leakage as amount of water supplied in order to maintain test pressure within +/- 35 kPa of the test pressure after the air in the pipeline has been expelled, for period of 1 hour.
- .19 Do not exceed allowable leakage of 0.11 L/m of pipe, including lateral connections.
- .20 Locate and repair defects if leakage is greater than amount specified.
- .21 Repeat test until leakage is within specified allowance for full length of water main.

3.12 BACKFILL

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D 698.

3.12 BACKFILL
(Cont'd)

- .3 (Cont'd)
.1 In other areas, compact to at least 90% maximum density to ASTM D 698.

3.13 FLUSHING AND
DISINFECTING

- .1 Flushing and disinfecting operations:witnessed by Departmental Representative carried out by contractor.
.1 Notify Departmental Representative at least 4 days in advance of proposed date when disinfecting operations will begin.
- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.
- .3 Flushing flows as follows:

Pipe Size mm	Flow (L/s) Minimum
150 and below	38
- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed to Departmental Representatives approval, introduce strong solution of chlorine as approved by Departmental Representative into water main and ensure that it is distributed throughout entire system.
- .7 Contractor to perform disinfection.
- .8 Rate of chlorine application to be proportional to rate of water entering pipe.
- .9 Chlorine application to be close to point of filling water main and to occur at same time.
- .10 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .11 Flush line to remove chlorine solution after 24 hours.
- .12 Measure chlorine residuals at extreme end of pipe-line being tested.

3.13 FLUSHING AND
DISINFECTING
(Cont'd)

- .13 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.
- .14 The chlorinated water shall remain in the main for at least 24 hours. At the end of this period, the treated water in all portions of the main shall have a residual of not less than 10 mg/l free chlorine.
- .15 After the final flushing and before the water main is placed in service, water samples shall be collected from the line and tested for bacteriological quality and show the absence of coliform organisms, disinfection shall be repeated until satisfactory samples have been obtained.
- .16 The Contractor shall get approval of the governing agency before the heavily chlorinated water can be discharged into storm, sanitary or other receiving systems. If the heavily chlorinated water cannot be accepted by nearby storm, sanitary, or other receiving systems, the water shall be discharged into tanks and disposed of at an approved site. The cost associated with disposing of the heavily chlorinated water shall be borne by the Contractor.