

# CHAPTER 17

## TEMPORARY BYPASS PUMPING SYSTEMS FOR GRAVITY SEWER PIPE DIAMETERS GREATER THAN 24-INCH IN DIAMETER

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## 1 **PART 1 - GENERAL**

### 2 **1.1 DESCRIPTION AND SCOPE**

3           A. The Contractor shall furnish, construct, maintain and operate bulkheads,  
4           containment system, plugs, hoses, piping, and pumps to bypass sewage flow  
5           around the project area for the duration of the project. The bypass system shall,  
6           at all times, prevent backup or overflow onto streets, yards and unpaved areas  
7           or into buildings, adjacent ditches, storm sewers, and waterways. The Contractor  
8           shall design and provide the bypass system with sufficient firm pumping capacity  
9           to pump the existing sewer being bypassed flowing full and/or to convey the flows  
10           specified further herein. Firm capacity is defined as the capacity of the pumping  
11           system when the largest pump is out of service. The Contractor is advised that  
12           during rain events the flow in the existing sewers will increase rapidly and will fill  
13           the pipe and, in many cases, surcharge the pipe.

14           B. Spills of any type, including but not limited to all spills and/or leaks caused by the  
15           operation of bypass pumps or other operations of the Contractor, are strictly  
16           prohibited at all times; notwithstanding such prohibition, any such occurrence shall  
17           be reported to Charlotte Water immediately after discovery and all costs, associated  
18           with the overflow and overflow clean up, including any fines and legal costs incurred  
19           by Charlotte Water and costs associated with property damage as a result of the  
20           overflow, shall be paid for solely by the Contractor. Costs of damage to real or  
21           personal property as a result of an overflow, and any other direct, indirect, incidental  
22           or consequential damages resulting therefrom or related thereto, shall be the sole  
23           responsibility of the Contractor, for which the Contractor will defend, indemnify and  
24           hold Charlotte Water harmless. In addition to these responsibilities of the  
25           Contractor, any spill that reaches a natural stream caused by the negligent  
26           operations of the Contractor may be deemed to be a substantial violation of the  
27           Contract Documents and a basis for termination under the General Conditions of  
28           this Contract.

29           C. The Contractor is forewarned of the potential for sewer surges which cause rapid  
30           increases in sewer discharges, in particular during rain events and from upstream  
31           pump station on/off operations. The Contractor's bypass equipment and set up  
32           shall be adequate to prevent overflows under these surge conditions. The  
33           Contractor shall provide ample free board and wet well volume as required to  
34           contain the sewage. If risers to assist with sewage containment are proposed by  
35           the Contractor, the risers shall be coordinated with the upstream system to prevent  
36           any backups, overflows, or any other problems.

### 37 **1.2 RELATED DOCUMENTS**

38           A. Charlotte Water Water and Sewer Design and Construction Standards and  
39           Standard Details.

### 41 **1.3 DEFINITIONS AND ABBREVIATIONS**

42           A. See Sections iii and iv of the Charlotte Water Water and Sewer Design and  
43           Construction Standards for common abbreviations and definitions.

1      **1.4    BYPASS PUMPING SYSTEM – DESIGN REQUIREMENTS**

2      A.     The bypass pumping systems shall have sufficient capacity to pump a peak flow  
3      of the line segment to be bypassed as specified herein. The Bypass Contractor  
4      shall provide all pipeline plugs, pumps of adequate size to handle peak flow during  
5      a 10-year storm event, and temporary discharge piping to ensure that the total  
6      flow of the main can be safely diverted around the project area. The bypass  
7      pumping system will be required to be operated 24 hours a day.

8      B.     The Contractor shall provide back-up pump(s) equal in capacity to the largest  
9      primary pump. Back-up pumps shall be on-line but isolated from the primary  
10     system by a valve. Contractor and pump supplier shall determine system  
11     pressure requirements based on proposed bypass piping size and layout and  
12     shall submit the proposed system curve for the pumping system as designed.

13     C.     The bypass pumping system shall pump the following flows:

14        1.    The pumping system shall meet the firm capacity as defined as the  
15        capacity of the pumping system when the largest pump is out of service.  
16        This flow represents the peak flow during a 10-year rain event measured  
17        in the upstream sewer system over the last several years per flow metering  
18        data. If flow monitoring for the upstream sewer system is not available, it  
19        is the responsibility of the contractor to perform flow monitoring for a  
20        duration of up to 3 months minimum to size the pumping system. Flow  
21        projections shall be developed by licensed NC PE and submitted to  
22        Charlotte Water for review and approval.

23     D.     If multiple force mains are used, the discharge piping shall be manifolded so the  
24        flow can be diverted to each specific pipe or any combination of pipes by quickly  
25        opening and/or closing valves. This will also allow a pipe to be isolated to make  
26        any necessary repairs.

27     E.     The Bypass Contractor shall have adequate standby equipment available and  
28        ready for immediate operation and tied into the bypass system for use in the event  
29        of an emergency or breakdown.

30     F.     Flow from all connecting sewers must be accommodated. Connecting sewers  
31        larger than 24" shall utilize hard piping and must have primary and standby sound-  
32        attenuated diesel auto-priming pumps. If connecting to the main bypass  
33        discharge line, the connection must have an isolating gate valve.

34     G.     **Suction and Discharge Manholes:** Existing manholes to be used as suction  
35        manholes and discharge manholes shall be modified by the Contractor as  
36        required. The suction manholes are subject to flooding during rain events - all  
37        modifications shall provide a leak tight manhole to prevent inflow into the  
38        manholes during flood conditions. The discharge manholes shall be sealed and  
39        protected per Paragraph 2.4C.

40     H.     **Plugging of Flows:** A minimum of two (2) plugs shall be used at each location  
41        where sewers are being plugged for bypass operations, meaning one plug shall  
42        be installed in the outgoing pipe of the manhole where the plugging occurs and  
43        then a second plug installed in the next downstream manhole in the incoming  
44        pipe. This will provide redundancy in the plugging operation for added safety. All  
45        plugs shall be restrained and reinforced to prevent movement and blowouts. The

1 contractor shall tie-off and/or anchor plugs such that in a blowout event, the plug  
2 cannot be transported downstream.

3 I. A light tower shall be provided at each suction manhole/pump setup for pump  
4 watch during overnight hours.

5 **1.5 QUALITY ASSURANCE**

6 A. Any violations resulting from sewage spills shall be the sole responsibility of the  
7 Contractor.

8 **1.6 QUALIFICATIONS**

9 A. The design, installation and operation of the temporary pumping system shall be  
10 the Contractor's responsibility. The Bypass Contractor (bypass pumping system  
11 contractor) shall demonstrate to the Engineer that they specialize in the design  
12 and operation of temporary bypass pumping systems. The Bypass Contractor  
13 shall provide a minimum of five references of temporary bypass pumping projects  
14 of at least 30 million gallons per day (mgd) with at least one of the projects over  
15 50 mgd, of a similar size and complexity as this project, performed by their firm  
16 within the past five years. The references shall include project scope of work and  
17 contact numbers and names for the Charlotte Water and General Contractor if the  
18 work was performed as a subcontractor. Charlotte Water reserves the right to  
19 approve or disapprove of a bypass pumping contractor based on experience or  
20 performance on other similar projects.

21 B. The Bypass Contractor must have a physical location and service facility within  
22 60 miles of the project site.

23 C. All bypass pumping equipment shall be owned and maintained by the Bypass  
24 Contractor. No subleasing of bypass pumps or piping shall be allowed, approved  
25 or acceptable. Proof of ownership shall be submitted to the Engineer for review  
26 and verification. Charlotte Water will not approve the Bypass Contractor if he/she  
27 does not own the bypass pumping equipment being furnished for this project.

28 In addition, all pumps set up and tear down and piping installation and removal  
29 shall be performed by employees of the Bypass Contractor as documented by  
30 employee records. Subcontracting of the set up and tear down shall not be  
31 allowed.

32 Further, all pump and piping maintenance, repairs, pump watch (manning of  
33 pumps 24 hours per day), etc. shall be performed by employees of the Bypass  
34 Contractor as documented by employee records. Subcontracting of these duties  
35 (and any other duties related to the bypass pumping system) shall not be allowed.

36 **1.7 SUBMITTALS**

37 A. The Contractor shall coordinate with the Engineer to determine the required  
38 Bypass System and the type and number of pumps to be used. For bypass  
39 pumping systems, Contractor shall submit, prior to installation, a detailed plan and  
40 description outlining all details and provisions of the temporary bypass pumping  
41 system. The plan shall be specific and complete, including such items as  
42 schedules, locations, elevations, type of plugs, plug restraints and blocking,  
43 temporary piping, capacities of equipment, instrumentation and controls, alarm  
44 systems, communication systems, soundproof enclosures, materials,

1        precautions taken regarding handling the wastewater flow, and all other incidental  
2        items necessary and/or required to ensure proper operation of the bypass  
3        pumping system, including protection of the access and bypass pumping  
4        locations from damage due to the discharge flows, ability to pump dry weather  
5        and wet weather flows, and compliance with the requirements and permit  
6        conditions specified in these Contract Documents. No bypass pumping shall  
7        begin until all provisions and requirements have been reviewed and approved by  
8        Charlotte Water.

9        B. The design of the temporary bypass system shall be sealed by a North Carolina  
10      licensed Professional Engineer. The bypass pumping plan shall include, but not  
11      be limited to, the following:

- 12        1. Overall sequence of construction for bypass pumping system.
- 13        2. General layout for the bypass pumping system including locations and  
14        staging areas for pumps and piping locations/routes.
- 15        3. Modifications to existing sewer manholes and structures to perform the  
16        bypass pumping and restoration to such structures upon completion.
- 17        4. Modifications to existing sewer manholes and structures such that the  
18        manhole covers are elevated to the 100-year base flood elevation plus 1-  
19        foot.
- 20        5. Suction and Discharge Piping:
  - 21        a. Drawings showing the alignment of the bypass pipes.
  - 22        b. Flow stoppage system, including pipe and channel plugging method,  
23        types of plugs, plug materials, size of plugs, plug restraints and  
24        blocking, location and number of proposed tie-off and/or anchors  
25        used to prevent movement or blowouts for plugs.
  - 26        c. Details of suction piping including number, size, materials, fittings  
27        including quick disconnects, connections to other piping, method  
28        of installation, and all other details related to the pump suction  
29        piping.
  - 30        d. Details of discharge piping including number, size, materials, fittings  
31        including quick disconnects, connections to other piping, method  
32        of installation, details of the discharge location and piping  
33        arrangement at that location, and all other details related to the  
34        pump discharge piping.
  - 35        e. Sections showing suction and discharge piping depth, embedment,  
36        select fill and special backfill.
  - 37        f. Restraint systems for piping including thrust and restraint block  
38        sizes and locations and/or restraining systems on the piping.
  - 39        g. Any temporary pipe supports, and anchoring required.
  - 40        h. Show force main pipe material and thickness can withstand all normal  
41        operating and surge pressures with a safety factor of 2.0.
  - 42        i. Protection against main breaks and damage.

- j. Method of protecting discharge manholes or structures from erosion and damage.
- k. Schedule for installation of and maintenance of bypass pumping lines.

6. Bypass Pumps

- a. Bypass pump sizes, capacity, number of each size to be on site, basis of selection (calculations), and power requirements.
- b. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted) for each set up.
- c. Size and location of standby power generators and diesel storage and access plan if engine driven equipment is to be provided, or plan for suitable connection to existing electrical gear, if electrical power is to be provided.
- d. Elevation of bypass pumps, standby power generators and diesel storage base compared to the 100-year flood base elevation.
- e. Design plans for access to bypass pumping locations.
- f. Method of noise control for each pump and/or generator including primary sound enclosures and sound blankets.
- g. Fuel tank location, size, and containment systems.
- h. Fuel consumption rate information (include for proposed pumps, at full capacity, include breakdown for one pump running, two pumps running, etc.).
- i. Instrumentation and control system to determine flow levels and to eliminate the risk of spills due to improper installation and operations. The instrumentation and control system submitted by the Contractor for approval by Charlotte Water shall include all equipment proposed (including redundant instrumentation and control equipment) and sequences of instrumentation activation as well as all alarms and fail-safe provisions.

7. Continuous on-site monitoring plan.

8. Traffic control requirements and measures are to be employed throughout the project.

9. General contact and emergency contact information for all personnel responsible for the operations and maintenance of the bypass pumping operations.

## 1.8 PLAN APPROVAL

- A. Completed Bypass Pumping Plans shall be submitted to Charlotte Water for review and approval 30 days prior to any proposed bypass pumping operations.
- B. Contractor shall provide full list of employees on watch, schedule, and contact information for each. The list shall include a hierarchy of who is to be notified in the event of an emergency.

## 1 **PART 2 - PRODUCTS**

### 2 **2.1 BYPASS PUMPING EQUIPMENT**

- 3 A. The pumps used must be manufactured by a company that is ISO 9001 registered  
4 with a RAB (registration accreditation board) accredited third party registrar. The  
5 pump manufacturer shall also be ISO 9001 certified for Engineering Design  
6 Services and After Market Service. A copy of the ISO 9001 certificate shall be  
7 included with the bypass pump submittal to the Engineer.
- 8 B. Pumps shall be dry self-priming type, in good working order, with a working  
9 pressure gauge on the discharge. All pumps used shall be fully automatic self-  
10 priming units that do not require the use of foot-valves or vacuum pumps in the  
11 priming system. All pumps used must be constructed to allow dry running for long  
12 periods of time to accommodate the cyclical nature of wastewater flows. The  
13 pumping equipment shall be sound attenuated as specified herein and be  
14 mounted on an environmental skid which has the capacity of containing any and  
15 all hazardous fluids utilized within the engine compartment. All diesel-driven  
16 engines must be Tier 3 or newer.
- 17 C. Pumps may either be engine driven equipment or electrically driven equipment.  
18 Contractor shall be responsible for all power costs associated with provision and  
19 operation of engine driven equipment including but not limited to purchase and  
20 delivery of fuel. Contractor shall be responsible for providing all equipment and  
21 connections required to provide electrically driven equipment and for protecting  
22 the power feed. If diesel powered pumps are provided, Contractor shall store  
23 sufficient fuel on site to allow for 72 hours of continuous operation without fuel  
24 delivery. 72 hours of continuous operation shall be based on 24 hours of operation  
25 at the system's firm capacity. The fuel shall be stored responsibly above the 100-  
26 year base flood elevation with self-containment and where possible shall not be  
27 located in a floodplain.
- 28 D. Pumps shall meet the requirements of the governing municipality's noise  
29 ordinance. All pumps shall be Quiet Flow™, Critically Silenced™ or sound  
30 attenuated to 68 dBA at 23 feet. Pumps shall be provided with a pre-engineered  
31 sound attenuation enclosure. Sound blankets shall not be acceptable for primary  
32 noise attenuation, but sound blankets may also be required around the entire  
33 bypass pumping system if noise becomes an issue. If required, the sound  
34 blankets shall be free standing and 12-ft high minimum, shall have Class 1  
35 flammability per ASTM E-84 and shall reduce sound by at least 10 dB at 125 Hz.
- 36 E. Contractor shall provide the necessary stop/start controls for each pump. The  
37 stop/start control shall be an integral part of the engine control panel. For  
38 bypassing sewers greater than 24" and when using 6-inch pumps and larger,  
39 transducers are required to maintain the proper surcharge levels in the sewer line.
- 40 F. Contractor shall provide level control device to allow pumps to ramp up and down  
41 in response to incoming sewage flow. Provide standby level control device to  
42 alarm high liquid level and to start pumps. The level control devices shall be  
43 designed to operate for a minimum of 24 hours on battery backup in the event of  
44 power failure.
- 45 G. All pumps shall be manned 24 hours per day when operational. The Engineer will  
46 not consider allowing the use of auto dialers to report pumping system emergency

1 conditions. Full time telemetry is required, and interface with Charlotte Water may  
2 be required. All proposed auto-dialer information is to be submitted to Charlotte  
3 Water for review and approval.

4 H. Alarm systems shall be local (flashing light) and shall also activate the auto  
5 dialer. At a minimum, the following alarms shall be reported:

6 1. High liquid level in the bypass pumping suction manhole with level control  
7 device.  
8 2. Engine failure  
9 3. Power failure

10 I. Charlotte Water shall be notified immediately if the bypass pumping system is  
11 unable to keep up with the incoming flow, regardless of the reason.

12 J. The local alarm and level control devices shall be designed to operate for a  
13 minimum of 24 hours on battery backup in the event of power failure.

## 14 **2.2 FORCE MAIN PIPING**

15 A. All discharge piping shall be rigid piping with positive, restrained joints. Allowable  
16 piping materials shall be fused, high-density polyethylene pipe (HDPE) as  
17 manufactured by Phillips Driscopipe, Inc. or equal, with a minimum wall thickness  
18 equaling SDR26 or PVC Pressure Pipe as manufactured by Certa-Lok or  
19 approved equal. Under no circumstances will aluminum "irrigation" type piping,  
20 glued PVC pipe or soft (lay-flat) hose be allowed.

21 All fused joints shall be performed by a certified operator (certified by a  
22 manufacturer of pipe fusion equipment). An appropriately sized fusion machine  
23 shall remain on site throughout the duration of the project to address any  
24 emergency pipe repair issues.

25 B. The force main piping shall be designed and rated for at least 1.25 times the  
26 maximum system pressure. The maximum velocity in the suction and discharge  
27 piping shall be 10 feet per second. The Contractor shall be responsible for all  
28 design calculations and shall be responsible for securing and protecting all force  
29 main piping in any manner required by Charlotte Water, Engineer or other  
30 controlling agency. The discharge piping shall be protected from pedestrian and  
31 vehicular traffic. Contractor shall add additional protection as deemed necessary  
32 to fully protect the piping at no additional cost to Charlotte Water. Design of the  
33 force main piping in accordance with these specifications shall be documented,  
34 including calculations, and submitted to Charlotte Water for approval.

35 C. Contractor shall provide a temporary cast iron or steel cover over the bypass  
36 pumping suction manhole and discharge manhole to safeguard the manholes, to  
37 prevent inflow and to minimize odors. At the discharge manhole, the Contractor  
38 shall route the discharge piping down into the manhole and shall install 90-degree  
39 bends on the end of the piping to direct the flow out of the discharge manhole and  
40 heading downstream. The piping arrangement shall be such that the flow is not  
41 vertically directed. This piping arrangement will help to direct the flow and minimize  
42 turbulence (and odors) in the discharge manhole.

43 D. A flow meter shall be installed on the discharge piping to continuously document  
44 the flow rate being pumped. The flow meter shall be continuously reviewed by the  
45 Contractor and compared to the pump curves submitted by the Contractor to

1 confirm that the bypass pumping system is operating as designed and expected.  
2 If the bypass pumping system is not pumping as designed and submitted, the  
3 Contractor shall take immediate actions to modify and correct the situation in  
4 manner approved by the Engineer. If at any time the bypass pumps are not  
5 keeping up with the flow and the specified pumping rate is not being achieved and  
6 the situation cannot be immediately resolved, the Contractor shall cease all  
7 pumping operations, return the flow to gravity through the existing sewer, and re-  
8 design the pumping system.

## 9 **PART 3 - EXECUTION**

### 10 **3.1 BYPASS SYSTEM**

- 11 A. Charlotte Water shall have the authority to increase normal working hours of the  
12 Contractor during bypass pumping operations.
- 13 B. Bypass System shall be comprised of a bypass pumping system combined with  
14 temporary piping to convey flow in the existing sewers.
- 15 C. It is essential to the operation of the existing sewerage system that there is no  
16 interruption in the flow of sewage throughout the duration of the project. To this  
17 end, the Contractor shall provide, maintain and operate all temporary facilities  
18 such as dams, plugs, pumping equipment (both primary and back-up units as  
19 required), piping, all necessary power, and all other labor and equipment  
20 necessary to intercept the sewage flow before it reaches the point where it would  
21 interfere with the work, carry it past the work, and return it to the existing sewer  
22 downstream of the work.
- 23 D. The Bypass Contractor shall provide all necessary means to safely convey the  
24 sewage past the work area. The Bypass Contractor will not be permitted to stop  
25 or impede the main flows under any circumstances. The Bypass Contractor shall  
26 maintain sewer flow around the work area in a manner that will protect public and  
27 private property from flooding and damage.
- 28 E. The Bypass System shall be leak free and shall (at a minimum) maintain the  
29 required firm pumping capacity. The Bypass System shall provide reliable and  
30 trouble-free pumping of the existing wastewater flow. All local alarms shall be  
31 readily visible to and accessible by Charlotte Water.
- 32 F. If, at any time during construction, effluent from the existing sewer is not fully  
33 contained by the bypass system and/or the bypass system is not keeping up with  
34 the flow, gravity service shall be restored immediately, and work shall be  
35 suspended until the problem is resolved to the satisfaction of the Engineer. Sewer  
36 system overflows will not be tolerated. All fines imposed on Charlotte Water  
37 associated with overflows caused by the Contractor's work shall be paid by the  
38 Contractor.
- 39 G. Odor Issues: If odor complaints occur at any time during the Contract, the  
40 Contractor shall take immediate measures to minimize the odor. It will be the  
41 Contractor's sole responsibility and cost to do all that is necessary to resolve the  
42 odor issues, including revising any bypass pumping layouts/configurations and  
43 adding odor control measures (such as chemical additions).

### 44 **3.2 FIELD QUALITY CONTROL AND MAINTENANCE**

1           A. The Contractor shall provide at least one (1) trained employee to man the bypass  
2           pumping system continuously while the pumps are in use to monitor the system  
3           and check for alarms and leaks. At no time during the bypass pumping operations  
4           shall the system be unmanned.

5           B. System Testing:

6           1. The Bypass Contractor shall perform leakage and pressure tests of the  
7           bypass pumping discharge piping using clean water prior to actual  
8           operation. The Engineer shall be given 24 hours' notice prior to testing.

9           2. Test pressure shall be 1.25 times the maximum system operating pressure.  
10           The test must hold pressure for a minimum of 1 hour.

11           3. The bypass design operating pressure must not exceed 10 PSI below the  
12           max pressure rating of the HDPE.

13           C. Contractor shall inspect the bypass discharge piping system a minimum of every  
14           two (2) hours to ensure no damage or leaks. All leaks must be addressed  
15           immediately. Flow shall be diverted off of the leaking piping immediately until  
16           repairs are made. The Contractor shall document each inspection and shall submit  
17           the inspection logs to the Engineer at the end of each week (or more frequently as  
18           required by the Engineer).

19           D. Contractor shall inspect the pump operation a minimum of every two (2) hours to  
20           ensure trouble-free and leak free operation. A monitoring log shall be maintained  
21           by the Contractor and available for observation by the Engineer/Charlotte Water  
22           upon request. All systems, piping, pumps, air vents, monitoring equipment, valves,  
23           plugs, security measures, level indicating devices and all related appurtenances  
24           associated with the bypass system shall be continuously and regularly monitored  
25           for proper and leak free operation.

26           E. Contractor shall record the following information every ½ hour in the monitoring log:

27           1. System Discharge Pressure  
28           2. Pump RPM  
29           3. Suction Manhole surcharge level  
30           4. Plug Pressure  
31           5. Fuel levels  
32           6. Flow

33           F. Any time the bypass pumping system is operating, the Contractor shall  
34           continuously perform the following maintenance services:

35           1. The Bypass Contractor shall insure that the temporary pumping system is  
36           properly maintained. At least one (1) trained pump watch employee (with  
37           a fully stocked service vehicle) shall be onsite 24/7 when pumps are  
38           operating.

39           2. The trained employee shall be full time employees of the bypass contractor  
40           with at least one year experience with bypass pumping. No temporary  
41           employees are permitted to operate or watch the bypass.

42           G. Spare Parts and Extra Materials:

- 1        1. Spare parts for each type of pump and piping shall be kept on site.
- 2        2. HDPE repair bands for each size HDPE shall be kept on site.
- 3        3. At least one (1) extra plug of each size utilized in the bypass pumping
- 4        setup.
- 5        4. At least one (1) fuel filter.
- 6        5. At least one (1) pipe repair clamp shall be on site at all times.

7        H. In the event of accidental spill or overflow, Contractor shall take all necessary  
8        actions immediately to stop the spill or overflow and take action to clean up,  
9        disinfect the spill and immediately notify Charlotte Water. Disinfection shall  
10       include, but is not limited to, removal of all debris, pumping of any excess overflow  
11       back into the system, neutralization by raking and liming. Charlotte Water will  
12       provide the Contractor with a call-down emergency list for contacts in the event of  
13       a spill or overflow. All bypass system abnormalities, operational changes,  
14       maintenance, and repairs shall be reported immediately to the Engineer and  
15       Charlotte Water. All alarms shall be responded to in person by qualified  
16       Contractor's personnel immediately.

### 17        **3.3 INSTALLATION AND REMOVAL**

- 18        A. Contractor shall locate the bypass pipelines to minimize any disturbance to existing  
19        utilities and site areas (such as trees) and shall obtain approval of the pipeline  
20        locations from the Engineer.
- 21        B. The Contractor shall remove manhole sections or make connections to the  
22        existing sewer and construct temporary bypass pumping structures only at access  
23        locations as approved by the Engineer and as may be required to provide  
24        adequate suction conduit.
- 25        C. Plugging or blocking of sewage flows shall incorporate a primary and secondary  
26        plugging device. When plugging or blocking is no longer needed for performance  
27        and acceptance or work, it is to be removed in a manner that permits the sewage  
28        flow to slowly return to normal without surge, to prevent surcharging or causing  
29        other major disturbances downstream.
- 30        D. During all bypass pumping operation, the Contractor shall protect existing  
31        structures, equipment and piping from damage inflicted by any equipment. The  
32        Contractor shall be responsible for all physical damage to the existing structures,  
33        equipment and piping caused by human or mechanical failure.
- 34        E. When working inside existing structures, the Contractor shall exercise caution and  
35        comply with all federal, state, and local occupational safety and health standards  
36        when working in the presence of gases, combustible or oxygen-deficient  
37        atmospheres, and confined spaces.
- 38        F. The Contractor shall notify the Engineer at least 48 hours prior to initial startup  
39        and/or to any significant changes to the bypass system. This includes moving  
40        pumps and/or piping, installing or removing plugs, starting a new bypass location,  
41        ceasing an existing bypass location, reestablishing gravity flow, etc. The Engineer  
42        must inspect and approve the existing layout and all pumping equipment at each  
43        significant change to the bypass system. A bypass pumping checklist addressing  
44        all relevant features of the bypass system shall be generated by the Contractor  
45        and approved by the Engineer. The bypass pumping checklist shall be completed

1 by both the Contractor and Engineer prior to the startup of any bypass pumping  
2 operations and/or to any significant changes to the bypass system.

3 G. When the bypass piping crosses local streets and private driveways, the  
4 Contractor must bury the bypass pipelines in trenches, cover with flowable fill or  
5 ABC stone, and install asphalt patches per the Standard Specifications and  
6 Details. Steel road plates may be used for short periods of time until the asphalt  
7 can be installed. Bypass road ramps will only be allowed if specifically approved  
8 by the Engineer. Upon completion of the bypass pumping operations, and after  
9 the receipt of written approval of the Engineer, the Contractor shall remove all the  
10 piping, restore all property to pre-construction condition and restore all pavement  
11 in accordance with the standard specifications and details.

12 H. When bypass pumping operations are complete, piping shall be drained and  
13 flushed into the sewer system prior to disassembly. The piping shall be flushed  
14 for a period long enough to ensure that all piping is clean and free from wastewater.  
15 All pumps, piping, fittings, thrust blocks, etc. shall be removed from the site upon  
16 project completion.

17  
18 END OF SECTION