

7-13 DEWATERING

7-13.1 Description

The Contractor is required install, maintain, operate, and remove a complete dewatering system designed by a Professional Engineer or Hydrogeologist who is licensed to practice in the State of Washington based on the requirements of these Special Provisions, the existing conditions, Contractors proposed construction methods, and information provided in the Geotechnical report contained within the Appendix of these Contract Documents.

Dewatering is required in advance of excavation to control groundwater to maintain dry excavations, prevent sloughing, softening of the bottom of any excavation, and prevent formation of "quick" conditions "boils" or "heave" during excavation. The Contractor shall depress water levels and hydrostatic pressures a minimum of 6 inches below the excavation bottom at all times under all conditions until all backfill has been completed for that excavation. The Contractor shall employ sumps within the trench line to pump any pocketed or undrained water not otherwise collected or removed by the dewatering system. The use of sumps and pumps shall not be employed to lower groundwater levels more than two feet. The Contractor shall assure that the dewatering systems operate continuously during each stage or phase of excavation and backfill. The Contractor shall ensure that the operation of any temporary dewatering system will not result in excessive drawdowns or undesirable hydraulic gradients which may affect adjacent improvements.

Clean and contaminated groundwater encountered during excavation operations shall be collected by the Contractor. The contaminated water shall be treated and disposed of in a legal manner in accordance with all applicable disposal regulations and water quality criteria. The Contractor shall obtain all applicable permits for disposal, at Contractor's expense, and shall furnish a copy of the permits to the Engineer.

7-13.1(1) Submittals: Groundwater Control Plan

The Contractor shall submit a Groundwater Control Plan to the Engineer for review.

The Groundwater Control Plan shall include:

- A narrative of the Contractor's proposed dewatering system methodology,
- Design calculations demonstrating system and equipment adequacy,
- Dewatering schedule, including mobilization, installation, development, testing, water quality analysis, start-up, monitoring, operation, shutdown, decommissioning, clean-up and removal,
- Number and location of temporary monitoring wells to be installed,
- Working drawings showing system layout and components including number and location of dewatering wells and/or wellpoints and discharge outfall(s)
- Pumps and sumps for removal of incidental seepage, perched groundwater, etc.
- Provision for the settlement and removal of sediments prior to discharge (settling tanks),
- Provision for the treatment of any contaminated water prior to discharge, this shall be included should contaminated water be encountered. A description of what would be consider extra work should contaminated ground water be encountered shall be included. This provision will be reviewed and agreed upon prior to construction and will be the basis for payment under force account should Contaminated water be encountered,
- Specifications of proposed materials and equipment, including pump curves,

The Engineer's review of the Groundwater Control Plan shall not constitute approval of method nor relieve the Contractor from full responsibility for errors or emissions therein nor from the entire responsibility for complete and adequate groundwater level control and volume removal in the excavated areas to the extent specified herein. The Contractor shall be solely responsible for control of the groundwater levels and hydrostatic pressures to the depths herein specified and for avoiding settlement outside the excavation as herein specified. The Contractor shall bear sole responsibility for proper design, installation, operation, maintenance and any failure of any component of the temporary dewatering system for the duration of the Contract.

The Contractor shall design all dewatering system components such that water table drawdown outside the immediate trench and/or excavation area does not result in settlement of existing structures, utilities, and pavement. The Contractor shall bear the sole responsibility for any and all costs to adjacent structures associated with settlement resulting from operation of the temporary dewatering systems.

7-13.1(2) Submittals: Field and Monitoring Data

The Contractor shall submit the following field and monitoring data:

- 1 Drilling Logs: The drilling logs shall include the location, drilling method(s), subsurface conditions (soil and water), borehole depth, and Ecology start card number.
- 2 Well As-Built Diagrams: The As-Built diagrams shall include the total depth, screen slot size, screen length and depth interval, filter pack material and depth interval, and seal material and depth interval.
- 3 Monitoring Data: The following data should be recorded and submitted to the Engineer on a weekly basis; number of dewatering wells or wellpoint systems in operation, daily water levels in monitoring wells, total discharge from dewatering well and wellpoint systems. Monitoring wells that become inactive shall be repaired or replaced within 24 hours. Verify monitoring wells are functioning properly by adding or subtracting water to demonstrate the monitoring wells are functioning properly.

7-13.1(3) Quality Assurance

Referenced Standards: This Section incorporates by reference the latest revision of the following documents. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail, provided that all regulatory requirements are met.

| Reference | Title |
|---------------------|---------------------------------------------------------------------------------------------|
| Chapter 173-160 WAC | Minimum Standards for Construction and Maintenance of Wells. |
| Chapter 173-162 WAC | Regulation And Licensing Of Well Contractors And Operators |
| Chapter 173-200 WAC | Water Quality Standards for Ground Waters of the State of Washington. |
| Chapter 173-154 WAC | Protection of Upper Aquifer Zones. |
| ASTM D 5092 | Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers. |

Dewatering Subcontractor: The Contractor shall employ the services of a specialty dewatering subcontractor who has at least five years experience in the field of dewatering

system, installation, operation, and maintenance, and can document successful completion of similar projects.

Dewatering System Designer: The Groundwater Control Plan shall be prepared by a Professional Engineer or Hydrogeologist who is licensed to practice in the State of Washington, and who has a minimum of five years of experience in the design of dewatering systems for similar projects with soil similar to that shown in the geotechnical report..

7-13.2 Materials

Materials for dewatering system construction shall conform to the following requirements:

Well Casings:

- Monitoring wells shall be constructed of 2-inch nominal diameter Schedule 40 flush-threaded PVC well casing.
- Dewatering wells and wellpoints shall be constructed of Schedule 40 flush-threaded PVC well casing.

Well Screens:

- Monitoring well screens shall be constructed with 2-inch nominal diameter Schedule 40 machine-slotted PVC well screen 10 feet long, with a slot width of 0.010 inch.
- Dewatering well and wellpoint screens shall be constructed of diameter Schedule 40 machine-slotted PVC well screens of the same diameter as the casing material. Slot size shall be determined by the Contractor as part of the dewatering well system design to be consistent with the aquifer formation and filter material, and shall be provided in the Groundwater Control Plan.

Filter Materials:

The Contractor shall furnish sand and gravel filter material for creating filter packs in the monitoring wells, dewatering wells, and wellpoints, with the following requirements for each well:

- The filter material for dewatering wells shall consist of clean, well-rounded, washed select gravel that is free from silt, clay or other deleterious material, with an appropriate grain-size distribution that is designed to be sufficiently permeable to act as a hydraulically efficient well filter pack that does not impair the hydraulic performance of the wells at operational flow rates, while preventing the migration of surrounding native soils or aquifer materials into the well.
- Design and selection of the appropriate filter pack gradation shall be included in the Groundwater Control Plan, consistent with the design, screen selection, slot size, pumping capacity and hydraulic performance of the dewatering wells.
- The Contractor shall install sufficient filter material for initial filter packing of the well to completely fill the annulus from the bottom of the well screen to 5 feet above the top of the well screen. In addition, the Contractor shall furnish and place such additional filter material as the wells may require during well development.

Seal Materials:

The Contractor shall install a surface seal for each monitoring well, dewatering well, and wellpoint in accordance with Washington Administrative Code (WAC) 173-160.

Pumps and Piping:

- The Contractor shall provide and size appropriately all pumps and piping necessary to convey and remove groundwater from the dewatering wells and wellpoints to the designated point of discharge.
- Piping shall be rigid PVC, HDPE or equivalent. Flexible hose shall not be permitted.
- The piping shall be designed to minimize head loss and turbulent flow, and shall be protected from all vehicular traffic or other potential damage as appropriate.

Settling Tank:

Standby Equipment:

The Contractor shall maintain on-site, at a minimum level of 20 percent, additional dewatering system components, including valves, flow meters, pumps and piping, and other system hardware to ensure that immediate repair or modification of any part of the system can be made.

Standby Power:

- The Contractor shall have on-site 100 percent standby electrical generating capacity or other source of power, in case the primary power source is lost or provide proof that a generator can be on-site within 4-hours of lost power.
- Power system and standby power services for the temporary dewatering system shall be independent from power sources used or required for the project. The Contractor shall use this electric service solely to power the temporary dewatering system, separate from all other power needs
- The Contractor shall use electrical generators or obtain electrical service from the utility company and shall pay application fees. The Contractor shall pay for power usage fees throughout the contract period.
- Existing power lines along the project limits may be de-energized during construction by the Private utility companies. Should the contractor utilize electrical service from the existing PSE or Tacoma Power Utility lines it shall have a transfer switch and generator on site during the time of utility power outage The Contractor shall assume that all power lines will be energized during construction unless stated otherwise within these Contract Documents.

7-13.2 Construction Requirements

The Contractor shall meet the requirements of WAC 173-160 for all well construction, development and decommissioning. The Contractor shall obtain variances as required to construct dewatering systems that achieve the level of groundwater drawdown specified. The Contractor shall design all dewatering system components such that formation materials (sand and silt) do not move during pumping.

Notification: The Contractor shall promptly notify the Engineer of any groundwater that the Contractor believes may be chemically contaminated and shall, under the direction of the Engineer, redirect water discharge to the City sanitary sewer (City sewer) at the location approved by the City, or cease pumping until provisions have been made for water treatment.

7-13.3(1) Operational Requirements

The Contractor shall be or shall employ the services of a specialist subcontractor who is generally recognized as experienced and knowledgeable in the field of dewatering system

installation, operation and maintenance, and shall carry general liability insurance coverage of at least \$5 million. The Contractor shall employ the services of a licensed water well driller per WAC 173-162 for all well drilling, installation, construction, development and testing. The dewatering system shall be operated at all times by workers who are competent and trained in all aspects of the system operation, maintenance and monitoring, and who have had at least 40 hours current valid health and safety training per OSHA.

The Contractor shall control surface runoff so as to prevent entry or collection of water in excavations or in other isolated areas of the site.

1. **Schedule:** Dewatering shall be scheduled around the planned excavation schedule. Dewatering systems shall be installed in advance of the planned excavation to allow sufficient time to establish the required drawdown in each area of construction, and then run continuously and shall not be shut down between shifts, at night, or on holidays, weekends, or work stoppages of any kind without written permission from the Engineer. Dewatering systems or sumps shall be operated continuously for as long as they are needed in a given area.
2. **Operational Monitoring:** The Contractor shall provide continuous 24-hour operational monitoring of the dewatering system, by experienced personnel present on site or available on call. The Contractor shall bear full responsibility for all damages to work in the excavation area and for damages to any other area or structures caused by the Contractor's failure to maintain and operate the system properly. The Contractor shall provide adequate backup power, pumps and equipment so that dewatering can be maintained in the event of a power or equipment failure. Additionally, the pumping rate shall be set low enough in each well to prevent excessive drawdown.
3. **System Installation, Development and Testing:** The Contractor shall bear full responsibility for acquiring a water supply with which to install any dewatering system components necessary to achieve proper completion of all work performed under this Contract (i.e., drilling and jetting). Mud-rotary drilling is not permitted as a method for well installation. No additives other than clean water shall be allowed during well drilling. The Contractor shall remove fines and drilling debris from newly installed dewatering wells and monitoring wells to enhance the hydraulic connection between the screened interval and the surrounding formation. Wells shall be developed to reduce sand content and turbidity by appropriate means that do not cause formation or well damage. Initial well development water shall be stored and allowed to settle before discharge. If there is suspected groundwater contamination in the vicinity, the development water should be segregated from other development water and the Engineer should be notified. . No areas of potential contamination have been identified within the Project limits.
4. **Dewatering System Protection:** The Contractor shall bear full responsibility for taking all reasonable precautions necessary to ensure continuous, successful operation of the temporary dewatering systems. This includes establishing and/or maintaining adequate marking of all well, pump and pipeline locations and protecting power cables against

damage or theft. Wherever dewatering wells or discharge lines require crossing intersection roadways or driveways access the lines shall be buried below grade to as required to not restrict access, steel plates may be used when approved by the Engineer. All discharge lines shall be installed to support the heaviest road vehicles and construction equipment on-site and shall provide at least 6 inches of clearance between the dewatering system element and the underside of the steel plates if approved for use. The Contractor shall clearly identify all vehicular access points across the dewatering system with brightly colored or flagged 8 foot-high poles on each side of the access point. The Contractor shall valve all ramped pipelines on both sides of the ramp.

5. Formation Protection: The Contractor shall design, construct, operate and maintain any dewatering system such that foundation soils, natural or engineered, will not experience fines removal upon pumping. The Contractor shall develop dewatering wells and/or wellpoints until the sand/silt content of the discharge water is less than 10 parts per million (ppm) as determined by a centrifugal separating meter such as a Rossum SAND TESTER (Journal AWWA, 46:123, February 1954), or equivalent. The Contractor shall provide all of the equipment and fittings for monitoring sand content and properly mount them upstream of any settling points. The Contractor shall take sand content measurements on a daily basis for the 1st five working days after well installation, and weekly thereafter in the presence of the Engineer and submit written test reports within 24 hours to the City and the Contractors Engineer.

6. System Removal: Upon written authorization of the Engineer, as work is completed in each area of project, the Contractor shall decommission and remove all dewatering system elements. The Contractor shall assume ownership and responsibility for the disposal of all dewatering pumps, pipes and other assorted system hardware. The Contractor shall employ the services of a licensed water well driller per WAC 173-162 for well decommissioning and removal, which will be accomplished in accordance with WAC 173-160.

7-13.3(2) Dewatering Discharge

All water removed by the dewatering system (unless contaminated) will be discharged to appropriate discharge points. Pre-approved discharge points will be the City storm drain system or to the Fife Ditch located on the south side of 8th Street E for the culvert and the existing storm system in the warehouses south of 56th Ave E that front 8th Street E for the watermain.. Discharges with storm drains that flow to a surface water outfall must conform to all requirements of the National Pollution Discharge Elimination System (NPDES) and State Waste Discharge General Permit for stormwater discharges associated with Construction Activities. Water shall be discharged at one or more designated points, at rates not to exceed the flow capacity of the storm drain system.

In the event that water from the dewatering systems does not meet permit requirements for discharge to the storm drain due to contaminated water, water shall be discharged to the City sanitary sewer. Discharge authorization for disposal to City sanitary sewer will be obtained by the City. Other necessary permits required for discharge, must be identified by the contractor and obtained from regulatory agencies with appropriate jurisdiction.

Decontamination water and stormwater collected in any stockpile areas may also be discharged under this permit. The Contractor shall be responsible for all cost of disposing of water to the sanitary sewer system, unless the reason of discharge is solely due to existing groundwater contamination.

7-13.4 Measurement

No specific unit of measurement will apply to "Dewatering" Lump sum

7-13.5 Payment

Payment shall be made for the following bid items:

"Dewatering", per lump sum.

The lump sum contract price for "Dewatering" shall be full pay for furnishing all labor, materials, tools, equipment and incidentals necessary to provide a complete dewatering system as specified, including but not limited to design, submittals, reporting, installation, operation, Sediment tank, restoration of all disturbance caused by the dewater system.