



Chabot-Las Positas Community College District

Measure A Bond Program

SPECIFICATIONS

SECTION 31 10 00 - SITE PREPARATION AND DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to site preparation, unless otherwise noted. This section applies to:
 - 1. Surface and subsurface demolition.
 - 2. Backfilling of excavations and depressions.
 - 3. Coordination, demolition and/or relocation of existing utilities.
 - 4. Prior to start of demolition of facilities, shut-off, disconnect, cut, and cap where required, underground utility services to facilities.
 - 5. Removal of A.C. pavement driveway and concrete pavement, concrete pads, and A.C. curbing.
 - 6. Removal of cyclone wire, wood fences and barricades.
 - 7. Removal of storm drainage piping, catch basins, and manholes.
 - 8. Removal of vegetation and trees as specified herein.
- B. Contractor shall provide labor, material and equipment required for demolishing, cutting, removing and disposing of existing construction as designated and shown on the drawings for the following as required, unless otherwise noted.
- C. Coordinate all work with capping or sealing of existing utilities.
- D. Related Sections:
 - 1. Section 31 2200 – EARTHWORK AND GRADING.
 - 2. Section 31 2333 – TRENCHING, BACKFILLING, AND COMPACTING.

1.2 SUBMITTALS

- A. Comply with requirements of Section 01 3300 – SUBMITTAL PROCEDURES.
- B. Submit copies of all permits and certificates required for the project to the District's Representative, for record purposes.
- C. Permits and notices authorizing demolition.
- D. Submit copy of letters or certificates of severance of utilities services from the affected agencies or utilities.
- E. Submit copies of proposed haul route(s) from the demolition worksite to an authorized disposal site as approved by authority having jurisdiction.
- F. Submit copy of permit for transport and disposal of debris.
- G. Make arrangements of disposing of waste and excess materials at a legally licensed landfill/disposal facility outside worksite and pay cost thereof.
- H. Photograph existing conditions of existing structure surfaces, equipments, and adjacent improvements that might be misconstrued as damage related to removal operations. File photographs with District's Representative prior to start of work.
- I. Submit proposed dust control measures and a copy of approved permit.

- J. Submit proposed noise control measures and a copy of approved permit.
- K. Work Schedule: Submit a proposed schedule of work items to be performed, and a description of how the work is to be accomplished, for the review and approval by the District's Representative.
- L. Report of inspections conducted with the District's Representative and Architect both before and after performing work.

1.3 QUALITY ASSURANCE

- A. Comply with the following Standards: American National Standards Institute, Inc. "American National Standard Safety Requirements for Demolition" (ANSI A10.6 and A10.8).
- B. Regulatory Agencies:
 - 1. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, "Construction Safety Order."
 - 2. Comply with applicable local and state agencies having jurisdiction.
 - 3. Comply with governing EPA notification regulations.
- C. Secure all required Permits or Certificates for demolition or discontinuance of utilities, prior to beginning the work.

1.4 PROJECT CONDITIONS

- A. District's Representative assumes no responsibility for actual condition of the site to be altered.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by District's Representative as far as practical.
- B. Disposal of Existing Improvements:
 - 1. All materials indicated to be removed shall become the property of the Contractor; dispose of these outside the project site.
 - a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the Site.
 - b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from the construction site by the Contractor.
 - 2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor's employees and no others.
- C. Salvage and Reuse:
 - 1. Where units or items of existing work are designated in Section 01 3113 - PROJECT COORDINATION or Contract Plans to be removed and reused in the new work or are to become salvage, remove such units or items carefully.
 - a. Use tools and methods that will not damage such units or items.
 - b. Protect underlying or adjoining work from damage.
 - c. Salvaged items shall be cleaned by the Contractor.
 - 2. Recycle AC pavement and Class II AB where practical.
 - 3. Recycle concrete where practical.

4. Items indicated to be salvaged shall be removed carefully, cleaned, and returned to the District. Coordinate with the District's Representative.
- D. Protection:
1. Erect and maintain temporary bracing, shoring, lights, and barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the District's employees, finishes, improvements to remain and adjoining property from damage, all in accordance with applicable regulations.
 2. Wet down areas affected by this work as required to prevent dust and dirt from rising.
- E. Scheduling:
1. Complete and submit a project schedule to the District for approval
 2. Coordinate with the District's Representative in scheduling excessively noisy or dirty work.
 3. Schedule work at the District's convenience to cause minimal interference with the District's normal operations.
 4. Work hours are only during the following time periods 7:00 AM - 7:00 PM on weekdays and 9:00 AM-5:00 PM on Saturdays if required.
- F. Submit a traffic plan for review and approval by the District
- G. Traffic Circulation: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
1. Do not close or obstruct public thoroughfares without first obtaining the required permit or permission of the responsible jurisdiction.
 2. Where closing of a vehicular or pedestrian traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion.
 3. Maintain emergency access routes and coordinate any interruptions with local entities.
 4. Provide pedestrian paths as necessary and coordinate with the District.

PART 2 – PRODUCTS

2.1 PIPE ABANDONMENT MATERIALS

- A. Slurry cement backfill conforming to Caltrans Standard Specification 19-3.02E.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas affected by work of this Section and verify following:
1. Disconnection of utilities as required.
 2. That utilities serving occupied portions of buildings on and off the site will not be disturbed.
 3. Removal by the District of the District's personal property, movable furniture and equipment items not designated for relocation.
- B. Document video and/or photograph, as necessary, existing items to remain that are damaged and submit photographs to District.
- C. Where existing conditions conflict with representations of the Contract Documents, notify the District's Representative and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received in writing.

3.2 PREPARATION

- A. Verify that the area to be demolished or removed has been vacated, or adequate space made available to perform the work.
- B. Arrange for, and verify, termination of utility services to include removing meters and capping of lines.
- C. Lay out cutting work at Job Site and coordinate with related work for which cutting is required.

3.3 DEMOLITION

- A. If known or suspected hazardous materials are encountered during operations, stop operations immediately and notify the District's Representative.
- B. Perform work in accordance with ANSI A10.6-1969 unless otherwise noted.
- C. Provide noise and dust abatement as required to prevent contamination of adjacent areas.
- D. Remove all materials not designated as salvage, in their entirety.
- E. Remove building foundations in their entirety, unless otherwise indicated on the plans.
- F. Fill voids in the land left by the removal of existing structures as follows:
 - 1. In accordance with the requirements of Section 31 2200 – EARTHWORK AND GRADING. Grade finished remaining surface to the contours shown, or if not shown, to match the existing natural contours.
- G. Lower, or remove, heavy structural framing members by hoist or crane.
- H. Concrete and Masonry:
 - 1. Demolish concrete and masonry in sections, less than 3 feet in any direction.
 - 2. Method of cutting shall be limited to saw cutting and torch.
- I. If unknown items such as human remains are encountered during operations, stop operations immediately and notify the District's Representative.
- J. The District's Representative will provide a list of any items to be stockpiled for future use. Stockpile location will be a site on campus determined by the District's Representative.

3.4 CUTTING

- A. Make new openings neat.
- B. Do not cut or alter structural members and any utilities including appurtenances unless indicated to do so in the Construction Documents or written approval is received from the Architect.
- C. Take care not to damage reinforcing or structural steel scheduled to remain in place.
- D. Concrete: Cut new openings in concrete by coring and saw cutting. Saw run-bys will not be permitted.

3.5 UTILITY REMOVAL:

- A. Where utility removal is shown on the plans, excavate to expose existing utility, demolish and remove section of pipe or conduit indicated. Cap section of pipe or conduit to remain. Mark end of utility with stake, rebar, or Surveyor's marker.
- B. Provide thrust block or other mechanical restraint where dead end is created on pressurized pipe systems. Thrust blocks shall be per NFPA 24 Standards.
- C. Included in demolition are any appurtenances, including but not limited to valves, valve boxes, and irrigation system components.
- D. Backfill trench in accordance with requirements of Section 31 2333 – TRENCHING, BACKFILLING, AND COMPACTING.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning of demolished materials on-site is prohibited. Burning may be performed off-site of District's property provided it is done in a legal manner.

3.7 FIELD QUALITY CONTROL

- A. The District's Representative and Architect will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

END OF SECTION

SECTION 31 22 00 - EARTHWORK AND GRADING

PART 1 - GENERAL

1.1 SUMMARY:

- A. This section describes general requirements, products, and methods of execution relating to on-site earthwork. Any work within the public right-of-way shall be constructed to the standards of the City of Livermore and State of California Department of Transportation. Work includes, but is not limited to, the following:
 - 1. Grading.
 - 2. Material.
 - 3. Excavation.
 - 4. Filling and backfilling.
 - 5. Soil Sterilant.
 - 6. Termiticide.

- B. Provide labor, material and equipment and services necessary to complete the excavations, re-compaction and finish grading as specified and indicated on Drawings.
 - 1. Obtain permit from local authorities.
 - 2. Provide surveying for grading operations.
 - 3. Provide shoring design.
 - 4. Provide dewatering operations.
 - 5. Provide site grading, cut, fill and finish.
 - 6. Provide excavation and backfill for filling construction, including trenches within building lines.
 - 7. Preparation for subgrade for building slabs, walks, pavements, and landscaping.
 - 8. Provide distribution of stockpiled topsoil.
 - 9. Provide sub-base course for walks and pavements.
 - 10. Provide engineered fills for building slabs and foundations.
 - 11. Provide sand and gravel for capillary break/moisture barrier under building slabs.
 - 12. Provide sub-surface drainage backfill for walls and trenches.

- C. The work includes removal and legal disposal off the site of debris, rubbish and other materials resulting from clearing and grubbing operations.

- D. Work specified in Related Sections:
 - 1. Section 31 1000 – SITE PREPARATION AND DEMOLITION.
 - 2. Section 31 2333 – TRENCHING, BACKFILLING, AND COMPACTING.

1.2 DEFINITIONS:

- A. Select Fill:
 - 1. Soil or soil-rock material approved by District's Representative used by the Contractor in order to raise grades or to backfill excavations.
 - 2. The District's Testing Agency will make sufficient tests and/or observations for the purpose of issuing a written statement that material meets or exceeds the requirements of the construction documents.

- B. On-site Material: Soil or earth material obtained from required on-site excavation.

- C. Excavation: Consists of the removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.

- D. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, rock base course, or topsoil materials.

- E. Import Material: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- F. Base Course: The layer placed between the sub-base and surface pavement in a paving system.
- G. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.
- H. Overexcavation: Removal of material below required subgrade elevations.

1.3 SUBMITTALS:

- A. Comply with provisions of Section 01 3300 – SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's literature and data, including, where applicable, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
 - 1. Imported materials.
 - 2. Class II aggregate base (Caltrans Section 26).
 - 3. Soil Sterilant.
 - 4. Termiticide.
 - 5. Cement Treatment.
 - 6. Geotextiles.
 - 7. Subdrainage Pipe.
- C. Test Reports: Submit the following reports for import material directly to Architect from the Contractor's testing services:
 - 1. Test reports on borrow material.
 - 2. Density test reports.
 - 3. One optimum moisture-maximum density curve for each type of soil encountered.
 - 4. Not used.
 - 5. Not used.
 - 6. Soil percolation rate test for soils to be used in storm water treatment zones.
- D. Shoring Design: Where shoring is required by State Law, Contractor shall provide necessary design, provide proposed excavation shoring method for review prior to commencement of excavation requiring shoring. Include the following information:
 - 1. Basic design assumptions.
 - 2. Design Calculations.
 - 3. Describe materials or shoring system to be used.
 - 4. Indicate whether or not any components will remain after filling or backfilling.
 - 5. The shop drawings for the proposed shoring system.
 - 6. Coordinate with the Construction Documents and identify any proposed modifications or deviations.
 - 7. Certification of the above by a registered professional civil or structural engineer licensed by the State of California.
 - 8. Submittal will be reviewed for general conformance with project plans, but no review of calculations will be provided.
- E. Dewatering Plan: Based upon site surface and subsurface conditions, including available geotechnical and hydrological data, provide a system to perform the following:
 - 1. Lower the ground water level below bottom of excavation.
 - 2. Relieve the hydrostatic pressure below the subgrade to prevent uplift.

3. Prevent surface drainage from accumulating within work area.
 4. Legally discharge and dispose of excess water.
 5. Submit description of basic components of proposed dewatering system and its planned method of operation.
- F. Samples:
1. 20-lb. samples sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources. Provide to Geotechnical Engineer as requested.
 2. 20-lb samples sealed in air tight containers of specialty soils for submission to a plant and soil testing facility for analysis. Include perc test and sieve analysis.
- G. Storm Water Pollution Prevention / Erosion Control Plans/Water Pollution Control Plans
- H. Permit/Notice of Intent (N.O.I.), for discharge of storm run-off from the construction site.
- I. Haul Routes.
- 1.4 ASSURANCE:
- A. Requirements of Regulatory Agencies:
1. Comply with State of California Business and Transportation Agency, California Department of Transportation (CDT, Caltrans) "Standard Specifications" (Caltrans Standard Specification).
 2. Comply with State of California Code of Regulations (CCR).
 3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).
 4. City of Livermore Department of Public Works, Standards and Specifications and Drawings, latest edition.
 5. BCDC, ACOE, Fish and Wildlife, if applicable.
- B. Soil Testing:
1. District will engage a geotechnical testing agency, to include testing soil materials proposed for use in the work and for quality control testing during excavation and fill operations.
- C. Codes and Standards:
1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
 2. Statewide General Permit to Discharge Storm Water associated with construction activity.
 3. The project Storm Water Pollution Prevention and Monitoring Plan.
- D. Comply with the latest editions of the following Standards and Regulations:
1. American Society for Testing and Materials (ASTM):
 - a. Concrete Aggregates.
 - b. C125: Standard Terminology Relating to Concrete and Concrete Aggregates.
 - c. C136: Sieve Analysis of Fine and Coarse Aggregates.
 - d. C566: Total Evaporable Moisture Content of Aggregate by Drying.
 - e. D421: Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
 - f. D422: Particle Size Analysis of Soil.
 - g. D854: Specific Gravity of Soils.
 - h. D1556: Density of Soil by the Sand Cone Method.
 - i. D1557: Laboratory Compaction Characteristics of Soil Using Modified Effort

- j. D2216: Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
 - k. D2487: Classification of Soils for Engineering Purposes.
 - l. D2922: Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - m. D2937: Density of Soil in Place by Drive Cylinder Method.
 - n. D3017: Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - o. D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 2. California Code of Regulations, Title 24, Part 2 - Basic Building Regulations, Chapter 24 - Excavations, Foundations, and Retaining Walls.
 3. California Department of Transportation (Caltrans) Standard Specifications:
 - a. Section 10: Watering.
 - b. Section 18: Dust Palliatives.
 - c. Section 19: Earthwork.
 4. CAL/OSHA, Title 8.
 5. City of Livermore Standard Plans and Specifications
 6. Other authorities having jurisdiction
- E. Geotechnical Engineering Services:
1. Geotechnical Engineer shall be provided by the District or Contractor, as the District's Representative to observe grading observations during preparation offsite, excavation, and compaction of fill materials.
 2. Make visits to site to familiarize him generally with progress and quality of work.
 3. Make field observations and tests to enable him to form opinions regarding adequacy of site preparation, acceptability of fill materials and extent to which earthwork construction and relative compaction comply with specifications requirements.
 4. Examine conditions exposed in foundation excavations.
- F. Site Information:
1. Geotechnical Investigation Reports are available for examination by Contractor.
 2. Additional soil borings and other exploratory operations may be made by Contractor at no cost to the District. Submit proposed boring locations for review prior to performing the work.
- G. Contractor Qualifications:
1. Have successfully installed structural soil mixes similar to the quality specified for a period of not less than 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Protect materials of this section before, during and after installation; objects designated to be retained; and the installed work of other trades.
- B. In the event of damage to any of these items, immediately make repairs or replacements necessary to the acceptance of the District's Representative and at no additional cost to the District.

1.6 PROJECT CONDITIONS:

- A. Site Information: Review geotechnical report titled Geotechnical Evaluation & Geologic Hazards Assessment by Ninyo & Moore (dated January 14, 2021), noting:
 1. The character of the material to be excavated or used for subgrade is not necessarily as indicated.

2. Ground water elevations indicated are those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
- B. Environmental Requirements:
1. When unfavorable weather conditions necessitate interrupting filling and grading operations, prepare areas by compaction of surface and grading to avoid collection of water.
 2. Provide adequate temporary drainage to prevent erosion.
 3. After interruption, reestablish compaction specified in last layer before resuming work.
 4. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.
 5. Protect existing streams, ditches and storm drain inlets from water-borne soil by means of straw bale dikes, filter fiber dams, or other methods.
- C. Protections of open excavations.
1. Barricade open excavations and post with warning lights.
 2. Comply with requirements of Section 01 5000 –TEMPORARY FACILITIES.
 3. Operate warning lights as recommended by authorities having jurisdiction.
 4. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.
- D. Protection of Subgrade
1. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.
 2. At Contractor's option, and with the Geotechnical Engineer's approval, a working pad of granular material may be laid to protect footing and floor subgrade soils from disruption by traffic during wet conditions.
- E. Transport of soils.
1. Transport all excess soils materials by legally approved methods to disposal areas.
 2. Coordinate with the District's Representative.
 3. Sufficient topsoil and fill material shall be retained from the site to complete project requirements.
 4. Any additional topsoil and fill requirements shall be the responsibility of the Contractor.
- F. Blasting and use of explosives will not be permitted.
- G. Dust Control Requirements: At all times during earthwork operations and until final completion and acceptance of the earthwork, the Contractor shall prevent the formation of an airborne dust and dirt nuisance from interfering with the surrounding normal operations. The Contractor shall effectively stabilize the site of work in such a manner that it will confine dust particles to the immediate surface of the work and to obtain a minimum of 40 percent emissions reduction by applying a dust palliative except in areas of active cut and fill. The dust palliative shall be non-petroleum based. Water alone is not considered to be a dust palliative. The dust palliative shall be applied at the rate and method in conformance with Section 18, "Dust Palliatives," of the Caltrans Standard Specifications and as recommended and/or specified by the manufacturer. Contractor shall assume liability for all claims related to dust and dirt nuisances.

- H. All areas to receive Structural Soil shall be inspected by the District's Representative prior to beginning this work.

1.7 EXISTING UTILITIES

- A. The District will contact local utility agencies prior to construction and arrange for the shut-off of all utilities serving the buildings to be demolished. Coordinate work required to abandon active lines with the Program Manager and the District.
- B. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
- C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the District's Representative immediately for directions.
 - 1. Cooperate with the District and public and private utility companies in keeping their respective services and facilities in operation.
 - 2. Repair damaged utilities to the satisfaction of the District's Representative.
- D. Do not interrupt existing utilities serving facilities occupied and used by the District or others, except when permitted in writing by the District and then only after acceptable temporary utility services have been provided.

1.8 SEQUENCING AND SCHEDULING:

- A. The schedule of operations shall be reviewed by the District's Representative prior to commencement of any work.
- B. Coordinate operations with other construction activities, such as relocation of existing utilities.
- C. Coordinate operations with adjacent construction sites and contractors to complete the scope of work in a timely manner.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. General:
 - 1. Fill material will be subject to approval of the Geotechnical Engineer.
 - 2. The Geotechnical Engineer's report on acceptability shall be final and binding.
 - 3. During grading operations, soil types other than those analyzed in the geotechnical report for the project, may be encountered.
 - 4. Consult the Geotechnical Engineer to determine the suitability of these soils.
 - 5. Organic content 3 percent by dry weight or less.
- B. Select (Low Expansion) Fill Material: Soil excavated from site (native) or imported conforming to requirements for fill material contained in geotechnical report for this project. Select on-site borrow fill shall be lime treated per section 10.3.5 of the geotechnical report for this project.
- C. Native Fill Requirements:
 - 1. Approved native materials shall have a particle size not exceeding 3 inches as determined by ASTM D422, at least 90 percent relative compaction and contain less than 3 percent organic content by weight.

- D. Imported Fill Requirements: Imported fill, where required, shall be non expansive granular soil, free of organic matter and deleterious substances. Imported fill material shall be close-graded with 35 percent or more passing No. 4 sieve and either: Expansion Index of 50 or less, Plasticity Index of 12 or less, or less than 10 percent, by dry weight, passing No. 200 sieve.
1. Be thoroughly compactable without excessive voids.
 2. Meet the following plasticity requirements:
 - a. Maximum Plasticity Index of 12, as determined by ASTM D4318.
- E. Imported Fill for Planting Areas: Imported fill for use in planting areas shall be sandy loam weed free soil. Submit analysis from certified Soil and Plant Lab. Coordinate with Landscape Architect.
- F. Topsoil: Friable clay loam surface soil found in a depth of not less than 10 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2 inches in diameter, and without weeds, roots and other objectionable material.
1. Use topsoil for top 2 feet of fill against exterior walls, except at paving and sidewalks.
 2. Topsoil may also be used beyond the area within 5 feet of building, except under paving and sidewalks.
 3. Confirm suitability of stockpiled materials.
- G. Sand: Clean, well-graded fine to coarse sand with not more than 2 percent passing the #200 sieve based on wet sieve analysis. Provide at locations indicated in the construction documents.

Where coarse sand is required, provide sand no finer than No.40 sieve.

- H. Drain Rock:
1. Washed, uniformly graded mineral aggregate ASTM D448 with percentage composition of dry weight conforming to following limits:
 - a. Passing 1-inch Sieve: 100 percent.
 - b. Passing 3/4-inch Sieve: 90-100 percent.
 - c. Passing No. 4 Sieve: 0-10 percent.
 2. Base at Slab-on-Grade: As specified in the geotechnical report for this project.
 3. Absorption of water to saturated-surface dry condition shall not exceed 3 percent of oven-dry weight of a sample.
- I. Backfill material for use behind retaining walls shall be a granular material consisting of sand, broken rock, or a mixture of sand and gravel containing no size larger than 2 ½ inches and not more than 15 percent passing the No. 200 sieve.
- J. Trench Backfill:
1. Trench Backfill above pipe zone material and in top 3 feet of building pad and top 1 foot below flatwork to be as per select fill and exclude rock/lumps retained on 4-inch sieve or 2-inch sieve in top 12 inches
 2. Trench backfill in all over locations to be or per general fill excluding rock/lumps retained on 4-inch sieve or 2-inch sieve in top 12 inches.
- K. Pipe/Conduit Bedding Material: 90 to 100 percent (by mass) should pass No. 4 sieve, and 5 percent or less should pass No. 200 sieve.
- L. Pea Gravel: 3/8 inch to ½ inch washed, uncrushed gravel. Use at drainage pipe and at other locations indicated.

- M. Filter Fabric: Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D4759 and the referenced standard test method in parentheses.
 - 1. Grab Tensile Strength (ASTM D4632): 120 lb.
 - 2. Apparent Opening Size (ASTM D4751): #70 U.S. Standard sieve.
 - 3. Permeability (ASTM D4491): 135 gallons per minute per square foot.

- N. Drainage Pipe:
 - 1. Perforated corrugated plastic drainage tubing meeting ASTM F667, with continuous integral nylon filter screen.
 - 2. Acceptable Manufacturers and Products: Advanced Drainage Systems "DrainGuard," Hancor "Agri-Flow."
 - 3. Provide couplings, elbows and other fittings as recommended by pipe manufacturer.

- O. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

2.2 SOIL STERILANT:

- A. Soil Sterilant shall be Treflan E.C. or approved equivalent.

2.3 TERMITICIDE:

- A. Termiticide shall be Permethrin, Denon, or approved equivalent.

PART 3 - EXECUTION

3.1 GENERAL:

- A. Prior to commencement of earthwork, become thoroughly familiar with site conditions.

- B. If event discrepancies are found, immediately notify the District's Representative in writing, indicating the nature and extent of differing conditions.

- C. Requirements:
 - 1. Grades and elevations are to be established with reference to benchmarks referenced on Drawings.
 - 2. Maintain engineering markers such as monuments, benchmarks and location stakes. If disturbed or destroyed, replace.

- D. No earthwork shall be performed without physical presence or acceptance of the Geotechnical Engineer.

- E. The Geotechnical Engineer's acceptance is required by these specifications; notify the District's Representative at least 48 hours prior to commencing any phase of earthwork.
 - 1. No phase of work shall proceed until prior phase has been accepted by the Geotechnical Engineer.
 - 2. Work shall not be covered up or continued until acceptance of the Geotechnical Engineer shall give written notice of conformance with the specifications upon completion of grading.

- F. Compacting:
 - 1. Compact by power tamping, rolling or combinations thereof as accepted by the Geotechnical Engineer.

2. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
3. Scarify and re-compact any layer not attaining compaction until required density is obtained.
4. Compaction by flooding, ponding or jetting will not be permitted, unless specifically accepted by the Geotechnical Engineer.

G. Hazardous Materials

1. If any materials are encountered that may be hazardous (as defined in Section 25117 of the California Health and Safety Code), inform the District's Representative verbally within 24 hours and in writing within 2 business days. Upon discovery, material is to remain undisturbed until investigation by State's representative is complete. The removal and disposal of hazardous materials, if discovered, is not part of the scope of work of this Division for this project.

3.2 SITE PREPARATION:

- A. Protect structures, utilities, sidewalks, pavements, and other facilities which are to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. Set up tree protection measures prior to commencing grading or demolition operations.

B. Clearing and Grubbing:

1. Remove from area of designated project earthwork all improvements and obstructions, including designated concrete curbs or slabs, asphaltic concrete, all tree and shrub roots, any abandoned buried utility, any irrigation lines, and other matter determined by the Geotechnical Engineer to be deleterious.
 - a. In all new planting areas, remove existing base material.
 - b. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.
 - c. Vegetation should be removed to such a depth that organic material is generally not present.
2. Remove from the site all trees and shrubs, unless otherwise indicated on the drawings as existing trees to be left standing.
3. Active utilities with the project limit should be rerouted or protected from damage by construction activities.
4. Rubble and excavated materials that do not meet the criteria of fill should be disposed of in an appropriate landfill.
5. Excavations resulting from the removal of buried utilities, tree stumps, or obstructions should be backfilled with compacted fill in accordance with the recommendations of the geotechnical report.
6. Existing Trees to remain:
 - a. Verify the locations of existing trees to be preserved.
 - b. Replace existing trees to remain that are damaged during construction at no additional cost to the District.
 - c. Carefully make clean cuts at roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over ½ inch in size with tree pruning compound.

C. Topsoil:

1. Strip topsoil to whatever depths encountered in manner to prevent intermingling with the underlying subsoil or other objectionable material.
2. Remove heavy growths of grass from areas before stripping. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to the main root system.

3. Stockpile topsoil in storage piles to freely drain surface water.
4. Cover storage piles if required to prevent windblown dust.

3.3 EXISTING UTILITIES:

- A. Protect existing utilities that are to remain in operation as specified.
- B. Demolish and completely remove from the site existing underground utilities indicated to be removed. See Section 31 1000 – SITE PREPARATION AND DEMOLITION.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at contractor's risk.
- D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
 1. Use hand or light equipment for excavating immediately adjacent to or for excavations exposing a utility or buried structure.
 2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
 3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
 4. Report damage of utility line or subsurface structures immediately to the District's Representative.

3.4 DEWATERING:

- A. Do not allow water from surface drainage or underground sources to accumulate in excavations, unfinished fills, or other low areas.
- B. Provide and maintain ample means and devices to remove water promptly and dispose properly of water entering excavations or other parts of the work to prevent softening of exposed surfaces.
- C. Dewater by methods which will ensure dry excavation and preservation of finish lines and grades of excavation bottoms.
- D. Prior to excavating below ground water level, place dewatering system in operation.
 1. Lower the ground water level a minimum of 1 foot below the bottom of the excavation.
 2. Relieve the hydrostatic pressure in pervious zones below the subgrade elevation to prevent uplift.
 3. Use screens and gravel packs as necessary to prevent removal of fines from the soil.
- E. Operate the dewatering system continuously, 24 hours a day, 7 days a week until construction work below existing ground water level is completed.
 1. Measure and record the performance of the dewatering system.
 2. After placement of initial slabs and backfill, the ground water level may be allowed to rise.
 3. At no time allow ground water to rise higher than 1 foot below the prevailing level of excavation or backfill.
 4. Have a back-up pump and system available for immediate use.

- F. Dispose of water away from the work in suitable manner without damage to adjacent property or menace to public health.
- G. Do not drain water into work being built or under construction without prior acceptance of the District's Representative.
- H. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.

3.5 SITE EXCAVATION:

- A. General
 - 1. All supports, shoring, and sheet piling required for the sides of excavations or for protection of adjacent existing improvements shall be provided and maintained by the Contractor. The adequacy of such systems shall be the complete responsibility of the Contractor.
 - 2. Earth and rock, regardless of character and subsurface conditions, shall be excavated to depths shown on drawings and to the neat dimensions of the footings wherever practicable, to permit pouring of footings and grade beams without use of side forms, except at slab perimeters.
 - 3. Large rocks, pieces of concrete or other obstructions, if encountered during the excavation/scarifying operations, shall be removed and disposed of by the Contractor off the site in a legal manner.
 - 4. Where footing excavation is too deep, backfill shall be concrete. Where footings are over dug laterally, side forms shall be employed for backfill with rock fill or concrete backfill shall be used (Contractor's option).
 - 5. Where forming is required, only that excavation necessary to permit placing and removal of forms shall be done.
- B. Excavate subgrade as required to allow for finish grades shown on drawings, as required for structural fill or otherwise required for proper completion of the work.
- C. Remove and replace subgrade materials designated by Geotechnical Engineer as unsuitable.

3.6 FILL AND COMPACTING:

- A. General Requirements:
 - 1. Backfill excavations as promptly as work permits.
 - 2. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the District's Representative.
 - 3. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
 - 4. In excavations, use satisfactory excavated or borrow material.
 - 5. Under grassed areas, use satisfactory excavated or borrow material.
- B. After subgrade compaction has been approved by the Geotechnical Engineer, spread the engineered fill materials in lifts not exceeding 8 inches and uniformly mixed during the spreading operation.
 - 1. Bring non-expansive fill materials to or slightly above the optimum moisture content and compacted to at least 90 percent of the maximum laboratory dry density, per ASTM D1557.
 - 2. Bring non-expansive aggregate fill materials to or slightly above the optimum moisture content and compacted to at least 95 percent of the maximum laboratory dry density, per ASTM D1557.
 - 3. Do not compact the top 12 inches of soil in the planting areas.

4. Fill sections greater than 5 feet in depth shall be compacted to at least 95 percent.
- C. Repeat compaction procedure until proper grade is attained.
- D. Rocks generated during site earthwork may be used in fill when conforming to material specifications.

3.7 MOISTURE CONTROL:

- A. Do not place, spread or roll fill material during unfavorable weather conditions or when fill material is excessively wet.
- B. Do not resume operations until moisture content and fill density are satisfactory to the Geotechnical Engineer.
- C. Provide berms or channels to prevent surface water from flooding excavations. Promptly remove water collecting in depressions.
- D. Where soil has been softened or eroded by flooding or by placement during unfavorable weather, remove damaged areas and re-compact as described for fill and compaction.
- E. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material.
 1. Prevent free water appearing on surface during or subsequent to compaction operation.
 2. Remove and replace, or scarify and air dry, soil material too wet to permit compaction to specified density.
 3. Soil material removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.8 GRADING:

- A. General: Uniformly grade areas of work including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
 1. All areas covered by the project, including excavated and filled areas and adjacent transition areas, shall be uniformly graded so that finished surfaces are at the elevations established by the plans. Planter areas to receive future topsoil shall be graded below finished grade to allow for such material.
 2. Finished surfaces and surfaces to receive paving and aggregate base shall be smooth, compacted, and free from irregular surface drainage.
 3. Ditches, gutters, and swales shall be finished to permit proper surface drainage.
 4. All surface areas, except paved and sloped embankments exceeding 8:1, shall be hydroseeded.
- B. Grading Tolerances:
 1. Excavations shall not exceed 0.10-foot variation from dimensions and elevations shown or noted, unless otherwise approved by the District's Representative.
 2. Fill and backfill shall be placed with tolerance of plus or minus 0.10 foot if placed in layers.
 3. Grading shall be done within plus or minus 0.10 foot typically; areas under slabs, walks or pavements shall be graded within tolerance of 0 to 0.10 foot.
 4. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.

5. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
 6. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.
- C. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.9 FIELD QUALITY CONTROL:

- A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
1. Perform field in-place density tests according to ASTM D1556 (sand cone method), ASTM D2167 (Rubber Balloon Method), or ASTM D2937 (Drive Cylinder Method), as applicable.
 - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D6938 , provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. With each density calibration check, check the calibration curves furnished with the moisture gauges according to ASTM D6938
 - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work on each different type of material encountered, and at intervals as directed by the Architect.
 2. Footing Subgrade: At footing subgrades, use a hand probe and consult with the Geotechnical Engineer.
 3. Paved and Building Slab Areas; At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 square feet or less of paved area or building slab, but in no case fewer than three tests.
 4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
 5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but not fewer than two tests.
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.
- C. After grading is completed and the testing agency has completed observation of the work, permit no further excavation or filling, except as approved by the District's Representative.

3.10 PROTECTION:

- A. Protect newly graded areas from traffic and erosion. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer's recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completion of construction. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

- C. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction at no cost to the district.

3.11 TERMITICIDE:

- A. Termiticide shall be applied to soils as recommended by the manufacturer. Termiticide shall be applied uniformly at the rate recommended by the manufacturer to all areas beneath and around wood frame structures.

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SECTION 31 23 33 - TRENCHING, BACKFILLING, AND COMPACTING

PART 1 – GENERAL

1.1 SUMMARY:

- A. Provide labor, material, equipment, and services necessary to complete the backfilling and compacting as necessary for this project. Section includes, but is not limited to:
 - 1. Initial Backfill Material.
 - 2. Subsequent Backfill.
 - 3. Detectable Tape.
 - 4. Trench Excavation.
 - 5. Pipe Bedding.
 - 6. Trench Backfill.
 - 7. Trench Surfacing.
- B. Work specified in Related Sections include:
 - 1. Section 31 2200 – EARTHWORK AND GRADING.
 - 2. Section 33 4000 – STORM DRAINAGE.

1.2 DEFINITIONS:

- A. Engineered Fill:
 - 1. Soil or soil-rock material approved by the Geotechnical Engineer and transported to the site by the Contractor in order to raise grades or to backfill excavations.
 - 2. Contractor shall provide sufficient tests, and a written statement that all materials brought onto the project site comply with specification requirements.
- B. Excavation: Consists of the removal of material encountered to subgrade elevations.
- C. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base.
- D. Base: The layer placed between the subgrade and surface pavement in a paving system.
- E. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

1.3 SYSTEM DESCRIPTION:

- A. Requirements:
 - 1. Comply with the recommendations of the Geotechnical Engineer.
 - 2. Protect existing trees to remain. No grading is permitted under the drip line of protected trees.
 - 3. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.
 - 4. Unless otherwise indicated in the Drawings, all excavation for pipelines shall be open cut.

1.4 SUBMITTALS:

- A. Comply with provisions of Section 01 3300 – SUBMITTAL PROCEDURES.

- B. Test Reports: Submit the following report for import material directly to the District's Representative from the Contractor's testing services:
 - 1. Compaction test reports for import materials.
- C. Submit description of compactors proposed for use when requesting placement of base material.

1.5 QUALITY ASSURANCE:

- A. Requirements of Regulatory Agencies:
 - 1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) latest edition of "Standard Specifications." (Caltrans Standard Specification).
 - 2. Comply with State of California Code of Regulations (CCR).
 - 3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).
- B. Soil Testing:
 - 1. District shall engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.
 - 2. Test results will be submitted to the District's Representative.
- C. Codes and Standards:
 - 1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
 - 2. NPDES Construction General Permit.
 - 3. Project Storm Water Pollution Prevention Plan (SWPPP)
 - 4. California Department of Transportation Standard Specifications (Caltrans Standard Specification):
 - a. Section 19: Earthwork.
 - b. Standard Test Methods: No. 202.
 - 5. American Society for Testing and Materials (ASTM):
 - a. D1556: Density of Soil by the Sand Cone Method.
 - b. D1557: Moisture Density Relations of Soils and Soil-Aggregate Mixtures.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Protect materials before, during and after installation.

1.7 PROJECT CONDITIONS:

- A. Environmental Requirements:
 - 1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.
 - 2. Protect existing streams, ditches and storm drain inlets during work on this project.
- B. Barricade open excavations and post with warning lights.
 - 1. Operate warning lights and barricades as required.
 - 2. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.
- C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.

- D. Transport all excess soils materials by legally approved methods to disposal areas.
 - 1. Coordinate with the District's Representative.
 - 2. Any additional fill requirements shall be the responsibility of the Contractor.

1.8 EXISTING UTILITIES:

- A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility agency immediately for directions.
 - 1. Cooperate with the District's Representative and public and private utility companies in keeping their respective services and facilities in operation.
 - 2. Repair damaged utilities to the satisfaction of the utility owner.
- C. Do not interrupt existing utilities serving facilities occupied and used by the District or others, except when permitted in writing by the District's Representative and then only after acceptable temporary utility services have been provided.

1.9 SEQUENCING AND SCHEDULING:

- A. The sequence of operations shall be reviewed and approved by the District's Representative prior to commencement of any work.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. General:
 - 1. Backfill materials will be subject to approval of the Engineer.
 - 2. For approval of backfill fill material, notify the District's Representative at least 7 days in advance of intention to import material.
 - 3. Consideration shall also be given to the environmental characteristics as well as the corrosion potential of backfill materials. Laboratory testing, including pH, soluble sulfates, chlorides, and resistivity shall be reviewed. Backfill materials shall not be more corrosive than the native materials.
- B. Trench Sand:
 - 1. Material free from clay, organic materials, and other deleterious substances and conforming to Caltrans Standard Specification Section 19-3.02F(2).
- C. Trench Gravel:
 - 1. Granular material free from clay, organic materials, and other deleterious substances and conforming to Class 1 Type A Permeable Material, per Caltrans Standard Specification Section 68-2.02F(2).
- D. Approved Native Fill:
 - 1. See Section 31 2200 – EARTHWORK AND GRADING.
- E. Imported Fill:
 - 1. See Section 31 2200 – EARTHWORK AND GRADING.
- F. Class II Aggregate Base: ¾" maximum, Class II AB, free from organic matter and other deleterious substances and conforming to Caltrans Standard Specification Section 26-1.02A.

- G. Controlled Low Strength Material (CLSM):
 - 1. Low strength structural backfill with a compressive strength between 50 and 100 psi, conforming to Caltrans Standard Specifications Section 19-3.02G.
- H. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

- A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 75 mm 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.
 - 1. Warning Tape Color Codes.
 - Red: Electric.
 - Yellow: Gas, Oil; Dangerous Materials.
 - Orange: Telephone and Other Communications.
 - Blue: Water Systems.
 - Green: Sewer Systems.
 - White: Steam Systems.
 - Gray: Compressed Air.
 - 2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
 - 3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 920 mm 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.3 DETECTION WIRE FOR NON-METALLIC PIPING

- A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 – EXECUTION

3.1 GENERAL:

- A. Prior to commencement of work, become thoroughly familiar with site conditions.
- B. In the event discrepancies are found, immediately notify the District's Representative in writing, indicating the nature and extent of differing conditions.
- C. Backfill excavations as promptly as work permits.
- D. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the District's Representative.
- E. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

- F. In excavations, use satisfactory excavated or borrow material.
- G. Under grassed areas, use satisfactory excavated or borrow material.

3.2 COMPACTING:

- A. Compact by power tamping, rolling or combinations thereof.
 - 1. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
 - 2. Scarify and re-compact any layer not attaining compaction until required density is obtained.

3.3 SITE PREPARATION:

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.

3.4 EXISTING UTILITIES:

- A. Identify the location of existing utilities.
 - 1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Drawings, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
 - 2. The Contractor shall contact Underground Service Alert (USA) at 811 for assistance in locating existing utilities.
 - 3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Engineer of Record to clear the utility.
- B. Protect all existing utilities to remain in operation.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor's risk.
- D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
 - 1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.
 - 2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
 - 3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
 - 4. Report damage of utility line or subsurface structures immediately to the District's Representative.
- E. Backfill trenches resulting from utility removal in accordance with this section.

3.5 TRENCH EXCAVATION

- A. General:
1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
 2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.
 3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.
 4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.
- B. Existing Paving and Concrete:
1. Existing pavement over trench shall be saw cut, removed, and hauled away from the job. Existing pavement shall be neatly saw cut a minimum of 6-inches beyond the limits of excavations.
 2. Existing concrete over the trench shall be saw cut to a full depth in straight lines either parallel to the curb or right angles to the alignment of the sidewalk.
 3. Boards or other suitable material shall be placed under equipment out rigging to prevent damage to paved surfaces.
- C. Trench Width:
1. The maximum allowable trench widths at the top of the pipe shall be as follows:

<u>Pipe Type</u>	<u>Trench Width (Maximum)</u>
Copper	Outside diameter of barrel plus 18 inches
Plastic	"
Vitrified Clay	"
Cast-Iron	Outside diameter of barrel plus 24 inches
Ductile-Iron	"
Reinforced Concrete	

 - a. The maximum trench width shall be inclusive of all shoring.
 - b. If the maximum trench width is exceeded, the District's Representative or Inspector of Record may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.
 2. For pipes 3 inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.
- D. Open Trench:
1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
 2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.
- E. Excavation Bracing:
1. The excavation shall be supported and excavation operations shall be conducted in accordance with the California Industrial Accident Commission and CAL/OSHA.
 2. The Contractor shall, at his/her own expense, furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of all excavations (whether above or below the pipe grade), and to prevent any movement which could in any way diminish the required trench section or otherwise injure or delay the work. The

sheeting and bracing shall be withdrawn in a manner such as to prevent any earth movement that might overload the pipe.

- F. Excavated Material:
 1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.
 2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
 3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

3.6 PIPE BEDDING

- A. Bedding Excavation: The trench shall be excavated below the grade of the pipe bottom to the following minimum depths:

<u>Pipe Type</u>	<u>Depth</u>
Copper	3 inch
Reinforced Concrete	3 inch
Plastic: 2 inch diameter and smaller	3 inch
Cast/Ductile Iron	6 inch
Plastic: over 2 inch diameter	6 inch

1. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The Inspector of Record will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.
2. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing pipe bedding material. Pipe bedding shall be trench sand or trench gravel, as defined in these specifications. Sufficient pipe bedding material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe, plus 1/8th of the pipe diameter. The relative compaction of tamped material shall be not less than 90 percent. It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

3.7 TRENCH BACKFILL

- A. Initial Backfill:
 1. Prior to trench backfill, the condition of the trench and lying of pipe must be inspected and approved by the Inspector of Record.
 2. Trench Sand and Trench Gravel shall be used for initial backfill. After the pipe has been properly laid and inspected, initial backfill material shall be placed on both sides of the pipe and compacted to final depth as follows:

<u>Pipe Type</u>	<u>Depth</u>
Copper	6 inches above top of pipe
Cast Iron	6 inches above top of pipe
Plastic: less than 3 inches diameter	6 inches above top of pipe
Plastic: 3 inches diameter and larger	12 inches above top of pipe
Ductile Iron	12 inches above top of pipe
Reinforced Concrete	½ outside diameter of pipe (pipe spring line)

3. Compaction: Initial backfill compaction shall be by mechanical means. The initial backfill material shall be hand tamped in layers not exceeding 4 inches in un-compacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortional stress. After hand tamping, the relative compaction of the initial backfill material shall be not less than 90 percent.

4. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.
- B. Subsequent Backfill:
1. Subsequent backfill material shall consist of approved native material, imported fill, or Class II AB conforming to these specifications.
 2. Structure and utility trench backfill should be moisture conditioned, placed in lifts eight inches or less in loose thickness, and mechanically compacted to at least 90 percent relative compaction except the relative compaction shall not be less than 95 percent within 2-1/2 feet of finished permanent surface grade or 1-1/2 feet below the finished subgrade, whichever is greater; jetting will not be permitted. The moderately expansive clay soils exposed in trenches should not be allowed to dry out prior to placement of trench backfill materials.
 3. It must be the contractor's responsibility to select equipment and procedures that will accomplish the grading as described above. He/she must organize his/her work in such a manner that the Soil Engineer can test and/or observe each element of grading.
- C. Controlled Low Strength Material (CLSM):
1. CLSM is permitted at Engineer of Records discretion or where indicated on the contract documents.
- D. Jetting and Ponding:
1. Jetting of trench backfill is not permitted.
- E. Compaction Testing:
1. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

3.8 TRENCH SURFACING

- A. Unpaved Areas:
1. In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
 2. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, contractor to scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.
- B. Temporary Surfacing:
1. Temporary surfacing shall be a minimum of 2 inches of cutback asphalt on 10 inches of Class 2 aggregate base and shall be placed at all trench locations subject to vehicular or pedestrian traffic.
 2. Temporary surfacing shall be laid within one day after backfilling (except where the Contractor elects to place permanent surfacing within this time period).
 3. Before the trenching area is opened for traffic, all excess dirt, rock, and debris shall be removed, the street surface shall be swept clean and the pavement shall be washed down with a water truck and pressure nozzle.
 4. Temporary surfacing shall be maintained to prevent the occurrence of mud holes and prevent the surface from settling below 1 inch or rising more than 1 inch from the existing pavement grade.

3.9 MOISTURE CONTROL:

- A. Do not resume operations until moisture content and fill density are satisfactory to the Geotechnical Engineer.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Testing Services: Allow testing agency to test each backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
- B. When testing agency reports that backfills are below specified density, contractor to scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

3.11 PROTECTION:

- A. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, contractor to scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.12 CLEAN-UP:

- A. Remove all debris, equipment, tools and materials upon completion prior to final inspections to the satisfactions of the engineer.
- B. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer's recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completions of construction.

END OF SECTION

SECTION 33 40 00 - STORM DRAINAGE

PART 1 – GENERAL

1.1 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site storm drainage excluding portions within five feet of buildings unless otherwise noted. Any work within the public right-of-way shall be constructed to the standards of the City of Livermore and State of California Department of Transportation as may be appropriate.
 - 1. Storm drain piping.
 - 2. Storm drain structures including curb inlets, catch basins, area drains, and manholes.
- B. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.
- C. Related Sections:
 - 1. Section 31 2333 – TRENCHING, BACKFILLING, AND COMPACTING.

1.2 SUBMITTALS

- A. Comply with the requirements of Section 01 3300 – SUBMITTAL PROCEDURES.
- B. Product Data: Manufacturer's literature and data, including, where applicable, pressure rating, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
 - 1. Piping and fittings.
 - 2. Jointing material.
 - 3. Gaskets, couplings, and sleeves.
 - 4. Precast concrete structures, including manholes and drainage inlets.
 - 5. Concrete mix design for precast and cast-in-place structures.
 - 6. Manhole lids and frames.
 - 7. Manhole steps.
 - 8. Pipe to Structure Connection Seal.
 - 9. Drainage inlet grates and frames.

1.3 QUALITY ASSURANCE

- A. Comply with the latest editions of the following Standards and Regulations:
 - 1. American Society for Testing and Materials (ASTM).
 - a. A74: Cast Iron Soil Pipe and Fittings.
 - b. A615: Deformed and Plain Billet-Steel Bars for Reinforcement.
 - c. B32: Solder Metal.
 - d. C76: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - e. C150: Portland Cement.
 - f. C478: Precast Reinforced Concrete Manhole Sections.
 - g. C494: Chemical Admixtures for Concrete.
 - h. C920-02: Elastomeric Joint Sealants.
 - i. D2241-00: Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - j. D2680-01 Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
 - k. D2729: Perforated PVC Drain Pipe.
 - l. D3034-00: Type PSM Polyvinyl Chloride (PVC) Sewer pipe and Fittings.
 - m. F1336-02: Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings.

2. California Department of Transportation (Caltrans): Standard Specifications:
 - a. Section 51: Concrete Structures.
 - b. Section 52: Reinforcement.
 - c. Section 55: Steel Structures.
 - d. Section 66: Corrugated Metal Pipe.
 - e. Section 70: Miscellaneous Facilities.
 - f. Section 72: Slope Protection.
 - g. Section 75: Miscellaneous Metal.
 - h. Section 90: Portland Cement Concrete.
 3. American Association of State Highway and Transportation Officials (AASHTO) for H2O Loading.
 4. American Concrete Institute (ACI).
 5. Other authorities having jurisdiction.
- B. System Description: Grades and elevations are to be established with reference to the benchmarks referenced on the Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

- C. Delivery and Storage
1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
 2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
- D. Handling
1. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. When handling lined pipe, take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

PART 2 – PRODUCTS

2.1 PIPING

- A. Polyvinyl Chloride (PVC) Pipe: PVC pipe conforming to ASTM D3034, SDR 26 with bell-and-spigot type of rubber gasket joints. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.
- B. Reinforced Concrete Pipe (RCP): RCP shall conform to ASTM C76 with tongue-and-groove or bell-and-spigot joints. Unless indicated otherwise on the plans, all reinforced concrete pipe shall be Class III, 1350-D pipe.
- C. High-Density Polyethylene (HDPE) Pipe: HDPE Pipe shall conform to AASHTO M294 Type S. Acceptable for use in non-vehicular areas ONLY.
- D. Polyethylene Pipe (PE): PE 4710, Pressure Class 160, DR 13.5, conforming to AWWA C906. Driscopex 4000/4100, or approved equivalent.
- E. Perforated Pipe: PVC conforming to ASTM D2729 or HDPE SDR 17 conforming to AWWA C906

2.2 MANHOLES

- A. Manholes shall be pre-cast concrete of the size and shape shown on the Drawings and shall conform to Sections 70-4.02 of the Caltrans Standard Specifications and to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. Concrete shall consist of Type II cement.
- B. Frames and covers shall be cast iron conforming to Section 75-2.02B of the Caltrans Standard Specifications. Manhole covers shall have the words "STORM DRAIN" in letters not less than 2-inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.
- C. All interior concrete surfaces shall be coated with Xypex Concentrate or approved equivalent. Use of a water-resistant admix such as "Xypex Crystalline" is acceptable, at Contractor's option.
- D. Frames and grates for manholes and catch basins shall be match-marked in pairs before delivery to the job site. Grates shall be ductile iron conforming to Section 75-2.02B of the Caltrans Standard Specifications. The grates shall fit into their frames without rocking. Grates shall have a maximum opening of one-half inch between bars, unless otherwise noted in the Drawings. All drainage inlets shall be marked with a stencil or permanent label reading "NO DUMPING FLOWS TO CREEK."
- E. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Drawings. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.
- F. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of Caltrans Section 90 and as herein specified. The concrete shall be minor concrete. The grading of the combined aggregate shall conform with the Caltrans requirements of the 1/2-inch maximum. The consistency of the fresh aggregate shall be such that the slump does not exceed four inches, as determined by Test Method No. Calif. 520. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.

2.3 PIPE TO STRUCTURE CONNECTOR/SEAL

- A. A flexible pipe to manhole connector shall be used for all pipe penetrations and/or cast-in-place concrete structures.
 - 1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.
 - 2. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C-923. The connector and stainless steel hardware shall meet or exceed the performance requirements proscribed in ASTM C-923.
 - 3. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
 - 4. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

2.4 CLEAN-OUTS

- A. A box shall be provided for each clean-out. Boxes shall be pre-cast concrete with cast iron frame and cover marked "STORM DRAIN"; Christy G05 or approved equivalent.

2.5 CULVERT AND OUTFALL HEADWALLS

- A. All headwalls shall be constructed in conformance with Caltrans Standard Plans as indicated.

PART 3 – EXECUTION

3.1 PIPE INSTALLATION

- A. Pipe shall be installed in conformance with Section 31 2333 – TRENCHING, BACKFILLING AND COMPACTING, and manufacturer's recommendations. HDPE pipe shall be installed in conformance with ASTM D2321 and as recommended by the pipe manufacturer. HDPE pipe is acceptable for use in non-vehicular areas ONLY.
- B. Pipe laying:
 - 1. No pipe shall be laid until the Geotechnical Engineer inspects and approves the conditions of the bottom of the trench.
 - 2. Pipe laying shall proceed "up grade" with the spigot section of the bell-and-spigot pipe pointing in the direction of the flow.
 - 3. Each section of pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.
 - 4. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.
- C. Debris Control:
 - 1. The interior of the sewer pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be plugged.
 - 2. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and pulled forward past every joint immediately after joining has been completed.

3.2 POURED-IN-PLACE CONCRETE

- A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of the Caltrans Standard Specifications.
- B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the Caltrans Standards Specifications. Unless otherwise noted herein or in the Drawings, exposed surfaces of structures shall be Class 1 surface finish.
- C. Curing shall conform to applicable portions in Section 90 of Caltrans Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the District Representative or Inspector of Record has approved the forms and reinforcement.
- D. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.3 PIPELINE FLUSHING

- A. Newly constructed storm drain pipes shall be flushed with water to clean. A metal screen shall be used to collect and remove any rock, silt and other debris that is flushed out during cleaning. Reclaimed water shall be used where available.

3.4 DEFLECTION TESTING

- A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.
- B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.
- C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.
- D. Pull-Through Device:
 - 1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
 - a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
 - b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
 - 2. Ball, cylinder, or circular sections shall conform to the following:
 - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
 - b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
 - c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
 - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
 - 3. Pull-Through Device:
 - a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
 - b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.
- E. Deflection measuring Device:
 - 1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
 - 2. Obtain approval of deflection measuring device prior to use.
- F. Deflection Measuring Device Procedure:
 - 1. Measure deflections through each run of installed pipe.
 - 2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.

3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.

- G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

3.5 CLEANING

- A. Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

3.6 VIDEO INSPECTION

- A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the storm drainage line shall be televised with a color closed-circuit television with tilt-head camera recorded in DVD format. The original DVD and log sheets shall be provided to the District.

1. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement or completion of the attached scope:
 - a. Low spot (1 inch or greater - mainlines only).
 - b. Joint separations (3/4 inch or greater opening between pipe sections).
 - c. Cocked joints present in straight runs or on the wrong side of pipe curves.
 - d. Chips in pipe ends.
 - e. Cracked or damaged pipe.
 - f. Dropped joints.
 - g. Infiltration.
 - h. Debris or other foreign objects.
 - i. Other obvious deficiencies.
 - j. Irregular condition without logical explanation.

END OF SECTION