SECTION 02200
EARTHWORK AND SITE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION.

Requirements specified in Conditions of the Contract and Division l form a part of this Section. Provide labor, equipment, tools, materials, and services needed to accomplish all site preparation, earthwork and incidental appurtenant work as described herein or shown on the Drawings.

A. Work Included in This Section. Principal items are:

1. Requirements
2. Materials
3. Site Preparation
4. Removals
5. Dust Control
6. Care of Drainage Water
7. Excavation
8. Pavement Subgrade
9. Clean-up
10. Disposal of Surplus and/or Unsuitable Materials

B. Definitions

1. Site. The property owned by Valley Center Municipal Water District, shown within the boundaries on the Drawings, along with easements and/or rights-of-way roads, drainage facilities, and pipelines, and the Contractor's working and storage areas adjacent to the facilities.

2. Structural/Slab Fill. Compacted fill of suitable material, or select material, in all areas of the site requiring filling to grade as shown on the Drawings.

3. Select Material as specified herein shall be any material imported or excavated from the cut areas that in the opinion of the Soil Engineer is suitable for use in constructing fills shallower than 36 inches below rough grade.

4. Select Granular Material. Imported coarse material, or a process material derived from on-site excavated material, for use in constructing structural fill and structural backfill.

5. Waste Excavation. Material from project excavations which is not suitable for use in backfill or compacted fills or is in excess of that required to be used for fill or backfill.

6. Rock Excavation. Excavation of solid ledge rock that, in the opinion of the Engineer, requires for its removal drilling and blasting, wedging, sledging, barring or breaking up with power-operated tools. The term “Rock Excavation” indicates a method of removal and not a geological formation.

1.02 SITE INVESTIGATION.

Contractor's Responsibility. Prior to Bid Opening, the Contractor shall carefully examine the site and make all inspections necessary in order to determine the full extent of the work required to make the completed Work conform to the Drawings and Specifications. The Contractor shall

satisfy themselves as to the nature and location of the Work, the conformation and conditions of the existing ground surface, and the character of equipment and facilities needed prior to and during prosecution of the Work. The Contractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the Drawings, or between the Drawings and Specifications must be brought to the Owner's attention in order to clarify the exact nature of the Work to be performed.

1.03 SAFETY.

The Contractor shall familiarize himself with, and shall at all times conform to, the regulations of the "OSHA General Industry Occupational Safety and Health Standards", and "OSHA Safety and Health Regulations for Construction Safety Orders" and "Construction Safety Orders," Article 6 "Excavations, Trenches, Earthwork" of the State of California, Department of Industrial Relations, Division of Occupational Safety and Health (CAL/OSHA).

1.04 ENVIRONMENTAL SAFEGUARDS AND REGULATIONS.

The Contractor shall comply with regulations in force at all times to prevent pollution of air and water.

1.05 QUALITY ASSURANCE.

A. By Contractor. Exercise due care to assure procurement, storage and placement of materials from site or offsite sources which will comply with the requirements, Specifications and standards set out herein. On the recommendation of the Engineer, provide inspection and testing by independent testing services, approved by the owner, engaged and paid for by the Contractor. In this regard, a Soils Engineer will be engaged by the Contractor, who shall act as an independent representative, to perform inspection of the removal and replacement of unsuitable materials, all excavations, and the placement and compaction of all fills and backfills within the limits of earthwork on this Project as required by the project specifications. Costs for all such inspections and tests will be paid by the Contractor.

B. By Engineer. The Engineer, through his project representative(s), will be the onsite arbiter and judge of the acceptability of the Work done, based on such observations and tests he may require or perform.

C. By Owner. The Owner may, confirm the inspection and testing performed by contractor’s Soils Engineer. In this regard, a Soils Engineer will be engaged by the Owner, who shall act as the direct representative of the Owner in soils work, to perform inspection of the removal and replacement of unsuitable materials, all excavations, and the placement and compaction of all fills and backfills within the limits of earthwork on this Project. Costs for all such inspections and tests will be paid by the Owner, except the Contractor shall reimburse the cost of retest and reinspection done by the owner if it is determined that the Contractor’s testing was done incorrectly.

D. Applicable Criteria, Tests and Standards.

1. For Earthwork for Slabs. The Contractor will provide the services of a qualified Soils Engineer to make tests of prepared subgrade and compacted fill. Testing will be at the discretion of the Soils Engineer. The Contractor shall schedule commencement or subgrade preparation per the discretion of the Soils Engineer.
2. For Waste. Material deemed unsuitable by the Soils Engineer from tests or visual inspection, and all material delivered to fill, which cannot be satisfactorily

compacted, shall be wasted in an area, provided by the Contractor, that is acceptable to local authorities.

3. For Clean-up. The Contractor shall remove all rubbish, debris, junk, temporary materials, and any waste excavated materials from the Project Site and dispose of in accordance with all applicable laws, regulations, permits and approvals from Owners and property upon which the material will be disposed. The Contractor shall perform restoration of staging and storage areas and temporary roads to the satisfaction of the Owner, as a condition for acceptance and final payment.

4. Standards for Soil Classification, Properties and Tests

   a. Classification. All earthwork and embankment (including: controlled fill; backfill for trenches; structural fill; structural backfill; road embankment; and borrow) shall be classified in accordance with "Standard Test Method for Classification of Soils for Engineering Purposes" (ASTM D2487).

   b. Physical Properties. All earthwork and embankment shall be tested for specific gravity and moisture content in accordance with "Standard Test Method for Specific Gravity of Soils" (ASTM D854); and "Standard Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures" (ASTM D2216).

   c. Compaction. All moisture density relationships shall be performed in accordance with "Standard Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb: Rammer and 18-in. Drop" (ASTM D1557). This method is known as the ``Modified Proctor Test.'' No other tests will be allowed for determining moisture density relationships.

   d. Nuclear Field Density Tests. Field density or field moisture content testing shall be allowed using ``Standard Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods - Shallow Depth" (ASTM D2922); and ``Standard Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods - Shallow Depth" (ASTM D3017).

   e. Sand-Cone Field Density Tests. Field density of earthwork and embankment shall include tests using "Standard Test Method for Density of Soil in Place by the Sand-Cone Method" (ASTM D1556).

   f. Atterberg Limits. The plastic index and liquid limit of structural fills and structural backfills shall conform to "Standard Test for Liquid Limit, Plastic Limit, and Plasticity Index of Soils" (ASTM D4318).

   g. California Bearing Ratio (CBR). Where required for determining pavement subgrade performance by using the CBR method, use "Standard Test Method for CBR of Laboratory-Compacted Soils" (ASTM D1883).

   h. R-Value. Where required for determining pavement subgrade performance by using the R-Value method, use "Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils" (ASTM D2844).

   i. Expansion Index. Where required to determine the potential expansion of an earthwork or embankment, use the "Expansion Index Test" (UBC Standard 29-2).

1.06 COMPACTION.

The maximum dry density, optimum moisture content and field density of each soil type used in compacted fill, backfill and trench backfill shall be determined as stated above.

1.07 INSPECTION.

A. Observation and compaction tests shall be made by the Soil Engineer during the filling and/or compacting operations so that he can state his opinion that the fill was constructed in accordance with the Specifications. When nuclear field density tests are used, every tenth test shall be duplicated (at the identical location) with a sand cone test to verify accuracy.

B. The Soil Engineer shall make field density tests in the compacted materials below the surface where the surface is disturbed. When these tests indicate that the density of any layer of fill or portion thereof is below the specified density, the particular layer or portion shall be reworked until the specified density has been obtained.

1.08 REQUIREMENTS.

A. General.

1. The Work performed under this Specification shall be constructed to the lines, grades, elevations, slopes and cross sections indicated on the Drawings, specified herein, and/or directed by the Owner in writing. Slopes, graded surfaces, and drainage features shall present a neat, uniform appearance upon completion of the Work.
2. It shall be the Contractor's responsibility (1) to maintain adequate safety measures and working conditions; and (2) to take all measures necessary during the performance of the Work to protect the entire project area and adjacent properties which would be affected by this Work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the Owner. It shall be the Contractor's responsibility to maintain completed areas until the entire project area is in satisfactory compliance with the project Specifications.

B. Utility Protection. Utility lines and structures indicated on the Drawings which are to remain in service shall be protected by the Contractor from any damage as a result of his operations. Where utility lines or structures not shown on the Drawings are encountered, the Contractor shall report them to the Owner before proceeding with the Work. The Contractor shall bear the cost of repair or replacement of any utility lines or structures which are broken or damaged by his operations.

1.09 EXPLOSIVE.

Do not use explosives unless specifically authorized, in writing, by the Engineer.

1.10 GUARANTEE.

Work done under this Section shall in all respects come under the terms of the guarantee stated in the General Conditions.

PART 2 - PRODUCTS

2.01 MATERIALS.

A. Structural/Slab Fill Materials shall consist of select granular material, either imported or manufactured from excavated on-site rocky materials.

1. The select granular material can be import course sand, import "DG" (decomposed granite) or a processed material derived from the on-site excavation. The gradation for select granular soil should fall within the following limits:

Sieve Size	% Finer
1"	100
3/4"	90 - 100
No. 4	50 - 100
No. 30	25 - 55
No. 200	0 - 20
Sand Equivalent:	50 min.

2. All select granular material shall be of quality specified in Subsection 200 of the Standard Specification for Public Works Construction, (Greenbook) latest edition.

B. Crushed Rock. Crushed Rock for the upper blanket of material in open areas shall consist of hard, durable crushed stone, and shall be free from organic material, clay balls, or other deleterious substances. Crushed rock gradation shall be 1-inch size conforming to ASTM test grading "A" as follows:

Sieve Size	Percentage Passing
1-1/2"	100
1"	90 - 100
3/4"	30 - 60
1/2"	0 - 20
No. 4	0 - 5

C. Native Backfill. Native soil prepared as necessary to be free from clods or rocks larger than 2 inches in greatest dimension, and free from organic material.

PART 3 - EXECUTION

3.01 SITE PREPARATION.

A. The Work performed under this Specification shall be constructed to the lines, grades, elevations, slopes and cross sections indicated on the Drawings, specified herein, and/or directed by the Owner. Slopes, graded surfaces, and drainage features shall present a neat uniform appearance upon completion of the Work.

B. It shall be the Contractor's responsibility (l) to maintain adequate safety measures and working conditions; and (2) to take all measures necessary during the performance of the Work to protect the entire project area and adjacent properties which would be affected by this Work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the Owner. It shall be the Contractor's responsibility to maintain completed areas until the entire project area is in satisfactory compliance with the job specification.

C. Utility lines and structures indicated on the Drawings which are to remain in service shall be protected by the Contractor from any damage as a result of his operations. Where utility lines or structures not shown on the Drawings are encountered, the Contractor shall report them

to the Owner before proceeding with the Work. The Contractor shall bear the cost of repair or replacement of any utility lines or structures which are broken or damaged by his operations.

3.02 REMOVALS, CLEARING AND GRUBBING.

A. Protection. Existing items not designated to be demolished or removed shall be protected from damage. Any such item damaged by the Contractor shall be restored or replaced immediately at the Contractor's expense.

B. Debris and Waste Material. All debris and waste material resulting from demolition, clearing, and grubbing shall be removed from the site and disposed of by the Contractor.

C. Clearing. Clearing consists of the complete removal of objectionable materials and obstructions above and below the ground surface including tree stumps, brush, grass, vegetative matter and other objectionable materials within the project limits. All brush and organic material shall be removed before placing any earth fills. It shall be the Contractor's responsibility to save and protect all trees that lie outside the construction area. No trees shall be removed unless approved by owner.

D. Grubbing. Grubbing consists of the complete removal of stumps, including tap roots or lateral roots 1-1/2 inches or more in diameter, and the removal of brush, grass or weeds to depths below the natural ground as specified herein. Stumps shall be grubbed to a depth of 6 inches below the natural ground surface, or to the depths as determined in the field by the Engineer at the time of construction.

3.03 DUST CONTROL.

A. The Contractor shall take all steps possible to prevent and reduce dust arising from the construction activity. He shall have adequate water trucks on the site at all times and water, as necessary, the areas where dust may arise. He shall cooperate fully with the Owner and water immediately, when told to do so. The Contractor shall follow OSHA Standard, 29 CFR 1926. 1153.

3.04 CARE OF DRAINAGE WATER.

A. Contractor shall take care of drainage water from the construction operations, and of storm water and wastewater reaching the construction area from any source, so that no damage will be done to the excavation, pipe or structures. The Contractor shall be responsible for any damages to persons or property on or off the construction site due to such drainage water or to the interruption or division of such storm water or wastewater on account of his operations.

B. Such grading shall be done as may be necessary to prevent surface water from flowing into excavations, and any water accumulating therein shall be removed by pumping or by other approved methods.

3.05 EXCAVATION.

A. General. The Contractor shall perform all excavation necessary or required as shown on the Drawings. The excavation shall include the removal and disposal of all earth materials of whatever nature encountered, which shall include both rock excavation and soil excavation when either or both are present, and shall include the furnishing, placing, and maintaining of shoring and bracing necessary to safely support the sides of the excavations. The Work shall also include all pumping, ditching and other required measures for the removal or exclusion of water.

B. Common Excavation. Common excavation shall consist of all excavation not separately designated.

1. All surfaces to receive compacted fill shall be scarified six inches deep, brought to optimum moisture, and recompacted at 90 percent relative compaction ready to receive a bed of controlled fill as specified.

C. Structure or Slab Excavation. Structure or slab excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature which would interfere with the proper execution and completion of the Work. The removal of such materials shall conform to the lines and grades shown on the Drawings and/or herein specified. Temporary structure excavations shall at all times conform to the Requirements of the State of California, Division of Occupational Health and Safety and pertinent requirements contained in the referenced Soils Investigation Report (if provided).

1. All surfaces to receive concrete slabs-on-grade shall be over excavated and recompacted with a minimum compacted fill thickness of 12 inches at 95 percent relative compaction.
2. Rough grade excavations for structures and footings will be inspected by the Owner to verify that the excavations extend into satisfactory soils and are free of loose and disturbed materials.
3. All surfaces to receive geomembrane shall be free from rocks, stone, cobbles or anything larger than 1" that cannot be compacted and embedded into the subgrade surface. All surfaces to be lined with geosynthetics shall be firm and unyielding with no ruts or irregularities that can cause damage to the liner system. The finish subgrade surface shall be flat, smooth and level with no objects protruding from the surface that can cause damage to the geomembrane liner system. Final inspection on the subgrade surface shall be conducted by the project stakeholders prior to liner deployment.

D. Compaction. Fill material shall be placed in horizontal layers and compacted with power operated tampers, rollers, idlers, or vibratory equipment.

1. Add water to the backfill material or dry the material as necessary to obtain moisture content within 2% of optimum. Employ such means as may be necessary to secure a uniform moisture content throughout the material of each layer being compacted.
2. If the backfill material becomes saturated from rains or any other source because it was not compacted to the specified density or was not backfilled and compacted to the surface grade, through negligence or otherwise, remove the faulty material and replace it with suitable material compacted to the specified density. No additional payment will be made for doing such work or removal and replacement.
3. Compaction of embankment and backfill materials by flooding, ponding or jetting is not permitted

E. Rock Excavation. During excavation, if rock is encountered, and the rock is deemed not rippable with a standard heavy duty excavation equipment, Caterpillar 336 or equal, then this shall be considered a change in scope and contractor shall submit a change order per the General Conditions.

F. Trench Excavation. Trench excavation is not a part of this Section. See Section 02221, "Trenching, Backfilling and Compacting".

3.06 PAVEMENT SUBGRADE.

All Base Course and asphalt concrete pavement shall be underlain by a minimum 12 inch thickness of compacted structural fill. In areas where less than 12 inches of fill or no filling is proposed, the existing grade shall be scarified and the moisture content adjusted to obtain optimum moisture content and recompacted to a depth of at least 12 inches. Compaction shall be a minimum of 95 percent of maximum density at optimum moisture.

3.07 CLEAN-UP.

Upon completion of Work in this Section, all rubbish and debris shall be removed from the job site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.

3.08 DISPOSAL OF SURPLUS AND/OR UNSUITABLE MATERIALS.

Excavated materials which are determined by the Soil Engineer to be unsuitable for use in backfill or compacted fills or excavated material that is in excess of that required to be used for backfill or to construct fills shall be disposed of by the Contractor at his cost.

3.09 CRUSHED ROCK PLACEMENT.

At those locations at which rock is encountered, place a finish blanket of crushed rock in an even layer (of approximately 4 inches thickness) of crushed rock over neatly trimmed, graded and compacted earth.

END OF SECTION 02200