SECTION 02115
EMBANKMENT

PART I: GENERAL

1.1 GENERAL REQUIREMENTS
- A. Construction of embankments with qualified excess excavated material and borrow material.

1.2 MEASUREMENT AND PAYMENT
- A. Unit Prices:
  1. No separate payment will be made for borrow material and handling under this section. Include payment in unit price for excavation or borrow.
  2. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum):
  1. If Contract is Stipulated Price Contract, payment for work in this Section shall be included in Total Stipulated Price.

1.3 REFERENCES
- A. ASTM – American Society for Testing and Materials.
  1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft_3 (600 kN-m/m_3)).
  2. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  3. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- B. CFTS – City of Friendswood Technical Specifications.
- C. TCEQ – Texas Commission on Environmental Quality.
- D. TDSHS – Texas Department of State Health Services.
- E. TRRC – Texas Railroad Commission.

PART II: PRODUCTS

2.1 MATERIALS
- A. Refer to Section 02135 – Excavation For Roadway, for acceptable excess materials from roadway excavation.
- B. Refer to Section 02125 – Excavation and Backfill For Utilities, for acceptable excess materials from utility excavation and trenching.
- C. Refer to Section 02110 – Borrow, for acceptable borrow materials.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify that borrow and excess excavated materials to be reused are approved.

B. Verify that removal and clearing and grubbing operations have been completed.

3.2 PREPARATION

A. Backfill test pits, stump holes, small swales and other surface irregularities. Backfill and compact in designated lift depths to requirements for embankment compaction.

B. Record location and plug and fill inactive water and oil wells. Conform to Texas Department of State Health Services (TDSHS), Texas Commission on Environmental Quality (TCEQ) and Texas Railroad Commission (TRRC) requirements. Notify the Project Manager prior to plugging wells.

C. Excavate and dispose of unsuitable soil and other unsuitable materials which will not consolidate. Backfill and compact to requirements for embankment. Unsuitable soil is defined in Section 02120 – Excavation and Backfill for Structures and Section 02140 – Utility Backfill Materials.

D. Backfill new utilities below future grade. Conform to requirements of Sections 02125 – Excavation and Backfill For Utilities, 02400 – Water Lines, 02500 – Gravity Sanitary Sewers and 02510 – Sanitary Sewer Force Mains.

3.3 PROTECTION

A. Protect trees, shrubs, lawns, existing structures and other features outside of embankment limits.

B. Protect utilities above and below grade, which are to remain.

C. Conform to protection requirements of Section 02135 – Excavation For Roadway.

3.4 PLACING EMBANKMENT

A. Do not conduct placement operations during inclement weather or when existing ground or fill materials exceed three percent (3%) above optimum moisture content. The Contractor may manipulate wet material to facilitate drying by disking or windrowing.

B. Do not place embankment fill until density and moisture content of previously placed material complies with specified requirements.

C. Scarify areas to be filled to minimum depth of four inches (4 In) to bond existing and new materials. Mix with first (1st) fill layer.

D. Spread fill material evenly, from dumped piles or windrows, into horizontal layers approximately parallel to finished grade. Place proper thickness to meet specified compacted thickness. Break clods and lumps and mix materials by blading, harrowing, disking or other approved method. Extend each layer across full width of fill.
E. Each layer shall be homogeneous and contain uniform moisture content before compaction. Mix dissimilar abutting materials to prevent abrupt changes in composition of fill.
F. Layers shall not exceed the following compacted thickness:
    1. Areas indicated to be under future paving or shoulders, to be constructed within six months (6 Mos): six inches (6 In) when compacted with pneumatic rollers or eight inches (8 In) when compacted with other rollers.
    2. Other areas: Twelve inches (12 In).
G. For steep slopes, cut benches into slope and scarify before placing fill. Place increasingly wider horizontal layers of specified depth to level of each bench.
H. Build embankment layers on back slopes, adjacent to existing roadbeds, to level of old roadbed. Scarify top of old roadbed to minimum depth of four inches (4 In) and recompact with next fill layer.
I. Construct to lines and grades shown on the Drawings.
J. Remove unsuitable material and excess soil not being used for embankment from site in accordance with requirements of Section 01580 – Waste Material Disposal.
K. Maintain moisture content of embankment materials to attain required density.
L. Compact to following minimum densities at moisture content of optimum to three percent (3%) above optimum as determined by ASTM D698, unless otherwise indicated on the Drawings:
    1. Areas under future paving and shoulders: Minimum density of ninety-five percent (95%) of maximum dry density.
    2. Other areas: Minimum density of ninety percent (90%) of maximum dry density.

3.6 TOLERANCES
A. Top of compacted surface: Plus or minus one-half inch (±1/2 In) in cross section or in sixteen feet (16 Ft) longitudinally.

3.7 FIELD QUALITY CONTROL
A. Compaction Testing shall be performed in accordance with ASTM D698 or ASTM D2922 and ASTM D3017 under provisions of Sections 01470 – Testing Laboratory Services and 01475 – Quality Control Testing Procedures.

B. A minimum of three (3) tests shall be taken for each one thousand linear feet (1000 Lf) per lane of roadway or five hundred square yards (500 Sy) of embankment per lift at random locations determined by the Project Manager.

C. If tests indicate work does not meet specified compaction requirements, recondition, recompact and retest at no cost to the City.

END OF SECTION