

32 9100 Planting Soil

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INSTRUCTIONS TO THE SPECIFICATION WRITER:

The following document is intended as a general specification to guide the writing of a project-specific specification. Each project is unique and it is required that the specification be developed accordingly. DO NOT USE THE FOLLOWING SPECIFICATION WITHOUT MAKING IMPORTANT ADJUSTMENTS to reflect local conditions, regulations, market standards, project schedules and local and regional practices. The following are specific items that need to be addressed.

1. General instructions for using this specification: *These instructions are intended to guide the specification writer (the specifier) through the process of editing this document into a Planting Soil specification. Be sure to delete these instructions (i.e. all the text in red) before issuing the specifications. Note that there is a watermark on each page identifying this as a draft specification. Be sure to delete this watermark before issuing this document. The watermark is found in Mac versions under the "Insert" pull down in the tool bar and in PC versions under page layout.*

2. General Requirements - Division 01 (Construction Specification Institute) specifications and other contract elements: *This specification is designed to be used in conjunction with standard Division 01 specifications, which cover project general conditions and project wide contract elements. THIS IS NOT A STAND-ALONE SPECIFICATION and should not be used as a contract for the modification, purchase of and installation of planting soil. Important issues of project ownership, liability, insurance, contract language, project controls, Instructions to bidders, change orders and review and approval of the work are normally in the Division 01 specifications.*

3. The construction team: *A construction project is a team effort where the Owner, in effect, creates a partnership with all the Contractors to build a project. As with any good contract there are protections for all parties that the Owner will get the quality of project that they desire within the time limits and budget available; and the Contractor will be paid for the work satisfactorily completed. In between the initial bidding and the final completion there will be many places where parts of the construction do not work out as originally intended. This is normal and a good contract should allow for these changes in a manner that is equitable to both the Owner and the Contractor. To get there, a team approach and spirit must prevail. All parties must assume that each is operating in the best interest of the project goals. The clearer the goals and description of the project, the smoother the flow of a successful project. **The more each of the team members can trust the other members, the better the project.** This should be a critical principle in approaching interpretation of the specification.*

4. Other project documents: *This specification is intended to be used in conjunction with other project documents including the bid forms, the construction contract, Division 1 specifications, other specifications directly related to this section; other specifications that are not directly related to this work and most critically the Project construction drawings. It is very critical that all these documents be prepared with consistent terminology and that they be coordinated. The terms used for the parts of trees and other plants, different soil types, drainage features, irrigation features and structures such as paving, walls and planters must be consistent across disciplines. A very common mistake is the use of different terms and details for soil and the extent of soil work. The terms and details for planting, planting soil, subsoil and other materials must be well coordinated.*

5. Related specification sections: *This specification requires an additional specification section to describe several important related parts of the planting process.*

Tree Protection: *This specification assumes that there is a separate specification section and construction drawings and details for tree protection; remove this section if there are no existing trees to*

be protected on the project.

Planting: This specification assumes that there is a separate specification section and construction drawings for installation of plants.

Irrigation: This specification assumes that there might be a separate specification section for irrigation associated with the project planting.

6. Reviewing and approval authority: Each specification identifies a certain entity as responsible for the review and approval of the work, project submittals, changes to the work and final acceptance of the work. The entity is normally identified in Division 1. For the purposes of this specification, the term the “Owner’s Representative” has been used as a placeholder for this entity. Once the proper term is defined (for example Contracting Officer, The Architect, The Landscape Architect, The Engineer etc.) this term should replace the words “Owner’s Representative” wherever it appears in this specification.

7. Header and footer requirements: Change the header/footer language to meet the project requirements.

8. Note to specifier: Before issuing the document, be sure to remove all “Note to specifier” incorporated into this document in red text after you have read them and responded to the recommendations.

9. Submittals: Submittals are a critical part of any construction contract. This is where all products and materials are reviewed and approved in advance of the work. Planting Soil quality control is in this section. Including very specific requirements for approval of submittals, while a good practice, assumes that the reviewing authority has the skills needed to make these reviews and interpret the results. A common practice is to make very specific requirements but not have the time or expertise to enforce them. Lack of review of submittals does not automatically transfer quality control to the Contractor. In fact, lack of review or inappropriate review can make the reviewing authority responsible for having accepted the submittal even if it was not acceptable. **Do not put into the specification submittal requirements that you do not have the time, resources or knowledge, which you knew or should have known, to enforce.**

10. Specification modifications: There are locations in this specification where additional information is required to reflect project region or contract conditions. Please insert the requested information.

DRAFT

SECTION 32 9100

PLANTING SOIL

PART 1 – GENERAL

1.1 SUMMARY

Note to specifier: Remove parts of this work description that do not apply.

- A. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Planting Soil and /or the modification of existing site soil for use as Planting Soil, complete as shown on the drawings and as specified herein.
- B. The scope of work in this section includes, but is not limited to, the following:
 - 1. Locate, purchase, deliver and install Imported Planting Soil and soil amendments.
 - 2. Harvest and stockpile existing site soils suitable for Planting Soil.
 - 3. Modify existing stockpiled site soil.
 - a. Modify existing site soil in place for use as Planting Soil.
 - b. Install existing or modified existing soil for use as Planting Soil.
 - 4. Locate, purchase, deliver and install subsurface Drain Lines.
 - 5. Fine grade Planting Soil.
 - 6. Install Compost into Planting Soil.
 - 7. Clean up and disposal of all excess and surplus material.

1.2 CONTRACT DOCUMENTS

- A. Shall consist of specifications, general conditions, and the drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.3 RELATED DOCUMENTS AND REFERENCES

- A. Related Documents:

Note to specifier: Coordinate this list with the other related specification sections. Add or delete sections as appropriate.

- 1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
- 2. Related Specification Section
 - a. Section - Planting
 - b. Section - Irrigation
 - c. Section – Lawn
 - d. Section – Tree and Plant Protection
- B. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.
 - 1. ASTM: American Society of Testing Materials cited section numbers.
 - 2. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil

Survey Handbook, title 430-VI. Available Online.

3. US Composting Council www.compostingcouncil.org and http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf.
4. *Methods of Soil Analysis*, as published by the Soil Science Society of America (<http://www.soils.org/>).
5. *Up by Roots: healthy soils and trees in the built environment*. 2008. J. Urban. International Society of Arboriculture, Champaign, IL.

1.4 VERIFICATION

- A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities, and shall immediately inform the Owner's Representative of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Owner's Representative.

1.5 PERMITS AND REGULATIONS

- A. The Contractor shall obtain and pay for all permits related to this section of the work unless previously excluded under provision of the contract or general conditions. The Contractor shall comply with all laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor shall promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.
- B. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth.
- C. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard shall apply or Owner's Representative shall determine which shall govern.
- D. Comply with the requirements of the California code of regulation title 23 waters, division 2 department of water resources chapter 2.7 model water efficient landscape ordinance, 492.5 soil management report.

Note to specifier: Remove the paragraph below if the project is not in California.

1. Where requirements of specification section Planting Soil are more stringent than the California code, the more stringent requirements shall prevail.

1.6 PROTECTION OF WORK, PROPERTY AND PERSON

- A. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to the Contractor's actions.

1.7 CHANGES IN WORK

- A. The Owner's Representative may order changes in the work, and the contract sum adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.
- B. All changes in the work, notifications and contractor's request for information (RFI) shall conform to the contract general condition requirements.

1.8 CORRECTION OF WORK

- A. The Contractor shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Owner's Representative, at the soonest possible time that can be coordinated with other work and seasonal

weather demands but not more than 180 (one hundred and eighty) days after notification.

1.9 DEFINITIONS

Note to specifier: Use the following definitions as needed to define words used in this specification. Delete and words that are not used.

- A. Acceptable drainage: Drainage rate is sufficient for the plants to be grown. Not too fast and not too slow. Typical rates for installed Planting Soil are between 1 - 5 inches per hour. Turf soils are often higher, but drainage rates above 2 - 3 inches per hour will dry out very fast. In natural undisturbed soil a much lower drainage rate, as low as 1/8th inch per hour can still support good plant growth. Wetland plants can grow on top of perched water layers or even within seasonal perched water layers, but could become unstable in high wind events.
- B. Amendment: material added to Topsoil to produce Planting Soil Mix. Amendments are classified as general soil amendments, fertilizers, biological, and pH amendments.
- C. Biological Amendment: Amendments such as Mycorrhizal additives, compost tea or other products intended to change the soil biology.
- D. Compacted soil: soil where the density of the soil is greater than the threshold for root limiting, and further defined in this specification.
- E. Compost: well decomposed stable organic material as defined by the US Composting Council and further defined in this specification.
- F. Drainage: The rate at which soil water moves through the soil transitioning the soil from saturated condition to field capacity. Most often expressed as saturated hydraulic conductivity (Ksat; units are inches per hour).

Note to specifier: The following is a general introduction to soil drainage terminology and is intended for the benefit of the specifier only. Do not include the following information in the completed specifications.

The drainage rate of any soil is also influenced by the drainage rate of the soil lower in the profile. A compacted hard pan or Cliché layer below a free drainage soil can create poor drainage in the upper soil profile. To understand soil drainage one must investigate the total profile. Measured drainage rates are also highly influenced by soil compaction particularly in installed soil. A soil that drains at 1 inch per hour at 200 psi might become anaerobic if compacted to 350 psi. The amount of organic matter also influences drainage particularly if the organic matter is the result of adding Compost to the soil. A little Compost (10% by volume) will almost always increase drainage, but at higher amounts of Compost above 20% by volume will begin to slow drainage in the lower level of the profile because the Compost also holds water. In general it is not advisable to add much Compost to Planting Soil Mixes that are to be placed deeper than 12 inches but lots of Compost can be added to the upper 6 inches of the soil profile.

- G. End of Warranty Acceptance: The date when the Owner's Representative accepts that the plants and work in this section meet all the requirements of the warranty. It is intended that the materials and workmanship warranty for Planting, Planting Soil, and Irrigation (if applicable) work run concurrent with each other, and further defined in this specification.
- H. Existing Soil: Mineral soil existing at the locations of proposed planting after the majority of the construction within and around the planting site is completed and just prior to the start of work to prepare the planting area for soil modification and/or planting, and further defined in this specification.
- I. Fertilizer: amendment used for the purpose of adjusting soil nutrient composition and balance.
- J. Fine grading: The final grading of the soil to achieve exact contours and positive drainage, often accomplished by hand rakes or drag rakes other suitable devices, and further defined in this specification, and further defined in this specification.
- K. Finished grade: surface or elevation of Planting Soil after final grading and 12 months of settlement of the soil, and further defined in this specification.

- L. Graded soil: Soil where the A horizon has been stripped and relocated or re-spread; cuts and fills deeper than 12 inches, and further defined in this specification.
- M. Installed soil: Planting soil and existing site soil that is spread and or graded to form a planting soil, and further defined in this specification.
- N. Minor disturbance: Minor grading as part of agricultural work that only adjusts the A horizon soil, minor surface compaction in the top 6 inches of the soil, applications of fertilizers, installation of utility pipes smaller than 18 inches in diameter thru the soil zone.
- O. Owner's Representative: The person or entity, appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner's Representative may appoint other persons to review and approve any aspects of the work.
- P. Ped: a clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.
- Q. Planting Soil: Topsoil, or Planting Soil Mixes which are imported or existing at the site, or made from components that exist at the site, or are imported to the site; and further defined in this specification.
- R. *Poor drainage: Soil drainage that is slower than that to which the plants can adapt. This is a wide range of metrics, but generally if the soil is turning grey in color it is reasonable preferable to either to plant moisture adaptive plants at smaller sizes that are young in age with shallow root balls or look at options to improve the drainage*
- S. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this specification.
- T. Soil Fracturing: Deep loosening the soil to the depths specified by using a back hoe, and further defined in this specification.

Note to specifier: *The following paragraph is a general introduction to soil fracturing terminology and is intended for the benefit of the specifier only. Do not include the following information in the completed specifications.*

The back hoe method of soil fracturing is more practical in small spaces and can be more selective in areas and depths loosened when constrained by utility lines and structures such as walks, curbing or walls. The back hoe digs into the soil lifting and then dropping the soil immediately back into the hole. The bucket then moves to the adjacent soil and repeats. Optimally, a layer of Compost is spread over the soil before fracturing is begun and the Compost falls into the spaces between the soil chunks created by the effort. The deeper the fracturing and the more compact and dryer the soil the more difficult the operation becomes, but is generally less limited by built objects than soil ripping. Fracturing is not practical when soil moisture is close to or above field capacity. Fracturing leaves the soil surface quite rough with large soil clods. These must be broken by additional tilling. Tilling in more Compost to the surface after fracturing will help create an A horizon soil and/or imported or reused Topsoil can be added on top of the fractured soil.

- U. Soil Horizons: as defined in the USDA National Soil Survey Handbook
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242.
- V. Soil Ripping: Loosening the soil by dragging a ripping shank or chisel thru the soil to the depths and spacing specified, and further defined in this specification.

Note to specifier: *The following is a general introduction to soil ripping terminology and is intended for the benefit of the specifier only. Do not include the following paragraph in the completed specifications.*

Soil ripping requires large heavy equipment to be able to operate in the space. The deeper the ripping and the more compact and dryer the soil the more difficult the operation becomes. Ripping is not practical when soil moisture is close to or above field capacity. Existing shallow utilities such as electric and particularly irrigation lines make ripping near these lines difficult if not impossible.

- W. Soil Tilling: Loosening the surface of the soil to the depths specified with a **rotary tine tilling machine, roto tiller, (or spade tiller)**, and further defined in this specification.

Note to specifier: *The following is a general introduction to soil tilling terminology and is intended for the benefit of the specifier only. Do not include the following information in the completed specifications.*

Compost can be added at the time of tilling. Tilling has the advantage of using more compact equipment that can work in small spaces. The great disadvantage is that even large commercial tillers are limited to about 8 inches maximum tilling depth. Garden tillers typically have a maximum depth of 6 inches. The second disadvantage is that the tines create additional compaction below the tilled soil and drainage will be reduced between the tilled soil and the undisturbed subsoil.

*A new tiller called a **spade tiller** is becoming available that does a better job at breaking the interface between the tilled soil and the subsoil as well as retaining some of the original soil structure. This type of tiller, originally developed for the wine industry, is preferred if one is available.*

As with all soil modification techniques, Soil Tilling is more difficult the more compact and dryer the soil. Soil Tilling is not practical when soil moisture is close to or above field capacity.

- X. Soil trenching: Cutting narrow trenches thru the soil at the depths and spacing specified to loosen the soil profile, and further defined in this specification.

Note to specifier: *The following is a general introduction to soil trenching terminology and is intended for the benefit of the specifier only. Do not include the following paragraph in the completed specifications.*

Where space is limited and soil fracturing is not practical, the soil can be trenched using a standard chain trenching machine. This can cut trenches easily in compacted soil to depths of 30 inches or more. The trenches are dug about 3 feet on center and backfilled with Compost. This improves drainage and over time loosens the soil between the trenches. Trenching is usually combined with additional Compost and surface soil tilling to create a new A horizon. Soil trenching is not practical when soil moisture is close to or above field capacity but not very limited by dry soil conditions.

- Y. Subgrade: surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing Planting Soil.
- Z. Substantial Completion Acceptance: The date at the end of the Planting, Planting Soil, and Irrigation installation (if applicable) where the Owner's Representative accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project, and further defined in this specification.
- AA. Topsoil: naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this specification.
- BB. Undisturbed soil: Soils with the original A horizon intact that have not been graded or compacted. Soils that have been farmed, subjected to fire or logged but not graded, and natural forested land will be considered as undisturbed.

1.10 SUBMITTALS

- A. See the contract General Conditions for policy and procedures related to submittals.
- B. Submit all product submittals eight weeks prior to the start of the soil work.

Note to specifier: *Confirm submittal time above is appropriate for project schedule.*

- C. Product data and certificates: For each type of manufactured product, submit data and certificates that the product meets the specification requirements, signed by the product manufacturer, and complying with the following:
1. Submit manufacturers or supplier's product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and

specific requested testing.

- a. For each Compost product submit the following analysis by a recognized laboratory:
 - 1.) pH
 - 2.) Salt concentration (electrical conductivity)
 - 3.) Moisture content %, wet weight basis
 - 4.) Particle size % passing a selected mesh size, dry weight basis
 - 5.) Stability carbon dioxide evolution rate mg CO₂-C per g OM per day
 - 6.) Solvita maturity test
 - 7.) Physical contaminants (inerts) %, dry weight basis
 - 8.) US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)
 - b. For Coarse Sand product submit the following analysis by a recognized laboratory:
 - 1.) pH
 - 2.) Particle size distribution (percent passing the following sieve sizes):
 - 3/8 inch (9.5 mm)
 - No 4 (4.75 mm)
 - No 8 (2.36 mm)
 - No 16(1.18 mm)
 - No 30 (.60 mm)
 - No 50 (.30 mm)
 - No 100 (.15 mm)
 - No 200 (.075 mm)
- D. Samples: Submit samples of each product and material, where required by Part 2 of the specification, to the Owner's Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only.
1. Submit samples a minimum of 8 weeks prior to the anticipated date of the start of soil installation.
 2. Samples of all Topsoil, Coarse Sand, Compost and Planting Soil shall be submitted at the same time as the particle size and physical analysis of that material.
- E. Soil testing for Imported and Existing Topsoil, existing site soil to be modified as Planting Soil and Planting Soil Mixes.
1. Topsoil, existing site soil and Planting Soil Mix testing: Submit soil test analysis report for each sample of Topsoil, existing site soil and Planting Soil from an approved soil-testing laboratory and where indicated in Part 2 of the specification as follows:
 - a. Submit Topsoil, Planting Soil, Compost, and Coarse Sand for testing at least 8 weeks before scheduled installation of Planting Soil Mixes. Submit Planting Soil Mix test no more than 2 weeks after the approval of the Topsoil, Compost and Coarse Sand. Do not submit to the testing laboratory, Planting Soil Mixes, for testing until all Topsoil, Compost and Coarse Sand have been approved.
 - b. If tests fail to meet the specifications, obtain other sources of material, retest and resubmit until accepted by the Owner's Representative.
 - c. All soil testing will be at the expense of the Contractor.
 2. Submit all testing required by California Code of regulation Title 23 waters, Division 2 Department of Water resources Chapter 2.7 Model Water Efficient Landscape Ordinance, 492.5 Soil Management Report.
Note to specifier: Delete the above paragraph if the project is not in California.
 3. Provide a particle size analysis (% dry weight) and USDA soil texture analysis. Soil testing of Planting Soil Mixes shall also include USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay.
 4. Provide the following other soil properties:
 - a. pH and buffer pH.

- b. Percent organic content by oven dried weight.
- c. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.
- d. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.
- e. Cation Exchange Capacity (CEC).

1.11 SOIL INSTALLATION MOCKUP

Note to specifier: *This section is designed to provide the construction team an opportunity to test means and methods and to record expectations on the finished soil installation. The Owner's Representative must understand enough about soil installation to make an assessment of the mockup and have sufficient observation fee budget to review the work. Mockups add to the cost of the project and this section should be evaluated for its critical nature to the soil installation scope.*

- A. Prior to installation or modification of Topsoil, site soil, Planting Soil, or Planting Soil Mixes, construct at the site, a mockup of each soil type using the means and methods and equipment proposed by the Contractor to complete the work. Installation of the mockup shall be in the presence of the Owner's Representative. The purpose of the mockup is to test the methods of installation and compaction of the soil and to serve as a benchmark for completed soil compaction and serve to calibrate penetrometer readings to the known proctor density of the mockup. The mockup shall be as follows:
 - 1. Following acceptance of the soil submittals, in areas that can be protected from disturbance and further compaction, install mockups of each soil type and soil modification, 20 foot X 20 foot X the full depth of the deepest installation, using the requirements of these specifications. Compaction methods, including the type of compaction equipment and number of passes required to achieve the required compaction, shall be evaluated and results measured.
 - 2. Compaction in the mockup soil shall be tested using the penetrometer. A minimum of four penetrometer readings from each Planting Soil shall be taken at the specified depths of the soil profile. Record the soil moisture at each penetrometer test site. In the event that the penetrometer readings exceed the specified densities, reconstruct the mockup, adjusting the soil density to achieve the desired results. Where the modification requires ripping, tilling or fracturing soils that are over compacted, start the procedure in a new location so that the process is working on soil that is similar to the density of the expected soil.
 - 3. Submit a report of the final methods of soil installation, the penetrometer and soil moisture readings to the Owner's Representative.
 - 4. The mockup area may remain as part of the installed work at the end of the project if protected from further compaction, contamination or other disturbance.
 - 5. Provide a protective 4 foot high fence on metal posts around each mockup to keep all work and equipment from entering the surface of the mockup area.

1.12 OBSERVATION OF THE WORK

- A. The Owner's Representative may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.
 - 1. The Owner's Representative may utilize the Contractor's penetrometer and moisture meter at any time to check soil compaction and moisture.
- B. The Owner's Representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Owner's Representative shall be afforded sufficient time to schedule visit to the site. Failure of the Owner's Representative to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1. SOIL MOCKUP REVIEW: At the time of construction of all soil mockups.
2. EXISTING SOIL CONDITIONS REVIEW: Prior to the start of any soil modification that will utilize or modify the existing soil.
3. EXCAVATION REVIEW: Observe each area of excavation prior to the installation of any Planting Soil.
4. DRAIN LINE INSTALLATION REVIEW: Upon completion of the installation of drain lines and prior to the installation of any Planting Soil
5. COMPLETION of SOIL MODIFICATIONS REVIEW: Upon completion of all soil modification and installation of planting soil.
6. COMPLETION OF FINE GRADING AND SURFACE SOIL MODIFICATIONS REVIEW: Upon completion of all surface soil modifications and fine grading but prior to the installation of shrubs, ground covers, or lawns.

1.13 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction meeting with the Owner's Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1.14 QUALITY ASSURANCE

- A. Installer Qualifications: The installer shall be a firm having at least 5 years of experience of a scope similar to that required for the work, including the preparation, mixing and installation of soil mixes to support planting. The installer of the work in Section: Planting, shall be the same firm installing the work in this section.
 1. The bidders list for work under this section shall be approved by the Owner's Representative.
 2. Installer Field Supervision: When any Planting Soil work is in progress, installer shall maintain, on site, an experienced full-time supervisor who can communicate in English with the Owner's Representative.
 3. Installer's field supervisor shall have a minimum of five years experience as a field supervisor installing soil, shall be trained and proficient in the use of field surveying equipment to establish grades and can communicate in English with the Owner's Representative.
 4. The installer's crew shall be experienced in the installation of Planting Soil, plantings, and irrigation (where applicable) and interpretation of planting plans, soil installation plans, and irrigation plans (where applicable).
 5. Submit references of past projects and employee training certifications that support that the Contractors meet all of the above installer qualifications and applicable licensures.
- B. Soil testing laboratory qualifications: an independent laboratory, with the experience and capability to conduct the testing indicated and that specializes in USDA agricultural soil testing, Planting Soil Mixes, and the types of tests to be performed. Geotechnical engineering testing labs shall not be used.
- C. All delivered and installed Planting Soil shall conform to the approved submittals sample color, texture and approved test analysis.
 1. The Owner's Representative may request samples of the delivered or installed soil be tested for analysis to confirm the Planting Soil conforms to the approved material.
 2. All testing shall be performed by the same soil lab that performed the original Planting Soil testing.
 3. Testing results shall be within 10% plus or minus of the values measured in the approved Planting Soil Mixes.

4. Any Planting Soil that fails to meet the above criteria, if requested by the Owner's Representative, shall be removed and new soil installed.
- D. Soil compaction testing: following installation or modification of soil, test soil compaction with a penetrometer.
1. Maintain at the site at all times a soil cone penetrometer with pressure dial and a soil moisture meter to check soil compaction and soil moisture.
 - a. Penetrometer shall be AgraTronix Soil Compaction Meter distributed by Ben Meadows, www.benmeadows.com or approved equal.
 - b. Moisture meter shall be "general digital soil moisture meter" distributed by Ben Meadows, www.benmeadows.com or approved equal.
 2. Prior to testing the soil with the penetrometer check the soil moisture and penetrometer readings in the mockup soils. Penetrometer readings are impacted by soil moisture and excessively wet or dry soils will read significantly lower or higher than soils at optimum moisture.
 3. The penetrometer readings shall be within 20% plus or minus of the readings in the approved mockup when at similar moisture levels.

1.15 SITE CONDITIONS

- A. It is the responsibility of the Contractor to be aware of all surface and subsurface conditions, and to notify the Owner's Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.
1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner's Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner's Representative of such conditions, they shall remain responsible for plant material under the warranty clause of the specifications.
 2. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.

1.16 SOIL COMPACTION – GENERAL REQUIREMENTS

- A. Except where more stringent requirements are defined in this specification. The following parameters shall define the general description of the threshold points of soil compaction in existing, modified or installed soil and subsoil.

Note to specifier: *All soil has some level of compaction and subsoil is naturally more compacted than Topsoil simply from the static weight of the upper level soil. There are three common ways to measure, quantify and assess levels of compaction that may be used to determine compaction levels.*

1. **Bulk Density Method**

Units - Bulk density lb./cf or g/cc dry weight. Threshold results that determine critical bulk density are different for each soil texture.

Measurement tool - Bulk density cores.

Pro/cons - Requires one day or more per test, accurate, somewhat expensive. Landscape architect can own and operate equipment or hire a soil testing service.

2. **Standard Proctor Method ASTM D 698**

Units - % maximum dry bulk density as tested by the standard proctor method. Threshold results that determine critical bulk density are the same for each soil texture. A proctor test will typically also provide results as Bulk density lb./cf dry weight.

Measurement Tool - Densitrometer

Pro/cons - Moderately slow 10 minutes per test, accurate, expensive, lab test required to determine every specific soil texture's Proctor density curve, readings are impacted by soil organic matter, must hire a soil testing service.

3. **Penetration Resistance Method**

Units – PSI (lb. pressure per sq. in.) Threshold results that determine critical bulk density are somewhat the same for each soil texture.

Measurement tool - Penetrometer

*Pro/cons - Fast less than one minute per test, **not very accurate**. The Owner's representative may interpret the results and require different limits based on soil type, and moisture content at the time the soil is tested.*

Inexpensive, limited by soil moisture and gravel, landscape architect can own and operate equipment, no soil testing service required.

- B. The following are threshold levels of compaction as determined by each method.
1. Acceptable Compaction: Good rooting anticipated, but increasing settlement expected as compaction is reduced and/or in soil with a high organic matter content.
 - a. Bulk Density Method – Varies by soil type see Chart on page 32 in Up By Roots.
 - b. Standard Proctor Method – 75-85%; soil below 75% is unstable and will settle excessively.
 - c. Penetration Resistance Method – about 75-250 psi, below 75 psi soil becomes increasingly unstable and will settle excessively.
 2. Root limiting Compaction: Root growth is limited with fewer, shorter and slower growing roots.
 - a. Bulk Density Method – Varies by soil type see Chart on page 32 in Up By Roots.
 - b. Standard Proctor Method – above approximately 85%.
 - c. Penetration Resistance Method – about 300 psi.
 3. Excessive Compaction: Roots not likely to grow but can penetrate soil when soil is above field capacity.
 - a. Bulk Density Method – Varies by soil type see Chart on page 32 in Up By Roots.
 - b. Standard Proctor Method – Above 90%.
 - c. Penetration Resistance Method – Approximately above 400 psi

1.17 DELIVERY, STORAGE, AND HANDLING

- A. Weather: Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity.
- B. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.
- C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used.
- D. Deliver all chemical amendments in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in a weather protected enclosure.
- E. Bulk material: Coordinate delivery and storage with Owner's Representative and confine materials to neat piles in areas acceptable to Owner's Representative.

1.18 EXCAVATING AND GRADING AROUND UTILITIES

- A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Notification of the *local utility locator service, Insert PHONE NUMBER*, is required for all planting areas. The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the *local utility locator service*.

Note to specifier: Insert the telephone number and correct name of the local utility locator service to the paragraph above if available.

PART 2 – PRODUCTS

Note to specifier: Delete all products not applicable to this specific project. Local conditions for the harvested materials will vary and these specifications may need to be revised to reflect local source requirements, availability, budgets and plants to be grown.

2.1 IMPORTED TOPSOIL

- A. Imported Topsoil definition: Fertile, friable soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1 inch diameter, heavy, sticky or stiff clay, stones larger than 2 inches in diameter, noxious seeds, sticks, brush, litter, or any substances deleterious to plant growth. The percent (%) of the above objects shall be controlled by source selection not by screening the soil. Topsoil shall be suitable for the germination of seeds and the support of vegetative growth. Imported Topsoil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds. Imported Topsoil shall meet the following physical and chemical criteria:

Note to specifier: Make adjustments in the following to account for the fact that these idea soils may not be available in your area.

1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 25%. And a combined clay/silt content of no more than 55%.
 2. pH value shall be between 5.5 and 7.0.
 3. Percent organic matter (OM): 2.0-5.0%, by dry weight.
 4. Soluble salt level: Less than 2 mmho/cm.
 5. Soil chemistry suitable for growing the plants specified.
- B. Imported Topsoil shall be a harvested soil from fields or development sites. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where Coarse Sand, Composted organic material or chemical additives has been added to the soil to meet the requirements of this specification section shall not be acceptable. Retained soil peds shall be the same color on the inside as is visible on the outside.
- Note to specifier:** Make adjustments to the above to account for the fact that these idea soils may not be available in your area. Soil peds may not normally occur, especially where soils have a high sand content.
- C. Imported Topsoil for Planting Soil shall NOT have been screened and shall retain soil peds or clods larger than 2 inches in diameter throughout the stockpile after harvesting.
- D. Stockpiled Existing Topsoil at the site meeting the above criteria may be acceptable.
- E. Provide a two gallon sample from each Imported Topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds intact that represent the size and quantity of expected peds in the final delivered soil.

2.2 COMPOST

- A. Compost: Blended and ground leaf, wood and other plant based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Source material shall be yard waste trimmings blended with other plant or manure based material designed to produce Compost high in fungal material.
1. Compost shall be commercially prepared Compost and meet US Compost Council STA/TMECC criteria or as modified in this section for "Compost as a Landscape Backfill Mix Component".

http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf

2. Compost shall comply with the following parameters:
 - a. pH: 5.5 - 8.0.
 - b. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
 - c. Moisture content %, wet weight basis: 30 – 60.
 - d. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear.
 - e. Stability carbon dioxide evolution rate: mg CO₂-C/ g OM/ day < 2.
 - f. Solvita maturity test: > 6.
 - g. Physical contaminants (inerts), %, dry weight basis: <1%.
 - h. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels.
 - i. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.
- B. Provide a two gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.3 COARSE SAND

- A. Clean, washed, sand, free of toxic materials
 1. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
 2. Coarse Sands shall be clean, sharp, natural Coarse Sands free of limestone, shale and slate particles. Manufactured Coarse Sand shall not be permitted.
 3. pH shall be lower than 7.0.
 4. Provide Coarse Sand with the following particle size distribution:

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100
No 8 (2.36 mm)	80-100
No 16 (1.18 mm)	50-85
No 30 (.60 mm)	25-60
No 50 (.30 mm)	10-30
No 100 (.15 mm)	2-10
No 200 (0.75 mm)	2-5
- B. Provide a two gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.4 FERTILIZER, BIOLOGICAL AND OTHER AMENDMENTS

Note to specifier: *Fertilizers and specialty biological amendment products such as Mycorrhizal amendments or Compost Tea are not generally required or recommended at planting and are not included in this specification. If the project team would like to add any of these amendments, add the product descriptions here. These types of amendments, if used at all, should never be applied without a soil test that documents their need and application rate.*

2.5 LIME

- A. ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
 2. Provide lime in form of dolomitic limestone.
- B. Provide manufacturer's literature and material certification that the product meets the requirements.

2.6 EXISTING SOIL (Acceptable for planting with minimum modifications)

Note to specifier: *If existing soil is to be retained and reused, it is prudent to document the condition of this soil prior to the start of construction. Documentation (called a soil report) should include standard agricultural chemical soil testing, soil profile condition, as well as documenting soil penetration resistance to anticipated rooting depth. Such testing is typically already needed in order to make the decision of reusing this resource and the testing and observations can easily be inserted into this section of the specification.*

Undisturbed soil or soil with minor disturbance to soil profiles (e.g. farming) has at least two of the following attributes:

- A. Site soils not excessively graded or not compacted at root limiting or above.*
- B. Soils previously disturbed have a restored A horizon (min 2.5% organic matter dry weight) at least 6 inches deep and B and/or C horizons that drain and have acceptable compaction.*
- C. Soils are currently supporting mature tree and or large shrub growth with high vitality.*
- D. Sufficient soil volumes meeting the above criteria above rock or other limiting structures to support the proposed plants.*

In addition to the above, the soil organic matter, pH, and chemistry in the A horizon should be suitable for the proposed plants, or may need to be modified if required. In dry climates and sandy soils plants are often adapted to grow in soil with very low organic matter and high pH. Raising the organic matter too high or lowering the pH may negatively impact native or adapted plant performance.

- A. General definition of existing soil: Surface soil in the areas designated on the soils plan as existing soil, that is not altered, compacted to root limiting density, graded or contaminated before or during the construction process and considered acceptable for planting and long term health of the plants specified either as it exists or with only minor modification.
 - 1. The Owner's Representative shall verify that the soil in the designated areas is suitable at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for use as Planting Soil to the point where the soil is no longer suitable to support the plants specified, the Owner's Representative may require modification of the damaged soil up to and including removal and replacement with soil of equal quality to the soil that existed prior to construction. Examples of damage include further compaction, contamination, grading, creation of hard pan or drainage problems, and loss of the O, and or A horizon.
 - a. Do not begin work on additional modifications until changes to the contract price are approved by Owner's Representative.
 - 2. Soil testing results and soil observation notes that describe the pre-construction soil conditions in the existing soil areas are included as an appendix to this specification:

Note to specifier: *Delete the above sentence if no soil test are included.*
- B. Protect existing soil from compaction, contamination, and degradation during the construction process.
- C. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not increase compaction of soil to root limiting levels.
- D. Modifications:
 - 1. When results of soil tests recommend chemical adjustments, till surface soil to six inches or greater after chemical adjustments have been applied.
 - 2. Remove existing turf thatch, ground cover plants and weeds.
 - 3. Provide pre-emergent weed control if indicated.
 - 4. Make chemical adjustment as recommended by the soil test.

2.7 MODIFIED EXISTING SOIL (SOIL SUITABLE FOR PLANTING WITH INDICATED MODIFICATION)

Note to specifier: SOILS PLANS: *This specification assumes that there will be separate set of drawings in the construction documents titled Soils Plans. These plans and details will define the areas on the site where different type of soil modification practices will occur. The plan should be a simple diagram with each type of soil modification keyed to a detail. Details of different modifications are included in the set of details that accompany this set of specifications. Using this method allows a wide range of different modifications to be required such that the modifications can easily fix the existing soil conditions, the expectations for plant performance, the project budget and schedule.*

In the event that there is not a separate Soils Plan, this information can be added to the Planting Plan. On simple sites where one soil modification may be appropriate, the specification could be used without having a plan. If no Soils Plan is included, be sure to remove reference to a Soils Plan from these specifications and replace it with the appropriate reference that defines the limits of soil modification.

A. General definition: Surface soil in the areas designated on the soils plan as Modified Existing Soil has been altered and or graded before or during the construction process but is still considered acceptable for planting and long term health of the plants specified with the proposed modifications. Modifications respond to the soil problems expected or encountered. The Owner's Representative shall verify that the soil in the designated areas is suitable for modification at the beginning of planting bed preparation work in that area.

1. The Owner's Representative shall verify that the soil in the designated areas is suitable for the specified modification at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for modification to the point where the soil is no longer suitable to support the plants specified with the specified modification, the Owner's Representative may require further modification of the damaged soil up to an including removal and replacement with soil of equal quality to the soil that would have resulted from the modification. Damage may include further compaction, contamination, grading, creation of hard pan or drainage problem, and loss of the O, and or A horizon.
2. General requirements for all soil modifications:
 - a. Take soil samples, test for chemical properties, and make appropriate adjustments.
 - b. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not add to the compaction in the soil.
 - c. All soil grading, tilling and loosening must be completed at times when the soil moisture is below field capacity. Allow soil to drain for at least two days after any rain event more than 1 inch in 24 hours, or long enough so that the soil does not make the hand muddy when squeezed.
 - d. Provide pre-emergent weed control after the soil work is complete and plants planted but prior to adding mulch to the surface, if indicated by weed type and degree of threat.

B. Modified existing soil – soil removed, stockpiled, and spread

1. Description of condition to be modified: Existing soil that is suitable for reuse as Planting Soil but is in the wrong place of elevation, or cannot be adequately protected during construction. Soil is to be harvested, stockpiled and re-spread with or without further modifications as indicated.

Note to specifier; *If existing soils are to be harvested and reused, the areas where soil may be reused and the depths of soil harvesting must be described on the drawings and the specifications. This requires that the specifier has site and soil knowledge sufficient to make these decisions. Additionally, one of the greatest limitations on reuse of soil at many projects is finding a suitable place to store the soil during construction. This coordination must be resolved during the design process with the project manager.*

2. Modifications:
 - a. Excavate existing soil from the areas and to depths designated on the drawings. Stockpile in

zones noted on the drawings or in areas proposed by the Contractor.

- 1.) Prepare a soil stock pile plan for approval.
- b. Excavate soil using equipment and methods to preserve the clumps and pedes in the soil. Generally this means using the largest piece of equipment that is practical for the project size and scope.
- c. Protect stock piles from erosion by compacting or tracking the soil surface, covering with breathable fabric or planting with annual grasses as appropriate for the season, location, and length of expected time of storage.
- d. Re-spread soil as required in Part 3 of this specification.

C. Modified existing soil – compacted surface soil (Tilling Option)

Note to specifier: *If the soil problem is limited to surface compaction, one of two options should be considered: Tilling option or Radial Trenching option. Tilling prepares an entire root zone for trees and other plants but is relatively shallow. The radial trenching goes deeper. As the level of compaction increases, these two methods become less effective. Select one of these options based on the project requirements and delete the other or use both options to treat the upper (Tilling) and lower (Trenching) portions of the soil profile..*

1. Description of condition to be modified: Surface soil compaction to a maximum of 6 inches deep from traffic or light grading. Original A horizon may be previously removed or graded but lower profile intact with acceptable compaction levels and limited grading. The soil organic matter, pH and chemistry in the A horizon may not be suitable for the proposed plants and may need to be modified as required.

2. Modifications:

Note to specifier: *A spade tiller is a superior tiller than the standard roto tiller. A spade tiller leaves a soil with larger pedes and less glazing between the loose soil and the subsoil. However these tillers are limited in availability and may be more costly than the conventional tiller. Check with local Contractors before requiring a spade tiller over roto tiller.*

- a. Till top 6 inches or deeper of the soil surface, with a *roto tiller, spade tiller, ripper* or agricultural plow. Spread 2 - 3 inches of Compost on the surface of the tilled soil and make any chemical adjustment as recommended by the soil test.

1.) If spade tillers are to be required, add a paragraph to that effect here.

- b. Till or disk the Compost into the loosened soil. Smooth out grades with a drag rake or drag slip.

D. Modified existing soil – compacted surface soil (Radial Trenching Option)

1. Description of condition to be modified: Surface soil compaction to a maximum of 24 inches deep from traffic or light grading. Original A horizon may be previously removed or graded but lower profile below 24 inches intact with acceptable compaction levels and limited grading. The soil organic matter, pH and chemistry in the A horizon may not be suitable for the proposed plants and may need to be modified as required.

2. Modifications:

- a. Using a trenching machine, dig trenches to the extent and depth shown on the plans and details.
- b. Backfill the trench with the soil removed from the trench. Add additional site soil if needed to fill the trench to be flush to the existing grade after the soil settlement.

E. Modified existing soil – compacted subsoil

1. Description of condition to be modified: Deep soil compaction the result of previous grading, filling and dynamic or static compaction forces. Original A horizon likely removed or buried. The soil organic matter, pH and chemistry in the A horizon is likely not suitable for the proposed plants and should be modified as required.

Note to specifier: *Select one of the following options as appropriate to the constraints at the site, and the project budget. Do not give the contractor the option to select any of the below alternative*

as they are not equal treatments. Soil fracturing is the most effective and may be the most cost effective in small to medium size spaces. Soil ripping is usually the cheapest option but only appropriate in large spaces, approximately ¼ acre or greater, accessible by large size grading machines, and where there are no underground utilities or where limited utility locations can be avoided. Soil trenching is only suitable for spaces where only small sized equipment such as a walk-behind chain trencher can access the area. If different treatments are appropriate for different locations on the same project be clear on the drawings the extent of each treatment.

The Trenching modification below is for compacted soil that is NOT within the root zone of existing trees and is substantially different from the modification “Radial Trenching” described above. The practice of radial trenching within the root zone of an existing tree is not described in this specification.

2. Soil Ripping:
 - a. Step one: After grading and removing all plants and debris from the surface, using a tracked dozer or similar large grading equipment, loosen the soil by dragging a ripping shank or chisel thru the soil to depths of 24 inches with ripping shanks spaced 18 inches or less apart in two directions. The number of shanks per pull is dependent on the degree of soil compaction and the size of the dozer.
 - b. Step 2: Spread 3-4 inches of Compost over the ripped area and till into the top 6 inches of the soil surface.
 3. Soil Fracturing:
 - a. Step one: After grading and removing all plants and debris from the surface, spread 2 – 3 inches of Compost over the surface of the soil. Loosen the soil to depth of 18 - 24 inches, using a backhoe to dig into the soil through the Compost. Lift and then drop the loosened soil immediately back into the hole. The bucket then moves to the adjacent soil and repeats the process until the entire area indicated has been loosened.
 - b. Step 2: Spread 3-4 inches of Compost over the ripped area and till into the top 6 inches of the soil surface.
 4. Trenching:
 - a. Step one: After grading and removing all plants and debris from the surface using a chain trenching machine, dig 24 inch deep trenches, 24 inches apart across the entire area. Maintain an 18-inch standoff from the edges of all curbs, paving and structures. Backfill the trenches with Compost.
 - b. Step 2: Spread 3-4 inches of Compost over the trenches area and till into the top 6 inches of the soil surface. Compost tilling treatment shall extend to the edges of curbs, paving and structures.
 5. Following soil ripping or fracturing the average penetration resistance should be less than 250 psi to the depth of the ripping or fracturing.
 6. Do not start planting into ripped or fractured soil until soil has been settled or leave grades sufficiently high to anticipate settlement of 10 – 15% of ripped soil depth.
- F. Modified existing soil – low organic matter
1. Description of condition to be modified: Low soil organic matter and/or missing A horizon but soil is not compacted except for some minor surface compaction. The soil organic matter, pH and/or chemistry are likely not suitable for the proposed plants and should be modified as required.
 2. Modifications:
 - a. Spread 3 - 4 inches of Compost over the surface of the soil and make chemical adjustment as recommended by the soil test.
 - b. Till Compost into the top 6 inches of the soil.
- G. Modified existing soil – soil within the root zone of existing established trees

Note to specifier: *Any of the above soil conditions may be present within the root zone areas of*

large existing trees to remain but these must be dealt with in a different manner in order to preserve the root system of the tree. Options are limited. On the other hand, usually problems with soil within the root zone of mature trees are limited to the surface 6 - 12 inches of soil. These are most often excess surface soil compaction, chemical changes from applied material, added soil over an existing soil, severed roots, and drainage problems caused by adjacent work that changed drainage patterns. Deep compaction and other deep soil disturbances would likely already have killed the tree or the tree has adapted to the condition.

Modifications to consider:

Surface compaction - There are several methods to remediate excess surface soil compaction within a root zone. The preferred method is to use a pneumatic digging device such as an Air Knife or Air Spade that can loosen soil without significant damage to roots. Compost is added to the soil as part of the loosening process. A specification section on this process is included. Other methods include vertical mulching, radial trenching, surface applications of Compost or mulch, Compost Tea injections into soil, and soil-injected air combined with added material. Each of these has demonstrated limited success depending on the level of compaction and many variables in the process. Due to the complexity of each of these options they will not be included in the specification. Consult a local soils and / or arboricultural expert to develop a specification.

Chemical changes - Changes in soil chemistry due to applications intentional and inadvertent are too complex to determine and remediate to be part of this specification. Consult a local soils and / or arboricultural expert to develop a specification.

Soil added over the root zone - Small amounts of soil added over the root zone may not be a problem for the tree, and leaving it there or mixing with an air knife may be the best option. Often the greatest damage to the tree is caused not by the soil, even at relatively deep layers of soil, but the damage caused by the equipment that brought in the soil or is used to remove the soil. Setting requirements to remediate soil added over the root zone are too complex to be part of this specification. Consult a local soils and / or arboricultural expert to develop a specification.

Drainage problems - The different types of conditions that cause drainage problems and how to remediate them around existing trees are too complex to be part of this specification. Consult a local soils and / or arboricultural expert to develop a specification.

1. Description of condition to be modified: Surface compaction near or above root limited levels in the upper soil horizon the result of traffic or other mechanical compaction.
2. Modifications:
 - a. Remove the tops of all plants to be removed from the root zone. Remove sod with a walk behind sod cutter. Do not grub out the roots of plants to be removed.
 - b. Use a pneumatic air knife to loosen the top 9 – 12 inches of the soil. Surface roots may move and separate from soil during this process but the bark on roots should not be broken
 - 1.) Pneumatic air knife shall be as manufactured by:
Concept Engineering Group, Inc., Verona, PA (412) 826-8800
or
Supersonic Air Knife, Inc., Allison Park, PA (866) 328 5723
 - c. Make chemical adjustment as recommended by the soil test and add 2 - 3 inches of Compost over the soil.
 - d. Using the pneumatic air knife, mix the Compost into the top 6 – 8 inches of the loosened soil.
 - e. Work in sections such that the entire process - including irrigation - can be completed in one day. Apply approximately one inch of water over the loosened soil at the completion of each day's work. Apply mulch or turf as indicated on the drawings within one week of the completion of work.

2.8 PLANTING SOIL MIXES

Note to specifier: The subject of Planting Soil Mixes is quite complex and requires significant

information about the goals of the planting. Mixes can include free draining high use turf planting soil mixes, bio-retention mixes, specialty mixes for palm planting or slow draining mixes designed to reduce water use and maintenance. The specifier will need to design the Planting Soil Mix that is best for each part of the project. The following specification is for a moderately slow draining Mix that would be good for trees and shrubs and can serve as a template for other mixes. The key adjustment for most applications is to change the proportion Topsoil/Coarse Sand and Compost. Local suppliers may also have their own specification or Mix design. These can be inserted into this specification.

Note that the topsoil and planting mix is not to be screened or mixed in a soil blending machine. Screening and blending breaks down important topsoil peds and reduces drainage in the soil. Machine blended and screened mixes typically will require more sand

- A. General definition: Mixes of Existing Soil or Imported Topsoil, Coarse Sand, and or Compost to make a new soil that meets the project goals for the indicated planting area. These may be mixed off site or onsite, and will vary in Mix components and proportions as indicated.
- B. Planting Mix - moderately slow draining soil for trees and shrub beds
 1. A Mix of Imported Topsoil, Coarse Sand and Compost. The approximate Mix ratio shall be:

Mix component	% by moist volume
Imported Topsoil unscreened	45-50%
Coarse sand	40-45%
Compost	10%
 2. Final tested organic matter between 2.75 and 4% (by dry weight).
 3. Mix the Coarse Sand and Compost together first and then add to the Topsoil. Mix with a loader bucket to loosely incorporate the Topsoil into the Coarse Sand/Compost Mix. DO NOT OVER MIX! Do not mix with a soil blending machine. Do not screen the soil. Clumps of Soil, Compost and Coarse Sand will be permitted in the overall Mix.
 4. At the time of final grading, add fertilizer if required to the Planting Soil at rates recommended by the testing results for the plants to be grown.
 5. Provide a two gallon sample with testing data that includes recommendations for chemical additives for the types of plants to be grown. Samples and testing data shall be submitted at the same time.

2.9 PRE-EMERGENT HERBICIDES

Note to specifier: *Pre-emergent herbicides have known environmental impacts. The project team must evaluate the risks and rewards of using chemical treatments to control weeds and consider specifying hand weed removal.*

- A. Chemical herbicides are designed to prevent seeds of selective plants from germinating. Exact type of herbicide shall be based on the specific plants to be controlled and the most effective date of application.
- B. Submit report of expected weed problems and the recommendation of the most effective control for approval by Owner's Representative. Provide manufacturer's literature and material certification that the product meets the requirements.

Note to specifier: *Insert additional products as needed for the specific project requirements.*

Note to specifier: *If soil drainage rates or subsurface conditions indicate that additional drainage beyond modification in needed subsurface drain lines may need to be added.*

There are many pipe options available from heavy duty Schedule 40 PVC pipes to lightweight ABS corrugated flexible pipes. This specification will provide three pipe options. The specifier must select the appropriate pipe from the below list that meets the budget and operational needs of the project and delete the other options. It is advised not to use the corrugated pipe as it is too easily crushed and tends to silt up faster than the other alternatives.

Note that filter fabric socks and other filter cloth applications around the pipe or the pipe bedding material is not include in this specification and is not recommended due to tendency of the filter cloth to clog.

2.10 HEAVY DUTY PIPE DRAIN PIPE

- A. Drain pipe shall be 4 inch diameter, perforated, PVC, Schedule 40 pipe. Holes in the pipe shall only be on the bottom quadrant. All fittings, elbows, unions, T's and screw caps shall be the same material and from the same manufacturer as the pipe. "T" and elbow joints shall be sanitary type connections. All joints shall be solvent welded. Submit manufacturers product literature for approval by the Owner's Representative.
 - 1. When pipe has perforations on all quadrants, drape a 12 inch wide 4 mil plastic sheet over the length of the pipe to force water to the bottom of the pipe.
- B. Clean out: Clean out risers shall be 4 inch diameter Schedule 40 PVC solid pipe compatible with the bottom fitting and clean out screw cap. Elbow fitting at the bottom of the clean out riser. When the cleanout is in the middle of a pipe run the fitting shall be a sanitary T fitting. Screw cap FITTING shall be PVC Schedule 40.

2.11 MEDIUM DUTY PIPE DRAIN PIPE

- A. Drain pipe shall be 4 inch diameter, perforated, PVC, double wall (smooth interior wall / corrugated exterior wall) pipe. Holes in the pipe shall only be on the bottom quadrant. All fittings, elbows, unions, T's and screw caps shall be the same material and from the same manufacturer as the pipe. "T" and elbow joints shall be sanitary type connections. All joints shall be gasketed bell and spigot. Example source A -2000 by Contech Construction Products or approved equal. Submit manufacturers product literature for approval by the Owner's Representative.
 - 1. When pipe has perforations on all quadrants, drape a 12 inch wide 4 mil plastic sheet over the length of the pipe to force water to the bottom of the pipe.
- B. Clean out: Clean out risers shall be 4 inch diameter Schedule 40 PVC solid pipe compatible with the bottom fitting and clean out screw cap. Elbow fitting at the bottom of the clean out riser. When the cleanout is in the middle of a pipe run the fitting shall be a sanitary T fitting. Screw cap FITTING shall be PVC Schedule 40.

2.12 LIGHT DUTY PIPE DRAIN PIPE

- A. Drain pipe shall be 4 inch diameter, perforated, HDPE, single wall corrugated exterior pipe. ASTM F405. All fittings, elbows, unions, T's and screw caps shall be the same material and from the same manufacturer as the pipe. All joints shall be gasketed bell and spigot. Example source ADS Single Wall Pipe by Advance Drainage Systems or approved equal. Submit manufacturers product literature for approval by the Owner's Representative.
 - 1. When pipe has perforations on all quadrants, drape a 12 inch wide 4 mil plastic sheet over the length of the pipe to force water to the bottom of the pipe.
- B. Clean out: Clean out risers shall be 4 inch diameter Schedule 40 PVC solid pipe compatible with the bottom fitting and clean out screw cap. Elbow fitting at the bottom of the clean out riser. When the cleanout is in the middle of a pipe run the fitting shall be a sanitary T fitting. Screw cap FITTING shall be PVC Schedule 40.

PART 3 – EXECUTION

3.1 SITE EXAMINATION

- A. Prior to installation of Planting Soil, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.

1. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under drain lines as shown on the drawings.
 2. Confirm that surface all areas to be filled with Planting Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Planting Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.
 3. Confirm that no adverse drainage conditions are present.
 4. Confirm that no conditions are present which are detrimental to plant growth.
 5. Confirm that utility work has been completed per the drawings.
 6. Confirm that irrigation work, which is shown to be installed below prepared soil levels, has been completed.
- B. If unsatisfactory conditions are encountered, notify the Owner's Representative immediately to determine corrective action before proceeding.
- 3.2 COORDINATION WITH PROJECT WORK
- A. The Contractor shall coordinate with all other work that may impact the completion of the work.
 - B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.
 - C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner's Representative of any conflicts encountered.
- 3.3 GRADE AND ELEVATION CONTROL
- A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.
- 3.4 SITE PREPARATION
- A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.
 - B. Remove all construction debris and material including any construction materials from the subgrade.
 - C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
 - D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.
 - E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
 1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.
 2. Any damage to the paving or site features or work shall be repaired at the Contractor's expense.
- 3.5 SOIL MOISTURE
- A. Volumetric soil moisture level, in both the Planting Soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilt point and below field capacity for each type of soil texture within the following ranges.

Soil texture	Permanent wilting point	Field capacity
Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

- B. The Contractor shall confirm the soil moisture levels with a moisture meter (Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent). If moisture is found to be too low, the planting holes shall be filled with water and allowed to drain before starting any planting operations. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

3.6 EXISTING SOIL MODIFICATION

- A. Follow the requirements for modifying existing soil as indicated in Part 2 for the different types of soil modifications. The extent of the areas of different soil modification types are indicated on the Soils Plan or as directed by the Owner's Representative.

Note to specifier: Note above that it is critical for the contract documents to define the extent of all soil improvement work on a Soil Plan and detail drawing that is part of the contract documents.

3.7 DRAIN PIPE INSTALLATION

1. Trench lines to depths and widths shown on plans.
2. Place 2 – 3 inches Coarse Sand as bedding for pipes.
3. Place pipe (holes facing down) to invert elevations shown on the plan.
 - a. If pipe with holes on all sides is used drape a piece of 4 mil plastic 12 inches wide over top of pipe.
 - b. Cover sides and top of pipe with Coarse Sand with min 4 inches of Coarse Sand cover above top of pipe.
 - c. Backfill trench with Planting Soil compacted to same level as Planting Soil requirements.
4. Add cleanout pipe reaching the surface at the uphill end of each pipe run as shown on drawings.
5. Connect pipes to manhole or daylight outfall as shown on the drawings.

3.8 PLANTING SOIL AND PLANTING SOIL MIX INSTALLATION

Note to specifier: These specifications are not intended to include Planting Soils over architectural structures that are waterproofed. If this condition exists, add special installation instructions in this paragraph.

- A. Prior to installing any Planting Soil from stockpiles or Planting Soil Mixes blended off site, the Owner's Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.
- B. All equipment utilized to install or grade Planting Soils shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6 inch long teeth to scarify any soil that becomes compacted.
- C. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Planting Soil.
 1. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the back hoe or loader bucket, tiller or other suitable device.

2. Immediately install the Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
 3. In the event that the loosened area becomes overly compacted, loosen the area again prior to installing the Planting Soil.
- D. Install the Planting Soil in 12 - 18 inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Planting Soil by dragging the teeth of a loader bucket or backhoe across the soil surface to roughen the surface.
 - E. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of the each bed area.

Note to specifier: *The following 4 paragraphs are not normal to most soil installation specifications but are deemed critical to the process. Be sure that the Owner's Representative is familiar with these requirements during construction observation.*

- F. Where possible place large trees first and fill Planting Soil around the root ball.
- G. Installing soil with soil or mulch blowers or soil slingers shall not be permitted due to the over mixing and soil ped breakdown cause by this type of equipment.
- H. Where travel over installed soil is unavoidable, limit paths of traffic to reduce the impact of compaction in Planting Soil. Each time equipment passes over the installed soil it shall reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil. Comply with the paragraph "Compaction Reduction" (section 3.9) in the event that soil becomes over compacted.
- I. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. The Contractor shall install the Planting Soil at a higher level to anticipate this reduction of Planting Soil volume. A minimum settlement of approximately 10 - 15% of the soil depth is expected. All grade increases are assumed to be as measured prior to addition of surface Compost till layer, mulch, or sod.

3.9 COMPACTION REQUIREMENTS FOR INSTALLED OR MODIFIED PLANTING SOIL

- A. Compact installed Planting Soil to the compaction rates indicated and using the methods approved for the soil mockup. Compact each soil lift as the soil is installed.
- B. Existing soil that is modified by tilling, ripping or fracturing shall have a density to the depth of the modification, after completion of the loosening, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilting point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.
- C. Installed Planting Soil Mix and re-spread existing soil shall have a soil density through the required depth of the installed layers of soil, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilt point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.
- D. Planting Soil compaction shall be tested at each lift using a penetrometer calibrated to the mockup soil and its moisture level. The same penetrometer and moisture meter used for the testing of the mockup shall be used to test installed soil throughout the work.
- E. Maintain moisture conditions within the Planting Soil during installation or modification to allow for satisfactory compaction. Suspend operations if the Planting Soil becomes wet. Apply water if the soil is overly dry.
- F. Provide adequate equipment to achieve consistent and uniform compaction of the Planting Soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction. Use the same equipment and methods of compaction used to construct the Planting Soil mockup.

- G. Do not pass motorized equipment over previously installed and compacted soil except as authorized below.
 - 1. Light weight equipment such as trenching machines or motorized wheel barrows is permitted to pass over finished soil work.
 - 2. If work after the installation and compaction of soil compacts the soil to levels greater than the above requirements, follow the requirements of the paragraph "Over Compaction Reduction" below.

3.10 OVER COMPACTION REDUCTION

- A. Any soil that becomes compacted to a density greater than the specified density and/or the density in the approved mockup shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Planting Soil is installed and approved.
- B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or greater below finished grade.

3.11 INSTALLATION OF CHEMICAL ADDITIVES

- A. Following the installation of each soil and prior to fine grading and installation of the Compost till layer, apply chemical additives as recommended by the soil test, and appropriate to the soil and specific plants to be installed.
- B. Types, application rates and methods of application shall be approved by the Owner's Representative prior to any applications.

3.12 FINE GRADING

- A. The Owner's Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.
- B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 – 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.
- C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.
- D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner's Representative in the event that conditions make it impossible to achieve positive drainage.
- E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.
- F. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and ground cover planting areas shall be a 2 inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1 inch deviation from the plane in 10 feet.

3.13 INSTALLATION OF COMPOST TILL LAYER

Note to specifier: *The following paragraph is critical to building a proper A/O horizon in installed Planting Soil Mixes. This added layer of Compost must be shown on the soil details in the drawings.*

- A. After Planting Soil Mixes are installed in planting bed areas and just prior to the installation of shrub or groundcover plantings, spread 3 – 4 inches of Compost over the beds and roto till into the top 4 - 6 inches of the Planting Soil. This step will raise grades slightly above the grades required in paragraph

“Fine Grading”. This specification anticipates that the raise in grade due to this tilling will settle within a few months after installation as Compost breaks down. Additional settlement as defined in paragraph “Planting Soil and Planting Soil Mix installation” must still be accounted for in the setting of final grades.

3.14 CLEAN-UP

- A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
 - 1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.
- B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner’s Representative seals are to remain on the trees and removed at the end of the warranty period.
 - 1. Make all repairs to grades, ruts, and damage to the work or other work at the site.
 - 2. Remove and dispose of all excess Planting Soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.15 PLANTING SOIL AND MODIFIED EXISTING SOIL PROTECTION

- A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair or replace damaged Planting Soil immediately.
- B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner’s Representative. Planting Soil shall be loosened or replaced at no expense to the Owner.
 - a. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.
 - b. Where modified existing soil has become contaminated and needs to be replaced, provide imported soil that is of similar composition, depth and density as the soil that was removed.

3.16 PROTECTION DURING CONSTRUCTION

- A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers.
 - 1. Maintain protection during installation until the date of plant acceptance (see specifications section – Planting). Treat, repair or replace damaged work immediately.
 - 2. Provide temporary erosion control as needed to stop soil erosion until the site is stabilized with mulch, plantings or turf.
- B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner’s Representative shall determine when such cleaning, replacement or repair is satisfactory. Damage to existing trees shall be assessed by a certified arborist.

3.17 SUBSTANTIAL COMPLETION ACCEPTANCE

- A. Upon written notice from the Contractor, the Owners Representative shall review the work and make a determination if the work is substantially complete.
- B. The date of substantial completion of the planting soil shall be the date when the Owner’s

Representative accepts that all work in Planting, Planting Soil, and Irrigation installation sections is complete.

3.18 FINAL ACCEPTANCE / SOIL SETTLEMENT

- A. At the end of the plant warrantee and maintenance period, (see Specification section - Planting) the Owner's Representative shall observe the soil installation work and establish that all provisions of the contract are complete and the work is satisfactory.
 - 1. Restore any soil settlement and or erosion areas to the grades shown on the drawings. When restoring soil grades remove plants and mulch and add soil before restoring the planting. Do not add soil over the root balls of plants or on top of mulch.
- B. Failure to pass acceptance: If the work fails to pass final acceptance, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owner's Representative.

APPENDIX TO 32 9100 PLANTING SOIL

Existing Soil Test Data

Note to specifier: If existing soil test data is available, add such testing reports in this location. Include a plan of the site designating the extent of the different soil types identified and the location of all soil test pits. If no testing was completed, remove the appendix.

END OF SECTION 32 9100

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