

TECHNICAL SPECIFICATIONS

| | PAGE |
|---|------------|
| <u>DIVISION 1 - GENERAL REQUIREMENTS</u> | (NOT USED) |
| <u>DIVISION 2 - SITE WORK</u> | |
| SECTION 02100 - CLEARING AND GRUBBING..... | 1-3 |
| SECTION 02210 - SITE EARTHWORK | 1-8 |
| SECTION 02221 - TRENCH EXCAVATION AND BACKFILL..... | 1-2 |
| SECTION 02270 - TEMPORARY SOIL EROSION CONTROL | 1-2 |
| SECTION 02444 - CHAIN-LINK FENCING | 1-2 |
| SECTION 02609 - ELECTRONIC MARKERS FOR POTABLE AND NON-POTABLE WATER SYSTEMS | 1-2 |
| SECTION 02718 - NON-POTABLE WATER SYSTEM | 1-3 |
| <u>DIVISION 3 - CONCRETE</u> | (NOT USED) |
| <u>DIVISION 4 - MASONRY</u> | |
| SECTION 04410 - GROUTED RUBBLE PAVING | 1-4 |
| <u>DIVISION 5 - METALS</u> | (NOT USED) |
| <u>DIVISION 6 - WOOD AND PLASTICS</u> | (NOT USED) |
| <u>DIVISION 7 - THERMAL AND MOISTURE PROTECTION</u> | (NOT USED) |
| <u>DIVISION 8 - DOORS, WINDOWS, GLASS</u> | (NOT USED) |
| <u>DIVISION 9 - FINISHES</u> | (NOT USED) |
| <u>DIVISION 10 - SPECIALTIES</u> | (NOT USED) |
| <u>DIVISION 11 - EQUIPMENT</u> | (NOT USED) |
| <u>DIVISION 12 - FURNISHINGS</u> | (NOT USED) |
| <u>DIVISION 13 - SPECIAL CONSTRUCTION</u> | (NOT USED) |
| <u>DIVISION 14 - CONVEYING SYSTEMS</u> | (NOT USED) |
| <u>DIVISION 15 - MECHANICAL</u> | (NOT USED) |
| <u>DIVISION 16 - ELECTRICAL</u> | (NOT USED) |

DIVISION 2 - SITE WORK

SECTION 02100 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.

1.02 WORK INCLUDED

- A. Furnish all labor, materials, equipment and tools necessary to accomplish all clearing and grubbing work as indicated on the plans and as specified herein.
- B. It shall be the responsibility of the Contractor to examine the project site and determine for himself the existing conditions.
- C. Obvious conditions of the site existing on the date of the bid opening shall be accepted as part of the work, even though they may not be clearly indicated on the plans and/or described herein or may vary therefrom.
- D. All debris of any kind accumulated from clearing or grubbing shall be disposed of off-site weekly and the whole area left clean. The Contractor shall be required to make all necessary arrangements related to the proposed place of disposal.
- E. Burning onsite will not be permitted.

1.03 EWA VILLAGES GOLF COURSE NOTIFICATION: Contractor shall notify the golf course manager in writing at least two weeks before start of any work in the golf course.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 SEQUENCE OF WORK: All sequence of work shall be subject to the approval of the Construction Manager.

3.02 PROTECTION

- A. Adequate precautions shall be taken before commencing and during the course of the work to insure the protection of life, limb and property.
- B. The Contractor shall protect from damage all surrounding structures, trees, plants, grass, walks, pavements, utility boxes, etc. Any damages will be repaired or replaced by the Contractor to the satisfaction of the Construction Manager.

- 3.03 PERMITS: The Contractor shall apply for and obtain the necessary permits prior to the commencement of work. The Contractor shall pay for all fees.
- 3.04 BARRICADE: Erect temporary barricade to prevent people and animals from entering the project area, to the extent as approved by the Construction Manager. Such barricades shall not be less than 5'-0" in height. The extent of barricades may be adjusted as necessary with the approval of the Construction Manager. This work shall be accomplished to the satisfaction of the Department and at no extra cost to the Department. Barricades shall be removed upon completion of work and job site premises left clean.
- 3.05 MAINTAINING TRAFFIC
- A. The Contractor shall conduct operations with minimum interference to streets, driveways, sidewalks, etc.
 - B. When necessary, the Contractor shall provide, erect and maintain lights, barriers, etc., as required by traffic and safety regulations with special attention to protection of life.
- 3.06 CONSTRUCTION LINES, LEVELS AND GRADES
- A. The Contractor shall verify all lines, levels and elevations indicated on the plans before any clearing, excavation or construction begins. Any discrepancy shall be immediately brought to the attention of the Construction Manager and any change shall be made in accordance with his instruction. The Contractor shall not be entitled to extra payment if he fails to report the discrepancies before proceeding with any work whether within the area affected or not.
 - B. All lines and grades shall be established by a Surveyor licensed in the State of Hawaii.
- 3.07 CLEARING AND GRUBBING
- A. The Contractor shall clear and grub and remove the top 8 inches from the entire area within the area to be graded, all rubbish, grass and weeds, stumps, large roots, buried logs, garbage, boulders and other unsuitable material. Where soft wet soils are encountered, light equipment should be used.
 - B. Any stumps and roots larger than 3 inches in diameter shall be removed to a depth not less than 18 inches below the original grade level. Fill voids with select fill to maintain indicated grade.

- C. No excavation or filling shall be undertaken until area has been cleared and grubbed.
- 3.08 CONTRACT ZONE LIMITS: The Contract Zone Limits shown on the plans indicate only in general the limits of the work involved. The Contractor, however, is required to perform any and all necessary and incidental work which may fall outside of these demarcation lines.
- 3.09 VERIFICATION OF EXISTING GRADES: Verify existing grades, inverts, and improvements before any clearing and grubbing work is done. Protect existing culvert outlet and GRP headwall. Immediately bring to the attention of the Construction Manager any discrepancy, and make any changes in accordance with his instructions. Starting of clearing and grubbing operations will be construed to mean that the Contractor agrees that the existing grades, inverts, and improvements are essentially correct as indicated. No extra compensation will be allowed if existing grades, inverts, and improvements are in error after verification thereof or if he fails to report the discrepancies before proceeding with any work.
- 3.10 CLEAN-UP: Clean up and remove all debris accumulated from construction operations from time to time, when and as directed by the Construction Manager. Upon completion of the construction work and before final acceptance of work, remove all surplus materials, equipment, etc., and leave entire job site clean and neat.

END OF SECTION

SECTION 02210 – SITE EARTHWORK

PART 1 – GENERAL

1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.

1.02 WORK INCLUDED: Furnish all labor, materials, services, equipment and related items necessary to excavate, fill, remove, transport, stockpile and dispose of all materials within the limits of the project required to construct the site work improvements in accordance with these specifications, dimensions, sections and details shown on the plans, and the approval of the Department.

1.03 RELATED WORK IN OTHER SECTIONS

Trench Excavation and Backfill.....Section 02221
Temporary Soil Erosion Control.....Section 02270

1.04 SUBSURFACE SOIL DATA: Subsurface soil investigations have been made at the project site. A copy of the complete report entitled “Revised Preliminary Geotechnical Exploration Report – Proposed East Kapolei Phase II Development Study Area I, Honouliuli, Ewa, Oahu, Hawaii,” dated June 2009, prepared by PSC Consultants LLC is available with these bid documents provided at the DHHL website. Test pit and boring logs are shown in the soils report.

The Contractor is expected to examine the site and the record of soil investigation and decide for himself the character of materials to be encountered. The Engineer will not assume responsibility for variations of subsoil quality or condition at locations other than places shown and at the time investigations were made.

The soils report and its recommendations are made part of these specifications.

1.05 PROTECTION

A. Erosion Control: The Contractor shall incorporate into his work schedule the Temporary Erosion Control Measures and the Permanent Erosion Control procedures indicated on the plans and as specified in the contract.

B. Dust Control: Every effort shall be made by the Contractor to keep dust to a minimum. Spraying the ground with water or other means of control shall be used wherever possible. The Contractor shall have an adequate supply of water for moisture conditioning of fill material.

Without limiting the generality or applicability of other indemnity provisions of the contract, the Contractor agrees that he shall indemnify and hold harmless the Department from and against all suits, actions, claims, demands, damages, costs and expenses (including but not limited to attorney's fees) arising out of any damage to any property whatsoever or injury to any person whomsoever, in any way caused or contributed to by dust from the Contractor's operations.

- C. Existing Utilities and Work Areas: The Contractor shall be responsible for the protection of existing surface and subsurface utilities and poles within and abutting the project site, trench excavations and other work areas.
- D. Finished Grades and Subgrades: All subgrades shall be kept moist until covered by concrete rubble paving. All finished grades shall be kept moist until covered by landscaping or other permanent groundcover. Where shrinkage cracks are noted after compaction of the subgrade or finished grade, the subgrade or finished grade shall be rescarified, moisture-conditioned to above the optimum moisture content, and recompact to the specified requirement at no additional cost to the Department. During construction, the Contractor shall properly grade and maintain all excavated surfaces to provide positive drainage and prevent ponding of water. In the event that ponding of water caused softening of the subgrades, the Contractor shall remove the soft soils and shall backfill the excavation with select granular fill and compact, as specified, at no additional cost to the Department.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General Fill: On-site material shall consist of material excavated from within the project limits that is found below the stripped organic material layer. This excavated material may be stockpiled at the location indicated on the plans if approved by the Geotechnical Engineer. Roots, trees, branches, and all other organic matter missed during the clearing and grubbing operations shall be removed from the fill materials. The Contractor shall coordinate the haul route with the Construction Manager of the DHHL East-West Road.
- B. Organic Topsoil (Stripped Material): Subsequent to acceptable clearing and grubbing, remove the top 8 inches of organic material laden topsoil as required. This material shall be used for topsoil after grading onsite and any excess shall be disposed of off the site.

2.02 GRASSING

A. General Description: The Contractor shall provide all materials, equipment, and labor necessary to complete the work. Slope control planting shall consist of hydro-mulch seeding with vegetative cuttings as required, fertilizing graded and disturbed areas, and shall include continuous care and maintenance in accordance with these specifications.

B. Materials

1. Seed: Grass seed for hydro-mulching shall be freshly improved and hulled Bermuda grass (*Cynodon dactylon*). Seed quality shall have a minimum purity of 97 percent, minimum germination of 85 percent and weed content not exceeding ½ percent.
2. Fertilizer: Commercial fertilizer generally used for hydro-mulching shall be 13-34-10 pelletized fertilizer or equal during the grassing operation and the maintenance period. However, it shall be the responsibility of the Contractor to decide the analysis and ratio, quantity, method and frequency of application to insure sufficient nutrients for the sustained growth of the grasses specified.
3. Mulch: Mulch for hydro-mulching shall be specially processed fiber containing no growth or germination inhibiting components. After addition and agitation in the hydraulic equipment with fertilizers, grass seed, water and other additives not detrimental to plant growth, the fibers shall form a homogeneous slurry. When hydraulically sprayed on the soil, the fiber shall form a blotter-like groundcover which readily absorbs water and allows infiltration to the underlying soil. Mulch shall be applied at the minimum rate of 1,500 pounds per acre.
4. Water
 - a. The Contractor shall furnish and pay for all water required for planting and during period of maintenance.
 - b. The Contractor shall furnish all labor, materials and equipment necessary to install all temporary water lines, valves, etc., and upon completion of the work shall remove all such equipment.

C. Planting Methods

1. Soil Preparation

- a. The top layer of soil on the slope face shall be fertile and shall permit a normal growth of grass. It shall be free of extraneous materials harmful to plant growth.
- b. Slope areas incapable of supporting plant growth shall have topsoil spread and be compacted prior to grassing operations.
- c. The soil profile shall be wetted to a depth of 4 to 6 inches.

2. Fertilizing: Apply fertilizer evenly onto the soil surface at the minimum rate as required by analysis.

3. Planting by Hydro-Mulching

- a. Broadcast stolons at a minimum rate of 4 bushels per 1,000 square feet.
- b. Apply the seed, fertilizer and mulch with approved hydraulic equipment using seed at a minimum rate of 3 pounds per 1,000 square feet and mulch at a minimum rate of 1,500 pounds per acre.
- c. Areas inaccessible to hydro-mulching applications shall be seeded, fertilized and mulched by approved hand methods.

D. Maintenance

1. Initial: Maintenance shall commence simultaneously with hydro-mulching operations and includes watering, fertilizing, mowing, insect and disease control and protection.

2. Watering

- a. After planting, the ground shall be continuously kept moist for the first 14 days.
- b. When the grass begins to cover, reduce the frequency of watering and increase the length of the watering period.
- c. Watering shall be done in a manner that will prevent erosion due to excessive application of water. Watering equipment shall be of a type that will prevent damage to the planted areas.

- d. The Contractor shall repair erosion caused by excessive rainfall or watering, at no cost to the Owner.
 - 3. Mowing: Grass shall be mowed and not taller than 1-inch in height.
 - 4. Inspect and Disease Control: Regular inspections shall be made; if required, suitable insecticide or fungicide treatment shall be applied.
 - 5. Protection: Planted areas shall be protected against traffic by providing proper safeguards as needed. Repair and replant damaged areas promptly.
 - 6. Repair: The Contractor shall replant and fertilize areas failing to show sufficient growth to produce a satisfactory stand of grass at the time of final inspection.
- E. Acceptance: Maintenance of the plant material shall continue for 60 calendar days and/or until 95 percent minimum plant coverage is uniformly established and the work is approved and accepted by the Construction Manager and the City.

PART 3 – EXECUTION

3.01 MASS GRADING

- A. Notification of Schedule: The Construction Manager shall be notified by the Contractor after clearing and grubbing and before any fill is placed and also at least two weeks in advance before grading operations are scheduled to begin. Further, the Contractor shall advise the Construction Manager of the proposed overall schedule for earthwork operations.
- B. General: All cuts and fills to be constructed shall be monitored by a licensed geotechnical consultant (soils engineer) retained by the Owner who shall approve all foundation preparation, fill material, methods of placing and compaction and perform field density tests during the grading. Written approval shall be issued upon completion of cuts and fills. No deviation from these specifications shall be made except upon the written approval of the Construction Manager and/or other public agencies having jurisdiction.

C. Preparation of Subgrades for Areas to Receive Fill

1. Firm Competent Soils: After clearing and grubbing in fairly level areas and removal of 8 inches of topsoil containing organic materials, the area shall be proofrolled to locate soft and yielding spots. The surface to receive fill shall be scarified to a depth of 6 inches until free of large clods, moisture-conditioned to at least 2 to 3 percent above the optimum moisture content, and compacted to at least 90 percent of the maximum dry density established by ASTM D1557-91.
2. Soft Wet Soils: Soft, yielding or pumping areas shall be overexcavated to firm natural material and stabilized by backfilling with select material placed in 8-inch thick level lifts, moisture-conditioned at least 2 to 3 percent above optimum moisture content and compacted to 90 percent relative compaction.

- D. Soil Fill Placement and Compaction: After completion of the subgrade preparation, general fills or imported borrow materials shall be brought to at least 2 percent above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 90 percent of the maximum dry density established by ASTM D1557-91.

Each lift of non-expansive select material shall be brought to above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 90 percent of the maximum dry density established by ASTM D1557-91.

Each lift of fill shall be thoroughly compacted complete to the edge before the next layer is laid thereon. Compaction shall be obtained with the use of conventional compaction equipment designed for the intended purpose. The incidental compaction achieved by the passage of hauling units over the fill will not be considered adequate.

Each lift of fill material shall be brought to at least 2 to 3 percent above the optimum moisture content to permit compacting the specified requirements. If the soil moisture content is too high or too low, the soil moisture content shall be adjusted by suitable means before placement. Compaction of each lift of fill (including slopes, berms, etc.) shall be continued until the density as determined by field tests reaches a value of at least 90 percent of the maximum indicated by the aforementioned methods. The embankments shall be overfilled past the design slope and then cut back.

In all cases where the existing ground surface is steeper than five horizontal to one vertical, the existing ground shall be keyed and benched into the underlying stiff soils when fill is placed on the sloping ground surface.

- E. Excavations: All excavation shall be made to the lines and grades as shown on the project plans. All excavation shall be inspected and approved by the geotechnical engineer. Where conditions encountered require, he shall direct the necessary modifications to be made.

Suitable material from excavation shall be used in the fill, and unsuitable material free of organic material from excavation shall be disposed of offsite.

- F. Slopes: For fill slopes consisting of granular materials (six inches or less in size) and cut slopes, maximum slopes of two horizontal to one vertical (2:1) shall be used. Fill slopes shall be constructed by overfilling and cutting back to the required slope ratio.
- G. Drainage: Care shall be exercised during grading so that areas involved will drain properly. Water shall be prevented from running over the slopes by the temporary berms or drainage swales. Runoff diversion by ditches shall be completed in the time specified in the Proposal.
- H. Field Testing: The Construction Manager shall be notified seven (7) days prior to the start of grading. A pre-grading conference shall be held between the parties involved so as to discuss methods of operations, site problems and scheduling. Field density tests shall be taken by the geotechnical engineer retained by Contractor.
- I. Supervision: At all times, the Contractor shall have a responsible field superintendent on the project in full charge of the work with authority to make decisions. He shall cooperate with the Construction Manager in carrying out the work. Any instructions given to him by the Construction Manager shall be considered to have been given to the Contractor personally.
- J. Rainy Weather: No fill shall be placed, spread or rolled during unfavorable weather. When the work is interrupted by rain, operations shall not be resumed until field tests by the Construction Manager indicate that conditions will permit satisfactory results.
- K. Unforeseen Conditions: If unforeseen or undetected soil conditions such as soft spots, existing utility trenches, structure foundations, voids or cavities, boulders, seepage water or expansive soil pockets, etc. are encountered, the Contractor at his sole expense shall make all necessary corrective measures in the field as such conditions are detected.

- 3.02 UNSUITABLE EXCAVATED MATERIAL: The Contractor shall remove from the site all unsuitable excavated material unless specified otherwise by the Construction Manager. The unsuitable material not containing organic material shall be hauled and disposed of offsite. Unsuitable material containing organic material shall be disposed of off-site, unless otherwise specified.

Removal, including hauling and disposal, of the unsuitable material will not be paid for directly, but shall be considered incidental to the project.

END OF SECTION

SECTION 02221 – TRENCH EXCAVATION AND BACKFILL

PART 1 – GENERAL

- 1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.
- 1.02 WORK INCLUDED: Furnish all labor, materials, tools, equipment, and related items necessary for excavating and backfilling trench for sewer trunk main and appurtenances in conformity with the dimensions, profiles, sections, and details shown on the plans. Work shall be governed by Section 302 of the Water System Standards as amended herein. The Contractor shall be solely responsible for the means, techniques, procedures and sequences for bracing and shoring the excavation.
- 1.03 SUPPLEMENTS: All excavated material shall be unclassified regardless of its composition, whether soil, solid rock, coral, asphalt pavement, concrete, rubbish, or other material.

The installation of sheeting shall be done in a manner that will not cause settlement or disturbances of the pipe cushion or crushed rock cradle material.

All existing ground, roadways, and other improvements damaged, destroyed, or disturbed shall be, at the Contractor's expense, replaced, reconstructed, and restored in kind to an equal or better condition satisfactory to the Construction Manager.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Trench Backfill: Trench backfill shall consist of on-site material which does not contain more than 50 percent rocks, hard lumps of earth of 6 inches in greatest dimension, adobe or other deleterious material or in accordance with the following section of the DPW Standard Specifications, as revised, except as amended on the plans and/or in the specifications herewith:

BorrowSection 16

- B. Crushed Rock Trench Stabilization: Crushed rock trench stabilization material conforming to DPW Standard Specification Section 15 – Crushed Rock shall be graded ranging in size from 2-1/2 to 3/4 inches wrapped in geotextile fabric.
- C. Geotextile Fabric: Geotextile fabric shall be Mirafi 140N non-woven polypropylene fibers or equal.

- D. Cushion Material: Cushion material shall be crusher screening "S4C" conforming to BWS Standards Section 302 – Water Mains and Appurtenances.

Cushion material shall be placed 6 inches below the pipe to 12 inches above the pipe.

PART 3 - EXECUTION

- 3.01 EXCAVATION: Excavation shall be done in accordance with Section 302 - Water Mains and Appurtenances of the BWS Standards.
- 3.02 TRENCH BOTTOMS: After the trench bottoms are inspected by the BWS Inspector or Engineer and if found to be unsuitable, the Contractor shall conduct additional excavation in accordance with Section 302.07 – Mud Removal and Crushed Rock Trench Stabilization of the BWS Standards.

The depth of the crushed rock trench stabilization shall be determined by the BWS Inspector or Geotechnical Engineer but not be more than 24 inches as shown by the BWS Standard Detail P10. Payment for additional excavation shall be a contingent item and shall include all costs for excavation, crushed rock and geotextile fabric.

- 3.03 TRENCH BACKFILL: Trench backfill shall be placed in level lifts of not more than 8 inches in loose thickness and moisture-conditioned to within 2 percent wet of optimum moisture content. Fine-grained soils shall be compacted to at least 90 percent relative compaction, and granular soils shall be compacted to at least 95 percent relative compaction determined in accordance with ASTM D1557.

END OF SECTION

SECTION 02270 – TEMPORARY SOIL EROSION CONTROL

PART 1 – GENERAL

- 1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.
- 1.02 WORK INCLUDED: Furnish all labor, materials, services, equipment and related items necessary to implement the temporary erosion control measures, submitted separately, as required by these specifications and as ordered by the Construction Manager during the life of the contract to control water pollution through the use of berms, stabilized entrance pad, silt fences, and other erosion control devices or methods.
- A. Temporary erosion and siltation control measures as described herein shall be applied to any erodible material within this project, including local material sources and work areas.
 - B. The Contractor shall be responsible for providing the necessary erosion control measures which are shown on the plans or which may be ordered by the Construction Manager. Trenching operations shall be performed in conformance with the applicable provisions of the “Water Pollution Control and Water Quality Standards” contained in the “Public Health Regulations,” State Department of Health.
 - C. The Contractor shall be responsible for promptly (next day after storms) removing all silt and debris resulting from his work and deposited in drainage facilities, roadways, neighboring lands, and other areas.
- 1.03 SUBMITTALS: Submit three (3) sets of the erosion control materials for approval by the Construction Manager.
- 1.04 RELATED WORK IN OTHER SECTIONS

Trench Excavation and Backfill.....Section 02221

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Silt Fences: To be Mirafi 140N or equal filter fabric installed as shown on the drawings.
- B. Stabilized entrance pad to be constructed as shown on the drawings.

PART 3 – EXECUTION

3.01 TEMPORARY EROSION CONTROL

- A. The Construction Manager has the authority to limit the area exposed by trenching operations. The Construction Manager may also direct the Contractor to provide immediate or temporary pollution control measures to prevent contamination of drainage channels and pipes, roads, neighboring lands, and other areas.

Except for specified measures which may be shown on the plans, the Contractor shall determine the appropriate erosion control measures to use. Such work may involve the construction of temporary berms and the use of temporary mulches, mats, and grassing, or the construction and use of other control devices or methods as necessary to control erosion.

- B. The Contractor shall incorporate all erosion control measures shown in the plans. The erosion controls may be modified as necessary to adjust to conditions that develop during construction. All modifications are subject to approval by the Construction Manager.
- C. The Contractor shall limit the surface area exposed by trenching and stockpiling trench excavated material to that which is necessary for him to perform the next operation and which is within his capability and progress in keeping the backfilling and silt fence installation and other such pollution control measures current.
- D. The Contractor shall, at the end of each work operation in any one day, shape the trench excavated material in such a manner as to control and direct the runoff to minimize the erosion of soils.
- E. The temporary erosion and siltation control measures outlined in these specifications are minimum requirements and shall not preclude the provision of any additional measures which the Contractor may deem necessary. Damages caused by the erosion of soils and the pollution of downstream areas shall be the responsibility of the Contractor and all costs for repairing, correcting, replacing and cleaning damaged or polluted facilities shall be borne by the Contractor.

END OF SECTION

SECTION 02444 – CHAIN-LINK FENCING

PART 1 - GENERAL

- 1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.
- 1.02 WORK INCLUDED: This Section includes the installation of new fencing on the existing golf course perimeter fence. Work shall be governed by Section 54 – Chain-Link Fence of the DPW Standard Specifications and DPW Standard Detail R-19.
- 1.03 GENERAL REQUIREMENTS
- A. Coordinate with other trades so that all inserts and attachments are properly set and that adequate provision is made for embedding this work, where required, in the rough stone work.
 - B. Submittals: Submit the following in accordance with the Special Provisions.
 - 1. Shop Plans: Submit shop plans for approval.

PART 2 - PRODUCTS

- 2.01 MATERIALS: All new, with physical and chemical characteristics equal to or better than those required herein.
- A. Fabric: Steel chain-link fabric. The top edge of all fence fabric shall be knuckle finished and the bottom shall be barbed selvage.
 - B. Posts and rails: The base material for the manufacture of steel pipe used for posts, braces, top rail braces, top rail, and gate frames shall conform to ASTM A120. Sizes of posts, rails and braces shall be called for in the DPW Standard Specifications or as indicated on the plans.
 - C. Fittings, Wires, and Rods: All fittings and hardware shall be galvanized. Couplings shall be of the outside sleeve type and at least 7 inches long. Tension wires shall be at least 7-gage galvanized coil spring wire. Ties to fasten the fabric to posts, rails and gate frames shall be not less than 12-gage galvanized steel.

Truss of tension rods used in trussing gate frames and line posts adjacent to end corner, slope, or gate posts shall be adjustable 3/8-inch galvanized steel rod.
 - D. Repair of Galvanized Surfaces: All surfaces cut, broken, burned, or abraded shall be coated with “Galvalloy,” “Galvicon,” or an approved equal.

- E. Concrete for footings shall be "Class B" as specified in Section 39-Portland Concrete Cement of the DPW Standard Specifications.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Line posts shall be spaced at not more than 10-foot intervals and shall be placed vertically plumb. Pull posts shall be installed at slope breaks.
- B. All posts shall be set in Class "B" concrete footing as shown in the DPW Standard Detail R-19. The top of the footings shall be crowned ½-inch high to drain water away from the post.
- C. End, corner and slope posts shall be braced to the midpoint of the nearest line post or posts with horizontal braces used as compression members and line posts trussed from the brace back to the bottom of the end, corner or slope post with 3/8-inch rods with turnbuckles. Change in line or grade where the angle of deflection is 30 degrees or more shall be considered as corner and slope points, respectively; and corner or slope posts shall be installed at these points. Unless specified, all fences shall be installed with top rail and bottom tension wire.
- D. On the existing golf course fence line, Contractor shall attach the new fence fabric between the recently installed corner posts after the concrete footings have gained sufficient strength to withstand the tension of installing the fabric. New line posts and fabric shall be installed through the GRP overflow spillway. The fabric shall follow the shape of the overflow spillway with the bottom of the fabric being 2 inches above the finished GRP nominal elevation.

- 3.02 CLEANUP: Clean up and remove all debris accumulated from construction operations from time to time, when and as directed by the Construction Manager. Upon completion of the construction work and before final acceptance of work, remove all surplus materials, equipment, etc.

END OF SECTION

SECTION 02609 – ELECTRONIC MARKERS FOR POTABLE AND NON-POTABLE WATER SYSTEMS

PART 1 – GENERAL

- 1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.
- 1.02 WORK INCLUDED: Furnish all labor, materials, tools and equipment necessary for the installation and testing of electronic markers over plastic pipe and concrete jackets for "locating" purposes.

Electronic markers shall be installed in lieu of copper toning wire along all new mains 4-inches and larger including non-potable water mains and fire hydrant and meter laterals.

PART 2 – PRODUCTS

- 2.01 MATERIALS: Electronic markers shall be the "Omni Marker," manufactured by Tempo, or approved equal.

| Application | Color | Frequency | Model Number | UPC Number |
|------------------------|--------|-----------|--------------|------------|
| Potable Water Main | Blue | 145.7 kHz | 161 | 60766 |
| Non-Potable Water Main | Purple | 66.35 kHz | 168 | 11050 |

PART 3 – EXECUTION

- 3.01 PLACEMENT: The electronic markers shall be hand placed in the trench, centered over the pipe and covered with sufficient base course material to prevent shifting prior to backfilling of the trench. Installation shall be at a minimum depth of 2 feet and a maximum depth of 3 feet from finish grade.
- 3.02 LOCATION: Installation of electronic markers shall be in accordance with the following:
- A. One marker at all changes in horizontal alignment (e. g., bends, deflection couplings and deflections at joints).
 - B. One marker 10 feet prior to and one marker 10 feet after a change in horizontal alignment unless markers are required within the 10-foot distance.
 - C. On straight runs, markers shall be placed at a maximum distance of 40 feet.

- D. One marker at the end of all mains and at all permanent cleanouts.
 - E. Markers at the beginning and ending of all concrete jackets.
- 3.03 TESTING: Contractor shall test the electronic markers prior to installation to verify proper operation. Construction Manager shall verify the number and locations of placed electronic markers before final paving of the project. Contractor shall record marker locations on the "as-built" drawings.
- 3.04 PAYMENT: Payment for electronic markers will be made at the Unit Price Bid based on the actual amount installed.

The Unit Price Bid for electronic markers shall be full compensation for all labor, materials, tools and equipment necessary for furnishing and installing electronic markers and all other incidentals required to complete the work.

END OF SECTION

SECTION 02718 – NON-POTABLE WATER SYSTEM

PART 1 – GENERAL

- 1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.
- 1.02 WORK INCLUDED: Furnish all labor, materials, tools, equipment and related items necessary to complete, in place, the potable water system in conformity with the dimensions, profiles, sections, and details shown on the plans. Work shall be governed by the Water System Standards, Board of Water Supply, City and County of Honolulu, et al., State of Hawaii, 2002,” hereinafter referred to as the BWS Standards.
- 1.03 SUBMITTALS:
- A. Manufacturer’s certificates that pipe materials were sampled, tested and inspected, along with test results.
 - B. Manufacturer’s installation instructions for PVC and ductile iron pipes and fittings.

PART 2 – PRODUCTS

- 2.01 MATERIALS: All materials shall conform to the BWS Standards, unless herein specified.
- A. Non-potable water pipe shall be polyvinyl chloride (PVC), DR 18, conforming to AWWA C905. Pipes shall be colored, Pantone 522 or equal. The pipes shall be integrally stamped/marked “CAUTION: RECYCLED WATER – DO NOT DRINK.” The stamping/marking shall be on the top of the pipe.
 - B. Purple identification tape, color index 77742 Violet #16, Pantone 512 or equal, shall be installed on top of concrete jackets longitudinally and shall be centered on the concrete jacket. The identification tape shall be prepared with white or black printing on a purple field conforming to the above color, having words “CAUTION: RECYCLED WATER – DO NOT DRINK.” The width of the tape shall be at least three (3) inches in width. The tape shall be continuous in its coverage on the jacket and shall be fastened to the jacket no more than ten (10) feet apart.
 - C. Fittings: Ductile iron fittings shall comply with AWWA C110, AWWA C111 and AWWA C115. Fittings shall be colored purple, color index 77742 Violet #16, Pantone 512 or equal. Fitting interiors shall be lined with polyethylene complying with ASTM D1248. Lining shall be 40 mils thick (nominal); 35 mils minimum.

- D. Ductile iron pipes shall be Class 52. Ductile iron pipes shall be colored purple, color index 77742 Violet, Pantone 512 or equal. Ductile iron pipes shall be lined with polyethylene complying with ASTM D1248. Lining shall be 40 mils thick (nominal); 35 mils minimum.

All ductile iron pipes, valves and fittings shall be wrapped with two layers of 8 mils polyethylene wrap. Polywrap shall be colored purple, color index 77742 Violet #16, Pantone 512 or equal. Alternatively, instead of purple polywrap, purple identification tape can supplement polywrap provided it complies with requirements listed under PVC pipe. Payment for the exterior polyethylene wrap shall be incidental to the price for ductile iron pipe and fittings.

- E. Frames and covers of manholes, valve boxes and meter boxes shall comply with the requirements of the BWS Standards, except all castings with the wording "WATER" shall be modified to read "RECYCLED WATER." The covers shall be provided with a 24-inch long galvanized steel coil chain, 3/16-inch with 12 links per foot, and welded to the frame and cover.
- F. Paint Schedule: Unless otherwise specified, all new exposed and existing metal, masonry or concrete surfaces and all miscellaneous items shall be coated using the systems specified in the Approved Materials List in Section 402 of the BWS Standards or approved equal.

PART 3 – EXECUTION

- 3.01 INSTALLATION: The installation, testing and acceptance of water lines shall be governed by the BWS Standards.

The Construction Manager shall be responsible for precisely laying out the various utility lines shown on the contract plans as provided elsewhere in these specifications. The location shown on the contract plans of the various existing utility lines which the new lines are to cross over or under or connect to were determined on the basis of the best information available; however, no assurance can be provided that the actual locations will be precisely as shown on the contract plans.

In performing all work, the Contractor shall exercise due care and caution necessary to avoid any damage to and impairment in the use of any existing utility lines. Any damage inflicted on existing lines resulting from the Contractor's operations shall be immediately repaired and restored as directed by the Construction Manager at the Contractor's expense.

Connections to or the lowering or relocation of existing mains shall be done by the Contractor in accordance with the BWS Standards. The Contractor shall furnish all necessary pipe, fittings, appurtenances and other incidental materials.

Trenching, pipe cushion and backfilling for the water main shall be in accordance with the BWS Standards.

The Contractor shall coordinate the connection of the new water line with the Construction Manager. The Contractor shall inform the Construction Manager a minimum of one week prior to the date of the actual connection. The inverts shown on the plans are approximate only, and the Contractor shall adjust the slope of the new water line as necessary to construct a fully functional and acceptable system. The Contractor shall ensure that all piping, fittings, materials, tools, equipment and incidentals are at the site and ready for connection.

- 3.02 Install non-potable water electronic markers as specified in Section 02609 – Electronic Markers for Potable and Non-Potable Water Systems.
- 3.03 IDENTIFICATION PAINTING: All above approved items, interiors of vaults and boxes and accessible items shall be colored purple, color index 77742 Violet #16, Pantone 512 or equal, in accordance with Section 303.27 Painting, of the Water Standards. Payment for painting will not be made directly but shall be a part of the unit price for the item of which it is a part.

END OF SECTION

DIVISION 4 - MASONRY

SECTION 04410 – GROUTED RUBBLE PAVING

PART 1 - GENERAL

1.01 GENERAL CONDITIONS: The General Conditions and Special Conditions preceding these specifications shall govern this section of the work.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Mortar and Grout Materials: Portland cement, masonry cement, mortar cement, lime and admixtures shall be stored in such a manner as to prevent deterioration or contamination with foreign matter. Cement which has become caked, partially set or otherwise deteriorated, or any material which becomes damaged or contaminated, shall be rejected.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Paving stones shall be clean, durable, free from seams or other imperfections. When tested under AASHTO Test Method T96, it shall show a wear not to exceed 50%. It shall have a minimum specific gravity of 2.4. The paving stones shall be at least 1/8 cubic foot in volume and have a minimum unit weight of 155 pounds per cubic foot.

Stones generated from on-site grading operations shall be initially used as long as it conforms to the criteria hereinabove. If on-site grading operations do not generate an adequate quantity of stones for the grouted rubble paving work, stones shall be imported as required if stones are not available at the designated borrow site. Stones to be used for this purpose shall be approved by the Geotechnical Engineer.

- B. Mortar or grout shall consist of one part cement to three parts fine aggregate and shall meet the requirements as provided in DPW Standard Specifications Section 39 "Portland Cement Concrete."
- C. Hydrated lime shall conform to the ASTM C207, Type S. Hydrated lime shall be added to the mortar and the quantity shall not exceed the recommendations of the manufacturer.

- D. Water used in mixing mortar or grout shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that may be deleterious to either the mortar or reinforcement. Non-potable water shall not be used.
- E. Preformed fillers for joints shall conform to the requirements of ASTM D944. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint.

PART 3 - EXECUTION

- 3.01 GENERAL: The Contractor shall use stones that are available from on-site grading operations. Stones shall be of the shape and size shown on the plans and grouted in place.
- 3.02 BEDDING: Excavate in accordance to DPW Standard Specifications Section 13 "Structure Excavation and Backfill." Free foundation bed of brush, trees, stumps, roots, debris and other objectionable materials, and dress to smooth surface.

Compact bed until relative compaction is not less than 90 percent and finish to smooth surface. Prior to laying stones, provide 3-days' notice to Construction Manager for inspection of foundation bed. Begin laying stones only after foundation is acceptable to the Construction Manager.

Moisten bedding material with water. Wet stones before laying.

The proportioning of materials for grout shall be by volume and done in such manner that the specified proportions can be controlled and accurately maintained. Fine aggregate shall be measured in a damp loose condition. Mixing shall be by a mechanical batch mixer for at least 5 minutes for grout, but for not more than 10 minutes. Hand mixing shall be permitted only for small batches of 3 cubic feet or less.

- 3.03 STONES: Stones shall be placed in a manner to produce a well-graded mass of rock with minimum practicable percentage of voids and shall be constructed to the lines and grades shown on the plans.

Wet stones before laying them in a full bed of grout having stiff consistency. Stones shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the filter material. Placement shall begin at the bottom of the areas to be covered and continue up slope. Use selected stones and shape roughly to make joints between 1/4 inch and 1/2 inch in width. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. The finished grouted rubble paving shall be free from objectionable pockets of small stones and clusters of larger stones. Finish surfaces shall not deviate more than 3/8 inch with a 10-foot straightedge. Placing stones in layers will not be permitted. Placing

stones by dumping it at the top of the slope and pushing it down the slope will not be permitted. No equipment shall be operated directly on the completed stone protection system. The Contractor shall maintain the stone protection until accepted by the Construction Manager and any material displaced prior to acceptance and due to the Contractor's negligence shall be replaced at not cost to the State.

- 3.04 GROUTING OF STONES: Grout shall be batched and mixed in sufficient quantities to prevent cold joints. Rock shall be flushed with water to remove fines from the rock prior to placing the grout. Rock shall be kept moist just ahead of the actual placing, but no flowing or standing water shall be present during the grouting operation.

Grout placement shall not be permitted when weather conditions prevent proper placement.

Grout placed on nearly level areas may be placed on one course. On slopes, the grout shall be placed in two (2) courses in successive lateral strips approximately 10 feet in width starting at the toe of the slope and progressing to the top. The flow of the grout shall be directed with brooms, spades or baffles to prevent it from flowing excessively along the same path and to assure that all intermittent spaces are filled. Sufficient barring shall be done to loosen tight pockets of stones and otherwise aid the penetration of grout so that all voids shall be filled and the grout fully penetrates the stones. All brooming shall be uphill and after the grout has stiffened, the entire surface shall be rebroomed to eliminate runs, to fill voids caused by sloughing, and to remove grout from the top surface and pockets or depressions of the upper stones.

Beginning immediately after placement and continuing for at least 7 days, all grout shall be cured and protected from premature drying, mechanical damage and exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available at the site. After completion of any strip or panel, no workman or other load shall be permitted on the grouted surface for a period of 24 hours. Exposed surfaces shall be kept continuously moist for the entire period, or until curing compound is applied.

- 3.05 EXPANSION JOINTS: Expansion joints shall consist of a vertical expansion joint filler in a butt-type joint as shown in the plans. The expansion joint shall be continuous, shaped to the subgrade. Preformed joint filler shall be furnished in the maximum lengths available. Damaged or repaired joint filler shall not be used.

The expansion joint filler shall be held in a vertical position. An approved installing bar or other device shall be used if necessary to ensure proper grade and alignment during placing and furnishing of the stone and grout. Finish joints shall not deviate in horizontal alignment more than 1/4 inch from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

- 3.06 MEASUREMENT AND PAYMENT: Grouted rubble paving shall be measured for payment by the square foot. Payment for grouted rubble paving shall be made at the unit price bid and shall be full compensation for furnishing all materials, tools, equipment, and labor to construct the work, including bedding excavation and preparation, weep holes and wrapped filter material.

END OF SECTION