

SECTION 02370

EROSION CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

The goal of this work is to establish vigorous stands of California native grasses that provide erosion control and wildlife habitat for areas damaged by construction work. The work shall consist of installing native grass seeding and/or live plugs and vegetation maintenance of all disturbed and constructed soil areas within this contract. The contractor shall be responsible for seeding all disturbed and constructed soil areas within the limits of construction and all off-site soil areas disturbed during site work, using specified native grasses. All necessary labor, materials, equipment, and services shall be provided by the Contractor for the site preparation, installation, and maintenance of all sites and grasses.

1.1.1 Planting Zone Definitions: Areas within the following zones are to be planted with specified native grass mix (see 2.1.1.2 Seed Species and Planting rates).

1.1.1.1 Lower Level Moist Zone

This zone begins at +3.5 feet NGVD on the transition slope from the marsh plain terrace to the flood plain terrace and includes designated areas within the flood plain terrace lower than +5 feet NVGD(see plan). This zone is located within the two year floodplain. Ten percent of higher high water tidal elevations will influence this zone (see 11111 tidal data).

1.1.1.2 Upper Level Moist Zone (Flood Plain Terrace and Lower Dike)

This includes all designated zones within the floodplain terrace (generally above +5 NVGD), lowered dike excavation areas above +5 feet NVGD and the lower 3 feet of all dike structure slopes (see plan). This zone is located within the two year floodplain. One percent of high high water tidal elevations will influence this zone (see 11111 tidal data).

1.1.1.3 Upper Level Dry Zone (Upper Dike structure)

This zone is found on the land and water sides of dike and berm structures, above the upper level moist zone, on the dry slopes, benches, and right-a-ways. This zone shall not include areas designated for structural or infrastructural construction(see plan).

1.1.2 Planting Method

Where practical and feasible, drill seeding methods shall be utilized in all locations covered in this contract. The contractor shall report all areas unsatisfactory for drill seeding to the contracting officer. Broadcast seeding methods shall be utilized in areas approved by the Contracting Officer.

1.1.2.1 Saltgrass (*Distichlis spicata*)

Saltgrass shall be planted by either broadcasting rhizomes or live plug methods.

1.2 QUALIFICATIONS

All work shall be done by an experienced Contractor familiar with California native grasses and its horticulture, industry methods and standards for native grass seeding. The Contractor shall employ modern equipment and state of the art methods and techniques. The Contractor shall have a minimum of 2 years of applicable on the job experience with native grass seeding, live plugs, weed control and long term vegetation maintenance.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ARICULTURAL MARKETING SERVICE (AMS)

AMS-01 Amended thru: Aug.. 1988) Federal Seed Act Regulations (Part 201-202)

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1909 (Basic) Fertilizer

FEDERAL SPECIFICATIONS (FS)

FS O-F-241 (Rev D) Fertilizers, Mixed, Commercial

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Schedules

Seeding Equipment List; GA.

A list of proposed seeding and mulching equipment to be used in performance of seeding operation, including descriptive data and calibration tests.

SD-08 Statements

Delivery; GA.

Delivery schedule, at least 10 days prior to the intended date of the first delivery.

SD-13 Certificates; GA

Certificates of compliance certifying that materials meet the requirements specified, prior to the delivery of materials. Certified copies of the reports for the following materials shall be included:

Seed; GA.

For each species random samples from unopened and labeled containers: percent pure live seed, minimum percent germination, dormant and hard seed, maximum percent weed seed content, date tested and state certification. Certification of seeds by the Association of Official Seed Certifying Agencies (AOSCA) through the California Crop Improvement Association (CCIA) is encouraged.

Rhizomes: GA;

For collection location, date, species, and weed content

Fertilizer; GA.

For chemical analysis, composition percent.

Straw Mulch; GA.

Harvest date and location, species, and weed content.

1.5 SOURCE INSPECTION

Seed suppliers are subject to inspection of methods, materials, and processing. Contractor shall provide supplier names and addresses upon award of contract.

1.6 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.6.1 Delivery

1.6.1.1 Protection

Seeds, rhizomes, fertilizers, and all other materials shall be protected from weather and contamination during delivery.

1.6.1.2 Live Plugs

Schedule delivery of plants as close to plant installation as possible

1.6.2 Inspection

Seed and rhizomes shall be inspected upon arrival at the job site by the Contracting Officer for conformity to species and quality in accordance with paragraph 2.1 MATERIALS. Other materials shall be inspected for meeting specified requirements. Unacceptable materials shall be removed from the job site and replaced by the Contractor.

1.6.3 Storage

Materials shall be stored in areas approved by the Contracting Officer. Seed and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical and herbicide treatment materials shall not be stored with other landscape materials. Mulch shall be kept covered from rain.

1.6.3.1 Live Plugs

Live plugs shall be stored in a protective area. Plants shall be watered regularly to keep plant roots moist and vigorous.

1.6.4 HANDLING

1.6.4.1 Materials

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Seed

2.1.1.1 Seed Classification

State-approved seed of the latest season's crop shall be provided in original sealed packages. Labels shall be in conformance with AMS-01 Amended thru: Aug.. 1988) and applicable state seed laws. AOSCA/CCIA certifications for seeds are encouraged(see 1.4 SUBMITTALS).

2.1.1.2 Seed Species and Planting Rates

The following native grass seeds shall be applied at the following Pure rates.

2.1.1.2.1 Upper level Dry Zone Mix

<u>Botanical Name</u>	<u>Common Name</u>	<u>Pure Live Seed/lb</u>	<u>Drilled lbs./ac</u>	<u>Broadcast lbs./ac</u>
Bromus carinatus	California Brome	64,000	2	5
Elymus glaucus	Blue Wildrye	110,000	5	6
Leymus triticoides	Creeping Wildrye	99,000	3	5
Hordeum californicum	California Barley	125,000	5	10
Nassella pulchra	Purple Needlegrass	50,000	5	5
Nassella cernua	Nodding Needle Grass	100,000	2	4
Melica californica	california Oniongrass	200,000	6	6
		Total:	28	41

2.1.1.2.2 Upper Level moist Zone Mix

<u>Botanical Name</u>	<u>Common Name</u>	<u>Pure Live Seed/lb</u>	<u>Drilled lbs./ac</u>	<u>Broadcast lbs./ac</u>
Deschampsia cespitosa	Tufted Hairgrass	800,000	4	5
Elymus trachycaulus majus	Yolo Slender wheatgrass	65,000	5	10
Hordeum				

brachyantherum salt	Meadow Barley Salt	60,000	8	12
Leymus triticoides	Creeping Wildrye	99,000	6	8
Muhlenbergia rigens	Deer Grass	400,000	4	6
	Total:		27	41

2.1.1.2.3 Low Level Moist Zone Mix

<u>Botanical Name</u>	<u>Common Name</u>	<u>Pure Live Seed/lb</u>	<u>Drilled lbs./ac</u>	<u>Broadcast lbs./ac</u>
Deschampsia cespitosa	Tufted Hairgrass	800,000	5	5
*Distichlis spicata (Rhizome)	Saltgrass	XX	XX	#
Festuca rubra Molate	Molate Fescue	296,000	5	5
Hordeum brachyantherum salt	Meadow Barley Salt	60,000	7	11
Leymus triticoides	Creeping Wildrye	99,000	5	8
Muhlenbergia rigens	Deer Grass	400,000	3	3
Sporobolus airoides	Alkali Sacation	750,000	5	5
	Total:		30	37

* See revegetation plan for zone location of Distichlis spicata planting

Contractor shall consult with contracting officer on recommended rhizome rates to fulfill satisfactory planting stand requirements (see section 02957 REVEGETATION ESTABLISHMENT)

2.1.1.3 Quality

Weed seed shall not exceed 1 percent by weight of the total of each species. Wet, moldy, insect infested, or otherwise damaged seed shall be rejected and removed from project site. Open containers of seed or improperly tagged containers will be rejected and removed from project site.

2.1.1.3.1 Sampling

For all seeds or containers, it is the option of the government to take random samples for each species, and require the Contractor to provide analysis of samples at no extra cost to the government.

2.1.1.4 Seed Mixing

The field mixing of seed shall be performed on site in the presence of the Contracting Officer.

2.1.2 Live Plugs

2.2.2.1 Plug Seed/Division Classification

Live plug cells shall be between 2 1/4" X 2 1/4" and 6" X 6" X 4 or a size approved by the contracting officer

2.1.2.2 Plug Species and planting Rates

The following species shall be applied at the following densities. Areas and zones shall be as designated and defined on the revegetation plans

2.1.2.2.1 Low Moist Soil Zone

<u>Botanical Name</u>	<u>Common name</u>	<u>Live Plugs/1000 sq. ft</u>
Distichlis spicata	Saltgrass	44*

*Number is based on an average cluster (containing 11 plugs) spaced an average distance of 12 feet (see 3.3.4 Live Plug Planting)

2.1.2.3 Propagating

Process and germinate or divide grass seedling plugs into cells/ flats, tree bands or leach tubes. Grow a minimum top size of 2 inches or with developed root system that holds together when removed from container.

2.1.2.4 Processing

Transport and plant within 2 weeks of reaching optimum size. Prune tops as necessary to prevent flowering of plants

2.1.3 Fertilizer

Fertilizer shall be commercial grade, free flowing, uniform in composition and conforming to FS O-F-241 and CID A-A-1909. The use, composition and quantity of fertilizer shall be determined by contractor provided soil test and contracting officers approval(see 3.1.2 Soil Conditions and 3.3.6 Fertilizer).

2.1.4 Compost (Optional substitution for fertilizer)

Compost shall be derived from green material consisting of chipped, shredded or ground vegetation or clean processed recycled wood products, or a Class A, exceptional quality biosolids compost, as required by US EPA, 40 CFR, part 503c regulations, or a combination of green material and biosolids compost. The compost shall be processed or completed to reduce weed seeds, pathogens, and deleterious material and shall not contain paint, petroleum products, herbicides, fungicides, or other chemical residues that would be harmful to plant or animal life. Other deleterious material such as plastic, glass, metal or rocks shall not exceed 0.1 percent by weight or volume. A minimum internal temperature of 135 degrees F shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum 90 days curing period after the 15 day thermophilic compost process has been completed. Compost shall be screened through a minimum 3/8 inch screen. The moisture content of the compost shall not exceed 25%. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal compost with a maximum moisture content of 25%. Compost usage shall be approved by the Contracting Officer prior to site application.

2.1.5 Mulch

Mulch shall be free from noxious weeds and seeds, mold, and other deleterious materials.

2.1.5.1 Straw Mulch

Straw shall be stalks from, in order of preference: native grasses, wheat,

barley, or rice furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment. Wheat or barley straw if used shall not be derived from dry farmed cereal crops.

2.1.5.2 Organic Tackifier

Organic tackifier shall be of psyllium or guar composition and applied in a liquid form with green dye as per manufacturer specifications.

2.1.6 Herbicides

All herbicides shall be State and County approved for land or aquatic applications. All work shall be done by a licensed applicator. Apply as per manufacturer, State, and/or Agriculture Extension specifications and recommendations.

2.1.6.1 Pre-Emergents Herbicides

Pre-Emergents Herbicides: diuron, chlor-sulfuron, pendamethalin, or approved others.

2.1.6.2 Broadleaf Herbicides

Broadleaf Herbicides: 2-4D, MCPA, bromozynil, or approved others.

2.1.6.3 General Contact Herbicides

General Contact Herbicides: Glyphosate based spraying or wicking.

2.1.7 Equipment

The contractor shall utilize equipment needed to satisfy the requirements of the specification. Equipment shall be approved by the contracting officer.

PART 3 EXECUTION

3.1 PLANTING TIMES AND CONDITIONS

3.1.1 Seeding and Planting Time Windows

The contractor shall be responsible for coordinating all site preparation and seeding operations with daily/monthly tidal cycles and seasonal water levels(see 11111tidal data).

3.1.1.1 Drill Seeding (Till or No-Till)

Seed shall be drill seeded within the August to December planting window.

3.1.1.2 Broadcast Seeding

Seeding shall be applied within the August to December planting window.

3.1.1.3 Live Plug Plantings

Timed after the first measurable rain when site soil will maintain moisture; planted no later than 20 January

3.1.2 Soil Conditions

Soil samples and analysis shall be conducted by the Contractor and the results are to be distributed to the Contracting Officer. The contractor shall be responsible for reporting potential problems and making recommendations associated with specified seed mix, application methods, fertilization and maintenance to the Contracting officer upon receiving soil analysis. Soil analysis results shall be included in the first year maintenance report (see 02957 REVEGETATION ESTABLISHMENT).

3.2 SITE SEED BED PREPARATION

Site seed bed preparation associated with weed control shall be coordinated and incorporated into the weed control program (see paragraph 3.2.3 Weed Control Program in section 02957 REVEGETATION ESTABLISHMENT)

3.2.1 Limits of Work

The Contractor shall stake in the field and map all areas requiring reseeding for Contracting Officer's approval. Existing native shrubs and trees shall be located, flagged, and protected. Upper Level Dry, Upper Level Moist, and Lower Level Moist zones shall be staked in the field and mapped in plan view for Contracting Officers approval. Estimated areas for each zone shall be provided. Any discrepancies with plans and specifications shall be brought to the Contracting Officer's attention.

3.2.2 Herbicide

If project schedule allows, the timing of herbicide applications shall be scheduled to reduce annual grass and broadleaf competition prior to seeding (see paragraphs 2.1.6.2 and 2.1.6.3; Broadleaf herbicides and General contact herbicides).

3.2.3 Mowing

If project schedule allows, all herbaceous vegetation over 12 inches tall shall be mowed to a maximum height of 6 inches. Timing of mowings shall be scheduled to prevent seed head formation of weed crop prior to seeding.

3.2.4 Clearing and Grubbing

All designated vegetation shall be cleared and removed from project sites before discing operation.

3.2.5 Discing

3.2.5.1 Prior to Seeding

All sites shall be disced to 12 inch depth in two directions to prepare all areas for seeding. Areas where accessibility and grades prohibit discing work shall be identified to the Contracting Officer for concurrence.

3.2.5.2 Weed Suppression Discing

If project schedule allows, the timing of discing operations shall be scheduled to reduce annual grass and broadleaf weed competition prior to seeding.

3.2.6 Field Area Debris

All rubbish, construction debris, and other material which might hinder proper seeding and vegetation establishment shall be removed from the site.

3.2.7 Smoothing and Rolling

Soil conditions such as large soil clods may require smoothing, with a land plane or ring roller prior to seeding, as determined by the contracting officer

3.3 SEED OR LIVE PLUG APPLICATION

Refer to 2.1 Materials for seeding and live plug rates.

3.3.1 General

Prior to seeding, any previously prepared seed bed areas compacted or damaged by interim rain, traffic or other cause, shall be reworked to restore the ground for optimum seedbed conditions.

3.3.2 Broadcast Seeding and Harrowing

Seed shall be uniformly broadcast at the rate as specified using mechanical broadcast seeders. Half of seed shall be broadcast in one direction, and the remainder at right angles to the first direction. Seed shall be covered to an average depth of 1/4 inch by harrowing with steel mat or chain drag, cultipacker, or other approved device. All areas broadcast seeded are to receive straw mulching. Equipment shall be checked and field adjusted regularly to ensure proper application rate and mixing. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.2.1 Saltgrass (*Distichlis spicata*)

Rhizomes shall be broadcast by hand in clustered groups. Groupings shall be dispersed at random with a minimum separation of 4 feet and a maximum separation of 20 feet at the rate as specified. Rhizomes shall be covered to an average depth of 1/4 inch by harrowing with steel mat or chain drag, hand work, cultipacker, or other approved device and/or mechanically or hand pressed into the underlying soil. Refer to revegetation plans for zone locations of *Distichlis spicata*.

3.3.2.2 Inaccessible Areas

For steeper or inaccessible areas hand broadcasting may be required. Harrow where practical.

3.3.3 Drill Seeding (Till and No-Till)

Adjust and calibrate equipment as per manufacturer's specifications and field test. Follow contours of grassland areas to provide complete coverage of all accessible areas. Only steep slopes, highly erosive areas, and locations determined by the contractor and approved by the contracting officer shall be mulched.

3.3.3.1 Drill Rates

Drill seeds at rates as specified in paragraph 2.0 Materials.

3.3.4 Live Plug Planting [Saltgrass (*Distichlis spicata*)]

Plugs shall be randomly clustered into groups with a minimum separation of 18 inches and a maximum separation of 36 inches between plugs. No less than 3 plugs and no more than 20 plugs shall be planted in any one grouping. Groupings shall be dispersed at random with a minimum separation of 4 feet and a maximum separation of 20 feet at the rate as specified. Compress soil around root mass to ensure good root to soil contact. Refer to revegetation plans for zone locations of *Distichlis spicata*.

3.3.5 Equipment Calibration

The equipment to be used and the methods of seeding shall be subject to the inspection and approval of the Contracting Officer prior to commencement of seeding operations. Immediately prior to the commencement of seeding operations, the Contractor shall conduct seeding equipment calibration tests in the presence of the Contracting Officer.

3.3.6 Fertilizer

The use of fertilizer and/or soil amendments shall not be required for native grass seeding preparation or installation.

3.3.6.1 Option for Fertilization

It shall be the contracting officers option to fertilize areas deficient in the macronutrients needed for the development and sustainability of native grasses as determined by the contractor provided soil test. (see 2.1.3 Fertilizer and 3.1.2 Soil Conditions). Fertilizer shall be spread uniformly prior to seeding and live plug installation. Apply 6-20-20 at a rate of 20lbs/1000sf or as determined by contractor provided soil test and contracting officers approval. Fertilizer shall be worked into soil utilizing harrowing, discing or other approved methods

3.3.7 Mulch

3.3.7.1 Straw Mulch

Straw mulch shall be applied to specified seeded areas (see paragraphs 3.3.2 Broadcast seeding and Harrowing and 3.3.3 Drill Seeding) upon completion and approval of the seeding application by the Contracting Officer. Mulch shall be spread by hand, blower-type mulch spreader or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of a steep slope and continued uniformly until the area is covered. The mulch shall be applied loose and not be bunched. All specified seeded areas shall be mulched within 48 hours of seeding.

3.3.7.1.1 Mulch Rates

Rate of mulch application shall be 2 tons per acre for wheat, barley, or native grass straw or 1-1/2 tons per acre for rice straw.

3.3.7.2 Straw Mulch tackifier

All straw mulch areas shall be anchored with a commercially available dyed organic tackifier. Apply as per manufacturer's specifications for complete coverage of mulch area at 100 lbs/ac

3.3.7.3 Mechanical Crimping (Optional Substitute for Tackifier)

Straw areas shall be mechanically crimped into soil. Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment. On slopes steeper than 3:1 (33%) whole straw shall be anchored with tackifier rather than crimping.

3.3.7.3 Hand Crimping (Optional Substitute for Tackifier)

Small straw mulched areas shall be crimped by hand using a digging spad or tile spade. On slopes steeper than 3:1 (33%) whole straw shall be anchored with tackifier rather than crimping.

3.4 REPAIR

Existing areas and roads that have been damaged from the seeding operations shall be restored to original condition at Contractor's expense.

3.5 CLEAN UP

Excess and waste material shall be removed from the seeded and staging areas and shall be disposed of off the site.

3.6 INSPECTIONS

3.6.1 Preliminary Inspection

Prior to the completion of the Installation Period, a preliminary inspection shall be held by the Contracting Officer. Time for the inspection shall be requested in writing by the Contractor at least 5 working days prior to desired date. The quantity and type seed mix installed and the acceptability of the seed mix installed, in accordance with the requirements stated herein, shall be determined and noted in writing.

3.6.2 Final Inspection

A final inspection shall be requested in writing by the Contractor at least 5 working days prior to the desired date. At the final inspection, the Contracting Officer will evaluate the deficiencies noted in the preliminary inspection, and assure that corrections have been completed. An "Installation Acceptance" will be given after all installation requirements have been satisfactorily completed and approved by the Contracting Officer. PARTIAL ACCEPTANCE OF ANY ITEM OR COMBINATION OF ITEMS WILL NOT BE GIVEN. A written acceptance by the Contracting Officer shall constitute the beginning of the Establishment Period. (see sections 02952 REVEGETATION and 02957 REVEGETATION ESTABLISHMENT)

-- End of Section --