





EXHIBIT D

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Conceptual Revegetation Plan for Otay Landfill, Chula Vista, California

Prepared for

Prepared by

Mr. Tom Gardner Republic Services 8514 Mast Blvd. Santee, California 92071 RECON Environmental, Inc. 1927 Fifth Avenue San Diego, CA 92101-2358 P. 619.308.9333 F 619.308.9334 RECON Number 4670.2 May 9, 2014 June 12, 2014 revised.

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Meagan Olson Restoration Biologist

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1.0 Introduction

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This revegetation plan (Plan) describes the methods and materials in which approximately 209 acres of landfill cap will be vegetated with native plant species at the Republic Services Inc. Otay Landfill in Chula Vista, California. This Plan is being prepared to serve as the guiding document to establish a native vegetative cover on the landfill cap. This Plan provides project success criteria, an implementation strategy, and a five-year maintenance, monitoring, and reporting program.

RECON Environmental, Inc. (RECON) has successfully restored 19 acres of closed landfill slopes with native scrub plant species indigenous to the area. From 2008 through 2011, the 19 acres were planted in phases of 5 to 10 acres and maintained to achieve an overall native cover of 80 percent within two to four years, depending on when the areas where implemented. The 19 acres are located immediately west of the proposed closed slopes that are being revegetated as part of this Plan. The knowledge gained and lessons learned from the previous revegetation efforts have been incorporated into this Plan to guide future revegetation efforts (RECON 2013).

1.1 **Project Location and Size**

The Otay Landfill is located east of Maxwell Road and north of Main Street within the city of Chula Vista, California (Figures 1, 2, and 3). The address is 1700 Maxwell Road, Chula Vista, California 91911. The landfill is located within the County of San Diego; however, the City of Chula Vista is located in all surrounding directions. While the landfill is not adjacent to any designated City of Chula Vista Preserve lands, the City's Multiple Species Conservation Program Subarea Plan adjacency guidelines, specifically brush management, was considered in the preparation of this Plan (City of Chula Vista 2003).

The landfill property occupies a total of 516 acres, with 19 acres of closed slopes that have been successfully restored. An additional 209 acres of slopes are planned for closure, and their restoration is addressed in this Plan. Combined with the 19 acres of previously restored slopes, a total of 230 acres will be revegetated once the revegetation efforts are complete.

1.2 Landfill Cap Revegetation Goals

The goals for establishing vegetation on the Otay Landfill cap are unlike goals typically set forth for traditional habitat restoration projects. Habitat restoration projects typically create habitat for sensitive plants or wildlife. The primary functions of the vegetative cover on a landfill are to provide slope stability and moisture control, control surface





RECON M UOBS3:4670\common_gis\fig1_reveg mxd_4/30/2014_ccn FIGURE 1 Regional Location



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runoff flows, enhance evapotranspiration, reduce moisture intrusion and leachate production, and reduce landfill gas production. In addition, the landfill cap should include the creation of a self-sustaining native vegetative layer that requires little maintenance and no additional irrigation once established and is free of invasive annual and perennial weed species.

The goals for the vegetation layer on the Otay Landfill cap are to meet the criteria for an erosion-resistant vegetative layer. Specifically, the cap must be capable of:

- supporting native vegetation;
- providing effective erosion resistance to foreseeable erosion effects by wind scour, raindrop impact, and runoff while not having a rooting depth to the top of the low-hydraulic-conductivity layer;
- harmonizing with the proposed post-closure land use;
- requiring minimal long-term maintenance (minimal need for irrigation and weed maintenance);
- ensuring rapid plant germination and growth, being persistent and selfpropagating;
- maintaining a high percentage of surface coverage (sufficient to prevent surface erosion).

2.0 Implementation

Implementation of the revegetation activities will begin upon final closure of the landfill cap. Revegetation of the 209 acres of landfill cap will be implemented in phases, with a recommended average of 10 to 50 acres implemented each year until all 209 acres have been planted. Implementing the site in phases allows for adaptations to be made to the revegetation approach based on the previous year's successes and failures. Container plant palette and density can be adjusted and weed control methods can be refined based on observations made during the previous year. Areas not being actively revegetated with native container plantings will be controlled for weed species in preparation for future planting. All revegetation areas will undergo an implementation period followed by a maintenance program until the weeds are adequately controlled and the native plants can sustain themselves with little to no maintenance. It is expected that site preparation will begin in the summer/fall following landfill closure, and planting would occur in the fall. The 120-day Plant Establishment Period (PEP) would begin after all container plants have been installed. After completion of the PEP, maintenance and monitoring would be conducted for a five-year period, or until the final success criteria is

achieved. All implementation and maintenance activities will be overseen by a qualified restoration biologist.

2.1 Restoration Contractor Qualifications

Republic Services, Inc. shall retain a habitat restoration firm to implement and maintain the revegetation areas at the Otay Landfill project site. The restoration contractor shall have experience implementing successful revegetation projects at landfill closure sites within southern California. The restoration contractor will assign a qualified restoration biologist as Project Manager. The Project Manager shall have a minimum of five years of experience implementing and maintaining upland restoration projects in southern California. The Project Manager will coordinate and supervise all restoration implementation and maintenance activities as well as the qualitative and quantitative monitoring.

2.2 Site Preparation

Republic Services, Inc. will begin preparing the revegetation sites by clearing the areas of all vegetation and placing the final soil cover. The final soil cover will be composed of clean and uncontaminated fill soil. After the soil cover has been placed, mulch will be applied. The mulch will consist of processed green waste provided by the landfill operation. The processed mulch will serve several important functions, including surface erosion control, weed abatement, cycling nutrients and organic matter into the topsoil, retaining soil moisture while increasing the evapotranspiration rate of the landfill cap, and regulating soil temperatures for planted container plants. The thickness of mulch application will range from 2 to 6 inches deep and will be applied through the use of hand crews and traditional farm-type machinery.

2.3 Initial Weed Maintenance

After site preparation and prior to container plant installation, the site will be treated for non-native weeds. Weeds encountered within the landfill slopes with either be cut, bagged, and disposed of off-site or treated with herbicide. Removing weeds prior to the installation of container plants will help reduce the existing weed seed bank on-site, allow for easier container plant installation, and reduce the need for intensive weed control after container plants are installed.

2.4 Plant Installation

The plant species selected for introduction into the landfill cap all possess a combination of several of the following characteristics: (1) they germinate quickly and provide rapid native plant cover; (2) they require little to no maintenance once established; (3) they are self-sustaining and can reproduce readily; (4) they are native to the area and are compatible with surrounding land uses; (5) they have fibrous or branching root systems that will not penetrate the landfill cap (do not have a taproot); (6) they will provide robust plant cover once established; and (7) they are not included on the San Diego Fire Chief's Association Fuel Modification Zone Plant List of Undesirable Plants and Weeds (City of Chula Vista 2003). Several native shrub species that are seemingly appropriate for the area have been omitted from the planting palette because they have a rooting depth exceeding the depth to the top of the low-hydraulic-conductivity layer at the site. All plant species proposed for installation were successfully established within the 19 acres of closed landfill.

2.4.1 Seed Collection

Seed collection activities should begin immediately and should be conducted within the project vicinity. Native seed will be collected in the summer and fall months, depending on the flowering time for target species and when seed becomes available. Native seeds will be collected and used for container plant propagation. Seed collection will begin approximately one year before the landfill cap is prepared for revegetation. Seed used for plant propagation should be collected from within the native plant populations of the surrounding areas. However, if additional quantities of the recommended species are needed, additional seed and plant sources should be from within a 10-mile radius of the revegetation site and at a similar elevation and distance from the coast as the revegetation site. All collected seed will be used for container plant propagation. The mulch layer that will be applied to the closed slopes during site preparation will prevent seeds from contacting the soil surface and, therefore, hand seeding will not be conducted within the site.

2.4.2 Plant Propagation

Plant production will begin approximately 6 months before the landfill cap is prepared for revegetation. Container plants shall be propagated in one-gallon containers by a local nursery experienced with growing native plant species, preferably for restoration purposes. Depending on availability and timing of planting, variations can be made to the plant palette and size of the container plants. Smaller container plants may be used at the discretion of the restoration biologist. In addition, during the first few years of the phased revegetation, the plant palette may be adapted to account for species that

perform well or do not perform well within the landfill. Table 1 presents the recommended container plant palette.

| Scientific Name | Common Name | Plants per Acre |
|--|-------------------------|-----------------|
| Ambrosia chenopodiifolia | San Diego bur ragweed | 40 |
| Astragalus trichopodus var. lonchus | coast locoweed | 30 |
| Atriplex canescens* | four-wing saltbush | 50 |
| Atriplex lentiformis | big saltbush | 40 |
| Brickellia californica** | California brickellbush | 85 |
| Encelia californica** | common encelia | 85 |
| Grindelia camporum** | San Diego gumplant | 60 |
| Hazardia squarrosa | sawtooth goldenbush | 40 |
| Isocoma menziesii** | coast goldenbush | 85 |
| Mirabilis californica** | wishbone bush | 40 |
| Peritoma arborea** | bladderpod | 50 |
| Salvia apiana | white sage | 20 |
| Stipa pulchra** | purple needlegrass | 85 |
| • F | Total | 710 |

| | TABLE 1 |
|----------|------------------------------------|
| PROPOSED | CONTAINER PLANTS FOR OTAY LANDFILL |

NOTE: These recommendations are guidelines that may be changed due to a variety of circumstances, including reflection of neighboring habitats and seed and plant availability at the time of installation. Changes to the seed species shall be pre-approved by the restoration biologist.

*Species included on the Fuel Modification Zone Plant List as acceptable in all fuel modifications zones, except where adjacent to Preserve land (City of Chula Vista 2003).

**Species included on the Fuel Modification Zone Plant List as acceptable in all fuel modifications zones (City of Chula Vista 2003).

All plants will be inspected by the restoration biologist and approved as healthy, disease free, and of proper size prior to planting. In addition, the restoration biologist will approve the final layout of all plant materials in the field prior to planting.

2.4.3 Planting

Plant installation should begin immediately following the initial weed maintenance within the revegetation site, but shall be limited to approximately November 15 to February 1 to coincide with seasonal winter rainfall.

Plants will be laid out within the revegetation site to mimic the patterns found in surrounding habitats. The north-facing slopes located on the north side of the landfill will be planted with clusters of larger shrubs, such as four-wing saltbush (*Atriplex canescens*), big saltbush (*Atriplex lentiformis*), and common encelia (*Encelia californica*) expanding the small canyons that exist in the surrounding native vegetation into the landfill cap to visually blend with the landfill's surroundings. The south-facing slopes on

the south side of the landfill will be planted with a dominance of native grass species, such as purple needlegrass (*Stipa pulchra*), to provide a natural transition from the closed landfill slopes to the existing grassland ecosystem south of the site (Figure 4). The first 100 feet from the base of the slopes along the landfill perimeter will only be planted with species included in Table 1 as acceptable per the Fuel Modification Zone Plant List (City of Chula Vista 2003) to prevent the installation of plant material that is especially combustible, dry, or known to develop dry undergrowth to prevent the spread of fire into or out of the landfill.

A planting density of 710 plants per acre is recommended, especially for the first few years of revegetation when the most successful plant palette and planting distribution will be determined and used to guide future revegetation efforts. Depending on the successes and failures observed during the first phases, the container plant palette and density may be adjusted to aid in reaching final success criteria.

Container plants will be installed using standard horticultural practices, using a hole at least twice the diameter of the root ball. All plants will be thoroughly watered in their pots before planting, as will the soil in all planting holes. Each container plant will be installed with a small two- to three-inch berm or planting basin approximately 24 inches in diameter around the edge of the plant to hold irrigation water.

3.0 Maintenance

Maintenance activities will be conducted for five years following implementation, or until it has been determined that the landfill cap is resistant to foreseeable adverse environmental factors (e.g., climate, disease, and pests) and that its high percentage of vegetative cover is sufficient to prevent surface erosion, whichever happens sooner. Maintenance activities will include weeding, providing supplemental irrigation, trash removal, and replanting, as necessary. The maintenance period will begin following implementation planting.

3.1 Schedule

The purpose of the five-year maintenance and monitoring period is to ensure the success of the revegetation effort and to allow native plants to establish and become self-sustaining. Maintenance is needed to create and maintain conditions favorable to establishment and growth of native plants. The maintenance program ensures that native species are being allowed to recruit, container plants are becoming established, and weeds are not outcompeting native vegetation. Maintenance measures will be conducted throughout all revegetation areas and will be coordinated by the restoration biologist. Maintenance will consist of two phases: a 120-day PEP and five-year

maintenance period. The restoration biologist will oversee all aspects of the revegetation program in order to detect problems at the earliest stage.

Maintenance activities of the landfill cap include irrigation, weed management, and potential remedial planting. Maintenance of the revegetation site will continue until the objectives of the plan are met. Success of the plantings will be assessed annually after installation. Plantings within the revegetation area must achieve the specified goals of plant survival and coverage in order for the project to be deemed successful. Table 2 presents the proposed maintenance and monitoring schedule.

| Type/Task | PEP | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---------------------------|---------------|---------------|---------------|----------------------------|----------------------------|----------------------------|
| Weed control | As- needed | As- needed | As- needed | Quarterly | Twice a year | Twice a year |
| Irrigation* | As- needed | As- needed | As- needed | Remove (if appropriate) | Remove (if appropriate) | Remove (if appropriate) |
| Qualitative monitoring | Bi-weekly | Monthly | Quarterly | Quarterly | Quarterly | Quarterly |
| Quantitative monitoring | ** | ** | Spring | Spring | Spring | Spring |

TABLE 2 MAINTENANCE AND MONITORING SCHEDULE

* Irrigation will be discontinued once plants are becoming established.

** Quantitative monitoring will begin in Year 2.

3.2 Supplemental Irrigation

After installation, the container plants will be cared for until they are successfully established. Plant care generally involves providing supplemental irrigation when needed. The timing and duration of applying supplemental water will be under the direction of the project's restoration biologist. Supplemental irrigation water will only come from a potable water source.

All supplemental irrigation will be provided by a water truck and hose. This method of irrigation is recommended because the thick layer of mulch applied during implementation will trap water and create cool and moist soil conditions suitable for plant establishment, thereby negating the need for daily overhead irrigation.

Watering with a hose will be applied in a way that mimics natural rainfall such that the droplet impacts on the soil surface will not cause surface erosion. Side spraying from the water truck will not be allowed. Once an area has become saturated at the surface, watering will move onto another area to avoid surface runoff. When the water has had time to soak in, the area may be re-wetted for thorough soil saturation.



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Otay Landfill Final Closure Plan

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Water truck operations will cease when the plants are of sufficient size and they have become established. After the water truck operations have been concluded, the site will continue to be monitored to ensure that the plants are not adversely affected. If significant signs of stress are apparent, watering via a water truck and hose will continue as needed.

3.3 Weed Maintenance

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Early and aggressive efforts in non-native weed abatement will be the first step towards restoring a favorable environment for desired native plant species. Weed maintenance will be a priority for the duration of the project to keep weed species from producing seeds and to control weed competition with native plants. Weed maintenance will consist primarily of crews using line trimmers and through the use of herbicide. Hand weeding or other weed control methods, including herbicide applications, will be performed by maintenance workers trained to distinguish weeds from native species. All herbicide applications will be completed under the supervision of a person holding a California Qualified Applicator's License.

Weed maintenance will continue throughout the maintenance period. Weeds will be killed or removed before they set seeds. A list of non-native weed species anticipated on-site is presented in Table 3. In the event that additional weed species are encountered, the restoration biologist will refine control measures to address the problem.

| Scientific Name | Common Name |
|----------------------|----------------------------|
| Avena spp. | wild oat |
| Brassica spp. | mustard |
| Bromus spp. | brome grass |
| Centaurea melitensis | tocolote |
| Chenopodium album | lamb's quarters |
| Cynara cardunculus | cardoon, artichoke thistle |
| Erodium spp. | filaree, storksbill |
| Hordeum spp. | barley |
| Medicago polymorpha | burclover |
| Ricinus communis | castor bean |
| Salsola tragus | Russian thistle |
| Sonchus spp. | sow thistle |
| Malva spp. | mallow |
| Nicotiana glauca | tree tobacco |

TABLE 3 ANTICIPATED WEED SPECIES

3.4 Brush Management

The City of Chula Vista requires brush management in areas where urban development interfaces with open space (City of Chula Vista 2003). The closed landfill, as planned, does not qualify as requiring brush management; however, brush management and fuel modification has been considered in the development of this Plan to prioritize public safety while meeting the Project goals.

3.5 Trash Removal

Trash consists of all man-made materials within the Otay Landfill project site that do not serve a function related to the revegetation effort. Once closed, the Otay Landfill will be a closed landfill where all of the trash has been buried beneath a landfill cap. Therefore, any articles of trash (i.e., plastic grocery bags, polystyrene cups, etc.) that may occasionally appear within the revegetation site would have blown in from adjoining properties. Trash will be removed from the site by hand during routine maintenance visits.

3.6 Remedial Planting

In the spring of each monitoring year, the revegetation sites will be evaluated for native shrub cover to ensure the prevention of surface erosion. If an area is identified as lacking native cover, it will be replanted with container stock. Qualitative and quantitative monitoring results will indicate if and when remedial planting is required. Details of monitoring are discussed in Section 4.0, Monitoring. Any replanting effort will be timed to coincide with the rainy winter season, and the protocol for seed collection, plant production, and planting will follow the procedures described in Section 2.0, Implementation, of this Plan.

4.0 Monitoring

Evaluation of plant health and identifying and correcting problems as they arise are necessary for ensuring successful vegetation establishment. Qualitative monitoring will be conducted throughout the PEP and maintenance and monitoring periods as outlined in Table 2. Quantitative monitoring will begin in Year 2 and will consist of ocular estimates of native and non-native cover.

4.1 Qualitative Monitoring

Qualitative monitoring will consist of the restoration biologist visiting the revegetation site to ensure that the vegetative cover is becoming adequately established, weeds are controlled, and that there are no signs of surface erosion. Monitoring will consist of an assessment of native species germination, general health of native vegetation, weed presence, vandalism, and erosion. During each monitoring visit, the restoration biologist will document the findings and take remedial actions where necessary.

4.2 Quantitative Monitoring

Quantitative monitoring will be conducted annually in the spring, beginning in Year 2, to determine if the revegetation site is achieving the project goals set forth in Section 1.2, Landfill Cap Revegetation Goals. Quantitative monitoring will include ocular estimates of native and non-native vegetative cover that will be compared to the same estimates taken for the surrounding native vegetation. Estimates taken for the revegetation site is achieving its success criteria. In addition, photo-points will be established to provide an overview of the site and assist in documenting the development of the revegetation site over the course of the five-year maintenance period, or until the goals of the project have been achieved, whichever happens sooner.

4.3 Success Criteria

Revegetation will be considered successful when the goals established in Section 1.2, Landfill Cap Revegetation Goals, have been met. To help determine if the site is on track to meet those goals, annual success criteria for native and non-native vegetative coverage have been established. Interim and final performance standards for achieving native vegetative coverage are shown in Table 4.

| TABLE 4 |
|-----------------------------------|
| FIVE-YEAR SUCCESS CRITERIA |
| (ABSOLUTE PERCENTAGES) |

| Year | Native Cover | Non-native Cover†* |
|------|-----------------|-----------------------|
| 1 | | |
| 2 | 20 | <40 |
| 3 | 35 | <30 |
| 4 | 50 | <20 |
| 5 | 60 | <15 |

†Annual herbaceous species.

*Perennial non-native species must be maintained at 0 percent.

5.0 Reporting

A 120-day PEP report will be prepared detailing the qualitative monitoring results that were recorded during the first 120-days of the project and will include details of implementation activities. The report will also summarize all maintenance activities conducted during that time period. The 120-day PEP report will make recommendations, if needed, to address any outstanding issues so that the project is successful, and will be submitted to Republic Services, Inc.

Annual reports will be prepared each year describing qualitative and quantitative monitoring results, and the results will be compared to those recorded during the previous year (starting in Year 2). The report will summarize maintenance activities, discuss general site conditions and trends, include photo documentation, compare monitoring results with the surrounding habitat, and make recommendations for remedial actions, if needed. The reports will be submitted to Republic Services, Inc. by September 1 of each monitoring year. At the completion of the restoration project, a final report will be prepared. The final report will summarize the entire restoration project from implementation through completion.

6.0 References Cited

City of Chula Vista

2003 City of Chula Vista Multiple Species Conservation Program Subarea Plan. February.

RECON Environmental, Inc. (RECON)

2013 Otay Landfill Closed Area Revegetation Site — Final Summary Report November 21.