San Diego Association of Governments

CREST CANYON INVASIVE PLANT CONTROL PROJECT

6th Quarterly & Final Report

Reporting Period: January 1, 2019 – March 31, 2019

SANDAG EMP Grant Agreement No. 5004947

Introduction

The Chaparral Lands Conservancy (TCLC) submits the sixth quarterly and final report for the Crest Canyon Invasive Plant Control Project (Project) EMP grant. Project activities during this reporting period included work to control purple veldtgrass and other invasive non-native plants (EMP grant Task 1a), GIS work (Task 1b), project management (Task 1c), and grant reporting and administration (Task 2).

The purpose of the EMP grant is to control purple veldtgrass and other invasive plants, especially in and near occurrences of three priority MSP species: coast wallflower, Orcutt's spineflower, and short-leaved dudleya. Work during the EMP grant period included GIS mapping of rare plants, GIS mapping of invasive plants, GIS comparison of past and current conditions to guide invasive plant control activities, and direct control of veldtgrass and other invasive plants with application of herbicide and hand removal.

Overall, the Project was successful in achieving the EMP grant deliverable to achieve a reduction of ≥90% of purple veldtgrass in the Crest Canyon Preserve *based on known conditions at the start of the grant performance period*. However, as discussed in the first and second quarterly reports, a far larger population and distribution of purple veldtgrass was identified during Project implementation that rendered impossible the grant deliverable of ≥90% control of this species throughout the Crest Canyon Preserve with the level of resources available from this grant. The grant deliverable of 100% reduction in purple veldt grass in and near occurrences of MSP species coast wallflower, Orcutt's spineflower, and short- leaved dudleya was nearly achieved with an estimated ≥99% reduction of purple veldtgrass in and near these sensitive and endangered plants. However, purple veldtgrass has been present in these areas for some time and is an abundant producer of seed so new veldtgrass sprouts are expected in these areas for years to come. Other grant deliverables were achieved to update mapping from the previous EMP grant to reflect current purple veldt grass locations and to document whether current purple veldt grass locations were identified in previous EMP grant or are new occurrences.

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Invasive Plant Control (Tasks 1a – 1c)

Invasive plant control work and expenses during this reporting period included the following:

- Work by San Diego Canyonlands to control purple veldtgrass and other invasive plants with application of herbicide and hand weeding (Task 1a).

- Work by AJP Consulting to map past and current occurrences of rare plants and invasive plants (Task 1b). Please see attached maps showing all mapped sensitive and listed plants, all documented invasive plants from the previous EMP grant and current Project, and the extent of overlapping invasive non-native plant control areas under the previous EMP grant and current Project.

- Project management work by TCLC staff to oversee and assist with contractor activities including field surveys of rare plant locations and updated mapping for invasive plants, guidance of herbicide application near rare plant occurrences, and hand weeding (Task 1c).

Grant Reporting & Project Administration (Task 2)

Grant reporting and Project administration work and expenses during this reporting period included Project accounting, oversight of contractor activities and expenditures, maintenance of insurance policies, updates to the property owner, and preparation of the EMP grant final report.

Discussion

Significant progress was made with this Project in controlling purple veldtgrass and other invasive non-native plants in a large portion of the Crest Canyon Preserve. Significant progress was also made in controlling purple veldtgrass and other invasive non-native plants in and near particular sensitive and endangered plants emphasized under the EMP grant as well as several other special plants (see attached maps). Approximately thirty relatively small and localized areas treated under a previous EMP grant between 2011 and 2014 were re-treated during Project implementation between 2017 and 2018 (see maps). But most areas treated under the Project appear to be new infestations of non-native plants or, in the case of the veldtgrass, may be from an established seed bank. Overall, the Project significantly reduced the distribution and population numbers purple veldtgrass and over twenty-five other invasive non-native plants for the direct benefit of sensitive native vegetation communities southern maritime chaparral and coastal sage scrub and at least nine sensitive and listed plant species.

The greatest challenge experienced during the Project was identification of a far greater distribution and far larger populations of purple veldtgrass than previously documented in the Crest Canyon Preserve, especially in the northern portion of the Preserve where veldtgrass is now the dominant species in

several areas over several acres as well as in and around occurrences of EMP grant special plants coast wallflower and Orcutt's spineflower and other sensitive plants cliff spurge, Del Mar sand aster, Del Mar manzanita, false goldenaster, sea dahlia, and Torrey pine. Purple veldtgrass appears to favor open sandy areas with lower native shrub cover including steep slopes, the very same habitat preferred by coast wallflower, Orcutt's spineflower, and several other sensitive plant species. And veldtgrass appears to be spreading quickly in Crest Canyon (and several other nearby areas like Torrey Pines State Natural Reserve and San Elijo Lagoon Ecological Reserve) with many more veldtgrass plants present amidst Orcutt's spineflower occurrences in just the four years since discovery of the spineflower in Crest Canyon in 2015. As such, purple veldtgrass may pose one of the greatest threats to persistence of Orcutt's spineflower and several other listed and sensitive species including the coast wallflower, Del Mar manzanita, Del Mar sand aster, false goldenaster, sea dahlia, Torrey pines, and others. Veldtgrass does not appear to favor the hard sandstone and thin clifftop soils that support the short-leaved dudleya. But several other invasive plants such as crown daisy, filaree, foxtail, and Hottentot fig do pose a significant threat to the dudleya and were controlled as part of this Project.

Project work under this EMP grant has significantly reduced purple veldtgrass populations in the Crest Canyon Preserve, especially around rare plant occurrences. But given the distribution, population numbers, and established seed bank of purple veldtgrass including very steep slopes where treatment is extremely difficult, this species is unlikely to ever be fully eradicated from the Crest Canyon Preserve. Long-term, intensive, annual treatments will be necessary to prevent the spread of veldtgrass throughout the preserve and to prevent establishment or re-establishment of other invasive non-native plants. Treatment of a major infestation of purple veldtgrass along Interstate 5 bordering the Crest Canyon Preserve will also be necessary to reduce the spread of purple veldtgrass.

Another challenge experienced during the Project was the lack of existing location data for coast wallflower and several other sensitive plant species in the Crest Canyon Preserve where current data was needed to guide invasive plant control work near sensitive plant occurrences. The San Diego Management and Monitoring Program database contained only a single point for coast wallflower, three points for Del Mar manzanita, and no data for any other sensitive plants except current data for Orcutt's spineflower provided by TCLC[1]. And only two points for coast wallflower were identified in the California Natural Diversity Database for Crest Canyon. As a result, field surveys were needed and conducted by contractors, TCLC staff, and volunteers to identify coast wallflower and other rare plant occurrences as well as to update invasive plant occurrences prior to and during invasive plant control work.

1. This is not a criticism of SDMMP. Agencies may not have collected this data or may not have provided data to SDMMP.

During the course of field surveys and invasive plant control work for this Project as well as during past surveys for Orcutt's spineflower, TCLC has identified a discreet and unique ecotone located in coastal areas between patches of southern maritime chaparral on steeper canyon slopes and coastal sage scrub in gently sloping canyon bottoms. This special ecotone consists of small, very sandy openings amidst chaparral or coastal sage scrub on gently sloping alluvial areas dominated by a number of small annual plants including the endangered Orcutt's spineflower and sensitive coast wallflower, small perennial plants including the sensitive false goldenaster and Del Mar sand aster, and delicate microbiotic soils. These open sandy areas were probably never common even prior to European settlement and are now extraordinarily rare following coastal development, past farming or other disturbance of most coastal canyons, and subsequent invasions of plant weeds into disturbed areas. A significant area of this ecotone in Crest Canyon was likely lost to erosion from uncontrolled stormwater runoff from new development of Del Mar Heights in the 1960s and 1970s. A subsequent intensive wetlands restoration project in San Dieguito Lagoon in the early 1980s further impacted this ecotone with placement of dredged material from the Lagoon back into Crest Canyon and installation of an elaborate subterranean stormwater system. In turn, several plant species dependent on this ecotone have become rare and endangered, and now both this unique ecotone and the dependent rare plants are seriously threatened by invasion of veldtgrass into this preferred habitat.

Project Schedule

The Project was completed in accordance with the schedule contained in the amended EMP Grant Agreement.

Project Budget

The Project was completed in accordance with the budget contained in the amended EMP Grant Agreement. Project expenditures are detailed in the final Invoice 6, submitted separately.

Please see below for Project photographs and maps. Please direct any questions to David Hogan at 760 809-9244 or director@chaparralconservancy.org. Thank you for your consideration and SANDAG support to conduct the Crest Canyon Invasive Plant Control Project.

The Chaparral Lands Conservancy

Preserving California's Shrubland Ecosystems

ABOVE – Purple veldtgrass is now the dominant plant in one of several ravines that were once coastal sage scrub. BELOW – Veldtgrass in a sandy open area ecotone amidst the largest Orcutt's spineflower occurrence in Crest Canyon. Dead vegetation in the foreground is veldtgrass treated in March 2018.

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Preserving California's Shrubland Ecosystems

ABOVE – Purple veldtgrass growing with Orcutt's spineflower.
BELOW – Delicate hand-pulling of veldtgrass amidst Orcutt's spineflowers.

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ABOVE – Coast wallflower in sandy open area ecotone.
BELOW – Remnant coast wallflower with purple veldtgrass treated March 2018.

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Preserving California's Shrubland Ecosystems

ABOVE – False goldenaster in sandy open area ecotone framed by purple veldtgrass.
BELOW – Older and newer purple veldtgrass herbicide treatments 2018.

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ABOVE – San Diego Canyonlands crew member spraying purple veldtgrass 2018.
BELOW – Sea fig hand weeded by volunteers 2018.

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Preserving California's Shrubland Ecosystems

ABOVE & BELOW –Sea fig hand weeded by volunteers 2019.

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Preserving California's Shrubland Ecosystems

ABOVE & BELOW– Purple veldtgrass treated in 2019.

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Preserving California's Shrubland Ecosystems

ABOVE & BELOW– Purple veldtgrass treated in 2019.

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ABOVE & BELOW– Purple veldtgrass growing amidst Orcutt's spineflower in 2019.

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Preserving California's Shrubland Ecosystems

ABOVE –Purple veldtgrass treated in 2019 near sensitive plant sea dahlia.
BELOW – Purple veldtgrass treated in 2019 growing amidst endangered plant Del Mar manzanita.

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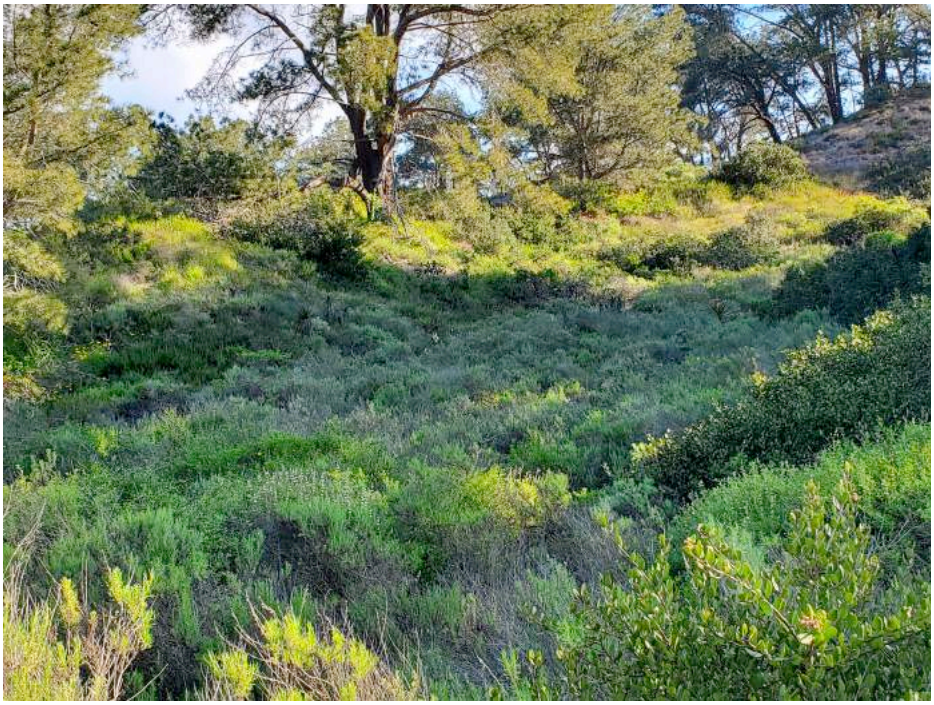
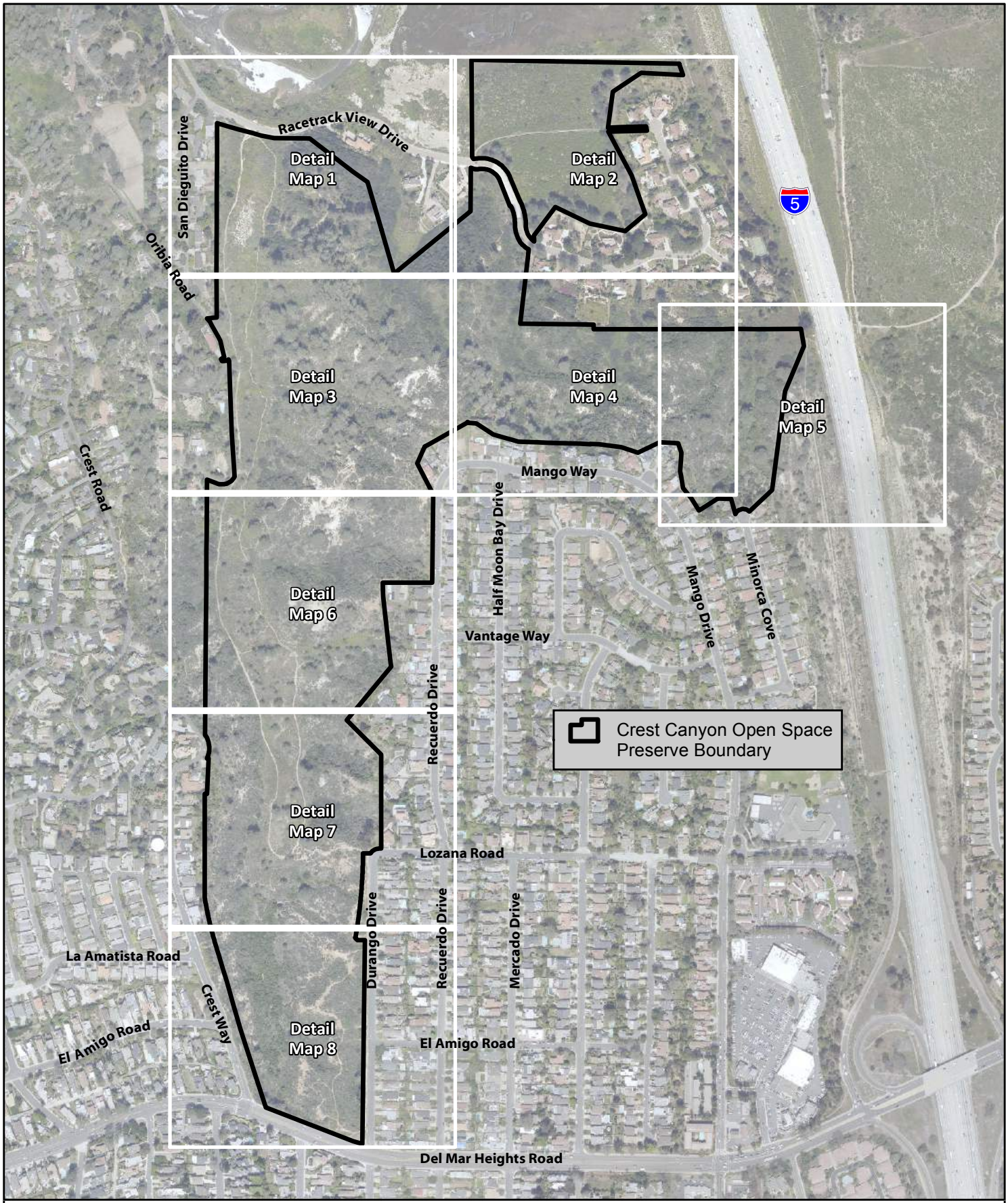
Preserving California's Shrubland Ecosystems

ABOVE –Purple veldtgrass in 2019 growing amidst sensitive plant Del Mar sand aster.
BELOW – Nearly pristine coastal sage scrub threatened by purple veldtgrass (upper right).





The Chaparral Lands Conservancy

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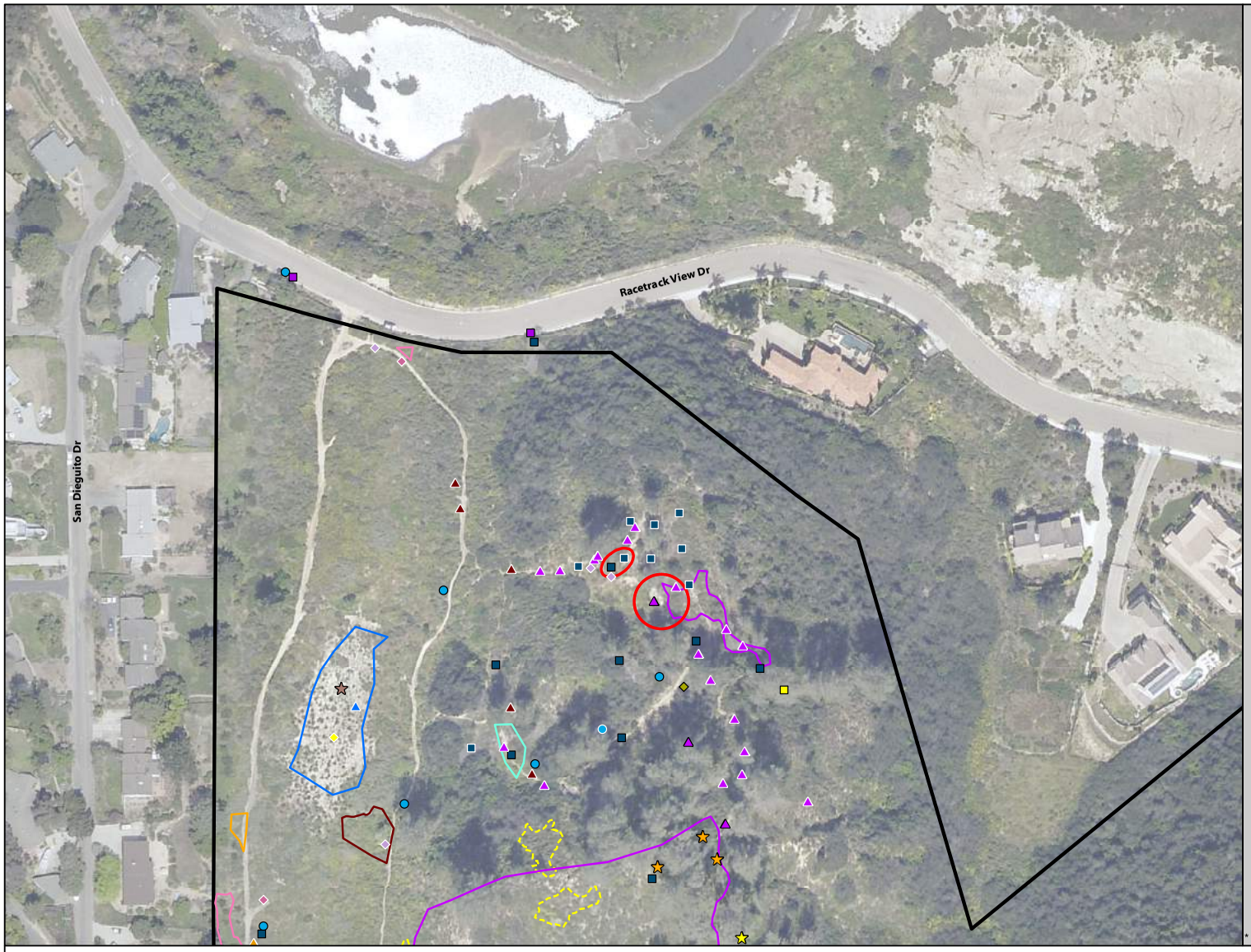
Map Key – Crest Canyon Invasive Plant Control Project



Crest Canyon Open Space Preserve Boundary

Invasive Plant Re-treatment Areas
2011-2014 & 2017-2019

Listed and Sensitive Plants*

- Cliff spurge (*Euphorbia misera*)
- Coast wallflower (*Erysimum ammophilum*)
- Sea dahlia (*Leptosyne maritima*)
- Coast wallflower (*Erysimum ammophilum*)

Crest Canyon Invasives Removal Project Treatment Areas (EMP 5001591; 2011 - 2014)

- African asparagus fern (*Asparagus asparagoides*)
- Cyclops acacia (*Acacia cyclops*)
- Hottentot fig (*Carpobrotus edulis*)
- Iris (*Iris* sp.)
- Ngaio (*Myoporum laetum*)
- Purple veldtgrass (*Ehrharta calycina*)

Crest Canyon Invasive Plant Control Project Treatment Areas (EMP 5004947; 2017 - 2019)

- African asparagus fern (*Asparagus asparagoides*)
- Crown daisy (*Glebionis coronaria*)
- Crystalline iceplant (*Mesembryanthemum crystallinum*)
- Filaree (*Erodium* sp.)
- Foxtail (*Agave attenuata*)
- Hottentot fig (*Carpobrotus edulis*)
- Purple veldtgrass (*Ehrharta calycina*)
- Shortpod mustard (*Hirschfeldia incana*)
- Slender-leaf iceplant (*Mesembryanthemum nodiflorum*)
- Tocalote (*Centaurea melitensis*)
- Crown daisy (*Glebionis coronaria*)
- Purple veldtgrass (*Ehrharta calycina*)
- Ripgut grass (*Bromus diandrus*)
- Shortpod mustard (*Hirschfeldia incana*)
- Slender-leaf iceplant (*Mesembryanthemum nodiflorum*)
- Tocalote (*Centaurea melitensis*)

* Sources: SDMMP, CNDDB, City of San Diego, TCLC

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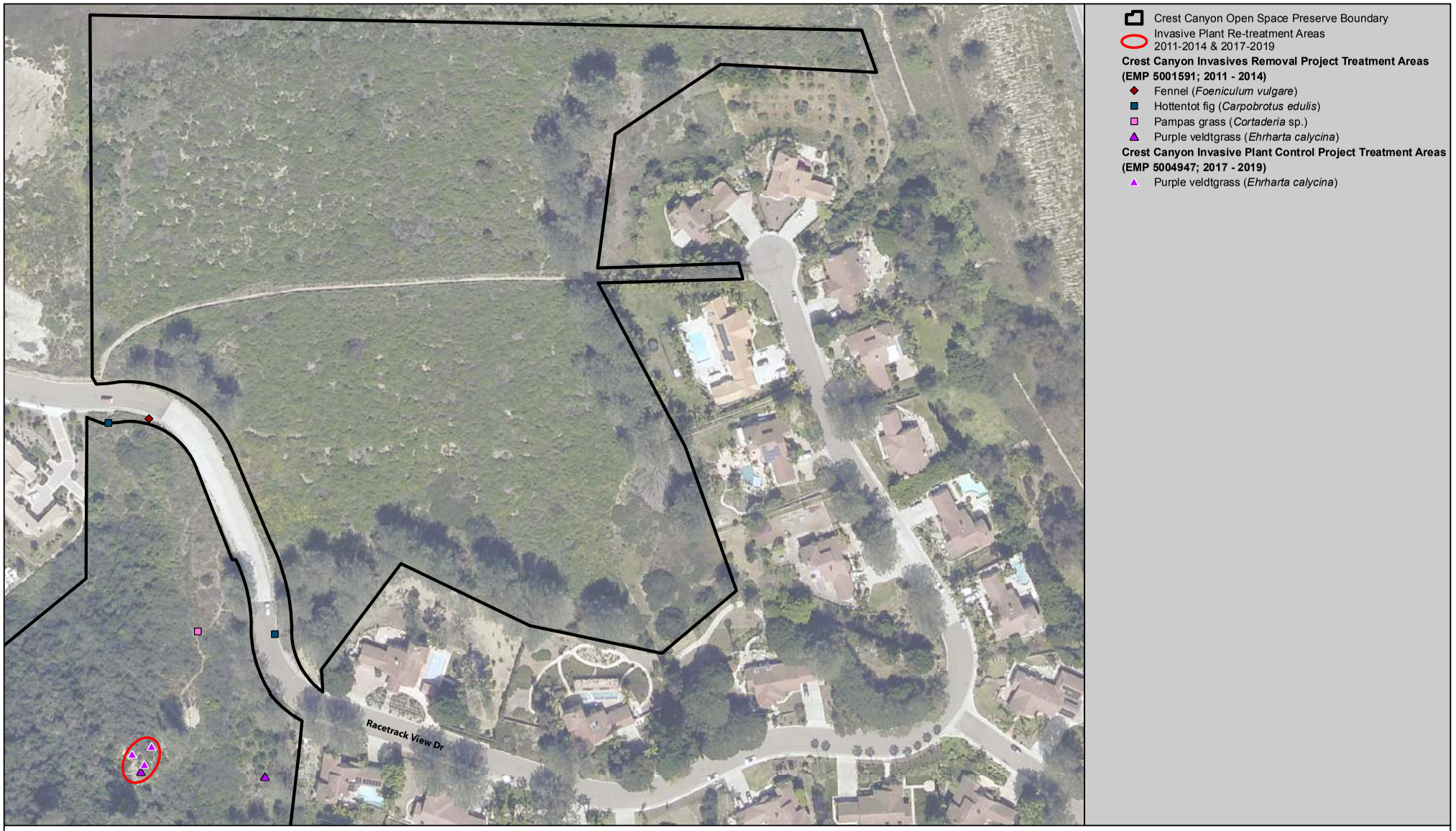
Detail Map 1 –

Crest Canyon Invasive Plant Control Project



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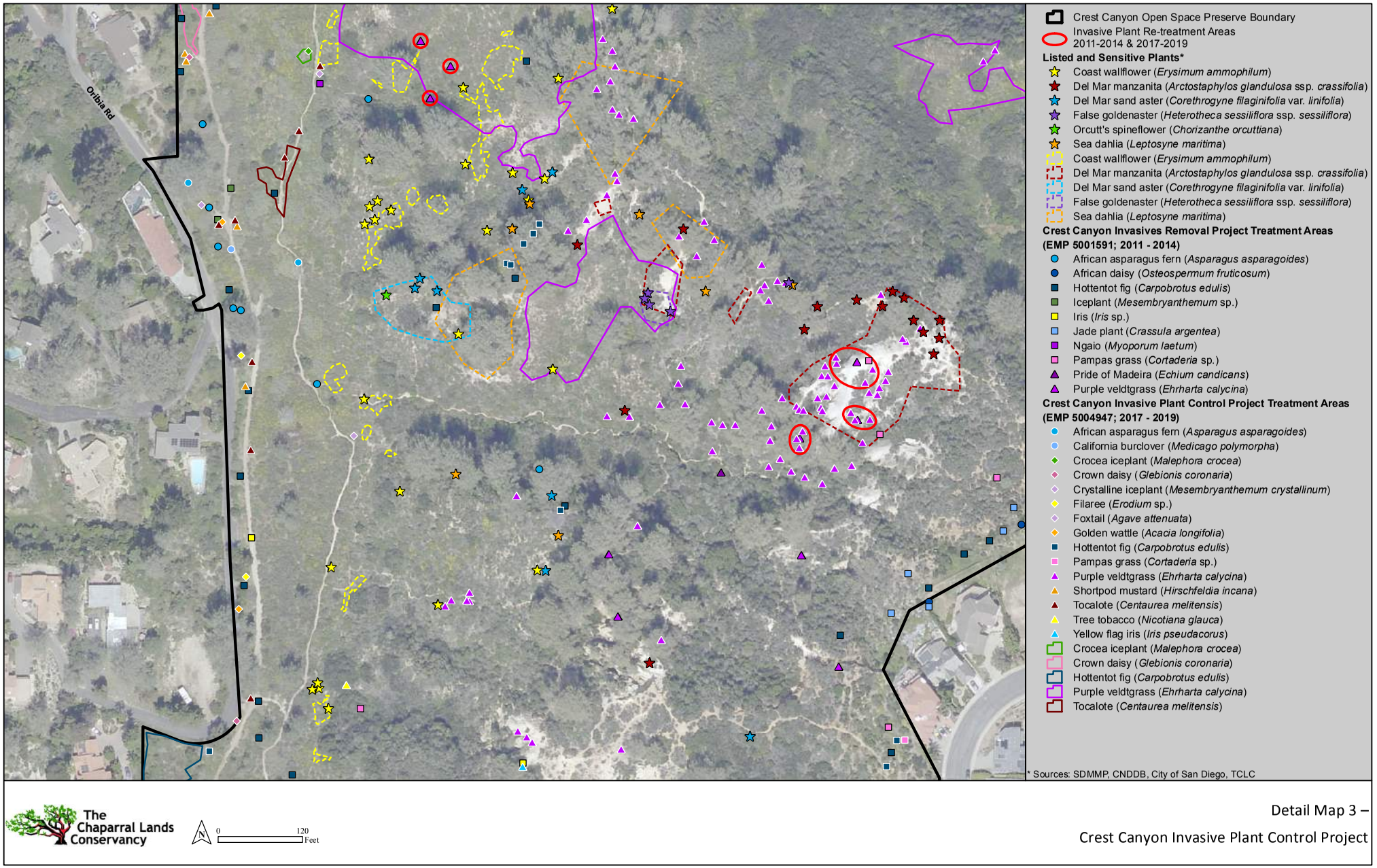
Detail Map 2 –

Crest Canyon Invasive Plant Control Project



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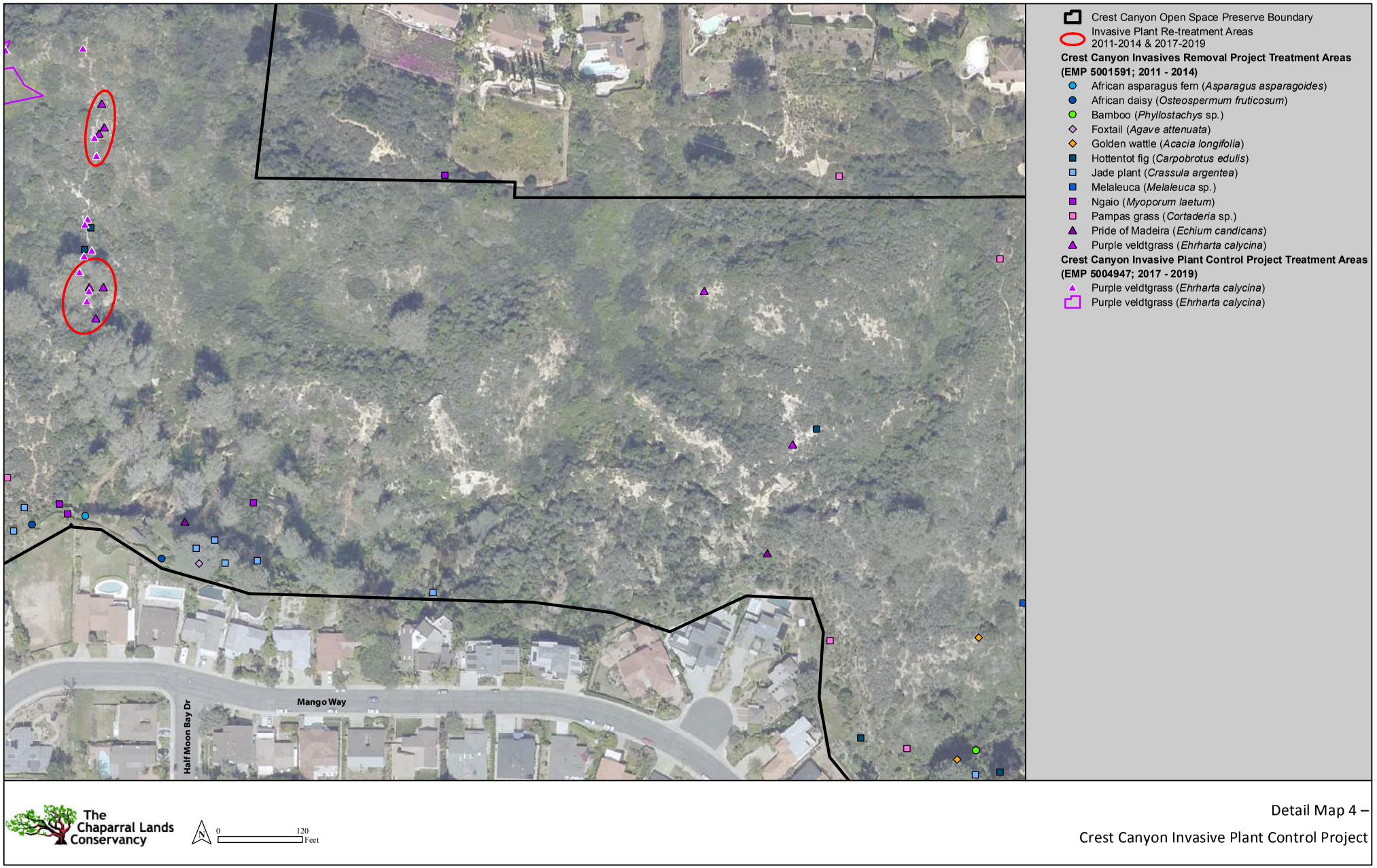
Detail Map 3 –

Crest Canyon Invasive Plant Control Project


Mango Way
Half Moon Bay Dr
Crest Canyon Open Space Preserve Boundary
Invasive Plant Re-treatment Areas
2011-2014 & 2017-2019
Crest Canyon Invasives Removal Project Treatment Areas
(EMP 5001591; 2011 - 2014)
African asparagus fern (Asparagus asparagoides)
African daisy (Osteospermum fruticosum)
Bamboo (Phyllostachys sp.)
Foxtail (Agave attenuata)
Golden wattle (Acacia longifolia)
Hottentot fig (Carpobrotus edulis)
Jade plant (Crassula argentea)
Melaleuca (Melaleuca sp.)
Ngaio (Myoporum laetum)
Pampas grass (Cortaderia sp.)
Pride of Madeira (Echium candicans)
Purple veldtgrass (Ehrharta calycina)
Crest Canyon Invasive Plant Control Project Treatment Areas
(EMP 5004947; 2017 - 2019)
Purple veldtgrass (Ehrharta calycina)
Purple veldtgrass (Ehrharta calycina)
The Chaparral Lands Conservancy
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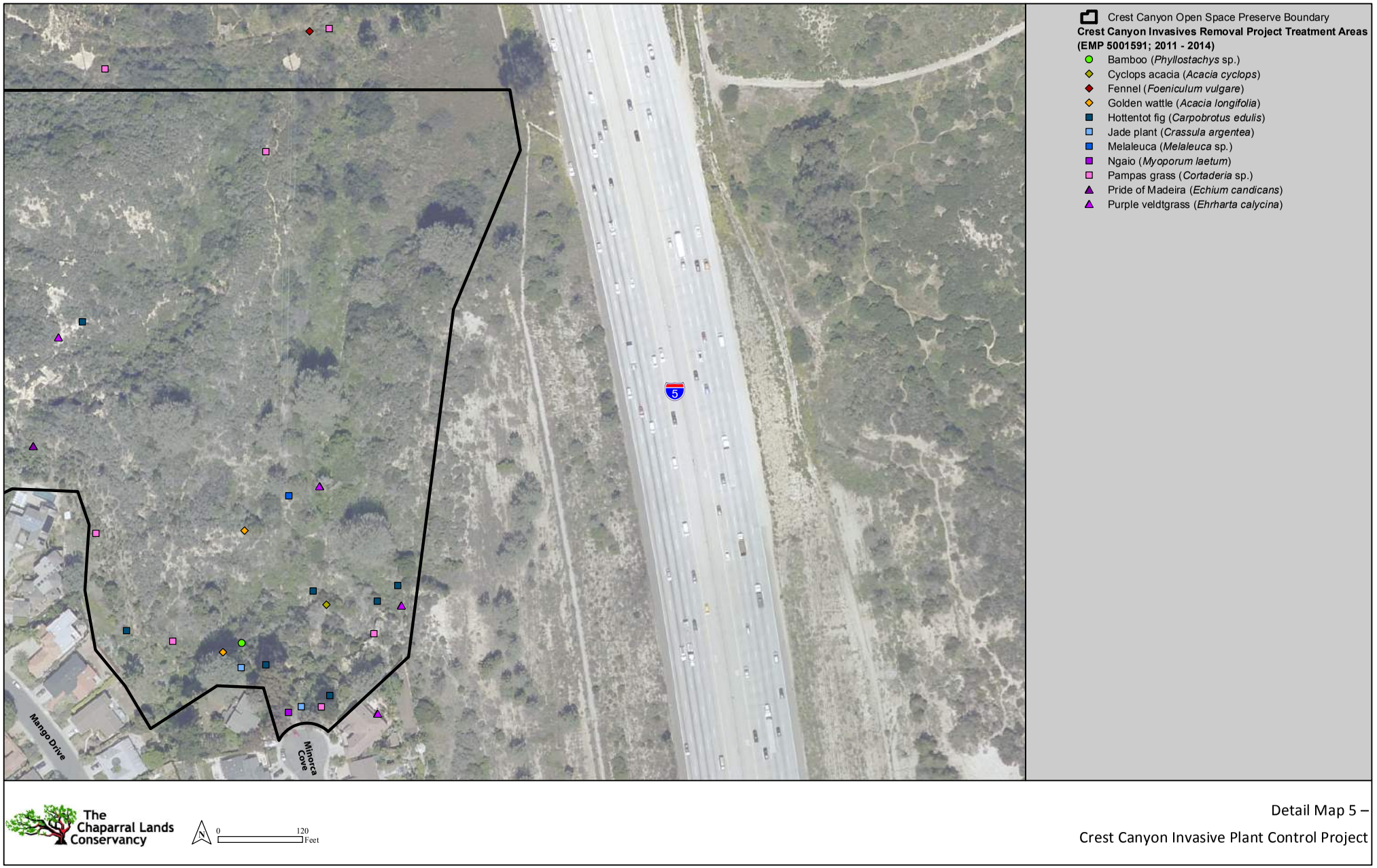
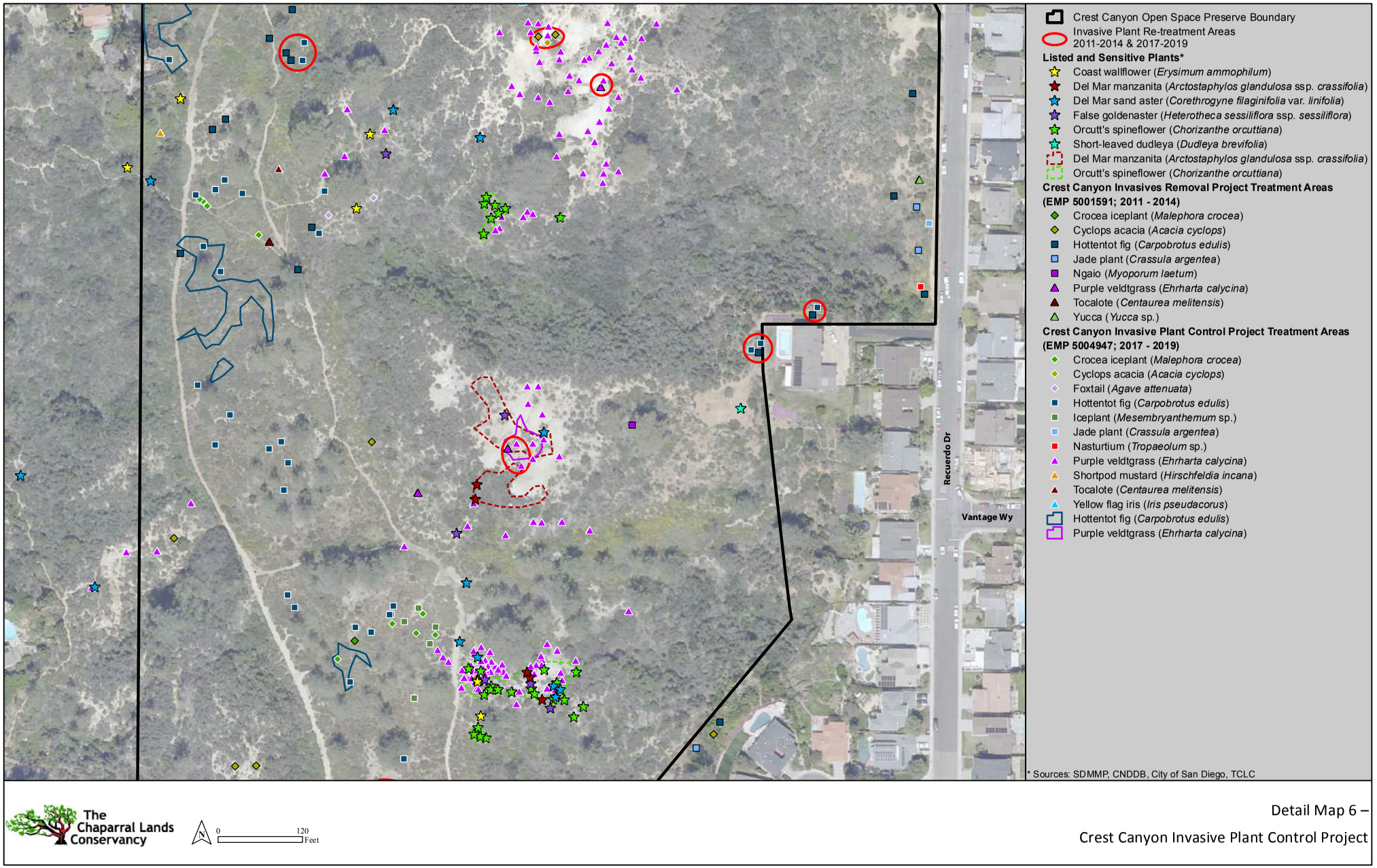
Detail Map 4 –
Crest Canyon Invasive Plant Control Project



Detail Map 5 –

Crest Canyon Invasive Plant Control Project



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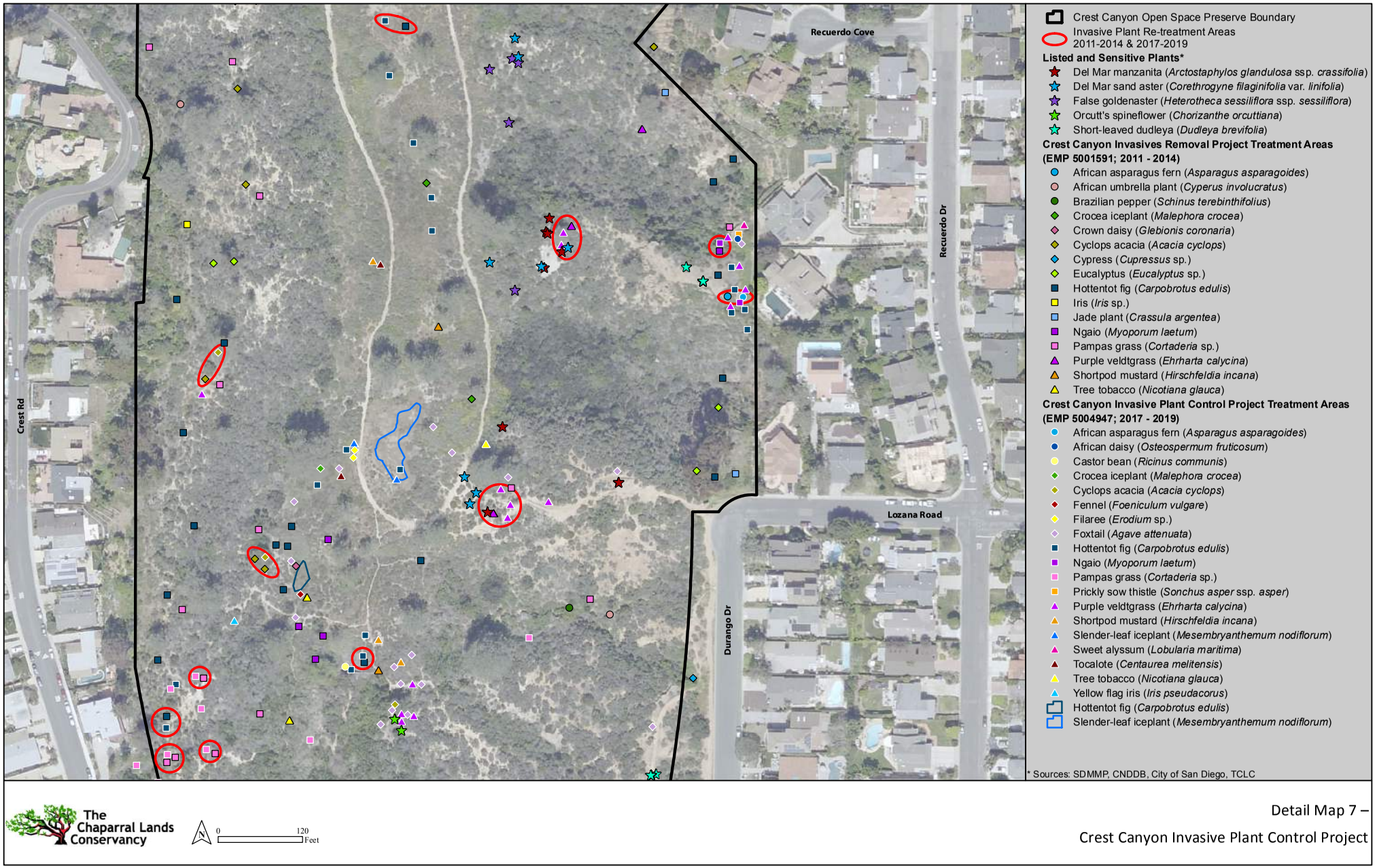
Detail Map 6 –

Crest Canyon Invasive Plant Control Project



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Detail Map 7 –

Crest Canyon Invasive Plant Control Project

Crest Canyon Open Space Preserve Boundary

Invasive Plant Re-treatment Areas
2011-2014 & 2017-2019

Listed and Sensitive Plants*

- Short-leaved dudleya (*Dudleya brevifolia*)

Crest Canyon Invasives Removal Project Treatment Areas (EMP 5001591; 2011 - 2014)

- African asparagus fern (*Asparagus asparagoides*)
- African fountaingrass (*Pennisetum setaceum*)
- African umbrella plant (*Cyperus involucratus*)
- Brazilian pepper (*Schinus terebinthifolius*)
- Brush cherry (*Syzigium* sp.)
- Century plant (*Agave americana*)
- Cyclops acacia (*Acacia cyclops*)
- Eucalyptus (*Eucalyptus* sp.)
- Fennel (*Foeniculum vulgare*)
- Hottentot fig (*Carpobrotus edulis*)
- Iris (*Iris* sp.)
- Jade plant (*Crassula argentea*)
- Mission prickly pear (*Opuntia ficus-indica*)
- Ngaio (*Myoporum laetum*)
- Pampas grass (*Cortaderia* sp.)
- Pride of Madeira (*Echium candicans*)
- Tree tobacco (*Nicotiana glauca*)
- Yucca (*Yucca* sp.)

Crest Canyon Invasive Plant Control Project Treatment Areas (EMP 5004947; 2017 - 2019)

- African fountaingrass (*Pennisetum setaceum*)
- African umbrella plant (*Cyperus involucratus*)
- Foxtail (*Agave attenuata*)
- Pampas grass (*Cortaderia* sp.)
- Pride of Madeira (*Echium candicans*)
- Shortpod mustard (*Hirschfeldia incana*)
- Tocalote (*Centaurea melitensis*)

* Sources: SDMMP, CNDDB, City of San Diego, TCLC

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Detail Map 8 –

Crest Canyon Invasive Plant Control Project