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# Western Snowy Plover Habitat Restoration at Vandenberg Air Force Base, California: Torch Oil Spill Mitigation

## *Phase 4 – 2014 End of Contract Summary*

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**Prepared for:**

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## Acronyms and Abbreviations

30 CES/CEIEA	30th Space Wing Installation Management Flight, Natural Resources Management
Base	Vandenberg Air Force Base
DoD	Department of Defense
MSRS	ManTech SRS Technologies, Inc.
VAFB	Vandenberg Air Force Base

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## 1.0 Introduction

On 27 September 1997, a rupture occurred along a pipeline connecting offshore torch/platform Irene to the onshore processing facility. The spill released 163 barrels of crude oil into the ocean, spreading throughout 17 miles of northern Santa Barbara County coastline. The most heavily oiled beach was Surf Beach on Vandenberg Air Force Base (VAFB or Base). In October 2007, a *Torch/Platform Irene Oil Spill Final Restoration Plan/Environmental Assessment* was developed, which calls for mitigation through the restoration of sandy beach and dune habitat on Surf Beach, funded through the Natural Resources Damage Assessment and Restoration Fund. Restoration is to be accomplished through the eradication of invasive plant species and enhancement of coastal strand habitat for the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*), a small shorebird that breeds on the beaches of VAFB.

In September 2007, the 30th Space Wing Installation Management Flight, Natural Resources Management (30 CES/CEIEA) at VAFB, tasked ManTech SRS Technologies, Inc. (MSRS) with implementing the *Final Plan for the Removal of Selected Invasive Plants from Western Snowy Plover Habitat at Vandenberg Air Force Base* (SRS Technologies 2005). This plan calls for the eradication of invasive coastal dune vegetation, European beachgrass (*Ammophila arenaria*), iceplant (*Carpobrotus* spp.), and Sydney golden wattle (*Acacia longifolia*) from a 30.8 acre area along a 0.62 mile section of coastline from the Santa Ynez river mouth extending south to the beach access trail at Surf Station, referred to herein as Area D (Figure 1).

In August 2009, VAFB tasked MSRS with conducting the first phase of the restoration plan, which included: collection of baseline vegetation data, development of photo monitoring stations, mechanical mulching of Sydney golden wattle and herbicide treatment of European beachgrass and iceplant within the restoration site (Figure 1). The original restoration site encompassed 30.8 acres. Work began in September 2009 with the mechanical mulching of 6-acres of habitat infested with Sydney golden wattle, which controlled the trees and created a firebreak perimeter in preparation for a prescribed burn of the restoration site.

On 22 October 2009, VAFB Hot Shots in coordination with 30 CES/CEIEA botanist, Ms. Luanne Lum, implemented a prescribed burn within the restoration area. The prescribed burn was the first step in a European beachgrass management schedule developed by Tim Hyland (California Department of Parks and Recreation) and Pete Holloran (Environmental Studies Department, University of California, Santa Cruz) for beaches in Santa Cruz County (T. Hyland, pers. comm.). In their work, fire was used to create optimal conditions for herbicide application by removing thatch, and promoting fresh re-growth of European beachgrass. Reemerging grass shoots were then treated with a 7-percent concentration of glyphosate herbicide containing a surfactant that facilitates adhesion of the herbicide to foliage. Though this method is reported to result in a 60-80 percent kill rate, successive retreatment was necessary to achieve target control goals.

During the 2010-11 contract period, MSRS performed repeated treatments of the restoration site using the glyphosate herbicide, brand named Rodeo® (Dow AgroSciences LLC). During that same period, test treatments of European beachgrass were conducted elsewhere on VAFB as part of a separate contract. These tests were intended to determine if the application of a low

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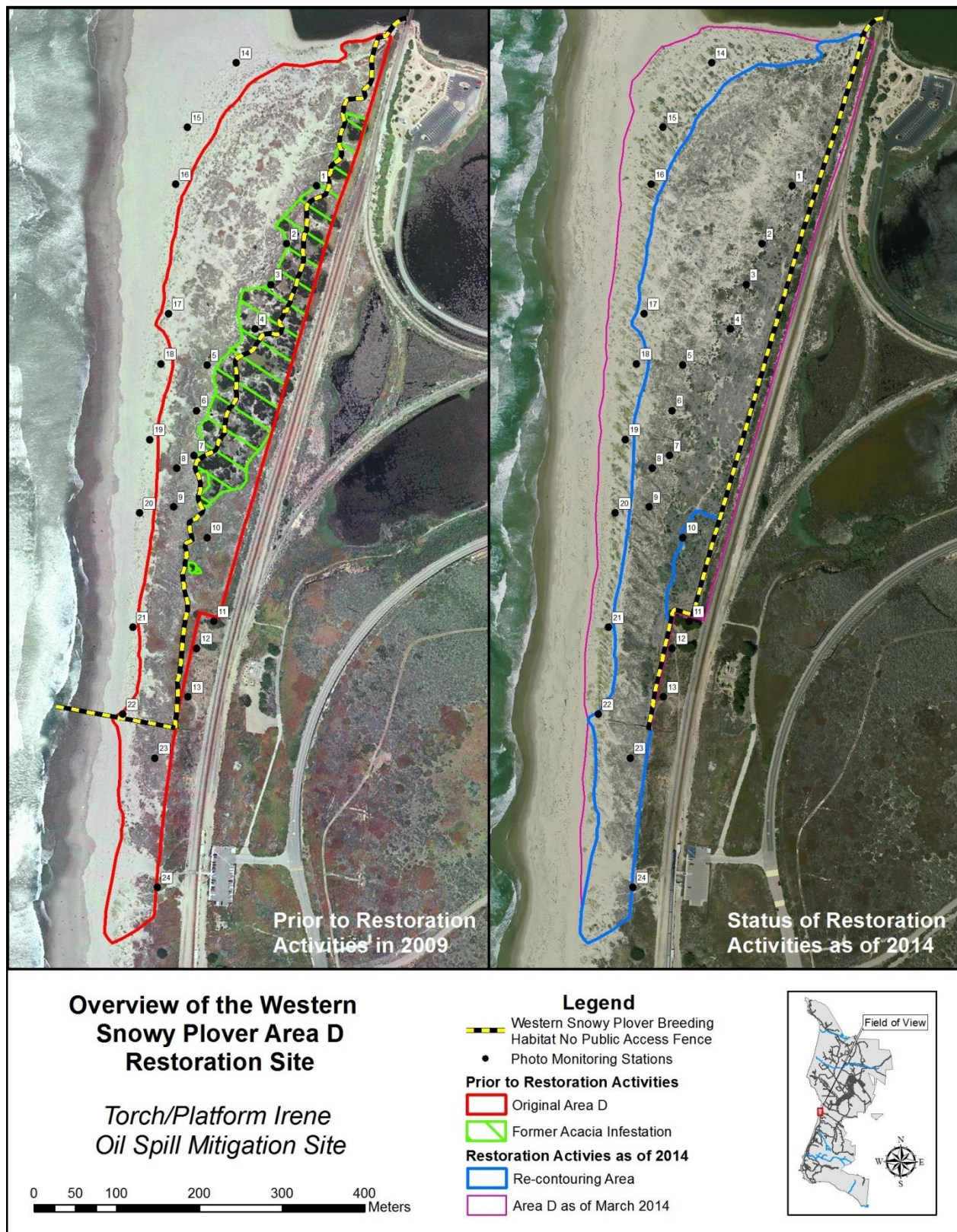
concentration imazapyr herbicide would result in a greater rate of beachgrass control than use of a high concentration glyphosate herbicide.

The results of testing trials indicate that imazapyr herbicides, brand name Polaris® (Nufarm Specialty Products) and Habitat® (DOW Chemical) significantly improve the effectiveness of European beachgrass treatments over Rodeo®. Furthermore, use of imazapyr reduces herbicide use in terms of weight by 89-percent. Given this information, Ms. Lum obtained DoD and U.S. Fish and Wildlife Service authorization for MSRS to switch herbicides for the remainder of the restoration project.

During the 2011-2012 contract period, MSRS performed two complete follow up weed treatments of the entire restoration site with an herbicide cocktail of 1-percent imazapyr and 2-percent glyphosate. In September 2012, MSRS also performed one round photo monitoring and weed treatment success. As of September 2012, all treatment sectors in Area D showed greater than 90-percent control of invasive weeds. However, dead invasive weed biomass still dominated ground cover in large portions of the back dune area.

Restoration efforts were not performed between the end of the 2011-2012 contract period and the beginning of the 2014-2015 period. This report summarizes dune re-contouring, herbicide treatment, and restoration activities performed during the 2014-2015 contract period (1 February 2014 to 31 January 2015) under FA4610-13-D-0002-0017. In 2014, dune contouring (Phase 4 of 5) was completed within the 50 acre restoration area at Surf Beach. In 2013, only one western snowy plover nest was initiated in the pre-contoured area of the restoration site. In 2014, 38 western snowy plover nests were initiated in the contoured area of Surf Beach and the contoured area had a higher hatch success than any other area (Robinette et al. 2015).





**Figure 1.** Location of invasive plant infestations, photo monitoring stations, and public access within the snowy plover restoration area before and after restoration activities.



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## 2.0 Dune Re-contouring

Despite the high level of invasive control achieved in previous phases of the restoration project, the European beachgrass formed a fore-dune ridge that prevented the movement of sand into the back dune. This created a greater potential for germination of invasive weeds and poor western snowy plover breeding habitat.

To facilitate the breakdown of the fore-dune ridge and bury invasive plant seed bank to a nonviable depth, MSRS conducted mechanical re-contouring of the dunes within 29 acres of Area D (Figure 1). Dune re-contouring also opened up potential western snowy plover breeding



**Figure 2.** Dune re-contouring by heavy equipment in February 2014.

habitat that had previously been inaccessible due to the large fore-dune ridge. Prior to the 2014 plover breeding season, heavy equipment was used to push dunes to a minimum elevation of two feet above the upper tidal zone (Figure 2). Excess sand was deposited in the upper portion of the intertidal. Care was taken to maintain a portion of the back dune dominated by intact native habitat. This created an open sheet of dune that sloped upward away from the tidal zone. As seen on other parts of VAFB, this open “sand sheet” habitat, maintained by constant wave and wind action, is the preferred western snowy plover nesting habitat (Figure 2).

Following the completion of dune re-contouring, MSRS expanded Area D to include tidal flats that were formerly outside the fore-dune crest (Figure 1). These areas were not prioritized for weed treatment in previous phases because they contained relatively small invasive weed infestations. The new restoration area, now 44.5 acres, encompasses these small infestations.

## 3.0 Native Plant Salvage and Re-vegetation

Prior to dune re-contouring, MSRS biologists salvaged giant coreopsis (*Coreopsis gigantea*) and dudleya (*Dudleya* sp.) plants from throughout the restoration area. MSRS replanted these plants after dune re-contouring had been completed.

## 4.0 Herbicide Treatment Summary

During the 2014-2015 contract period, MSRS performed spot treatments of re-growth of European beachgrass, iceplant, and Sydney golden wattle seedlings that had sprouted after re-contouring within the newly extended 44.5 acres of Area D (Figure 1). To minimize impacts on nesting western snowy plovers, these treatments were conducted in October 2014, outside of the nesting season. The October timing also allowed time for any invasive rhizomes and seeds

that were not buried deep enough to resprout so that they could be targeted during this treatment.

All three species were treated using a 1-percent concentration Polaris®, an imazapyr herbicide. Imazapyr is a persistent herbicide with documented success in controlling European beachgrass at other restoration sites on VAFB (MSRS 2012). In previous years, an herbicide cocktail of imazapyr and a glyphosate herbicide was used to treat weeds. Glyphosate was most effective at controlling annual weeds within the restoration area. Since there were no annual weeds observed within Area D during Phase 4, MSRS only applied imazapyr, which is effective on its own at controlling the three perennial invasive weed species present in the restoration area.

Over the course of the 2014-2015 contract, MSRS treated 1.89 acres of infested habitat using 2.28 pounds of concentrated Polaris. Table 1 provides a tabular summary of invasive weed treatment activities performed during this contract arranged by treatment quarter.

**Table 1.** Invasive weed treatment summary by quarter and species.

Time Period	Species	Method of Control	Chemical Type	Chemical (lbs)	Invasives Treated (Acres)	Total Invasives Treated Within T&E Habitat (Acres)	Total Invasives Treated Within Wetland Habitat (Acres)
<b>Winter Quarter 2014</b> (1 Feb – 31 Mar)	<i>No treatments performed in restoration area during the snowy plover breeding season</i>						
<b>Spring Quarter 2014</b> (1 Apr -30 Jun)	<i>No treatments performed in restoration area during the snowy plover breeding season</i>						
<b>Summer Quarter 2014</b> (1 Jul – 30 Sep)	<i>No treatments performed in restoration area during the snowy plover breeding season</i>						
<b>Fall Quarter 2014</b> (1 Oct - 31 Dec)	Acacia, beachgrass, iceplant	Foliar Herbicide	Polaris	2.28	1.89	1.89	0.00
<b>Overall Contract Totals</b>				<b>2.28</b>	<b>1.89</b>		

## 5.0 Assessment of Treatment Success

During Phase 4, MSRS performed three rounds of photo monitoring at all 24 photo documentation sites within Area D (Figure 1). The first round was performed in February 2014, prior to dune re-contouring. To document the structural change within the restoration site after dune re-contouring, MSRS performed a second round of photo monitoring in March 2014. In October 2014, MSRS performed a third round of photo monitoring to document sand movement and vegetation re-growth seven months after dune re-contouring. During each round, a total of 126 images were taken representing multiple camera angles at each monitoring station. A complete set of monitoring images are provided in PDF format on a Compact Disk appendix attached to this report. Figures 3 through 6 provide a sample time series of monitoring images taken between September 2009 and October 2014.

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Figures 3 and 4 illustrate the invasive plant control success within the back dune portion of the restoration site overlooking the area that was once densely vegetated with Sydney golden wattle and iceplant. Vegetation clearing and follow-up treatments within these areas during Phase 3 were effective at controlling invasive plants. However, the mulched Sydney golden wattle and dead iceplant biomass continued to choke the ground. As a result, the back dune was not suitable for western snowy plover breeding. During re-contouring, the fore-dunes were pushed over the back-dune area, burying the weed biomass and seedbank and creating an open sand sheet. Photo monitoring in March and October 2014 documented sand movement by wind and only minimal re-sprouting of invasive weeds.

Figures 5 and 6 show the success of invasive plant control and dune re-contouring along the fore-dune ridge created by the former European beachgrass infestation. Prior to dune re-contouring, European beachgrass rhizomes maintained the fore-dune crest, which ran the length of Area D. Re-contouring knocked down the fore-dune crest, broke up the dead beachgrass rhizome and root systems, and opened up the interior of the restoration site to sand movement by wind and wave action.

In prior years, photo monitoring was used to assess the treatment success of invasive weeds within designated treatment sectors. Since greater than 90-percent invasive weed control was achieved in Phase 3, MSRS shifted to assessing Area D as a whole, based on estimates of percent invasive weed cover recorded while performing invasive weed spot treatments. As of October 2014, only 1.98 acres of the site were infested with invasive weeds, therefore achieving greater than 95% control.

The transformation of the habitat appears to have increased nesting habitat for the western snowy plover. In 2013, prior to dune recontouring, only one nest was initiated in the pre-contoured area of the 50 acre restoration site. In 2014, after recontouring, 38 western snowy plover nests were initiated in the contoured area of Surf Beach and the contoured area had a higher hatch success than any other area on VAFB (Robinette et al. 2015).



**Figure 3.** Photo monitoring series at station D5 taken at a 137° azimuth showing effective invasive weed control and dune re-contouring. Invasive weeds present in October 2014 picture were later treated with herbicide.





SNPL\_D6\_37degrees\_2009Sep



SNPL\_D6\_37degrees\_2009Dec



SNPL\_D6\_37degrees\_2012Feb



SNPL\_D6\_37degrees\_2014Feb



SNPL\_D6\_37degrees\_2014Mar



SNPL\_D6\_37degrees\_2014Oct

**Figure 4.** Photo monitoring series at station D6 taken at a 37° azimuth showing effective invasive weed control and dune re-contouring. Any invasive weeds present in the October 2014 picture were later treated with herbicide.



SNPL\_D5\_300degrees\_2009Sep



SNPL\_D5\_300degrees\_2009Dec



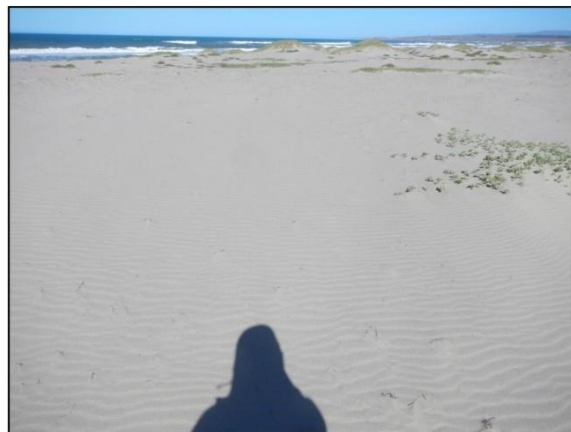
SNPL\_D5\_300degrees\_2012Feb



SNPL\_D5\_300degrees\_2014Feb



SNPL\_D5\_300degrees\_2014Mar



SNPL\_D5\_300degrees\_2014Oct

**Figure 5.** Photo monitoring series at station D5 taken at a 300° azimuth showing effective invasive weed control and dune re-contouring. Any invasive weeds present in the October 2014 picture were later treated with herbicide.





SNPL\_D17\_215degrees\_2009Sep



SNPL\_D17\_215degrees\_2009Dec



SNPL\_D17\_215degrees\_2012Feb



SNPL\_D17\_215degrees\_2014Feb



SNPL\_D17\_215degrees\_2014Mar



SNPL\_D17\_215degrees\_2014Oct

**Figure 6.** Photo monitoring series at station D17 taken at a 215° azimuth showing effective invasive weed control and dune re-contouring. Any invasive weeds present in the October 2014 picture were later treated with herbicide.

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## 6.0 Expense Reporting

Expenses incurred during the 2014-2015 contract period reflect labor hours for salvage and replanting of native species, oversight of dune recontouring, herbicide application, field mapping, photo monitoring, and report preparation, as well as costs of materials and herbicide (Table 2).

**Table 2.** Expenses incurred during the period of performance (1 February 2014 to 31 January 2015).

	Amount
Labor Support	\$26,822.66
Subcontractor (dune recontouring)	\$57,535.76
ODCs	\$1,080.80
<b>TOTAL</b>	<b>\$85,439.22</b>

## 7.0 References

- ManTech SRS (MSRS). March 2011. Western Snowy Plover Habitat Restoration at Vandenberg Air Force Base, California- Torch Oil Spill Mitigation Summary Report for Period 14 August 2009 to 31 January 2011.13pp.
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- Robinette, D.P, J. Miller, and J. Howar. 2015. Monitoring and Management of the Endangered California Least Tern and the Threatened Western Snowy Plover at Vandenberg Air Force Base, 2014.
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