

**APPENDIX D2: DELHI SANDS FLOWER-LOVING FLY HABITAT SUITABILITY
ASSESSMENT**

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BLOOMINGTON BUSINESS PARK SPECIFIC PLAN AREA

COMMUNITY OF BLOOMINGTON, SAN BERNARDINO COUNTY,
CALIFORNIA

Delhi Sands Flower-Loving Fly Habitat Suitability Assessment

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July 2021

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The undersigned certify that the statements furnished in this report and exhibits present data and information required for this biological evaluation, and the facts, statements, and information presented is a complete and accurate account of the findings and conclusions to the best of our knowledge and beliefs.



Travis J. McGill
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July 2021

Executive Summary

This report contains the findings of a habitat suitability assessment for the Delhi Sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*; DSF), a federally endangered species, for the proposed Bloomington Business Park Specific Plan Area, San Bernardino County, California. The purpose of this assessment is to characterize existing site conditions and assess the quality of Delhi sand soils on the project site to determine if they provide suitable habitat for DSF. The habitat suitability assessment was conducted by ELMT Consulting (ELMT) biologist Thomas J. McGill, Ph.D. on October 16, 2020.

The entire survey area has been subject to a variety of anthropogenic disturbances associated with development activities. Due to historical and current land uses, no undisturbed native plant communities or natural communities of special concern were observed within the survey area. The survey area consists of two (2) land cover types that would be classified as disturbed and developed.

The majority of the Specific Plan Area and Upzone Site have been mapped as supporting Tujunga loamy sand (TuB) and does not provide suitable habitat for DSF. Only the southwest portion of the Specific Plan Area has been mapped by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey as supporting Delhi sand soils. The area of Bloomington where the Specific Plan and Upzone site are located has historically been a rural residential area that has supported agricultural and farming activities for several decades. This has resulted in the Delhi Sand soils becoming mixed with Tujunga loamy soils. The large number of residential developments in this area impede the wind and the Delhi sand soils on the undeveloped portion of the specific plan area are no longer subject to aeolian processes.

Open sandy dunes with sparse vegetative cover were not observed within the Specific Plan Area. Unconsolidated soils are present in some areas beneath the hardened surface layer but are mixed with Tujunga loamy sands. High/good quality Delhi fine sands are absent from the Specific Plan Areas due to prolonged anthropogenic disturbance, including the disruption of the aeolian process in association with surrounding developments. In addition, the import of gravel and other alluvial materials combined with the disking of crops back into the soils for decades has degraded Delhi Sand soil quality, especially as it pertains to DSF.

Based on the habitat characteristics documented in the specific plan areas, Dr. McGill rated the areas as unsuitable for DSF with a habitat quality rating of 1. Two offsite corridors, designated for infrastructure improvements needed to serve the proposed developments with water, sewer and storm drain lines, were also assessed. Most of the pipeline routes occur in street alignments and do not pass through open, undeveloped habitat. One short segment along Jurupa Avenue between Alder Avenue and Laurel Avenue will be installed in an open area mapped as Delhi Sand soils. However, the Delhi sand soils in this short segment were either consolidated due to being mixing with Tujunga sandy loam soils or had been contaminated with organic matter from decades of disking crops back into soil. The short segment was rated as very low-quality with a rating of 2. Clean, unconsolidated Delhi Sand soils, needed by DSF, are not present.

Given the unsuitable and very low quality ratings of Delhi sand soils, the general lack of DSF sightings in this area, the recognized adverse changes in soil chemistry of Delhi sand soils in areas subjected to previous development and anthropogenic activities, it is highly unlikely that the Specific Plan Area is occupied or that the Specific Plan Area can become occupied in the future.

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Section 1 Introduction

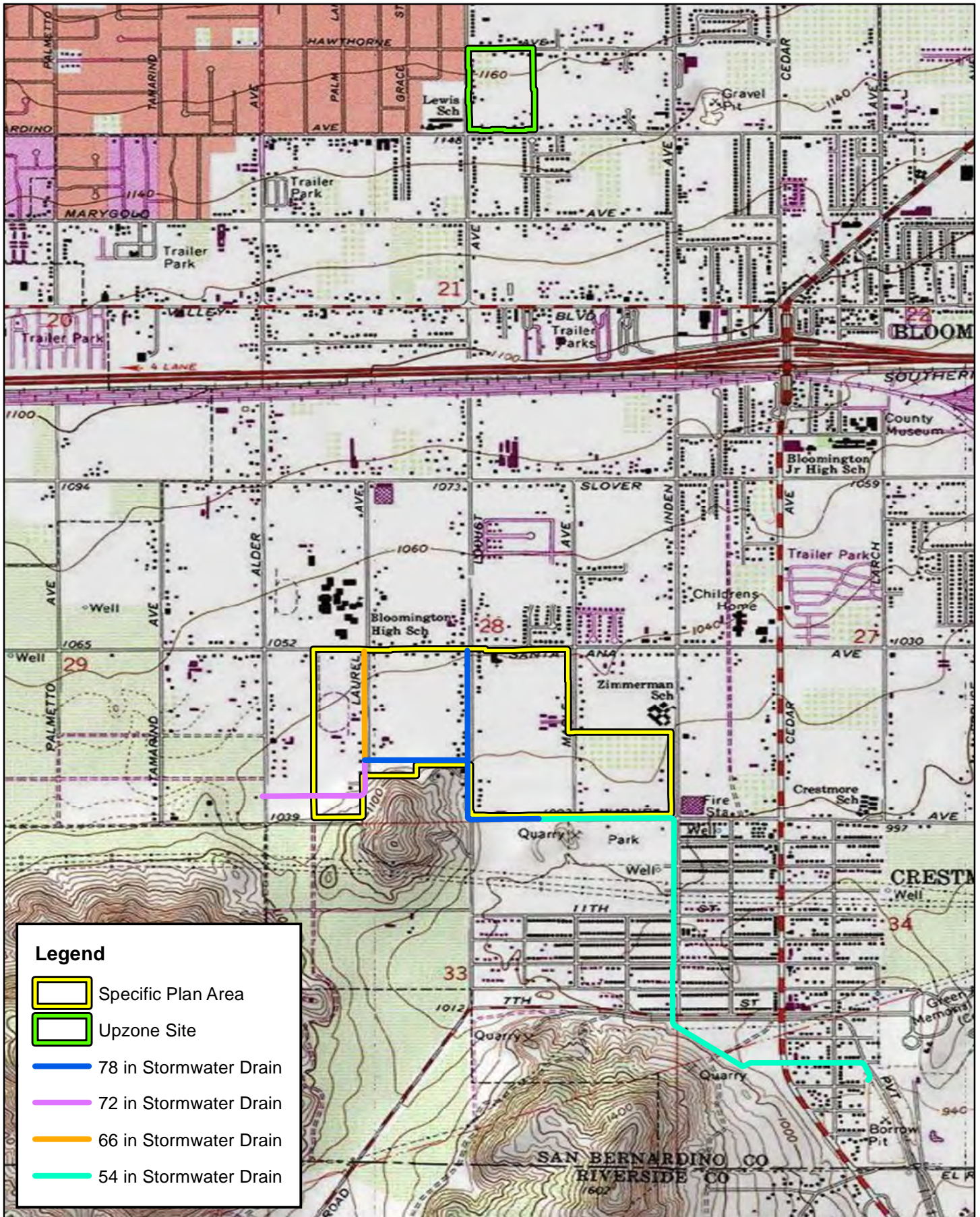
ELMT Consulting (ELMT) prepared this Delhi Sands Flower-loving Fly (DSF) Habitat Suitability Assessment for the proposed Bloomington Business Park Specific Plan Area (project site or site) located in the Community of Bloomington, San Bernardino County, California. The Specific Plan boundary and undeveloped areas immediately adjacent to the Specific Plan (survey area) was inventoried and evaluated the condition of the habitat on October 16, 2020. This assessment was conducted to determine if the soils on the undeveloped portion of the project site support clean Delhi sand soils capable of providing suitable habitat for DSF.

1.1 PROJECT LOCATION

The project site is generally located south of north of State Route 60, south of Interstate 10, west of Interstate 215 and east of Interstate 14 in the Community of Bloomington, San Bernardino County, California. The site is depicted on the Fontana quadrangle of the United States Geological Survey's (USGS) 7.5-minute map series within Section 28 of Township 1 South, Range 5 West (Exhibit 1, *Site Vicinity*). Specifically, the Specific Plan is bound by Santa Ana Avenue to the north, Linden Avenue to the east, Jurupa Avenue to the south, and Alder Avenue to the west (Exhibit 2, *Project Site*). The Upzone Site is bound by San Bernardino Avenue to the south, Locust Avenue to the west, Hawthorne Avenue to the north, and residential developments to the east.

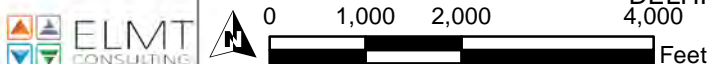
1.2 PROJECT DESCRIPTION

The Bloomington Business Park consist of four initial planning areas and two offsite infrastructure corridors for sewer, water and storm drains.

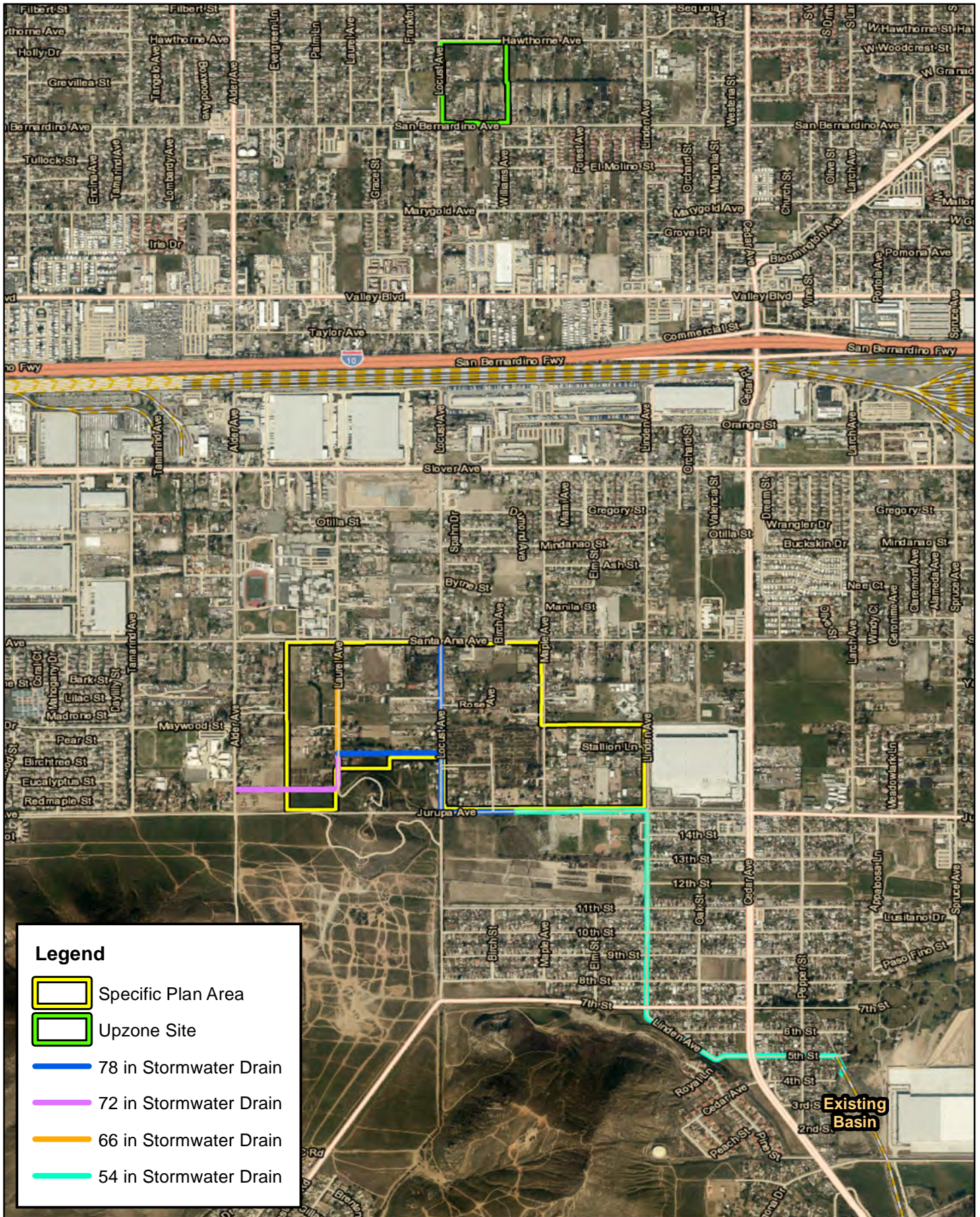


BLOOMINGTON BUSINESS PARK SPECIFIC PLAN AREA
 DELHI SANDS FLOWER-LOVIGN FLY SUITABILITY ASSESSMENT

Site Vicinity

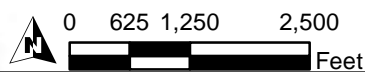


Source: USA Topographic Map, San Bernardino County



BLOOMINGTON BUSINESS PARK SPECIFIC PLAN AREA
 DELHI SANDS FLOWER-LOVIGN FLY SUITABILITY ASSESSMENT

Project Site



Source: ESRI Aerial Imagery, San Bernardino County

Section 2 Background

It has been generally acknowledged that DSF occur in Delhi sand soils, particularly clean dune formations composed of Aeolian sands. Conversely, soils and sands deposited by fluvial processes from the surrounding alluvial fans do not support DSF. These alluvial soils are composed of coarse sands, cobble and gravel (Tujunga soils) or coarse sands, silts and clays (Cieneba soils). In this part of Riverside County, the separation of soil types has been lost due to the mixing and cross contamination from years of agricultural activities, development, and other man-made disturbances such as surface mining/storage activities.

Depending on the extent of mixing and contamination, some areas formally mapped in 1970 as Delhi sand soils no longer have potential to support DSF populations. Conversely, some areas formally mapped as Cieneba soils may now be composed of Delhi sand soils and have potential to support DSF. Six DSF experts (Ken Osborne, Greg Ballmen, Rudy Matoni, Karen Cleary-Rose, Alison Anderson and Tom McGill) used this criterion, the relative abundance of clean Delhi sand soils versus the amount of Cieneba or other alluvial soils, to rate the suitability of the habitat to support DSF (Michael Brandman Associates, 2003). Soils high in gravel and alluvial materials, or high in fine materials such as silts and clays, were rated low, while soils that appear to be high in Aeolian deposited sands were rated high. This qualitative assessment of DSF habitat was further refined by considering the relative degree of soil compaction. Alluvial soils have a tendency to solidify to a hard surface pavement, while Aeolian soils are easier to penetrate and provide good substrate for DSF.

Although it has been common to attribute the presence of the four common plant species California buckwheat (*Eriogonum fasciculatum*), California croton (*Croton californicus*), deer weed (*Acmispon glaber*), and telegraph weed (*Heterotheca grandiflora*) as indicators of habitat suitability, for the assessment, vegetation composition was not given much weight in making this habitat evaluation. These dominant plant species, and plant species composition of habitats, may not be directly relevant to larval development (due to likely predatory or parasitic habitat of DSF larvae) (Osborne, et al. 2003). The known immature life histories of the nine asiloid fly families, including that to which the DSF is classified, are primarily predatory and/or parasitic on other invertebrate species (mainly insects) and the presence or absence of plant species appears not to be relevant to the life history of these flies.

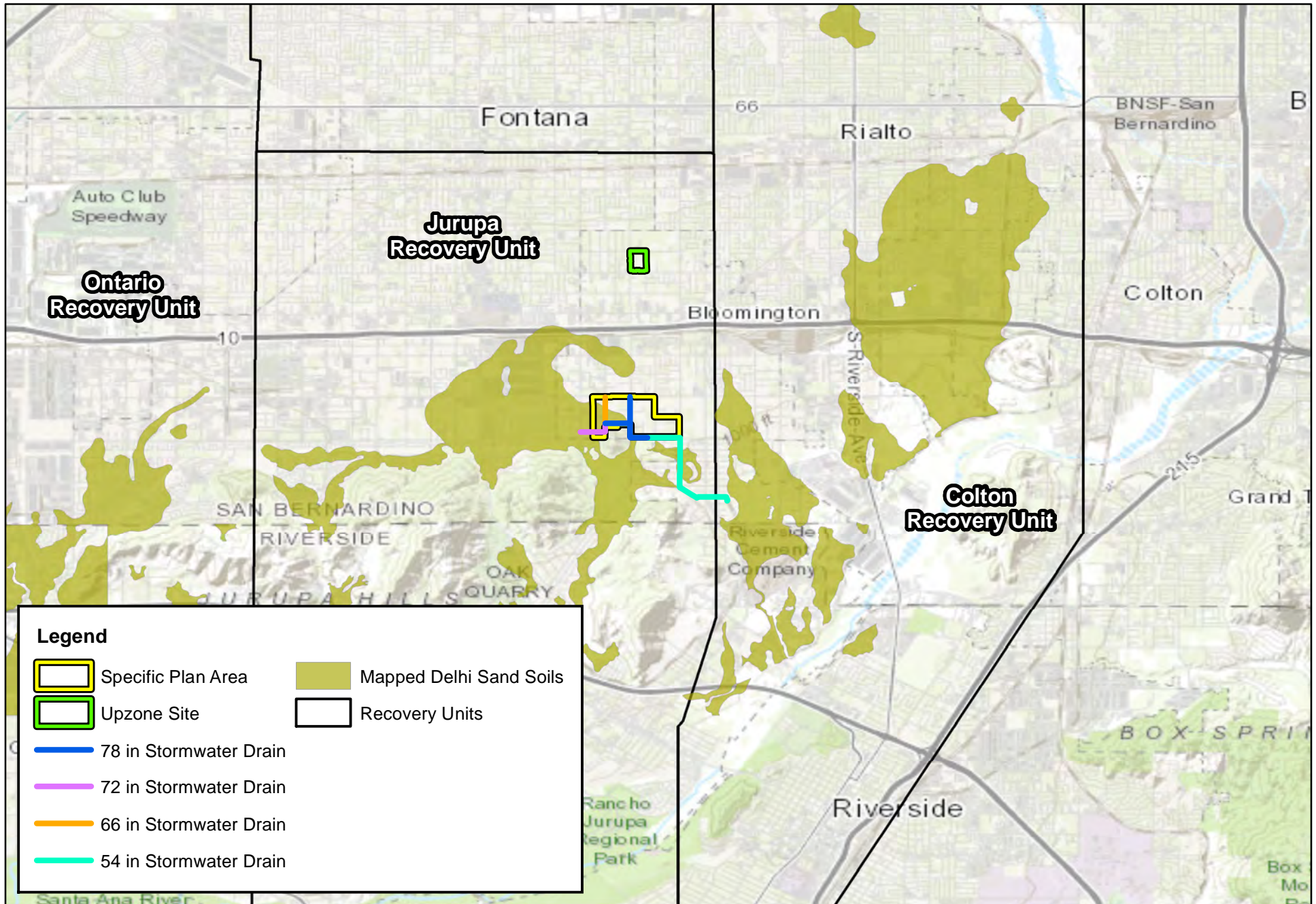
Land with suitable DSF habitat include those areas with open, undisturbed Delhi Series soils that have not been permanently altered by residential, commercial, or industrial development, or other human actions. Areas known to contain Delhi sand soils and/or to be occupied by DSF have been divided by USFWS into three recovery units (Colton, Jurupa, and Ontario Recovery Units (USFWS, 1997)). These recovery units are defined as large geographic areas based on geographic proximity, similarity of habitat, and potential genetic exchange. Within these three recovery units, are areas that have been previously protected by conservation easements:

- Colton: Eight sites have been permanently protected in the Colton recovery unit. In the USFWS five-year review of the DSF Recovery Plan (USFWS, 2008) the USFWS acknowledge that 8 sites had been identified as supporting DSF within the Colton Recovery Unit. These sites have

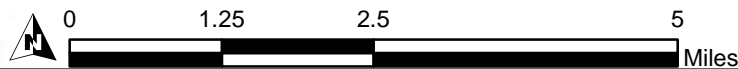
been permanently protected in the Colton Recovery Unit. Within the Colton Recovery unit, the Slover/Pepper population is partially protected through the establishment of a 7.5-acre Colton Transmission Facility Reserve at the eastern terminus of Santa Ana Ave in Colton and 150-acre Conservation Bank. There are about 160-acres of undeveloped DSF habitat contiguous with these conservation areas (USFWS, 2008).

- Jurupa: Approximately 21 ha (52-acres) of DSF habitat have been protected for this population along the Jurupa Hills. Approximately 12 ha (30-acres) are protected under a conservation easement within Riverside County (“I-15/Galena” Biological Opinion; FWS-WRIV-774). An additional 9 ha (22-acres) will be placed under a conservation easement and managed in San Bernardino County as a result of interagency consultation between the USFWS and the U. S. Army Corps of Engineers (Corps) (“Fontana Business Center” Biological Opinion; FWS-SB-1788.9), in accordance with section 7 of the Endangered Species Act.
- Ontario: In 2000, 4 ha (10-acres) of DSF habitat near the intersection of Greystone and Milliken Avenues in the City of Ontario, San Bernardino County, were acquired for conservation and an additional 1.2 ha (3-acres) of contiguous habitat was avoided, but not permanently conserved. At that time, these properties were surrounded by undeveloped land with some characteristics of DSF habitat, and the USFWS anticipated that a larger DSF reserve would be created that could sustain a robust DSF population. However, most of the surrounding property has subsequently been developed for commercial or industrial uses, and it is unlikely that the existing population can be sustained over the long term.

The project site is located within the Jurupa Recovery Unit, within, approximately 2.8 miles northeast of the previously conserved habitat protected under a conservation easement, and approximately 2 miles southwest of the Colton Dunes Conservation Bank (Exhibit 3, *DSF Recovery Units*).



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 DELHI SANDS FLOWER-LOVIGN FLY SUITABILITY ASSESSMENT
DSF Recovery Units



Source: ESRI World Topographic Map, San Bernardino County

Section 3 Methodology

The criteria discussed in detail below were used to rate the relative abundance of clean Delhi sand soils verses the amount of Cieneba, Tujunga, or other alluvial soils, to rate the suitability of the habitat to support DSF. Soils high in gravel and alluvial materials, or high in fine materials such as silts and clays, were rated low, while soils that appear to be high in Aeolian deposited sands were rated high. This qualitative assessment of DSF habitat was further refined by considering the relative degree of soil compaction. Alluvial soils have a tendency to solidify to a hard surface pavement, while Aeolian soils are easier to penetrate and provide good substrate for DSF.

3.1 SOIL

On-site and adjoining soils were researched prior to the field visit using the United States Department of Agricultural (USDA) Natural Resources Conservation Survey (NRCS) Soil Survey for San Bernardino County, California. In addition, a review of the local geological conditions and historical aerial photographs was conducted to assess the ecological changes the project site has undergone. In particular, the USDA NRCS was reviewed to determine the location of mapped Delhi sand soils on or within the immediate vicinity of the project site.

Based on the USDA NRCS Soil Survey, the survey area is historically underlain by Cieneba sandy loam (9 to 15 percent slopes), Cieneba-Rock outcrop complex (30 to 50 percent slopes), Delhi fine sand, and Tujunga loamy sand (0 to 5 percent slopes). Refer to Exhibit 4, *Soils*.

3.2 HABITAT SUITABILITY ASSESSMENT

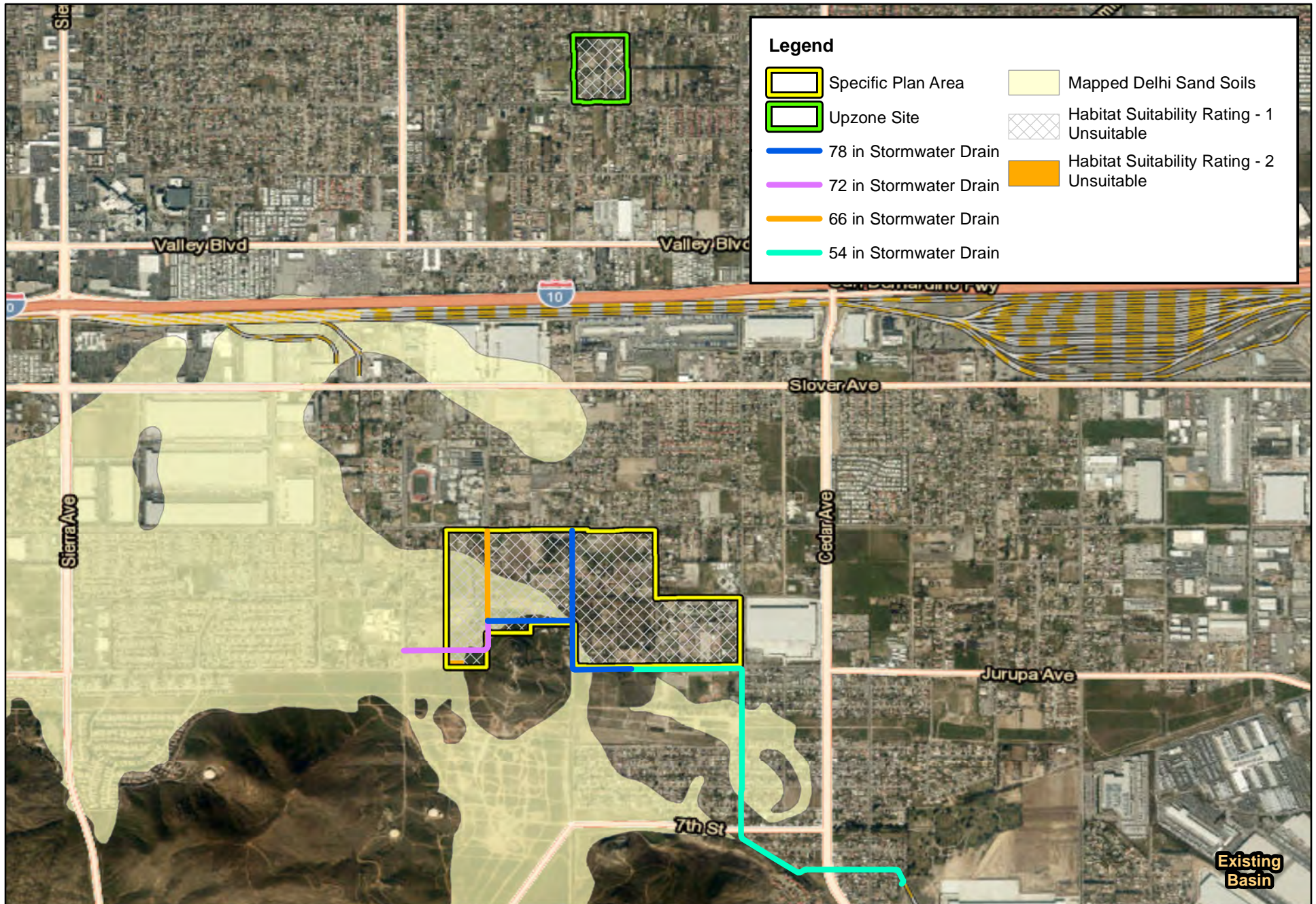
ELMT biologist Thomas J. McGill, Ph.D. surveyed the project site on October 16, 2020. The habitat suitability assessment consisted of a visual and tactile inspection of all areas on the project site that contain Delhi sand soils. Since the southwest corner of the project site was mapped as supporting Delhi sand soils, the southwest corner of the site was evaluated for the quality or purity and for its potential to support DSF. Areas were assigned one or more ratings ranging between 1 and 5, with 5 being the best quality and most suitable habitat:

1. Soils dominated by heavy deposits of alluvial material including coarse sands and gravels with little or no Delhi sand soils and evidence of soil compaction. Developed areas, non-Delhi sands soils with high clay, silt, and/or gravel content. Delhi sands extensively and deeply covered by dumping of exotic soils, rubble, trash or organic debris. *Unsuitable*.
2. Delhi sand soils are present, but the soil characteristics include a predominance of alluvial materials (Tujunga Soils and Hilmar loamy sand), or predominance of other foreign contamination. Sever and frequent disturbance (such as maintenance yard or high use roadbed). *Very Low Quality*.
3. Although not clean, sufficient Delhi sand soils are present to prevent soil compaction. Moderately contaminated Delhi sands. Delhi sands with moderate to high disturbance (such as

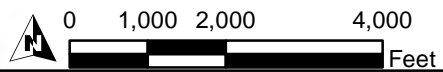
annual disking). Sufficient Delhi sands are present to prevent soil compaction (related to contamination by foreign soils). Some sandy soils exposed on the surface due to fossorial animal activity. *Low Quality*.

4. Abundant clean Delhi sand soils with little or no foreign soils (such as alluvial material, Tujunga soils or Hilmar loamy sand) present. Moderate abundance of exposed sands on the soil surface. Low vegetative cover. Evidence of moderate degree of fossorial animal activity by vertebrates and invertebrates. May represent high quality habitat with mild or superficial disturbance. *Moderate Quality*.
5. Sand dune habitat with clean Delhi sand soils. High abundance of exposed sands on the soil surface. Low vegetative cover. Evidence (soil surface often gives under foot) of high degree of fossorial animal activity by vertebrates and invertebrates. Sand associated plant and arthropod species may be abundant. *High Quality*.

It should be noted that habitat qualities often vary spatially within a site so that conditions on a site fall within a range of qualities. Further, overall habitat quality is affected by the connectivity of the site to other areas with suitable DSF habitat and the overall habitat value of the site.



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 DELHI SANDS FLOWER-LOVIGN FLY SUITABILITY ASSESSMENT
DSF Habitat Suitability



Source: ESRI Aerial Imagery, San Bernardino County

Section 4 Results

4.1 EXISTING CONDITIONS

The majority of the survey area is developed with residential/rural residential developments. Several farming and agricultural activities including horse and livestock corrals are found in association with the rural residences. The entire survey area has been subject to a variety of anthropogenic disturbances associated with development activities. Due to historical and current land uses, no undisturbed native plant communities or natural communities of special concern were observed within the survey area. These disturbances have eliminated the natural plant communities that once occurred on and surrounding the survey area. The survey area consists of two (2) land cover types that would be classified as disturbed and developed. Developed areas generally encompass all building/structures, and paved/impervious surfaces.

4.2 HABITAT SUITABILITY ASSESSMENT

Based on the NRCS USDA Web Soil Survey, only the southwest portion of the survey area is mapped as Delhi fine sand (refer to Exhibit 4, *Soils*). Soils observed throughout the survey area are generally compacted and did not give way underfoot during the survey. Open sandy dunes with sparse vegetative cover were not observed within the survey area. Unconsolidated soils are present in some areas beneath the hardened surface layer, and some areas contain loose soils at the surface in association with fossorial animal activity (mostly rodent burrows and ant mounds) but was not commonly observed.

High quality Delhi fine sands are absent from the survey area due to prolonged anthropogenic disturbance, including the disruption of the aeolian process in association with surrounding developments and associated agricultural areas. In addition, the introduction of gravel and other alluvial materials observed throughout most of the undeveloped areas have degraded soil quality, especially as it pertains to DSF. Native plants were typically not found in open fields within the survey area which were generally disked for weed control and fire abatement.

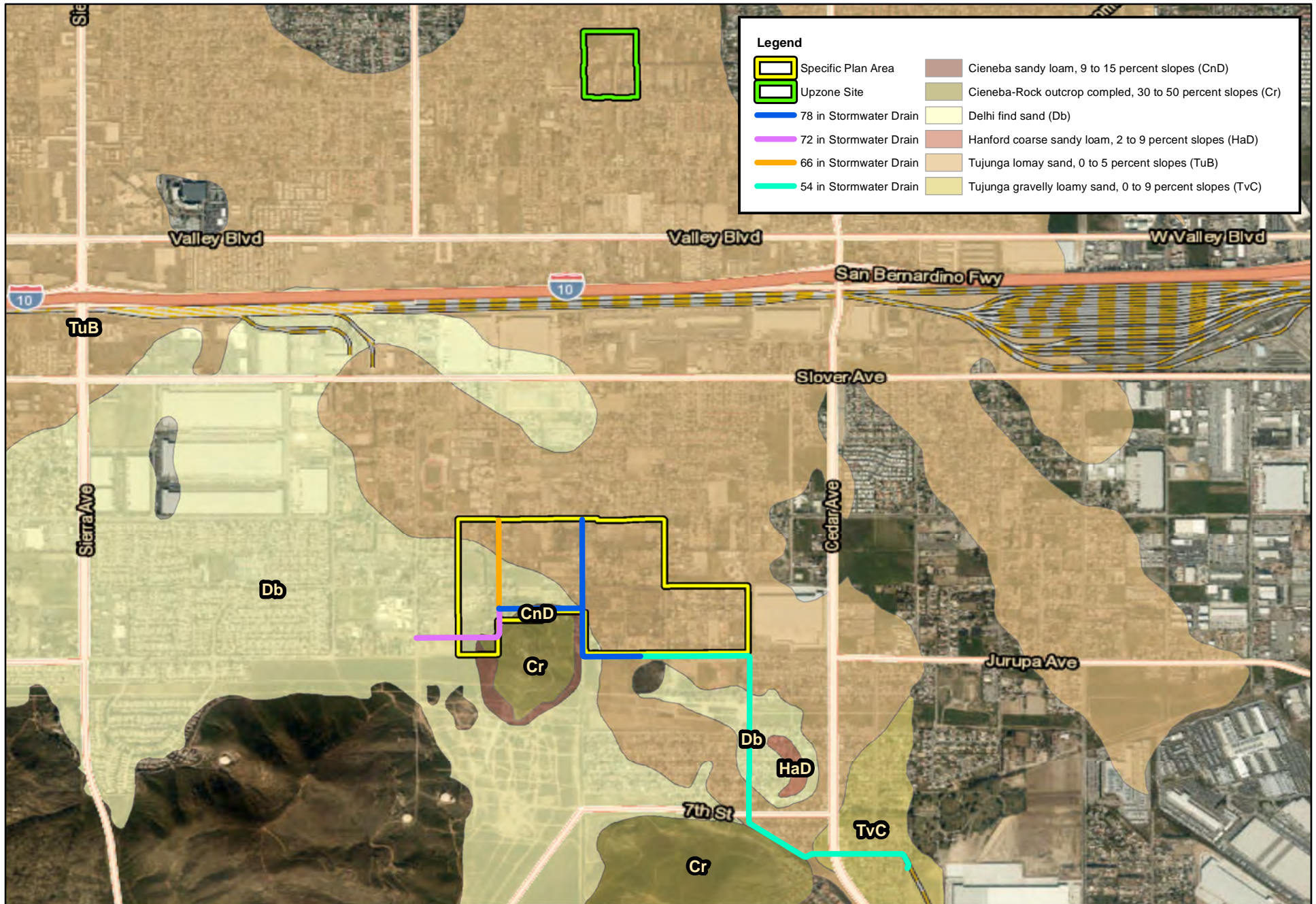
The Specific Plan Area consists for four (4) Planning Areas. The suitability of the habitat within each Planning Area to support DSF are described in detail below (Exhibit 5, *DSF Habitat Suitability*):

- Planning Area 1 is a 17-acre site located in the southeast corner of the Specific Plan Area. Soils in the area are limited to Tujunga loamy sand and does not support Delhi Sand soils. Most of the Planning Area is in either residential development or support agricultural activities. Planning Area 1 is unsuitable for DSF.
- Planning Area 2 is a 57.6-acre site located west of Planning Area 1 in the eastern half of the Specific Plan Area. Approximately fifty-five (55) acres of Planning Area 2 support Tujunga loamy, with only the southwest corner being mapped as Delhi sand soil. The area that has been mapped as Delhi sand soil on the southwest corner of Planning Area 2 is currently occupied by a fully landscaped residential development that precludes the availability of open Delhi sand soil. Planning Area 2 is unsuitable for DSF.













- Planning Area 3 is a 27.8-acre site west of Planning Area 2 in the western half of the Specific Plan Area. The northeastern two thirds of this area are mapped as Tujunga loamy sand and does not support Delhi Sand soils. The southwest corner is mapped as Delhi sand soils, but the areas has been severely contaminated with the Tujunga loamy sand soils or imported exotic soils. The southwest corner of Planning Area 3 no longer provides clean, unconsolidated Delhi sand soils, as this area has been heavily disturbed by onsite residential development. Planning Area 3 is unsuitable for DSF.
- Planning Area 4 is a 9.55-acre site along the western boundary of the Specific Plan Area. The entire area is mapped as Delhi sand soils. The site has been used as a rural residential development that has been heavily used for boarding horses and other livestock which contributes a large volume of organic materials into the soil. In addition, the Delhi sand soils have been further contaminated with the import of exotic soils, gravel and cobble that are distributed across the area. The disturbance of the upper layer of soils by decades of use by horses and livestock, combined with the continual contamination with organic materials and imported exotic soils has rendered the Delhi sand soils unsuitable for DSF. Planning Area 4 is unsuitable for DSF.

Additionally, two corridors were designated for offsite infrastructure improvements including development for water, sewer and storm drains. Most of the western corridor and all of the eastern corridor occur in street alignments and do not pass through open, undeveloped habitat. A short segment of the western corridor along Jurupa Avenue, between Alder and Laurel Avenues, passes through the southern edge of a rural residence that is maintained weed free through continual grading and an agricultural field that has been farmed for several decades, including grading of the site between crops. As a result, this area of open Delhi Sands has been exposed to continual disturbance for several decades and no longer supports clean Delhi Sand soils needed by DSF. Numerous focused surveys for DSF have been conducted on an adjacent project site, 200 yards to the south, over the last 20 years and have all been negative. There are no known extant DSF populations in the immediate vicinity. Without extant DSF populations in the vicinity, it is highly unlikely that this area of very low-quality Delhi Sand soils is occupied.

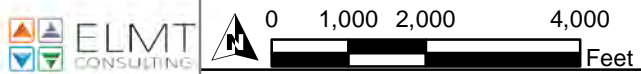
The area is rated as very low-quality habitat, with a habitat suitability rating of 2 and is highly unlikely to support DSF.



Legend

	Specific Plan Area		Cieneba sandy loam, 9 to 15 percent slopes (CnD)
	Upzone Site		Cieneba-Rock outcrop complex, 30 to 50 percent slopes (Cr)
	78 in Stormwater Drain		Delhi find sand (Db)
	72 in Stormwater Drain		Hanford coarse sandy loam, 2 to 9 percent slopes (HaD)
	66 in Stormwater Drain		Tujunga lomay sand, 0 to 5 percent slopes (TuB)
	54 in Stormwater Drain		Tujunga gravelly loamy sand, 0 to 9 percent slopes (TvC)

BLOOMINGTON BUSINESS PARK SPECIFIC PLAN AREA
 DELHI SANDS FLOWER-LOVIGN FLY SUITABILITY ASSESSMENT



Source: ESRI Aerial Imagery, Soil Survey Geographic Database, San Bernardino County

Soils

Section 5 Conclusion and Recommendations

Dr. McGill has been working with in the DSF ecosystem, including the Colton Dunes Conservation Bank and the West Valley Conservation Area in the City of Colton, for over 25 years. Based on his twenty-five years of experience with DSF and occupied DSF ecosystems, the information provided in this report, and information based on the referenced DSF habitat suitability scale (Ballmer, Osborne, McGill), Dr. McGill rated the Specific Plan areas as being unsuitable for DSF with a habitat suitability rating of 1. Additionally, he assessed the suitability of habitat within the western offsite infrastructure corridor between Alder and Laurel Avenues that is mapped as open Delhi Sand soils. The Delhi Sand soils in this short corridor was either consolidated due to the mixing with Tujunga sandy loam soils or had been contaminated with organic matter from decades of disking crops back into soil. The area was rated as very low-quality with a rating of 2. There are no known extant DSF populations in the immediate vicinity. It is improbable that a dispersing DSF individual would temporarily occupy the undeveloped areas within the Specific Plan. Without extant DSF populations in the vicinity, it is highly unlikely that this area of very low-quality Delhi Sand soils is occupied.

Given the unsuitable and very low quality rating of Delhi sand soils, the general lack of DSF sightings in this area, the recognized adverse changes in soil chemistry of Delhi sand soils in areas subjected to previous development and anthropogenic activities, it is highly unlikely that the Specific Plan Area or Upzone Site is occupied or that the Specific Plan Area can become occupied in the near future.

Section 6 References

- Osborne, K.H. 2002a. Focused surveys for the Delhi Sand giant flower-loving fly (*Rhaphiomidas terminatus abdominalis*) on a 125-acre portion of the Fontana Business Center site. Submitted to USFWS October 15, 2002.
- Osborne, K.H. Greg Ballmer and Thomas McGill. 2003. Delhi Sands Flower-loving Fly Habitat Assessment for the Fontana Business Center.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2020. *Web Soil Survey*. Online at <http://websoilsurvey.nrcs.usda.gov/app/>.
- U.S. Fish and Wildlife Services. 1996. Habitat Conservation Plan in support of the issuance of a Section 10(a) permit for incidental take of the endangered Delhi Sands Flower-Loving Fly (*Rhaphiomidas terminatus abdominalis*) in connection with the completion of the Cantara residential project in the City of Colton, California.
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- U.S. Fish and Wildlife Service. 2019. Recovery Plan Amendment for Delhi Sands Flower-Loving Fly (*Rhaphiomidas terminatus abdominalis*).
- U.S. Fish and Wildlife Services. 2008. Delhi Sands Flower-Loving Fly (*Rhaphiomidas terminatus abdominalis*) 5-Year Review: Summary and Evaluation. Carlsbad, California. March 2008.

Appendix A Site Photographs



Photograph 1: Mixed/contaminated soils with Planning Area 4.



Photograph 2: View of Planning Area 4.



Photograph 3: Mixed/contaminated soils with the undeveloped areas of Planning Area 4.



Photograph 4: Storm drain alignment in existing road.



Photograph 5: Storm drain alignment within existing road.



Photograph 6: Soils mixed with Tujunga soils.



Photograph 7: Soil mixed with loose gravel