FINAL ENVIRONMENTAL ASSESSMENT

PROPOSED INFIELD AND TAXIWAY IMPROVEMENTS PROJECT

MONTEREY REGIONAL AIRPORT

Monterey County, California

Prepared for:

MONTEREY PENINSULA AIRPORT DISTRICT
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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
As lead Federal Agency pursuant to the *National Environmental Policy Act of 1969*

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May 2019

This environmental assessment becomes a Federal document when evaluated, signed and dated by the responsible FAA Official.

Responsible FAA Official **Date** May 21, 2019

GENERAL INFORMATION ABOUT THIS DOCUMENT

WHAT'S IN THIS DOCUMENT? This document contains a Final Environmental Assessment (EA) for the Monterey Peninsula Airport District's proposed Infield and Taxiway Improvements Project at the Monterey Regional Airport in Monterey County, California. The Proposed Action is to resurface 15 existing infield areas located between Runway 10R-28L and parallel taxiways located to the north and south of the runway to enhance safety. Most of these infield areas are covered with a "chip seal" pavement surface treatment of liquid asphalt and fine aggregate. This chip seal treatment is decomposing into small pieces of material (foreign object debris or FOD) which can be blown into aircraft. FOD can damage propellers, engines, and other parts of the aircraft resulting in aircraft component failures that can cause aircraft accidents. The Proposed Action also includes the removal of Taxiway "E," and the reconfiguration of the Taxiway "F" and Taxiway "K" intersections and associated infield areas between Runway 10R-28L and Taxiway "A" to enhance safety by providing sufficient separation between aircraft to meet FAA taxiway and hold line design standards. To accommodate the reconfiguring of Taxiways "F" and "K", Taxiway "A" (and its associated storm drains and service road) at its connection with these taxiways would be shifted south. As part of this project the surface grades of the infield areas will be modified so as to meet FAA design standards, which will minimize the presence of ponded water on the airfield during storm events. Several different surface materials for the infield areas are under consideration including: chip seal, crushed aggregate (rock), asphalt concrete, or other similar materials. In addition to reducing FOD on the airfield and improving drainage, the new surface treatments will discourage wildlife, including burrowing animals, from using the infield areas. This will reduce the potential for wildlife-aircraft collisions with burrowing animals such as ground squirrels, or collisions with birds or mammals that prey on ground squirrels. This document discloses the analysis of the potential impacts of the Proposed Action, No Action, and other alternatives.

WHAT SHOULD YOU DO? Read this Final EA on this Proposed Action to understand the actions that the Monterey Peninsula Airport District and FAA intend to take relative to the Proposed Action at Monterey Regional Airport.

WHAT HAPPENS AFTER THIS? Following review of the Final EA, the FAA will either issue a Finding of No Significant Impact (FONSI), a FONSI/Record of Decision (ROD), or decide to prepare a Federal Environmental Impact Statement.

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Monterey County, California

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Chapter One
PURPOSE AND NEED

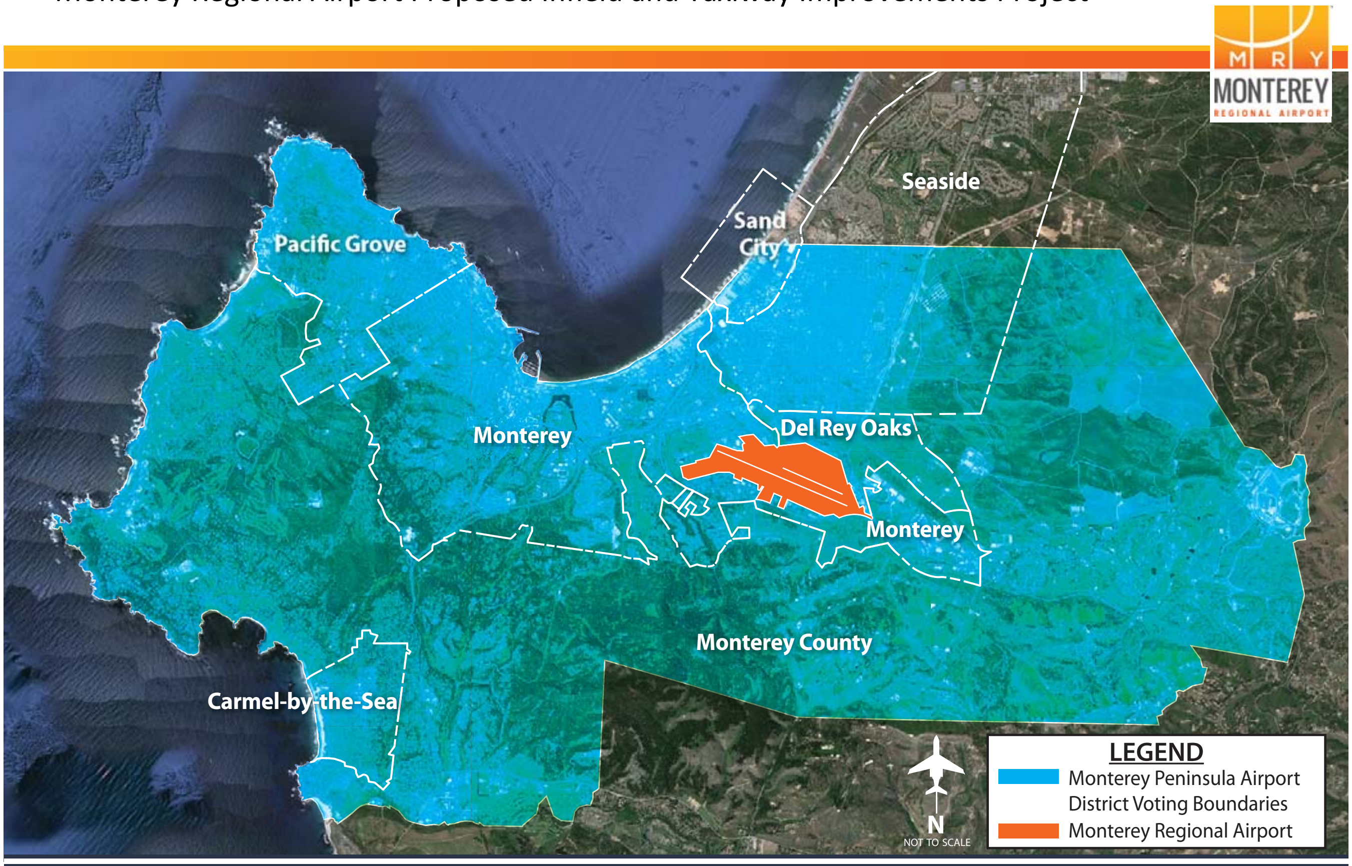
Chapter One PURPOSE AND NEED

Proposed Infield and Taxiway Improvements Environmental Assessment

1.1 INTRODUCTION

Monterey Regional Airport (Airport) is centrally located between the various cities in and around the Monterey Peninsula. As depicted on **Exhibit 1A**, the Airport is in the northwest portion of Monterey County, California. The Airport is bordered by the City of Monterey on the northwest, west, south, and east, and the City of Del Rey Oaks on the northeast. The United States (U.S.) Navy owns several parcels near the Airport, including the Monterey Pines Golf Course immediately west of the Airport. The Airport is situated approximately one mile to the southeast of the City of Monterey's central business district and one mile to the south of Monterey Bay. The Airport is located on 498 acres of property. An overview of the Airport is shown in **Exhibit 1B**. The Airport is owned and operated by the Monterey Peninsula Airport District (District).

The Proposed Action is to resurface the existing infield areas located between Runway 10R-28L and parallel taxiways located to the north and south of the runway to enhance safety. Most of these infield areas are covered with a "chip seal" pavement surface treatment of liquid asphalt and fine aggregate. Due to the age of this chip seal treatment, it is decomposing into small pieces of material (foreign object debris or FOD) which can be blown into aircraft. FOD can damage propellers, engines, and other parts of the aircraft resulting in aircraft component failures that can cause aircraft accidents. The Proposed Action also includes the removal of Taxiway "E," and the reconfiguration of the Taxiway "F" and Taxiway "K" intersections and associated infield areas between Runway 10R-28L and Taxiway "A" to enhance safety by providing sufficient separation



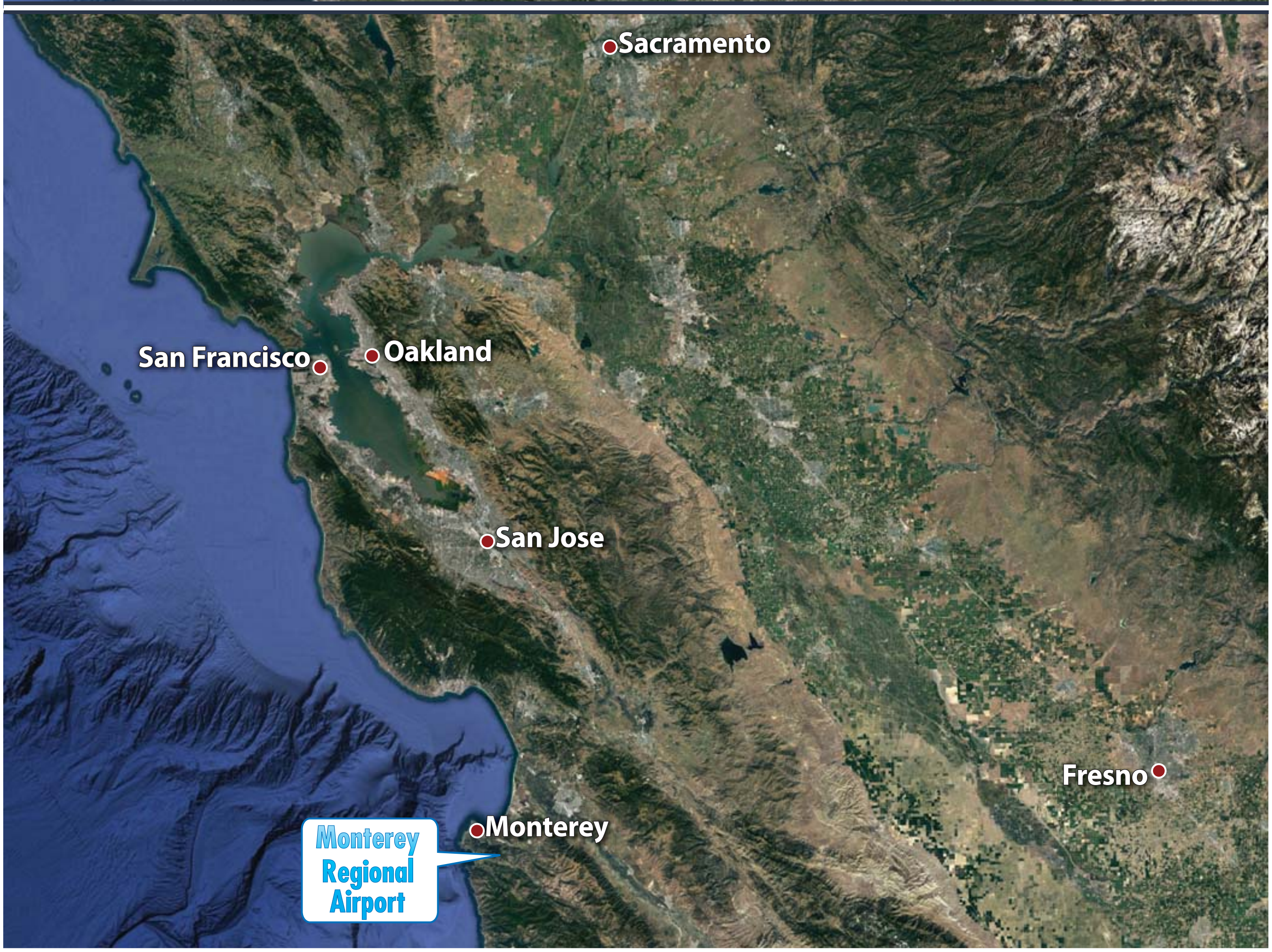


Exhibit 1A
VICINITY/LOCATION MAP

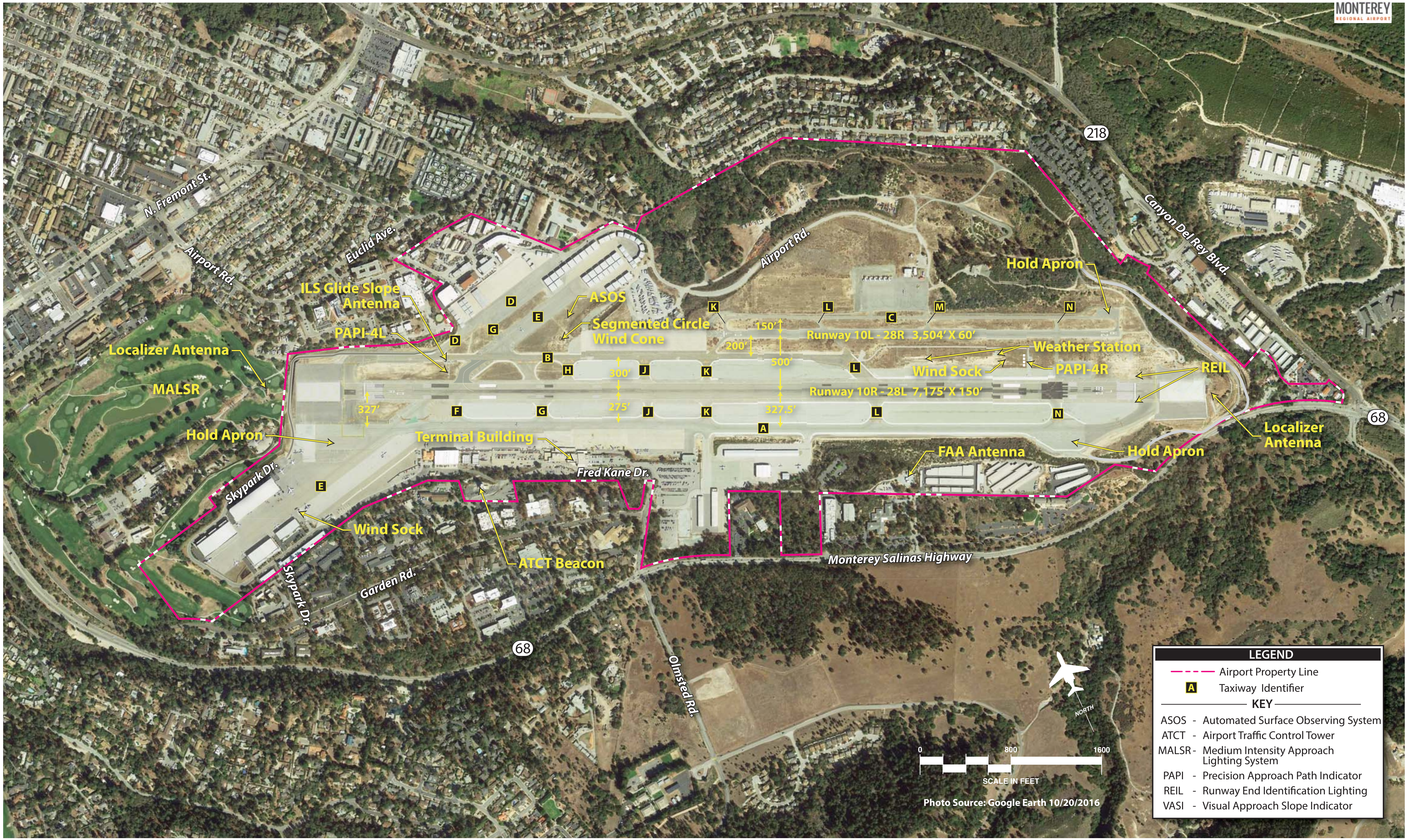


EXHIBIT 1B
EXISTING FACILITIES

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between aircraft to meet Federal Aviation Administration (FAA) taxiway and hold line design standards. To accommodate the reconfiguring of Taxiways "F" and "K," Taxiway "A" (and its associated storm drains and service road at its connection with these taxiways) would be shifted south. As part of the Proposed Action, the surface grades of the infield areas would be modified to meet FAA design standards, which would minimize the presence of ponded water on the airfield during storm events.

Several different surface materials for the infield areas are under consideration, including: chip seal, crushed aggregate (rock), and asphalt concrete. In addition to reducing FOD on the airfield and improving drainage, the new surface treatments would discourage wildlife, including burrowing animals, from using the infield areas. This would reduce the potential for wildlife-aircraft collisions with burrowing animals, such as ground squirrels, or collisions with birds or mammals that prey on ground squirrels. This document discloses the analysis of the potential impacts of the Proposed Action, No Action, and other alternatives.

The different areas on the Airport where construction would occur are identified on **Exhibit 1C** as the project environmental impact study area boundary (project study area). The Proposed Action would be constructed in two phases. Phase 1 would include Areas B-1, B-6, C-1, C-2, C-3, C-4, C-5, C-6, the closure of Taxiway "E" south of Runway 10R-28L, the reconfiguration of the Taxiway "F" connection with Taxiway "A," and associated drainage improvements. Phase 2 would include areas B-2, B-3, B-4, B-5, A-1, A-2, A-4, the reconfiguration of the Taxiway "K" connection with Taxiway "A" (unless already closed), and associated drainage improvements. The overall duration of construction would depend on the final surface treatment of the infield areas.

This Environmental Assessment (EA) has been prepared pursuant to the requirements of Section 102(2)(c) of the *National Environmental Policy Act of 1969* (NEPA), President's Council of Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] §§ 1500-1508), and Section 509(b)(5) of the *Airport and Airway Improvement Act of 1982*, as amended. This EA has also been prepared in accordance with FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA 2015) and FAA Order 5050.4B, *National Environmental Policy Act* (NEPA) *Implementing Instructions for Airport Actions* (FAA 2006). FAA is the lead Federal agency to ensure compliance with NEPA for airport development actions. This EA will aid the FAA and the District in complying with various Federal environmental laws and regulations that are applicable to the Proposed Action.

This chapter contains background information on the Airport, describes the Proposed Action, including its purpose and need, lists associated Federal actions, discusses other applicable Federal laws and statutes, and outlines the EA's format. The EA's scoping and agency coordination materials are in **Appendix A**.

1.2 AIRPORT BACKGROUND

The District was created in 1941 to manage and operate the Airport and airport lands. The District is a stand-alone public entity governed by five publicly elected members to the Board of Directors. The mission of the District is to provide the region with convenient commercial and general aviation access to the national air transportation system, to operate the Airport in a safe, efficient, sustainable, and fiscally responsible manner, and to develop the Airport to meet future needs, opportunities, and challenges.

The District includes the cities of Monterey, Pacific Grove, Carmel-by-the-Sea, Del Rey Oaks, and majority portions of Sand City and Seaside. Unincorporated communities, including Pebble Beach, the west end of Carmel Valley, Hidden Hills, Monterra, Laguna Seca, Pasadera, and Monterey-Salinas Highway to Laureles Grade, are also included within the District boundaries as shown on **Exhibit 1A**.

The Airport is classified as a non-hub primary commercial service airport in the *National Plan of Integrated Airport Systems (2017-2021)* (NPIAS) (FAA 2016). An airport must be listed in the NPIAS to be eligible for Federal funding. There are 139 fixed-wing aircraft based at the Airport, including 115 single-engine aircraft, 13 multi-engine aircraft, and 11 jets, as well as four helicopters. During the 12-month period ending on January 1, 2017, the Airport experienced 97,235 total operations (GCR Inc. 2017).

1.2.1 Airside Facilities

Airside facilities are those which facilitate aircraft movements between the air and ground. Generally, these facilities include runways, taxiways, airport lighting and marking, and navigational aids. Two parallel runways currently serve the Airport. Runway 10R-28L is the primary runway and Runway 10L-28R is the shorter runway. The runways are separated by 500 feet, centerline to centerline. The taxiway system at the Airport, as illustrated on **Exhibit 1B**, consists of parallel, connecting, access, and entrance/exit taxiways. **Table 1A** presents a summary of the Airport's airfield characteristics.

1.2.2 Landside Facilities

Landside facilities are those that support the aircraft and pilot/passenger handling functions, as well as other non-aviation facilities typically providing a revenue stream to the Airport. At the Airport, these facilities include the passenger terminal complex, cargo facilities, general aviation facilities, and support facilities, such as fuel storage, automobile parking, roadway access, and aircraft rescue and firefighting (ARFF). The primary landside facilities at the Airport are identified on **Exhibit 1B**.

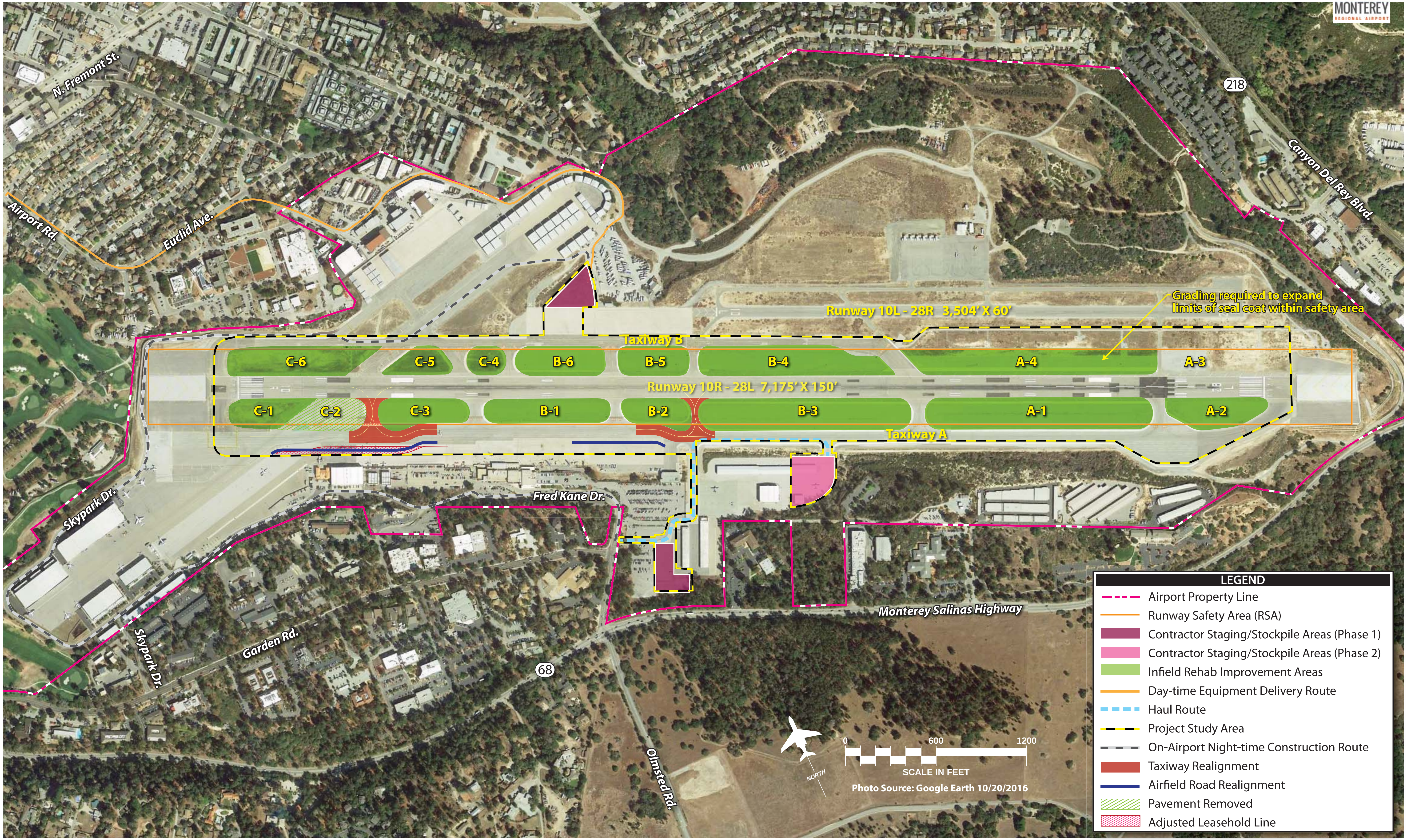

EXHIBIT 1C
PROPOSED ACTION

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TABLE 1A
Airside Facility Data
Monterey Regional Airport

Field Elevation: 257' MSL	RUNWAY 10R	RUNWAY 28L	RUNWAY 10L	RUNWAY 28R
Runway Length	7,175'		3'503	
Runway Width	150'		60'	
Runway Surface Material (Condition)	Grooved Asphalt (Good)		Asphalt (Good)	
Runway Markings (Condition)	Precision (Good)		Basic (Good)	
Displaced Threshold	175’	175'	none	
Runway Lighting	High Intensity		Medium Intensity	
Arresting Gear/System	EMAS	EMAS	none	none
Traffic Pattern	Left	Right	Left	Right
Runway Weight Bearing Capacity Single Wheel (S) Double Wheel (D) Dual Wheel Single (2S) Dual Wheel Tandem (2D)	 100,000 160,000 175,000 300,000		 12,500 N/A N/A N/A	
Runway Gradient (west to east)	1.40%		1.70%	
Taxiway Lighting	Medium Intensity			
Taxiway, Taxilanes & Apron Lighting	Centerline Markings, Tie-Down Area Marking, Reflectors			
Visual Approach Aids	PAPI-4L REIL MALSR	PAPI-4L REIL	none	
Instrument Approach Aids	ILS RNAV (GPS)	RNAV (RNP) RNAV (GPS) LOC/DME	RNAV (GPS)	GPS
Weather and Navigational Aids	Automated Surface Observing System; Lighted Wind Cone; Airport Beacon; Automatic Terminal Information System; Airport Traffic Control Tower			

Sources: FAA 2017, *Digital Chart Supplement – Southwest U.S. (effective January 5, 2017); Airport records.*

MSL = mean sea level
EMAS - Engineered Materials Arresting System
N/A - Not applicable
PAPI - Precision Approach Path Indicator
REIL - Runway End Identifier Lights
MALSR - Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
ILS – Instrument Landing System
RNAV - Area Navigation (GPS variant)
GPS - Global Positioning System
RNP - Required Navigation Performance (GPS variant)
LOC/DME – Localizer/Distance Measuring Equipment

1.3 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action involves several different construction activities related by their geographic proximity to each other within the Airport. These are:

- Infield area rehabilitation to reduce FOD and wildlife habitat
- Removal of a non-standard portion of Taxiway “E” to meet FAA airport design standards

- Reconfiguration of Taxiway “F” intersection with Taxiway “A”
- Reconfiguration of Taxiway “K” intersection with Taxiway “A”

The coordination of these construction activities would result in cost savings and the reduction of construction impacts on airport operations and the surrounding area.

1.3.1 Infield Area Rehabilitation

The Proposed Action involves resurfacing 15 existing infield areas located in the Air Operations Area (AOA) between Runway 10R-28L and parallel Taxiways “A” and “B,” located north and south of the runway (**Exhibit 1C**). (The Proposed Action excludes Area A-3 and infield areas around Runway 10L-28R, which would be affected by future plans for a new taxiway connection to Runway 10R-28L and improvements to Taxiway “B”). Presently, nine of the infield areas are chip-sealed (Areas A-1, A-2, B-1 through B-6, and Area C-3), one infield area is a combination of chip seal and natural ground (A-4), and four are entirely natural ground (Areas C-1, C-4, C-5, and C-6). Area C-2 is currently paved with asphalt concrete.

The proposed infield area rehabilitation would enhance safety by minimizing FOD, increasing separation distances between aircraft, improving drainage, and reducing the amount of infield areas attractive to wildlife, as described in the following subsections.

The alternatives discussion (Chapter Two) considers the installation of one of three different surface treatments: chip seal for all infield areas; asphalt concrete for all infield areas; and a combination of chip seal (Areas A and B) and crushed aggregate (rock) (Area C). Other infield surface treatment options, such as grass, artificial turf, and Portland cement concrete (PCC) were considered, but have been eliminated from further evaluation (Section 2.3).

1.3.1.1 Preconstruction Rodent Control

Airport maintenance/operations staff currently conduct weekly monitoring of the infield for the California ground squirrel (*Spermophilus beecheyii*) and apply a carbon monoxide (CO) fumigation machine when necessary. The fumigant tool that the Airport uses meets all California Air Resources Board (CARB) and U.S. Environmental Protection Agency (EPA) standards and is used in accordance with all existing laws and regulations,[1] including the *California Endangered Species Act* (Division 3, Chapter 1.5, commencing with Section 2050) and Sections 4002 and 4003 of the California Fish and Game Code (CFGC). The Airport’s Maintenance and Operations Department has trained operators/coordinators for these wildlife control activities and only targets the burrowing animals in the infield areas. No other animals are targeted when the fumigants are used. Within one week prior to the start of construction activities, measures to reduce and exclude any existing California ground squirrel population from the infield areas would be undertaken to ensure that this rodent population has been removed.

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[1] California law allows the use of CO to control burrowing rodent pests, although it is against the law to kill any animal other than a burrowing rodent pest with CO.

1.3.1.2 Site Preparation

Preliminary engineering was conducted to determine site preparation requirements for each of the infield areas (Neill Engineers Corp. 2017a). The site preparation actions needed for each infield area would be similar for any of the surface treatments under consideration with two exceptions. In Areas C-2 and C-3, the site preparation is dependent on the selected surface treatment (i.e., for a chip seal or asphalt concrete surface, no grading would be required, while for a crushed aggregate surface, excavation and grading would occur). The required surface treatments are discussed in detail under the alternatives in Chapter Two.

Ensuring that the infield areas meet FAA runway safety area (RSA) grading standards prior to replacement of the surface material would reduce the risk of damage to aircraft in the event of an aircraft leaving the runway pavement. Areas A-1, B-2, and B-3 would all require regrading to meet current RSA grading standards. Section 1.3.1.3 identifies other related actions necessary to make the infield areas wholly functional.

1.3.1.3 Related Taxiway Shoulder, Lighting, Signage, and Drainage Improvements

The Proposed Action includes improving all taxiway shoulders within the infield areas to 25 feet wide to provide an adequate buffer between the taxiways and the new infield material. Paved shoulders are required for taxiways accommodating Airplane Design Group (ADG)-IV and higher aircraft and are recommended for taxiways accommodating ADG-III aircraft (FAA Advisory Circular [AC] 150/5300-13A). Runway 10R-28L is rated ADG-III based on the wingspan of the critical aircraft operating at the Airport, while the taxiways serving Runway 10R-28L are classified as Taxiway Design Group (TDG)-4.

Existing taxiway lights and signs would be raised throughout the infield, as necessary, to accommodate the new taxiway shoulder locations and infield elevations. The taxiway shoulders would be marked (consistent with FAA AC 150/5340-1L, *Standards for Airport Markings* [2013b]) to further delineate the paved shoulders so that pilots are less likely to mistake the shoulder as usable taxiway. The precision approach path indicator (PAPI) located in Area A-4 may also need the foundation(s) of one or more boxes adjusted to accommodate the new grade in this area.

The proposed fill and grading improvements discussed in Section 1.3.1.2 would affect infield drainage features. For example, catch basins within Areas A-1, B-2, and B-3 would need to be raised. The Proposed Action also includes reconstruction of old catch basins within Areas B-4, B-5, B-6, and C-4, as well as a trench drain in Area C-5. They are the original structures and replacement parts, such as concrete grates, are no longer available.

Additional drainage improvements would be necessary in Area C-3 due to the proposed Taxiway "F" improvements (Section 1.3.3). An existing catch basin and approximately 50 feet of 18-inch reinforced concrete pipe (RCP) would be removed to accommodate the reconfigured Taxiway "F." In addition, a second existing catch basin would be raised to meet the new grades and a new catch basin at the low point of Area C-3 would be installed. By providing the additional catch basin, the remaining 18-inch RCP would not need to be relocated.

1.3.1.4 Infield Surface Treatments

The final surface for the infield area would use one or more of the following materials: chip seal, asphalt concrete, or crushed aggregate (rock), as discussed in Chapter Two. Other infield surface treatment options, such as grass, artificial turf, or PCC, either did not meet the project's purpose and need or were too costly (Section 2.3).

1.3.2 Removal of Taxiway "E"

Taxiway "E" south of Runway 10R-28L is a wide expanse of pavement with a painted "island" between two lanes and does not meet current FAA taxiway design standards. This portion of Taxiway "E" also contains a non-standard angled entrance to Runway 10R-28L. The Proposed Action includes the removal of the portion of Taxiway "E" between Runway 10R-28L and Taxiway "A," as well as the painted "island" (**Exhibits 1C** and **1D**). This includes the removal of existing taxiway lights and signs.

1.3.3 Reconfiguration of Taxiway "F" Intersection with Parallel Taxiway "A" and Drainage Improvements

The Proposed Action includes the relocation of the portion of Taxiway "F" between Runway 10R-28L and parallel Taxiway "A" to align with the taxiway north of the runway and to provide standard 90-degree (right angle) connections. Taxiway "F" would also be widened to 75 feet from its current width of 50 feet (**Exhibit 1D**). The additional width would allow all aircraft currently operating at the Airport to use this taxiway to access the southwest part of the Airport once the Taxiway "E" removal described in Section 1.3.2 occurs. Existing Taxiway "F" electrical lines, lights, and signage would be relocated.

Between its connections with Taxiways "F" and "K," parallel Taxiway "A" is currently located 275 feet from Runway 10R-28L (centerline to centerline) and the hold line markings on Taxiway "F" are located 200 feet from the runway centerline, rather than the FAA-required 250 feet. As part of the Proposed Action, Taxiway "A" (for a length of approximately 640 feet at its connection with Taxiway "F") would be shifted south for a centerline to centerline distance of 327.5 feet (**Exhibit 1D**). The new Taxiway "F" pavement would then be marked to locate its hold lines 250 feet south of the runway centerline. All associated Taxiway "A" lighting, signs, and markings would be moved in connection with this shift. These proposed changes in the existing taxiway system would reduce the depth of an adjacent fixed base operator (FBO) apron by approximately 50 feet and a portion of the secured access road located south of Taxiway "A" would be shifted and remarked as well. These improvements would require changes to the storm water drainage system.

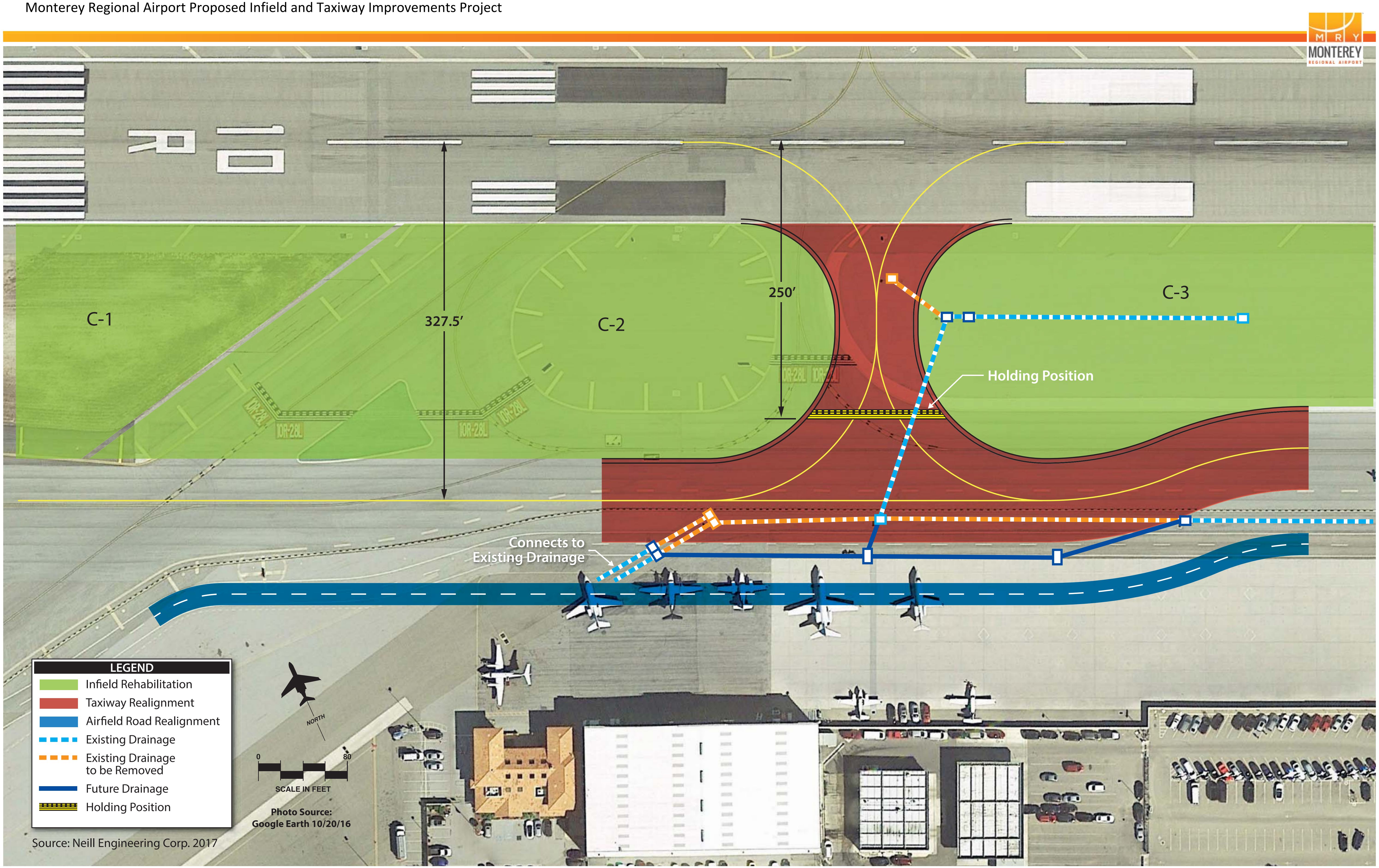

EXHIBIT 1D
PROPOSED TAXIWAY "E" REMOVAL AND TAXIWAY "F" RECONFIGURATION

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1.3.4 Reconfiguration of Taxiway "K" with Adjustment of Hold Line

The hold line markings on connecting Taxiway "K" at its intersection with Taxiway "A" are also located 200 feet from the runway centerline, rather than the FAA-required 250 feet. As part of the Proposed Action, Taxiway "A" (for a length of approximately 475 feet in the vicinity of Taxiway "K") would be shifted to 327.5 feet south of the runway centerline. All associated lighting, signs, and markings would be moved in connection with the shift. The pavement would then be remarked to allow the Taxiway "K" hold lines to be properly relocated 250 feet south of the runway centerline (**Exhibit 1E**).

1.4 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.4.1 Sponsor Purpose and Need

The District's purpose and need for the Proposed Action is to enhance the safe operation of the Airport by making physical modifications to the AOA in the infield areas between Runway 10R-28L and the parallel taxiways located to the north and south of the runway, and by making adjustments to connecting Taxiways "E," "F," "K," and "A" south of the runway.

The Proposed Action is needed to reduce potential damage to aircraft that may result from FOD from deteriorating chip seal surfaces and unpaved surfaces. The Proposed Action is also needed to enhance the safety of aircraft movements at MRY by modifying existing non-standard taxiway geometry and hold line separation distances between the taxiway and the runway centerline. The Proposed Action will also eliminate habitat for burrowing animals that attract wildlife hazardous to aircraft operations. Additionally, the Proposed Action will enhance safety by regrading infield areas that do not currently meet FAA airport grading design standards, which both enhances airport drainage, and provides a smooth surface to roll across if an aircraft loses control and veers off of a runway or taxiway.

The purpose of the Proposed Action is, therefore, to implement airport improvements that address the need to protect aircraft from damage and aircraft passengers from injury. The elements of the Proposed Action that would accomplish these purposes include:

- Reduce generation of FOD from deteriorating infield surfaces which can damage aircraft by being blown into the aircraft and cracking windows, damaging other aircraft components, or being sucked into aircraft engines. This would occur by removing old, deteriorating chip seal surfaces and replacing them with a new surface treatment. The Proposed Action includes surface treatment of 15 infield areas, 11 of which currently have a chip seal surface which has deteriorated, and the amount of FOD is increasing. As outlined in FAA AC 150/5210-24, *Airport Foreign Object Debris (FOD) Management* (2010), "asphalt and concrete pavements may be the most common source of FOD on an airport. Therefore, effective pavement maintenance practices are critical to the mitigation of FOD." The proposed infield surface improvements within these 11 infield areas would reduce the potential for FOD resulting from deteriorating chip seal surfaces.

- Reestablish surface grades in infield areas within the RSA and adjacent to the taxiways that provide a smooth uniform surface for aircraft that veer off a runway to roll across. Proposed grading improvements that comply with FAA slope gradient requirements would enhance the effectiveness of the RSA.

- Reestablish surface grades that enhance drainage on portions of the Airport. These areas either pond water and/or result in surface sheet flow of water across runways or taxiways that can reduce aircraft traction creating a hazard to aircraft. In addition, ponding can attract wildlife that creates a wildlife-aircraft strike hazard. Areas on the west end of the infield have continued to experience ponding and/or sheet flow during storm events. The Proposed Action includes drainage improvements that would enhance infield drainage and capture additional onsite drainage, providing ground percolation which would reduce onsite ponding and/or excessive drainage flows off the Airport.

- Reduce the potential for burrowing animals in the infield, which can create a wildlife hazard. To ensure compliance with 14 CFR Part 139.337, the Airport conducted a Wildlife Hazard Assessment (WHA) (MPAD 2011) and implemented a Wildlife Hazard Management Plan (WHMP) (MPAD 2013) to better understand, and reduce or mitigate, wildlife hazards. The WHMP recommends that infield areas be covered with a surface treatment that wildlife will not use. Some of the infield areas have a natural ground surface which is attractive to wildlife, including burrowing animals. This is undesirable from an aviation safety perspective as wildlife have the potential to collide with and damage aircraft.

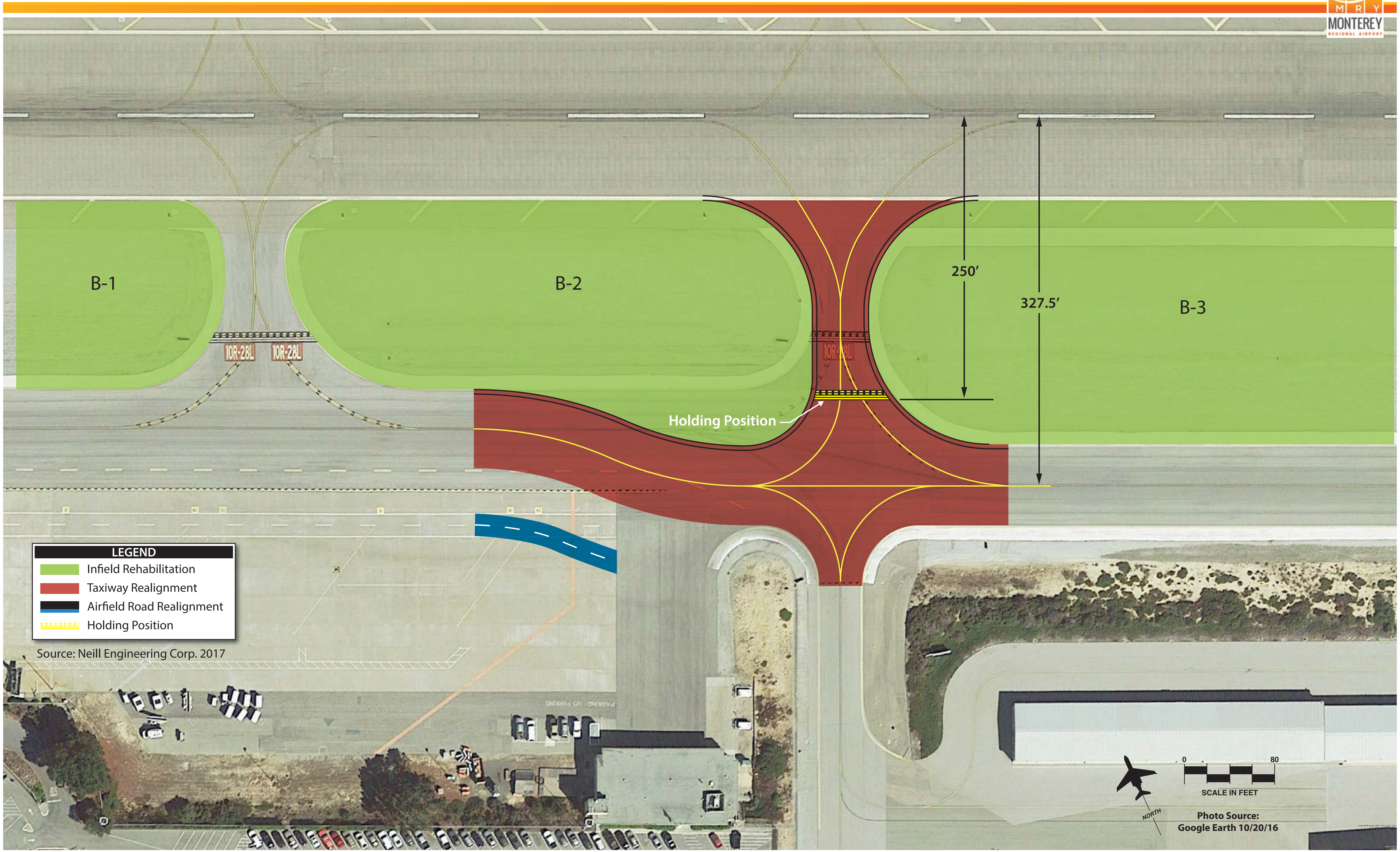
  Additionally, burrowing animals may tunnel under the paved surfaces of the airfield causing pavement failure, inducing erosion, or creating additional FOD. The infield improvements within these natural ground surface infield areas would reduce the potential habitat for burrowing animals, such as the California ground squirrel, which have been identified as a wildlife hazard at the Airport.

  The Airport currently monitors the infield areas on a weekly basis and conducts fumigation activities for nuisance rodents, as previously described. The Proposed Action would minimize the need for this ongoing maintenance activity by providing an impervious or semi-impervious surface within the infield areas.

- Remove a non-standard angle, wide expanse, existing taxiway connection (Taxiway "E") to enhance pilot situational awareness.

- Provide an acceptable 90-degree (right angle) taxiway connection at Taxiway "F" that meets the needs of the critical design aircraft.

- Move the hold lines on Taxiways "F" and "K" at their connections with Taxiway "A" to a standard 250 feet from the Runway 10R-28L centerline.



Source: Neill Engineering Corp. 2017

EXHIBIT 1E
PROPOSED TAXIWAY "K" HOLD LINE IMPROVEMENTS

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1.4.2 FAA Purpose and Need

FAA's statutory mission is to ensure the safe and efficient use of navigable airspace in the U.S. FAA must ensure that the Proposed Action does not derogate the safety of aircraft and airport operations at Monterey Regional Airport.

1.5 REQUESTED FEDERAL ACTIONS

The specific Federal actions that are requested include:

- Unconditional approval of that portion of the airport layout plan (ALP) that depicts the Proposed Action pursuant to Title 49 United States Code (USC) Sections 40103(b), 44718, and 47107(a)(16) and 14 CFR Part 77.

- Approval of project design and a Construction Safety and Phasing Plan (CSPP) to maintain aviation and airfield safety during construction pursuant to FAA AC 150/5370-10H, *Operational Safety on Airports during Construction* (14 CFR Part 139 [49 USC §44706]).

- Determination under 49 USC §§47106 and 107 related to eligibility of the Proposed Action for Federal funding under the Airport Improvement Program (AIP).

1.6 COORDINATION WITH OTHER LAWS AND STATUTES

Other Federal statutory or regulatory requirements applicable to the Proposed Action include the following:

- Since the project would affect over one acre of land, a General Construction permit under the National Pollutant Discharge Elimination Program (NPDES) would be required per the *Clean Water Act* (CWA). For California, the State Water Resources Control Board administers this program and monitors compliance with the Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region.

- Consultation with the U.S. Fish and Wildlife Service in accordance with Section 7 of the *Endangered Species Act*.

1.7 DOCUMENT ORGANIZATION

This EA evaluates the Proposed Action by organizing the information as follows:

- Chapter One describes the Proposed Action and outlines the purpose and need for the project;

- Chapter Two identifies alternatives to the Proposed Action and applies screening criteria to determine which alternatives should be carried forward for further environmental review;

- Chapter Three is a discussion of existing land uses and environmental resources related to the Airport, and more specifically, the project site;

- Chapter Four analyzes potential impacts of the Proposed Action (and selected alternatives) and identifies any mitigation measures;

- Chapter Five summarizes the scoping, agency coordination, and public participation for the project;

- Chapter Six contains a list of EA preparers;

- Chapter Seven provides the names of persons consulted, references, and websites used; and

- Documentation related to EA scoping, agency coordination, and FAA consultation processes is appended to the EA.

Chapter Two
ALTERNATIVES

Chapter Two ALTERNATIVES

Proposed Infield and Taxiway Improvements Environmental Assessment

2.1 INTRODUCTION

The objective of this chapter is to identify reasonable alternatives which accomplish the purpose and need identified in Chapter One. Once identified, each alternative is evaluated in terms of its ability to satisfy the objectives of the purpose and need for the project. The results of this evaluation are to determine which alternatives are considered reasonable and feasible, thereby warranting further consideration. The environmental impacts of implementing the alternatives carried forward for detailed consideration are discussed in Chapter Four of this Environmental Assessment (EA).

Council on Environmental Quality (CEQ) regulations (Title 40 Code of Federal Regulations [CFR] § 1502.14), regarding implementation of the *National Environmental Policy Act* (NEPA), require that Federal agencies perform the following tasks:

- Rigorously explore and objectively evaluate all reasonable alternatives and, for alternatives which were eliminated from detailed study, briefly discuss the reasons for having been eliminated;
- Devote substantial treatment to each alternative considered in detail, including the Proposed Action, so that reviewers may evaluate their comparative merits;
- Include reasonable alternatives not within the jurisdiction of the lead agency; and
- Include the alternative of No Action.

As stated in Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures* and FAA Order 5050.4B, *National Environmental Policy Act* (NEPA) *Implementing Instructions for Airport Actions*, alternatives can be eliminated from further consideration when the alternatives do not fulfill the purpose and need for the action or cannot be reasonably implemented. As discussed above, 40 CFR §1502.14(c) requires the evaluation of the No Action alternative regardless of whether it meets the stated purpose and need or is reasonable to implement.

2.2 ALTERNATIVES SCREENING CRITERIA

The alternatives evaluation involves a two-step screening process. The first step addresses whether the alternatives are "reasonable." An alternative is considered reasonable if it meets the purpose and need for the Proposed Action as identified in Section 1.4. The second step is to determine if the alternatives are "feasible." The feasibility of an alternative is established by considering other important factors, such as logistical, technical, and cost considerations.

2.2.1 Step 1 Criteria: Reasonable

A proposed alternative is considered reasonable based on the extent to which it meets the stated purpose and need for the Proposed Action. The purpose and need for the Proposed Action, as identified in Section 1.4, includes whether the alternative would:

- Reduce potential damage to aircraft that may result from FOD from deteriorating chip seal surfaces and unpaved surfaces;
- Enhance the safety of aircraft movements at MRY by modifying existing non-standard taxiway geometry and hold line separation distances between the taxiway and the runway centerline;
- Eliminate habitat for burrowing animals that attract wildlife hazardous to aircraft operations; and
- Enhance safety by regrading infield areas that do not currently meet FAA airport grading design standards, which both enhances airport drainage, and provides a smooth surface to roll across if an aircraft loses control and veers off of a runway or taxiway.

2.2.2 Step 2 Criteria: Feasible

The second phase of this evaluation focuses on which alternatives are considered feasible for the Proposed Action based on technical, logistical, and cost factors. These factors for the Proposed Action include whether the alternative would:

- Minimize maintenance when compared to other alternatives;
- Be similar in cost or less expensive than other alternatives in terms of initial implementation and lifecycle costs;
- Minimize construction impacts (days) when compared to other alternatives;
- Provide a uniform treatment of the infield areas so as to simplify maintenance; and
- Will not adversely impact operational capabilities, where practicable.

2.3 INITIAL ALTERNATIVES IDENTIFICATION

There are numerous options for treating infield areas, all of which are used at a variety of airports. These include:

- mowed grass or bare ground;
- Portland cement concrete (PCC);
- asphalt concrete;
- chip seal;
- crushed aggregate (rock);
- synthetic aviation turf (artificial turf); or
- a combination of these surface treatments.

Several combinations of surface treatments were originally considered as design options for this work effort. Combinations of numerous surface treatments were eliminated from detailed consideration in this EA because maintaining a large number of different infield surfaces makes infield maintenance excessively complicated.

Alternatives to address the non-standard design issues associated with Taxiway "E" include the abandonment of the pavement in place through remarking the pavement. This alternative has been eliminated as it would not provide uniformity across the infield areas.

The only alternative to adjusting the non-standard hold lines on Taxiways "F" and "K" is the No Action alternative, which would require FAA to approve a Modification of Standards request for the Airport. These approvals are made only when justified by unusual local conditions and require coordination with FAA.

2.4 RESULTS OF INITIAL ALTERNATIVES SCREENING

Table 2A presents the range of alternatives considered by the Airport for the infield areas. The first part of the table identifies whether the alternative meets the purpose and need for the project. Alternatives that do not meet the stated purpose and need for the project are considered unreasonable. The second part of the table addresses whether an alternative is deemed feasible based on the stated criteria of maintenance, cost (construction and life cycle, i.e., replacement and maintenance costs), construction impacts, and uniformity of appearance across the airfield. Alternatives that are significantly more expensive, or that involve sizeable added maintenance or construction actions, such as because they involve many multiple surface treatments across the airfield, are considered infeasible. Those alternatives that are both reasonable and feasible are discussed further in Section 2.4.1. Alternatives that are either not reasonable or not feasible are discussed in Section 2.4.2.

2.4.1 Alternatives Evaluated in Detail

Exhibit 2A shows three Proposed Action alternatives that will be evaluated in detail in this EA: chip seal, asphalt concrete, and a combination of chip seal/crushed rock. **Table 2B** identifies the site preparation and other details required, as well as the differences in construction and quantities of material between the three alternatives. **Tables 2C** and **2D** show the differences in construction haul trips and phasing of construction.

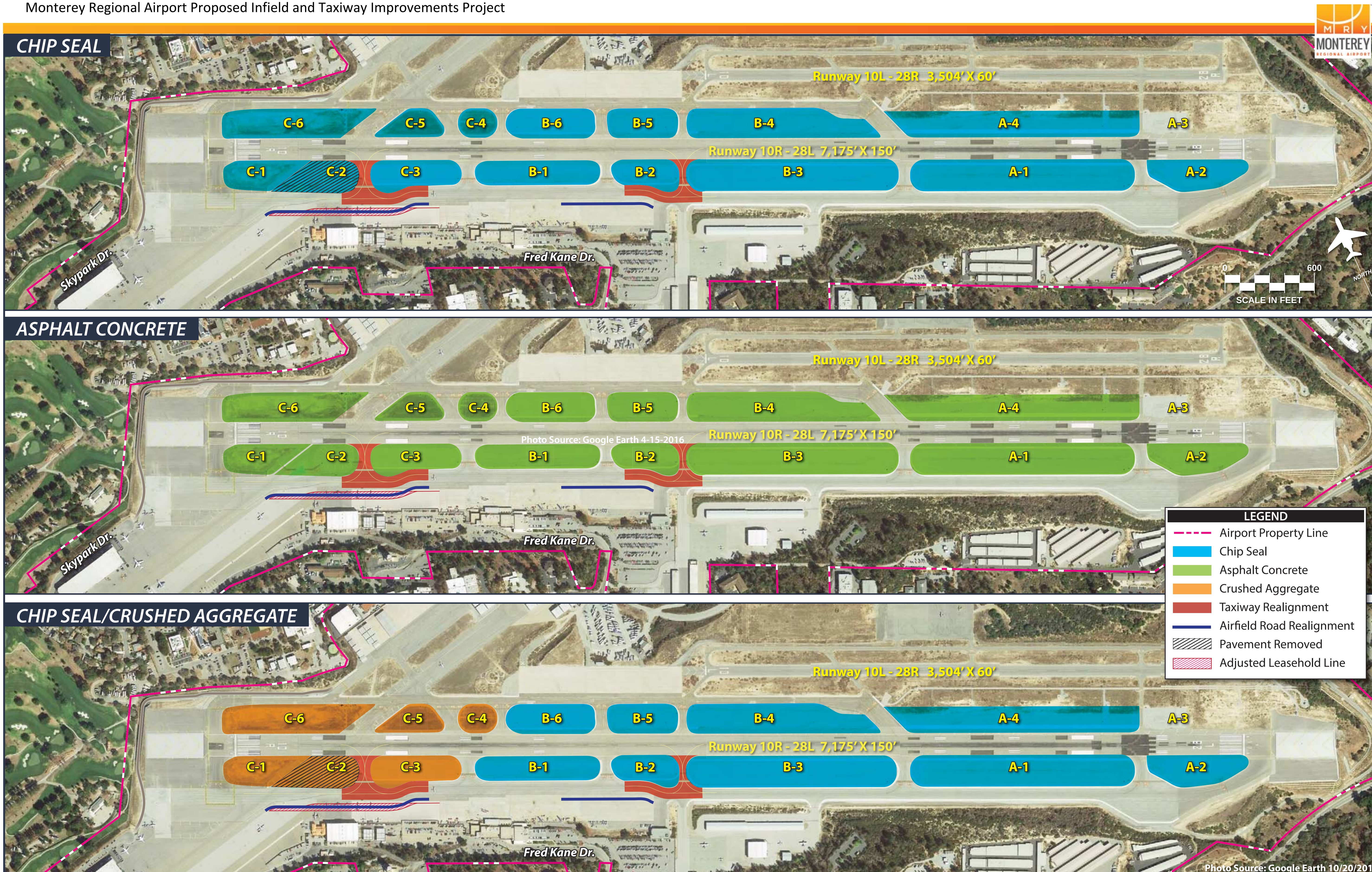

Exhibit 2A
PROPOSED ACTION ALTERNATIVES

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TABLE 2A
Alternative Evaluation Summary
Monterey Regional Airport

Evaluation Criteria	No Project	Mowed Grass/ Bare Ground	Portland Cement Concrete	Artificial Turf	Crushed Aggregate	Chip Seal	Asphalt Concrete	Chip Seal/Crushed Aggregate
Step 1: Reasonable								
- Reduce FOD	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- Provide infield areas that meet FAA grading standards	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- Meet FAA drainage design standards and minimize ponded water on the airfield	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- Reduce the potential for wildlife aircraft strike hazards	No	No	Yes	Yes	Yes	Yes	Yes	Yes
- Eliminate non-standard runway-taxiway intersections in areas where the infield rehabilitation is currently necessary	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continue to Step 2	**NO***	**NO**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Step 2: Feasibility								
- Minimize maintenance when compared to other alternatives.	n/a	n/a	No	Yes	Yes	Yes	Yes	Yes
- Be similar in cost or less expensive that other alternatives in terms of initial implementation and lifecycle costs.	n/a	n/a	No	No	No	Yes	Yes	Yes
- Minimize construction impacts (days) when compared to other alternatives.	n/a	n/a	No	No	No	Yes	Yes	Yes
- Provide uniformity across the infield areas.	n/a	n/a	Yes	Yes	Yes	Yes	Yes	Yes
Carry Forward for Further Evaluation	**YES***	**NO**	**NO**	**NO**	**NO**	**YES**	**YES**	**YES**

n/a = not applicable. Alternative was removed from consideration in Step 1.
* 40 CFR §1502.14(c) requires the evaluation of the No Action alternative regardless of whether it is reasonable, i.e., it meets the stated purpose and need.

TABLE 2B
Proposed Action Alternatives
Monterey Regional Airport

		PROPOSED ACTION ALTERNATIVES		
Subarea	**Action**	**Chip Seal Alternative (SPONSOR-PREFERRED ALTERNATIVE)**	**Asphalt Concrete Alternative**	**Chip Seal/Crushed Aggre-gate Alternative**
A-1	Site Preparation/ Other Related Improvements	Re-grading required. Fill with Class 2 base rock.[1] Grind existing taxiway shoulders. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars. Raise catch basins.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 90 cy of asphalt concrete. Place 1,500 cy of Class 2 base rock. Repave taxiway shoulder: 325 cy (650 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	170 cy of chip seal	1,515 cy (3,030 tons) asphalt concrete	Same as Chip Seal Alterna-tive
A-2	Site Preparation/ Other Related Improvements	**No grading required.** Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 15 cy of asphalt concrete. Repave taxiway shoulder: 175 cy (350 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	64 cy of chip seal	580 cy (1,160 tons) asphalt concrete	Same as Chip Seal Alterna-tive
A-4	Site Preparation/ Other Related Improvements	Excavate, grade, extend/construct (to the north) to sta-bilize the RSA. PAPI foundation adjustment may be required.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Excavate 1,500 cy of natural soil. Place 1,200 cy of Class 2 base rock. Add 100 cy of chip seal to stabilize bottom.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	163 cy of chip seal	1,450 cy (2,900 tons) asphalt concrete	Same as Chip Seal Alterna-tive

B-1	Site Preparation/ Other Related Improvements	**No grading required.** Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 53 cy of asphalt concrete. Repave taxiway shoulder: 195 cy (390 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	72 cy of chip seal	650 cy (1,300 tons) asphalt concrete	Same as Chip Seal Alterna-tive
B-2 (includes the lengthening of Taxiway "K")	Site Preparation/ Other Related Improvements	Re-grading required. Fill with Class 2 base rock. Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Install/relocate taxiway lighting system. Paint taxiway shoulder bars. Paint new taxiway markings, including access road align-ment. Raise catch basin.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 33 cy of asphalt concrete. Place 1,250 cy of Class 2 base rock. Repave taxiway shoulder: 115 cy (230 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	35 cy of chip seal & slurry seal of Taxiway "K" and por-tion of Taxiway "A"	360 cy (720 tons) asphalt concrete	Same as Chip Seal Alterna-tive
B-3	Site Preparation/ Other Related Improvements	Re-grading required. Fill with Class 2 base rock. Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars. Raise catch basin.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 79 cy of asphalt concrete. Place 3,150 cy of Class 2 base rock. Repave taxiway shoulder: 300 cy (600 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	160 cy of chip seal	1,420 cy (2,840 tons) asphalt concrete	Same as Chip Seal Alterna-tive

B-4	Site Preparation/ Other Related Improvements	**No grading required.** Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars. Reconstruct catch basin.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 70 cy of asphalt concrete. Repave taxiway shoulder: 230 cy (460 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	128 cy of chip seal	1,175 cy (2,350 tons) asphalt concrete	Same as Chip Seal Alterna-tive
B-5	Site Preparation/ Other Related Improvements	**No grading required.** Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 37 cy of asphalt concrete. Repave taxiway shoulder: 140 cy (280 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	50 cy of chip seal	455 cy (910 tons) asphalt concrete	Same as Chip Seal Alterna-tive
B-6	Site Preparation/ Other Related Improvements	**No grading required.** Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Grind 42 cy of asphalt concrete. Repave taxiway shoulder: 160 cy (320 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Final Surface Treat-ment	63 cy of chip seal	580 cy (1,160 tons) asphalt concrete	Same as Chip Seal Alterna-tive
C-1	Site Preparation/ Other Related Improvements	Excavate, convert existing natural ground to stabilize the RSA.	Same as Chip Seal Alternative	Same as Chip Seal Alterna-tive
	Estimated quantities	Excavate 800 cy of natural ground. Place 750 cy of Class 2 base rock.	Same as Chip Seal Alternative	Excavate 800 cy of natural ground.
	Final Surface Treat-ment	105 cy of chip seal (double chip)	375 cy (750 tons) as-phalt concrete	750 cy of crushed aggregate (in lieu of Class 2 base rock)

C-2 (includes the removal of Taxiway "E")	Site Preparation/ Other Related Improvements	Possible paving along taxiway shoulder. Paint taxiway bars. Remove/relocate taxiway lighting system and signs.	Same as Chip Seal Alternative	Remove existing material. Possible paving along taxiway shoulder. Paint taxiway bars. Remove/relocate taxiway lighting system and signs.
	Estimated quantities	Possible taxiway shoulder paving: 50 cy (100 tons).	Same as Chip Seal Alternative	Excavate 5,700 cy of asphalt and subbase. Possible taxiway shoulder paving: 50 cy (100 tons).
	Final Surface Treatment	63 cy of chip seal + 81,000 sf for old Taxiway "E"	90 cy (180 tons) asphalt concrete	1,250 cy of crushed aggregate
Reconfiguration of Taxiway "F" (includes overlay of portion of Taxiway "A")	Site Preparation/ Other Related Improvements	Excavate, prepare subgrade. Place Class 2 base rock. Pave Taxiways "F" and "A." Install storm drain improvements. Modify runway lighting system. Paint new taxiway and service road markings.	Same as Chip Seal Alternative	Same as Chip Seal Alternative
	Estimated quantities	Excavate 1,400 cy of asphalt, subbase, and bare ground. Place 1,000 cy of Class 2 base rock. Install 520 linear feet of 48" and 18" reinforced concrete pipe.	Same as Chip Seal Alternative	Same as Chip Seal Alternative
	Final Surface Treatment	Pave Taxiway "F" and Taxiway "A" overlay: 1,650 cy (3,300 tons).	Same as Chip Seal Alternative	Same as Chip Seal Alternative

C-3	Site Preparation/ Other Related Improvements	Place Class 2 base rock for new Taxiway "F' shoulder. Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Install/relocate taxiway lighting system. Reconstruct storm drain system. Paint taxiway shoulder bars.	Same as Chip Seal Alternative	Excavate, prepare subgrade. Place Class 2 base rock for new Taxiway "F' shoulder. Grind existing taxiway shoulder. Re-pave/pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Install/relocate taxiway lighting system. Reconstruct storm drain system. Paint taxiway shoulder bars.
	Estimated quantities	For taxiway shoulder: – Grind 25 cy of asphalt concrete – Excavate 150 cy of natural soil – Place 150 cy of Class 2 base rock – Repave taxiway shoulder: 175 cy (350 tons)	Same as Chip Seal Alternative	Excavate 1,200 cy of natural ground. For taxiway shoulder: – Grind 25 cy of AC – Excavate 150 cy of natural soil – Place 150 cy of Class 2 base rock Repave taxiway shoulder: 175 cy (350 tons).
	Final Surface Treatment	56 cy of chip seal	500 cy (1,000 tons) asphalt concrete	1,100 cy of crushed aggregate
C-4	Site Preparation/ Other Related Improvements	Excavate, convert existing natural ground to stabilize the RSA. Pave taxiway shoulder to 25 feet. Reconstruct catch basin.	Same as Chip Seal Alternative	Same as Chip Seal Alternative
	Estimated quantities	Excavate 820 cy of natural ground. Place 600 cy of Class 2 base rock. Pave taxiway shoulder: 115 cy (230 tons).	Same as Chip Seal Alternative	Excavate 820 cy of natural ground. Pave taxiway shoulder: 115 cy (230 tons).
	Final Surface Treatment	56 cy of chip seal (double chip)	200 cy (400 tons) asphalt concrete	600 cy of crushed aggregate (in lieu of Class 2 base rock)

C-5	Site Preparation/ Other Related Improvements	Excavate, convert existing natural ground to stabilize the RSA. Pave taxiway shoulder to 25 feet. Raise taxiway lights and signs. Paint taxiway shoulder bars. Reconstruct trench drain.	Same as Chip Seal Alternative	Same as Chip Seal Alternative
	Estimated quantities	Excavate 1,200 cy of natural ground. Place 800 cy of Class 2 base rock. Pave taxiway shoulder: 80 cy (160 tons).	Same as Chip Seal Alternative	Excavate 1,200 cy of natural ground. Pave taxiway shoulder: 80 cy (160 tons).
	Final Surface Treatment	96 cy of chip seal (double chip)	345 cy (690 tons) asphalt concrete	800 cy of crushed aggregate (in lieu of Class 2 base rock)
C-6	Site Preparation/ Other Related Improvements	Excavate, convert existing natural ground to stabilize the RSA. Pave and widen taxiway shoulder. Construct storm drain improvements, if needed, for existing ponding.	Same as Chip Seal Alternative	Same as Chip Seal Alternative
	Estimated quantities	Excavate 2,150 cy of natural ground. Place 1,950 cy of Class 2 base rock. Pave taxiway shoulder: 30 cy (60 tons).	Same as Chip Seal Alternative	Excavate 2,150 cy of natural ground. Pave taxiway shoulder: 30 cy (60 tons).
	Final Surface Treatment	270 cy of chip seal (double chip)	950 cy (1,900 tons) asphalt concrete	1,950 cy of crushed aggregate (in lieu of Class 2 base rock)

Source: Neill Engineering Corp. 2017a

[1] The California Department of Transportation (Caltrans) identifies five types of base rock (Class 1 through 5) that must meet certain specifications (Caltrans 2015, Section 26-1.02B).

cy = cubic yards
RSA = Runway Safety Area
PAPI = precision approach path indicators
sf = square feet

TABLE 2C
Estimated Haul Loads for Imported and Exported Material
Monterey Regional Airport

	Chip Seal Alternative	Asphalt Concrete Alternative	Chip Seal/Crushed Aggregate Alternative
Site Preparation/ Primary Construction	1,977 loads	1,977 loads	2,240 loads[1]
Taxiway "F"	370 loads	370 loads	370 loads
Surface Treatment of Infield Areas	161 loads	921 loads	706 loads
Total Number of Loads	**2,508 loads**	**3,268 loads**	**3,316 loads**
Duration of Construction[2]	**418 days**	**449 days**	**475 days**

Source: Neill Engineers Corp. 2017a
[1] Includes removal of Taxiway "E" pavement/subbase and portions of Taxiway "A."
[2] Does not include 10 days for two separate phases of preconstruction rodent control.

TABLE 2D
Anticipated Phasing of Construction
Monterey Regional Airport

	Chip Seal Alternative		Asphalt Concrete Alternative		Chip Seal/Crushed Aggregate Alternative	
	Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]
Preconstruction Rodent Control	5 days	5 days	5 days	5 days	5 days	5 days
Site Preparation/Primary Construction	214 days	163 days	214 days	163 days	219 days	163 days
Surface Treatment of In-field Areas	23 days	18 days	31 days	41 days	75 days	18 days
Estimated Duration of Construction per Phase[2]	**242 days = 10 months**	**186 days = 7 months**	**250 days = 10 months**	**209 days = 8 months**	**299 days = 12 months**	**186 days = 7 months**

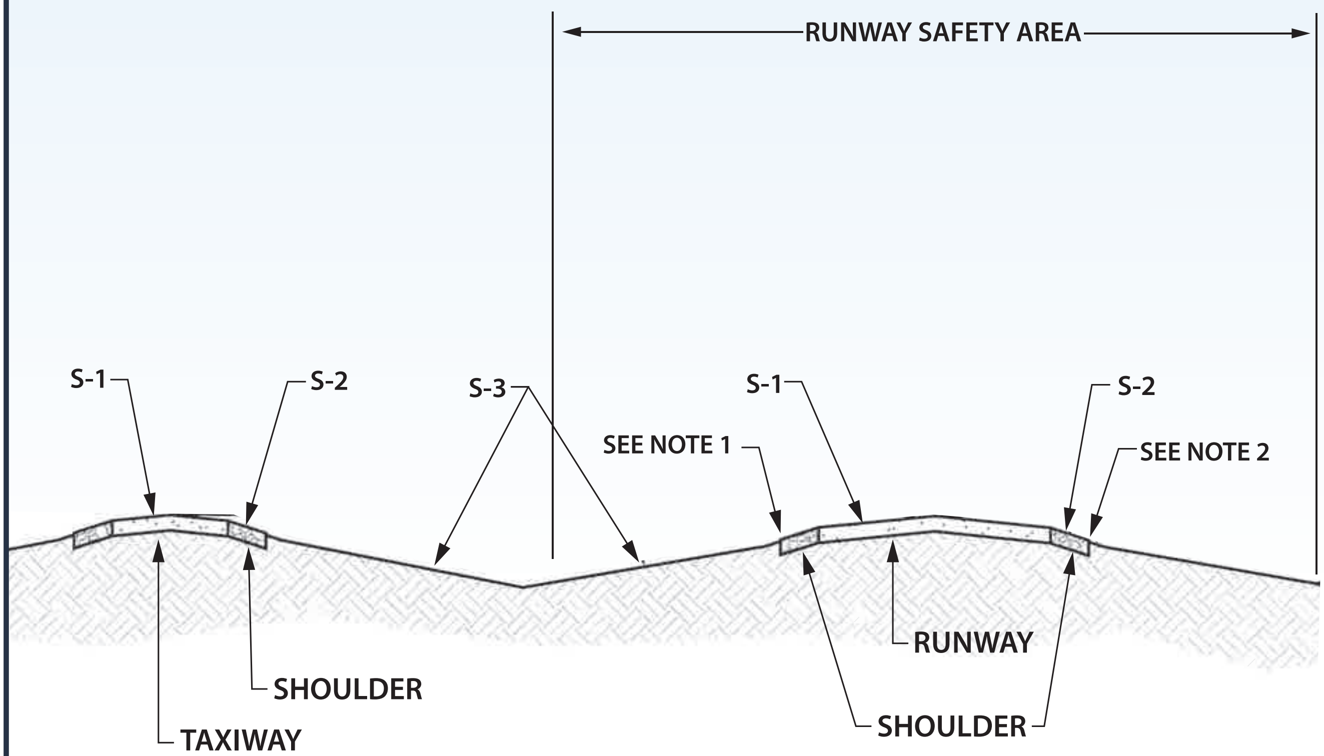
Source: Neill Engineers Corp. 2017a
[1] Phase 1: Areas C, B-1, B-6, TW "E," TW "F"; Phase 2: Areas A-1, A-2, A-4, B-2, B-3, B-4, B-5, TW "K"
[2] Assumes 25 work days/month. Partial months have been rounded.

Chip Seal Alternative

The Chip Seal alternative involves the resurfacing of 15 existing infield areas located in the Air Operations Area (AOA) between Runway 10R-28L and parallel Taxiways "A" and "B." The alternative would remove the existing surface (chip seal, pavement, or bare ground), regrade where necessary to meet FAA safety area grading standards in FAA Advisory Circular (AC) 150/5300-13A, *Airport Design,*[1] and apply a new chip seal surface treatment throughout the project area. Within one week prior to the start of construction activities, measures to reduce and exclude any existing California ground squirrel (*Spermophilus beecheyii*) population from the infield areas would be undertaken to ensure that the rodent population has been removed.

[1] In FAA AC 150/5300-13A, *Airport Design* (2014), the slope of the ground extending from the centerline of the runway and taxiway through the adjacent infield areas (i.e., transverse grades) must not be steeper than the slope percentages shown in **Exhibit 2B**.

TYPE OF AREA	REQUIRED SLOPE GRADIENT
Runway or Taxiway (S-1)	1.0% to 1.5%
Shoulder of Runway or Taxiway (S-2)	1.5% to 5% (but must be greater than or equal to runway or taxiway slope)
Infield Areas between Runway and Taxiway Shoulders (S-3)	1.5% to 3.0%



NOTES:

1. CONSTRUCT A 1.5 IN (4cm) DROP BETWEEN PAVED AND UNPAVED SURFACES.
2. MAINTAIN A -5.0% GRADE FOR 10 FEET OF UNPAVED SURFACE ADJACENT TO THE PAVED SURFACE.
3. S-2 APPLIES WHEN SHOULDERS ARE PROVIDED.

Source: FAA AC 150/5300-13A, Figure 3-23

EXHIBIT 2B: FAA GRADING STANDARDS FOR RUNWAYS, TAXIWAYS, AND INFIELD AREAS

The site preparation actions needed for each infield area are summarized in **Table 2B**. Within Areas A-2, B-1, B-4, B-5, and B-6, no grading improvements would be required. Areas A-4, C-1, C-4, C-5, and C-6 would require excavation of the existing infield areas, which are currently a combination of natural ground and chip seal surfaces, to remove the existing chip seal and to achieve the proper slope gradients. The subgrade in these areas would then be stabilized. Within three of the infield areas (Areas A-1, B-2, B-3), earthwork, including the placement of imported fill material and final grading, would be required to make these areas consistent with runway safety area (RSA) grading standards. **Exhibit 2C** depicts typical cross sections for Areas A-1, B-2, and B-3, and the proposed changes to the slope gradients.

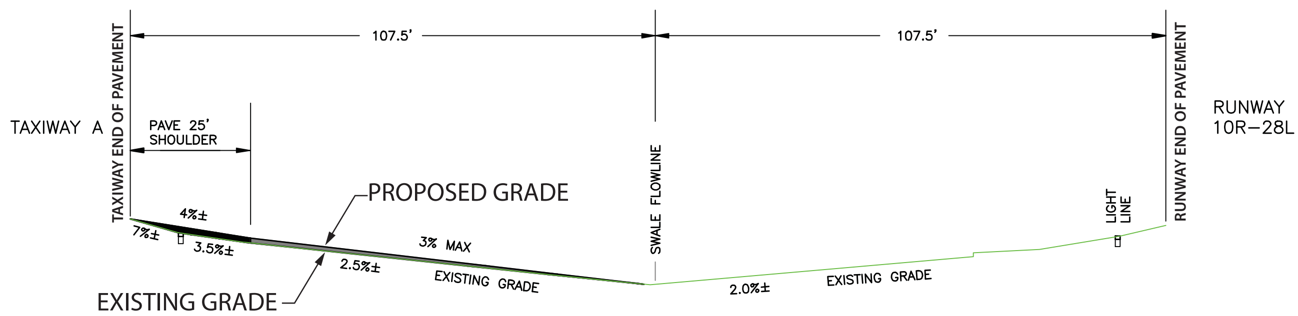
The proposed fill and grading improvements would affect several of the infield drainage structures. For example, catch basins within Areas A-1, B-2, and B-3 would need to be raised. In addition, old catch basins within Areas B-4 and C-4, as well as a trench drain in Area C-5, would be reconstructed. They are the original structures and replacement parts, such as concrete grates, are no longer available.

Areas A-1, A-2, B-1 through B-6, C-2, and C-3 improvements would include grinding and re-paving/paving the taxiway shoulder surfaces to 25 feet in width. **Table 2B** includes the amount of taxiway shoulder pavement to be removed through the grinding of the existing asphalt concrete and the amount of pavement necessary to provide new taxiway shoulders. The removed material would be stockpiled and reused by the Airport for maintenance of its service roads. The taxiway shoulders would be remarked (consistent with FAA AC 150/5340-1L, *Standards for Airport Markings* [2013b]) to further delineate the paved shoulders so that pilots are less likely to mistake the shoulder as usable taxiway. In Areas C-4, C-5 and C-6, new 25-foot-wide shoulders would be paved and painted with standard shoulder markings. Existing taxiway lights and signs would be raised throughout the infield, as necessary, to accommodate the new taxiway shoulder locations and infield elevations.

Certain taxiway connector safety enhancements to the taxiway system on the south side of Runway 10R-28L would also occur: Taxiway “E” and painted “island” removal between Taxiway “A” and Runway 10R-28L; Taxiway “F” reconfiguration between Taxiway “A” and Runway 10R-28L; Taxiway “K” intersection modifications at Taxiway “A” and Runway 10R-28L; and Taxiway “A” intersection adjustments at its connections with Taxiways “F” and “K” to allow the relocation of hold line markings. All associated navigational aids, lighting, and markings would be moved in connection with the Taxiway “A” reconfiguration. A portion of the secured access road located between an adjacent fixed base operator (FBO) apron and Taxiway “A” would also be shifted accordingly.

In addition, drainage improvements at the Taxiway “F” connection to Taxiway “A” would be necessary. An existing storm water trunk line near the Taxiway “F” improvements would be relocated along the new southern edge of Taxiway “A” and an existing drainage swale would be moved. Storm drainage improvements would involve the removal of existing 36-inch reinforced concrete pipe (RCP) and its associated catch basins, and the installation of 480 linear feet of 48-inch RCP and associated catch basins along the southern edge of Taxiway “A” (**Exhibit 1D**). An existing 18-inch RCP between the catch basin in Area C-3 south to the existing 36-inch RCP would

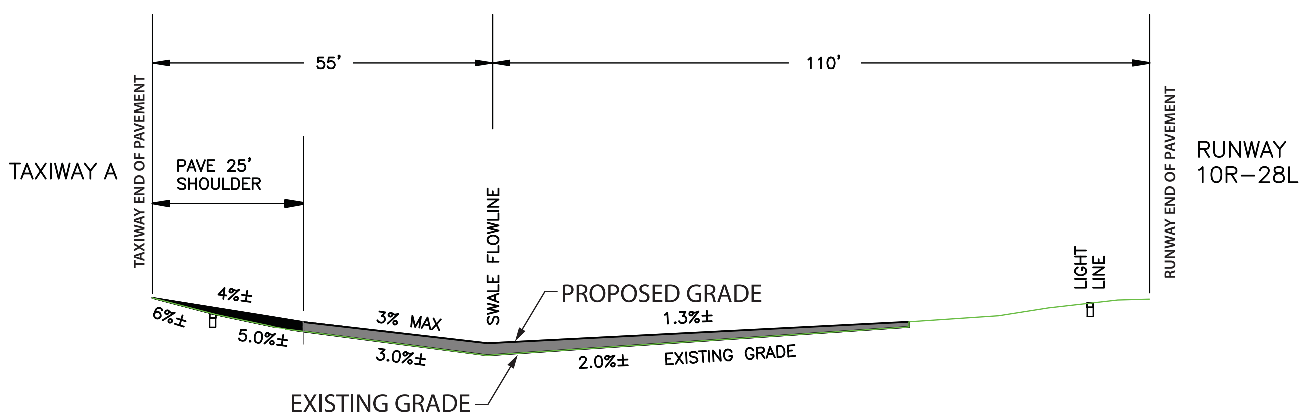
AREA A-1, SOUTHSIDE BETWEEN TAXIWAY "L" AND TAXIWAY "N"



NOTE: Typical cross section

Source: Neill Engineers Corp., 2016

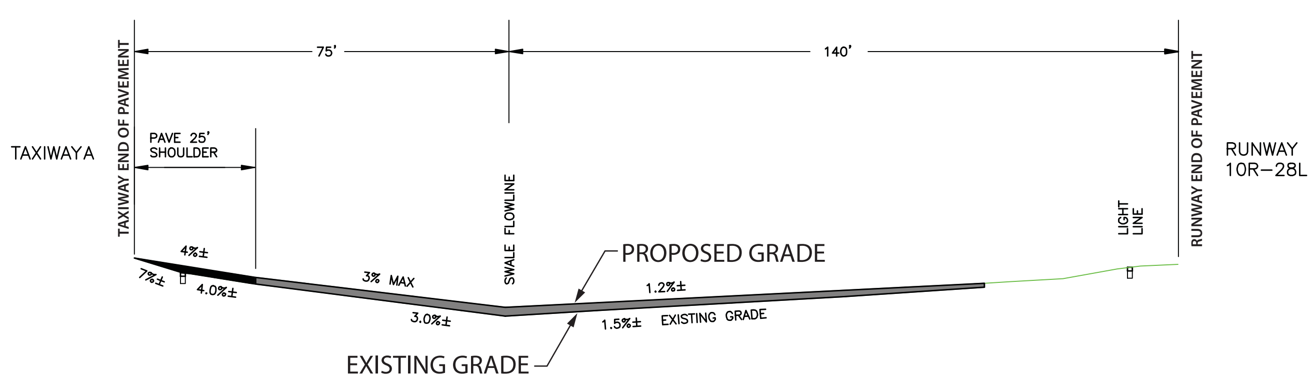
AREA B-2, SOUTHSIDE BETWEEN TAXIWAY "J" AND TAXIWAY "K"



NOTE: Typical cross section

Source: Neill Engineers Corp., 2016

AREA B-3, SOUTHSIDE BETWEEN TAXIWAY "K" AND TAXIWAY "L"



Source: Neill Engineers Corp., 2016

NOTE: Typical cross section

EXHIBIT 2C
PROPOSED SLOPE GRADIENT CHANGES

be extended 40 linear feet to reach the new 48-inch RCP. Once the existing Taxiway "E" section between Runway 10R-28L and Taxiway "A" is no longer used, it would become part of Area C-2 and would be covered with chip seal; the existing pavement would remain in place under this alternative.

The use of a temporary haul road and staging/stockpile areas would be necessary during project construction. The locations of these are depicted on **Exhibit 1C**. To the extent possible, construction traffic would be directed to a southern staging/stockpile area.[2] The haul road would route traffic to the Airport from Olmsted Road. As described in **Table 2B**, approximately 8,020 cubic yards of natural ground, asphalt, chip seal, and subbase would be excavated and removed offsite, and approximately 12,350 cubic yards of Class 2 base rock would be imported. This material could be transported to the Airport from a plant as far as Prunedale, California, located approximately 20 miles north of the Airport. Trucks hauling material for the project would use Highway 68 and Olmsted Road to the southern staging areas. The Chip Seal alternative would also require approximately 1,650 cubic yards of new chip seal and 3,740 cubic yards of asphalt concrete pavement for new taxiway shoulders and Taxiway "F."

All construction activity would occur during late night-time hours to minimize runway closure; commercial flights are not scheduled during the late night-time hours, therefore, creating less impact to operations. During this time, trucks would move between the north and south staging areas using the on-airport route shown on **Exhibit 1C**.

Based on the preliminary engineering estimates (**Table 2D**), the number of construction activity days to implement a Chip Seal alternative would be 428 days (approximately 17 months) overall. This estimate includes preconstruction rodent control prior to grading activity, site preparation, other associated improvements described in **Table 2B**, and application of the chip seal, as well as the taxiway connector and associated drainage infrastructure improvements. Approximately 2,500 delivery or haul loads for import or export of materials would occur over the life of the project (**Table 2C**). Based on engineering estimates, an average of four to 14 haul loads per work night would occur, with most of the trips (an average of nine round trips per night) occurring during the site preparation/primary construction phases.

The Chip Seal alternative would reduce FOD and correct RSA infield grades in accordance with FAA design standards. Based on FAA AC 150/5320-6E, *Airport Pavement Design and Evaluation,* Appendix A, Section 2 (2009), the assumed design period for chip-sealed pavements used in active runway or taxiway areas is ten years. However, use of chip seal in the infield may last beyond 20 years as it would not be subjected to aircraft movements which can accelerate deterioration of the surface.

[2] During the day-time hours only, one equipment delivery route could occur through a residential neighborhood northwest of the Airport using Airport Road and Euclid Avenue. The use of this route would be minimal and would be limited to single trips to drop off or remove equipment at the northern staging area.

The use of chip seal throughout the infield area would provide a visually uniform appearance for pilots operating at the Airport as all affected infield areas would be finished with a uniform surface type. The Chip Seal alternative would be designed and installed to offer no source of food, water, or shelter for animals, including but not limited to reptiles, rodents, and birds, and, therefore, would mitigate the wildlife hazards consistent with the Airport's Wildlife Hazard Management Plan (WHMP) (MPAD 2013).

Asphalt Concrete Alternative

The Asphalt Concrete alternative involves the resurfacing of 15 existing infield areas located in the AOA between Runway 10R-28L and parallel Taxiways "A" and "B" by removing the existing surface (chip seal, pavement, or bare ground), regrading where necessary to meet FAA safety area grading standards and applying an asphalt concrete surface treatment throughout the project area. Site preparation activities, including the regrading to meet RSA standards, as well as drainage, taxiway shoulder, and lighting improvements would be the same as with the Chip Seal alternative (**Table 2B**). Viable taxiway connector safety enhancements to the taxiway system on the south side of Runway 10R-28L, as detailed under the Chip Seal alternative above, would also be implemented, as would the associated drainage infrastructure improvements.

Based on preliminary engineering estimates, the number of construction activity days to implement the Asphalt Concrete alternative would be 459 days (approximately 18 months) overall. This estimate includes preconstruction rodent control prior to grading activity, site preparation, other associated improvements described in **Table 2B**, and application of the asphalt concrete, as well as the taxiway connector and associated drainage infrastructure improvements.

As previously described for the Chip Seal alternative, the use of a temporary haul road and staging/stockpile areas would be necessary during project construction (**Exhibit 1C**). Approximately 8,020 cubic yards of natural ground, asphalt, chip seal, and subbase would be excavated and removed offsite, and approximately 12,350 cubic yards of Class 2 base rock would be imported. Almost 15,000 cubic yards (30,000 tons) of asphalt pavement would also be required.

Based on the preliminary engineering estimates shown in **Table 2C**, approximately 3,270 delivery or haul loads for import or export of materials would occur over the life of the project. An average of four to 15 haul loads per work night would occur, with most of the trips (an average of 11 round trips per night) occurring during the site preparation/primary construction phases.

The Asphalt Concrete alternative would reduce FOD and correct RSA infield grades in accordance with FAA design standards. Based on FAA AC 150/5320-6E, *Airport Pavement Design and Evaluation,* Appendix A, Section 2 (2009), the assumed design period for asphalt concrete pavements is 15-20 years.

The use of asphalt concrete throughout the infield area would provide a visually uniform appearance for pilots operating at the Airport as all affected infield areas would be finished with a uniform surface type. The Asphalt Concrete alternative would be designed and installed to offer no source of food, water, or shelter for animals, including but not limited to reptiles, rodents, and birds, and, therefore, would mitigate the wildlife hazards consistent with the Airport's WHMP (MPAD 2013).

Chip Seal (Areas A and B) and Crushed Aggregate (Area C) Alternative

The Chip Seal/Crushed Aggregate alternative involves the resurfacing of 15 existing infield areas located in the AOA between Runway 10R-28L and parallel Taxiways "A" and "B" by removing the existing surface (chip seal, pavement, or bare ground), regrading where necessary to meet FAA safety area grading standards, and applying a chip seal or crushed aggregate surface treatment throughout the project area. Site preparation activities within Areas A and B of the infield, including the regrading to meet RSA standards and drainage, taxiway shoulder, and lighting improvements would be the same as with the Chip Seal alternative (**Table 2B**). Viable taxiway connector safety enhancements to the taxiway system on the south side of Runway 10R-28L, as detailed under the Chip Seal alternative above, would also be implemented, as would the associated drainage infrastructure improvements. In Area C, the natural ground would be excavated as would occur with the Chip Seal alternative. However, in lieu of placing Class 2 base rock as a foundation for a chip seal application, crushed aggregate would be installed.

Crushed aggregate is a ground cover rock that is applied to a prepared surface. Prior to installing crushed aggregate, the surface to be covered would be stripped of vegetation and existing pavement or chip seal, the underlying surface compacted to 95 percent compaction, and finish-graded to achieve the desired topography. The crushed aggregate would then be spread to between 2.5 inches to 4.0 inches in depth and bladed smooth and thoroughly watered to settle all fines to the bottom of the course.

Based on preliminary engineering estimates, the number of construction activity days to implement this alternative would be approximately 485 days (approximately 19 months) overall (**Table 2D**). This estimate includes preconstruction rodent control prior to grading activity, site preparation, other associated improvements described in **Table 2B**, and installation of new chip seal and crushed aggregate, as well as the taxiway improvements discussed under the Chip Seal alternative.

As previously described for the Chip Seal alternative, the use of a temporary haul road and staging/stockpile areas would be necessary during project construction (**Exhibit 1C**). Approximately 14,920 cubic yards of natural ground, asphalt, chip seal, and subbase would be excavated and removed offsite, and approximately 14,700 cubic yards of Class 2 base rock or crushed aggregate would be imported. Based on the preliminary engineering estimates shown in **Table 2C**, approximately 3,320 delivery or haul loads for import or export of materials would occur over the life of the project. An average of four to 15 haul loads per work night would occur, with most of the trips (an average of ten round trips per night) occurring during the site preparation/primary construction phases.

The Chip Seal/Crushed Aggregate alternative would reduce FOD and correct RSA infield grades in accordance with FAA design standards. (Given the size of the aggregate and compaction needed to install this type of surface, FOD comprised of the crushed aggregate components is unlikely to occur over time.) Based on FAA AC 150/5320-6E, *Airport Pavement Design and Evaluation,* Appendix A, Section 2 (2009), the assumed design period for the chip-sealed pavements used in active runway or taxiway areas is ten years. However, use of chip seal in the infield may last beyond 20 years as it would not be subjected to aircraft movements which can accelerate deterioration of the surface. The assumed design period for the crushed rock surface is 15-20 years.

In addition, the natural ground areas that the crushed aggregate would replace have been identified as potential habitat for burrowing animals that are wildlife hazards at the Airport. Given the compaction characteristics, it is unlikely that burrowing animals would use the crushed aggregate as habitat. The Chip Seal/Crushed Aggregate alternative would provide a visually uniform appearance for pilots operating at the Airport with the type of finish material transitioning from chip seal to crushed aggregate approximately 1,800 feet from the west end of the runway.

No Action Alternative

The No Action alternative considers maintaining the existing airport infield areas in their current condition and is used for comparative purposes when considering the Proposed Action alternatives. The No Action alternative would not result in future changes to the existing topography, drainage, or other environmental characteristics of the Airport and, thus, would not meet FAA safety area grading standards. The existing chip-sealed infield areas would continue to deteriorate and generate FOD. The Airport would also continue to have drainage issues on the west end, hold line issues on Taxiways "F" and "K," and a non-standard design on Taxiway "E." With this alternative, the Airport would need to continue its ongoing maintenance routine of weekly infield inspections and the fumigation of rodents. To the extent that nuisance rodents continued to be a wildlife attractant, this alternative would not protect aircraft from such damage and aircraft passengers from injury.

2.4.2 Alternatives Considered, but Eliminated from Detailed Consideration

Mowed Grass/Bare Ground

This alternative would remove the existing deteriorating chip seal or pavement and regrade the infield areas, as necessary, to meet FAA safety area grading standards, but would not apply a new surface treatment to any of the infield areas. Instead, the infield would remain as bare ground. As vegetation reestablished itself, the infield would need to be maintained and mowed.

This alternative would not meet the purpose and need for the project since the Airport's existing wildlife hazard issue within the infield would not be addressed. It has, therefore, been removed from further consideration. With this alternative, the Airport would need to continue its ongoing maintenance routine of weekly infield inspections and the fumigation of rodents. To the extent that nuisance rodents continued to be a wildlife attractant, this alternative would not protect aircraft from such damage and aircraft passengers from injury.

Portland Cement Concrete

This alternative would include the site preparation actions described under the Chip Seal alternative but would finish all 15 areas with PCC. Although PCC has a long service life, it is more difficult and costly to maintain and replace, particularly for the installation and rehabilitation of underground drainage, lighting systems, and navigation facilities. PCC has a much higher unit cost ($9.00/square foot [sf]) when compared to chip seal ($0.56/sf), asphalt concrete ($2.25/sf), or crushed rock ($2.35/sf). Its life cycle costs (i.e., replacement and maintenance costs) are also higher, even when averaged over a 20-year period. Because it does not minimize maintenance and is higher in cost than other alternatives, it has been eliminated from further consideration.

Artificial Turf

This alternative would include the site preparation actions described under the Chip Seal alternative but would finish all 15 areas with an artificial turf surface. Artificial turf may be applied directly over existing paved surfaces (Areas A-2, B-1, B-4, B-5, B-6, C-2, and C-3). It may also be installed over natural ground if the subgrade is compacted. In the present case, the existing natural ground areas (Areas C-1, C-4, C-5 and C-6) would need to be prepared in accordance with FAA AC 150/5370-15B, *Airside Applications for Artificial Turf* (2011), covered with Class 2 base rock (as defined by the California Department of Transportation [Caltrans]), and then covered with aviation turf. Installation of artificial turf in areas along runways and taxiways must first receive approval by FAA. This is done on a case-by-case basis by the FAA Office of Airport Safety and Standards with coordination through the FAA Airports Regional/District Office.

Cost estimates to install artificial turf are approximately $3.75/sf. This is notably higher than chip seal ($0.56/sf), asphalt concrete ($2.25/sf), or crushed rock ($2.35/sf). Its life cycle costs (i.e., replacement and maintenance costs) are also higher, even when averaged over a 20-year period. Due to artificial turf being higher in cost than other alternatives and not officially approved by FAA for use in areas along runways and taxiways, this alternative has been eliminated from further consideration.

Crushed Aggregate (Rock) (All 15 Infield Areas)

This alternative entails using a crushed aggregate material in 15 infield areas. Based on engineering specifications, the use of crushed aggregate would require careful removal of the existing shoulder and slope protection material to ensure minimal contamination of the underlying soil before being transported to a temporary location and stockpiled. The underlying material would then need to be checked and accepted by the project engineer. During installation, the stockpiled crushed aggregate would be blended with new crushed material and placed over the submaterial.

During the preliminary engineering review, it was determined that the underlying chip seal material is suitable as a subbase for new chip seal and asphalt concrete applications. In contrast, the crushed aggregate surface treatment would require that the existing chip seal surface be removed. Additionally, using crushed aggregate in all infield areas would unnecessarily destroy existing subbase material. As a result, using crushed aggregate in all affected infield areas would increase the construction period, the number of vehicle trips, and the cost of construction associated with the project. Based on these factors, an alternative using crushed aggregate in all affected infield areas is not considered feasible, since it would not minimize construction impacts. Therefore, it has been removed from further consideration.

2.5 SUMMARY OF THE ALTERNATIVES SCREENING PROCESS

Based on cost and the minimization of construction impacts, the Airport's preferred alternative is chip seal. However, three alternatives, the Chip Seal alternative, the Asphalt Concrete alternative, and the Chip Seal/Crushed Aggregate alternative, met both the reasonable and feasible criteria contained in the screening process; therefore, these alternatives are carried forward for evaluation in Chapter Four of this EA. As discussed previously, the No Action alternative is also addressed in Chapter Four.

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Chapter Three
AFFECTED ENVIRONMENT

Chapter Three AFFECTED ENVIRONMENT

Proposed Infield and Taxiway Improvements Environmental Assessment

3.1 INTRODUCTION

The purpose of this chapter is to describe the existing environment at Monterey Regional Airport (Airport) and its environs as it relates to the Proposed Action. The baseline year for identifying existing conditions in this chapter is generally 2015, which is when the study commenced. Updated information from 2016 and 2017 has also been incorporated, where appropriate.

The project study area for this Environmental Assessment (EA) includes the portions of the Airport that would be either permanently or temporarily affected by the project. The project study area includes the areas of actual construction, haul roads, and staging areas (refer to **Exhibit 1C**). The study area used to assess potential cumulative impacts is an approximate 1.7-square-mile area surrounding the Airport discussed in Section 3.16 and shown in **Exhibit 3G**. This cumulative study area is located partly within an unincorporated portion of the County of Monterey (County) and partly within the City of Monterey. However, some resource categories, such as water and air quality, are broader in scope. For example, air quality impacts in this EA are discussed in the context of the North Central Coast Air Basin, which extends beyond Monterey County. When the study area for cumulative impacts is larger than the study area defined in this paragraph, the cumulative study area is specified within the analysis contained in Chapter Four.

3.2 AIR QUALITY

Under the *Clean Air Act*, the United States (U.S.) Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) based on health risks for six pollutants: carbon monoxide (CO); nitrogen dioxide (NO_2); sulfur dioxide (SO_2); lead (Pb); ozone (O_3); and two sizes of particulate matter (PM): coarse dust particles less than or equal to 10 micrometers in diameter (PM_{10}) and fine particles less than or equal to 2.5 micrometers or less in diameter ($PM_{2.5}$) (**Exhibit 3A**). An area with ambient air concentrations exceeding the NAAQS for a criteria pollutant is said to be a nonattainment area for the pollutant's NAAQS, while an area where ambient concentrations are below the NAAQS is considered an attainment area. The U.S. EPA requires that areas designated as nonattainment demonstrate how they will attain the NAAQS by an established deadline. According to U.S. EPA's *Green Book*, as of February 13, 2017, Monterey County is in attainment for all NAAQS.

In addition to the NAAQS, the State of California (State) has promulgated ambient air quality standards that are more stringent than the NAAQS (**Exhibit 3A**). The Airport is located in the North Central Coast Air Basin (NCCAB). The NCCAB is currently designated as nonattainment for the State's O_3 and PM_{10} standards (CARB 2017).

3.3 BIOLOGICAL RESOURCES

The airport property supports several plant communities, including sensitive communities, such as maritime chaparral, coast live oak woodland, and Monterey pine forest. Numerous types of sensitive plants have also been documented on the property as well as in the general area. Topography on the Airport is nearly flat in areas directly adjacent to the runway, but slopes steeply at the western and eastern ends creating a plateau. On the north side of the airfield, topography is more varied with several hills and drainages.

In support of this EA, a biological field survey was conducted on May 5, 2015, of all proposed areas of disturbance, with follow-up surveys in April and July 2017. This biological study area (BSA) is congruent with the project study area and included approximately 122.8 acres located within the infields on either side of Runway 10R-28L. Prior to conducting a site visit, a literature review was performed to identify target species. A biological field survey report (SWCA 2017b), which includes the literature and survey methodology and results, was prepared, and is incorporated by reference into this EA.

Exhibit 3B shows the mapped existing habitat within the BSA. There is no federally-designated critical habitat within the BSA nor is any present anywhere on the Airport. The BSA consists of disturbed or developed land with remnant pockets of ruderal vegetation in sandy soil. Of the 122.8 acres surveyed, 84 percent of it is developed with chip seal (a pavement surface that is a combination of layered asphalt and aggregate), the existing runway and taxiways, and airfield markers. Due to the road-like composition of chip seal, the infield areas do not support significant vegetation. The remaining infield areas (approximately 18.5 acres) support ruderal vegetation that is routinely mowed for visibility and fire safety, but that has remnant occurrences of native forbs and shrubs. The BSA does not support any intact vegetative communities.

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1] Concentration[3]	California Standards[1] Method[4]	National Standards[2] Primary[3,5]	National Standards[2] Secondary[3,6]	National Standards[2] Method[7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 μg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 μg/m^3)		0.070 ppm (137 μg/m^3)		
Respirable Particulate Matter (PM10)[9]	24 Hour	50 μg/m^3	Gravimetric or Beta Attenuation	150 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m^3		—		
Fine Particulate Matter (PM2.5)[9]	24 Hour	—	—	35 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m^3	Gravimetric or Beta Attenuation	12.0 μg/m^3	15 μg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 μg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 μg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 μg/m^3)		0.053 ppm (100 μg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 μg/m^3)	Ultraviolet Fluorescence	75 ppb (196 μg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 μg/m^3)	
	24 Hour	0.04 ppm (105 μg/m^3)		0.14 ppm (for certain areas)[11]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[11]	—	
Lead[12,13]	30 Day Average	1.5 μg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 μg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 μg/m^3		
Visibility Reducing Particles[14]	8 Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 μg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 μg/m^3)	Gas Chromatography			

Source: California Air Resources Board 2016

EXHIBIT 3A
CALIFORNIA AND FEDERAL AMBIENT AIR QUALITY STANDARDS

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.
5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
7. Reference method as described by the U.S. EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the U.S. EPA.
8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.
9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.
10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.
11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.
12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (5/4/16)**

EXHIBIT 3A (CONTINUED)
CALIFORNIA AND FEDERAL AMBIENT AIR QUALITY STANDARDS

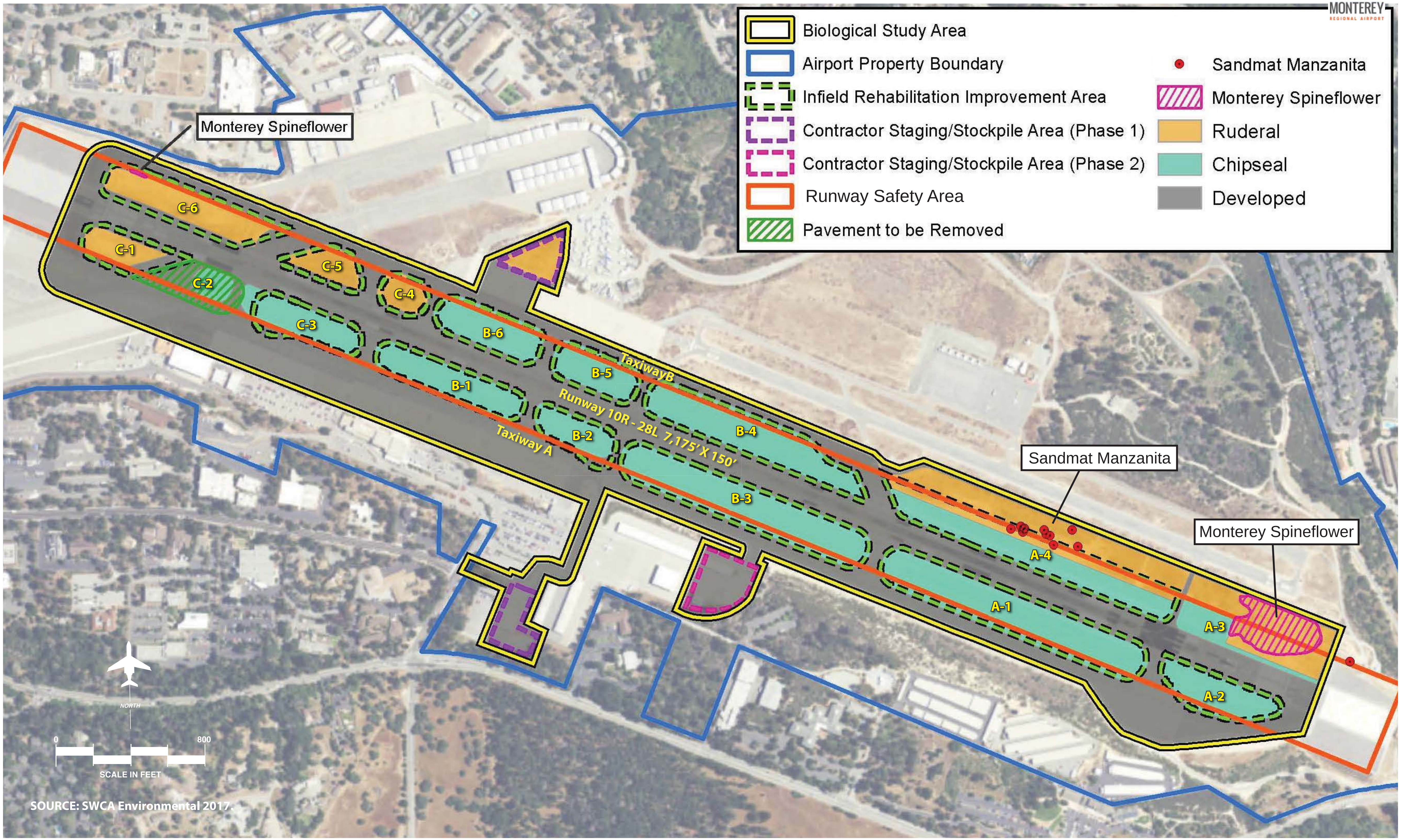

EXHIBIT 3B
INFIELD HABITAT MAP

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There was one plant species observed in the BSA during the field survey that is federally threatened under the Federal *Endangered Species Act*, and no plant species listed under the California *Endangered Species Act*.[1] No federal or state listed animal species were observed. However, previous wildlife surveys conducted for the Airport's Wildlife Hazard Assessment (WHA) documented the presence of California horned larks (*Eremophila alpestris actia*) within the BSA (MPAD 2011). These occurring or potentially occurring federally protected species are discussed further below:

- Monterey Spineflower (*Chorizanthe pungens*). Monterey spineflower is an annual herb that occurs at 3 to 450 meters above sea level in openings among chaparral, cismontane woodland, coastal dunes, coastal scrub, and valley and foothill grassland on sandy soils. Monterey spineflower is federally threatened under the Federal *Endangered Species Act*. As described in the Biological Assessment for this project (SWCA 2017a), within the BSA are approximately 18.8 acres of suitable habitat for the Monterey spineflower. Biological field surveys in 2017 found that approximately 2.2 acres of the approximately 18.8 acres of suitable Monterey spineflower habitat was occupied with approximately 2,400 individual plants (refer to **Exhibit 3B**). As an annual species, the distribution of individual Monterey spineflower plants varies from year to year.

- California Horned Lark (*Eremophila alpestris actia*). The California horned lark is a medium-sized (approximately 7 to 8 inches long), ground-dwelling bird that inhabits areas with sparse vegetation and exposed soil. The California subspecies is found along coastal grasslands.

Other ground nesting birds may also nest in the vegetated areas of the BSA. In addition to the presence of California horned lark, the WHA also identified a significant number of wildlife guilds that include avian, small mammals, coyotes, and black-tailed deer as being present at the Airport. Avian species are of most concern regarding the potential for wildlife airstrikes at the Airport and include corvids, such as American crow, western scrubjay, and Stellar's jay; shorebirds, such as killdeer and black-bellied plover; waterfowl, such as Canada geese; and blackbirds, starlings, and gulls. Wild turkeys have also been observed traversing the Airport. In addition, raptor species forage at the Airport, especially in the infield areas where small mammals occur to provide a food source.

Currently, airport staff patrol the Air Operations Area (AOA) and airport perimeter daily to monitor a variety of airfield issues, including potentially hazardous wildlife movements. The Federal Aviation Administration's (FAA) Form 5200-7, *Bird/Other Wildlife Strike Report* is filled out, as

[1] Sandmat manzanita (*Arctostaphylos pumila*) was also observed during the field survey. The California Native Plant Society (CNPS) has included sandmat manzanita on List 1B.2, which indicates that it is considered rare, threatened, and fairly endangered in California (i.e., 20 to 80 percent of occurrences are threatened). Sandmat manzanita is widespread on the airport property, and a few occurrences were observed growing within the BSA (refer to **Exhibit 3B**). The individuals located in the BSA are isolated from the maritime chaparral community on other parts of the airport property and mowed to approximately two inches tall. Due to the isolation and regular mowing, these individuals do not contribute to the ecological function of the maritime chaparral community on the airport property. The proposed project would improve the infield areas adjacent to the sandmat manzanita occurrences but would not directly affect the individuals.

necessary. In addition, airport maintenance/operations staff conduct weekly monitoring of the California ground squirrel (*Spermophilus beecheyii*) and apply a CO fumigation machine when necessary. The fumigant tool that the Airport uses meets all California Air Resources Board (CARB) and U.S. EPA standards and is used in accordance with all existing laws and regulations,[2] including the *California Endangered Species Act* (Division 3, Chapter 1.5, commencing with Section 2050) and Sections 4002 and 4003 of the California Fish and Game Code. The Airport's Maintenance and Operations Department has trained operators/coordinators for these wildlife control activities. They only target the burrowing animals in the infields; no other animals are targeted when the fumigants are used. The Airport's Wildlife Management Coordinator oversees all wildlife management activities in accordance with Title 14 Code of Federal Regulations (CFR) Part 139.337 and the Airport's Wildlife Hazard Management Plan (WHMP) (MPAD 2013).

The WHMP contains numerous strategies and techniques that are to be implemented for wildlife management at the Airport (MPAD 2013). Future project recommendations include the replacement of certain portions of the existing six-foot perimeter fence with twelve-foot fence with three-strand barbed-wire outriggers and a four-foot chain-link skirt to exclude black-tailed deer from jumping the fence and to discourage coyotes and other mammals from digging under the fence. The replacement of portions of the infield was also recommended to discourage the burrowing of mammals and the growth of their food source. This, in turn, would reduce the number of raptors and larger predator mammals foraging in the infield.

3.4 CLIMATE

Scientific measurements show that Earth's climate is warming, with concurrent impacts, including warmer air temperatures, increased sea level rise, increased storm activity, and an increased intensity in precipitation events. Increasing concentrations of greenhouse gases (GHGs) in the atmosphere affect global climate (IPCC 2014; U.S. Global Change Research Program 2009); this climate change due to GHG emissions, while a global phenomenon, can also have local impacts.[3]

Research has also shown that there is a direct correlation between fuel combustion and GHG emissions. GHGs from anthropogenic (man-made) sources include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). CO_2 is the most important anthropogenic GHG because it is a long-lived gas that remains in the atmosphere for up to 100 years.

The International Panel on Climate Change (IPCC) estimates that aviation accounted for 4.1 percent of global transportation GHG emissions. In the U.S., EPA data indicates that commercial aviation contributed 6.6 percent of total CO_2 emissions in 2013, compared with other sources, including the remainder of the transportation sector (20.7 percent), industry (28.2 percent), commercial (16.9 percent), residential (16.9 percent), agricultural (9.7 percent), and U.S. territories

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[2] California law allows the use of CO to control burrowing rodent pests, although it is against the law to kill any animal other than a burrowing rodent pest with CO.

[3] As explained by the U.S. EPA, "greenhouse gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." U.S. EPA, Climate Change Division, Office of Atmospheric Programs, 2009.

(0.05 percent) (U.S. EPA 2015b). Scientific research is ongoing to better understand climate change, including any incremental atmospheric impacts that may be caused by aviation.

3.5 COASTAL RESOURCES

The Airport is not within the California Coastal Zone, which is approximately 0.4 mile to the north of the project site at its closest point (i.e., northeast of the intersection of Casanova Avenue and Highway 218) (City of Monterey 2013). The project site is approximately one mile from Monterey Bay at its closest point.

3.6 *DEPARTMENT OF TRANSPORTATION ACT*, SECTION 4(f) RESOURCES

Section 4(f) of the *U.S. Department of Transportation* (DOT) *Act*, which was recodified and renumbered as Section 303(c) of 49 United States Code (USC), provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly-owned land from a historic site, public park, recreation area, or waterfowl and wildlife refuge of national, state, regional, or local importance unless there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from the use.

There are no potential Section 4(f) resources located within the project study area for the Proposed Action.

3.7 FARMLANDS

According to the U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS), the project area is primarily comprised of Baywood sand and Dune land, both of which are classified as "Not prime farmland" (USDA-NRCS 2015). A small section of Arnold loamy sand, which is classified as "Farmland of statewide importance," is located in the vicinity of Taxiway "A" and connector Taxiway "J." However, the project area is developed with airfield land uses. In fact, the California Department of Conservation's Important Farmland Map shows the entire project area as Urban and Built-Up Land (California Department of Conservation 2014); the airport property is not used for agricultural purposes.

3.8 HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

3.8.1 Hazardous Materials

There are no Superfund or Brownfield sites in proximity to the Airport; the closest such site is at the former United States Army post, Fort Ord (U.S. EPA 2015a). In addition, the State's Cortese List indicates that there are no sites at the Airport on the State's cleanup list (California DTSC 2015). The Airport was a former military base and there are five former U.S. Army Corps of Engineer (USACE) wells located on the northwestern area of the Airport. These wells have been remediated and are being investigated by the Airport as a viable source of non-potable water to serve the Airport and/or other users (Allterra 2015).

Activities involving the use of hazardous materials at the Airport are associated with fueling, maintenance, and repair of aircraft and airport-related vehicles. The Airport also has a fuel farm and an aircraft rescue and firefighting (ARFF) facility, both of which also store and require the transport of hazardous materials. Fuel storage facilities and businesses that handle hazardous materials located at the Airport are required to comply with all applicable regulations.

3.8.2 Solid Waste

Solid waste disposal for the Monterey area is managed by the Monterey Regional Waste Management District (MRWMD). The Monterey Peninsula Landfill (MPL) is the local disposal facility for solid waste. The Solid Waste Facility Permit for the District operation states that the peak tonnage of incoming waste shall not exceed 3,500 tons per day. The MPL currently receives approximately 300,000 tons per year (less than 1,000 tons per day) of municipal solid waste for disposal. The remaining landfill waste capacity is approximately 71 million cubic yards (cy). The MPL is projected to reach its full capacity in the year 2161. Construction of a new 23-acre lined landfill module was completed in June 2013 on the 70-acre MRWMD site. This lined landfill module has a waste capacity of approximately 5,000,000 tons and a service life of approximately 17 years (MRWMD 2015).

The *California Integrated Waste Management Act of 1989* (Assembly Bill [AB] 939) requires all counties to prepare a County Integrated Waste Management Plan. In Monterey County, the Monterey Regional Waste Management District coordinates the County's reuse and recycling efforts. The Airport implements a trash recycling program.

3.8.3 Pollution Prevention

The Central Coast Regional Water Quality Control Board (RWQCB) is the governing board for the Airport's stormwater discharges. The Airport operates under a General Industrial Storm Water Permit, which requires it to: (1) eliminate unauthorized non-stormwater discharge; (2) develop and implement a stormwater pollution prevention plan (SWPPP); and (3) monitor stormwater discharge. All stormwater is monitored to ensure that State water quality standards are being maintained in accordance with the Airport's approved SWPPP.

3.9 HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

In support of this EA, a cultural resource records search and intensive pedestrian field survey of the project study area were conducted in December 2015 to determine the presence or lack of cultural resources. No cultural resources were identified within or adjacent to the project area (SWCA 2017c).

By letter of December 21, 2017, the FAA advised tribal groups regarding the proposed project. As of the release of this EA, the FAA has received one response from a tribal group regarding the proposed project. By letter of February 5, 2018, the Ohlone/Costanoan-Esselen Nation (OCEN) stated that they identify the Airport as within the indigenous homeland of the OCEN. The OCEN stated that they object to all excavation in their indigenous homeland, even in areas that have been previously disturbed, or identified as having no significant archeological value. The OCEN requested:

- copies of any archeological reports regarding the project;
- inclusion in archeological mitigation and recovery programs;
- the responsibility and authority for disposition of any archeological items found during investigation of the site;
- that an OCEN Native-American monitor be used during construction of the project; and
- that the OCEN be able to consult with the lead agency for the proposed project.

The District will provide this Draft EA to the OCEN, and the District and the FAA will consult with the OCEN regarding the contents of this EA. Any suggestions that the OCEN may have regarding revisions to the Draft EA may be incorporated into the Final EA.

3.10 LAND USE

3.10.1 Existing Land Use

The project site, including staging areas, is wholly contained within the boundaries of the Airport, which is under the jurisdiction of the Monterey Peninsula Airport District (District). The Airport is bordered by the City of Del Rey Oaks to the northeast, and the City of Monterey to the northwest, west, south, and east (refer to **Exhibit 1A**). Land uses in proximity to the Airport include the U.S. Navy golf course and a government research complex (including the Fleet Numerical Meteorology and Oceanography Center [FNMOC], Naval Research Laboratory [NRL], and National Weather Service). Residential neighborhoods are located to the north, northwest, and northeast of the Airport, while mixed uses, including commercial and light industrial development, are present along Highways 68 and 218. To the south of Highway 68 is open space located within Monterey County.

The project site itself is located within the AOA between Runway 10R-28L's two parallel taxiways (Taxiway "B" on the north side and Taxiway "A" on the south side), as well as Runway 10L-28R on the east end of the project area. **Exhibit 1B** shows existing facilities and land use at the Airport. The infield areas are currently a combination of chip seal, pavement, and open ground, and have been highly disturbed due to airport maintenance activities required to meet FAA grading and safety area standards.

The northern staging area has been recently used for the west end runway safety area (RSA) improvements, which included the installation of an engineered materials arresting system

(EMAS) and related service road and taxiway geometric improvements. This project was completed in December 2015. The southern staging area for Phase 1 of the Proposed Action has been used as both a staging area and overflow parking lot. The southern staging area for Phase 2 is currently paved and used as apron for several general aviation hangars. All haul routes are located on existing paved roadways or parking areas, or, in the case of the northern staging area, on an existing dirt road.

3.10.2 General Plan and Zoning

The Airport is located within a Special Airport District. There are no General Plan designations or local zoning ordinances over the AOA.

The Airport has provided a Land Assurance letter specifying that appropriate action has been or will be taken, to the extent reasonable, to restrict the use of land next to or near the Airport to uses that are compatible with normal airport operations pursuant to 49 USC section 47107(a)(10) (**Appendix B**).

3.11 NATURAL RESOURCES AND ENERGY SUPPLY

The Airport receives natural gas and electricity from Pacific Gas and Electric (PG&E). In addition, the Airport has several fuel farms to store aviation fuel. In total, including fuel delivery trucks, the Airport has the capacity for 88,000 gallons of Jet A fuel and 37,750 gallons of AvGas (MPAD 2015). There are no fuel farms located on the project site.

California American Water Company (CalAm) provides water service to most of the Airport, although a few tenants, including the Airport, own their wells. Monterey Peninsula Water Management District (MPWMD) is charged with allocating water within the Monterey peninsula region and permitting the use of water credits for each jurisdiction/district, including the Airport.

3.12 NOISE AND COMPATIBLE LAND USE

The Airport's existing (2013) Community Noise Equivalent Level (CNEL)[4] noise contours were modeled as part of the recent airport master planning process and take into account changes in the runway ends due to the RSA project. The new noise contours represent a slight decrease in the area encompassed by the 65 decibel (dB) CNEL contour when compared to those shown in the Airport's Noise Exposure Map (NEM), which was accepted by FAA as complete on May 9, 2008 (MPAD 2008), due to a decrease in airport operations since preparation of the NEM. As shown on **Exhibit 3C**, the Airport's 65 CNEL noise contour extends off the Airport at both the west

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[4] The Day-Night Average Sound Level (DNL) accounts for the increased sensitivity to noise at night (10:00 PM to 7:00 AM) and is the metric preferred by FAA, the U.S. EPA, and the U.S. Department of Housing and Urban Development (HUD) as an appropriate measure of cumulative noise exposure. In California, however, these agencies accept the use of CNEL, which, in addition to night-time sensitivities, also accounts for increased sensitivities during the evening hours (7:00 PM to 10:00 PM).

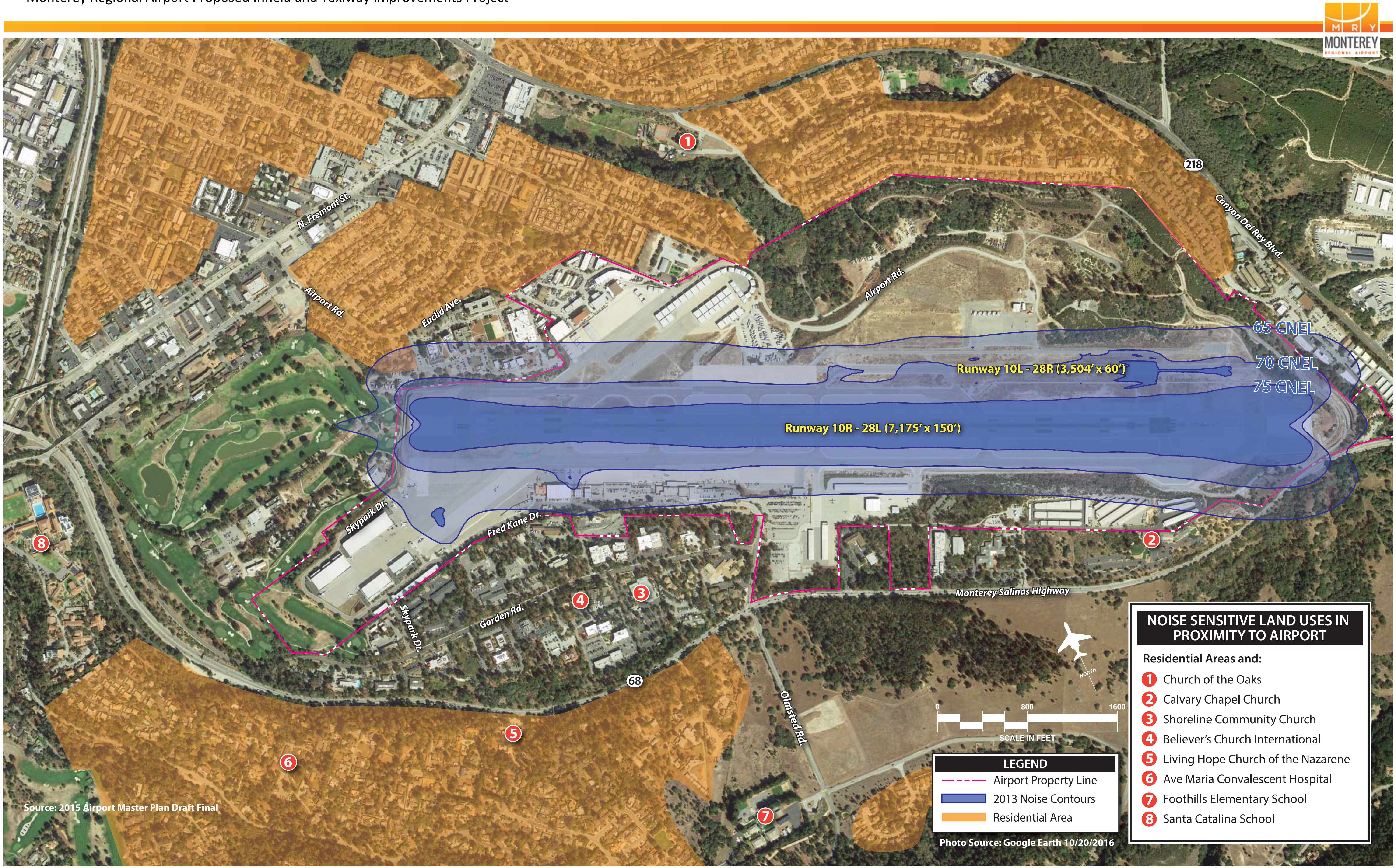

EXHIBIT 3C
EXISTING NOISE CONTOURS

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and east ends of the runway; the 70 CNEL noise contour is slightly off airport property to the southeast of Runway 28L end and northwest at the Runway 10R end.

On the east end, the 65 CNEL contour is located over vegetated open space to the southeast and over an industrial/office complex to the northeast. No sensitive noise-receptors are present.[5] To the west, the 65 CNEL contour extends over seven residential properties located on Lilac Street. These residences are approximately 700 to 900 feet northwest of the closest part of the project site. Most of these homes have received sound insulation measures, such as the installation of central air conditioning, improved insulation, and/or double-glazed windows from a previous airport sound insulation program to address noise compatibility. Those residences in that area that did not receive sound insulation were eligible but did not participate in the program. No sensitive noise receptors are affected by the existing 70 CNEL.

Other kinds of noise-sensitive land use in proximity to the proposed project site (within approximately 0.5 mile) are listed below and shown on **Exhibit 3C**. None of these noise-sensitive land uses are located within the existing 65 CNEL for the Airport:

- Places of Worship:
  - Calvary Chapel Church, located at 3001 Salinas Highway, approximately 0.1 mile south of the project site;
  - Shoreline Community Church, located at 2500 Garden Road, approximately 0.2 mile south of the project site;
  - Believer's Church International, located at 2400 Garden Road, approximately 0.2 mile south of the project site;
  - Church of the Oaks, located at 841 Rosita Road, approximately 0.5 mile north of the project site; and
  - Living Hope Church of the Nazarene, located at 1375 Josselyn Canyon Road, approximately 0.5 mile south of the project site.

- Medical Facilities: Ave Marie Convalescent Hospital, located at 1249 Josselyn Canyon Road, just over 0.5 mile southwest of the project site.

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[5] Noise-sensitive receptors, as defined by 14 CFR 150, may be residences, churches/places of worship, hospitals and health care facilities, and educational facilities. FAA has further clarified that, for purposes of 14 CFR 150, churches/places of worship are permanently established facilities intended solely for use as places of worship and not meant to be converted to other potential uses. For a hospital/health care facility to be considered a noise-sensitive medical facility under 14 CFR 150, it must provide for overnight stays or provide for longer recovery periods, where rest and relaxation are key considerations for use of the facility. Schools are facilities that provide full time use for instruction and training to students. According to 14 CFR 150, residential land use and schools are not considered compatible with a 65 DNL contour or higher. Religious facilities, hospitals, or nursing homes located within a 65 DNL contour are generally compatible if an interior noise level reduction of 25 dB is incorporated into the design and construction of the structure.

- Educational Facilities: None.[6] The closest schools are Foothills Elementary School, located at 1700 Via Casoli, approximately 0.6 mile south of the project site, and Santa Catalina School, located at 1500 Mark Thomas Drive, approximately 0.7 mile north and west of the project site.

As previously mentioned in Section 3.10.2, the Airport has provided a Land Assurance letter specifying that appropriate action has been or will be taken, to the extent reasonable, to restrict the use of land next to or near the Airport to uses that are compatible with normal airport operations pursuant to 49 USC section 47107(a)(10) (**Appendix B**).

3.13 SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

3.13.1 Population

Population and ethnicity data for the City of Del Rey Oaks, the City of Monterey, the County, and the State is presented in **Table 3A**. As shown in the table, approximately 0.4 percent of the County's population lives in the City of Del Rey Oaks and 6.6 percent of the County's population lives in the City of Monterey; total population estimates for 2015 were 1,673 and 28,283, respectively. Roughly 16 percent of the population in the cities of Del Rey Oaks and Monterey are from a minority race; the minority percentage in the County and the State overall is 23.6 percent and 34.5 percent, respectively. Approximately 17.4 percent of the population in the City of Monterey consider themselves Hispanic or Latino compared to 15.8 percent in the City of Del Rey Oaks, 56.9 percent Countywide, and 38.4 percent in the State overall.

[6] The Casanova Oak Knolls Center is located at 735 Ramona Avenue, approximately 0.25 mile from the proposed project site. This Center includes community preschool and recreational facilities; however, preschools are not considered noise-sensitive receptors per 14 CFR 150. See Footnote No. 6.

TABLE 3A
Population Characteristics
Cities of Del Rey Oaks and Monterey, Monterey County, and State of California

Characteristic	City of Del Rey Oaks	City of Monterey	Monterey County	State of California
Total Population	1,673	28,283	428,411	38,421,464
Race Alone or in Combination with other races[1]				
White	84.0%	83.9%	76.4%	65.5%
Black or African American	0.9%	5.2%	3.7%	7.1%
American Indian and Alaska Native	0.7%	1.5%	1.8%	1.9%
Asian	12.5%	10.0%	7.7%	15.6%
Hawaiian/Pacific Islander	0.7%	0.3%	0.9%	0.8%
Other	5.8%	5.0%	13.7%	14.1%
Hispanic or Latino (of any race)	15.8%	17.4%	56.9%	38.4%

Source: U.S. Department of Commerce, U.S. Census Bureau, American FactFinder website. DP-05, ACS Demographic and Housing Estimates, 2015 American Community Survey Five-Year Estimates. Available at: http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#none, accessed March 2017.
[1] The six percentages may add to more than 100 percent because individuals may report more than one race.

Table 3B summarizes economic characteristics from the American Community Survey's 2015 five-year estimates for the cities of Del Rey Oaks and Monterey, as well as the County and the State overall. As can be seen in this table, the City of Del Rey Oaks has the highest median household and per capita income and the lowest percentage of families living below the poverty level, followed by the City of Monterey. Both of the cities have a significantly higher level of economic well-being than either the County or the State overall, based on the economic indicators identified. The civilian unemployment rate is also lower in these two cities than in the County or State overall.

TABLE 3B
Economic Characteristics
Cities of Del Rey Oaks and Monterey, Monterey County, and State of California

Characteristic	City of Del Rey Oaks	City of Monterey	Monterey County	State of California
Median Household Income	$86,250	$66,166	$58,783	$61,818
Families Below the Poverty Level	1.9%	3.3%	13.0%	12.2%
Per Capita Income	$41,462	$37,915	$24,994	$30,318
Unemployment (Civilian labor force)	3.9%	5.1%	8.4%	9.9%

Source: U.S. Department of Commerce, U.S. Census Bureau, American FactFinder website. DP-03, Selected Economic Characteristics, 2015 American Community Survey 5-Year Estimates. Available at: http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#none, accessed March 2017.

3.13.2 Environmental Justice

Executive Order (E.O.) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and the accompanying Presidential Memorandum, as well as U.S. DOT Order 5610.2, *Environmental Justice*, require FAA to provide for meaningful public involvement by minority and low-income populations, as well as address potential impacts on these populations that may be disproportionately high and adverse.

The U.S. Census Bureau provides information regarding socioeconomic conditions in the Monterey area at the census tract and, in some cases, the block group level. The percentage of persons living below the poverty level (by census tract) and the percentage of minority populations (by block group) that include, or are near, the Airport are shown on **Exhibit 3D**. The percentage of households in the same census tract as the Airport that were below the poverty rate in 2010 was 11.6 percent, while the minority populations in the block group that contained the Airport was 33.6 percent.

3.13.3 Children's Environmental Health and Safety Risks

There is no potential for children to be located within the project study area for the Proposed Action, which is within the AOA of an active airport.

3.13.4 Surface Transportation and Traffic

The Airport can be accessed from the north or south of the airfield.

From the north:

- Airport Road via N. Fremont Street
- Euclid Avenue from Ramona or Casanova Avenues via N. Fremont Street

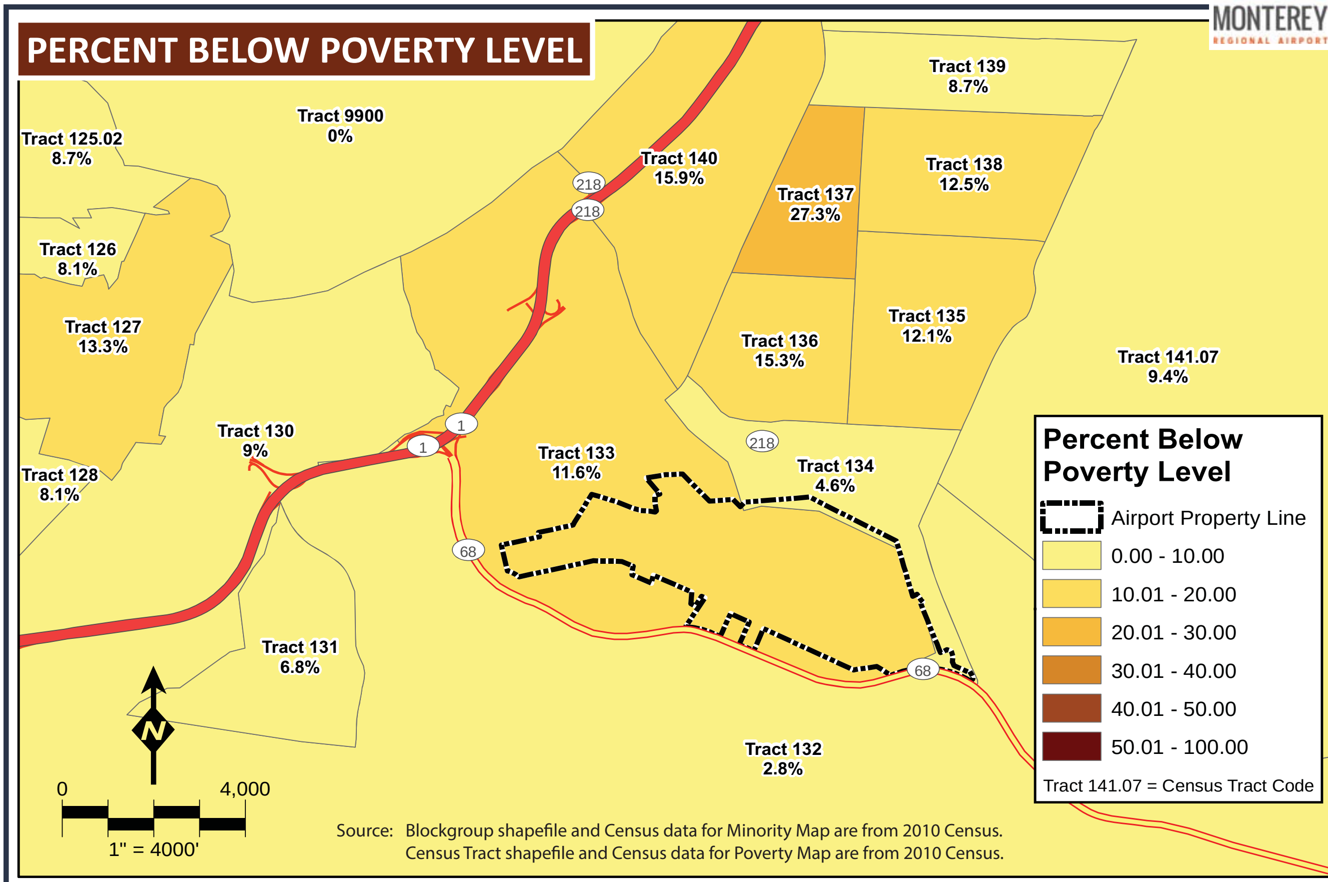
From the south:

- Olmsted Road via Highway 68 (also known as the Monterey-Salinas Highway)
- Garden Road via Fairground Road

The City of Monterey identifies N. Fremont Street from Highway 1 east to the City limits and Olmsted Road from Highway 68 to the airport entrance as Minor Arterial Streets; Airport Road from the Airport to N. Fremont Street and Garden Road from Fairground Road to Olmsted Road are listed as Collector Streets (City of Monterey 2004; 2013). The intersections of Olmsted Road with Highway 68, Garden Road with Fairground Road, and Airport Road, Ramona Avenue, and Casanova Avenue with Fremont Street are controlled by traffic signals. All other intersections are either uncontrolled or controlled by stop signs. Airport Road between Fremont Street and the Airport also has traffic calming medians, sidewalk pop-outs and decorative paved crosswalks located intermittently through the residential neighborhood.

Highway 68, between Highway 218 and Highway 1, experienced approximately 22,300 annual average daily trips (AADT) during 2015, based on a report by Caltrans (Caltrans 2017). During that same time period, the peak month experienced 22,400 to 23,600 trips, while the peak hour

PERCENT BELOW POVERTY LEVEL



PERCENT MINORITY

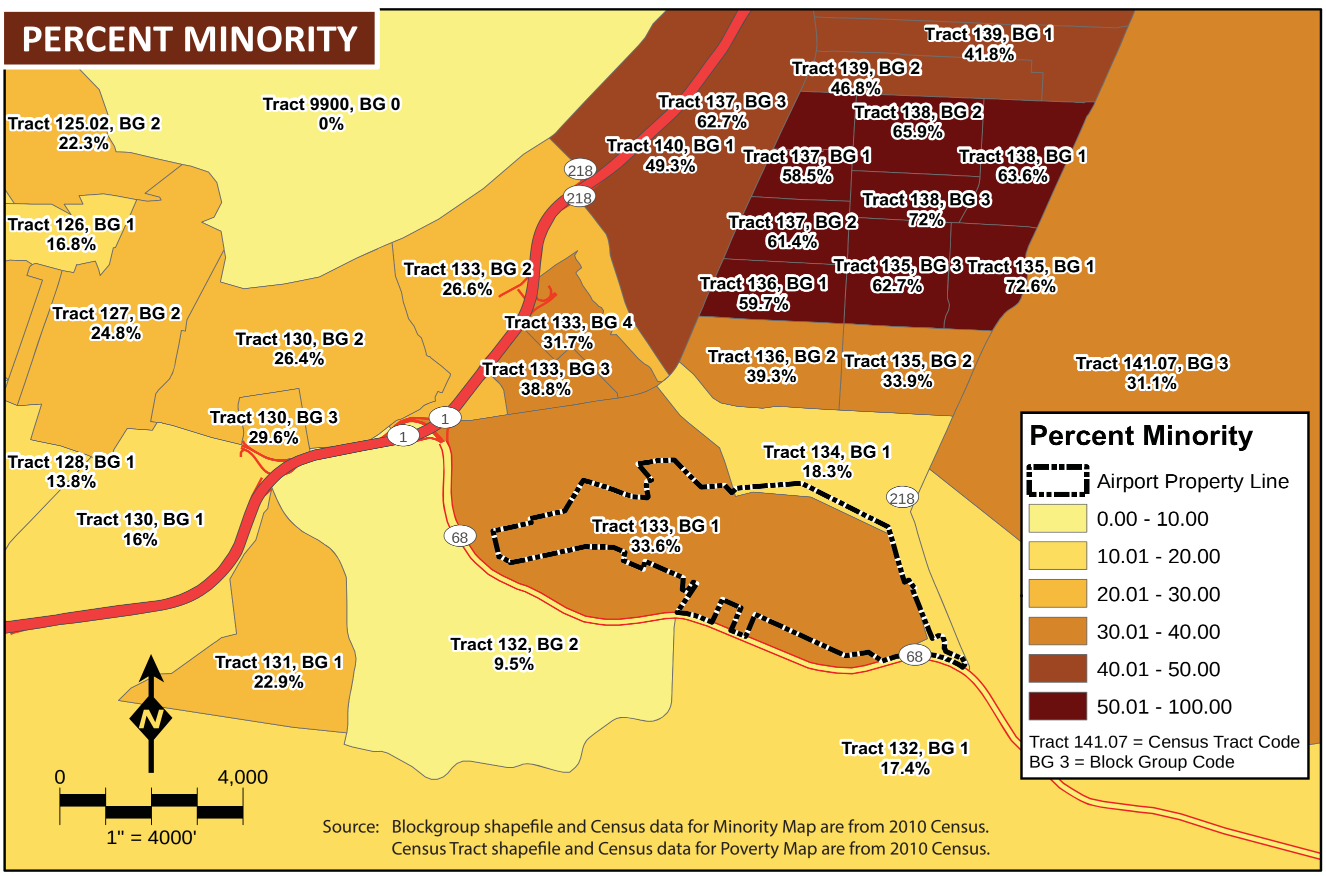


EXHIBIT 3D
LOW INCOME AND MINORITY POPULATIONS

was between 1,850 and 1,950 trips; the peak hour counts occurred in July in both the AM and PM peak hours (Caltrans 2017).

The City of Monterey completed a citywide traffic and parking study in 2012 that included N. Fremont Street as a study corridor. **Table 3C** shows existing and future levels of service (LOS) at intersections within the study area.

TABLE 3C
North Fremont Intersection PM Peak Hour[1] Levels of Service

Intersection	Intersection Control	Existing (2008) LOS[2]	Future LOS[2]
Fremont Street/Casa Verde Way	Signal	C	C
Fremont Street /De la Vina Avenue	Signal	B	C
Fremont Street /Ramona Avenue	Signal	B	B
Fremont Street /Casanova Avenue	Signal	B	C

Source: City of Monterey. *Monterey Citywide Transportation and Parking Study*, December 2012.
[1] Friday afternoon PM peak hour in August (peak month conditions)
[2] Level of service was determined using the Synchro traffic analysis software program, which allows for detailed intersection configurations and signal timing plans to be evaluated. The LOS designation of a roadway or an intersection indicates whether the capacity is adequate to handle the volume of traffic using the facility. LOS "A" indicates excellent service level, with minimal stacking of vehicles, while LOS "F" describes densely congested conditions.

3.14 VISUAL EFFECTS

3.14.1 Light Emissions

The Airport has the normal lighting sources associated with a Part 139 certificated airport (see **Table 1A**); the project area itself (i.e., the infield) contains the following lighting fixtures:

- 4-box precision approach path lights (PAPIs) on each end of Runway 10R-28L
- Lighted wind sock
- Runway end indicator lights (REILs) on the Runway 28L end

3.14.2 Visual Resources

Highway 68 is a designated Scenic Highway by the State and the County, primarily to protect scenic views from the highway of adjacent wooded hills. Portions of the Airport, primarily in the eastern end below the plateau, are visible from this highway. Once the State (i.e., California Department of Transportation [Caltrans]) determines that a proposed scenic highway satisfies the qualifications for a scenic designation, the local governing body, with citizen support, must adopt a program to protect the scenic corridor. In the case of Highway 68, both the County and the City of Monterey have established policies to protect its scenic qualities. While neither the County nor the City of Monterey has jurisdiction over the Airport, the City of Monterey does have jurisdiction over adjacent lands along Highway 68 within the City limits.

3.15 WATER RESOURCES

3.15.1 Wetlands

No wetland (hydrophytic) plant species or hydric soils were identified in the project study area during a biological resources field survey conducted for the project in May 2015. The National Wetlands Inventory (NWI) (USFWS 2016b) was also reviewed and no mapped wetlands or water features were found.

3.15.2 Floodplains

The only area of the Airport that is located within a mapped 100-year floodplain (Zone AO, Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance Flood) is the extreme south-eastern corner of the Airport at the junction of Highways 68 and 218; other parts of the corner and along the Airport's eastern boundary with Del Rey Oaks could be inundated by a 100-year flood, but with average depths of less than one foot (Zone X, Other Flood Areas) (FEMA 2009). The remainder of the Airport, including the proposed project site, is located outside the mapped 500-year floodplain (Zone X, Other Areas) and is not subject to inundation due to its location atop a plateau.

3.15.3 Surface Waters

The Airport is located within the Canyon del Rey and Seal Rock Creek-Frontal Monterey Bay sub-watersheds of the Salinas watershed. According to the U.S. EPA's My WATERS Mapper online tool, the closest water bodies listed on a *Clean Water Act* (CWA), Section 303(d) list (Impaired Waters List) are Majors Creek and the Monterey Harbor, located approximately 1.75 miles west and northwest of the Airport, respectively (U.S. EPA 2015c). All stormwater from the Airport is monitored to ensure that State water quality standards are being maintained in accordance with the Airport's approved SWPPP.

There are three drainage areas that discharge storm runoff from the project study area into the drainage facilities of adjacent municipalities: the northeast portion of the Airport; the southwest portion of the Airport; and the northwest portion of the Airport (**Exhibit 3E**). **Table 3D** summarizes these drainage areas in terms of: total area; impervious area; pervious area; percent impervious; and the total flow (Q) for a five-year, 24-hour storm event at each discharge location. The complete table with additional technical information, by subbasin, is provided in **Appendix C**.

TABLE 3D
Existing Hydrologic Conditions
Monterey Regional Airport

Drainage Area	Total Area (acres)	Pervious Area (acres)	Impervious Area (acres)	Percent Impervious	Confluence Point[1] 5-Year, 24-hour Event Runoff (Q)
Northeast	248	137	111	45%	158 cfs
Southwest	147	51	96	65%	137 cfs
Northwest	45	12	33	73%	62 cfs

Source: Kimley-Horn Associates 2018.
[1] Refer to **Exhibit 3E** for confluence points.
cfs = cubic feet per second

- Northeast Drainage Area. This drainage basin is approximately 248 acres and consists of the airfield area north of the centerline of main Runway 10R-28L between the east end of the runway and connector Taxiway "G," including Taxiway "B," Runway 10L-28R, taxiways, aircraft parking areas, and the entire undeveloped northside area. Stormwater in this area is collected by a series of catch basins and storm drain pipes that discharge into a large detention pond located at the northwest corner of the Airport. The pond was designed to provide approximately 409,000 cubic feet of available pond storage and to accommodate future development (Neill Engineers Corp. 2017b). For example, it will allow the 10-year existing storm to pass but will detain the difference between the projected 100-year future developed runoff and the existing 10-year runoff. During a five-year, 24-hour storm, runoff at the confluence point (**Exhibit 3E**) is 158 cubic feet per second (cfs). The detention pond drains into a natural drainage channel that runs along Rosita Road in Del Rey Oaks, and into Canyon Del Rey Creek, ultimately ending up in Laguna Grande Lake in Seaside.

- Southwest Drainage Area. This drainage basin is approximately 147 acres and consists generally of the area south of the main Runway 10R-28L centerline between Taxiway "E" and Taxiway "L," including the corresponding segment of Taxiway "A," the southside aircraft parking ramp areas, the Airport's terminal building area and parking lots, fixed base operator (FBO) areas, and all the areas to the south and southwest. Stormwater runoff is collected by a system of catch basins and storm drain pipes. The storm drain trunk line for this drainage area runs downhill along Taxiway "A" beginning at connector Taxiway "L" through the infield safety areas, then across and along Taxiway "A." It then turns in the southwesterly direction through the Del Monte Aviation and Monterey Jet Center FBO sites, crosses Sky Park Drive through the Monterey Pines (Navy) Golf Course, and ultimately connects into the City of Monterey storm drain system along Highway 68 where it discharges into Del Monte Lake located at the Navy Postgraduate School. During a five-year, 24-hour storm, runoff at the confluence point (**Exhibit 3E**) is 137 cfs.

- Northwest Drainage Area. This 45-acre drainage area is comprised of two sections. This westerly portion consists generally of the northwesterly portion of the airfield area from Taxiway "E" to the west, including the westerly portion of Taxiway "B" and northerly infield safety areas between connector Taxiways "E" and "G," and the northerly portion of

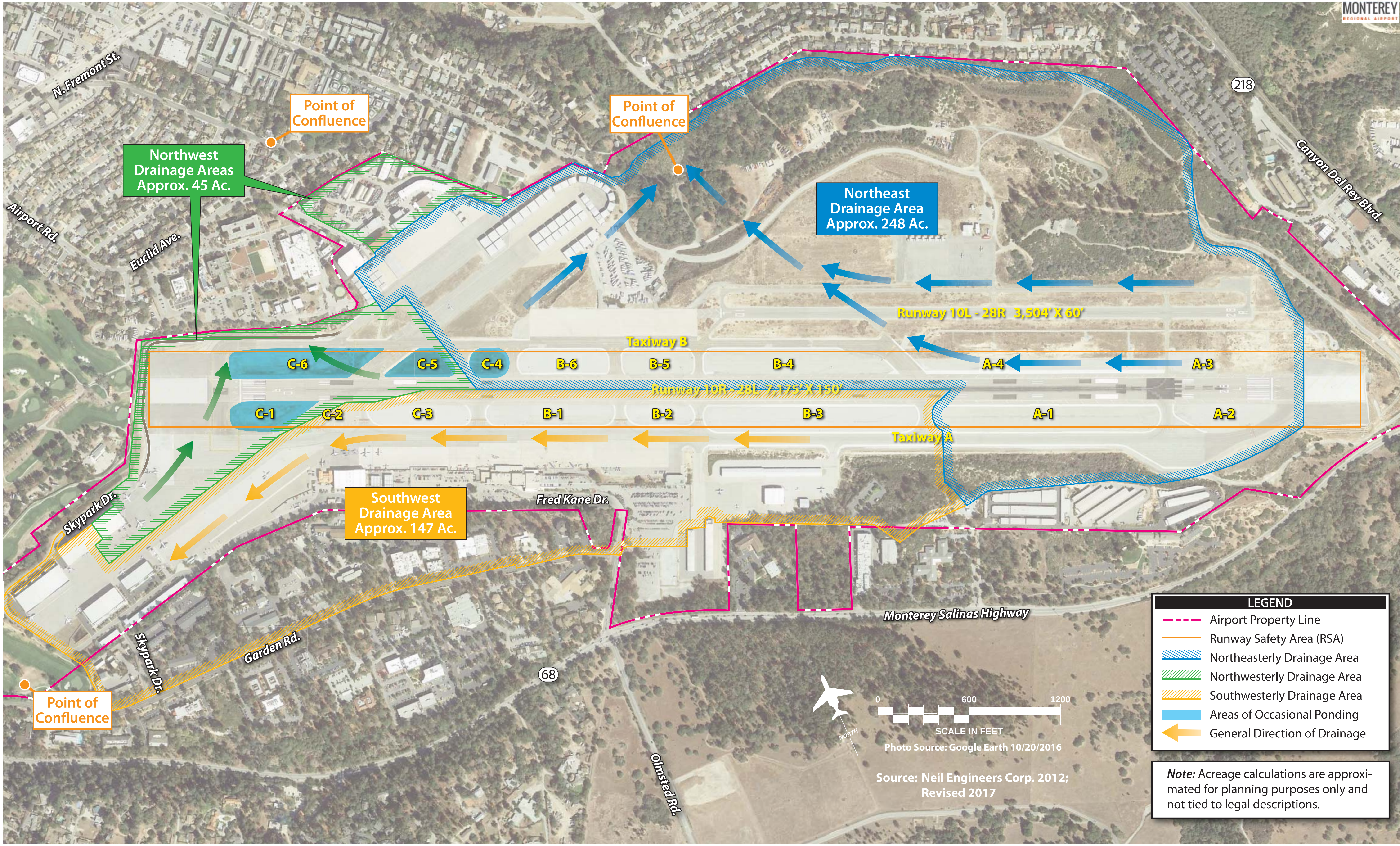


EXHIBIT 3E
INFIELD AREA DRAINAGE MAP

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the Monterey Jet Center FBO site. The northerly portion of this drainage basin includes the Old Northside area, and is not affected by the infield areas of the Airport.

The westerly end of this drainage area drains toward the adjacent Navy Golf Course and Navy property to the north. The runoff is collected by a system of catch basins and storm pipes that connect to the Navy storm drain facilities before entering the City of Monterey facilities on Airport Road, ultimately ending up in Laguna Grande Lake in Seaside. During a five-year, 24-hour storm, runoff at the confluence point (**Exhibit 3E**) is 62 cfs.

Smaller drainage areas, such as the southwesterly portion of the Airport, drain toward Highway 68 via surface flows, while the easterly end portion of the Airport drains toward Highway 68 and Del Rey Oaks.

The existing drainage system at the Airport has been designed for a five-year storm event per FAA AC 150/5320-5D, *Airport Drainage Design*, Section 2-2.4.2 (FAA 2013a). An analysis of existing storm drain deficiencies using a five-year, 24-hour storm event was completed in support of this EA (**Appendix C**). The location of existing storm drain deficiencies are shown in **Exhibit 3F**. Generally, the main storm drains within the infield are currently operating above capacity (i.e. are deficient) during a five-year storm event. Ponding occasionally occurs on the west side of the infield in the natural areas during certain storm events.

3.15.4 Groundwater

The Airport is also located on the southernmost portion of the Salinas Valley-Seaside Area ground water subbasin, which has an estimated capacity of one million acre-feet (Ricondo 2008). The nearest sole source aquifers are the Santa Margarita and Scotts Valley Sole Source Aquifers, located approximately 30 miles north (USGS 2016).

Although there are two retention ponds located in the southern part of the Airport that allow the percolation of stormwater into the groundwater for recharge of the groundwater basin, for the most part, the Airport, and especially the infield area, does not serve as a groundwater recharge area. The natural ground areas of the infield are highly compacted and sheet flow currently occurs over most of the infield.

3.15.5 Wild and Scenic Rivers

The closest Wild and Scenic River to the Airport is Big Sur River, located approximately 23 miles south (USGS 2016). This river is designated as Wild for 19.5 miles and is located within a different subwatershed. There are no other creeks or rivers in Monterey County that are currently under study or on the Nationwide Rivers Inventory (USFWS 2016a; U.S. Department of Interior 2016).

3.16 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

The purpose of this section is to outline those projects that will need to be considered during the cumulative impact analysis in Chapter Four of this EA. NEPA regulations at 40 CFR §1508.7 define a cumulative impact as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions. Past projects are defined as those that have been undertaken over the past five years within the vicinity of the Airport. Foreseeable future actions are defined as those that are likely to become a reality, such as projects that have been included within the five-year Airport Capital Improvement Program (ACIP). Other developments considered are those that are planned or currently under development within the vicinity of the Airport.

3.16.1 On-Airport Development

Table 3E identifies past and ongoing improvements at the Airport (from 2011 - 2017) that could contribute to cumulative impacts.

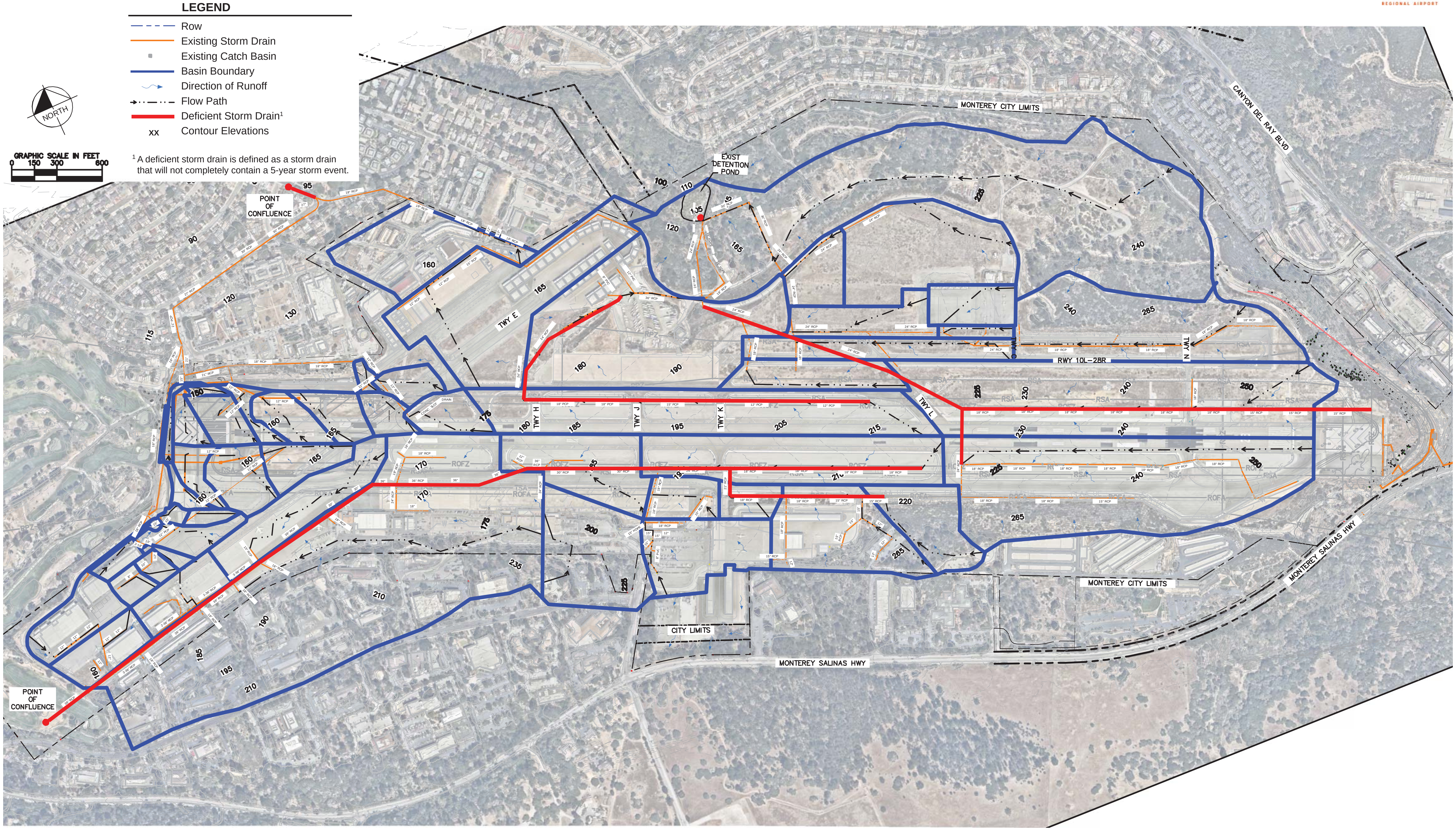
TABLE 3E
Past and Ongoing Airport Improvements (Years 2011 – 2017)
Monterey Regional Airport

Fiscal Year	Project Description
2011	Parking Lot Seal and Stripe
2011	Airfield Pavement (Phase 3)
2011	North Side Sewer Line Replacement
2012	Ready Return Lot Overlay
2012	South Side Hangar Apron Sealcoat
2013	AOA Perimeter Fence Security
2014	ARFF Apron Expansion Joints
2014	Slurry Seal – Skypark Drive
2014	Tarpy's Restaurant Roof and Structure
2014-15	Runway Safety Area Improvement Project
2017	Airfield Electrical Vault Replacement
2017	Solar Farm Construction

Sources: Monterey Regional Airport records.

In addition, the draft Airport Master Plan includes a proposed safety enhancement project that is currently being evaluated in a separate EA that includes several components associated with increasing the runway-taxiway separation to 327.5 feet (ft) between Taxiway "A" and the Airport's primary runway (Runway 10R-28L). If approved, the project components would be phased over the next 10 years and would include the following four general phases:

- **Phase 1**: Relocate general aviation tenants from the southeast part of the Airport to north of the airfield. Construct a new "north side" road from the expanded north side general aviation area to Del Rey Gardens Drive. Construct new ARFF building.



Source: Kimley-Horn Associates 2018

EXHIBIT 3F
STORM DRAIN SYSTEM DEFICIENCIES

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- **Phase 2**: Demolish existing ARFF building. Construct new commercial passenger terminal complex (including apron and taxilanes, terminal access road, and automobile parking).

- **Phase 3**: Demolish existing terminal building. Remark Taxiway "A" to 327.5 feet from Runway 10R-28L (including connector Taxiways "G" and "J" hold lines). Provide apron islands at Taxiways "G" and "J".

- **Phase 4**: Construct replacement surface parking lot along Fred Kane Drive.

The Airport's most recently proposed ACIP includes the following projects, as listed in **Table 3F**.

TABLE 3F
Proposed Airport Improvements (Years 2018 - 2023)
Monterey Regional Airport

Fiscal Year	Project Description
2018	Runway 10L-28R Overlay and PAPI Installation
2018	South Side Land Acquisition Part A (5.5 acres)
2019	North Side General Aviation Construction (Phase 1A)
2020	North Side Road Construction (General Aviation Area to Del Rey Gardens Drive)
2020	North Side General Aviation Construction (Phase 1B)
2020	ARFF Construction (Phase 1)
2021	North Side General Aviation Construction (Phase 1C)
2021	ARFF Construction (Phase 2)
2021	Demolish Existing ARFF (Phase 1)
2021	Demolish South Side General Aviation (Phase 1)
2022	Demolish Existing ARFF (Phase 2)
2022	Demolish South Side General Aviation (Phase 2)
2023	Terminal Apron Construction (Phase 1)

Sources: Monterey Peninsula Airport District, Resolution No. 1695 RE: Proposed FY 2018-2023 Airport Capital Improvement Plan (ACIP) Submittal to FAA, dated October 11, 2017.

3.16.2 Off-Airport Development

The cities of Del Rey Oaks and Monterey were also contacted regarding off-airport projects within the cumulative study area (**Exhibit 3G**). Based on information from the City of Monterey, the following projects have been added to the cumulative project list (City of Monterey, email and personal communication with T. Bennett). No off-airport development information was received from the City of Del Rey Oaks.

- Santa Catalina School, 1430 Mark Thomas (City of Monterey): 27,323-sf Math and Science building. Constructed in 2015/16.

- 2969 Monterey Salinas Highway (City of Monterey): 68,564-sf automobile storage condominiums. Use Permit submitted in 2017.

- 3051 Monterey Salinas Highway (City of Monterey): Pastures of Heaven (Pet Memorial Park). No new buildings. Under development in 2017.

Local roadway and highway projects were researched using the Transportation Agency for Monterey County (TAMC) website. Based on this information, no roadway or highway improvement projects are scheduled to occur within the cumulative project study area.

U.S. Navy facilities within the cumulative study area include: the Navy golf course, FNMOC, and the NRL. The Navy golf course conducts miscellaneous minor improvement projects, as funding allows. One reasonably foreseeable project that could occur within five years is a ball catch fence between the golf course and the Monterey Fairgrounds. The NRL has had two building construction projects within the past five years: a building expansion in 2011 and a new building in 2013. There are no reasonably foreseeable capital improvement projects at the FNMOC or the NRL for the next five years (U.S. Navy, NSA Monterey, email and personal communication with S. Quimby).

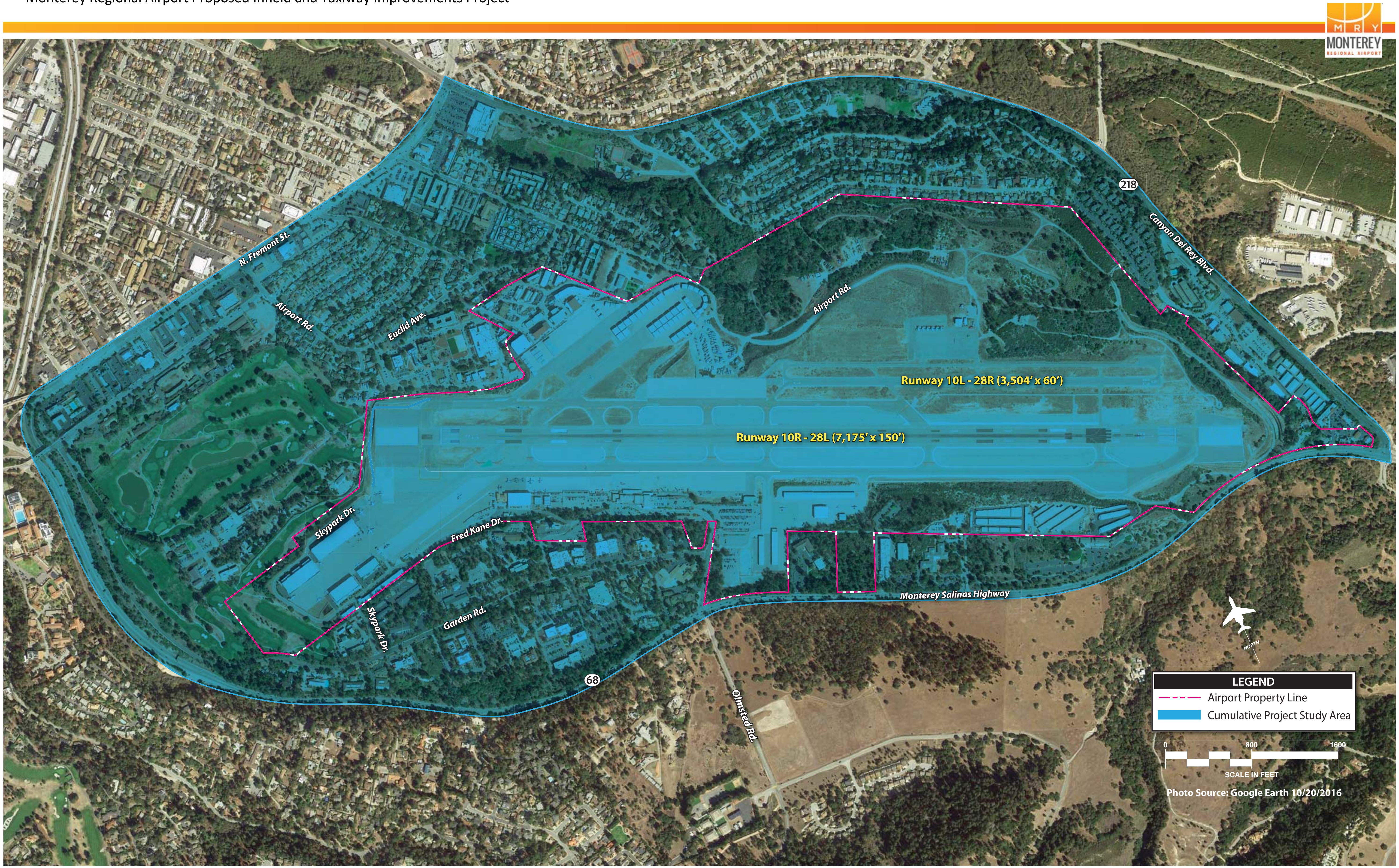

EXHIBIT 3G
CUMULATIVE PROJECT STUDY AREA

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Chapter Four
ENVIRONMENTAL CONSEQUENCES AND MITIGATION

Chapter Four
ENVIRONMENTAL CONSEQUENCES AND MITIGATION

Proposed Infield and Taxiway Improvements
Environmental Assessment

4.1 INTRODUCTION

Federal Aviation Administration (FAA) Orders 1050.1F, *Environmental Impacts: Policies and Procedures* (Order 1050.1F) and 5050.4B*, National Environmental Policy Act* (NEPA) *Implementing Instructions for Airport Actions* (Order 5050.4B) define the form and content of Environmental Assessments (EAs). Environmental impacts are determined by comparing the anticipated local environmental condition after development (Proposed Action alternative) to the conditions at and around the Monterey Regional Airport (Airport) should no project be developed (No Action alternative). Data regarding the existing condition is provided within Chapter Three of this EA.

For the purposes of this EA, the environmental consequences have been evaluated for the sponsor's preferred alternative (i.e., the Chip Seal alternative), which would involve resurfacing 15 infield areas with a new chip seal. The EA also addresses the following additional Proposed Action (i.e., "build") alternatives: Asphalt Concrete alternative and Chip Seal/Crushed Aggregate alternative. In accordance with the CEQ regulations 40 CFR § 1508.8, the No Action (i.e., "no build") alternative has also been retained for further environmental analysis. All other project alternatives under consideration were eliminated because they did not meet the stated project criteria (see Section 2.2).

The environmental consequences of each impact category include consideration of the following:

- **Direct effects** – Direct effects are defined as those which are caused by the Proposed Action and occur at the same time and place (40 CFR § 1508.8[a]).

- **Indirect effects and their significance** – Indirect effects are defined as those which are caused by the Proposed Action and are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR § 1508.8[b]).

- **Cumulative effects and their significance** – Cumulative effects are defined as the impact on the environment which results from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions (40 CFR § 1508.7). Section 3.16 lists the past, present, and reasonably foreseeable future actions considered for this EA's analysis; a cumulative impact analysis is then provided in Section 4.4. Resources which are not affected by the Proposed Action alternative have not been evaluated for cumulative impacts unless a resource agency requested an evaluation (see **Appendix A**).

Where necessary, mitigation measures are listed which will reduce or eliminate anticipated environmental impacts for each of the alternatives. Special purpose laws and local programs and policies that protect various environmental resources are also identified.

4.2 RESOURCES NOT IMPACTED BY PROJECT ALTERNATIVES

As outlined within paragraph 706.f of FAA Order 5050.4B, concise analysis was undertaken *only* for potential impacts that the alternatives under consideration may cause. The project area is located within the Airport's boundaries and, as discussed in Chapter Three, the following resources are not located in the project area or would not be impacted by the project alternatives:

- coastal resources;
- *Department of Transportation Act*, Section 4(f)
- farmlands;
- land use;
- children's environmental health and safety risks;
- visual resources;
- wetlands;
- floodplains; and
- wild and scenic rivers.

Therefore, these FAA Order 1050.1F environmental impact categories are not addressed further in this EA.

4.3 RESOURCES POTENTIALLY IMPACTED BY PROJECT ALTERNATIVES

The following sections contain impact analyses for those categories defined within FAA Order 1050.1F that could potentially be affected by project alternatives. The No Action alternative provides an evaluation of future environmental conditions if none of the Proposed Action alternatives are undertaken. Where there is not a potential for a significant impact, the rationale for this conclusion is discussed.

NEPA regulations at 40 CFR § 1506.2 (b) requires that EAs discuss any inconsistencies with approved State and/or local plans and laws. Since the Airport's infield is located within a Special District, local jurisdictional plans and policies do not apply; however, where regional or State plans are applicable, a discussion has been provided.

4.3.1 Air Quality

Analysis Methodology and Significance Thresholds

Under the *Clean Air Act* (CAA), the United States (U.S.) Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants, as described in Section 3.2.

The Federal CAA, as amended by the *Clean Air Act Amendments of 1990,* and FAA provide guidance for conducting air quality analyses for airport projects under NEPA. A significant air quality impact occurs under NEPA when a project or action exceeds one or more of the NAAQS. Per FAA's *Aviation Emissions and Air Quality Handbook, V*ersion 3, Update 1 (2015a), projects that will not increase the capacity of an airport or change aircraft and vehicle traffic patterns are not likely to cause or create a "reasonable foreseeable increase in emissions."

As discussed in Section 3.2, the Airport is in the North Central Coast Air Basin (NCCAB), which is currently designated in attainment for all the NAAQS. Because the NCCAB is currently in attainment for all NAAQS, there are no current State Implementation Plans (SIPs) for the area. In addition, no applicability test under the General or Transportation Conformity Rules of the CAA is warranted; there are no applicable *de minimis* thresholds for NAAQS criteria pollutants.[1]

None of the Proposed Action alternatives under consideration would permanently change airport operations or aircraft and vehicle traffic patterns or would have reasonably foreseeable increases in emissions when compared to the No Action alternative in the long term. Per FAA Order 5050.4B, because the level of airport operations is not expected to change as a result of the project, no operational emissions inventory was prepared or is required under NEPA. Additionally, because the NCCAB area is currently in attainment of all the NAAQS, no General Conformity or Transportation Conformity determinations, as mandated by the CAA, are necessary. However, for the purposes of disclosure, a construction-related emissions inventory was prepared.

[1] If a conformity determination was required, the levels of project-related construction emissions presented in this section are well below the *de minimis* thresholds typically applied. *De minimis* thresholds are defined as pollutant or pollutant precursor levels above which a project's emissions would be considered significant in terms of attaining the NAAQS in a timely manner and conforming to a SIP.

Under State law, the California Air Resources Board (CARB) implements more stringent standards than the Federal CAA (see **Exhibit 3A**). The Monterey Bay Air Resources District (MBARD), formerly known as the Monterey Bay Unified Air Pollution Control District (MBUAPCD), is responsible for air monitoring, permitting, enforcement, long range air quality planning, regulatory development, and other activities related to air pollution within the NCCAB. The MBARD assists CARB in air quality regulation and program enforcement within the NCCAB and is responsible for adopting and updating an air quality management plan (AQMP) to ensure attainment of the California Ambient Air Quality Standards (CAAQS). MBARD coordinates closely with the Association of Monterey Bay Area Governments (AMBAG) and other regional and local governmental agencies to develop and implement the AQMP. The *Triennial Plan Revision 2009-2011* (MBUAPCD 2013) outlines MBARD planning requirements necessary to maintain the State ozone (O_3) standard and continue the five percent per year O_3 reduction goal established by CARB. MBARD also enforces local rules to help further the goals of the *2012-2015 Air Quality Management Plan* (MBARD 2017).

For evaluation of construction projects, MBARD thresholds state that a project would not have a significant air quality effect on the environment if the project would (MBARD 2016):

- Emit (from all project sources, mobile, area, and stationary) less than:
  - 137 pounds per day of nitrogen oxides (NOx)
  - 137 pounds per day of reactive organic gases (ROG)[2]
  - 82 pounds per day of respirable particulate matter (PM_{10})
  - 55 pounds per day of fine particulate matter ($PM_{2.5}$)
  - 550 pounds per day carbon monoxide (CO)

Air emissions occurring due to construction activity vary based on the project's duration and level of activity. Construction emissions occur mostly as exhaust products from the operation of construction equipment and vehicles but can also occur as fugitive dust emissions from land disturbance during material staging, demolition, and movement. Evaporative emissions also result from asphalt paving operations. The type of construction equipment commonly used can be categorized as both off- and on-road equipment. Off-road equipment is normally used for earthwork, paving, demolition, and other onsite activities, while on-road equipment is typically used to transport and deliver supplies, material, and employees.

To quantify temporary air quality impacts, a construction emissions inventory for each of the three Proposed Action alternatives was prepared using the California Emissions Estimator Model (CalEEMod). The CalEEMod software model evaluates highway vehicle emissions, such as those from dump trucks or light-duty work trucks, and emissions related to non-highway approved vehicles, such as heavy construction equipment.

[2] For the purposes of this report, ROG and volatile organic compounds (VOC) are considered equivalent.

Proposed Action Alternatives

Table 4A summarizes the estimated construction emissions in tons per year (per the NAAQS) for each of the Proposed Action alternatives. None of these alternatives would generate construction emissions above any *de minimis* thresholds (generally 100 tons/year for nonattainment or maintenance areas) typically applied during a CAA conformity determination. Construction-related emissions would be short term and localized to the construction area and along identified haul routes. Best management practices (BMPs), which were not incorporated into the analysis summarized in **Table 4A**, can be implemented to further reduce particulate emissions (refer to *Mitigation Measures*).

TABLE 4A
Construction Emissions Inventory per the NAAQS (Tons Per Year)
Monterey Regional Airport

Pollutant	Chip Seal Alternative		Asphalt Concrete Alternative		Chip Seal/Crushed Aggregate Alternative	
	Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]
CO	5.69	4.30	6.12	3.04	7.39	4.24
NO_x	2.26	1.96	2.92	1.90	3.06	2.17
SO_2	0.01	0.01	0.01	0.01	0.02	0.1
PM_{10}	0.98	0.77	1.04	0.50	1.29	0.76
$PM_{2.5}$	0.35	0.29	0.10	0.12	0.45	0.23
VOC	0.71	0.54	0.78	0.40	0.92	0.55

Source: Neill Engineers Corp. 2017a
[1] Phase 1: Areas C, B-1, B-6, TW "E," TW "F"; Phase 2: Areas A-1, A-2, A-4, B-2, B-3, B-4, B-5, TW "K"

Table 4B summarizes construction emissions in pounds per day to allow comparison with the MBARD thresholds for meeting the State CAAQS. As indicated in the table, none of the Proposed Action alternatives would result in exceedances of the MBARD thresholds for construction emissions.

TABLE 4B
Construction Emissions Inventory per the CAAQS (Pounds Per Day)
Monterey Regional Airport

		Chip Seal Alternative		Asphalt Concrete Alternative		Chip Seal/Crushed Aggregate Alternative	
Pollutant	MBARD Threshold	Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]
CO	550	68.83	47.12	72.50	48.77	114.43	64.06
NO_x	137	34.52	16.99	27.63	23.77	42.25	32.29
SO_2	-	0.12	0.09	0.14	0.10	0.25	0.13
PM_{10}	82	10.87	8.08	33.50	28.42	25.85	10.30
$PM_{2.5}$	55	3.70	2.81	9.40	7.90	7.99	3.78
VOC	137	8.19	5.73	8.90	6.14	13.76	8.02

Source: Neill Engineers Corp. 2017a
[1] Phase 1: Areas C, B-1, B-6, TW "E," TW "F"; Phase 2: Areas A-1, A-2, A-4, B-2, B-3, B-4, B-5, TW "K"

Indirect Impacts

None.

Conclusion

None of the Proposed Action alternatives would result in operational impacts to air quality since no changes in airport operations or aircraft and vehicular traffic patterns would occur. During construction, the Proposed Action alternatives would not exceed the MBARD construction emission thresholds and would, thus, not result in exceedance of the CAAQS. *De minimis* thresholds for the NAAQS would also not be exceeded. None of the Proposed Action alternatives would result in a significant air quality impact.

No Action Alternative

The No Action alternative would not change airport operations or aircraft and vehicle traffic patterns and would, thus, have no change over local or regional air quality in the long term. In the short term, no construction emissions would occur. No significant impact to air quality would occur under the No Action Alternative.

Mitigation Measures

As neither the Proposed Action alternatives, or the No Action alternative, would result in a significant impact on air quality, no mitigation measures are required.

However, as the MBARD requires that all projects include adequate measures to minimize fugitive dust and ozone precursors through its permitting and *California Environmental Quality Act* (CEQA) evaluation processes, all applicable MBARD rules will be followed, including:

- Rule 400 – Visible Emissions. Imposes general and industry-specific restrictions on particulate emissions that would obscure visibility in the NCCAB.

- Rule 402 – Nuisances. Restricts discharges of air contaminants or other materials that cause injury, nuisance, or annoyance to the public or businesses.

- Rule 403 – Particulate Matter. Establishes an overall emissions discharge limit of 0.15 grain per standard dry cubic foot of exhaust gas, as well as hourly limits based on process rates.

- Rule 412 – Sulfur Content of Fuels. Restricts burning of gaseous fuels containing more than 50 grains per 100 cubic feet of hydrogen sulfide, or any fuels with a gross sulfur content exceeding 0.5 percent by weight.

- Rule 425 – Use of Cutback Asphalt. Imposes restrictions on the manufacture, sale, and use of rapid cure, medium cure, slow cure, and emulsified asphalts within the district.

In addition, to further control dust and minimize air pollution, the use of standard BMPs, including those outlined within FAA Advisory Circular (AC) 150/5370-10H, *Standards for Specifying Construction of Airports, Item C-102, Temporary Air and Water Pollution, Soil Erosion and Siltation Control,* will be implemented (FAA 2018). Consistent with this advisory circular, typical methods of controlling dust and other air pollutants will include:

- Exposing the minimum area of erodible earth.
- Applying temporary mulch with or without seeding.
- Using water sprinkler trucks.
- Using covered haul trucks.
- Using dust palliatives or penetration asphalt on haul roads.
- Using plastic sheet coverings.

4.3.2 Biological Resources

Analysis Methodology and Significance Thresholds

Biotic resources are the various types of flora (plants) and fauna (animals) and the habitat supporting those species located in a particular area. FAA Order 1050.1F, Exhibit 4-1, states that a significant impact to federally-listed threatened or endangered species occurs when the United States Fish and Wildlife Service (USFWS) determines the Proposed Action would be likely to jeopardize the continued existence of a federally-listed threatened or endangered species or would result in the destruction or adverse modification of federally-designated critical habitat.

The following regulations are pertinent to this analysis:

- The Federal *Endangered Species Act* (ESA) *of 1973* provides protection for species that are facing potential extinction. Impacts to listed species resulting from the implementation of a project require the responsible agency or individual to formally consult with the USFWS to determine the extent of impact to a particular species. If the USFWS determines that impacts to a species would likely occur, alternatives and measures to avoid or reduce impacts must be identified. USFWS also regulates activities conducted in Federal critical habitat, which are geographic units designated as areas that support primary habitat constituent elements for listed species.

- The *Migratory Bird Treaty Act* (MBTA) prohibits private parties and Federal agencies from intentionally taking a migratory bird, their eggs, or nests.

- State regulations include the California ESA, which ensures legal protection for plants listed as rare or endangered and species of wildlife formally listed as endangered or threatened. This State law also lists Species of Special Concern based on limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational values.

A biological survey of an approximately 133-acre Biological Study Area (BSA) shown on Exhibit 3B was completed on May 5, 2015, a portion of the year when the Monterey spineflower, an annual plant, could be detected. Additional surveys of the infield areas located east and west of Taxiway "L" were conducted on April 27, 2017 and July 27, 2017.

Proposed Action Alternatives

All Proposed Action alternatives would replace native ground with another type of surface material within the infield areas A-4, C-1, C-3, C-4, C-5, and C-6. These areas currently support ruderal vegetation. Plants found within this habitat are typically introduced Mediterranean species that colonize disturbed lands. A few occurrences of hardy native species, such as Monterey spineflower (*Chorizanthe pungens*), sandmat manzanita (*Arctostaphylos pumila*), purple owl's clover (*Castilleja exserta*), and annual lupine (*Lupinus bicolor*), have also been able to exist in the ruderal vegetation (refer to **Exhibit 3B**). Monterey spineflower is an annual species listed as threatened under the Federal ESA. A few occurrences of Monterey spineflower were mapped within Area C-6, based on the May 2015 field survey (SWCA 2017b). As with many annual species, the size and locations of Monterey spineflower occurrences can fluctuate through time. This factor limits the predictive value of plant location as indicators of future occurrences, making it difficult to accurately account for the loss of individuals resulting from a proposed project. As such, an assessment of affected suitable habitat and occupied habitat is a better indication of the effects of a project on this species.

As described in the Biological Assessment for this project (SWCA 2017a), within the BSA are approximately 18.8 acres of suitable habitat for the Monterey spineflower. Biological field surveys in 2017 found that approximately 2.2 acres of the approximately 18.8 acres of suitable Monterey spineflower habitat was occupied with approximately 2,400 individual plants (refer to **Exhibit 3B**). As an annual species, the distribution of individual Monterey spineflower plants varies from year to year. The Airport has designed the project to avoid most Monterey spineflower habitat. However, implementation of the Proposed Action using Chip Seal, Asphalt Concrete, or a combination of Chip Seal/Crushed Aggregate would result in the loss of approximately 0.015 acre (approximately 653 square feet) of occupied Monterey spineflower habitat in Area C-6. This 0.015-acre area would be affected by any of the Proposed Action alternatives. The Biological Assessment (SWCA 2017a) concluded that this loss of 0.015 acre of Monterey spineflower represented an adverse effect on the Monterey spineflower and the FAA initiated formal consultation with the USFWS Ventura Field Office by letter of December 22, 2017 regarding this project. The USFWS issued a Biological Opinion on June 15, 2018, that the Proposed Action is not likely to jeopardize the continued existence of the Monterey spineflower (**Appendix D**).

No critical habitat for federally-designated threatened or endangered species is present on the Airport nor would any be adversely affected by the Proposed Action alternatives.

The BSA also provides suitable habitat for nesting bird species (including the California horned lark) that are protected under the MBTA. Common passerines may use the ruderal vegetation for nesting and/or foraging; raptors may use the area for foraging. Ground bird nesting habitat would be impacted by project activities, including grading and vegetation removal. If the project activities are conducted between March and September, birds may be nesting within or adjacent to the affected area and the individuals could be directly or indirectly impacted. Direct impacts may include loss of active nests during vegetation removal. See *Mitigation Measures* below.

<u>Indirect Impacts</u>

None.

<u>Conclusion</u>

All three Proposed Action alternatives would remove occupied, or suitable but unoccupied, Monterey spineflower habitat resulting in an adverse effect on that federally threatened species. There also exists the potential to adversely affect birds protected by the MBTA. Mitigation is required to reduce these impacts below a level of significance, as listed below.

No Project Alternative

The No Project alternative would leave the infield as it is. No additional disturbance to plants or wildlife protected by the Federal ESA or the MBTA would occur.

Mitigation (or Avoidance) Measures

FAA initiated Section 7 consultation (under the Federal ESA) with the USFWS regarding potential impacts to the Monterey spineflower by letter of December 22, 2017 (**Appendix D**). The following measures were proposed in the Biological Assessment (SWCA 2017a) to address the adverse effects of the Proposed Action alternatives. The USFWS issued a Biological Opinion on June 15, 2018, that the Proposed Action, with implementation of the mitigation and avoidance measure identified below, is not likely to jeopardize the continued existence of the Monterey spineflower (**Appendix D**).

- Monterey spineflower shall be conserved in the temporarily impacted or undisturbed portions of the BSA by broadcast seeding and relocating the soil seed bank. Seed to be broadcast shall be collected from the project area prior to start of construction. All seed collection activities shall be conducted by a USFWS-approved biologist. This species flowers from April through June; therefore, seed collection shall begin in August and continue through September, or when seed production ceases. To the extent feasible, all available seeds shall be collected from plants located in the project disturbance areas.

- Soil from the project disturbance areas containing Monterey spineflower seed shall be collected and reapplied. To accomplish this, the upper six inches of soil located within the vicinity of existing Monterey spineflower individuals shall be collected and redistributed prior to grading activities. Soil collection shall occur immediately following completion of seed collection and prior to the first rainfall. The collected soil shall be immediately distributed in areas within the BSA that does not have existing Monterey spineflower occurrences. Seed collected from the action area shall be broadcast over the relocated soil, and then the receptor site shall be lightly raked to cover the seed. The ruderal areas north of Area C-4 are a recommended soil/seed receptor site.

- To ensure that the Monterey spineflower soil conservation and seeding efforts are successful, the project sponsor shall retain a USFWS-approved biologist to assess the receptor site for signs of germination for two seasons after completion of the project. The conservation measures shall be considered successful if Monterey spineflower germination is observed in the receptor site during at least one of the two monitoring seasons. If germination is not observed in the receptor site, the District shall coordinate with the FAA to determine appropriate remedial actions designed to conserve the species in the BSA. Potential remedial actions may include non-native species removal within the vicinity of existing Monterey spineflower occurrences or collecting seed from other nearby occurrences and broadcasting the seed in the BSA. Monterey spineflower is a late blooming species; therefore, the monitoring should be conducted between April and June.

In addition, the following measure shall be implemented to avoid impacts to migratory birds:

- To the maximum extent possible, initial grading of the ruderal vegetation in the project area will be conducted between October and February, which is outside of the typical migratory bird breeding season for the area. Since October to February is typically the wet season, as discussed in Section 4.3.9.1, temporary BMPs will be employed to control water pollution, soil erosion, and siltation. If the project schedule does not provide for late season initial grading in the ruderal vegetation, a nesting bird survey will be conducted by a qualified biologist no more than one week prior to the grading to determine presence/absence of nesting birds within the vegetated area. In the event that active nests are observed, work activities will be avoided within 100 feet of the active nest(s) until young birds have fledged and left the nest. Based on the habitat conditions, if present, active nests would likely be of killdeer or a sparrow species. The nesting period of these species is approximately three weeks. The nests shall be monitored weekly by a biologist having experience with nesting birds to determine when the nest(s) become(s) inactive. The buffer may be reduced but not eliminated during active nesting if deemed appropriate by the biologist. Readily visible exclusion zones will be established in areas where nests must be avoided. The District and the appropriate regulatory agency will be contacted if any state or federally listed bird species are observed during surveys. Nests, eggs, or the young of birds covered by the MBTA, and California Fish and Game Code will not be moved or disturbed until the young have fledged.

4.3.3 Climate

Analysis Methodology and Significance Thresholds

The Federal CAA, as amended by the *Clean Air Act Amendments of 1990,* and FAA also provide guidance for conducting greenhouse gas (GHG) and climate change analyses for airport projects under NEPA. Although there are no Federal standards for aviation-related emissions, it is well-established that GHG emissions can affect climate (IPCC 2014; U.S. Global Change Research Program 2009).

FAA has not identified any significance thresholds for aviation GHG emissions, and there are currently no accepted methods of determining significance applicable to aviation projects given the small percentage of emissions they contribute.

In June 2011, AMBAG adopted *Envisioning the Monterey Bay Area, A Blueprint for Sustainable Growth and Smart Infrastructure*, which was intended to lay the foundation for a Sustainable Communities Strategy (SCS) for the Monterey Bay area. As outlined in that document, the Monterey Bay area's target is the reduction of per capita GHG emissions from cars and light trucks to 2005 levels by 2020, and to reduce per capita levels to five percent below 2005 levels by 2035 (AMBAG 2011).

In June 2014, AMBAG adopted *Monterey Bay 2035: Moving Forward,* which includes the Regional Transportation Plan and SCS for the region (AMBAG 2014). The overall strategy is designed to accommodate future growth by: 1) concentrating development in infill areas; 2) creating incentives to develop on vacant lands in immediate proximity to the urban core, rather than on the outskirts of urban growth boundaries; 3) providing a mix of higher density housing and community design options; and 4) focusing infrastructure and transit expenditures to maximize achievement of a jobs-housing balance.

To date, MBARD has not finalized GHG construction significance thresholds. MBARD GHG operational thresholds (10,000 metric tons/year for stationary sources) are not applicable.

Proposed Action Alternatives

In the long term, the Proposed Action alternatives would not cause a net change in operational GHG emissions when compared to the No Action alternative, since they would not permanently change airport operations or aircraft and vehicle traffic patterns. Using the methodology described in Section 4.3.1, short-term, construction-related, GHG emissions have been quantified for each of the three Proposed Action alternatives for purposes of disclosure. This information is summarized in **Table 4C**.

TABLE 4C
Construction Greenhouse Gases Inventory (Metric Tons Per Year)
Monterey Regional Airport

Pollutant		Chip Seal Alternative		Asphalt Concrete Alternative		Chip Seal/Crushed Aggregate Alternative	
		Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]	Phase 1[1]	Phase 2[1]
CO_2		993.96	626.54	1,009.42	626.34	992.57	660.26
CH_4		0.07	0.05	0.08	0.05	0.07	0.06
N_2O		0.00	0.00	0.00	0.00	0.00	0.00
	GWP						
CO_2	1	993.96	626.54	1009.42	626.34	660.26	
CH_4	28	1.96	1.40	2.24	1.25	1.50	
N_2O	265	0.00	0.00	0.00	0.00	0.00	
Total CO_2e[2]		**995.82**	**627.94**	**1011.66**	**627.59**	**994.32**	**661.76**

Source: Neill Engineers Corp. 2017a
[1] Phase 1: Areas C, B-1, B-6, TW "E," TW "F"; Phase 2: Areas A-1, A-2, A-4, B-2, B-3, B-4, B-5, TW "K"
[2] Emissions totals for CO_2e are reported in metric tons. Emissions of CO_2, CH_4 and N_2O were converted to CO_2e using global warming potentials (GWP) of 1, 28, and 265, respectively, as contained in the United Nation's Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014).

NOTE: For purposes of comparison, MBARD operational GHG thresholds for stationary sources is 10,000 metric tons per year of CO_2e.

Indirect Impacts

None.

Conclusion

FAA and MBARD have not established thresholds of significance for GHGs. However, since the Proposed Action alternatives would contribute GHGs only temporarily during construction, no significant permanent increase in GHGs would occur.

No Action Alternative

The No Action alternative would not change airport operations or aircraft and vehicle traffic patterns and would, thus, have no change over the generation of GHGs in the long term. Similarly, since no construction would occur with the No Project alternative, no short-term GHGs would be generated.

4.3.4 Hazardous Materials, Solid Waste, and Pollution Prevention

Analysis Methodology and Significance Thresholds

FAA has not established a significance threshold for the Hazardous Materials, Solid Waste, and Pollution Prevention impact category. However, per Order 1050.1F, Exhibit 4-1, consideration should be given to the Proposed Action's potential to:

- Violate applicable Federal, State, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management;
- Involve a contaminated site, including but not limited to a site listed on the National Priorities List (NPL);
- Produce an appreciably different quantity or type of hazardous waste;
- Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity; or
- Adversely affect human health and the environment.

Four primary Federal laws have been passed governing the handling and disposal of hazardous materials, chemicals, substances, and wastes. The two statutes of most importance to airport projects are the *Resource Conservation Recovery Act* (RCRA) (as amended by the *Federal Facilities Compliance Act of 1992*) and the *Comprehensive Environmental Response, Compensation, Liability Act* (CERCLA), as amended (also known as Superfund). RCRA governs the generation, treatment, storage, and disposal of hazardous wastes. CERCLA provides for cleanup of any release of a hazardous substance (excluding petroleum) into the environment. Other laws include the *Hazardous Materials Transportation Act*, which regulates the handling and transport of hazardous materials and wastes, and the *Toxic Substances Control Act*, which regulates and controls the use of polychlorinated biphenyls (PCBs), as well as other chemicals or toxic substances in commercial use.

For preparation of this EA, Federal and State online databases related to the presence and/or cleanup of hazardous materials have been accessed relative to the project area. State and regional sources related to the treatment and disposal of solid waste within the County have also been used.

Proposed Action Alternatives

Any of the three Proposed Action alternatives would introduce construction activities within the infield areas of the Airport. There is no known contamination present in the area. During construction, the contractor would use equipment and vehicles that utilize fossil fuels and other potential hazardous materials. However, all construction activity would be subject to existing permit procedures for the handling, transporting, and disposal of such materials. If previously unknown contaminants are discovered during construction or a spill occurs, work would be halted, and the National Response Center, the California Environmental Protection Agency (which administers the State's Certified Unified Program Agency [CUPA] that oversees regulatory standards established by five different state agencies), and the Monterey County Environmental Health Division would be notified. The contractor would follow standard hazardous materials containment procedures and BMPs, as required by FAA AC 150/5370-10H.

<u>Chip Seal or Asphalt Concrete Alternatives</u>

Solid waste would be generated as a result of the construction phase of the proposed project due to the grinding of existing asphalt concrete shoulders within several of the infield areas, regardless of the surface treatment. A total of approximately 444 cubic yards (cy) of old shoulder pavement would be removed from the project area and stockpiled on the Airport for use in service road maintenance or other suitable repurposing (**Table 4D**).

Approximately 8,020 cy of dirt or old chip seal would be removed and taken to the Monterey Peninsula Landfill or a disposal site of the project contractor's choosing (**Table 4D**). Miscellaneous solid waste, such as incidental construction debris and old catch basins, and approximately 575 linear feet of 18- or 36-inch reinforced concrete pipe (RCP) would also be deposited in the landfill. This solid waste removal would not adversely impact the landfill, which has a remaining capacity of approximately 71 million cy, as well as a new landfill module that can accept another approximately 5 million tons.

<u>Chip Seal/Crushed Aggregate Alternative</u>

Under this alternative, approximately 9,220 cy of dirt or old chip seal would be removed for disposal at the Monterey Peninsula Landfill or a disposal site of the project contractor's choosing. Another 5,700 cy of existing Taxiway "F" pavement and subbase would be disposed for a total export of approximately 14,920 cy. All other disposal activity would be the same as listed above for the Chip Seal or Asphalt Concrete alternatives. Approximately 444 cy of old shoulder pavement would be removed from the project area and stockpiled on the Airport for use in service road maintenance or other suitable repurposing (**Table 4D**).

Indirect Impacts

None.

Conclusion

The use of hazardous materials and the short-term generation of solid waste to implement any of the Proposed Action alternatives during construction would not have a significant impact on the environment or on the disposal capacity of local landfills. However, the Chip Seal/Crushed Aggregate alternative would result in almost twice the amount of solid waste and excess fill material to be disposed at local landfills than either the Chip Seal or Asphalt Concrete alternatives. The operations and maintenance of any of the Proposed Action alternatives would not result in short or long-term generation of solid or hazardous waste after construction.

TABLE 4D
Estimated Solid Waste Comparison by Alternative
Monterey Regional Airport

Project Area	Chip Seal and Asphalt Concrete Alternatives		Chip Seal/Crushed Aggregate Alternative	
	Pavement to be Reused (cy)	Excess Soil (cy)	Pavement to be Reused (cy)	Excess Soil or Other Material (cy)
A-1	90		90	
A-2	15		15	
A-4		1,500		1,500
B-1	53		53	
B-2	33		33	
B-3	79		79	
B-4	70		70	
B-5	37		37	
B-6	42		42	
C-1		800		800
C-2				5,700 (TW “E/F” pavement and subbase)
C-3	25	150	25	1,350
TW “F”		1,400		1,400
C-4		820		820
C-5		1,200		1,200
C-6		2,150		2,150
TOTAL	**444**	**8,020**	**444**	**14,920**

Source: Neill Engineers Corp. 2017a
cy = cubic yards; TW = taxiway

No Action Alternative

Under the No Action alternative, the potential for impacts related to the use, storage, or disposal of hazardous materials or pollution related to accidental spills of hazardous materials would continue to be what currently occurs at the Airport. No additional impacts or risk would occur, and the accidental spillage of fuel is less likely to happen when compared to the Proposed Action alternative since there would not be construction activities.

The No Action alternative would not result in the short- or long-term generation of solid waste from the project site. Therefore, impacts related to solid waste disposal and regional landfills would not occur.

4.3.5 Historical, Architectural, Archaeological, and Cultural Resources

Analysis Methodology and Significance Thresholds

Determination of a Proposed Action's environmental impact to historic and cultural resources is made under guidance contained in the *National Historic Preservation Act of 1966* (NHPA), as amended, and the *Archaeological and Historic Preservation Act of 1974*. Section 106 of the NHPA requires Federal agencies to consider the effects of their undertaking (or action) on properties listed on or eligible for listing on the National Register of Historic Places (NRHP). The FAA has not established a significance threshold for Historical, Architectural, Archaeological, and Cultural Resources. However, a factor to consider is if the Proposed Action would result in a finding of "adverse effect" through the Section 106 process.

An Area of Potential Effect (APE) was established for the Proposed Action, which is congruent with the project study area, and is the same for all Proposed Action alternatives (**Exhibit 4A**). All areas within the APE that were not covered by pavement or chip seal or being used as a staging area for the 2015 Runway Safety Improvement (RSA) improvement project were surveyed for cultural resources in December 2015.

Proposed Action Alternatives

An archaeological survey of the APE resulted in the identification of no new or previously recorded archaeological resources or historic properties (SWCA 2017c). The project site is part of the infield of an airport and has been subject to development and ongoing maintenance activities. The FAA has determined there are "no historic properties affected" by the Proposed Action and, therefore, the Proposed Action would not have a significant impact on historical, architectural, archaeological, or cultural resources. The California State Historic Preservation Office (SHPO) concurred with FAA's determination and finding on March 22, 2018 (**Appendix E**).

There are no federally recognized Native American tribes for the Monterey region and, therefore, the FAA has not conducted any government-to-government consultation with such tribes. However, in December 2017, the FAA contacted those California tribes identified by the Native American Heritage Commission as having interest in the region as part of its general project coordination efforts. As of the release of this EA, the FAA has received one response from a tribal group regarding the proposed project. By letter of February 5, 2018, the Ohlone/Costanoan-Esselen Nation (OCEN) stated that they identify the Airport as within the indigenous homeland of the OCEN. The OCEN stated that they object to all excavation in their indigenous homeland, even in areas that have been previously disturbed, or identified as having no significant archeological value. The OCEN requested:

- copies of any archeological reports regarding the project;
- inclusion in archeological mitigation and recovery programs;
- the responsibility and authority for disposition of any archeological items found during investigation of the site;
- that an OCEN Native-American monitor be used during construction of the project; and
- that the OCEN be able to consult with the lead agency for the proposed project.

The District provided the Draft EA to the OCEN, who subsequently requested consultation (**Appendix F**).[3] An invitation for consultation was sent via email from the Airport to the OCEN on August 22, 2018. No response was received within 30 days. A follow-up phone call was made on September 27, 2018, to confirm that the OCEN still desired to schedule a consultation meeting. On October 2, 2018, the Airport and the OCEN's representative met to coordinate calendars. An appointment was set for October 23, 2018 at 1:00 PM. This time was confirmed with the OCEN via email on October 3, 2018. The OCEN's representative did not attend the meeting, nor did they contact the Airport to reschedule the meeting. Therefore, consultation on this project is considered closed.

<u>Indirect Impact</u>

None.

<u>Conclusion</u>

No impacts to known historical, architectural, archaeological, or cultural resources would occur as a result of any of the Proposed Action alternatives.

No Action Alternative

Since no ground disturbance or change in airport use would result from the No Action alternative, no impacts to historical properties or other cultural resources would occur.

Mitigation Measures

In the event that unanticipated cultural resources are discovered during project construction activities, all construction in the vicinity of the discovery will be halted and the Airport, the FAA, and the SHPO will be notified as soon as possible to determine the appropriate course of action.

[3] A summary of the efforts by the District to consult with the OCEN tribe is included in **Appendix F**.

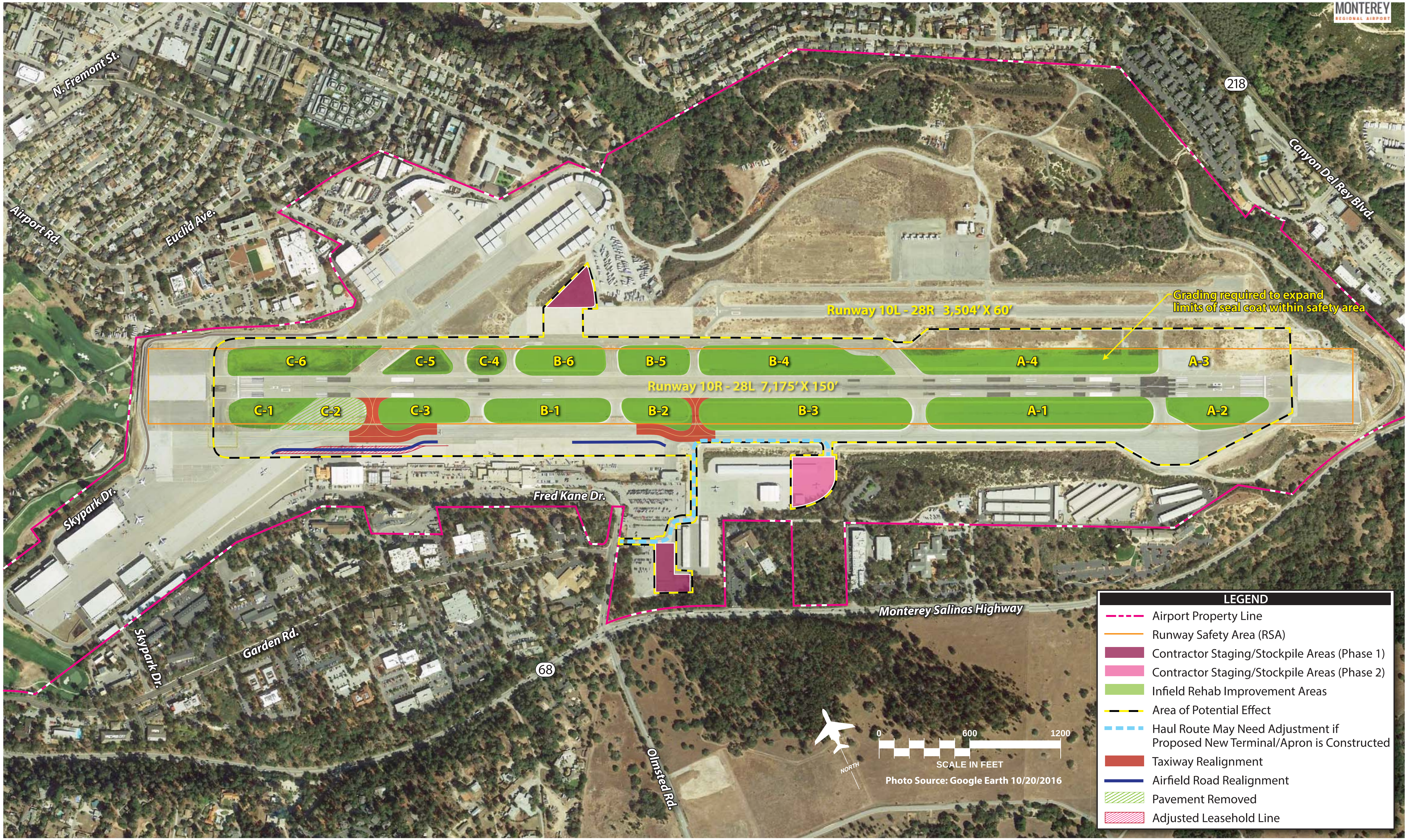

EXHIBIT 4A
AREA OF POTENTIAL EFFECT

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4.3.6 Natural Resources and Energy Supply

Analysis Methodology and Significance Thresholds

The FAA has not established a significance threshold for the Natural Resources and Energy Supply impact category (FAA Order 1050.1F, Exhibit 4-1). However, a factor to consider is if an action has the potential to cause demand to exceed available or future natural resource or energy supplies.

Proposed Action Alternatives

All the Proposed Action alternatives would require the importation of Class 2 aggregate base (as defined by the California Department of Transportation [Caltrans]) to properly prepare the subgrade for the selected surface treatment, the use of pavement to recreate taxiway shoulders, and minor amounts of chip seal for the bottom of Area A-4. In addition, all the Proposed Action alternatives would require additional natural resources for the final surface treatment as discussed in the subsections below. Paving the reconstructed Taxiway "F" and overlaying the shifted portions of Taxiway "A" would require approximately 1,650 cy (3,300 tons) of new pavement. **Table 4E** shows the quantities of imported rock, pavement, and/or chip seal needed for each Proposed Action alternative.

Chip Seal Alternative

The Chip Seal alternative would use fossil fuels, chip seal (fine aggregate), taxiway shoulder and Taxiway "F" pavement (asphalt concrete), and Class 2 aggregate base to prepare the areas for placement of the new chip seal. As shown in **Table 4E**, approximately 12,350 cy of Class 2 aggregate base, 3,740 cy of asphalt concrete pavement, and 1,651 cy of chip seal would be required.

TABLE 4E
Estimated Rock Import and Pavement Quantities by Phase[1]
Monterey Regional Airport

	Chip Seal Alternative	Asphalt Concrete Alternative	Chip Seal/Crushed Aggregate Alternative
Amount of Class 2 Aggregate Base or Crushed Rock (cy)			
Phase 1	5,250	5,250	7,600
Phase 2	7,100	7,100	7,100
Total:	**12,350**	**12,350**	**14,700**
Amount of Asphalt Concrete Pavement (cy)[2]			
Phase 1	2,455	6,145	2,455
Phase 2	1,285	8,240	1,285
Total	**3,740**	**14,385**	**3,740**
Amount of Chip Seal (cy)			
Phase 1	781	0	135
Phase 2	870	0	870
Total	**1,651**	**0**	**1,005**

Source: Neill Engineers Corp. 2017a
cy = cubic yard
[1] Phase 1: Areas C, B-1, B-6, TW "E," TW "F"; Phase 2: Areas A-1, A-2, A-4, B-2, B-3, B-4, B-5, TW "K"
[2] Assumes 1 cubic yard = 2 tons

This short-term demand for natural resources and energy supplies would be met using local suppliers to the extent feasible, based on market demand. According to the California Geological Survey (2012), the Monterey Bay area has enough permitted aggregate mineral sources to last another 41-50 years (based on per capita[4] projections). This assessment accounts for sand, gravel, and crushed stone, collectively referred to as aggregate. There are several permitted aggregate sources in Monterey County, including one with a capacity of 1.5 to 3 million tons and several with capacities of 0.5 to 1.5 million tons (California Geological Survey 2012).

Water would be used to wash dust from trucks before leaving the project area and to implement other dust control measures during various construction processes. Construction water would be obtained from an off-site provider (i.e., California American Water Company, CalAm) and/or on-airport wells.

Asphalt Concrete Alternative

The Asphalt Concrete alternative would use fossil fuels, Class 2 aggregate base, and large quantities of asphalt concrete. As shown in **Table 4E**, approximately 12,350 cy of Class 2 aggregate base and 14,385 cy of asphalt concrete pavement would be required.

This short-term demand for natural resources and energy supplies would be met using local suppliers to the extent feasible, based on market demand. As previously noted under the Chip Seal alternative discussion, there are several permitted aggregate sources in Monterey County, including one with a capacity of 1.5 to 3 million tons and several with capacities of 0.5 to 1.5 million tons (California Geological Survey 2012).

Water would be used to wash dust from trucks before leaving the project area and to implement other dust control measures during various construction processes. Construction water would be obtained from an off-site provider (i.e., CalAm) and/or on-airport wells.

Chip Seal/Crushed Aggregate Alternative

The Chip Seal/Crushed Aggregate alternative would use fossil fuels, Class 2 aggregate base, taxiway shoulder and Taxiway "F" pavement, chip seal, and aggregate material (i.e., crushed rock). As shown in **Table 4E**, approximately 14,700 cy of Class 2 aggregate base or crushed aggregate, 3,740 cy of asphalt concrete pavement, and 1,005 cy of chip seal would be required.

This short-term demand for natural resources and energy supplies would be met using local suppliers to the extent feasible, based on market demand. As previously noted under the Chip Seal alternative discussion, there are several permitted aggregate sources in Monterey County, including one with a capacity of 1.5 to 3 million tons and several with capacities of 0.5 to 1.5 million tons (California Geological Survey 2012).

[4] Over long enough periods, perhaps 20 to 30 years or more, the random impacts of major public construction projects and economic recessions tend to be smoothed and consumption trends become similar to historic per capita consumption rates. (California Geological Survey 2012:5).

Water would be used to wash dust from trucks before leaving the project area and to implement other dust control measures during various construction processes. Construction water would be obtained from an off-site provider (i.e., CalAm) and/or on-airport wells.

Indirect Impacts

None.

Conclusion

No significant impact to natural resources and energy supply would occur as a result of any of the Proposed Action alternatives because local supplies of natural resources and energy are available and sufficient to meet the requirements of the project. However, the Asphalt Concrete alternative would require substantially more asphalt concrete pavement (almost three times more) than either the Chip Seal or Chip Seal/Crushed Aggregate alternatives.

No Action Alternative

Since no ground disturbance or change in airport use would result from the No Action alternative, no change in demand for natural resources or energy supplies at the Airport would occur.

4.3.7 Noise and Compatible Land Use

Analysis Methodology and Significance Thresholds

FAA Order 1050.1F, Table 4-1 states that a significant noise increase occurs when the Proposed Action would increase noise by Day-Night Average Sound Level (DNL) 1.5 decibel (dB) or more for a noise-sensitive area (such as residents, schools, medical facilities, and places of worship) that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a 1.5 dB or greater increase, when compared to the No Action alternative for the same timeframe. In California, FAA accepts the substitution of Community Noise Equivalent Level (CNEL) in place of DNL (see Section 3.1.12).

Proposed Action Alternatives

Since the type and number of operations at the Airport would not be changed by the project, it would not cause changes to the overall long-term noise environment of the Airport. The Proposed Action alternatives would not change land use on or adjacent to the airport. The MPAD has provided a land use assurance letter (**Appendix B**) indicating the MPAD will work with the City of Monterey and the City of Del Rey Oaks to restrict the use of land adjacent to or in the immediate vicinity of the Airport to activities and purposes compatible with Airport operations including the landing and takeoff or aircraft.

Construction-related noise impacts result from the use of construction equipment in proximity to noise-sensitive uses. The construction/demolition phases of the Proposed Action alternatives are expected to include earthwork/grading and the pouring of chip seal, concrete, or rock. Construction vehicular noise would also occur. Based on information from the project engineer, scrapers, loaders, and dump trucks would be used during excavation and site preparation activities. During primary construction, dump trucks, graders, rollers, and water trucks would be used. These construction activities would be similar for all three alternatives.

Table 4F provides average noise levels, in A-weighted decibels (dBA), 50 feet from a construction site based on the type of construction equipment. The dBA noise levels are an expression of the relative loudness of sounds in air as perceived by the human ear. In comparison, FAA noise thresholds are expressed in dB DNL (or CNEL in California), which is an annual average sound level. These noise metrics are not equivalent. **Table 4F** is provided for informational purposes only and is not intended for use in determining an impact based on FAA significance thresholds.

TABLE 4F
Anticipated Project Construction Operations, Equipment Types, and Their Noise Levels
Monterey Regional Airport

Equipment	Typical Noise Level (dBA[1]) 50 Feet From Source
Backhoe	80
Dozer	85
Grader	85
Loader	85
Paver	89
Roller	74
Scraper	89
Shovel	82
Truck	88

Source: FHWA 2006
[1] A-weighted decibels, abbreviated dBA, dBa, or dB(a), are an expression of the relative loudness of sounds in air as perceived by the human ear.

As discussed in Section 3.12, the closest residences to the project area are approximately 700 feet northwest of the closest portion of the project (Area C-6). These same residences are approximately 3,200 feet from the farthest portion of Phase 1 of the project (Area B-1). Phase 2 of the construction would occur on the eastern end of the airfield and would be approximately 1,200 to 1,600 feet from the closest residents, which are located north and northeast of the Airport's eastern end.

As sound travels away from its source, the sound is absorbed to a certain extent by both the atmosphere and by intervening vegetation. At a distance of 700 feet, the project's equipment noise would be reduced by four to five dB; at a distance of 3,200 feet, the reduction would be six to ten dB. In addition, the homes closest to the Airport on the northwest side received special sound insulation treatment as a mitigation measure identified in the Airport's 14 CFR Part 150 Noise Compatibility Program. The sound insulation, in addition to the normal sound reduction provided by standard construction practices, contributes another 30 dB of interior sound attenuation.

Construction noise impacts would be temporary, as discussed below, for each Proposed Action alternative.

Chip Seal Alternative

Based on the proposed construction schedule, construction noise would occur during the night-time hours of 12:30 to 4:30 AM in two separate phases. The construction activity would begin at the west end of the infield and finish at the east end. During Phase 1, construction activity in the area closest to the residences northwest of the Airport (Area C-6) would take approximately 45 days. As construction activity moves farther south and east from this subarea, these temporary impacts would be less. The entire phase of construction is anticipated to take approximately ten months. During Phase 2, construction activity in the area closest to the residences northeast of the Airport (Area A-4) would take approximately 33 days. The entire phase of construction is anticipated to take approximately seven months.

Asphalt Concrete Alternative

Based on the proposed construction schedule, construction noise would occur during the night-time hours of 12:30 to 4:30 AM in two separate phases. The construction activity would begin at the west end of the infield and finish at the east end. During Phase 1, construction activity in the area closest to the residences northwest of the Airport (Area C-6) would take approximately 48 days. As construction activity moves farther south and east from this subarea, these temporary impacts would be less. The entire phase of construction is anticipated to take approximately ten months. During Phase 2, construction activity in the area closest to the residences northeast of the Airport (Area A-4) would take approximately 38 days. The entire phase of construction is anticipated to take approximately eight months.

Chip Seal/Crushed Aggregate Alternative

Based on the proposed construction schedule, construction noise would occur during the night-time hours of 12:30 to 4:30 AM in two separate phases. The construction activity would begin at the west end of the infield and finish at the east end. During Phase 1, construction activity in the area closest to the residences northwest of the Airport (Area C-6) would take approximately 43 days. As construction activity moves farther south and east from this subarea, these temporary impacts would be less. The entire phase of construction is anticipated to take approximately one year (12 months). During Phase 2, construction activity in the area closest to the residences northeast of the Airport (Area A-4) would be the same as the Chip Seal alternative (i.e., it would take approximately 33 days). The entire phase of construction is anticipated to take approximately seven months.

Indirect Impacts

None.

<u>Conclusion</u>

The temporary project-related construction noise would occur when residents are typically indoors and would be reduced by the intervening distance and vegetation, windows, and, in the case of the residents living northwest of the Airport, by a previously implemented interior sound insulation program. As the temporary construction activities would not result in a 1.5 dB CNEL noise level increase to any noise-sensitive areas that are either at or above the 65 dB CNEL noise exposure level, or would become so as a result of a 1.5 dB CNEL noise level increase associated with this project, no significant noise impacts would occur. The Airport implements a voluntary program in which the contractors are asked to minimize the times that they back up the equipment to reduce the number of times that back-up beepers are required.

No Action Alternative

Since no construction or change in airport use would occur with the No Action alternative, no impacts related to noise or land use compatibility would occur.

4.3.8 Socioeconomics and Environmental Justice

Analysis Methodology and Significance Thresholds

The FAA has not established a significance threshold for this impact category (FAA Order 1050.1F, Exhibit 4-1). However, a factor to consider that is applicable to the Proposed Action alternatives is if project-related traffic would disrupt local traffic patterns and substantially reduce the level of service of the roads serving the Airport and its surrounding communities. Factors to consider for environmental justice are if the Proposed Action alternatives would lead to disproportionately high and adverse impacts to an environmental justice population (i.e., low income or minority).

Proposed Action Alternatives

Any of the Proposed Action alternatives would be contained entirely on the Airport and would not result in an impact to local traffic patterns or impacts to any populations, including low income or minority population groups.

In the short term, construction traffic would include workers driving to and from the Airport (automobiles or light-duty trucks); heavy-duty trucks to move dirt, chip seal, asphalt concrete, and/or rock; and other heavy equipment, such as graders, loaders, and rollers. Most of the heavy construction equipment would be brought to the Airport and stored at one of the staging areas until the equipment is no longer required. This onsite storage of equipment would limit the trips related to the construction equipment to one trip in and one trip out.

The construction work must be conducted at night to minimize runway closures; commercial flights are not scheduled during the late night-time hours, therefore, limiting construction to these hours would create less impacts to airport operations. As a result, impacts to the level of service on Highway 68 or Olmsted Road are not expected since minimal construction trips would occur during the day time, including peak hours. However, for purposes of disclosure, construction trips related to heavy-duty truck trips and construction worker vehicles have been estimated by the project engineer based on construction activities for the various stages of the project for each surface treatment. The heavy-duty truck trips are summarized in **Table 4G**.

Because construction trips on Airport Road would be extremely limited (i.e., day time only for single trips to drop off or remove equipment at the northern staging area), no significant impacts to the Casanova Oak Knolls neighborhood, which has an approximate 34 percent minority and 12 percent low income population based on the 2010 census, would occur (refer to **Exhibit 3D**). This area is the only area containing residents, schools, or parks in proximity to the project area. No disproportionate impacts to environmental justice populations would occur.

TABLE 4G
Heavy-Duty Construction Truck Trips by Phase[1]
Monterey Regional Airport

	Chip Seal Alternative	Asphalt Concrete Alternative	Chip Seal/Crushed Aggregate Alternative
Round Truck Trips			
Phase 1	1,456	1,692	2,264
Phase 2	1,052	1,576	1,052
Duration[2]			
Phase 1	147 days	155 days	204 days
Phase 2	128 days	151 days	128 days
Average Trips/Night			
Phase 1	9.9	10.9	11.1
Phase 2	8.2	10.4	8.2

Source: Neill Engineers Corp. 2017a
[1] Phase 1: Areas C, B-1, B-6, TW "E," TW "F"; Phase 2: Areas A-1, A-2, A-4, B-2, B-3, B-4, B-5, TW "K"
[2] The duration shown in this column is the duration of the haul trip construction activity, not the total project duration shown in **Table 2C**.

Chip Seal Alternative

The average number of heavy-duty truck trips that are anticipated to occur during construction are ten roundtrips per night during Phase 1 and eight roundtrips per night during Phase 2. During project construction, workers would also be driving personal vehicles to and from the work site during the late-night hours. This alternative is anticipated to generate an additional seven trips per night related to construction workers' private vehicles. The additional night-time trips on Highway 68 or Olmsted Road would not create a significant change or disruption in the level of service.

Asphalt Concrete Alternative

The average number of heavy-duty truck trips that are anticipated to occur during construction are 11 roundtrips per night during Phase 1 and ten roundtrips per night during Phase 2. The higher number of heavy-duty truck trips during either phase, when compared to the Chip Seal alternative, would occur due to use of asphalt concrete instead of chip seal. During project construction, workers would also be driving personal vehicles to and from the work site during the late-night hours. This alternative is anticipated to generate an additional seven trips per night related to construction workers' private vehicles. The additional night-time trips on Highway 68 or Olmsted Road would not create a significant change or disruption in the level of service.

Chip Seal/Crushed Rock Alternative

The average number of heavy-duty truck trips that are anticipated to occur during construction are between 11 roundtrips per night during Phase 1 and eight roundtrips per night during Phase 2. The higher number of heavy-duty truck trips during Phase 1, when compared to the Chip Seal alternative, would occur due to the need to import crushed rock for the western part of the infield. The removal of Taxiway "E" and the reconstruction of Taxiway "F" also contributes to the higher amount of heavy-duty truck trips during the first year of construction.

During project construction, workers would also be driving personal vehicles to and from the work site during the late-night hours. This alternative is anticipated to generate an additional seven trips per night related to construction workers' private vehicles. The additional night time trips on Highway 68 or Olmsted Road would not create a significant change or disruption in the level of service.

Indirect Impacts

None.

Conclusion

No significant changes to the level of service on the surrounding street network would result from any of the Proposed Action alternatives. However, the Asphalt Concrete and Chip Seal/Crushed Rock alternatives would create more heavy truck trips than the Chip Seal alternative due to the need to import additional asphalt concrete or crushed rock, respectively.

No Action Alternative

Since no construction or change in airport use would result from the No Action alternative, no impacts related to construction or project-related traffic would occur.

Mitigation Measures

Although no significant traffic impacts would occur because project-related construction traffic would occur during low traffic periods at night, Caltrans will require the development of a Traffic Control Plan for construction routes and activities affecting Highway 68 to minimize any potential effects of construction traffic. The District's construction contractor will be required to prepare such a plan and submit it to Caltrans for review and approval.

4.3.9 Water Resources (Surface Waters & Groundwater)

Analysis Methodology and Significance Thresholds

FAA Order 1050.1F identifies the following subcategories of impact under the overall topic of water resources: wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers. As discussed in Section 3.15, the project area is not located within proximity to any wetlands, floodplains, or rivers, including designated wild and scenic rivers. Therefore, the following discussion is focused on potential surface waters and groundwater impacts.

4.3.9.1 Surface Waters

Analysis Methodology and Significance Thresholds

Per Order 1050.1F, Table 4-1, an action will have significant impacts to surface waters if it would:

- Exceed water quality standards established by Federal, State, local, and tribal regulatory agencies; or

- Contaminate public drinking water supply such that public health may be adversely affected.

The *Clean Water Act* (CWA) (and the State *Porter-Cologne Water Quality Control Act*) regulate activities that could adversely affect surface waters in California under the oversight of the State Water Resources Control Board and its nine Regional Water Quality Control Boards (RWQCBs). The Airport is within the Central Coast RWQCB's jurisdiction and must comply with the policies and water quality objectives of the 2016 edition of the *Water Quality Control Plan for the Central Coast Basin* (Basin Plan). The Federal *Safe Drinking Water Act* also prohibits Federal agencies from funding actions that would contaminate an EPA-designated sole source aquifer or its recharge area.

Proposed Action Alternatives

The Proposed Action alternatives would replace the infield areas of the Airport with a surface (or surfaces) that would discourage the burrowing of the ground squirrel and other small mammals. In addition, the regrading of certain infield areas is necessary to meet FAA standards. For example, in Areas A-1, B-2, and B-3, changes to the existing grades are proposed to meet FAA runway and taxiway grading standards. These aspects of the project could have ramifications upon onsite drainage and the amount and quality of runoff.

Hydrologic analysis was conducted for each Proposed Action alternative and each respective runoff coefficient was analyzed (**Appendix C**). Chip seal is designed to keep water from penetrating the road structure on paved surfaces and to fill seal cracks and raveled surfaces of old pavement. For the subareas of the infield that already have a chip seal, no changes to drainage runoff would occur for either the Chip Seal or Chip Seal/Crushed Rock alternatives. This would occur in nine of the infield areas (Areas A-1, A-2, B-1 through B-6, and Area C-3), as well as one infield area that is mostly covered with chip seal with narrow strip of natural ground (A-4). Asphalt concrete, which is an impervious surface similar to chip seal in terms of its runoff coefficient (both are estimated to be 0.9), would similarly have no changes to drainage runoff in these areas. Crushed aggregate has a lower runoff coefficient (0.35) due the fact that some runoff would be stored within the spaces between the rocks where it could ultimately percolate into the natural ground. Since the project study area is located within three different drainage basins, the following analysis is evaluated by drainage basin (refer to **Exhibit 3E**), with each Proposed Action alternative discussed within the text.

- <u>Northeast drainage basin</u>: Subareas A-1, A-2, A-4, B-4, B-5, B-6, and C-4 are located within this drainage basin. The existing runoff for the five-year, 24-hour storm event is approximately 158 cfs (**Table 3D**). **Chart 1** shows a comparison of the hydrologic flow between the Proposed Action alternatives. Based on this comparison, the conversion of the natural field area within this drainage basin (Subarea C-4) under either the Chip Seal or Asphalt Concrete alternatives would increase runoff by 0.83 percent during a five-year, 24-hour storm. This would have a negligible effect on existing storm drain deficiencies. For the Chip Seal/Crushed Aggregate alternative, a slight reduction in runoff (0.08 percent) would occur due to the placement of crushed aggregate in Subarea C-4.

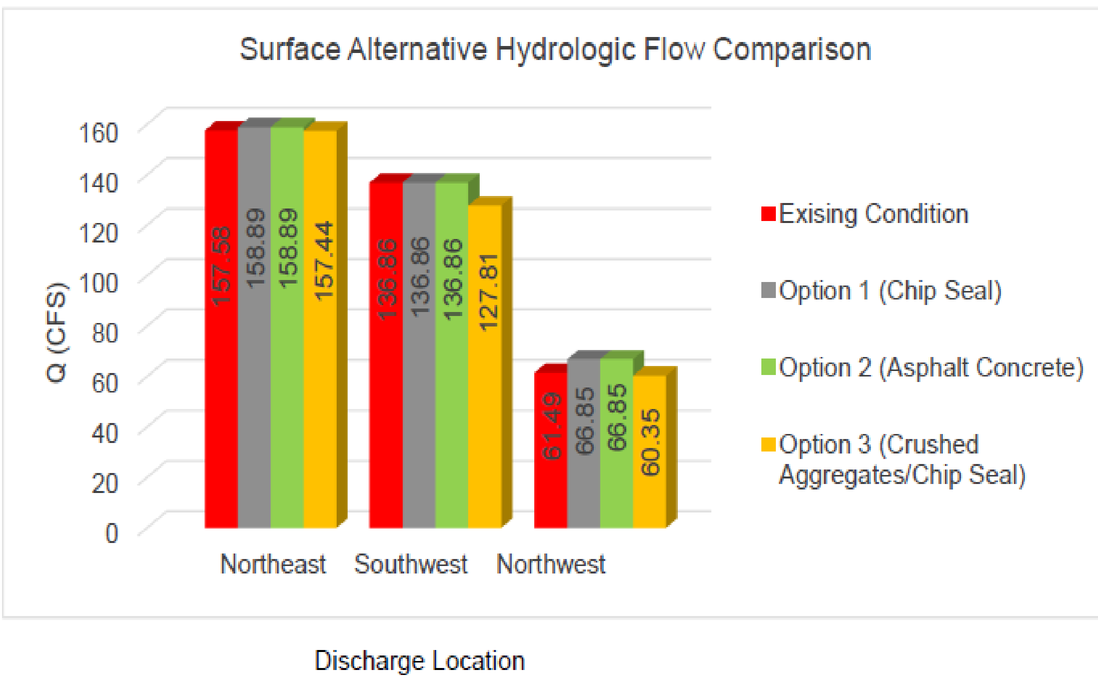
- <u>Southwest drainage basin</u>: Subareas B-1, B-2, B-3, C-2, C-3 and the proposed changes to Taxiways "F" and "J" are within this drainage basin. The existing runoff for the five-year, 24-hour storm event is approximately 137 cfs (**Table 3D**). **Chart 1** shows a comparison of the hydrologic flow between the Proposed Action alternatives. No change to the existing five-year, 24-hour storm event runoff would occur for either the Chip Seal or Asphalt Concrete alternatives. For the Chip Seal/Crushed Aggregate alternative, a reduction in runoff (6.62 percent) would occur due to the placement of crushed aggregate in Subarea C-3. However, this reduction is not enough to mitigate the existing storm drain deficiencies within the drainage basin (Kimley-Horn Associates 2018).

- <u>Northwest drainage basin</u>: Subareas C-1, C-5, and C-6 are within this drainage basin. The existing runoff for the five-year, 24-hour storm event is approximately 62 cfs (**Table 3D**). **Chart 1** shows a comparison of the hydrologic flow between the Proposed Action alternatives. Based on this comparison, the conversion of the natural field areas within this drainage basin (Subareas C-1, C-5, and C-6) under either the Chip Seal or Asphalt Concrete alternatives would increase runoff by 8.72 percent during a five-year, 24-hour storm. This would have a minimal impact on the storm drain system since this existing system is not deficient (Kimley-Horn Associates 2018). For the Chip Seal/Crushed Aggregate alternative, a reduction in runoff (1.86 percent) would occur due to the placement of crushed aggregate.

Although the storm drain system within the Airport's infield operates at a deficiency during the five-year, 24-hour storm event within the northeast and southwest drainage basins, none of the Proposed Action alternatives would significantly exacerbate this existing condition. In the case of the Chip Seal/Crushed Aggregate alternative, the situation would be minimally improved by the estimated reduction in runoff.

For all the Proposed Action alternatives, the Airport's SWPPP would be updated to incorporate the project and a Central Coast RWQCB stormwater discharge permit would be required. The installation of new impervious surfaces would require a stormwater management plan to prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data, which for Monterey is encompassed by the five-year storm event. Compliance must be achieved by optimizing infiltration with retention of the remaining volume achieved via storage, rainwater harvesting and/or evapotranspiration. However, based on a letter received from the Central Coast RWQCB on April 5, 2018, regarding the Proposed Action, "since a large portion of the work is repaving existing pavement surfaces to existing line and grade, only the new pavement surfaces in the infield area are subject to the PCRs." (PCRs refer to the Central Coast RWQCB's Resolution R3-2013-0032*, Post-Construction Requirements* (PCRs) *for Development in the Central Coast Region*.) See **Appendix A**, for both an email from the Central Coast RWQCB on January 1, 2016, as well as the follow-up letter of April 5, 2018. Since only nominal increases in stormwater runoff is anticipated for any of the alternatives, no impacts related to meeting this requirement would occur.

Chart 1: Surface Alternative Hydrologic Flow Comparison



Source: Kimley-Horn Associates 2018

<u>Construction Impacts</u>

During construction, impacts to water quality could occur with any of the Proposed Project alternatives. BMPs would be employed by the contractor, as required by FAA AC 150/5370-10H and a project-specific SWPPP per the State's Construction General Permit Order 2009-2009-DWQ (California Water Boards website 2018). These measures would include temporary measures to control water pollution, soil erosion, and siltation through the use of berms, fiber mats, gravels, mulches, slope drains, and other erosion control methods. Thus, the Proposed Project alternatives would not exceed water quality standards established by Federal, State, local, and tribal regulatory agencies or contaminate public drinking water supply such that public health may be adversely affected.

Indirect Impacts

None.

Conclusion

Based on the analysis above, including the hydrologic analysis contained in **Appendix C**, no significant impacts to surface water or water quality standards would occur as a result of any of the Proposed Action alternatives.

No Action Alternative

The No Action alternative would not include any type of construction activity or change in impervious surfaces. However, the existing chip seal within the infield Areas A and B has reached its useful life and is beginning to deteriorate. As a result, the Airport is experiencing a problem with foreign object debris (FOD), which can get washed into the drainage system during storm events. This increases the amount of maintenance needed and adversely affects the quality of surface waters leaving the Airport through its storm drain system (although the Airport's SWPPP is implemented to minimize these pollutants). The existing storm drain deficiencies would also continue.

Mitigation Measures

During project design, final pre-construction and post-construction runoff rates shall be determined. However, based on the preliminary analysis completed for this EA, drainage improvements are not required to mitigate the Proposed Action or No Action alternatives.

4.3.9.2 Groundwater

Analysis Methodology and Significance Thresholds

Per Order 1050.1F, Table 4-1, an action will have significant impacts to groundwater if it would:

- Exceed groundwater quality standards established by Federal, State, local, and tribal regulatory agencies; or
- Contaminate an aquifer used for public water supply such that public health may be adversely affected.

Proposed Action Alternatives

As discussed in Section 4.3.9.1, the Proposed Action would result in a change from pervious surfaces to impervious surfaces within portions of the Airport's infield. This change would only have an impact on the opportunities for groundwater recharge at the Airport under the Chip Seal/Crushed Aggregate alternative within Subarea C, which would increase the opportunities for groundwater recharge in the west end of the infield. The installation of crushed aggregate would allow some runoff to be stored within the spaces between the rocks where it can percolate into the natural ground. However, the infield is not a significant location for groundwater recharge since even the natural ground areas of the infield are highly compacted. Sheet flow currently occurs over most of the infield.

<u>Indirect Impacts</u>

The Airport's operational SWPPP will be updated to address stormwater pollutants that could result from any additional surfaces at the Airport, including mitigation that may be required as part of a Central Coast RWQCB stormwater discharge permit. These measures would also ensure that any runoff that percolates into the groundwater has been similarly treated.

No Action Alternative

Under the No Action alternative, no changes to the amount or quality of water that percolates underground would occur.

Mitigation Measures

None necessary.

4.4 CUMULATIVE IMPACTS

Analysis Methodology and Significance Thresholds

For this analysis, cumulative projects are those that would occur within the general vicinity of the Airport as defined by the 1.7-square mile cumulative project study area shown in **Exhibit 3G**.

According to FAA Order 1050.1F, cumulative impacts are evaluated on the following time horizons: past actions, present actions, and reasonably foreseeable actions. Past actions are those known to have occurred within the five years immediately prior to the year of project implementation. Present actions are those projects which are ongoing and would continue during the implementation of the Proposed Action. Reasonably foreseeable actions are those that have: 1) received local approval for implementation, such as a building permit, and are expected to occur within the five years immediately after project implementation; or 2) are programmed into the five-year Airport Capital Improvement Program (ACIP). Projects without a building permit, such as those outlined within a community's General Plan or Specific Plan, are not considered reasonably foreseeable as part of this analysis.

Specific thresholds for cumulative impacts are not established in FAA Order 1050.1F as the significance threshold varies according to the affected resources. In evaluating cumulative impacts, the impact of the Proposed Action alternative should be added to the impacts of past, present, and reasonably foreseeable future actions to determine if the significant impact threshold would be exceeded.

As discussed in Section 3.16.1, several projects on airport property have been undertaken or are planned to be undertaken in the next five years. Section 3.16.2 discusses other off-airport projects considered in this EA. These projects have been considered in determining whether the Proposed Action, in conjunction with past, present, and reasonably foreseeable future actions within the spatial boundaries of the cumulative project study area (Exhibit 3G), would create incremental impacts that would be significant.

Proposed Action Alternative

It has been determined through the analysis contained in Chapters Three and Four that the following resources are either not present at the Airport or existing permits and regulations adequately protect the resource and, thus, no project-specific or cumulative impacts would occur: coastal resources; *Department of Transportation Act*, Section 4(f) resources; farmlands; historical, architectural, archaeological, and cultural resources; land use; visual effects; and wetlands, floodplains, and wild and scenic rivers. Since the Proposed Action would not create impacts to these impact categories, no incremental impacts would occur in conjunction with past, present, and reasonably foreseeable future actions.

Resource issues that are appropriate for analysis under a cumulative impact assessment are addressed below and include potential construction-related impacts to: air quality; climate; biological resources (migratory birds); hazardous materials, solid waste, and pollution prevention; natural resources and energy supply; noise and compatible land use; socioeconomics impacts (traffic); and environmental justice. Long-term impacts include those to biological and water resources (surface and groundwater). These categories were identified for cumulative impact analysis because of the potential for incremental impacts related to the Proposed Action in conjunction with other on- and off-airport development projects.

<u>Construction-Related Cumulative Impacts</u>

<u>Air Quality and Climate (Greenhouse Gases)</u>. Due to the short-term nature of the construction phase of each past, present, and reasonably foreseeable future actions, air emissions associated with these projects would only occur during a limited time period. At a regional level, the MBARD requires that all projects include adequate measures to minimize fugitive dust, ozone precursors, and GHGs through its permitting and CEQA evaluation processes. All cumulative projects will be required by the MBARD to comply with the conditions of its rules and regulations.

Past, present, and reasonably foreseeable future actions considered in this EA that have occurred within the past five years would not create incremental impacts to air quality standard exceedances in conjunction with the Proposed Action alternative, which is anticipated to be constructed in two phases with the first phase of construction likely to occur in 2020. There is one action, an automobile storage project at 2969 Monterey Salinas Highway, which started construction in August 2018 and is anticipated to be completed in November of 2019. This project is predicted to generate approximately 73 pounds per day of PM_{10} and 53 pounds per day of NOx (City of Monterey website 2019). These pollutants would not be introduced to the airshed at the same time as the Proposed Action alternative's construction and would not contribute to an incremental exceedance of air quality standards.

One future action likely to occur with a five-year timeframe of the Proposed Action alternative within the cumulative study area involves the first phases of the Airport's Proposed Airfield Safety Enhancement Project for Taxiway "A" Relocation and Associated Building Relocations (safety enhancement project). According to the Airport's most recent five-year ACIP, the first phases of the safety enhancement project would occur after the first phase of the Proposed Action alternative. Later phases of the safety enhancement project would also be offset from Phase 2 of the Proposed Action alternative as the Airport is not likely to be able to fund both construction projects within the same fiscal year. Thus, the safety enhancement project's construction pollutants would not be introduced to the airshed at the same time as the Proposed Action alternative's construction. The actions, in combination with each other, would not contribute to an incremental exceedance of air quality standards.

Similarly, no incremental impacts related to the emissions of greenhouse gases would occur as a result of construction of the Proposed Action alternative in combination with other actions.

<u>Biological Resources (Migratory Birds)</u>. The Proposed Action alternatives identify potential impacts to nesting birds protected under the MBTA, and Section 4.3.2 of this EA recommends mitigation to avoid impacts. As long as preconstruction nesting bird surveys or other protective measures are conducted prior to development, as necessary, to avoid the nesting season and migratory bird nests, cumulative impacts to protected birds would be avoided. Other construction projects are subject to similar MBTA requirements, and no incremental impacts would occur when impacts of the Proposed Action alternative and other construction projects are combined.

<u>Hazardous Materials, Solid Waste, and Pollution Prevention</u>. Hazardous and solid wastes would be generated by the Proposed Action alternative, as well as by other cumulative projects during the construction phase. The Federal and State governments have established policies and programs that require the proper disposal and handling of these types of waste products. Through compliance with existing programs and regulations, no significance thresholds for hazardous materials and solid waste would be exceeded. All actions considered in this EA would also be required by the Central Coast RWQCB to comply with the conditions of the applicable National Pollutant Discharge Elimination System (NPDES) permits. Since all construction projects are subject to similar regulatory requirements, no incremental impacts would occur when impacts of the Proposed Action alternative and other construction projects are combined.

<u>Natural Resources and Energy Supply</u>. Fossil fuels would be used during construction and would be obtained by local retail providers for both the Proposed Action alternative and other actions. The combined demand would occur over a period of more than 10 years. No cumulative impacts would result from this incremental demand, which is controlled by the market.

Similarly, the use of water for dust suppression is based on market factors. However, because water is a limited resource in the central California, the incremental demand for water during construction could be of concern if the region is in a drought. This scenario is speculative and cannot be determined at this time. However, any local drought restrictions in place at the time of construction would be followed to minimize cumulative impacts on local and regional water supplies.

Noise and Compatible Land Use. Construction for the Proposed Action alternative would occur during a limited time period and only at night during very limited hours. Construction of the other actions considered in this EA would occur primarily during the day and are not scheduled to occur concurrently with the Proposed Action alternative. Thus, no cumulative impacts related to noise, in conjunction with other construction projects being undertaken at the same time, would occur.

Socioeconomics (Traffic). As mentioned previously under Noise and Compatible Land Use, construction for the Proposed Action alternative would occur only at night and during a limited period. During the daytime hours, only minimal construction trips would occur to deliver construction equipment or materials. Construction of the past, present, and reasonably foreseeable future actions considered in this EA would occur primarily during the day and are not scheduled to occur concurrently with the Proposed Action alternative. Thus, no cumulative impacts related to traffic, in conjunction with other construction projects being undertaken at the same time, would occur.

Environmental Justice. No disproportionate impacts to low-income or minority populations would result from the Proposed Action alternative, and would not, therefore, result in a cumulative, incremental impact when combined with past, present, and reasonably foreseeable future actions. There are no other known actions being undertaken at the same time.

Long-Term Cumulative Impacts

Biological Resources (Monterey spineflower). As described in the Biological Assessment for this project (SWCA 2017a), within the BSA are approximately 18.8 acres of suitable habitat for the Monterey spineflower. Biological field surveys in 2017 found approximately 2.2 acres of the approximately 18.8 acres of suitable Monterey spineflower habitat was occupied with approximately 2,400 individual plants (refer to **Exhibit 3B**). The Airport has designed the project to avoid most Monterey spineflower habitat. However, implementation of the Proposed Action alternative using Chip Seal, Asphalt Concrete, or a combination of Chip Seal/Crushed Aggregate would result in the loss of approximately 0.015 acre (approximately 653 square feet) of occupied Monterey spineflower habitat in Area C-6.

Some of the past, present, and reasonably foreseeable future actions would also have impacts to Monterey spineflower. According to an Initial Study on the automobile storage project at 2969 Monterey Salinas Highway, approximately 0.25 acre of suitable habitat for a small Monterey spineflower population could be affected (City of Monterey website 2019). The Airport's safety enhancement project could affect approximately 366 individuals (based on 2017 surveys) (SWCA

2018). Both these actions are requiring (or will require) mitigation. Because the USFWS monitors impacts to Monterey spineflower under Section 7 of the *Endangered Species Act*, mitigation will be adequate to ensure that significant cumulative impacts to the species do not occur.

Water Resources (Surface Water and Groundwater). Two of the Proposed Action alternatives (Chip Seal or Asphalt Concrete), as well as some of the past, present, and reasonably foreseeable future actions listed in Section 3.16, would result, or have resulted, in additional impervious surfaces. The proposed project, as well as other actions, would manage its stormwater runoff in accordance with required NPDES permits and other local or regional regulations, such as the 2016 Basin Plan and Resolution R3-2013-0032, *Post-Construction Requirements for Development in the Central Coast Region*.

According to the Initial Study on the automobile storage project at 2969 Monterey Salinas Highway, that project would not create or contribute runoff which would exceed the existing or planned stormwater drainage system nor provide substantial additional sources of polluted runoff. The project applicant has prepared a Storm Water Control Plan (Attachment 9 of the Initial Study). The City of Monterey implements stormwater design requirements in compliance with the State and Central Coast RWQCB (City of Monterey 2019 website). Other actions within the city must also meet similar requirements.

The Airport's proposed safety enhancement project would result in approximately 670,000 square feet (sf) of additional impervious surface, while the Proposed Action alternative would result in approximately 400,000 sf. With both the Proposed Action alternative and the proposed safety enhancement project combined, an approximate nine percent increase in on-airport impervious surface would occur. (The Airport currently has approximately 11,400,000 sf of impervious surface.) Overall, however, existing drainage patterns would not change due to the Proposed Action alternative and other airport development projects. The additional drainage would be directed to on- and off-airport stormwater conveyance systems that include detention ponds to ensure that pre- and post-construction runoff rates are consistent with applicable State and Central Coast RWQCB policies. For any airport project, the Airport's SWPPP would be updated to incorporate the project, and a Central Coast RWQCB stormwater discharge permit would be required. The installation of new impervious surface would require a stormwater management plan to prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data, which for Monterey is encompassed by the five-year storm event.

Since all the past, present, and reasonably foreseeable future actions considered in this EA are subject to similar regulatory requirements, no incremental impacts would occur when impacts of the Proposed Action alternative and other actions are combined. No significant cumulative impact to water resources would occur.

No Action Alternative

No cumulative impacts would occur with the No Action alternative, since this alternative would not result in any physical change at the Airport. Thus, incremental impacts in conjunction with past, present, and reasonably foreseeable future actions discussed in this EA would not result from this alternative.

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Chapter Five
COORDINATION AND PUBLIC INVOLVEMENT

Chapter Five
COORDINATION AND PUBLIC INVOLVEMENT

Proposed Infield and Taxiway Improvements
Environmental Assessment

5.1 PUBLIC AND AGENCY SCOPING PROCESS

The MPAD issued a notice of opportunity for comment on the scope of this Environmental Assessment (EA) on November 13, 2015. The public scoping comment period extended to December 18, 2015. Public scoping letters were also sent to a number of resource agencies seeking input regarding potential environmental resources which might be impacted by the proposed infield improvements project at Monterey Regional Airport (Airport). A list of the agencies and organizations contacted, a copy of the information sent, and the responses received are included in this EA in **Appendix A**.

Responses to the scoping materials were received from the following six agencies and individuals:

- Email from Todd Bennett, Senior Associate Planner, City of Monterey Planning Department, dated November 17, 2015. Requested information on construction activities, including traffic, noise, and the export of materials.

- Email from Bob Benzies, dated November 18, 2015. Requested the following information:

  - How far (distance-wise) east and west along Highway 68 will local traffic be compromised?
  - For how long (number of days)?
  - Will it be operational 24/7 or will the times of days and weekends be impacted differently?

- Telephone call and follow-up email from Grant Leonard, Transportation Agency for Monterey County (TAMC), dated November 23, 2015. Requested that signage regarding construction traffic on Highway 68 be used to notify bicyclists and motorists of the potential for additional construction traffic.

- Telephone call from Richard Rucello with the Casanova-Oak Knolls Association (CONA), dated November 25, 2016. Requested the following information regarding the proposed project:
    - Number of dump trucks
    - Hours of operation
    - Weeks/years of operation
    - Alternative construction routes to the CONA neighborhood
    - Amount of material to be removed
    - Total magnitude of the project

- Letter from John Olejnik, California Department of Transportation (Caltrans), District 5, Development Review, dated December 9, 2015. Stated they are interested in potential staging and temporary construction issues. Requested the opportunity to review both the traffic analysis and traffic management plans as they relate to Highway 68/Olmstead Road. Encouraged construction traffic to avoid the AM and PM peak hours to the extent possible. Identified the permit procedures for any work within the State right-of-way.

- Email from Michael Godwin, Central Coast Regional Water Board, dated January 11, 2016. Identified the permit conditions from the Regional Water Board that will be required. Encouraged a project design that will allow stormwater to infiltrate.

A description of the different construction activities by alternative is included in **Tables 2B**, **2C**, and **2D**. The potential for environmental impacts associated with the Proposed Action alternatives are discussed in Chapter 4 of the EA.

5.2 DRAFT ENVIRONMENTAL ASSESSMENT'S AVAILABILITY FOR PUBLIC REVIEW

This Draft EA is available for review by the general public and interested parties for a period of 30 days. A Notice of Availability (NOA) was published in *The Monterey Herald* on June 29, 2018. An NOA with a link to the Draft EA was also sent to agencies and individuals contacted during the initial scoping period discussed in Section 5.1.

Copies of the Draft EA are available for review at the following locations:

Federal Aviation Administration (FAA) San Francisco Airports District Office	1000 Marina Boulevard, Suite 220 Brisbane, CA 94005-1835
Monterey Regional Airport	200 Fred Kane Drive, Suite 200 Monterey, CA 93940
Monterey Public Library	625 Pacific Street Monterey, CA 93940
Monterey Airport website	https://montereyairport.specialdistrict.org

Anyone wishing to comment on the Draft EA may submit written comments by letter or email to the following address:

Monterey Regional Airport
200 Fred Kane Drive, Suite 200
Monterey, CA 93940
Attn: Chris Morello, Senior Manager – Planning and Development
planning@montereyairport.com

The cutoff date for comment submission is no later than **5:00 PM – Pacific Daylight Savings Time, July 30, 2018**. Please allow enough time for mailing. The Airport must **receive** the comments by the deadline, rather than the letter simply be postmarked by that date. Emailed comments must also be received by the deadline.

Before including your name, address, and telephone number, email, or other personal identifying information in your comment, be advised that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

Under the *National Environmental Policy Act*, the Airport will prepare written responses to comments received on the Draft EA and prepare a Final EA for transmittal to the FAA for review and approval. All agency and/or public comment letters received during the official comment period will be included in the Final EA along with individual responses. Following review of the Final EA, the FAA will either issue a Finding of No Significant Impact or decide to prepare a Federal Environmental Impact Statement.

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Chapter Six
LIST OF PREPARERS

Chapter Six
LIST OF PREPARERS

Proposed Infield and Taxiway Improvements
Environmental Assessment

Persons responsible for preparation of this Environmental Assessment (EA) document and significant supporting background analysis and materials are listed below.

NAME	EXPERTISE	PROFESSIONAL EXPERIENCE
FEDERAL AVIATION ADMINISTRATION (FAA) REVIEWER		
Doug Pomeroy	Environmental Protection Specialist, San Francisco Airports District Office (ADO), Western-Pacific Region	M.S., Wildland Resource Science; B.S., Wildlife Management. 33 years of experience. Performs FAA evaluation of environmental documentation and coordination with Federal and State agencies.
AIRPORT REVIEWER		
Michael LaPier, AAE	Executive Director, Monterey Regional Airport	B.S., Business Administration. Over 30 years of experience in senior airport management. Is an Accredited Airport Executive (AAE) and has served as a member of the Small Airports Committee and United States (U.S.) Government Affairs Committee through Airports Council International - North America.
EA PREPARERS		
Coffman Associates		
James Harris	Airport Master Planning; Environmental Analysis; and Airport Management	B.S., Civil Engineering. Responsible for master planning, noise and land use compatibility planning, and environmental documentation for airports. Extensive experience throughout the western U.S., especially in California.

Judi Krauss	Land Use Planning; Environmental Analysis and Documentation; Socioeconomics	M.A., Economics; B.A., Environmental Studies. Transportation and land use planning, socioeconomic studies, and environmental analysis/documentation. Experienced in managing complex, multi-disciplined, environmental studies under the *National Environmental Policy Act* (NEPA) and the *California Environmental Quality Act* (CEQA).
Kory Lewis	Land Use Planning; Environmental Analysis and Documentation; Noise Monitoring and Assessment; Air Quality Analysis	Master of Urban Planning; B.A., Geography. Experienced in land use management, air quality and noise assessment, preparation of environmental documentation for airport projects, and air quality, noise, and visual impact computer modeling.
SWCA Environmental Consultants		
Travis Belt	Senior Biologist	B.S., Forestry and Natural Resources. 15 years of experience in biological resources management, special-status species surveys, *Endangered Species Act* compliance, and environmental documentation.
Heather Gibson	Principal Investigator; Historical Archaeologist	Ph.D., Anthropology; M.A., Anthropology. Registered Professional Archaeologist (RPA). 15 years of research experience, including archival research, surveys, excavations, and construction monitoring at sites throughout California.
Leroy Laurie	Cultural Resource Specialist	B.S., Social Sciences. 15 years of experience as a cultural resource specialist throughout California and Nevada. Technical experience in archaeological fieldwork, laboratory analysis, archaeological testing plans, and graphics/mapping. Served as the primary point of contact for Native American coordination for CEQA and Section 106 compliant projects.

Chapter Seven
REFERENCES

Chapter Seven
REFERENCES

Proposed Infield and Taxiway Improvements
Environmental Assessment

The following documents and websites were utilized during the preparation of this Environmental Assessment (EA):

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Appendix A
AGENCY COORDINATION AND SCOPING PROCESS

APPENDIX A
AGENCY COORDINATION AND SCOPING PROCESS

The following agencies and individuals were contacted by the Monterey Regional Airport planning staff during the scoping for this Environmental Assessment (EA) to solicit input regarding the Proposed Action and its possible environmental effects:

Federal

Regulatory Division
U.S. Army Corps of Engineers
1455 Market Street, 16th Floor
San Francisco, California 94103-1398

Rick Farris
VFWO Section 7 Coordinator
U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, CA 93003

State

Julie Vance
California Department of
Fish and Wildlife
Central Region
1130 E. Shaw Avenue, Suite 206
Fresno, CA 93710

Benjamin Turner
California Department of Conservation
801 K Street, MS-24-02
Sacramento, CA 95814

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California Department of Transportation
Chief, LD-IGR Program Branch
P.O. Box 942874, MS-40
Sacramento, CA 94274-0001

Krista Kiaha
Branch Chief
California Department of Transportation
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50 Higuera Street
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John Olejnik
District 5 Development Review
California Department of Transportation
District 5
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San Luis Obispo, CA 93401-5415

Jonathan Taylor
Air Resources Board
AQPSD
1001 I Street
Sacramento, CA 95814

Georgianne Turner
California Department of Resources Recycling and Recovery
Waste Evaluation and Enforcement Branch
1001 I Street--P.O. Box 4025
Sacramento, CA 95812-4025

Dominic Roques
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401-7906

Dan Carl
Senior Deputy Director
Central Coast District Office
California Coastal Commission
725 Front Street, Suite 300
Santa Cruz, CA 95060-4508

Frank Roddy
California State Water Resources Board
Division of Water Quality
P.O. Box 806
Sacramento, CA 95812-4025

Cynthia Gomez
Executive Secretary
California Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, CA 95814

<u>Local</u>

Carl P. Holm, AICP
Director
Monterey County Resource Management Agency
168 W. Alisal Street, 2nd Floor
Salinas, Ca 93901

Richard Stedman
Air Pollution Control Officer
Monterey Bay Unified Air Pollution Control District
24580 Silver Cloud Court
Monterey, CA 93940

Ariana Green
Transportation Planner
Transportation Agency for Monterey County
55-B Plaza Circle
Salinas, CA 93901

Daniel Dawson
City Manager
City of Del Rey Oaks City Hall
650 Canyon Del Rey Road
Del Rey Oaks, CA 93940

Diana Ingersoll, P.E.
Deputy City Manager –
Resource Management Services
City of Seaside
440 Harcourt Ave.,
Seaside, CA 93955

Kim Cole
Managing Principal Planner
City of Monterey
570 Pacific St
Monterey, CA 93940

Maura F. Twomey
Executive Director
Association of Monterey
Bay Area Governments
445 Reservation Road, Suite G
P.O. Box 809
Marina, California 93933

Anastazia Aziz, AICP, Senior Planner
Community Development Department
City of Pacific Grove
300 Forest Avenue
Pacific Grove, CA 93950

Marc Wiener
Senior Planner
City of Carmel by the Sea
P.O. Box CC
Carmel-by-the-Sea, CA 93921

Capt. Kevin Bertelsen
Navy Support Activity Monterey
271 Stone Road
Monterey, CA 93943-5000

Norm Groot
Monterey County Farm Bureau
931 Blanco Circle
P.O. Box 1449
Salinas, CA 93902-1449

Nate Young
General Manager
Monterey Jet Center
300 Sky Park Drive
Monterey, CA 93940

Russell Lockwood
General Manager
Del Monte Aviation
100 Sky Park Drive
Monterey, CA 93940

Mookie Patel
Alaska Airlines, Inc.
200 Fred Kane Dr.
Monterey, CA 93940

Jana Leonard
Allegiant Airlines
200 Fred Kane Dr., Suite 118
Monterey, CA 93940

James Seadler
US Airways
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Monterey, CA 93940

Jay Champion
United Airlines
200 Fred Kane Dr., Suite 100
Monterey, CA 93940

Robert Pastor
American Eagle Airlines, Inc.
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Monterey, CA 93940

Keith Standiford
Monterey Navy Flying Club
1600 Airport Road
Monterey, CA 93940

Monterey Flyers, Inc.
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Monterey, CA 93940

Joel Weinstein
Sierra Club, Ventana Chapter
P.O. Box 5667
Carmel, CA 93921

Blake Matheson
Monterey Audubon Society
P.O Box 5656,
Carmel, CA 93921

Mike Brassfield
CONA
P.O. Box 2304
Monterey, California 93942-2304

The Highway 68 Coalition
c/o Mike Weaver
52 Corral de Tierra Rd
Salinas, CA 93908

Robert Benzies
Pasadera Homeowners Association
422 Las Laderas Drive
Monterey, CA 93947 -7613

Ian Priestnell
807 Tresoro Ct.
Monterey, CA 93940

Alex Hulanicki
237 Chaucer Drive
Salinas, CA93901

Responses to the scoping materials were received from the following seven agencies and individuals:

- Email from Todd Bennett, Senior Associate Planner, City of Monterey Planning Department, dated November 17, 2016.
- Email from Bob Benzies, dated November 18, 2015
- Telephone call and follow-up email from Grant Leonard, Transportation Agency for Monterey County (TAMC), dated November 23, 2015.
- Telephone call from Richard Rucello with the Casanova-Oak Knolls Association (CONA), dated November 25, 2016.
- Letter from John Olejnik, California Department of Transportation (Caltrans), District 5, Development Review, dated December 9, 2015.
- Email from Michael Godwin, Central Coast Regional Water Board, dated January 11, 2016.

Copies of these response letters and emails follow the presentation of the EA scoping materials within this appendix.

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STATE OF CALIFORNIA
County of Monterey

I am a citizen of the United States and a resident of the County aforesaid. I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of The Monterey Herald, a newspaper of general circulation, printed and published daily and Sunday in the City of Monterey, County of Monterey, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Monterey, State of California; that the notice, of which the annexed is a printed copy (set in type not smaller than 6 point), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

11/13/15

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Executed on 11/13/2015 at Monterey, California.

Danielle Landaker

Signature

Notice Of Intent to Prepare an Environmental Assessment
And
Notice Of Opportunity for Public Comment
Comments Due December 18, 2015

The Monterey Peninsula Airport District (MPAD) is announcing its intent to prepare an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) of 1969 and implementing regulations for proposed improvements to the areas between the runways and taxiways on the infield of Monterey Regional Airport.

Aviation safety requires that airport infield areas be managed so as to minimize foreign object debris (FOD) that could break away from the surface of the infield areas and damage the exterior of an aircraft or be sucked into and damage an aircraft engine. The infield areas at the airport are deteriorating and the amount of FOD is increasing. The deteriorating infield areas are also attracting wildlife, including burrowing animals. This is undesirable from an aviation safety perspective as wildlife have the potential to collide with and damage aircraft.

The purpose of the EA is to consider and evaluate the potential environmental impacts of the proposed actions and alternatives, including the no action alternative. FAA is the Lead Agency for the project under NEPA and MPAD plans to prepare the EA in accordance with FAA Order 1050.1F: Policies and Procedures for Considering Environmental Impacts and FAA Order 5050.4B: National Environmental Policy Act Implementing Instructions For Airport Actions.

The proposed improvements would include ground disturbance in several of the infield areas to treat and/or replace the ground surface material. Prior to resurfacing, earthwork that includes the placement of fill material and final grading would be required to make these areas compliant with Runway and Taxiway Safety Area transverse grade limitations as outlined in FAA Advisory Circular 150/5300-13A, Airport Design. At this time, a replacement ground surface treatment has not been determined; however, alternatives to be evaluated in the EA include updated chip seal pavement, crushed aggregate, and aviation grade synthetic turf.

MPAD invites comments on the contents of the EA during a 30-day comment period that will be initiated upon publication of this Notice. Please submit any written comments you may have on the content of the EA by December 18, 2015.

Please submit any written comments you may have on the content of the EA to: Planning & Development Department, Attn: Shelley Glennon, Monterey Peninsula Airport District, 200 Fred Kane Drive #200, Monterey, CA 93940. Comments may also be submitted by email to: sglennon@montereyairport.com.

____
Michael La Pier A.A.E, Executive Director
Monterey Peninsula Airport District
Dated: ____________
Publish: November 13, 2015

Fly MONTEREY
Monterey Regional Airport

November 12, 2015

Anastazia Aziz, AICP, Senior Planner
Community Development Department
City of Pacific Grove
300 Forest Avenue
Pacific Grove, CA 93950

RE: ***Environmental Assessment for Proposed Infield Improvements at Monterey Regional Airport, Monterey County, California***

Dear Ms. Aziz,

The Monterey Peninsula Airport District, as owner and operator of the Monterey Regional Airport, is proposing to make improvements to the existing infield areas between runways and taxiways at the airport. Because improvements to the infield areas have the potential to effect the environment, the District is currently preparing an Environmental Assessment (EA) on the proposed infield improvement project pursuant to the requirements of Section 102(2) of the *National Environmental Policy Act* (NEPA) *of 1969*. The EA will conform to the requirements and standards set forth by the Federal Aviation Administration (FAA) as contained in FAA Order 1050.1F: Policies and Procedures for Considering Environmental Impacts and FAA Order 5050.4B: National Environmental Policy Act Implementing Instructions For Airport Actions. The FAA is the Lead Agency for the project under NEPA.

Aviation safety requires that airport infield areas be managed so as to minimize foreign object debris (FOD) that could break away from the surface of the infield areas and damage the exterior of an aircraft or be sucked into and damage an aircraft engine. The infield areas at the airport are deteriorating and the amount of FOD is increasing. The deteriorating infield areas are also attracting wildlife, including burrowing animals. This is undesirable from an aviation safety perspective as wildlife have the potential to collide with and damage aircraft.

The proposed infield improvements, identified on **Exhibit 1 (see enclosure)**, would include ground disturbance in several of the infield areas to remove the existing chip-sealed surfaces. Chip seal is a pavement surface treatment which involves application of alternating layers of liquid asphalt and fine aggregate. This chip seal has deteriorated and is now producing FOD.

EXECUTIVE STAFF Michael La Pier, AAE | Executive Director Scott Huber | District Counsel
200 Fred Kane Drive, Suite 200 | Monterey, CA 93940 Phone | 831 648 7000 Fax | 831 373 2625 www.montereyairport.com

Additionally, the Monterey Regional Airport Wildlife Hazard Management Plan (WHMP) recommends that infield areas at the airport be covered with a surface treatment that wildlife not use. The WHMP specifies the use of aviation grade synthetic turf, however; the same result could be achieved with a pavement surface treatment.

Prior to resurfacing, earthwork including the placement of fill material and final grading would be required to make these areas compliant with Runway and Taxiway Safety Area transverse grade limitations as outlined in FAA Advisory Circular 150/5300-13A. The improvements will take place in 17 existing infield areas adjacent to Runway 10R-28L. Of these 17 infield areas, two would require additional grading beyond the current extent to enable surface treatment of the Runway Safety Area. At this time, a replacement surface treatment has not been determined; however, alternatives to be evaluated within the EA include: updated chip seal pavement, crushed aggregate (also known as "interlocking rock"), and aviation grade synthetic turf.

Temporary haul roads, staging areas, and borrow/stockpile areas would also be necessary. The location of these routes and areas is also depicted on **Exhibit 1**. As indicated on the exhibit, one of the haul roads would route construction traffic through a residential neighborhood north of the airport. The second haul road located on the south side of the airport would route traffic through Olmstead Road onto Highway 68. To the extent possible, construction traffic will be routed primarily to the southern staging/stockpile area.

The purpose of this letter is to solicit your comments or concerns regarding potential environmental impacts of the proposed project. Please provide any written comments regarding this project to the address below by **December 18, 2015.**

Mailing Address: Shelley Glennon
Planning Manager - Environmental
Planning & Development Department
Monterey Peninsula Airport District
200 Fred Kane Drive #200
Monterey, CA 93940

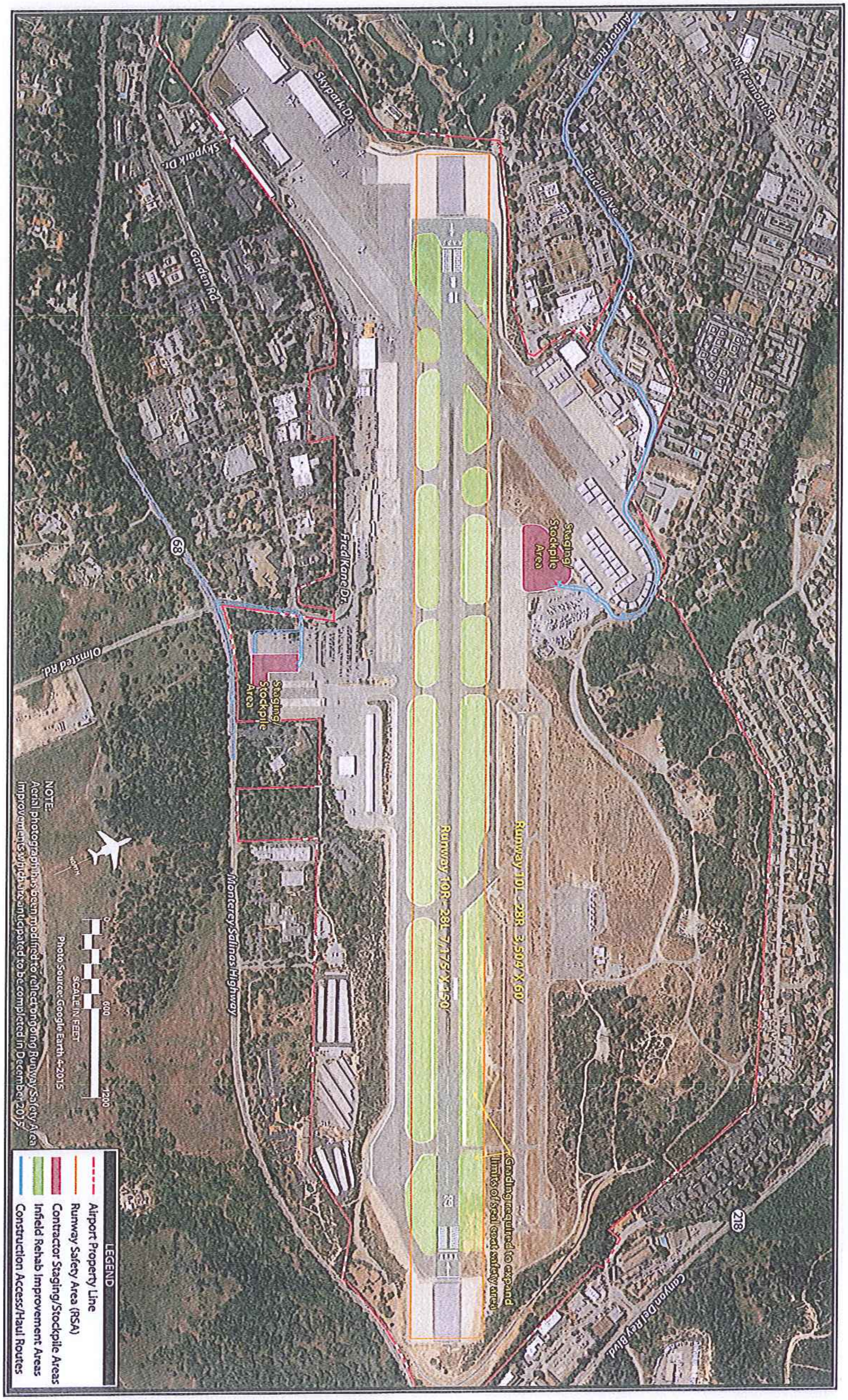
Email Address: sglennon@montereyairport.com

If you have any questions or need additional information, please feel free to contact me at (831) 648-7000 Ext. 209.

Sincerely,

Shelley Glennon
Planning Manager – Environmental
Monterey Peninsula Airport District

Enclosure



Skypark Dr.
Garden Rd.
Fred Kane Dr.
Olmsted Rd.
Monterey-Salinas Highway
Euclid Ave.
Airport Rd.
Staging/ Stockpile Area
Staging/ Stockpile Area
Runway 10R-28L 7,175' X 150'
Runway 10L-28R 3,504' X 60'
Canyon Del Rey Blvd.
68
218
NOTE:
Aerial photograph has been modified to reflect ongoing Runway Safety Area improvements which are anticipated to be completed in December 2017
Photo Source: Google Earth 4-2015
SCALE IN FEET
0
600
1200
LEGEND
Airport Property Line
Runway Safety Area (RSA)
Contractor Staging/Stockpile Areas
Infield Rehab Improvement Areas
Construction Access/Haul Routes
Exhibit 1
INFIELD IMPROVEMENTS

Shelley Glennon

From: Kimberly COLE <cole@monterey.org>
Sent: Tuesday, November 17, 2015 1:10 PM
To: Todd Bennett
Cc: Shelley Glennon
Subject: Re: EA for infield improvements

Also, is there going to be nighttime construction? Kim

On Tue, Nov 17, 2015 at 11:59 AM, Todd Bennett <bennett@monterey.org> wrote:

> Hi Shelley,
>
> I have a couple of questions in regards to the letter you sent the City. Do you have an idea of how many cubic yards of dirt/chip seal will need to be removed from the site? How much of that will need to go through the Airport Road access point (i.e. how many truck trips)? Would the removal of the infield chip seal areas require grinding, or would it be collected using a loader or bulldozer? What time of the day would the work be done?
>
> The City would like to see these issues reviewed in the EA, and based upon the EA evaluation, the City may have specific project comments.
>
> Thanks for the opportunity to participate in the EA review. And if I don't see you before then, have a great Thanksgiving.
>
> Sincerely,
>
> Todd Bennett
> Senior Associate Planner
>
> --

--
Kimberly Cole, AICP Principal Planner
City of Monterey, Planning Office
580 Pacific Street
Monterey, CA 93940

cole@monterey.org

1-831-646-3759

Shelley Glennon

From:	bobbenzies@comcast.net
Sent:	Wednesday, November 18, 2015 3:19 PM
To:	Shelley Glennon
Cc:	BENZIES Bob
Subject:	Environmental Assess. Proposed Infield Improvements - COMMENT/CONCERN

November 18, 2015 - Wednesday @ 1518

Hi Shelly,

Please forward this written comment / concern to yourself via this email because I did not have sufficient time from its initial receipt until today to respond in writing via postal mail.

Per you letter regarding the Proposed Infield Improvements – second to last paragraph – "…haul road located on the south side of the airport would route traffic through Olmsted Road onto Highway 68. Th the extent possible, construction traffic will be routed primarily to the southern staging/stockpile area."

[ ] How far (distance wise) east and west along Highway 68 will local traffic be compromised?
[ ] For how long, as in number of days, will this situation continue?
[ ] Will it be operational 24/7 or will the times of the days and weekends be impacted differently?

Bob Benzies
422 Las Laderas Drive
Monterey, CA 93947

Shelley Glennon

From: Grant Leonard <grant@tamcmonterey.org>
Sent: Monday, November 23, 2015 5:33 PM
To: Shelley Glennon
Subject: RE: Infield Rehab EA Comments / WHMP 2013

Hi, Shelley,

Thanks for the information about the Infield Rehabilitation Plan. Yes, generally if construction will impact the roadways, share the road signage is beneficial for both the bicycling and motoring public. I'm not sure how big the impact will be on the haul routes, but it's a good thing to consider.

And thank you for sending the WHMP.

Best,

Grant Leonard
Transportation Agency For Monterey County (TAMC)
55-B Plaza Circle, Salinas, CA 93901
Direct Phone: 831-775-4402
Office Receptionist phone: 831-775-0903
Office Fax: 831-775-0897
Email: grant@tamcmonterey.org

From: Shelley Glennon [mailto:sglennon@montereyairport.com]
Sent: Monday, November 23, 2015 4:21 PM
To: Grant Leonard
Subject: Infield Rehab EA Comments / WHMP 2013

Hi Grant,

Thanks for your comments on the Infield Rehabilitation Project. From what we discussed, you informed me that there are a lot of bicyclist that use Highway 68 and therefore having signage that allows construction trucks to share the road with them would be beneficial.

Also, as you requested, please see our attached WHMP.

Let me know if you have any questions.

Thank you!

Shelley Glennon | Planning Manager
Planning & Development Department
Monterey Peninsula Airport District
Phone: (831) 648-7000 Ext. 209
Mobile: (831) 402-0731
sglennon@montereyairport.com

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Shelley Glennon

From: Shelley Glennon
Sent: Monday, November 30, 2015 3:24 PM
To: Kory Lewis
Cc: 'Judi Krauss'
Subject: Infield Rehabilitation Project EA Scoping - KONA Comments

Hi Kory,

Richard Rucello with KONA called me last Wednesday on November 25, 2015. He wanted to know the following information:

1) Number of dump trucks
2) Hours of operation
3) Weeks/years of operation
4) Are alternative routes going to be considered (i.e. the Master Plan North side access road to Canyon Del Rey Highway 218)
5) Amount of material to be removed
6) Total Magnitude of project

I informed him that I would forward his comments to you and that construction impacts will be discussed within the environmental assessment.

Thank you,

Shelley Glennon | Planning Manager
Planning & Development Department
Monterey Peninsula Airport District
Phone: (831) 648-7000 Ext. 209
Mobile: (831) 402-0731
sglennon@montereyairport.com

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
50 HIGUERA STREET
SAN LUIS OBISPO, CA 93401-5415
PHONE (805) 549-3101
FAX (805) 549-3077
TDD (805) 549-3259
http://www.dot.ca.gov/dist05/

Received
DEC 14 2015
Planning and Development
Monterey Peninsula Airport District

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December 9, 2015

MON-68-5.57

Shelley Glennon, Planning Manager
Monterey Peninsula Airport District
200 Fred Kane Drive, Suite 200
Monterey, CA 93940

Dear Ms. Glennon:

COMMENTS TO MONTEREY PENINSULA AIRPORT INFIELD IMPROVEMENTS

The California Department of Transportation (Caltrans), District 5, Development Review, offers the following comments to your infield improvements project. Specifically, we are interested in identifying any potential staging or temporary construction traffic issues.

1. When available, Caltrans requests the opportunity to review both the traffic analysis and traffic management plans as they relate to impacts on Highway 68/Olmstead Road. Considering the existing operational concerns along Highway 68, we would encourage construction traffic avoid the AM and PM peak hours to the extent possible.

2. Any work within the State right-of-way will require an encroachment permit issued from Caltrans. Detailed information such as complete drawings, biological and cultural resource findings, hydraulic calculations, environmental reports, traffic study, etc., may need to be submitted as part of the encroachment permit process.

If you have any questions, or need further clarification on items discussed above, please don't hesitate to call me at (805) 542-4751.

Sincerely,

JOHN J. OLEJNIK
Associate Transportation Planner
District 5 Development Review Coordinator

cc: Orchid Monroy (D5)

"Caltrans improves mobility across California"

Shelley Glennon

From: Godwin, Michael D.@Waterboards <MichaelD.Godwin@Waterboards.ca.gov>
Sent: Monday, January 11, 2016 12:49 PM
To: Shelley Glennon
Cc: Godwin, Michael D.@Waterboards
Subject: RE: Proposed Infield Improvements at Monterey Regional Airport

Hi Shelley

The following permit conditions will apply for the work:

Construction General Permit (WQO 2009-0009 and amendments) (here). This is for development of a stormwater pollution prevention plan (SWPPP) and for the Central Coast Regional Water Board and statewide requirements for post-construction stormwater controls. New installation or replacement of impervious surfaces will require a stormwater management plan to retain the runoff for an 85th percentile storm. This is part of the construction permit required for all projects of 1 acre or greater.

In addition to the Construction General Permit, the project should comply with Resolution R3-2013-0032 Post-Construction Stormwater Management Requirements for Development in the Central Coast Region (here) and (here). This resolution has stricter stormwater runoff compliance requirements in addition to ones expressed in the Construction General Permit.

In reviewing your letter about types of material to be installed in the infield areas, have the design engineers look for solutions to allow the stormwater to infiltrate. If the infield areas are to be paved or some other impervious surface (artificial turf), there should be a design to allow the runoff to infiltrate. This can be accomplished by directing runoff to a detention basin, permeable pavement runway and taxiway shoulders (with permeable base and subbase materials), stormwater structures that have permeable designs to allow stormwater to percolate into the subsoil, infiltration galleries, etc. Many options are available. I was curious, if you will be paving or covering the infield areas, ask the design engineers if there is a mix design for roller compacted permeable concrete. That might be a cost efficient method of treating the infield areas without the expense of FAA rated artificial turf.

I did a quick review of the referenced citations in your letter. It appears that FAA Order 1050.1f section 5-64.e is applicable for this project. Consulting engineers in the Monterey area and Monterey County engineers are quite familiar with the post-construction requirements. There are also some post-construction requirements in the Monterey County grading codes.

Let me know if you have any questions. Thanks for the opportunity to provide you some comments.

Mike Godwin, PG
Stormwater and Hydromodification
Central Coast Water Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401
Direct Phone 805-549-3886
michaeld.godwin@waterboards.ca.gov

From: Shelley Glennon [mailto:sglennon@montereyairport.com]
Sent: Monday, January 11, 2016 9:33 AM
To: Godwin, Michael D.@Waterboards
Subject: RE: Proposed Infield Improvements at Monterey Regional Airport

Hello Mike,

As requested, please see the attached exhibit. If you have any questions, please let me know.

Thank you,

Shelley Glennon | Planning Manager
Planning & Development Department
Monterey Peninsula Airport District
Phone: (831) 648-7000 Ext. 209
Mobile: (831) 402-0731
sglennon@montereyairport.com

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From: Godwin, Michael D.@Waterboards [mailto:MichaelD.Godwin@Waterboards.ca.gov]
Sent: Monday, January 11, 2016 9:16 AM
To: Shelley Glennon <sglennon@montereyairport.com>
Subject: RE: Proposed Infield Improvements at Monterey Regional Airport

Hi Shelley

If you could please provide me with a general figure from the 11/17/2015 letter of the infield improvements for the airport? It will make it easier for me to understand the proposed improvements.

Thanks.

Mike Godwin, PG
Stormwater and Hydromodification
Central Coast Water Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401
Direct Phone 805-549-3886
michaeld.godwin@waterboards.ca.gov

Appendix B
LAND USE ASSURANCE LETTER

M R Y
MONTEREY
REGIONAL AIRPORT

February 9, 2018

Federal Aviation Administration
San Francisco Airports District Office
Ms. Laurie Suttmeier, Assistant Manager
1000 Marina Blvd., Suite 220
Brisbane, CA 94005-1835

RE: LAND USE ASSURANCE LETTER – MONTEREY REGIONAL AIRPORT

Dear Ms. Suttmeier,

The Monterey Peninsula Airport District (MPAD) makes the following statement of compatible land use assurance as required by 49 United States Code Section 47107(a)(10).

The Monterey Peninsula Airport District provides assurance that appropriate action, including the adoption of zoning laws, has been or will be taken to the extent reasonable to restrict the use of land next to or near the airport to uses that are compatible with normal airport operations, pursuant to 49 United States Code Section 47107(a)(10).

In addition, the MPAD continues to support and encourage compatible land uses surrounding the airport boundaries through regular communication with the Monterey County Airport Land Use Commission.

Sincerely,

Michael La Pier, AAE
Executive Director

cc: Grant File

T (831) 648-7000
F (831) 373-2625
W www.montereyairport.com
200 Fred Kane Drive, Suite 200
Monterey, CA 93940

Appendix C
DRAINAGE ANALYSIS

Kimley»Horn

TECHNICAL MEMORANDUM
DRAINAGE – MONTEREY REGIONAL AIRPORT

To:	Coffman Associates, Inc.
From:	Sam McWhorter, P.E. Alexander Lin, E.I.T. Kimley-Horn and Associates, Inc. 401 B Street, Suite 600 San Diego, California 92101
Date:	April 24, 2018
Subject:	Monterey Regional Airport Infield Surface Improvement Hydrology and Hydraulics Technical Memorandum

Summary

This technical drainage memo was prepared to summarize the analysis of the existing drainage conditions, identify deficiencies for the existing storm drain system and conduct drainage impact evaluation on 3 surface alternatives within the Monterey Regional Airport property. The 3 surfaces are chip sealed pavement, asphalt concrete, and a mixture of chip seal pavement and crushed aggregate.

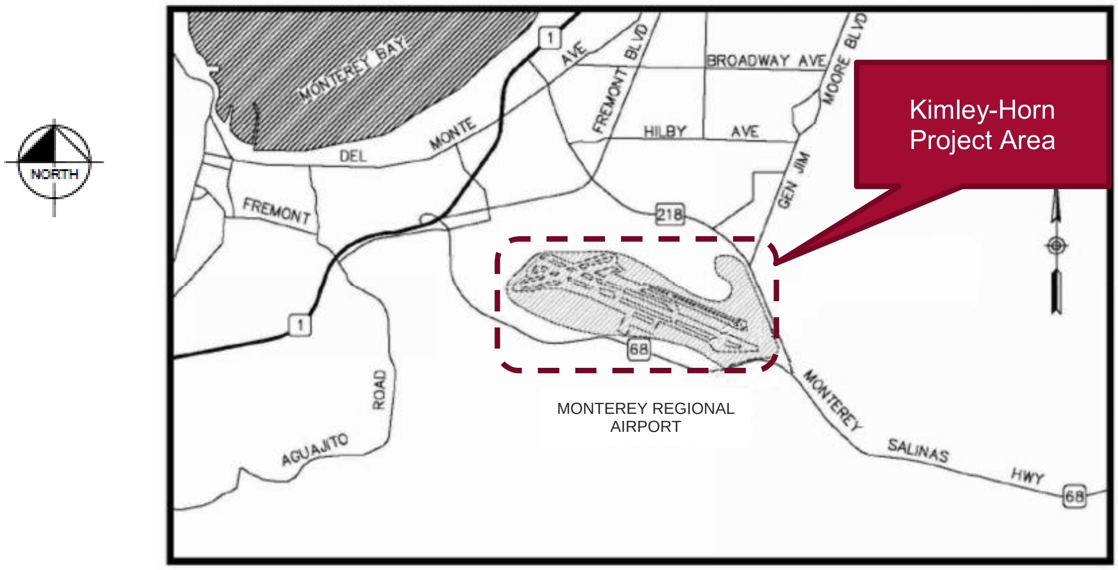
The project area hydrology and storm drain hydraulics were analyzed for the 5-year storm event in accordance with the *Federal Aviation Administration's Advisory Circular 150/5320-5C Surface Drainage Design Manual.* See **Figure 1** for Existing Hydrology Exhibit and **Figure 3** Storm Drain System Deficiencies Location Exhibit. **Figure 4-6** depicts storm drain deficiencies for each surface alternatives.

Overview

Project Setting

The airport is a general aviation and commercial aviation facility located north of Monterey Salinas Highway (Highway 68) and just east of Monterey Bay (Figure 1). The airport is owned and operated by the municipalities that make up the Monterey Regional Airport District and consists of two (2) runways, two (2) parallel taxiways plus other associated connector taxiways. The existing drainage system at the Airport consists of pipe culverts under the taxiways and runways.

Monterey Regional Airport



Vicinity Map

Topographic information for the project was obtained from site specific survey provided by Neill Engineers Corporation (March 2nd, 2018). The airport generally slopes from south to north draining across the airport runway and taxiways through culverts. The project is located within the Canyon Del Rey-Frontal Monterey Bay Watershed. The airport is located in the "Central Coast" area of Southern California. The average high temperature for Monterey is 64 Degrees Fahrenheit with an average annual rainfall of 21.16 inches (www.usclimatedata.com). Most of the rainfall in the watershed occurs from November through March.

Soil types were determined using the United State Department of Agriculture (USDA) Web Soil Survey. The project site consists of mostly Type A Soil. See **Appendix E** for soil report.

Existing Condition

Hydrologic Analysis

The 5yr-24 hr. storm event was used to evaluate the existing storm drains. See **Table 1** for Existing Hydrology Calculations.

Hydrology Calculations has been prepared in accordance with the *Federal Aviation Administration's Advisory Circular 150/5320-5C Surface Drainage Design Manual.*

The rainfall intensity is required to calculate the sheet flow travel time. The rainfall intensity (i), for the 5yr-24hr storm was found by using an Intensity-Duration Frequency (IDF) curve developed by the *Caltrans IDF Rainfall Curve Program, v. 2.11 (*2004 Data). The IDF curve equation shown below is relative to the 5 yr-24hr storm event, with the constants relative to the Del Monte Rain Gauge Stations, in close proximity to the project site.

$I_5 = 0.525 t_c^{-0.527}$

Where: i_{25} = Rainfall Intensity [in/hr.] (5yr-24hr Storm)
t_c = Rainfall Duration [hrs.]

Table 1 depicts the on-site tributary areas delineated for the project site. The results of the Hydrologic Analysis are located in **Appendix A**. The Caltrans IDF curve data used in the hydrologic calculations are located in **Appendix B**. Excerpts from the FAA UFC are located in **Appendix C**.

Table 1 – Existing Airport Hydrology

Existing Hydrology Calculations							
Drainage Basin	Total Area (acres)	Pervious Area (acres)	Impervious Area (acres)	Weighted Runoff Coefficient*	Tc 5-yr-24hr (minutes)	Intensity 5yr (in/hr.)	Q_5-yr (cfs)
A	4.51	0.45	4.06	0.85	16.82	1.03	3.93
B	1.19	0.00	1.19	0.90	5.00	1.94	2.08
C	3.91	0.04	3.87	0.90	11.11	1.28	4.47
D	3.83	0.96	2.87	0.78	17.41	1.01	2.99
E	1.15	0.01	1.14	0.90	7.36	1.59	1.63
F	0.24	0.00	0.24	0.90	5.00	1.94	0.42
G	0.84	0.01	0.83	0.90	5.00	1.94	1.46
H	0.51	0.00	0.51	0.90	5.00	1.94	0.89
I	62.72	31.36	31.36	0.65	19.96	0.94	38.23
J	7.74	0.00	7.74	0.90	16.17	1.05	7.30
K	2.35	0.00	2.35	0.90	5.00	1.94	4.11
L	0.43	0.04	0.39	0.85	5.00	1.94	0.71
M	0.72	0.00	0.72	0.90	5.00	1.94	1.26
N	0.81	0.01	0.80	0.90	5.00	1.94	1.41
O	1.83	0.00	1.83	0.90	5.00	1.94	3.20
P	3.69	0.37	3.32	0.85	9.13	1.42	4.44
Q	3.00	1.80	1.20	0.60	15.18	1.08	1.95
R	0.17	0.17	0.00	0.40	5.58	1.84	0.12
S	0.63	0.32	0.32	0.65	5.00	1.94	0.80
T	1.40	0.14	1.26	0.85	5.00	1.94	2.31
U	0.35	0.32	0.04	0.45	10.86	1.29	0.20
V	2.41	0.24	2.17	0.85	5.00	1.94	3.98
W	1.22	0.24	0.98	0.80	5.00	1.94	1.90
X	2.68	1.61	1.07	0.60	5.00	1.94	3.13
Y	2.67	1.60	1.07	0.60	10.74	1.30	2.08
Z	0.50	0.25	0.25	0.65	5.00	1.94	0.63

Drainage Basin	Total Area (acres)	Pervious Area (acres)	Impervious Area (acres)	Weighted Runoff Coefficient*	Tc 5-yr-24hr (minutes)	Intensity 5yr (in/hr.)	Q_5-yr (cfs)
AA	1.80	0.72	1.08	0.70	5.00	1.94	2.45
AB	1.91	0.96	0.96	0.65	5.30	1.89	2.34
AC	2.83	1.98	0.85	0.55	5.80	1.80	2.80
AD	9.17	0.92	8.25	0.85	5.00	1.94	15.16
AE	25.00	10.00	15.00	0.70	16.20	1.05	18.32
AF	20.25	2.03	18.23	0.85	10.80	1.30	22.31
AG	8.53	0.00	8.53	0.90	5.00	1.94	14.93
AH	11.01	6.61	4.40	0.60	6.34	1.72	11.33
AI	14.51	0.00	14.51	0.90	6.40	1.71	22.30
AJ	3.04	0.30	2.74	0.85	11.14	1.28	3.29
AK	2.13	0.85	1.28	0.70	5.00	1.94	2.90
AL	8.01	0.40	7.61	0.88	8.26	1.49	10.46
AM	10.97	5.49	5.49	0.65	7.98	1.52	10.84
AN	6.02	4.21	1.81	0.55	13.06	1.17	3.88
AO	5.14	4.63	0.51	0.45	21.34	0.91	2.09
AP	6.14	4.91	1.23	0.50	34.52	0.70	2.16
AQ	4.98	3.98	1.00	0.50	30.50	0.75	1.87
AR	3.65	3.29	0.37	0.45	14.68	1.10	1.81
AS	14.22	3.56	10.67	0.78	28.50	0.78	8.57
AT	3.59	0.04	3.55	0.90	5.00	1.94	6.25
AU	0.98	0.88	0.10	0.45	17.07	1.02	0.45
AV	61.09	54.98	6.11	0.45	26.32	0.81	22.28
AW	18.67	14.94	3.73	0.50	12.19	1.22	11.35
AX	31.30	21.91	9.39	0.55	20.29	0.93	16.00
AY	33.30	8.33	24.98	0.78	11.75	1.24	32.00
AZ	19.77	3.95	15.82	0.80	29.26	0.77	12.12

Confluence Point

The on-site tributary areas defined in **Table 1** ultimately confluences at 3 discharge locations. The colors blue, red, and green indicates which confluence point each basin discharges into. Blue indicates the basin discharges into the Northeast confluence point. Red indicates the basin discharges into the Southwest confluence point. Green indicates the basin discharges into the Northwest confluence point. The total flow at each discharge location are shown in **Table 2.**

Northeast confluence point discharges into an existing detention basin.
The Southwest confluence point discharge into a 36" RCP and flow is conveyed off-site.
The Northwest confluence point discharges into a 27" RCP and flow is conveyed off-site.

Table 2 - Confluence Points

Confluence Points	
Discharge Location	**Q (cfs)**
Northeast	**158**
Southwest	**137**
Northwest	**62**

See **Figure 2** for confluence point exhibit.

Hydraulic Analysis

Storm drains on the airport were analyzed using the computer program StormCAD. Existing storm drain sizes, invert elevations, and catch basin/manhole rim elevations were gathered by Neill Engineers Corporation (March 2018). The information provided was used to prepare a StormCAD hydraulic model. The StormCAD modeling results are located in **Appendix D**.

The model was used to verify capacity of the existing storm drain system for the project areas and determine locations where pipe sizes were deficient and did not meet the design storm capacity. Deficient storm drains are depicted on **Figure 3**.

Tailwater Elevation Assumption

The outfall (36" RCP) tailwater elevation for Southwesterly portion of the site was assumed to be at the top of pipe. This assumption was based on a 2% surface slope at the discharge pipe location from existing topography, thus a similar slope for the pipe was assumed. As-built plans of the 36" RCP were not provided. This assumption had adequately modeled the existing storm drain deficiencies in the event of full-flowing condition in the outfall pipe.

The outfall (27" RCP) tailwater elevation for the Northwesterly portion of the site was assumed to be at the top of pipe. As-built plans of the 27" RCP were not provided. When modeling the discharge pipe with existing flow rates, the 27" RCP was past full-flowing condition. Thus, top of pipe tailwater elevation was assumed for the Northwesterly portion of the site.

The tailwater elevation for the Northeasterly portion of the site was assumed to be at the top of the detention basin elevation.

Proposed Condition

Hydrologic Analysis

Hydrological analysis was conducted for each surface alternative and its respective runoff coefficient were analyzed. The results of the Hydrologic Analysis are located in **Appendix A**.

Option 1 consists of replacing all infields with 6-inches of base with chip seal on top.
Option 2 consists of replacing all infields with 2-inches hot-mixed asphalt with 6" of crushed aggregate base.
Option 3 consists of replacing certain infields with crushed aggregate and the majority of infield with chip seal.
See **Exhibit 2A** for infield surface treatment options and locations.

Runoff Coefficient

Chip Seal is designed to keep water from penetrating the road structure on paved surfaces and to fill seal cracks and raveled surfaces of old pavement. The cost of chip seal is typically 15%-20% of the cost of pavement overlays. There would be no drainage mitigation from implementing chip sealed infields. The runoff coefficient for chip seal will remain at 0.9.

Asphalt Concrete is an impervious surface similar to chip seal. Runoff coefficient of 0.9 was used for drainage evaluation. Drainage patterns would not be altered from implementing asphalt concrete infields.

Crushed Aggregate will have lower runoff coefficient due to the storage volume. 0.35 was used for locations with crushed aggregates.

Kimley»Horn

Chart 1: Surface Alternative Hydrologic Flow Comparison

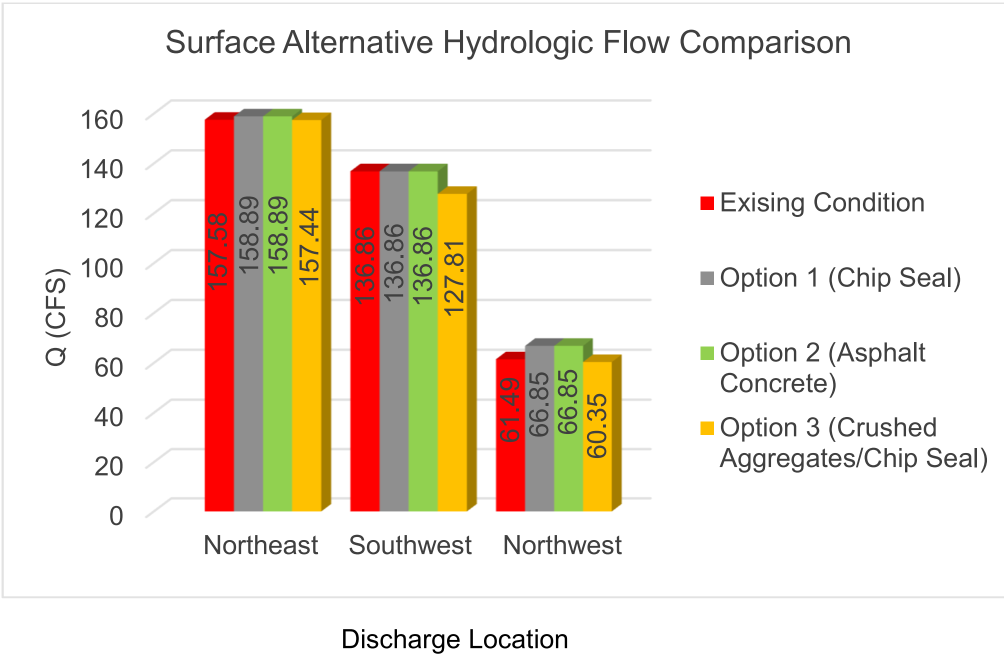
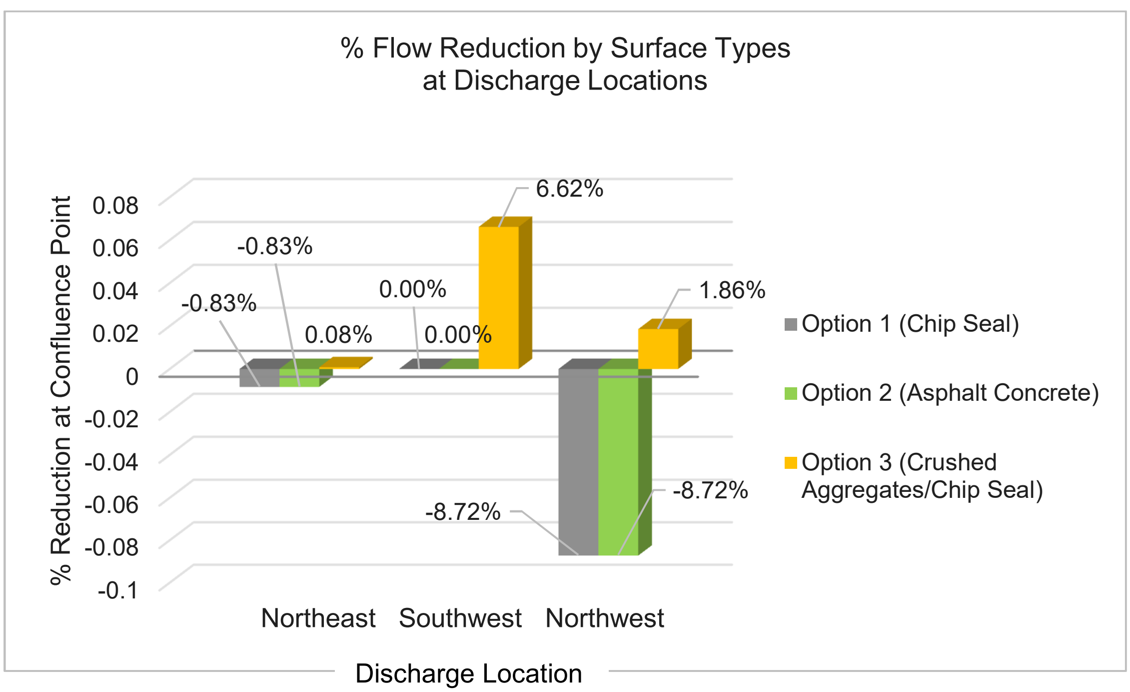


Chart 2: Percent Flow Reduction by Surface Types



*Negative % represents increase in flow.

Hydraulic Analysis

Existing StormCAD model was utilized to verify the capacity of the existing storm drain systems with the project site for each surface alternatives. Analysis and findings at each confluence point are as followed:

- Northeast confluence point – Based on **Chart 1 & 2**, the conversion of natural infields in **Option 1 & 2** to impervious area would increase the runoff by 0.83% for the Northeast confluence point. It would have a negligible effect on the existing storm drain deficiencies for this discharge location. **Option 3** would reduce the runoff at this location by 0.08%.

- Southwest confluence point - Based on **Chart 1 & 2**, the conversion of natural infields in **Option 1 & 2** to impervious area would not have any impact to the existing condition for the Southwest confluence point. This is because additional runoffs generated from the infields does not discharge at this location. It would not have any impact to the existing storm drain deficiencies. **Option 3** would significantly reduce the runoff at this location by 6.62%. However, the reduction in flow will not mitigate the existing storm drain deficiency at this location.

- Northwest confluence point – Based on **Chart 1 & 2**, the conversion of natural infields in **Option 1 & 2** to impervious area would increase the flow by 8.72% compare to the existing condition for the Northwest confluence point. However, this would have minimal impact to the storm drain system since this existing system is not deficient. **Option 3** will reduce the runoff at this location by 1.86%.

Deficient storm drains for all 3 options are shown on **Figure 4, 5, and 6**.

Conclusion

Hydrology and Hydraulics evaluations were conducted for the Monterey Regional Airport. Based on the hydrological analysis, Option 3 will reduce the existing flow at all 3 confluence points. It will assist in the mitigation of storm drain deficiencies within the airport limits. Option 1 and Option 2 increase the hydrologic flow to the Northeast and Northwest confluences. However, the increase is slight enough to be considered negligible. If the airport wanted to address this, they could up-size the existing pipes in the network that are considered deficient (**Figure 2**); in-lieu of upsizing, storm water detention can be utilized. However, no analysis on any proposed alternatives have been performed.

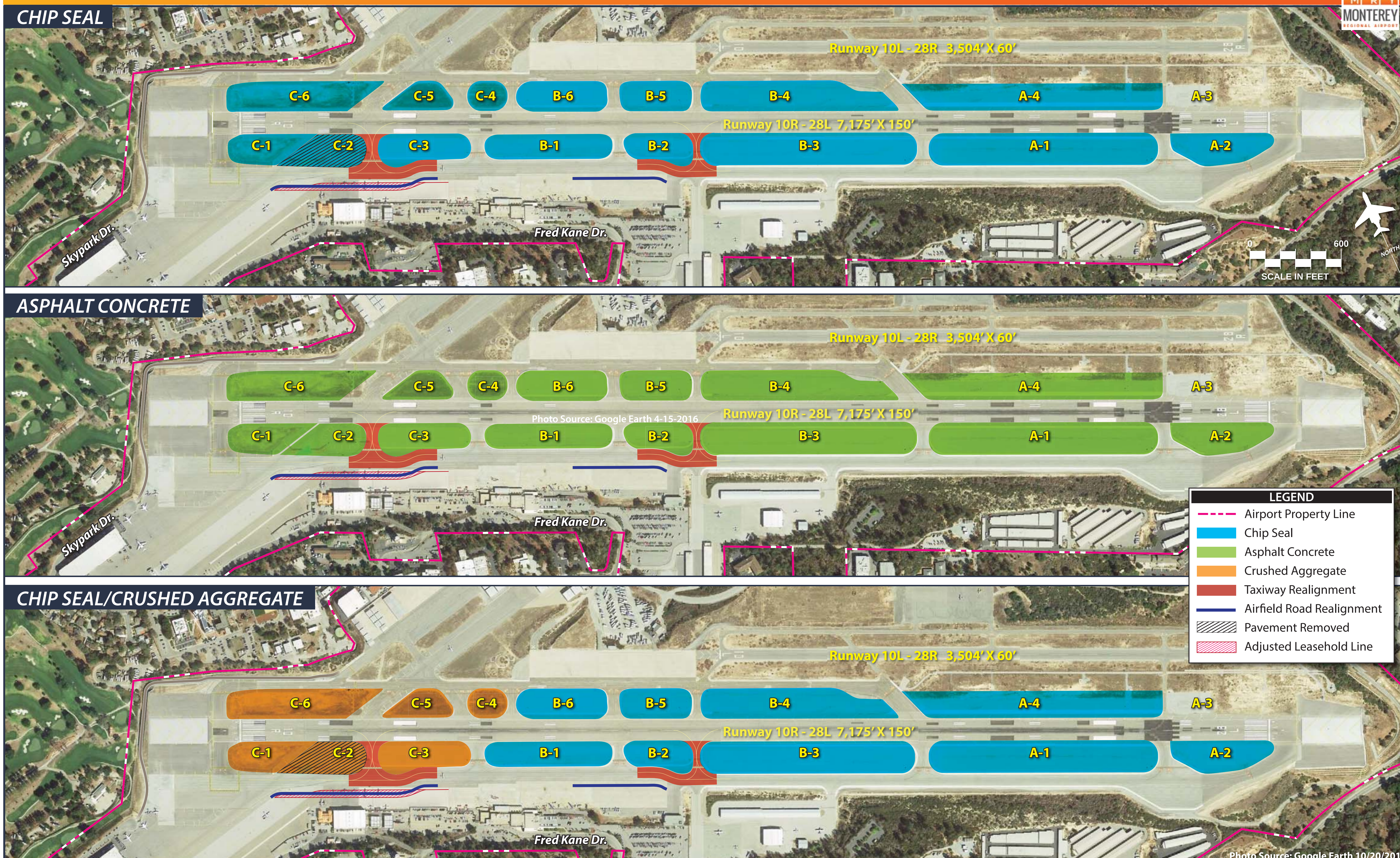


Exhibit 2A
PROPOSED ACTION ALTERNATIVES

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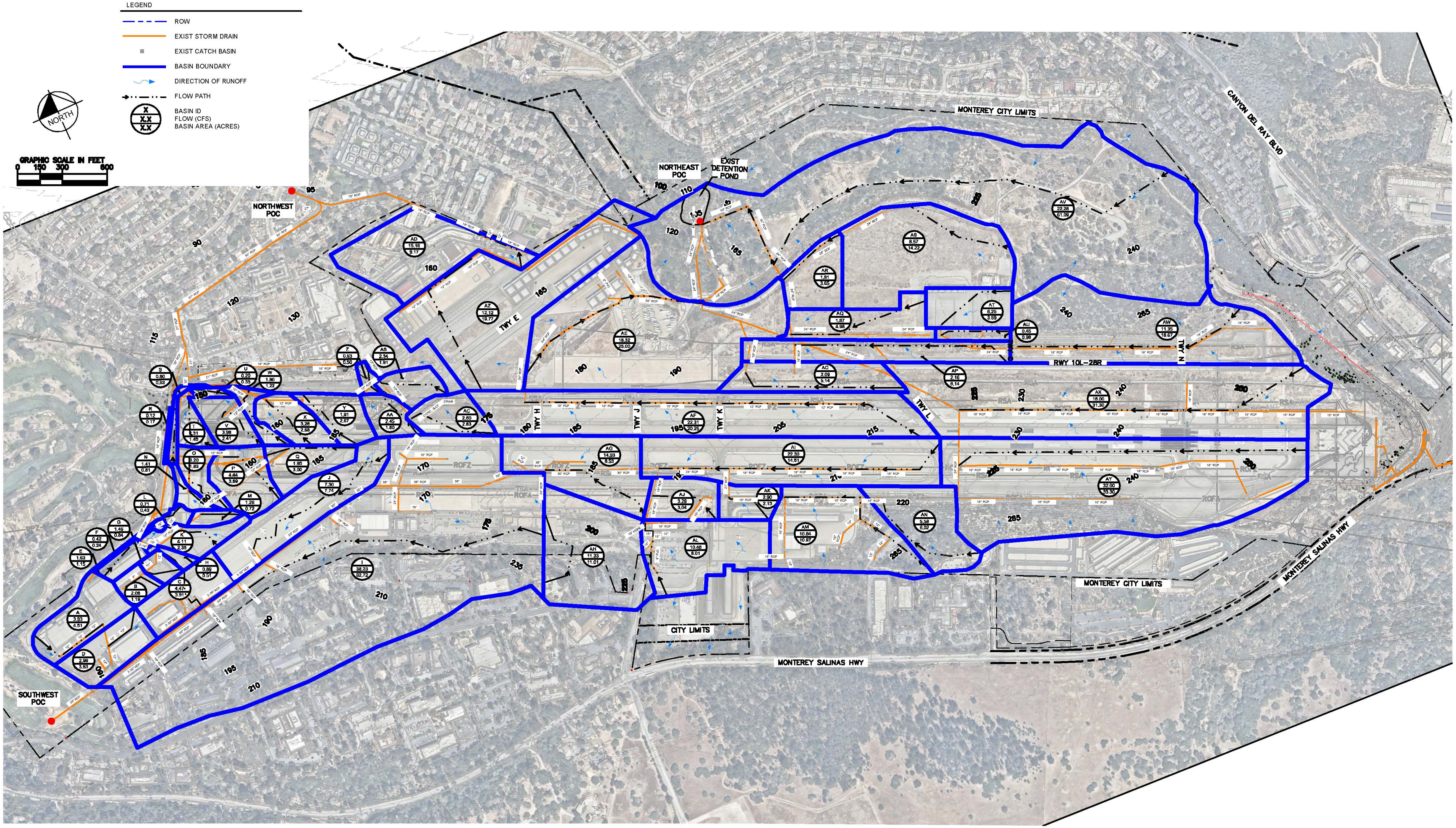

Kimley»Horn

Figure 1
EXISTING HYDROLOGY EXHIBIT
Monterey Airport
March 2018

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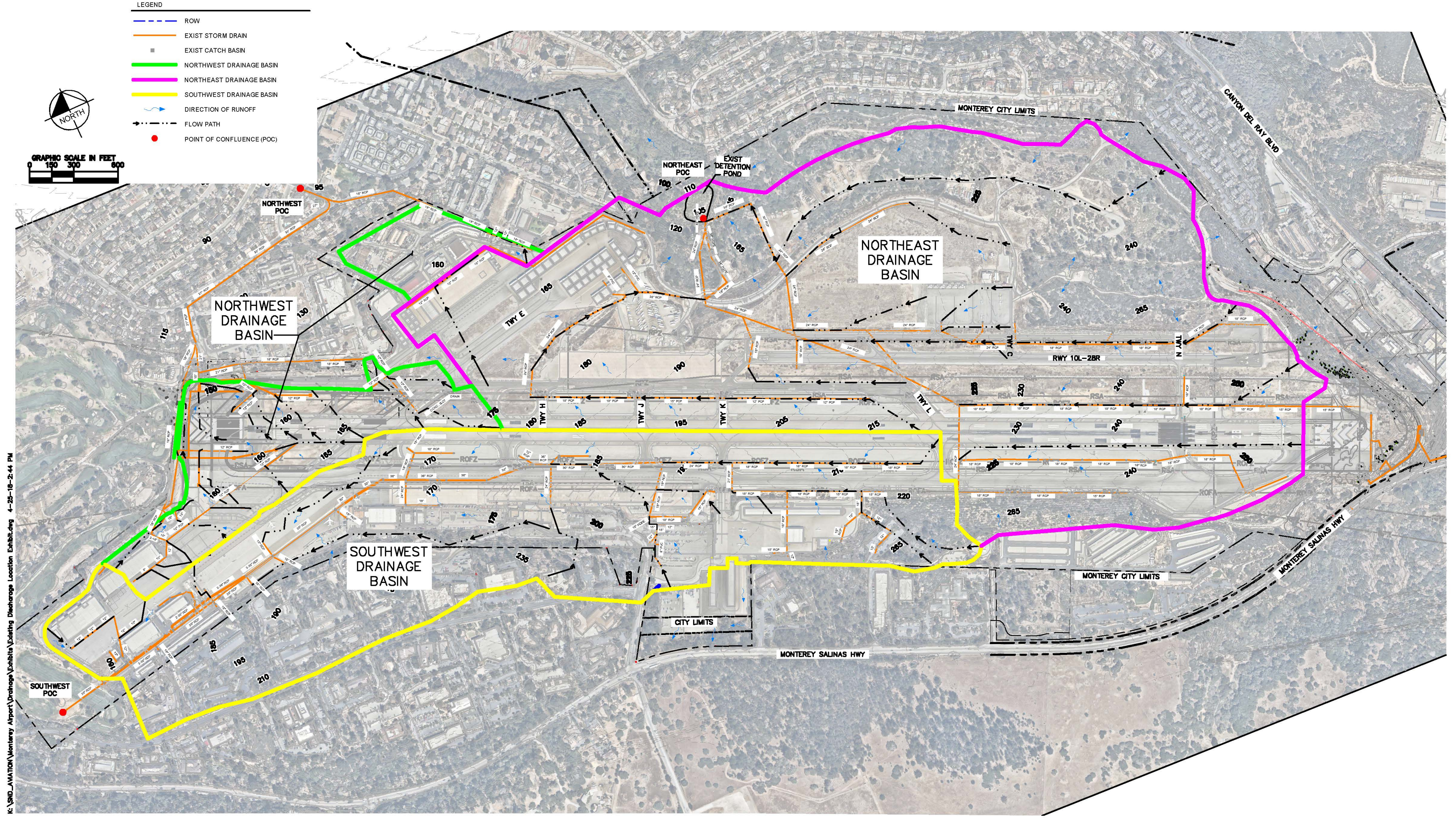

Kimley»Horn

Figure 2
DISCHARGE LOCATION EXHIBIT
Monterey Airport
April 2018

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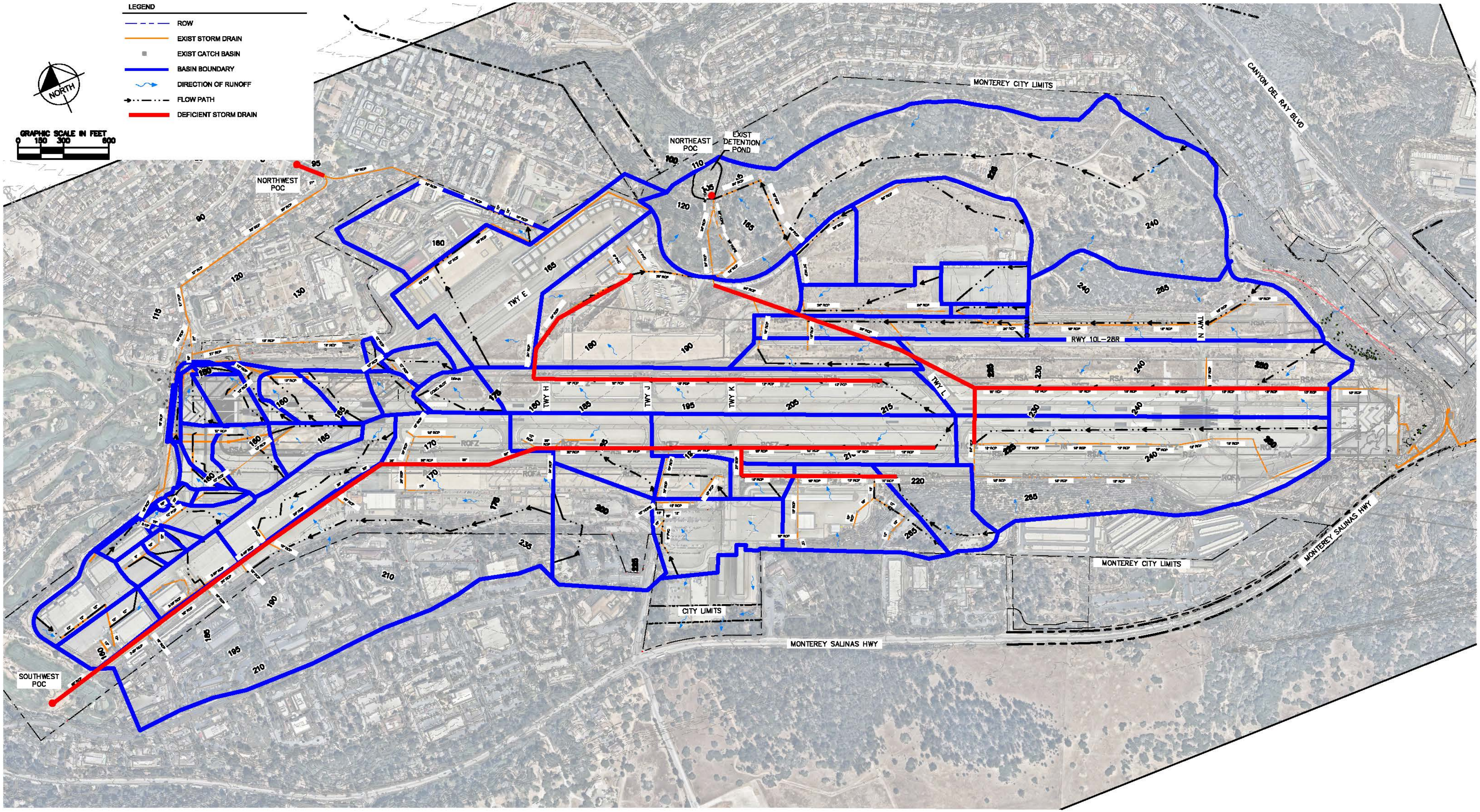

Kimley»Horn

Figure 3
STORM DRAIN SYSTEM DEFICIENCIES
Monterey Airport
April 2018

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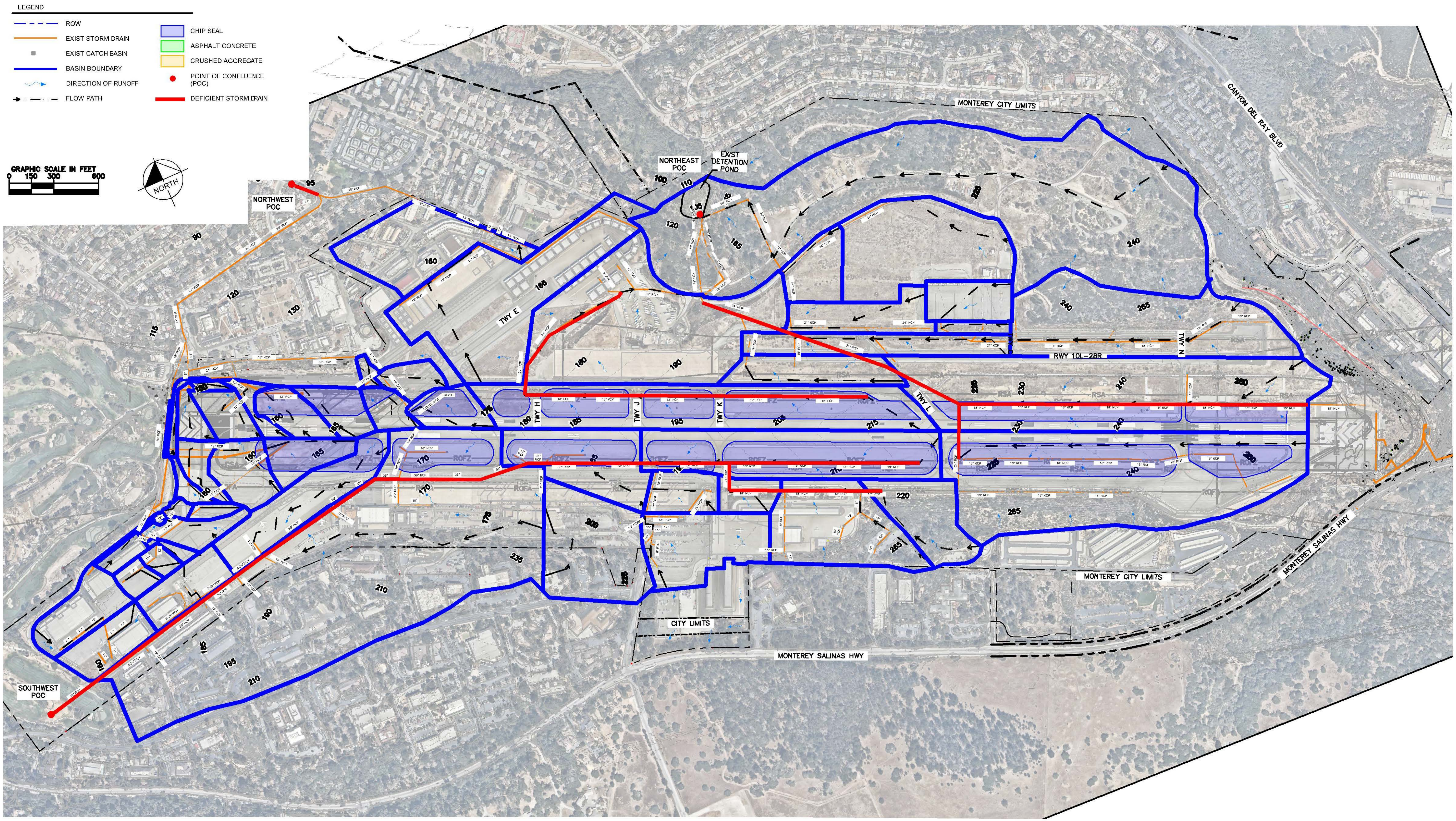

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Figure 4
INFIELD IMPROVEMENT: CHIP SEAL EXHIBIT
Monterey Airport
April 2018

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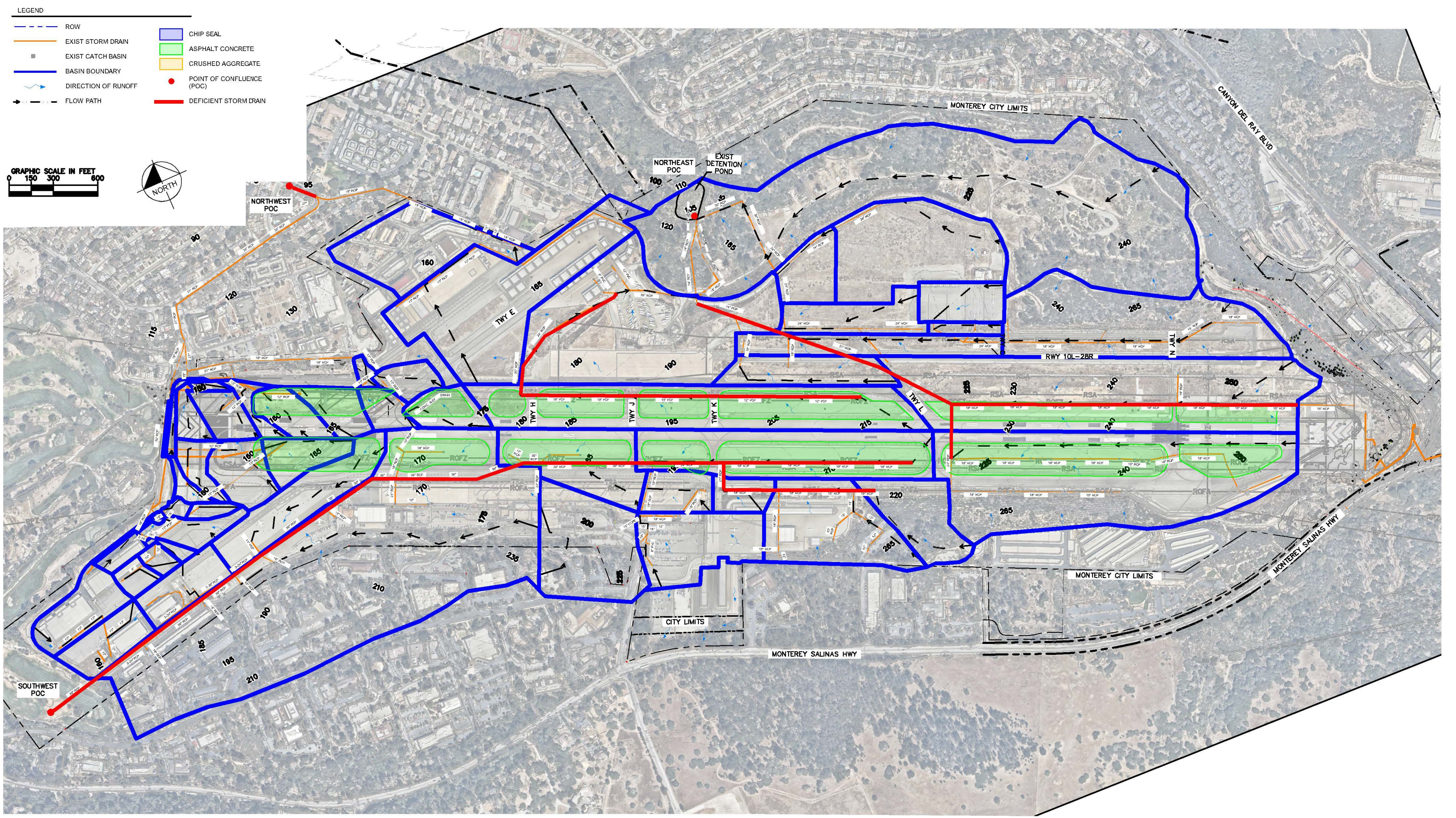

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Figure 5
INFIELD IMPROVEMENT: ASPHALT CONCRETE EXHIBIT
Monterey Airport
April 2018

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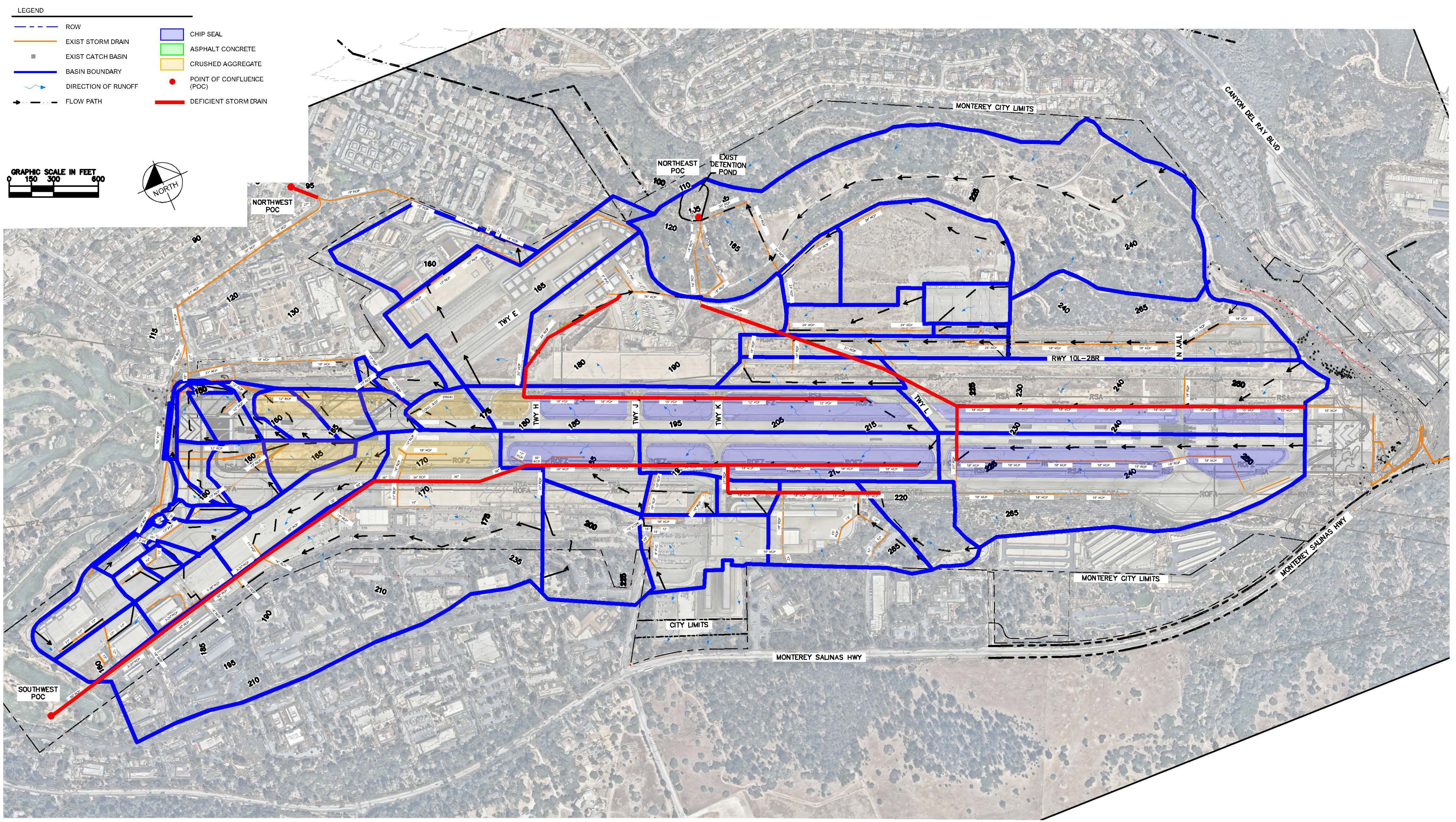

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Figure 6
INFIELD IMPROVEMENT: CRUSHED ROCK/ CHIP SEAL EXHIBIT
Monterey Airport
April 2018

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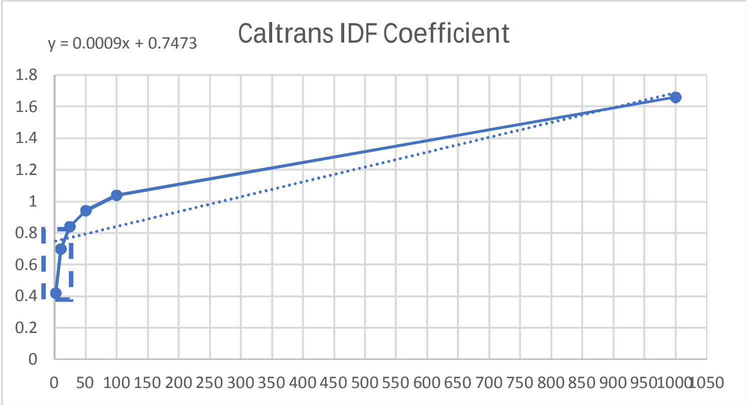
APPENDICES

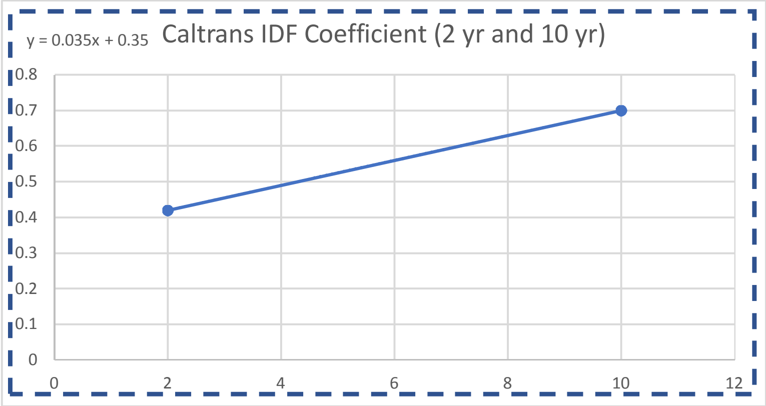
APPENDIX A

HYDROLOGIC ANALYSIS

Existing Hydrology Calculations							
Drainage Basin	Total Area (acres)	Pervious Area (acres)	Impervious Area (acres)	Weighted Runoff Coefficent*	Tc 5-yr-24hr (minutes)	$Intensity_{5yr}$ (in/hr)	Q_5-yr (cfs)
A	4.51	0.45	4.06	0.85	16.82	1.03	3.93
B	1.19	0.00	1.19	0.90	5.00	1.94	2.08
C	3.91	0.04	3.87	0.90	11.11	1.28	4.47
D	3.83	0.96	2.87	0.78	17.41	1.01	2.99
E	1.15	0.01	1.14	0.90	7.36	1.59	1.63
F	0.24	0.00	0.24	0.90	5.00	1.94	0.42
G	0.84	0.01	0.83	0.90	5.00	1.94	1.46
H	0.51	0.00	0.51	0.90	5.00	1.94	0.89
I	62.72	31.36	31.36	0.65	19.96	0.94	38.23
J	7.74	0.00	7.74	0.90	16.17	1.05	7.30
K	2.35	0.00	2.35	0.90	5.00	1.94	4.11
L	0.43	0.04	0.39	0.85	5.00	1.94	0.71
M	0.72	0.00	0.72	0.90	5.00	1.94	1.26
N	0.81	0.01	0.80	0.90	5.00	1.94	1.41
O	1.83	0.00	1.83	0.90	5.00	1.94	3.20
P	3.69	0.37	3.32	0.85	9.13	1.42	4.44
Q	3.00	1.80	1.20	0.60	15.18	1.08	1.95
R	0.17	0.17	0.00	0.40	5.58	1.84	0.12
S	0.63	0.32	0.32	0.65	5.00	1.94	0.80
T	1.40	0.14	1.26	0.85	5.00	1.94	2.31
U	0.35	0.32	0.04	0.45	10.86	1.29	0.20
V	2.41	0.24	2.17	0.85	5.00	1.94	3.98
W	1.22	0.24	0.98	0.80	5.00	1.94	1.90
X	2.68	1.61	1.07	0.60	5.00	1.94	3.13
Y	2.67	1.60	1.07	0.60	10.74	1.30	2.08
Z	0.50	0.25	0.25	0.65	5.00	1.94	0.63
AA	1.80	0.72	1.08	0.70	5.00	1.94	2.45
AB	1.91	0.96	0.96	0.65	5.30	1.89	2.34
AC	2.83	1.98	0.85	0.55	5.80	1.80	2.80
AD	9.17	0.92	8.25	0.85	5.00	1.94	15.16
AE	25.00	10.00	15.00	0.70	16.20	1.05	18.32
AF	20.25	2.03	18.23	0.85	10.80	1.30	22.31
AG	8.53	0.00	8.53	0.90	5.00	1.94	14.93
AH	11.01	6.61	4.40	0.60	6.34	1.72	11.33
AI	14.51	0.00	14.51	0.90	6.40	1.71	22.30
AJ	3.04	0.30	2.74	0.85	11.14	1.28	3.29
AK	2.13	0.85	1.28	0.70	5.00	1.94	2.90
AL	8.01	0.40	7.61	0.88	8.26	1.49	10.46
AM	10.97	5.49	5.49	0.65	7.98	1.52	10.84
AN	6.02	4.21	1.81	0.55	13.06	1.17	3.88
AO	5.14	4.63	0.51	0.45	21.34	0.91	2.09
AP	6.14	4.91	1.23	0.50	34.52	0.70	2.16
AQ	4.98	3.98	1.00	0.50	30.50	0.75	1.87
AR	3.65	3.29	0.37	0.45	14.68	1.10	1.81
AS	14.22	3.56	10.67	0.78	28.50	0.78	8.57
AT	3.59	0.04	3.55	0.90	5.00	1.94	6.25
AU	0.98	0.88	0.10	0.45	17.07	1.02	0.45
AV	61.09	54.98	6.11	0.45	26.32	0.81	22.28
AW	18.67	14.94	3.73	0.50	12.19	1.22	11.35
AX	31.30	21.91	9.39	0.55	20.29	0.93	16.00
AY	33.30	8.33	24.98	0.78	11.75	1.24	32.00
AZ	19.77	3.95	15.82	0.80	29.26	0.77	12.12
						Total:	355.93

NorthEasterly Drainage Area	248.08	Ac		157.58
SouthWesterly Drainage Area	136.86	Ac		136.86
NorthWesterly Drainage Area	61.49	Ac		61.49
Total:	446.44		Total:	355.93





Return Year	Coefficient
2	0.42
10	0.7
25	0.84
50	0.94
100	1.04
1000	1.66

Return Year	Coefficient
2	0.42
10	0.7

5	0.525

Existing Hydrology Calculations								Infield Improvement															
								Asphalt Concrete					Chip Seal					Crushed Aggregates					
Drainage Basin	Total Area (acres)	Pervious Area (acres)	Impervious Area (acres)	Weighted Runoff Coefficent*	Tc 5-yr-24hr (minutes)	$Intensity_{5yr}$ (in/hr)	Q_5-yr (cfs)	Pervious Area (acres)	Impervious Area (acres)	Weighted Runoff Coefficent*	Q5-yr (cfs)	% Reduction	Pervious Area (acres)	Impervious Area (acres)	Weighted Runoff Coefficent*	Q5-yr (cfs)	% Reduction	Pervious Area (acres)	Impervious Area (acres)	Weighted Runoff Coefficent*	Q5-yr (cfs)	% Reduction	
A	4.51	0.45	4.06	0.85	16.82	1.03	3.93																3.93
B	1.19	0.00	1.19	0.90	5.00	1.94	2.08																2.08
C	3.91	0.04	3.87	0.90	11.11	1.28	4.47																4.47
D	3.83	0.96	2.87	0.78	17.41	1.01	2.99																2.99
E	1.15	0.01	1.14	0.90	7.36	1.59	1.63																1.63
F	0.24	0.00	0.24	0.90	5.00	1.94	0.42																0.42
G	0.84	0.01	0.83	0.90	5.00	1.94	1.46																1.46
H	0.51	0.00	0.51	0.90	5.00	1.94	0.89																0.89
I	62.72	31.36	31.36	0.65	19.96	0.94	38.23	31.36	31.36	0.65	38.23	0%	31.36	31.36	0.65	38.23	0%	43.90	18.82	0.515	30.29	21%	38.23
J	7.74	0.00	7.74	0.90	16.17	1.05	7.30	0.00	7.74	0.90	7.30	0%	0.00	7.74	0.90	7.30	0%	1.94	5.81	0.76	6.18	15%	7.30
K	2.35	0.00	2.35	0.90	5.00	1.94	4.11																4.11
L	0.43	0.04	0.39	0.85	5.00	1.94	0.71																0.71
M	0.72	0.00	0.72	0.90	5.00	1.94	1.26																1.26
N	0.81	0.01	0.80	0.90	5.00	1.94	1.41																1.41
O	1.83	0.00	1.83	0.90	5.00	1.94	3.20																3.20
P	3.69	0.37	3.32	0.85	9.13	1.42	4.44																4.44
Q	3.00	1.80	1.20	0.60	15.18	1.08	1.95	0.00	3.00	0.90	2.92	-50%	0.00	3.00	0.90	2.92	-50%	2.70	0.30	0.41	1.32	33%	1.95
R	0.17	0.17	0.00	0.40	5.58	1.84	0.12																0.12
S	0.63	0.32	0.32	0.65	5.00	1.94	0.80																0.80
T	1.40	0.14	1.26	0.85	5.00	1.94	2.31																2.31
U	0.35	0.32	0.04	0.45	10.86	1.29	0.20																0.20
V	2.41	0.24	2.17	0.85	5.00	1.94	3.98																3.98
W	1.22	0.24	0.98	0.80	5.00	1.94	1.90																1.90
X	2.68	1.61	1.07	0.60	5.00	1.94	3.13	0.00	2.68	0.90	4.69	-50%	0.00	2.68	0.90	4.69	-50%	1.61	1.07	0.57	2.97	5%	3.13
Y	2.67	1.60	1.07	0.60	10.74	1.30	2.08	0.00	2.67	0.90	3.12	-50%	0.00	2.67	0.90	3.12	-50%	1.60	1.07	0.57	1.98	5%	2.08
Z	0.50	0.25	0.25	0.65	5.00	1.94	0.63																0.63
AA	1.80	0.72	1.08	0.70	5.00	1.94	2.45	0.72	1.08	0.70	2.45	0%	0.72	1.08	0.70	2.45	0%	0.72	1.08	0.68	2.38	3%	2.45
AB	1.91	0.96	0.96	0.65	5.30	1.89	2.34																2.34
AC	2.83	1.98	0.85	0.55	5.80	1.80	2.80	0.00	2.83	0.90	4.58	-64%	0.00	2.83	0.90	4.58	-64%	1.98	0.85	0.52	2.62	6%	2.80
AD	9.17	0.92	8.25	0.85	5.00	1.94	15.16																15.16
AE	25.00	10.00	15.00	0.70	16.20	1.05	18.32																18.32
AF	20.25	2.03	18.23	0.85	10.80	1.30	22.31	0.00	20.25	0.90	23.62	-6%	0.00	20.25	0.90	23.62	-6%	2.03	18.23	0.85	22.18	1%	22.31
AG	8.53	0.00	8.53	0.90	5.00	1.94	14.93	0.00	8.53	0.90	14.93	0%	0.00	8.53	0.90	14.93	0%						14.93
AH	11.01	6.61	4.40	0.60	6.34	1.72	11.33																11.33
AI	14.51	0.00	14.51	0.90	6.40	1.71	22.30	0.00	14.51	0.90	22.30	0%	0.00	14.51	0.90	22.30	0%						22.30
AJ	3.04	0.30	2.74	0.85	11.14	1.28	3.29																3.29
AK	2.13	0.85	1.28	0.70	5.00	1.94	2.90																2.90
AL	8.01	0.40	7.61	0.88	8.26	1.49	10.46																10.46
AM	10.97	5.49	5.49	0.65	7.98	1.52	10.84																10.84
AN	6.02	4.21	1.81	0.55	13.06	1.17	3.88																3.88
AO	5.14	4.63	0.51	0.45	21.34	0.91	2.09																2.09
AP	6.14	4.91	1.23	0.50	34.52	0.70	2.16																2.16
AQ	4.98	3.98	1.00	0.50	30.50	0.75	1.87																1.87
AR	3.65	3.29	0.37	0.45	14.68	1.10	1.81																1.81
AS	14.22	3.56	10.67	0.78	28.50	0.78	8.57																8.57
AT	3.59	0.04	3.55	0.90	5.00	1.94	6.25																6.25
AU	0.98	0.88	0.10	0.45	17.07	1.02	0.45																0.45
AV	61.09	54.98	6.11	0.45	26.32	0.81	22.28																22.28
AW	18.67	14.94	3.73	0.50	12.19	1.22	11.35																11.35
AX	31.30	21.91	9.39	0.55	20.29	0.93	16.00	21.91	9.39	0.55	16.00	0%	21.91	9.39	0.55	16.00	0%						16.00
AY	33.30	8.33	24.98	0.78	11.75	1.24	32.00	8.33	24.98	0.78	32.00	0%	8.33	24.98	0.78	32.00	0%						32.00
AZ	19.77	3.95	15.82	0.80	29.26	0.77	12.12																12.12
						Total:	355.93																355.93

					Asphalt Concrete Q5-yr (cfs)	Asphalt Concrete % Reduction	Chip Seal Q5-yr (cfs)	Chip Seal % Reduction	Crushed Aggregates Q5-yr (cfs)	Crushed Aggregates % Reduction
NorthEasterly Drainage Area	248.08	Ac	157.58	cfs	158.89	-1%	158.89	-1%	157.44	0%
SouthWesterly Drainage Area	136.86	Ac	136.86	cfs	136.86	0%	136.86	0%	127.81	7%
NorthWesterly Drainage Area	61.49	Ac	61.49	cfs	66.85	-9%	66.85	-9%	60.35	2%

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Basin **A** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.26	1.91	1.85
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0091	0.0091	0.0091	0.0091
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.95	3.23	3.29
Tti (min) [e	2.3	1.9	1.8	1.8

Tti = 1.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.74
V (ft/s) [ec	1.746547
L (ft)	178.9685
Tt (min) [ec	1.71

Tti = 3.54 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.0001
V (ft/s)	0.45
L (ft)	362.4853
Tt (min)	13.28

Tti = 16.82 min

Basin **B** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.47	2.13	2.06
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0068	0.0068	0.0068	0.0068
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.82	3.05	3.10
Tti (min) [e	2.5	2.1	2.1	2.0

Tti = 2.0 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.72
V (ft/s) [ec	1.722784
L (ft)	221.1559
Tt (min) [ec	2.14

Tti = 4.19 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.3333
R (ft)	0.16665
s (ft/ft)	0.05
V (ft/s)	7.76
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin C (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	5.32	5.39	5.41
n	0.013	0.013	0.013	0.013
L (ft)	100	100	100	100
S (ft/ft)	0.0021	0.0021	0.0021	0.0021
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.88	1.87	1.87
Tti (min) [e	5.3	5.4	5.4	5.4

Tti = 5.4 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.74
V (ft/s) [ec	1.746547
L (ft)	277.29
Tt (min) [ec	2.65

Tti = 8.06 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.3333
R (ft)	0.16665
s (ft/ft)	0.0007
V (ft/s)	0.92
L (ft)	168.33
Tt (min)	3.06

Tti = 11.11 min

Basin D (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	6.29	6.61	6.68
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0003	0.0003	0.0003	0.0003
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.72	1.68	1.67
Tti (min) [e	6.3	6.6	6.7	6.7

Tti = 6.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.01
V (ft/s) [ec	0.203032
L (ft)	98.152
Tt (min) [ec	8.06

Tti = 14.75 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.0007
V (ft/s)	1.20
L (ft)	192.16
Tt (min)	2.66

Tti = 17.41 min

Basin E (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.76	2.43	2.37
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0047	0.0047	0.0047	0.0047
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.66	2.84	2.88
Tti (min) [e	2.8	2.4	2.4	2.4

Tti = 2.4 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.43
V (ft/s) [ec	1.33137
L (ft)	399.6278
Tt (min) [ec	5.00

Tti = 7.36 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 7.36 min

Basin F (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.28	0.96	0.91
n	0.013	0.013	0.013	0.013
L (ft)	25	25	25	25
S (ft/ft)	0.015	0.015	0.015	0.015
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.98	4.63	4.78
Tti (min) [e	1.3	1.0	0.9	0.9

Tti = 0.9 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.01
V (ft/s) [ec	0.203032
L (ft)	43.3844
Tt (min) [ec	3.56

Tti = 4.46 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin G (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.19	1.84	1.77
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0102	0.0102	0.0102	0.0102
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.01	3.30	3.36
Tti (min) [e	2.2	1.8	1.8	1.8

Tti = 1.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.87
V (ft/s) [ec	1.893756
L (ft)	194.9156
Tt (min) [ec	1.72

Tti = 3.47 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin H (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.78	1.43	1.37
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0203	0.0203	0.0203	0.0203
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.35	3.76	3.85
Tti (min) [e	1.8	1.4	1.4	1.4

Tti = 1.4 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.59
V (ft/s) [ec	2.560136
L (ft)	174.6062
Tt (min) [ec	1.14

Tti = 2.49 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin **I** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	3.17	2.88	2.82
n	0.013	0.013	0.013	0.013
L (ft)	100	100	100	100
S (ft/ft)	0.0118	0.0118	0.0118	0.0118
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.47	2.60	2.63
Tti (min) [e	3.2	2.9	2.8	2.8

Tti = 2.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.96
V (ft/s) [ec	1.989299
L (ft)	2046.492
Tt (min) [ec	17.15

Tti = 19.96 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 19.96 min

Basin **J** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.20	1.85	1.78
n	0.013	0.013	0.013	0.013
L (ft)	25	25	25	25
S (ft/ft)	0.0025	0.0025	0.0025	0.0025
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.00	3.29	3.35
Tti (min) [e	2.2	1.8	1.8	1.8

Tti = 1.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.47
V (ft/s) [ec	1.391917
L (ft)	1203.103
Tt (min) [ec	14.41

Tti = 16.17 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 16.17 min

Basin K (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.15	1.80	1.73
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0108	0.0108	0.0108	0.0108
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.04	3.33	3.40
Tti (min) [e	2.1	1.8	1.7	1.7

Tti = 1.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.5
V (ft/s) [ec	2.486624
L (ft)	339.6108
Tt (min) [ec	2.28

Tti = 3.99 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.005
V (ft/s)	3.22
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin L (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.68	1.34	1.27
n	0.013	0.013	0.013	0.013
L (ft)	20	20	20	20
S (ft/ft)	0.0039	0.0039	0.0039	0.0039
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.45	3.90	4.00
Tti (min) [e	1.7	1.3	1.3	1.3

Tti = 1.3 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	0.57
V (ft/s) [ec	1.532858
L (ft)	130.1432
Tt (min) [ec	1.42

Tti = 2.68 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.005
V (ft/s)	4.21
L (ft)	0.00
Tt (min)	0.00

Tti = 5.00 min

Basin **M** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	0.55	0.34	0.31
n	0.013	0.013	0.013	0.013
L (ft)	7	7	7	7
S (ft/ft)	0.02	0.02	0.02	0.02
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	6.23	7.96	8.39
Tti (min) [e	0.5	0.3	0.3	0.3

Tti = 0.3 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.42
V (ft/s) [eq	2.419406
L (ft)	266.8243
Tt (min) [ec	1.84

Tti = 2.14 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.005
V (ft/s)	4.21
L (ft)	0.00
Tt (min)	0.00

Tti = 5.00 min

Basin **N** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.97	1.62	1.56
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0143	0.0143	0.0143	0.0143
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.17	3.52	3.60
Tti (min) [e	2.0	1.6	1.6	1.5

Tti = 1.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.43
V (ft/s) [eq	2.42791
L (ft)	177.9289
Tt (min) [ec	1.22

Tti = 2.77 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin **O** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration			
	1	2	3	4
Tti (min) [a	5	1.91	1.56	1.49
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.016	0.016	0.016	0.016
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.23	3.59	3.68
Tti (min) [e	1.9	1.6	1.5	1.5

Tti = 1.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.63
V (ft/s) [eq	2.592139
L (ft)	474.2657
Tt (min) [ec	3.05

Tti = 4.53 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin **P** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration			
	1	2	3	4
Tti (min) [a	5	4.41	4.30	4.27
n	0.013	0.013	0.013	0.013
L (ft)	200	200	200	200
S (ft/ft)	0.0157	0.0157	0.0157	0.0157
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.08	2.11	2.11
Tti (min) [e	4.4	4.3	4.3	4.3

Tti = 4.3 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	2.23
V (ft/s) [eq	1.043292
L (ft)	304.6132
Tt (min) [ec	4.87

Tti = 9.13 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 9.13 min

Basin Q (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	3.65	3.41	3.36
n	0.013	0.013	0.013	0.013
L (ft)	100	100	100	100
S (ft/ft)	0.0074	0.0074	0.0074	0.0074
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.30	2.38	2.40
Tti (min) [e	3.6	3.4	3.4	3.4

Tti = 3.4 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	1.06
V (ft/s) [eq	0.719294
L (ft)	510.4358
Tt (min) [ec	11.83

Tti = 15.18 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 15.18 min

Basin R (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.69	2.36	2.30
n	0.15	0.15	0.15	0.15
L (ft)	25	25	25	25
S (ft/ft)	0.1696	0.1696	0.1696	0.1696
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.70	2.89	2.93
Tti (min) [e	2.7	2.4	2.3	2.3

Tti = 2.3 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	5.43
V (ft/s) [eq	1.627996
L (ft)	322.0851
Tt (min) [ec	3.30

Tti = 5.58 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.58 min

Basin S (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.26	1.91	1.84
n	0.013	0.013	0.013	0.013
L (ft)	30	30	30	30
S (ft/ft)	0.0033	0.0033	0.0033	0.0033
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.96	3.23	3.29
Tti (min) [e	2.3	1.9	1.8	1.8

Tti = 1.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	7.02
V (ft/s) [eq	1.851066
L (ft)	350.4623
Tt (min) [ec	3.16

Tti = 4.98 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin T (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.43	1.10	1.04
n	0.013	0.013	0.013	0.013
L (ft)	24	24	24	24
S (ft/ft)	0.0096	0.0096	0.0096	0.0096
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.76	4.32	4.45
Tti (min) [e	1.4	1.1	1.0	1.0

Tti = 1.0 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.9
V (ft/s) [eq	2.798603
L (ft)	418.2284
Tt (min) [ec	2.49

Tti = 3.52 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin **U** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	7.62	8.33	8.49
n	0.15	0.15	0.15	0.15
L (ft)	50	50	50	50
S (ft/ft)	0.0211	0.0211	0.0211	0.0211
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.56	1.49	1.47
Tti (min) [e	7.6	8.3	8.5	8.5

Tti = 8.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	5.89
V (ft/s) [eq	1.695552
L (ft)	238.2569
Tt (min) [ec	2.34

Tti = 10.86 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.005
V (ft/s)	3.22
L (ft)	0
Tt (min)	0.00

Tti = 10.86 min

Basin **V** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.93	1.58	1.51
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0155	0.0155	0.0155	0.0155
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.21	3.57	3.65
Tti (min) [e	1.9	1.6	1.5	1.5

Tti = 1.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.97
V (ft/s) [eq	2.84969
L (ft)	347.1829
Tt (min) [ec	2.03

Tti = 3.53 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.005
V (ft/s)	4.21
L (ft)	0.00
Tt (min)	0.00

Tti = 5.00 min

Basin W (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	3.01	2.71	2.65
n	0.013	0.013	0.013	0.013
L (ft)	100	100	100	100
S (ft/ft)	0.014	0.014	0.014	0.014
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.54	2.69	2.72
Tti (min) [e	3.0	2.7	2.6	2.6

Tti = 2.6 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.87
V (ft/s) [eq	2.776421
L (ft)	385.3226
Tt (min) [ec	2.31

Tti = 4.95 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.005
V (ft/s)	4.21
L (ft)	0.00
Tt (min)	0.00

Tti = 5.00 min

Basin X (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.15	1.80	1.74
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0107	0.0107	0.0107	0.0107
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.03	3.33	3.39
Tti (min) [e	2.2	1.8	1.7	1.7

Tti = 1.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.69
V (ft/s) [eq	2.639416
L (ft)	389.2567
Tt (min) [ec	2.46

Tti = 4.18 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin **Y** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.95	1.60	1.53
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.015	0.015	0.015	0.015
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.20	3.55	3.63
Tti (min) [e	1.9	1.6	1.5	1.5

Tti = 1.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	1.66
V (ft/s) [eq	0.900135
L (ft)	498.1779
Tt (min) [ec	9.22

Tti = 10.74 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 10.74 min

Basin **Z** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.12	1.77	1.71
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0112	0.0112	0.0112	0.0112
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.05	3.36	3.43
Tti (min) [e	2.1	1.8	1.7	1.7

Tti = 1.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	8.55
V (ft/s) [eq	5.936733
L (ft)	198.7348
Tt (min) [ec	0.56

Tti = 2.25 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin **AA** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration			
	1	2	3	4
Tti (min) [a	5	2.25	1.90	1.83
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0093	0.0093	0.0093	0.0093
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.96	3.24	3.30
Tti (min) [e	2.2	1.9	1.8	1.8

Tti =	1.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.82
V (ft/s) [eq	2.739051
L (ft)	453.441
Tt (min) [ec	2.76

Tti =	4.58 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti =	5.00 min

Basin **AB** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration			
	1	2	3	4
Tti (min) [a	5	2.99	2.68	2.62
n	0.013	0.013	0.013	0.013
L (ft)	100	100	100	100
S (ft/ft)	0.0144	0.0144	0.0144	0.0144
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.55	2.70	2.73
Tti (min) [e	3.0	2.7	2.6	2.6

Tti =	2.6 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.35
V (ft/s) [eq	2.359019
L (ft)	381.0673
Tt (min) [ec	2.69

Tti =	5.30 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti =	5.30 min

Basin AC (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.93	2.62	2.56
n	0.013	0.013	0.013	0.013
L (ft)	100	100	100	100
S (ft/ft)	0.0153	0.0153	0.0153	0.0153
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.58	2.73	2.77
Tti (min) [e	2.9	2.6	2.6	2.5

Tti = 2.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.61
V (ft/s) [eq	2.576187
L (ft)	502.4874
Tt (min) [ec	3.25

Tti = 5.80 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.80 min

Basin AD (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.98	1.63	1.56
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0142	0.0142	0.0142	0.0142
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.17	3.51	3.59
Tti (min) [e	2.0	1.6	1.6	1.5

Tti = 1.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	5.59
V (ft/s) [eq	4.800322
L (ft)	225.6789
Tt (min) [ec	0.78

Tti = 2.33 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.0366
V (ft/s)	8.70
L (ft)	233.7511
Tt (min)	0.45

Tti = 5.00 min

Basin **AG** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.14	1.79	1.73
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0109	0.0109	0.0109	0.0109
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.04	3.34	3.41
Tti (min) [e	2.1	1.8	1.7	1.7

Tti = 1.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	2.02
V (ft/s) [eq	2.885627
L (ft)	492.5773
Tt (min) [ec	2.85

Tti = 4.56 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	1.25
R (ft)	0.625
s (ft/ft)	0.0166
V (ft/s)	10.79
L (ft)	246.8572
Tt (min)	0.38

Tti = 5.00 min

Basin **AH** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	3.24	2.95	2.90
n	0.013	0.013	0.013	0.013
L (ft)	100	100	100	100
S (ft/ft)	0.011	0.011	0.011	0.011
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.45	2.57	2.59
Tti (min) [e	3.2	3.0	2.9	2.9

Tti = 2.9 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	16.15
V (ft/s) [eq	2.807629
L (ft)	582.6109
Tt (min) [ec	3.46

Tti = 6.34 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 6.34 min

Basin **AI** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	2.25	1.90	1.83
n	0.013	0.013	0.013	0.013
L (ft)	75	75	75	75
S (ft/ft)	0.0209	0.0209	0.0209	0.0209
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.96	3.24	3.30
Tti (min) [e	2.2	1.9	1.8	1.8

Tti = 1.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.76
V (ft/s) [eq	2.693524
L (ft)	151.4535
Tt (min) [eq	0.94

Tti = 2.76 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.0158
V (ft/s)	7.49
L (ft)	1279.07
Tt (min)	2.85

Tti = 5.60 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	1
R (ft)	0.5
s (ft/ft)	0.0185
V (ft/s)	9.82
L (ft)	470.429
Tt (min)	0.80

Tti = 6.40 min

Basin **AJ** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	7.79	8.56	8.73
n	0.15	0.15	0.15	0.15
L (ft)	100	100	100	100
S (ft/ft)	0.0784	0.0784	0.0784	0.0784
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.54	1.47	1.45
Tti (min) [e	7.8	8.6	8.7	8.8

Tti = 8.8 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.94
V (ft/s) [eq	2.827909
L (ft)	403.1462
Tt (min) [eq	2.38

Tti = 11.14 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.005
V (ft/s)	3.22
L (ft)	0
Tt (min)	0.00

Tti = 11.14 min

Basin AK (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	3.25	2.96	2.91
n	0.013	0.013	0.013	0.013
L (ft)	120	120	120	120
S (ft/ft)	0.0157	0.0157	0.0157	0.0157
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.44	2.56	2.59
Tti (min) [e	3.2	3.0	2.9	2.9

Tti = 2.9 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	6.36
V (ft/s) [eq	1.761903
L (ft)	217.3747
Tt (min) [ec	2.06

Tti = 4.95 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.005
V (ft/s)	4.21
L (ft)	0.00
Tt (min)	0.00

Tti = 5.00 min

Basin AL (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	6.29	6.61	6.68
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0003	0.0003	0.0003	0.0003
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.72	1.68	1.67
Tti (min) [e	6.3	6.6	6.7	6.7

Tti = 6.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.31
V (ft/s) [eq	2.323807
L (ft)	118.1392
Tt (min) [ec	0.85

Tti = 7.54 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.3333
R (ft)	0.16665
s (ft/ft)	0.023
V (ft/s)	5.26
L (ft)	228.02
Tt (min)	0.72

Tti = 8.26 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.625
R (ft)	0.3125
s (ft/ft)	0.07
V (ft/s)	13.96
L (ft)	171.39
Tt (min)	0.20

Tti = 8.46 min

Basin AM (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	4.44	4.33	4.31
n	0.15	0.15	0.15	0.15
L (ft)	50	50	50	50
S (ft/ft)	0.1275	0.1275	0.1275	0.1275
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.07	2.10	2.10
Tti (min) [e	4.4	4.3	4.3	4.3

Tti = 4.3 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	13.7
V (ft/s) [ec	2.585912
L (ft)	292.041
Tt (min) [ec	1.88

Tti = 6.19 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.159
V (ft/s)	18.14
L (ft)	244.52
Tt (min)	0.22

Tti = 6.41 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.625
R (ft)	0.3125
s (ft/ft)	0.0193
V (ft/s)	7.33
L (ft)	141.50
Tt (min)	0.32

Tti = 6.74 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.625
R (ft)	0.3125
s (ft/ft)	0.0141
V (ft/s)	6.27
L (ft)	251.72
Tt (min)	0.67

Tti = 7.40 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.0152
V (ft/s)	7.35
L (ft)	255.07
Tt (min)	0.58

Tti = 7.98 min

Basin AN (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.62	1.28	1.22
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0276	0.0276	0.0276	0.0276
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.52	3.99	4.10
Tti (min) [e	1.6	1.3	1.2	1.2

Tti = 1.2 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	12.85
V (ft/s) [ec	2.504408
L (ft)	806.1757
Tt (min) [ec	5.37

Tti = 6.57 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.005
V (ft/s)	4.21
L (ft)	0.00
Tt (min)	0.00

Tti = 6.57 min

Basin **AV** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	7.91	8.71	8.89
n	0.15	0.15	0.15	0.15
L (ft)	100	100	100	100
S (ft/ft)	0.0746	0.0746	0.0746	0.0746
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.53	1.45	1.44
Tti (min) [e	7.9	8.7	8.9	8.9

Tti = 8.9 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	2
V (ft/s) [ec	2.871306
L (ft)	2922.338
Tt (min) [ec	16.96

Tti = 25.89 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	1.25
R (ft)	0.625
s (ft/ft)	0.1273
V (ft/s)	29.89
L (ft)	757.12
Tt (min)	0.42

Tti = 26.32 min

Basin **AO** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.64	1.30	1.24
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0263	0.0263	0.0263	0.0263
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.49	3.95	4.06
Tti (min) [e	1.6	1.3	1.2	1.2

Tti = 1.2 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	1.62
V (ft/s) [ec	0.889224
L (ft)	1073.262
Tt (min) [ec	20.12

Tti = 21.34 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.005
V (ft/s)	4.21
L (ft)	0.00
Tt (min)	0.00

Tti = 21.34 min

Basin **AZ** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	18.85	21.68	22.33
n	0.15	0.15	0.15	0.15
L (ft)	200	200	200	200
S (ft/ft)	0.0165	0.0263	0.0263	0.0263
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	0.97	0.90	0.88
Tti (min) [e	18.9	21.7	22.3	22.5

Tti = 22.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.35
V (ft/s) [eq	2.359019
L (ft)	560.4748
Tt (min) [eq	3.96

Tti = 26.43 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.0019
V (ft/s)	1.98
L (ft)	242.51
Tt (min)	2.04

Tti = 28.47 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.625
R (ft)	0.3125
s (ft/ft)	0.0024
V (ft/s)	2.59
L (ft)	122.29
Tt (min)	0.79

Tti = 29.26 min

Basin **AY** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

Iteration	1	2	3	4
Tti (min) [assumed]	5	5.48	5.59	5.61
n	0.013	0.013	0.013	0.013
L (ft)	200	200	200	200
S (ft/ft)	0.0076	0.0076	0.0076	0.0076
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.85	1.83	1.83
Tti (min) [equated]	5.5	5.6	5.6	5.6

Tti = 5.6 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.86
V (ft/s) [equated]	2.768987
L (ft)	308.77
Tt (min) [equated]	1.86

Tti = 7.48 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.0146
V (ft/s)	7.20
L (ft)	1846
Tt (min)	4.27

Tti = 11.75 min

Basin **AF** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

Iteration	1	2	3	4
Tti (min) [a	5	3.50	3.25	3.20
n	0.013	0.013	0.013	0.013
L (ft)	150	150	150	150
S (ft/ft)	0.0191	0.0191	0.0191	0.0191
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	2.35	2.44	2.46
Tti (min) [e	3.5	3.2	3.2	3.2

Tti = 3.2 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	2.36
V (ft/s) [ec	3.119037
L (ft)	279.24
Tt (min) [ec	1.49

Tti = 4.68 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.0148
V (ft/s)	5.53
L (ft)	1094.195
Tt (min)	3.30

Tti = 7.97 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.625
R (ft)	0.3125
s (ft/ft)	0.0146
V (ft/s)	6.38
L (ft)	384.2447
Tt (min)	1.00

Tti = 8.98 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.016
V (ft/s)	7.54
L (ft)	824.8785
Tt (min)	1.82

Tti = 10.80 min

Basin AX (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	6.53	6.90	6.99
n	0.15	0.15	0.15	0.15
L (ft)	50	50	50	50
S (ft/ft)	0.0354	0.0354	0.0354	0.0354
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.69	1.64	1.63
Tti (min) [e	6.5	6.9	7.0	7.0

Tti = 7.0 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	1.9
V (ft/s) [eq	0.963009
L (ft)	519.0495
Tt (min) [ec	8.98

Tti = 15.99 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
S (ft/ft)	0.0143
V (ft/s)	7.13
L (ft)	1839.613
Tt (min)	4.30

Tti = 20.29 min

Basin AE (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	9.75	11.22	11.56
n	0.15	0.15	0.15	0.15
L (ft)	50	50	50	50
S (ft/ft)	0.0093	0.0093	0.0093	0.0093
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.37	1.27	1.25
Tti (min) [e	9.7	11.2	11.6	11.6

Tti = 11.6 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	3.2
V (ft/s) [eq	1.253665
L (ft)	70.1014
Tt (min) [ec	0.93

Tti = 12.56 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	1
R (ft)	0.5
s (ft/ft)	0.0101
V (ft/s)	7.26
L (ft)	789.6957
Tt (min)	1.81

Tti = 14.37 min

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	1.5
R (ft)	0.75
s (ft/ft)	0.0031
V (ft/s)	5.27
L (ft)	577.9365
Tt (min)	1.83

Tti = 16.20 min

Basin AP (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	8.06	8.92	9.11
n	0.15	0.15	0.15	0.15
L (ft)	50	50	50	50
S (ft/ft)	0.0175	0.0175	0.0175	0.0175
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.51	1.43	1.42
Tti (min) [e	8.1	8.9	9.1	9.1

Tti = 9.1 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	1.8
V (ft/s) [eq	0.934717
L (ft)	1422.79
Tt (min) [ec	25.37

Tti = 34.52 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2)

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.0174
V (ft/s)	6.00
L (ft)	0
Tt (min)	0.00

Tti = 34.52 min

Basin AW (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	7.15	7.71	7.83
n	0.15	0.15	0.15	0.15
L (ft)	50	50	50	50
S (ft/ft)	0.0261	0.0261	0.0261	0.0261
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.61	1.55	1.53
Tti (min) [e	7.2	7.7	7.8	7.9

Tti = 7.9 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	7.52
V (ft/s) [eq	1.915854
L (ft)	140.5937
Tt (min) [ec	1.22

Tti = 9.08 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.0163
V (ft/s)	7.61
L (ft)	1417.908
Tt (min)	3.11

Tti = 12.19 min

Basin **AQ** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration			
	1	2	3	4
Tti (min) [a	5	11.76	14.08	14.63
n	0.15	0.15	0.15	0.15
L (ft)	100	100	100	100
S (ft/ft)	0.0199	0.0199	0.0199	0.0199
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.24	1.13	1.10
Tti (min) [e	11.8	14.1	14.6	14.7

Tti = 14.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	1.66
V (ft/s) [eq	0.900135
L (ft)	850.9614
Tt (min) [ec	15.76

Tti = 30.50 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	1
R (ft)	0.5
s (ft/ft)	0.0156
V (ft/s)	9.02
L (ft)	0
Tt (min)	0.00

Tti = 30.50 min

Basin **AU** (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration			
	1	2	3	4
Tti (min) [a	5	7.76	8.51	8.68
n	0.15	0.15	0.15	0.15
L (ft)	50	50	50	50
S (ft/ft)	0.0199	0.0199	0.0199	0.0199
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.54	1.47	1.45
Tti (min) [e	7.8	8.5	8.7	8.7

Tti = 8.7 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	1.45
V (ft/s) [eq	0.841274
L (ft)	421.9299
Tt (min) [ec	8.36

Tti = 17.07 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.75
R (ft)	0.375
s (ft/ft)	0.02
V (ft/s)	8.43
L (ft)	0.00
Tt (min)	0.00

Tti = 17.07 min

Basin AT (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	1.81	1.46	1.39
n	0.013	0.013	0.013	0.013
L (ft)	50	50	50	50
S (ft/ft)	0.0192	0.0192	0.0192	0.0192
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	3.32	3.72	3.81
Tti (min) [e	1.8	1.5	1.4	1.4

Tti = 1.4 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.619
S (%)	1.52
V (ft/s) [ec	2.503147
L (ft)	514.6113
Tt (min) [ec	3.43

Tti = 4.81 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.05
V (ft/s)	10.17
L (ft)	0
Tt (min)	0.00

Tti = 5.00 min

Basin AR (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	8.92	10.08	10.34
n	0.15	0.15	0.15	0.15
L (ft)	30	30	30	30
S (ft/ft)	0.0045	0.0045	0.0045	0.0045
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.43	1.34	1.33
Tti (min) [e	8.9	10.1	10.3	10.4

Tti = 10.4 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	0.06
V (ft/s) [ec	0.171131
L (ft)	32.7515
Tt (min) [ec	3.19

Tti = 13.58 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	1
R (ft)	0.5
s (ft/ft)	0.009
V (ft/s)	6.85
L (ft)	448.778
Tt (min)	1.09

Tti = 14.68 min

Basin AS (5 year)

Sheet Flow Travel Time

Tti = Kc/I^0.4 (nL/sqrt(S))^0.6

	Iteration 1	2	3	4
Tti (min) [a	5	14.08	17.52	18.35
n	0.15	0.15	0.15	0.15
L (ft)	100	100	100	100
S (ft/ft)	0.0109	0.0109	0.0109	0.0109
Kc	0.933	0.933	0.933	0.933
I (in/hr)	1.94	1.13	1.00	0.98
Tti (min) [e	14.1	17.5	18.3	18.5

Tti = 18.5 min

Shallow Concentrated

V=(3.28)kS^1/2

k	0.213
S (%)	2.42
V (ft/s) [ec	1.086829
L (ft)	650.2484
Tt (min) [ec	9.97

Tti = 28.50 min

Open Channel and Pipe Flow Velocity

V=(1.49/n)*(R^(2/3))*(S^1/2) Tt=L/60V

n	0.013
r (ft)	0.5
R (ft)	0.25
s (ft/ft)	0.005
V (ft/s)	3.22
L (ft)	0
Tt (min)	0.00

Tti = 28.50 min

APPENDIX B

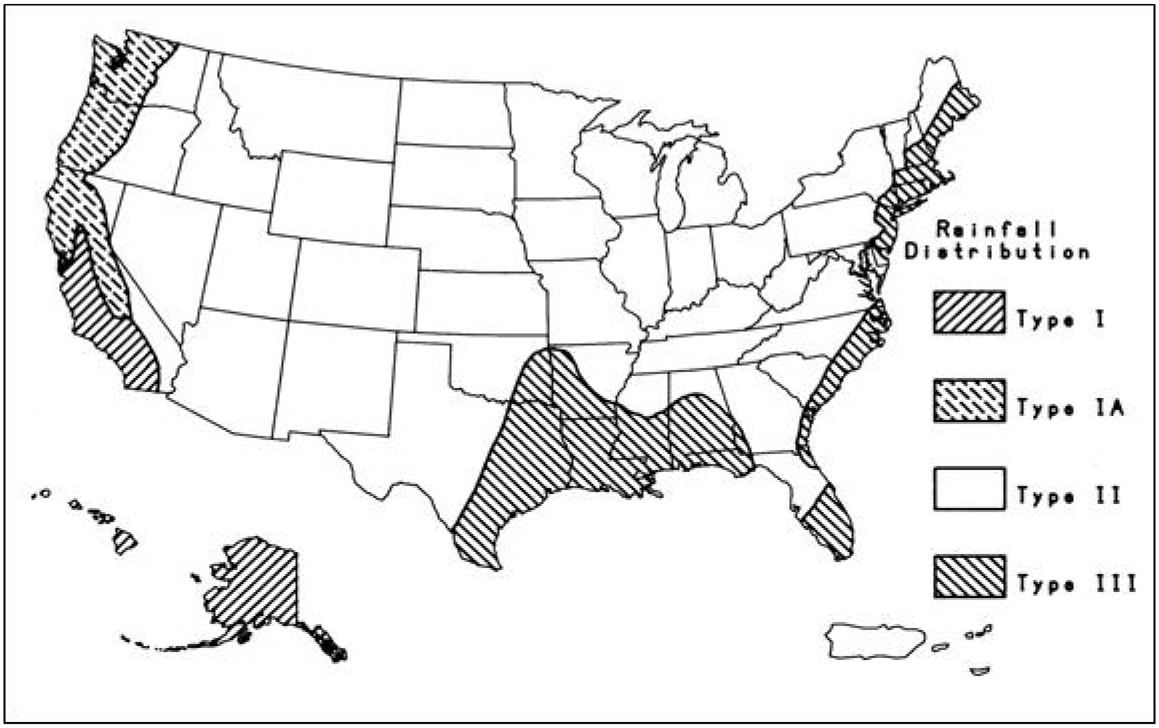
CALTRANS IDF CURVE

245	MORGAN HILL 6 WSW	640	37.094	121.742	SCL	0.59	0.99	1.18	1.32	1.46	2.30	-0.378	D105846 00	1945	1975
246	MORGAN HILL BOSSANA	770	37.150	121.783	SCL	0.56	0.94	1.12	1.26	1.39	2.19	-0.250	D105847 00	1945	1970
247	MORGAN HILL	320	37.178	121.575	SCL	0.46	0.78	0.94	1.05	1.16	1.83	-0.398	D105853 00	1946	1998
248	MOUNT MADONNA	1800	37.017	121.717	SCR	0.69	1.15	1.38	1.54	1.70	2.69	-0.354	D105973 00	1945	1985
249	PEABODY RANCH	472	37.046	121.509	SCL	0.43	0.73	0.88	0.99	1.10	1.77	-0.545	D106770 00	1972	1992
250	SAN BENITO	1355	36.508	121.082	SBT	0.35	0.59	0.70	0.79	0.87	1.38	-0.461	D107719 00	1940	1998
251	SAN FELIPE HIGHWAY S	365	37.017	121.333	SCL	0.43	0.72	0.86	0.97	1.06	1.68	-0.403	D107755 00	1944	1974
252	SAN JUAN BAUTIST 3SS	615	36.817	121.517	SBT	0.42	0.70	0.84	0.95	1.04	1.66	-0.461	D107834 00	1944	1987
253	SUNSET BEACH STATE P	85	36.900	121.833	SCR	0.48	0.80	0.96	1.08	1.19	1.89	-0.455	D108680 00	1940	1998
254	UPPER TRES PINOS	2050	36.633	121.033	SBT	0.36	0.56	0.64	0.70	0.75	1.04	-0.395	D109189 00	1940	1976
255	UVAS DAM	412	37.067	121.700	SCL	0.57	0.97	1.16	1.30	1.44	2.28	-0.398	D109196 00	1975	1981
256	UVIS RESERVOIR	489	37.066	121.688	SCL	0.56	0.95	1.14	1.29	1.42	2.29	-0.349	D109196 80	1975	1992
257	ARROYO SECO	800	36.233	121.483	MON	0.47	0.79	0.95	1.07	1.18	1.86	-0.295	D200322 00	1940	1998
258	CASTROVILLE TREATMNT	13	36.767	121.767	MON	0.43	0.71	0.85	0.95	1.05	1.66	-0.449	D201586 25	1971	1981
259	DEL MONTE	46	36.600	121.867	MON	0.42	0.70	0.84	0.94	1.04	1.64	-0.527	D202362 00	1940	1986
260	GONZALES 9 ENE	2350	36.550	121.300	SBT	0.34	0.57	0.68	0.76	0.84	1.33	-0.495	D203502 00	1944	1976
261	KING CITY	320	36.200	121.133	MON	0.37	0.63	0.75	0.84	0.93	1.48	-0.395	D204555 00	1940	1998
262	LAURELES GRADE	1350	36.550	121.750	MON	0.40	0.67	0.80	0.90	0.99	1.56	-0.565	D204836 50	1971	1981
263	MT TORO	2370	36.550	121.633	MON	0.41	0.68	0.82	0.91	1.01	1.59	-0.407	D205998 80	1971	1981
264	PRUNEDALE ECHO VALLE	525	36.833	121.667	MON	0.44	0.74	0.89	0.99	1.09	1.73	-0.494	D207156 50	1971	1981
265	SALINAS COUNTRY CLUB	160	36.750	121.633	MON	0.44	0.73	0.87	0.97	1.07	1.69	-0.469	D207669 30	1971	1981
266	SLACK CANYON	1730	36.083	120.667	MON	0.41	0.69	0.83	0.93	1.02	1.62	-0.437	D208276 00	1944	1989
267	SOLEDAD	204	36.433	121.317	MON	0.36	0.59	0.71	0.79	0.88	1.38	-0.577	D208338 00	1976	1982
268	AIRFIELD HLMR	1040	36.000	121.317	MON	0.55	0.92	1.10	1.23	1.36	2.15	-0.484	D300050 50	1964	1973
269	BRYSON	925	35.800	121.083	MON	0.60	1.02	1.22	1.37	1.51	2.39	-0.404	D301142 00	1946	1998
270	LOCKWOOD 2 N	1104	35.967	121.083	MON	0.39	0.65	0.77	0.86	0.95	1.50	-0.485	D305017 00	1940	1978
271	VALLETON	950	35.883	120.700	MON	0.37	0.62	0.74	0.83	0.92	1.45	-0.522	D309221 00	1943	1973
272	CARMEL VALLEY ROBINS	125	36.533	121.800	MON	0.45	0.76	0.90	1.01	1.11	1.76	-0.440	D401534 25	1971	1981
273	LUCIA WILLOW SPRINGS	360	35.883	121.450	MON	0.68	1.14	1.37	1.53	1.69	2.68	-0.488	D405184 00	1941	1993
274	S E FARALLON	27	37.700	123.000	SF	0.45	0.76	0.91	1.02	1.13	1.82	-0.532	E008376 00	1904	1978
275	KENT LAKE	360	37.998	122.708	MRN	0.77	1.33	1.56	1.75	1.94	3.11	-0.400	E104502 00	1955	1979
276	LAGUNITAS LAKE	785	37.947	122.595	MRN	0.79	1.36	1.60	1.80	1.98	3.18	-0.397	E104652 00	1930	1986
277	NACASIO TOWN 1 SE	265	38.042	122.693	MRN	0.81	1.39	1.64	1.83	2.03	3.25	-0.460	E106187 00	1954	1980
278	NACASIO DAM	315	38.108	122.720	MRN	0.61	1.04	1.23	1.37	1.52	2.44	-0.457	E106187 02	1975	1990
279	PT REYES LIGHT STA	510	37.995	123.017	MRN	0.47	0.80	0.96	1.07	1.19	1.90	-0.468	E107027 00	1906	1926
280	POINT REYES STATION	31	38.067	122.800	MRN	0.63	1.05	1.26	1.42	1.57	2.52	-0.437	E107088 20	1975	1994
281	TOMALES	80	38.247	122.903	MRN	0.53	0.89	1.07	1.20	1.32	2.12	-0.520	E108954 00	1970	1994
282	EL VERANO CORP YARD	100	38.300	122.483	SON	0.53	0.83	0.98	1.08	1.18	1.80	-0.449	E202822 20	1958	1976
283	KENTFIELD	80	37.946	122.551	MRN	0.74	1.25	1.50	1.68	1.86	2.99	-0.317	E204500 00	1984	1994
284	MILL VALLEY	10	37.896	122.527	MRN	0.61	1.02	1.23	1.38	1.53	2.45	-0.524	E205647 00	1958	1994
285	MT TAMALPAIS 2 SW	1480	37.900	122.600	MRN	0.63	1.07	1.28	1.44	1.59	2.55	-0.378	E205996 00	1940	1998
286	MT TAMALPAIS	2600	37.917	122.583	MRN	0.55	0.92	1.11	1.24	1.37	2.20	-0.422	E205998 00	1905	1982
287	NOVATO 8 WNW	350	38.133	122.717	MRN	0.53	0.89	1.07	1.20	1.33	2.12	-0.496	E206290 00	1943	1995
288	NOVATO FS #1	35	38.105	122.537	MRN	0.55	0.92	1.10	1.24	1.37	2.20	-0.460	E206290 01	1958	1994
289	PETALUMA F S NO 2	16	38.241	122.629	SON	0.45	0.76	0.91	1.02	1.13	1.81	-0.449	E206826 00	1944	1998
290	SAN ANSELMO	100	37.976	122.562	MRN	0.78	1.32	1.58	1.77	1.96	3.15	-0.409	E207707 00	1958	1994
291	SAN RAFAEL FS #4	5	37.967	122.533	MRN	0.70	1.18	1.42	1.60	1.76	2.83	-0.489	E207880 10	1977	1994
292	SAN RAFAEL CIVIC CEN	120	37.996	122.530	MRN	0.57	0.95	1.15	1.29	1.42	2.28	-0.413	E207880 21	1964	1994
293	STENSON BEACH	10	37.914	122.645	MRN	0.52	0.88	1.05	1.18	1.31	2.09	-0.443	E208518 50	1979	1994
294	WOODACRE FD	430	38.007	122.642	MRN	0.65	1.09	1.31	1.47	1.63	2.61	-0.417	E209770 21	1964	1994
295	ANGWIN PACIFIC UNION	1815	38.571	122.435	NAP	0.56	0.95	1.14	1.28	1.41	2.26	-0.437	E300212 00	1968	1998
296	ATLAS ROAD	1660	38.643	121.248	NAP	0.61	1.03	1.23	1.39	1.53	2.46	-0.413	E300372 00	1940	1994
297	FAIRFIELD 3 NNE	110	38.283	122.033	SOL	0.48	0.81	0.97	1.09	1.21	1.93	-0.542	E302933 00	1940	1998
298	OAKVILLE 4 SW	1465	38.383	122.467	NAP	0.59	1.00	1.20	0.35	1.49	2.38	-0.410	E306354 00	1940	1987
299	SAINT HELENA 4 WSW	1792	38.500	122.533	NAP	0.60	1.01	1.21	1.36	1.50	2.41	-0.452	E307646 00	1940	1998
300	BERKELEY	345	37.867	122.250	ALA	0.53	0.90	1.08	1.21	1.34	2.15	-0.389	E400693 00	1950	1989
301	CASTRO VALLEY FIRE D	255	37.697	122.081	ALA	0.51	0.86	1.04	1.17	1.29	2.06	-0.504	E401583 80	1968	1980
302	CROCKETT C&H	9	38.051	122.217	CC	0.51	0.86	1.03	1.15	1.28	2.05	-0.550	E402177 80	1978	1994
303	CULL CANYON	620	37.770	122.062	ALA	0.48	0.81	0.97	1.09	1.21	1.94	-0.484	E402213 50	1975	1980
304	DANVILLE WU	330	37.830	122.002	CC	0.53	0.88	1.06	1.19	1.32	2.11	-0.478	E402279 50	1973	1994
305	HAYWARD 6 ESE	715	37.652	121.986	ALA	0.56	0.95	1.14	1.28	1.41	2.26	-0.450	E403863 00	1941	1988
306	HAYWARD CORP YARD	55	37.647	122.095	ALA	0.53	0.89	1.07	1.20	1.33	2.13	-0.506	E403863 02	1957	1978
307	MARSH CREEK FS	680	37.897	121.865	CC	0.41	0.68	0.82	0.92	1.02	1.63	-0.457	E405366 50	1973	1994
308	MARTINEZ 3 S	225	37.967	122.133	CC	0.49	0.82	0.98	1.10	1.22	1.95	-0.441	E405371 00	1944	1998
309	MARTINEZ FCD	49	37.988	122.087	CC	0.40	0.67	0.81	0.91	1.00	1.61	-0.522	E405371 50	1972	1994
310	MT DIABLO ST PK	1600	37.850	121.933	CC	0.49	0.78	0.93	1.05	1.16	1.86	-0.496	E405916 00	1956	1995
311	MT DIABLO	3690	37.880	121.918	CC	0.47	0.79	0.95	1.06	1.18	1.89	-0.443	E405916 20	1976	1994
312	OAKLAND AP NWS	3	37.733	122.200	ALA	0.47	0.80	0.96	1.07	1.19	1.90	-0.484	E406335 00	1940	1985
313	ORINDA FILTERS	370	37.893	122.200	CC	0.66	1.14	1.34	1.50	1.66	2.67	-0.500	E406501 01	1958	1989
314	ORINDA FIRE STATION	700	37.895	122.170	CC	0.53	0.89	1.07	1.20	1.33	2.14	-0.460	E406502 22	1974	1994
315	PIEDMONT FIRE DEPT	330	37.823	122.232	ALA	0.50	0.85	1.02	1.14	1.26	2.02	-0.526	E406856 70	1967	1980
316	RICHMOND CITY HALL	55	37.933	122.350	CC	0.55	0.92	1.11	1.24	1.37	2.20	-0.523	E407414 50	1975	1994
317	RODEO FIRE STATION	30	38.035	122.270	CC	0.43	0.89	1.07	1.20	1.33	2.13	-0.570	E407528 10	1973	1994
318	ST MARYS COLLEGE	620	37.841	122.107	CC	0.60	1.01	1.22	1.37	1.51	2.42	-0.463	E407661 00	1955	1994
319	UPPER SAN LEANDRO FT	413	37.774	122.164	ALA	0.55	0.94	1.11	1.24	1.37	2.20	-0.543	E409185 00	1945	1989
320	WALNUT CREEK FILTERS	384	37.913	122.085	CC	0.48	0.82	0.97	1.09	1.20	1.92	-0.305	E409421 01	1973	1989
321	WALNUT CREEK 2 ESE	245	37.883	122.033	CC	0.51	0.86	1.03	1.16	1.28	2.05	-0.574	E409423 00	1945	1983
322	WALNUT CREEK 2 ENE	80	37.935	122.044	CC	0.58	1.00	1.18	1.32	1.46	2.34	-0.574	E409429 50	1949	1983
323	ARROYO DEL VALLE WTP	640	37.631	121.784	ALA	0.47	0.79	0.95	1.07	1.18	1.90	-0.495	E500310 00	1978	1999
324	ARROV DEL VALLE WATE	640	37.631	121.784	ALA	0.44	0.74	0.88	0.99	1.10	1.76	-0.527	E500311 20	1975	1985
325	ARROYO DEL VALLE SAN	700	37.617	121.750	ALA	0.39	0.65	0.78	0.88	0.97	1.55	-0.484	E500312 00	1958	1975
326	BIEL RANCH	3399	37.467	121.530	SCL	0.33	0.56	0.67	0.75	0.83	1.34	-0.587	E500728 50	1965	1992

APPENDIX C

FAA UFC EXCERPTS

Figure 2-3. Approximate Geographic Areas for SCS Rainfall Distributions



Although the SCS distributions shown do not agree exactly with IDF curves for all locations in the region for which they are intended, the differences are within the accuracy limits of the rainfall depths from the Weather Bureau's rainfall frequency atlases.

2-3.2 Determination of Peak Flow Rates. Peak flows are generally adequate for design and analysis of conveyance systems such as storm drains or open channels; however, if the design or analysis must include flood routing (e.g., storage basins or complex conveyance networks), a flood hydrograph is required. This section discusses three methods, the Rational Method, the SCS TR-55 method, and the USGS regression equations, that are used to derive peak flows for both gaged and ungaged sites. Each method can be used to develop a peak discharge. The drainage area of the project usually dictates which of these methods should be used. The Rational Method is the most commonly used method, but due to its assumptions, it is limited to drainage areas smaller than 200 acres. For drainage areas up to 2000 acres, the SCS TR-55 method is commonly used. Due to the way in which the regression equations were developed, they are usually not appropriate for very small areas, but each set of equations has its own limitations and those should be understood before the equations are applied. The regression equations are often used to compute the discharges for larger areas such as those necessary for culvert design.

2-3.2.1 **Rational Method.** One of the most commonly used equations for the calculation of peak flow from small areas is the Rational Formula, given as Equation 2-1:

$$Q = CIA \tag{2-1}$$

where:

Q = flow, ft^3/s

C = dimensionless runoff coefficient representing the characteristics of the watershed

I = rainfall intensity, in/hr

A = drainage area, hectares, acres

2-3.2.1.1 **Assumptions**. Assumptions inherent in the Rational Formula are that:

- Peak flow occurs when the entire watershed is contributing to the flow.
- Rainfall intensity is the same over the entire drainage area.
- Rainfall intensity is uniform over a time duration equal to the time of concentration (t_c). The time of concentration is the time required for water to travel from the hydraulically most remote point of the basin to the point of interest.
- The frequency of the computed peak flow is the same as that of the rainfall intensity, i.e., the 10-year rainfall intensity is assumed to produce the 10-year peak flow.
- The coefficient of runoff is the same for all storms of all recurrence probabilities.

2-3.2.1.2 **Limitations**. Because of the inherent assumptions, the Rational Formula should be applied only to drainage areas smaller than 200 acres.

2-3.2.2 **Runoff Coefficient**

2-3.2.2.1 The runoff coefficient, C, in Equation 2-1 is a function of the ground cover and a host of other hydrologic abstractions. It relates the estimated peak discharge to a theoretical maximum of 100 percent runoff. Typical values for C are given in Table 2-1. If the basin contains varying amounts of different land cover or other abstractions, a composite coefficient can be calculated through area weighing using Equation 2-2:

$$\text{weighted } C = \frac{\sum (C_x A_x)}{A_{total}} \tag{2-2}$$

where:

x = subscript designating values for incremental areas with consistent land cover

Table 2-1. Runoff Coefficients for Rational Formula

Type of Drainage Area	Runoff Coefficient, *C**
Business:	
Downtown areas	0.70 - 0.95
Neighborhood areas	0.50 - 0.70
Residential:	
Single-family areas	0.30 - 0.50
Multi-units, detached	0.40 - 0.60
Multi-units, attached	0.60 - 0.75
Suburban	0.25 - 0.40
Apartment dwelling areas	0.50 - 0.70
Industrial:	
Light areas	0.50 - 0.80
Heavy areas	0.60 - 0.90
Parks, cemeteries	0.10 - 0.25
Playgrounds	0.20 - 0.40
Railroad yard areas	0.20 - 0.40
Unimproved areas	0.10 - 0.30
Lawns:	
Sandy soil, flat, 2 percent	0.05 - 0.10
Sandy soil, average, 2 to 7 percent	0.10 - 0.15
Sandy soil, steep, 7 percent	0.15 - 0.20
Heavy soil, flat, 2 percent	0.13 - 0.17
Heavy soil, average, 2 to 7 percent	0.18 - 0.22
Heavy soil, steep, 7 percent	0.25 - 0.35
Streets:	
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Brick	0.70 - 0.85
Drives and walks	0.75 - 0.85
Roofs	0.75 - 0.95
*Higher values are usually appropriate for steeply sloped areas and longer return periods because infiltration and other losses have a proportionally smaller effect on runoff in these cases.	

2-3.2.2.2 Example 2-1 illustrates the calculation of the runoff coefficient, *C*, using area weighing.

Example 2-1

Given: These existing and proposed land uses:

Existing conditions (unimproved):

Land Use	Area, acres	Runoff Coefficient, *C*
Unimproved Grass	22.1	0.25
Grass	21.2	0.22
Total =	43.3	

Proposed conditions (improved):

Land Use	Area, acres	Runoff Coefficient, *C*
Paved	5.4	0.90
Lawn	1.6	0.15
Unimproved Grass	18.6	0.25
Grass	17.7	0.22
Total =	43.3	

Find: Weighted runoff coefficient, *C*, for the existing and proposed conditions.

Solution:

Step 1. Determine weighted *C* for existing (unimproved) conditions using Equation 2-2.

$$\text{weighted } C = \frac{\sum(C_x A_x)}{A}$$

$$\text{weighted } C = \frac{[(22.1)(0.25)+(21.2)(0.22)]}{(43.3)}$$

$$\text{weighted } C = 0.235$$

Step 2. Determine weighted *C* for proposed (improved) conditions using Equation 2-2.

$$\text{weighted } C = \frac{[(5.4)(0.90)+(1.6)(0.15)+(18.6)(0.25)+(17.7)(0.22)]}{(43.3)}$$

$$\text{weighted } C = 0.315$$

2-3.2.3 **Rainfall Intensity.** Rainfall intensity, duration, and frequency curves are necessary to use the Rational Method. Regional IDF curves are available in most state and local highway agency manuals and are also available from NOAA. If the IDF curves are not available, they should be developed.

2-3.2.4 **Time of Concentration.** A number of methods can be used to estimate time of concentration, t_c, some of which are intended to calculate the flow velocity within individual segments of the flow path (e.g., shallow concentrated flow, open channel flow, etc.). The time of concentration can be calculated as the sum of the travel times within the various consecutive flow segments. For additional discussion on establishing the time of concentration for inlets and drainage systems, see Chapters 3 and 6 of this manual.

2-3.2.4.1 **Sheet Flow Travel Time**. Sheet flow is the shallow mass of runoff on a planar surface with a uniform depth across the sloping surface. This usually occurs at the headwater of streams over relatively short distances, rarely more than about 400 feet (ft), and possibly less than 80 feet. Sheet flow is commonly estimated with a version of the kinematic wave equation, a derivative of Manning's equation, shown as Equation 2-3:

$$T_{ti} = \frac{K_c}{I^{0.4}}\left(\frac{nL}{\sqrt{S}}\right)^{0.6} \qquad (2\text{-}3)$$

where:

T_{ti} = sheet flow travel time, minutes (min)

n = roughness coefficient (see Table 2-2)

L = flow length, ft

I = rainfall intensity, in/hr

S = surface slope, feet per feet (ft/ft)

K_c = empirical coefficient equal to 0.933

Table 2-2. Manning's Roughness Coefficient (*n*) for Overland Sheet Flow

Surface Description	*n*
Smooth asphalt	0.011
Smooth concrete	0.012
Ordinary concrete lining	0.013
Good wood	0.014
Brick with cement mortar	0.014
Vitrified clay	0.015
Cast iron	0.015

Surface Description	*n*
Corrugated metal pipe	0.024
Cement rubble surface	0.024
Fallow (no residue)	0.05
Cultivated soils	
Residue cover < 20 percent	0.06
Residue cover > 20 percent	0.17
Range (natural)	0.13
Grass	
Short grass prairie	0.15
Dense grasses	0.24
Bermuda grass	0.41
Woods*	
Light underbrush	0.40
Dense underbrush	0.80
*When selecting *n*, consider cover to a height of about 1.2 inches. This is only part of the plant cover that will obstruct sheet flow.	

Since the rainfall intensity value, *I*, depends on t_{ti} and t_{ti} is not initially known, the computation of t_{ti} is an iterative process. An initial estimate of t_{ti} is assumed and used to obtain *I* from the IDF curve for the locality. The t_{ti} is then computed from Equation 2-3 and used to check the initial value of t_{ti}. If they are not the same, the process is repeated until two successive t_{ti} estimates are the same.

2-3.2.4.2 **Shallow Concentrated Flow Velocity**. After short distances of at most 300 ft, sheet flow tends to concentrate in rills and then gullies of increasing proportions. Such flow is usually referred to as shallow concentrated flow. The velocity of such flow can be estimated using a relationship between velocity and slope as shown in Equation 2-4:

$$V = (3.28)kS_p^{0.5} \quad (2\text{-}4)$$

where:

V = velocity, ft/s

k = intercept coefficient (see Table 2-3)

S_p = slope, percent

Table 2-3. Intercept Coefficients for Velocity vs. Slope Relationship of Equation 2-4

Land Cover/Flow Regime	*k*
Forest with heavy ground litter; hay meadow (overland flow)	0.076
Trash fallow or minimum tillage cultivation; contour or strip cropped; woodland (overland flow)	0.152
Short grass pasture (overland flow)	0.213
Cultivated straight row (overland flow)	0.274
Nearly bare and untilled (overland flow); alluvial fans in western mountain regions	0.305
Grassed waterway (shallow concentrated flow)	0.457
Unpaved (shallow concentrated flow)	0.491
Paved area (shallow concentrated flow); small upland gullies	0.619

2-3.2.4.3 **Open Channel and Pipe Flow Velocity**. Flow in gullies empties into channels or pipes. Open channels are assumed to begin where either the blue stream line shows on USGS quadrangle sheets or the channel is visible on aerial photographs. Cross-section geometry and roughness should be obtained for all channel reaches in the watershed. Manning's equation can be used to estimate average flow velocities in pipes and open channels as follows:

$$V = \frac{1.49}{n} R^{2/3} S^{1/2} \tag{2-5}$$

where:

n = roughness coefficient (see Table 2-4)

V = velocity, ft/s

R = hydraulic radius (defined as the flow area divided by the wetted perimeter), ft

S = slope, ft/ft

Table 2-4. Values of Manning's Coefficient (*n*) for Channels and Pipes

Conduit Material	Manning's *n**
Closed Conduits	
Brick	0.013 - 0.017
Cast iron pipe	
Cement-lined and seal coated	0.011 - 0.015

Conduit Material	Manning's *n**
Concrete (monolithic)	0.012 - 0.014
Concrete pipe	0.011 - 0.015
Corrugated-metal pipe – 0.5 inch by 2.5 inch corrugations	
Plain	0.022 - 0.026
Paved invert	0.018 - 0.022
Spun asphalt lines	0.011 - 0.015
Plastic pipe (smooth)	0.011 - 0.015
Vitrified clay	
Pipes	0.011 - 0.015
Liner plates	0.013 - 0.017
Open Channels	
Lined channels	
Asphalt	0.013 - 0.017
Brick	0.012 - 0.018
Concrete	0.011 - 0.020
Rubble or riprap	0.020 - 0.035
Vegetal	0.030 - 0.400
Excavated or dredged	
Earth, straight and uniform	0.020 - 0.030
Earth, winding, fairly uniform	0.025 - 0.040
Rock	0.030 - 0.045
Unmaintained	0.050 - 0.140
Natural channels (minor streams, top width at flood stage < 100 feet)	
Fairly regular section	0.030 - 0.070
Irregular section with pools	0.040 - 0.100
*Lower values are usually for well-constructed and maintained (smoother) pipes and channels.	

For a circular pipe flowing full, the hydraulic radius is one-fourth of the diameter. For a wide rectangular channel ($W > 10\ d$), the hydraulic radius is approximately equal to the depth. The travel time is then calculated as follows:

$$T_{ti} = \frac{L}{60V} \tag{2-6}$$

where:

T_{ti} = travel time for segment i, min

L = flow length for segment i, ft

V = velocity for segment i, ft/s

Example 2-2

Given: These flow path characteristics:

Flow Segment	Length (ft)	Slope (ft/ft)	Segment Description
1 (sheet flow)	223	0.005	Bermuda grass
2 (shallow conduit)	259	0.006	Grassed waterway
3 (flow in conduit)	479	0.008	15-in concrete pipe

Find: Time of concentration, t_c, for the area.

Solution:

Step 1. Calculate time of concentration for each segment.

Segment 1

Obtain Manning's *n* roughness coefficient from Table 2-2: *n* = 0.41

Determine the sheet flow travel time using Equation 2-3:

$$T_{ti} = \frac{K_c}{I^{0.4}} \left(\frac{nL}{\sqrt{S}} \right)^{0.6}$$

Since the rainfall intensity value, *I*, is being sought and is also in the equation, an iterative approach must be used. From experience, estimate a time of concentration and read a rainfall intensity from the appropriate IDF curve. In this example, try a time of concentration of 30 min and read from the IDF curve in Figure 2-1 an intensity of 3.4 in/hr. Now use Equation 2-3 to see how good the 30-min estimate was.

First, solve the equation in terms of *I*.

$$T_{ti1} = \left[\frac{0.933}{(I)^{0.4}} \right] \left[\frac{(0.41)(223)}{(0.005)^{0.5}} \right]^{0.6} = \frac{(68.68)}{I^{0.4}}$$

Inserting 3.4 in/hr for *I*, the result is 42.1 min. Since 42.1 is greater than the assumed 30 min, try the intensity for 42 min from Figure 2-1, which is 2.8 in/hr.

Using 2.8 in/hr, the result is 45.4 min. Repeat the process with 2.7 in/hr for 45 min and the result is a time of 46.2. This value is close to the 45.2 min.

Use 46 min for segment 1.

Segment 2

Obtain the intercept coefficient, *k*, from Table 2-3: *k* = 0.457 and K_c = 3.281

Determine the concentrated flow velocity from Equation 2-4:

$$V = 3.28 k S_p^{0.5} = (3.28)(0.457)(0.6)^{0.5} = 1.16 \text{ ft/s}$$

Determine the travel time from Equation 2-6:

$$T_{ti2} = \frac{L}{(60V)} = \frac{259}{[(60)(1.16)]} = 3.7 \text{ min}$$

Segment 3

Obtain Manning's *n* roughness coefficient from Table 2-4: *n* = 0.011

Determine the pipe flow velocity from Equation 2-5 (assuming full flow)

V = (1.49/0.011)(1.25/4)0.67 (0.008)0.5 = 5.58 ft/s

Determine the travel time from Equation 2-6:

$$T_{ti3} = \frac{L}{(60V)} = \frac{479}{[(60)(5.58)]} = 1.4 \text{ min}$$

Step 2. Determine the total travel time by summing the individual travel times:

$t_c = T_{ti1} + T_{ti2} + T_{ti3}$ = 46.0 + 3.7 + 1.4 = 51.1 min   Use 51 min

Example 2-3

Given: Land use conditions from Example 2-1 and the following times of concentration:

Condition	**Time of concentration t_c (min)**	**Weighted *C* (from Example 2-1)**
Existing condition (unimproved)	88	0.235
Proposed condition (improved)	66	0.315

Area = 43.36 acres

Find: The 10-year peak flow using the Rational Formula and the IDF curve shown in Figure 2-1.

Solution:

Step 1. Determine the rainfall intensity, *I*, from the 10-yr IDF curve for each time of concentration.

Existing condition (unimproved) 1.9 in/hr

Proposed condition (improved) 2.3 in/hr

Step 2. Determine peak flow rate, *Q*.

Existing condition (unimproved):

$$Q = CIA$$

$$= (0.235)(1.9)(43.3)$$

$$= 19.3 \text{ ft}^3/\text{s}$$

Proposed condition (improved):

$$Q = CIA$$

$$= (0.315)(2.3)(43.3)$$

$$= 31.4 \text{ ft}^3/\text{s}$$

2-3.3 USGS Regression Equations. Regression equations are commonly used for estimating peak flows at ungaged sites or sites with limited data. The USGS has developed and compiled regional regression equations that are included in a computer program called the National Flood Frequency program (NFF). NFF allows quick and easy estimation of peak flows throughout the United States. All the USGS regression equations were developed using dependent variables in English units. Local equations may be available to provide better correspondence to local hydrology than the regional equations found in NFF. For more information on NFF, refer to paragraph 12-7.7.

2-3.3.1 **Rural Equations.** The rural equations are based on watershed and climatic characteristics within specific regions of each state that can be obtained from topographic maps, rainfall reports, and atlases. These regression equations are generally of the following form:

$$RQ_T = aA^bB^cC^d \qquad (2\text{-}7)$$

where:

APPENDIX D

HYDRAULIC ANALYSIS

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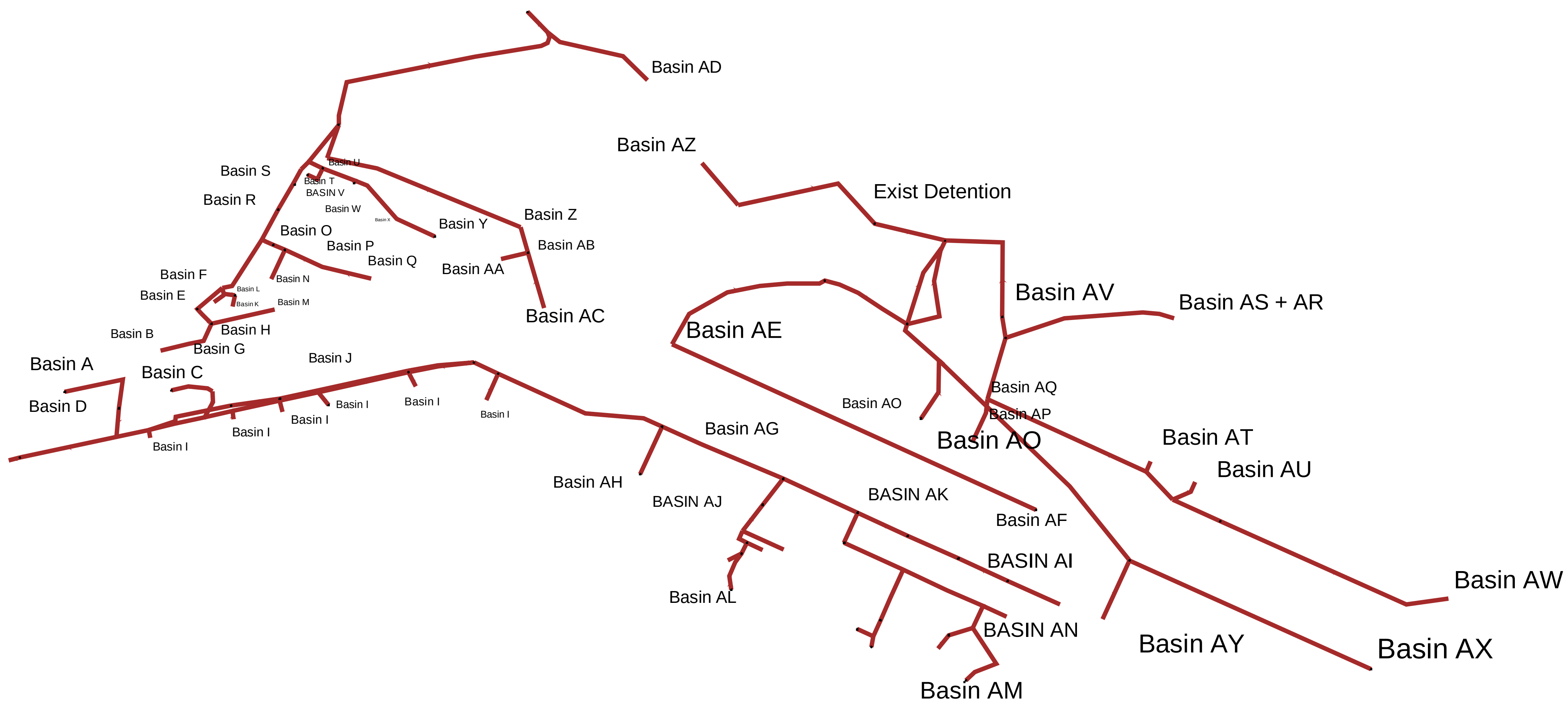
Scenario: Base



Existing Monterey Airport Terminal.stsw
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Page 1 of 1

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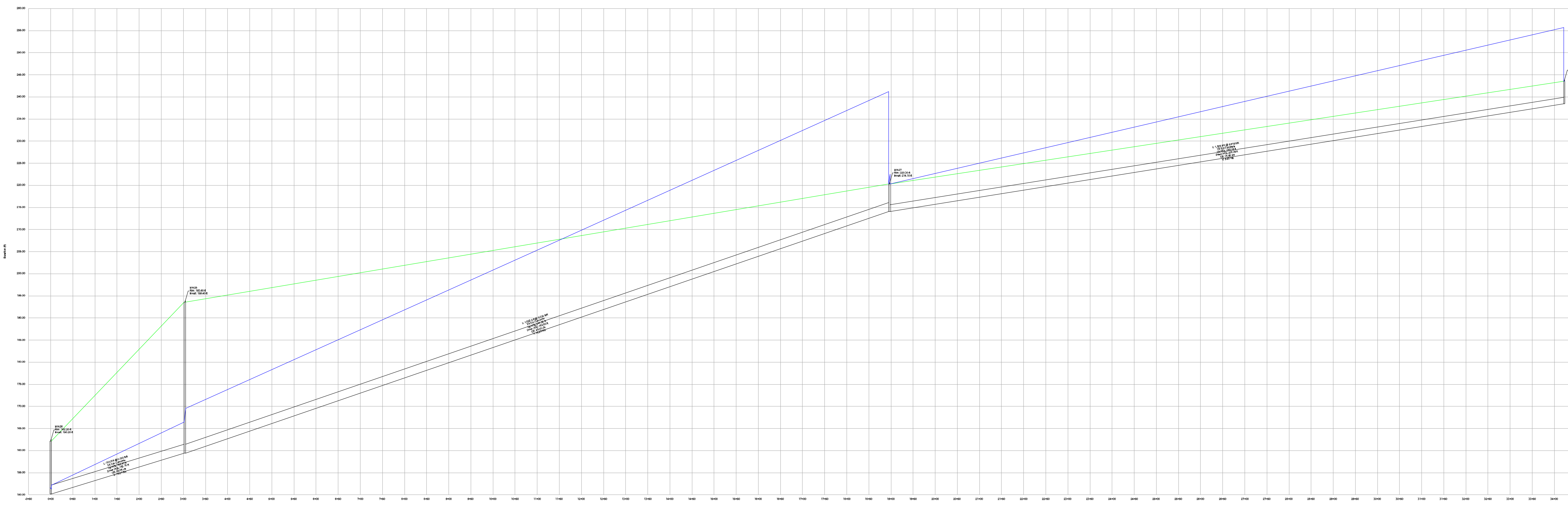
Profile Report
Engineering Profile - Across Taxiway B (Existing Monterey Airport Terminal.stsw)



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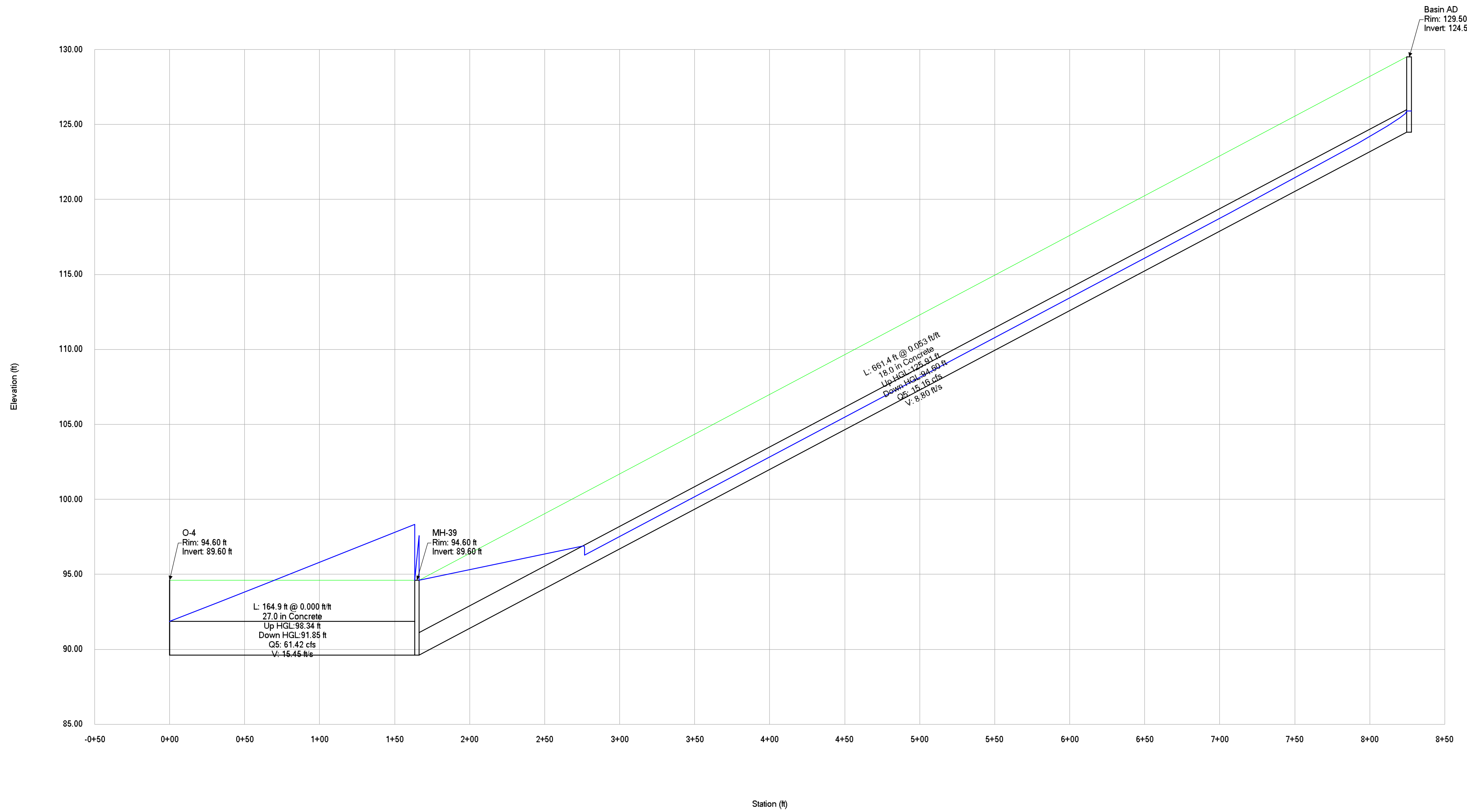
Profile Report

Engineering Profile - Outfall to Laguna Del Ray (Existing Monterey Airport Terminal.stsw)



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Profile Report
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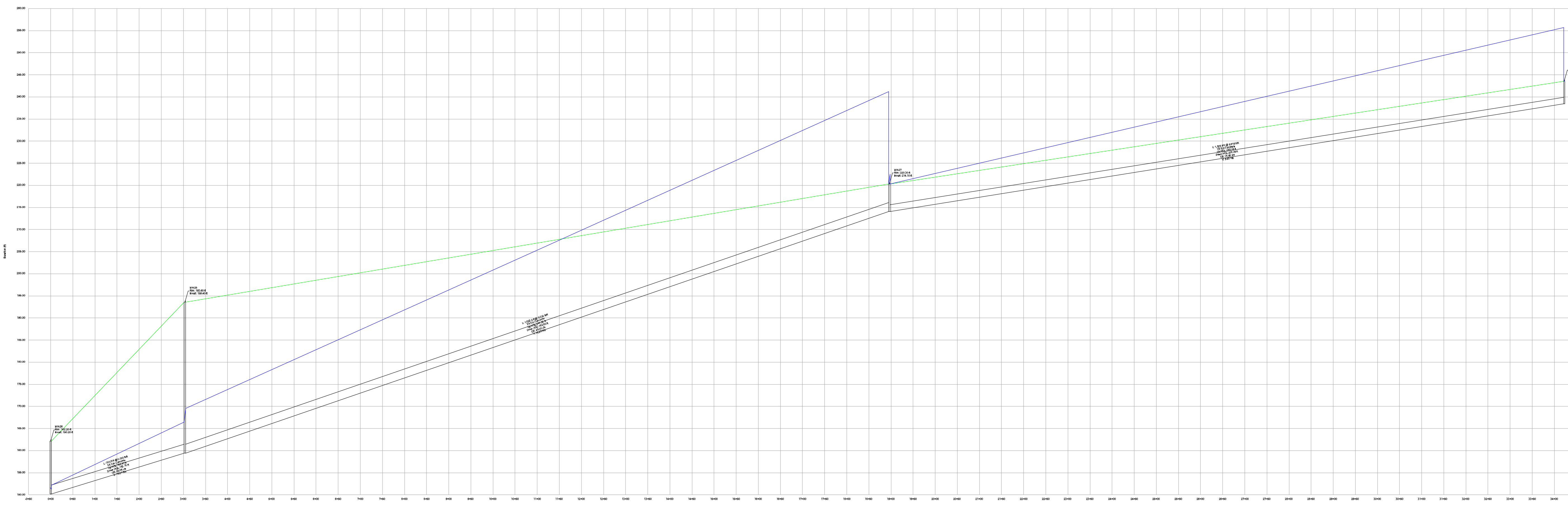

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Profile Report
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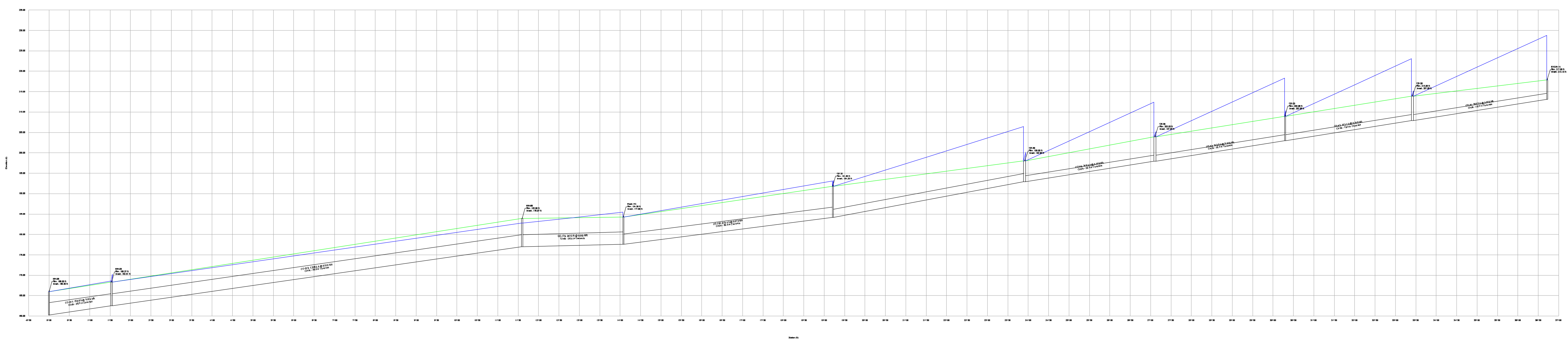

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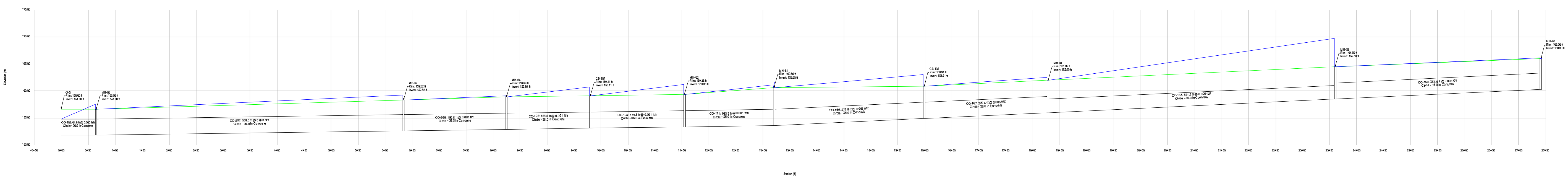
Profile Report
Engineering Profile - Taxilane E (Existing Monterey Airport Terminal.stsw)



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APPENDIX E

WEB SOIL REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Monterey County, California

April 11, 2018

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Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report

Soil Map

Map Scale: 1:15,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 200, 400, 800, 1200

Feet: 0, 500, 1000, 2000, 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Monterey County, California
Survey Area Data: Version 14, Sep 14, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AkD	Arnold loamy sand, 9 to 20 percent slopes, MLRA 15	137.1	21.2%
AkF	Arnold loamy sand, 15 to 50 percent slopes, MLRA 15	8.8	1.4%
BbC	Baywood sand, 2 to 15 percent slopes	404.4	62.4%
Df	Dune land	18.8	2.9%
OaD	Oceano loamy sand, 2 to 15 percent slopes	75.3	11.6%
ShC	Santa Ynez fine sandy loam, 2 to 9 percent slopes	1.5	0.2%
Xd	Xerorthents, dissected	2.1	0.3%
Totals for Area of Interest		**648.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not

Monterey County, California

AkD—Arnold loamy sand, 9 to 20 percent slopes, MLRA 15

Map Unit Setting

National map unit symbol: 2w62p
Elevation: 10 to 2,400 feet
Mean annual precipitation: 13 to 23 inches
Mean annual air temperature: 56 to 60 degrees F
Frost-free period: 250 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Arnold and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arnold

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

A1 - 0 to 8 inches: loamy sand
A2 - 8 to 28 inches: loamy fine sand
Bt - 28 to 48 inches: loamy fine sand
Cr - 48 to 79 inches: bedrock

Properties and qualities

Slope: 9 to 20 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: GRANITIC (R014XD090CA), SANDY (R015XD055CA)
Hydric soil rating: No

Minor Components

Santa ynez

Percent of map unit: 3 percent
Landform: Terraces

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, concave
Across-slope shape: Convex, concave
Hydric soil rating: No

Chamise

Percent of map unit: 2 percent
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Santa lucia

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Elkhorn

Percent of map unit: 2 percent
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

BbC—Baywood sand, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: h91l
Elevation: 20 to 800 feet
Mean annual precipitation: 15 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Baywood and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Baywood

Setting

Landform: Dunes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stabilized sandy eolian sands

Typical profile

H1 - 0 to 60 inches: sand

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: SANDY (R015XD055CA)
Hydric soil rating: No

Minor Components

Dune land

Percent of map unit: 10 percent
Hydric soil rating: No

Oceano

Percent of map unit: 5 percent
Hydric soil rating: No

Df—Dune land

Map Unit Setting

National map unit symbol: h92j
Elevation: 20 to 300 feet
Farmland classification: Not prime farmland

OaD—Oceano loamy sand, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: h95b
Elevation: 30 to 1,100 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 57 to 59 degrees F
Frost-free period: 200 to 350 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Oceano and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oceano

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stabilized eolian sands

Typical profile

H1 - 0 to 80 inches: loamy sand

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: SANDY (R015XD055CA)
Hydric soil rating: No

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Appendix D
UNITED STATES FISH AND WILDLIFE SERVICE SECTION 7 CONSULTATION

U.S. Department
of Transportation
Federal Aviation Administration

Western-Pacific Region
Airports Division

San Francisco Airports District Office
1000 Marina Boulevard, Suite 220
Brisbane, CA 94005-1835

Received
JAN 0 9 2018
Planning and Development
Monterey Peninsula Airport District

December 22, 2017

Mr. Steve Henry
Field Supervisor
Ventura Fish and Wildlife Office
U.S. Fish and Wildlife Service
2493 Portola Road – Suite B
Ventura, CA 93003

Subject: Initiation of Endangered Species Act, Section 7, Formal Consultation for the Monterey Regional Airport (MRY) Proposed Infield and Taxiway Improvements Project.

Dear Mr. Henry:

The Federal Aviation Administration is initiating Endangered Species Act, Section 7, consultation for the Monterey Regional Airport (MRY) Proposed Infield and Taxiway Improvements Project proposed by the Monterey Peninsula Airport District (MPAD) regarding the impacts of the project on the threatened Monterey spineflower (*Chorizanthe pungens).*

<u>Project Information</u>
The Proposed Infield and Taxiway Improvements is described in detail in the enclosed *Monterey Regional Airport Proposed Infield and Taxiway Improvements Project – Biological Assessment* dated December 2017. The MPAD proposes to resurface 15 existing infield areas located between Runway 10R-28L and parallel taxiways located to the north and south of the runway to enhance safety. Most of these infield areas are covered with "chip seal" pavement surface treatment of liquid asphalt and fine aggregate. This chip seal treatment is decomposing into small pieces of material (foreign object debris [FOD]) which can be blown into aircraft. FOD can damage propellers, engines, and other parts of the aircraft, resulting in aircraft component failures that can cause aircraft accidents.

The proposed project also includes the removal of Taxiway E, and the reconfiguration of the Taxiway F and Taxiway K intersections and associated infield areas between Runway 10R-28L and Taxiway A in order to enhance safety by providing sufficient separation between aircraft to meet FAA taxiway and hold line design standards. To accommodate the reconfiguring of Taxiways F and K, Taxiway A (and its associated storm drains and service road) at its connection with these taxiways would be shifted south.

Also as part of this project, the surface grades of the infield areas will be modified to meet FAA design standards, which will minimize the presence of ponded water on the airfield during storm events. Several different surface materials for the infield areas are under consideration, including chip seal, crushed aggregate (rock), asphalt concrete, or other similar materials.

In addition to reducing FOD on the airfield and improving drainage, the new surface treatments will discourage wildlife, including burrowing animals, from using the infield areas. This will reduce the potential for wildlife-aircraft collisions with burrowing animals, such as ground squirrels, or collisions with birds or mammals that prey on ground squirrels.

Effect of the Proposed Project on Listed Species

As described in the Biological Assessment, within the Biological Study Area (BSA) (i.e. Action Area) are approximately 18.8 acres of suitable habitat for the Monterey spineflower. Biological field surveys in 2017 found approximately 2.2 acres of the approximately 18.8 acres of suitable Monterey spineflower habitat was occupied with approximately 2,400 individual plants. As an annual plant species, the distribution of individual Monterey spineflower plants varies from year to year. Although the project will avoid most Monterey spineflower habitat, approximately 0.015 acre (approximately 653 square feet) of occupied Monterey spineflower habitat would be removed by the project. This loss of Monterey spineflower habitat is considered an adverse effect. No other federally threatened or endangered species, or designated critical habitat, are present in the BSA.

The adverse effect of the proposed project has been minimized by avoidance of Monterey spineflower where possible. The MPAD proposes to implement the conservation measures identified in Section 6.1.1 of the Biological Assessment including a soil and seed bank conservation program and seed and top soil collection and distribution, to address the adverse effect of the loss of 0.015 acre of Monterey spineflower habitat.

In accordance with 50 Code of Federal Regulations Part 402, we request that the U.S. Fish and Wildlife Service issue a Biological Opinion regarding this action by May 15, 2018 (i.e. within approximately 135 days of receipt of this letter).

If you have any questions regarding this matter I am available at 650-827-7612, or email me at Douglas.Pomeroy@faa.gov.

Sincerely,

Original signed by

Douglas R. Pomeroy
Environmental Protection Specialist

Copy to (w/o enclosure):
Chris Morello, Senior Manager of Development and Environment, Monterey Peninsula Airport District

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
08EVEN00-2018-F-0193

June 15, 2018

Douglas R. Pomeroy, Environmental Protection Specialist
San Francisco Airports District Office
Federal Aviation Administration
1000 Marina Boulevard, Suite 220
Brisbane, California 94005-1835

Subject: Biological Opinion on the Monterey Regional Airport Proposed Infield and Taxiway Improvements Project

Dear Mr. Pomeroy:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Infield and Taxiway Improvements (Project) at the Monterey Regional Airport and its effects on the federally threatened Monterey spineflower (*Chorizanthe pungens* var. *pungens*), in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). We received your December 22, 2017, request for formal consultation on December 26, 2017.

We have based this biological opinion on information that accompanied your December 22, 2017, request for consultation, including the Monterey Regional Airport Proposed Infield and Taxiway Improvements Project Biological Assessment (SWCA 2017b) and other information in our files. We can make a record of this consultation available at the Ventura Fish and Wildlife Office.

Consultation History

Although we received this request on December 22, 2017, it did not contain adequate information for the Service to fully analyze the Project. Subsequently, we requested additional information from your staff on April 11, 2018, which was received by our office on June 1, 2018.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Monterey Peninsula Airport District (MPAD) is proposing to resurface 15 existing infield areas located between Runway 10R-28L and parallel taxiways located to the north and south of the runway to enhance safety and meet Federal Aviation Administration (FAA) standards. Eleven of these infield areas are currently covered with a "chip seal" pavement surface treatment that is decomposing into small pieces of material (foreign object debris [FOD]). FOD can damage propellers, engines, and other parts of the aircraft, resulting in aircraft component failures that can cause aircraft accidents. The four remaining infield areas that would be resurfaced currently contain ruderal vegetation that is routinely mowed. The proposed Project also includes the removal of Taxiway E, and the reconfiguration of the Taxiway F and Taxiway K intersections and associated infield areas between Runway 10R-28L and Taxiway A. To accommodate the reconfiguring of Taxiways F and K, Taxiway A (and its associated storm drains and service road) at its connection with these taxiways would be shifted south.

Activities associated with this Project would include grading, compaction, and aggregate placing. The Project is expected to permanently remove 8.51 acres of suitable, but unoccupied Monterey spineflower habitat and permanently remove 0.015 acre of occupied Monterey spineflower habitat. Three staging areas would be used during construction of the Project. Two staging areas would be located on previously developed land that includes asphalt and gravel. The third staging area would occur on 1.09 acres in the north side of the Airport situated between the military ramp and the Recreational Vehicle storage area. This site currently contains mixed fill soil and gravel.

The MPAD proposes to implement the following Monterey spineflower conservation measures:

1. The MPAD will avoid the majority of the Monterey spineflower occurrences in the Biological Survey Area (BSA). The Project was designed to exclude the RSA surface improvements from Subarea A-3 because the area contains over approximately 2,000 Monterey spineflower individuals. The Project plans will clearly show the location of Project delineation fencing or flagging that excludes the adjacent Monterey spineflower occurrences from unnecessary disturbance. The fencing will consist of highly visible construction fence or pin-flags. The Project delineation fencing will remain in place and functional throughout the duration of the Project and no work activities will occur outside the delineated work area without the oversight of a monitoring biologist.
2. To minimize adverse effects of removing approximately 0.015 acre of occupied Monterey spineflower habitat, the MPAD will implement a soil and seed bank conservation program that will include seed and top soil collection and distribution.
    a. A Service-approved biologist will collect Monterey spineflower seeds from the action area prior to the start of construction. This species flowers from April through June; therefore, seed collection will begin in August and continue through September, or when seed production ceases. To the extent feasible, all available seed would be collected from plants located in the disturbance areas.
    b. The upper six inches of soil located in and around existing Monterey spineflower individuals within the 0.015-acre area to be disturbed will be collected and redistributed prior to grading activities. Soil collection will occur immediately following completion of seed collection and prior to the first rainfall. The collected soil will be immediately distributed in areas of suitable habitat within

the BSA where Monterey spineflower does not currently exist. Seed collected from the action area will be broadcast over the relocated soil, and then the receptor site will be lightly raked to cover the seed.

c. Collected seed and topsoil will be distributed onsite within approximately 25 square feet (Morello pers. comm. 2018) of the 1.2-acre Conservation Area 3. Conservation Area 3 is managed under the Habitat Conservation and Enhancement Plan (SWCA 2014) that was established during the Monterey Peninsula Airport Runway Safety Area (RSA) Improvement Project (RSA Project). The receptor site for this Project has minimal slope, ample openings in the vegetation, and the appropriate soils for Monterey spineflower (Morello pers. comm. 2018).

d. To ensure that the Monterey spineflower soil and seed bank conservation program is successful, MPAD will retain a Service-approved biologist to assess the receptor site for signs of germination for two seasons after completion of the Project. The conservation measures will be considered successful if Monterey spineflower germination is observed in the receptor site during at least one of the two monitoring seasons. If germination is not observed in the receptor site, the MPAD will coordinate with FAA to determine appropriate remedial actions designed to conserve the species within the BSA. Monterey spineflower is a late blooming species; therefore, monitoring will be conducted between April and June.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the range-wide condition of the Monterey spineflower, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the Monterey spineflower in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the Monterey spineflower; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the Monterey spineflower; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities, that are reasonably certain to occur in the action area, on the Monterey spineflower.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of the Monterey spineflower, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the Monterey spineflower in the wild by reducing the reproduction, numbers, and distribution of that species.

STATUS OF THE SPECIES

The Monterey spineflower was listed as a federally threatened subspecies on February 4, 1994 (Service 1994), and 11,055 acres of critical habitat were designated on January 9, 2008 (Service 2008). Information contained in this account was obtained primarily from the Monterey Spineflower (*Chorizanthe pungens* var. *pungens*) 5-Year Review (Service 2009).

Monterey spineflower is a prostrate annual species in the buckwheat family (Polygonaceae). It has long, somewhat wiry branching stems supporting aggregates of small white to pinkish flowers. Seeds typically germinate after the onset of winter rains and plants can be found above ground as early as December (Fox et al. 2006). Flowering occurs from late March to June, depending on weather patterns, and seed is dispersed in mid-summer.

At the time of listing, Monterey spineflower in the Monterey Bay area was known from scattered populations along the immediate coast, in the Prunedale Hills at Manzanita Park, in the coastal and inland areas of former Fort Ord, and from historical collections described as east of Watsonville and near Mission Soledad in the Salinas Valley. Since its listing, additional populations of Monterey spineflower have been discovered in the Prunedale Hills of Monterey County and interior areas of Santa Cruz County.

Monterey spineflower is currently known to be extant in southern Santa Cruz and northern Monterey Counties. The distribution of Monterey spineflower extends from Santa Cruz County south along the Monterey Bay to the Monterey Peninsula. Populations also occur inland in Monterey County in the Prunedale Hills and at the former Fort Ord, and one population has been located in the Soledad area of the Salinas Valley (Reveal and Hardham 1989, California Natural Diversity Database (CNDDB) 2017). Two historical collections were made farther south, in southern Monterey County in 1935 (listed as possibly extirpated in CNDDB) and in northern San Luis Obispo County in 1842. The CNDDB lists a total of 30 occurrences of Monterey spineflower in this range (CNDDB 2017).

As an annual species, Monterey spineflower responds strongly to annual precipitation patterns and amounts, resulting in large fluctuations in the population of plants visible above-ground from year to year. Many populations support large numbers of individuals (thousands or tens of thousands of plants) scattered in openings among the dominant perennial vegetation (CNDDB 2017).

Studies of the pollination ecology of the Monterey spineflower have not been conducted, however, studies of closely-related *Chorizanthe* taxa are considered relevant to conservation of the Monterey spineflower (Service 2009). A pollination ecology study of the federally endangered robust spineflower (*Chorizanthe robusta* var. *robusta*), which occurs in proximity to the Monterey spineflower at several locations in Santa Cruz County, found that while *C. robusta* var. *robusta* may self-pollinate, pollinator access to flowers significantly increased seed set (Murphy 2003). A diversity of insects including sweat bees (Halictidae), bumblebees (*Bombus* sp), wasps (Sphecidae), European honeybees (*Apis mellifera*), and soft-winged flower beetles (Dasytidae) were found to transport pollen of this taxon, suggesting that protecting pollinator diversity and habitat are important to its recovery. Anecdotal observations of the conspecific federally endangered Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*) noted floral visits by various pollinators including small ants, small flies, bee flies, European honeybees, and bumble bees (McGraw 2004). Other unpublished reports further support the idea that insect pollinators may play an important role in Monterey spineflower reproduction and seed viability (Harding Lawson Associates 2000, Service 2002).

It is unknown whether the highly invasive non-native Argentine ant (*Linepithema humile*) may displace native pollinators of the Monterey spineflower or adversely impact Monterey spineflower reproduction. Invasion of Argentine ants into natural habitats is a function of moisture, distance from urban edge, season, and vegetation type, and the species excludes many native insects where it becomes established (Suarez et al. 1998; Menke and Holway 2006; Menke et al. 2007). Argentine ants negatively affect native epigeic (above-ground) ants and have been demonstrated to negatively affect pollination by honey bees (Ward 1987; Human and Gordon 1996; Suarez et al. 1998; Holway and Suarez 2006; Bolger 2007; and Hanna et al. 2015). The data regarding Argentine ant impacts to non-ant arthropods also demonstrates that communities sampled from areas invaded by Argentine ants were less diverse than communities in non-invaded areas (Cole et al 1992; Human and Gordon 1997; Bolger et al. 2000; LeVan et al. 2014; Hanna et al. 2015), but impacts to non-ant arthropods may vary based on the life history of the co-occurring arthropod. Native ant abundance in some areas of former Fort Ord, an important stronghold for the Monterey spineflower and central to its recovery efforts, has been strongly negatively correlated with Argentine ant abundance (DiGirolamo and Fox 2006). Given the role native ants and bees appear to play in the reproductive biology of related *Chorizanthe* taxa (Murphy 2003, McGraw 2004, Service 2016), the potential for Argentine ants to adversely affect Monterey spineflower pollination ecology merits further study.

Researchers recently investigated the phylogenetic relationships of various members of the genus *Chorizanthe*, subsection *Pungentes*, including Monterey spineflower (Brinegar 2006, Baron and Brinegar 2007, Brinegar and Baron 2008, Brinegar and Baron 2009). Results from the first phase of the molecular study, using ribosomal DNA internal transcribed spacer (ITS) sequencing, indicate that Monterey spineflower and robust spineflower appear to be more closely related to one another than to the other subspecific taxa in the *C. pungens* and *C. robusta* complex. In a second phase of analysis, researchers sequenced chloroplast DNA to determine if it was possible to further differentiate Monterey spineflower from robust spineflower based on these genetic techniques. Results indicated that: (1) there is a general agreement between the results of the ITS sequencing and the DNA phylogenies for the *C. pungens/C. robusta* complex, while results for the other *Pungentes* taxa are often inconsistent with their position in the ITS-based phylogeny; (2) there is a general biogeographical pattern to this phylogeny with regard to the *C. pungens/C.*

robusta complex; and (3) there is genetic diversity between populations of Monterey spineflower. While the researchers suggest that a taxonomic revision of the *Pungentes* complex may be in order, no changes are being proposed at this time (S. Baron, botanic consultant, in litt. 2008).

Monterey spineflower readily grows where suitable sandy substrates occur and, like other *Chorizanthe* species, where competition with other plant species is minimal (Harding Lawson Associates 2000, Reveal 2001). Studies of the soil requirements and shade tolerances of a related taxon, Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*), concluded that this taxon is restricted to openings in sandy soils primarily due to its intolerance of shade produced by competing vegetation, rather than its restriction to the specific soil type (McGraw and Levin 1998).

Where Monterey spineflower occurs within native plant communities, along the coast as well as at more interior sites, it occupies microhabitats found between shrubs where there is little cover from other herbaceous species. In coastal dune scrub, shifts in habitat composition caused by patterns of dune mobilization that create openings suitable for Monterey spineflower are followed by stabilization and successional trends that result in increased vegetation cover over time (Barbour and Johnson 1988). Accordingly, over time there are shifts in the distribution and size of individual colonies of Monterey spineflower found in the gaps between shrub vegetation.

Human-caused disturbances, such as scraping of roads and firebreaks, can reduce the competition from other herbaceous species and consequently provide favorable conditions for Monterey spineflower, as long as competition from other plant species remains minimal. This has been observed at former Fort Ord, where Monterey spineflower occurs along the margins of dirt roads and trails and where it has colonized disturbances created by military training (Corps 1992, BLM 2003). However, such activities also promote the spread and establishment of non-native species, can bury the seedbank of Monterey spineflower, and do not result in the cycling of nutrients and soil microbial changes that are associated with some large-scale natural disturbances, such as fires (Stylinski and Allen 1999, Keeley and Keeley 1989).

The primary threats to the Monterey spineflower identified at the time of listing were development for human uses, recreation, and encroachment of invasive non-native species into its habitat. While these are still occurring and diminishing occurrences of Monterey spineflower, other lands that support this taxon have been purchased by conservation-oriented organizations and are preserved (e.g., Long Valley in the Prunedale Hills) or have the potential for long-term preservation (e.g., Caltrans lands). Within its range, numerous occurrences are on lands being restored or enhanced (e.g., State Beaches, Naval Post-Graduate School) or are planned for restoration and enhancement (e.g., former Fort Ord). A primary component of these programs is the removal of invasive non-native species that compete with Monterey spineflower. Monterey spineflower appears able to recolonize sites where non-native species have been removed (Service 2009).

Recovery

The Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan (Service 1998) outlines recovery criteria for Monterey spineflower. Monterey spineflower can be considered for delisting when the following criteria have been met:

1. The Fort Ord disposal and reuse process has led the management agencies to develop, fund, and implement permanent protection plans for the species' habitat including permanent iceplant suppression programs; and
2. Beach-dune occurrences on State Park and private lands throughout its current range from Santa Cruz to the Monterey Peninsula are covered under a permanent protection plan. Plans to conserve roughly 60 percent of Fort Ord appear sufficient for recovery of the interior occurrence. A reassessment would be made should plans call for conservation of less habitat. Existing management along the coast at the State Parks units needs to be supplemented with protection and management on private lands (management to be determined after a thorough analysis of the beach populations).

The recovery priority number for Monterey spineflower is 15. This number indicates that Monterey spineflower is a subspecies facing a low degree of threat and has a high potential for recovery.

Five-year Review

In 2009, the Service prepared a 5-year review of the Monterey spineflower's status. The review reports that the species occurs in more locations within southern Santa Cruz and Monterey Counties than was previously thought (presumably, at the time of listing in 1994). The Monterey spineflower appears to be well-distributed within the coastal portions of its range and able to colonize disturbed sites with sandy soils as long as a seed source is present, and as long as both native and non-native invasive species do not become abundant.

According to the 5-year review, the primary threats identified at the time of listing are still occurring and affecting Monterey spineflower occurrences; however, some lands that support the species have been purchased by conservation-oriented organizations and are preserved (e.g., Long Valley in the Prunedale Hills) or have the potential for long-term preservation (e.g., Caltrans lands). Within its range, numerous occurrences are on lands being restored or enhanced (e.g., State Beaches, Naval Post-Graduate School) or are planned for restoration and enhancement (e.g., former Fort Ord). A primary component of these programs is the removal of invasive non-native species that compete with the Monterey spineflower, and that may affect the Monterey spineflower indirectly by reducing the bare ground required for nesting by insects in the family Hymenoptera known to pollinate closely-related *Chorizanthe* taxa (Murphy 2003, Service 2009). The species appears able to recolonize sites where non-native species have been removed.

The Service concluded in the 5-year review (2009) that the Monterey spineflower still meets the definition of a threatened species and recommended retaining the recovery priority number of 15. Although the species is persisting at the coast, few occurrences in inland Santa Cruz and northern Monterey Counties are on protected lands with adequate management. Also, because the Monterey spineflower is particularly vulnerable to competition with non-native plant species, and because so many non-native plant species have invaded coastal habitats in the Monterey Bay area, an ongoing ability and commitment to maintain open habitat for the Monterey spineflower should be evident prior to delisting. This could be in the form of a set of management plan actions like a habitat management plan, a habitat conservation plan, or a policy that addresses habitat for sensitive species. Lastly, the Service concluded that it would be prudent to evaluate recent genetic analyses and any resulting taxonomic revision before implementing a status change for the Monterey spineflower.

ENVIRONMENTAL BASELINE

Action Area

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 Code of Federal Regulations 402.02). The action area for this biological opinion consists of all areas where people and equipment would be working, as described in the Project description section of this document, and all areas where the species would be translocated.

Habitat Characteristics of the Action Area

The Project site is located at the Monterey Regional Airport in Monterey County, California. Habitat within the action area consists primarily of ruderal/disturbed areas. Due to ongoing mowing and maintenance, this area supports remnant occurrences of native forbs and shrubs, including the subject species.

Previous Consultations in the Action Area

In 2010, the Service issued a biological opinion to the FAA for the construction of retaining walls at both ends of the runways, runway maintenance, relocating the airport access road, and creating a connecting taxiway. Based on the biological opinion, the proposed action affected approximately 1.77 acres of occupied Monterey spineflower habitat, up to approximately 7 acres of unoccupied Monterey spineflower habitat, and affected no more than two individual Yadon's piperia (*Piperia yadonii*) plants. We determined that the proposed action was not likely to jeopardize the continued existence of the Yadon's piperia and the Monterey spineflower due to the relatively small impacts to the species and the proposed conservation and minimization measures for the species which included designating conservation areas and enhancement of Yadon's piperia habitat.

In 2011, the FAA reinitiated consultation with the Service due to the realignment of a proposed access road that would result in the permanent loss of an additional 0.02 acre of occupied Monterey spineflower habitat and the loss of seven Monterey pines, which provide habitat for Yadon's piperia. We determined that the proposed action was not likely to jeopardize the continued existence of the Yadon's piperia and the Monterey spineflower due to the same conclusions that were reached for the 2010 action (Service 2011). The construction of the RSA Project, as described in both the 2010 and 2011 biological opinions, was completed in December 2015. SWCA Environmental Consultants (SWCA) and MPAD submitted the combined Construction Completion Report and first post-construction monitoring report in June 2016. SWCA and MPAD submitted the 2016 Annual Mitigation Monitoring Report in July 2017 (SWCA 2017).

Status of the Species in the Action Area

Information used to develop this section includes CNDDB occurrence data, reports submitted to the Service, published literature, information provided by regional species experts and resource agencies, previous Monterey Regional Airport biological opinions and related documents, and other information in our files. A botanical and wildlife survey of the BSA was conducted in May 2015, followed by botanical surveys within the infields located east of Taxiway "L" in July 2017. A description of the survey methods utilized can be found in the biological assessment (SWCA 2017b).

The BSA supports 18.8 acres of suitable habitat and 2.2 acres of occupied habitat for Monterey spineflower. At the time of the surveys, 2,400 Monterey spineflower individuals were observed within the BSA. MPAD excluded Subarea A-3 from RSA surface improvements in order to avoid approximately 2,000 Monterey spineflower individuals. The Project would impact a small population of Monterey spineflower individuals located within a 0.015-acre section of Subarea C-6. The Project will also impact approximately 8.51 acres of suitable, but unoccupied Monterey spineflower habitat located within infield Subareas C-1, C-4, C-5, and C-6, as well as the northern portion of Subarea A-4. Habitat within the action area is fragmented due to the concrete taxiways that surround each infield area; therefore, Monterey spineflower populations within the infield areas are limited in their ability to disperse or expand from the infield areas.

Designated critical habitat does not occur in the action area; Monterey spineflower critical habitat Unit 8 (Ford Ord) is found approximately 1.09 miles to the northeast of the Project. The closest Monterey spineflower occurrence is approximately 1.20 miles west of the Project.

Recovery

Although the action area is not specifically cited in the recovery plan (Service 1998) as serving a role in the Monterey spineflower's recovery, the site does provide suitable habitat that, collectively with other areas of occupied habitat, is important to the recovery of the species. The recovery plan states that the Monterey spineflower can be delisted when permanent protections are in place, like the Conservation Area that was developed during the RSA Project. As mentioned above, the recovery plan outlines two delisting criteria that are specific to Monterey spineflower.

Delisting criterion:

The Fort Ord disposal and reuse process has led the management agencies to develop, fund, and implement permanent protection plans for the species' habitat including permanent iceplant suppression programs.

The Fort Ord Habitat Conservation Plan is under development and not yet complete, this delisting criterion has not yet been met.

Delisting criterion:

Beach-dune occurrences on State Park and private lands throughout its current range from Santa Cruz to the Monterey Peninsula are covered under a permanent protection plan. Plans to conserve roughly 60 percent of Fort Ord appear sufficient for recovery of the interior occurrence. A reassessment would be made should plans call for conservation of less habitat. Existing management along the coast at the State Parks units needs to be supplemented with protection and management on private lands (management to be determined after a thorough analysis of the beach populations).

This delisting criterion has not been met, but substantial progress toward it has been made on lands managed by the California Department of Parks and Recreation. In the 5-year review, we recommended this criterion should be revised to reflect that interior populations in Santa Cruz County and the Prunedale Hills of Monterey County, in addition to those at former Fort Ord, are important to the recovery of the taxon (Service 2009). During the RSA Project, a Habitat Conservation and Enhancement Plan was developed for Conservation Area 3 in order to minimize impacts to the Monterey spineflower within the RSA Project action area (SWCA 2017). This conservation area contributes to the recovery goals of the species by conserving habitat of Monterey spineflower.

EFFECTS OF THE ACTION

This analysis takes into account incorporation of the proposed conservation measures as part of the action. The Service believes that incorporation of the proposed conservation measures would reduce potential adverse effects to the species.

The biological assessment (SWCA 2017b) indicates that 0.015 acre of occupied Monterey spineflower habitat would be removed during construction. All individual plants in this area would be subject to damage or mortality as a result of removal or cutting of plants and crushing or trampling by heavy equipment or personnel. Impacts to Monterey spineflower individuals occurring adjacent to the action area would be avoided through the use of Project delineation fencing or flagging.

Activities within the action area would permanently remove occupied and unoccupied Monterey spineflower habitat, including the seed bank, due to grading and application of asphalt on ruderal habitat. The proposed soil and seed bank conservation program would reduce these impacts. MPAD will implement a soil and seed bank conservation program that involves collecting seed prior to the start of construction and scattering the seeds within Conservation Area 3. We anticipate the measures proposed by MPAD would minimize effects to the Monterey spineflower.

In summary, the proposed action would result in the loss of a small amount of Monterey spineflower habitat within the action area. However, the proposed conservation measures would reduce these potential impacts. Based on this information, we do not believe that such loss would have long-term effects on the range-wide status of the species.

Effects on Recovery

As stated above, the action area is not specifically cited in the recovery plan (Service 1998) as serving a role in the recovery of the Monterey spineflower. The proposed Monterey Regional Airport Infield and Taxi Improvements Project would not appreciably reduce the chances of recovery for the Monterey spineflower as the amount of occupied habitat being permanently removed would be small, when taking into account the size of the species' range-wide distribution. The soil and seed bank conservation program may, depending on successful germination at Conservation Area 3, maintain genetic diversity of Monterey spineflower and establish a population within this Conservation Area. Due to these reasons we expect that the proposed Project will have little to no effect on recovery of the Monterey spineflower.

Summary of Effects

We expect direct effects of the Project to the Monterey spineflower on the site to be insubstantial, with the loss of 8.51 acres of unoccupied Monterey spineflower habitat and 0.015 acre of occupied Monterey spineflower habitat. However, we expect these effects to be relatively minor and minimized with the proposed conservation measures. MPAD has proposed to implement conservation measures, including a proposed soil and seed bank conservation program, to minimize impacts to the Monterey spineflower population within the action area. The overall effect of the Project would be minor relative to the overall range-wide status of the Monterey spineflower. Thus, we do not expect the Project would have significant effects on the overall survival and recovery of the Monterey spineflower.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. We do not consider future Federal actions that are unrelated to the proposed action in this section because they require separate consultation pursuant to section 7 of the Act. We are not aware of any non-Federal actions that are reasonably certain to occur in the action areas.

CONCLUSION

The regulatory definition of "to jeopardize the continued existence of the species" focuses on assessing the effects of the proposed action on the reproduction, numbers, and distribution, and their effect on the survival and recovery of the species being considered in the biological opinion. For that reason, we have used those aspects of the Monterey spineflower's status as the basis to assess the overall effect of the proposed action on the species.

Reproduction

The reproductive capacity of the Monterey spineflower within the action area would be largely eliminated by the loss of habitat and individuals, though the seed bank would be preserved before construction begins through the soil and seed bank conservation program. Overall, the effects on the reproductive capacity of the Monterey spineflower range-wide would be negligible. Far more plants will remain viable outside of the Project boundaries in other areas of the Monterey Regional Airport, as well as other locations within the Monterey spineflower's range. Thus, we do not expect the effects of the proposed Project on reproduction of the Monterey spineflower would reduce the likelihood of its survival and recovery in the wild.

Numbers

The loss of 0.015 acre of habitat occupied by the Monterey spineflower will largely eliminate all plants present within this portion of the action area. Monterey spineflower occurring within 2.185 acres would remain in Subarea A-3. We do not know the exact number of individuals represented by these acreages because these numbers can vary widely from year-to-year given fluctuations in rain and other factors. In a relative sense, the loss of individual plants associated with 0.015 acre of Monterey spineflower habitat is small compared to the range-wide distribution of Monterey spineflower. The closest Monterey spineflower critical habitat unit, titled Ford Ord, contains multiple large populations of Monterey spineflower that number in the tens of thousands in some years (Service 2008). We conclude that the proposed action will not reduce the numbers of Monterey spineflower plants to an extent that it would affect its survival and recovery.

Distribution

Although the proposed Project would remove 0.015 acre of occupied Monterey spineflower habitat, approximately 2.185 acres of occupied Monterey spineflower habitat would remain in Subarea A-3. While the Project would result in the loss of a small area occupied by the Monterey spineflower, suitable habitat would still be present at the Monterey Regional Airport. The action area is not within critical habitat and the affected habitat is currently fragmented due to being surrounded by concrete taxiways. Thus, the Project would not reduce the known range of Monterey spineflower, and would not reduce its distribution.

Recovery

The Project proposes to implement a soil and seed bank conservation program in which the collected soil and Monterey spineflower seeds will be distributed at Conservation Area 3. This conservation area was established as a mitigation requirement in the Monterey Peninsula Airport Runway Safety Area Improvement Project Biological Opinion (8-8-10-F-17 and revised 8-8-11-F-19R). Active habitat restoration activities, such as monitoring and invasive species removal, in the conservation areas are anticipated to occur through 2021 (SWCA 2017). The recovery criteria for Monterey spineflower includes (1) the protection of habitat with long-term commitments to conserving the species and the native vegetation and (2) the successful control of invasive non-native plants (and snails) (Service 1998). Since conservation area management plan includes the protection of habitat and invasive-species management, the Project is consistent with the recovery criteria outlined in the recovery plan. Based on these factors, although the proposed Project would remove a small amount of occupied Monterey spineflower habitat, we conclude the Project is not likely to interfere with the overall recovery of the Monterey spineflower.

Conclusion for the Monterey spineflower

After reviewing the current status of the Monterey spineflower, the environmental baseline for the action area, the effects of the proposed Monterey Regional Airport infield and taxiway improvements and the cumulative effects, it is the Service's biological opinion that the Project, as proposed, is not likely to jeopardize the continued existence of the Monterey spineflower. The Service has come to this conclusion due to the following reasons:

1. The effects on reproduction would be negligible, considering the small area of occupied habitat and number of plants that would be lost relative to the overall range of, and area of habitat occupied by, the Monterey spineflower. We conclude that the minor effects of the Project would not appreciably diminish reproduction of the Monterey spineflower either locally or range-wide;
2. The effects on numbers would be minor relative to the overall distribution of the Monterey spineflower. The loss of 0.015 acre of occupied Monterey spineflower habitat would not be a substantial reduction in numbers either locally or range-wide;

3. Although a small amount of occupied habitat would be lost, the distribution of the Monterey spineflower would not be changed by the proposed action. Monterey spineflowers would still exist adjacent to the Project site on the 2.185 acres of occupied habitat to be avoided, thus retaining the species in its current distribution; and
4. The proposed action would not interfere with or preclude ongoing recovery efforts for the Monterey spineflower.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened wildlife species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

In June 2015, the Service finalized new regulations implementing the incidental take provisions of section 7(a)(2) of the Act. The new regulations also clarify the standard regarding when the Service formulates an Incidental Take Statement [50 CFR 402.14(g)(7)], from "…if such take may occur" to "…if such take is reasonably certain to occur." This is not a new standard, but merely a clarification and codification of the applicable standard that the Service has been using and is consistent with case law. The standard does not require a guarantee that take will result; only that the Service establishes a rational basis for a finding of take. The Service continues to rely on the best available scientific and commercial data, as well as professional judgment, in reaching these determinations and resolving uncertainties or information gaps.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species; however, limited protection of listed plants is provided at section 9(a)(2) to the extent that the Act prohibits the removal and reduction to possession of federally listed plants from areas under Federal jurisdiction, the malicious damage or destruction of such plants on areas under Federal jurisdiction, and the destruction of listed plants on non-Federal areas in violation of State law or regulation or in the course of a violation of a State criminal trespass law.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

We recommend that the FAA work with the Monterey Regional Airport to develop an informational brochure and brief training for maintenance contractors who conduct weed control, landscaping, and other activities on the site that explains the relevant conservation measures being implemented to prevent adverse effects to Monterey spineflowers from application of herbicides, handling of invasive plants, intrusion of workers into adjacent occupied habitat, etc.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request for formal consultation. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (3) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) may have lapsed and any further take could be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

If you have any questions about this biological opinion, please contact Karen Sinclair of my staff at (805) 677-3315 or by electronic mail at karen_sinclair@fws.gov.

Sincerely,

Stephen P. Henry
Field Supervisor

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IN LITTERIS

Morello, C. 2018. Senior Manager of Development and Environment. Received by Karen Sinclair, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California. May 3, 2018. Subject: Questions for Monterey Regional Airport Infield and Taxi Improvements

Morello, C. 2018. Senior Manager of Development and Environment. Received by Karen Sinclair, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California. June 1, 2018. Subject: Questions for Monterey Regional Airport Infield and Taxi Improvements

Pomeroy, D. 2018. FAA Environmental Protection Specialist. Received by Karen Sinclair, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California. Dated April 24, 2018. Subject: Questions for Monterey Regional Airport Infield and Taxi Improvements

Appendix E
STATE HISTORIC PRESERVATION OFFICE SECTION 106 CONSULTATION

State of California • Natural Resources Agency Edmund G. Brown Jr., *Governor*

OFFICE OF HISTORIC PRESERVATION Julianne Polanco, *State Historic Preservation Officer*
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100, Sacramento, CA 95816-7100
Telephone: (916) 445-7000 FAX: (916) 445-7053
calshpo@parks.ca.gov www.ohp.parks.ca.gov

March 22, 2018 Refer to: FAA_2018_0222_001

Douglas R. Pomeroy
Environmental Protection Specialist
Federal Aviation Administration
San Francisco Airports District Office
1000 Marina Boulevard, Suite 220
Brisbane, CA 94005

RE: Monterey Regional Airport Infield and Taxiway Improvements Project, 200 Fred Kane Drive, Monterey, California

Dear Mr. Pomeroy:

The Federal Aviation Administration (FAA) is consulting with the California State Historic Preservation Officer (SHPO) in order to comply with Section 106 of the National Historic Preservation Act of 1966 (54 U.S.C. § 306108), as amended. The FAA is requesting SHPO concurrence with a no historic properties affected.

Monterey Regional Airport is proposing to resurface fifteen infield areas located between Runway 10R-28L, and parallel taxiways located to the north and south of the runway.

The FAA defines the undertaking's Area of Potential Effects (APE) as the infill areas and runway work areas, including staging and soil stockpiling locations, approximately 133 acres located within and surrounding the runway safety areas (infields) situated on either side of Runway 10R-28L.

Records on file in the California Historic Resources Information System do not indicate the presence of historic properties in the APE. To affirm this, archaeologists performed a pedestrian survey of the APE. Again, no historic properties were identified (see *Monterey Regional Infield and Taxiway Improvements Project, Cultural Resources Survey Report*, SWCA Environmental Consultants, 2018).

The FAA conducted Native American consultation. In a letter dated February 5, 2018, the Ohlone/Costanoan-Esselen Nation (OCEN) advised that they object to all excavation for any purpose in their known cultural lands, even when they are described as previously disturbed and of no significant archaeological value. In response, the FAA states that while understanding the OCEN's perspective, following such an approach would preclude most future aviation maintenance and development at Monterey Regional Airport.

The OCEN also has asked the FAA to provide archeological surveys and reports and to coordinate with the tribe in the event of unanticipated discovery. The FAA provided the OCEN with the archaeological survey report and states they will work with the tribe in the event of an unanticipated discovery.

Having reviewed the FAA's submittal and supporting documentation, SHPO offers the following comments:

1) The APE appears adequate to account for direct and indirect effects to historic properties;

2) SHPO concurs that the project will not affect historic properties;

3) Please be reminded that in the event of an inadvertent discover or change in the scale or scope of the undertaking, the FAA may have additional consultation responsibilities under 36 CFR Part 800.

If the FAA has questions or comments, please contact the State Historian Tristan Tozer at (916) 445-7027 or via e-mail at Tristan.Tozer@parks.ca.gov.

Sincerely,

Julianne Polanco
State Historic Preservation Officer

Appendix F
NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL ASSESSMENT, COMMENTS RECEIVED, AND RESPONSES TO COMMENTS

MONTEREY HERALD

Published by The Monterey Herald
P.O. Box 271 • Monterey, California 93942
(831) 726.4382

This space is reserved for the County Clerk's Filing Stamp

MONTEREY PENINSULA AIRPORT DISTRICT
Account No. 2141463
200 FRED KANE DR
STE 200
MONTEREY, CA 93940

Legal No. 0006179365
Notice of availability Draft EA

Ordered by:

PROOF OF PUBLICATION

STATE OF CALIFORNIA
County of Monterey

I am a citizen of the United States and a resident of the County aforesaid. I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of The Monterey Herald, a newspaper of general circulation, printed and published daily and Sunday in the City of Monterey, County of Monterey, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Monterey, State of California; that the notice, of which the annexed is a printed copy (set in type not smaller than 6 point), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

06/29/18

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Executed on 06/29/2018 at Monterey, California.

Danielle Landaker

Signature

Notice of Availability of a Draft Environmental Assessment for the Proposed Infield and Taxiway Improvements Project

Notice is hereby given that the Monterey Peninsula Airport District (District), as owner and operator of the Monterey Regional Airport ("Airport"), is seeking Federal Aviation Administration (FAA) approval of an Airport Layout Plan change for the Airport for the proposed Infield and Taxiway Improvements Project (Proposed Action).

The Proposed Action involves several construction activities including: Rehabilitation of 15 infield areas; Removal of a non-standard segment of Taxiway "E"; Reconfiguration of the Taxiway "F" intersection with Taxiway "A"; and Reconfiguration of the Taxiway "K" intersection with Taxiway "A."

The Proposed Action will enhance safety by: (1) Reducing potential damage to aircraft that may result from foreign object debris from deteriorating chip seal surfaces and unpaved surfaces; (2) Enhancing the safety of aircraft movements at the Airport by modifying existing non-standard taxiway geometry and hold line separation distances between the taxiway and the runway centerline; (3) Eliminating habitat for burrowing animals that attract wildlife hazardous to aircraft operations; and (4) Enhancing safety by regrading infield areas that do not currently meet FAA airport grading design standards, which both enhances airport drainage, and provides a smooth surface to roll across if an aircraft loses control and veers off of a runway or taxiway.

A Draft Environmental Assessment (EA) has been prepared to evaluate the potential environmental impacts of the Proposed Action described above pursuant to the requirements of Section 102(2)(c) of the National Environmental Policy Act (NEPA), and Section 509(b)(5) of the Airport and Airway Improvement Act of 1982, as amended. The FAA is the Lead Agency to ensure compliance with NEPA for airport development actions. The Draft EA was prepared in accordance with FAA Order 1050.1F, Environmental Impacts: Policies and Procedures; and FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions. Pursuant to the federal Clean Water Act, Clean Air Act, the National Historic Preservation Act, and the Department of Transportation Act, the Draft EA includes an analysis of prudent or feasible alternatives, potential impacts, and mitigation measures, as appropriate.

Beginning Friday, June 29, 2018, the Draft EA can be reviewed at the Airport District's office at:
200 Fred Kane Drive, Suite 200, Monterey, CA 93940, and Monterey Public Library, 625 Pacific Street, Monterey, CA 93940 while electronic copies can be viewed at: https://montereyairport.specialdistrict.org. The Draft EA can also be reviewed at the Federal Aviation Administration Airports District Office at 1000 Marina Boulevard, Suite 220, Brisbane, CA 94005.

Written comments on the proposed Environmental Assessment must be addressed to:
Chris Morello, Senior Manager - Planning & Environmental, Monterey Peninsula Airport District
200 Fred Kane Drive, Suite 200, Monterey, CA 93940

Comments may also be sent by email to: planning@montereyairport.com. The District will receive comments on the Draft Environmental Assessment during the public review period beginning **Friday, June 29, 2018 and closing at 5:00 pm (PST) on Monday, July 30, 2018.** Please allow enough time for mailing. All comments must be received by the deadline, not simply postmarked by that date.

Published on June 29, 2018
Michael La Pier, AAE, Executive Director

PUBLIC NOTICE

Notice of Availability of a Draft Environmental Assessment for the Proposed Infield and Taxiway Improvements Project

Date: June 29, 2018

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- Reconfiguration of the Taxiway "F" intersection with Taxiway "A"; and
- Reconfiguration of the Taxiway "K" intersection with Taxiway "A."

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3. Eliminating habitat for burrowing animals that attract wildlife hazardous to aircraft operations; and

4. Enhancing safety by regrading infield areas that do not currently meet FAA airport grading design standards, which both enhances airport drainage, and provides a smooth surface to roll across if an aircraft loses control and veers off of a runway or taxiway.

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Monterey Peninsula Airport District
200 Fred Kane Drive, Suite 200
Monterey, CA 93940

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(https://montereyairport.specialdistrict.org/)

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Legal Notices

See below for active requests for qualifications, requests for proposals or any other legal notices for the Monterey Peninsula Airport District.

Updated June 29, 2018

Notices

DRAFT EA FOR THE PROPOSED INFIELD AND TAXIWAY IMPROVEMENTS PROJECT
(HTTPS://MONTEREYAIRPORT.SPECIALDISTRICT.ORG/INFIELD-AND-TAXIWAY-IMPROVEMENT-PROJECT)

The District will receive comments on the Draft Environmental Assessment during the public review period beginning Friday, June 29, 2018 and closing at 5:00 pm (PDT) on Monday, July 30, 2018. Please allow enough time for mailing. All comments must be received by the deadline, not simply postmarked by that date.

Notice of Availability of a Draft Environmental Assessment for the Proposed Infield and Taxiway Improvements Project (/files/35eaa1bcb/NOA+MRY+Infield+EA.06.18.pdf)

Requests for Qualifications and/or Proposals

NONE

COMMENT C1

Ohlone/Costanoan-Esselen Nation

Previously acknowledged as
The San Carlos Band of Mission Indians
The Monterey Band
And also known as
O.C.E.N. or Esselen Nation
P.O. Box 1301
Monterey, CA 93942

www.ohlonecostanoanesselennation.org.

July 6, 2018

Re: Proposed Infield and Taxiway Improvements Project – Monterey Regional Airport

Saleki Atsa,

Ohlone/Costanoan-Esselen Nation is an historically documented previously recognized tribe. OCEN is the legal tribal government representative for over 600 enrolled members of Esselen, Carmeleno, Monterey Band, Rumsen, Chalon, Soledad Mission, San Carlos Mission and/or Costanoan Mission Indian descent of Monterey County. Though other indigenous people may have lived in the area, the area is the indigenous homeland of our people. Included with this letter please find a territorial map by Taylor 1856; Levy 1973; and Milliken 1990, indentifying Tribal areas.

C1-1 [**Ohlone/Costanoan-Esselen Nation objects to all excavation in known cultural lands, even when they are described as previously disturbed, and of no significant archaeological value.** Please be advised that it is our priority that our ancestor's remains be protected and undisturbed. We desire that all sacred burial items be left with our ancestors on site or as culturally determined by OCEN. We request all cultural items returned to Ohlone/Costanoan-Esselen Nation. We ask for the respect that is afforded all our current day deceased, by no other word these burial sites are cemeteries, respect for our ancestors as you would expect respect for your deceased family members in today's cemeteries. **Our definition of respect is no disturbance.**

C1-2a [OCEN request consultation with all soil disturbance.

OCEN's Tribal leadership desires to be provided with:

C1-3 [Archaeological reports/surveys, including subsurface testing, and presence/absence testing.
C1-4 [OCEN request to be included in mitigation and recovery programs,
C1-5 [OCEN request that Cultural and Tribal mitigation measures reflect request for OCEN Tribal Monitor,
C1-6 [Reburial of any of our ancestral remains, burial artifacts,
C1-7 [Placement/return of all cultural items to OCEN, and that
C1-8 [A Native American Monitor of Ohlone/Costanoan-Esselen Nation, approved by the OCEN Tribal Council is used within our aboriginal territory.
C1-2b [**OCEN request consultation with the lead agency.**

C1-9 [We ask that a sacred lands search with the Northwest Information Center, Sonoma State University and the Native American Heritage Commission. Please feel free to contact me at (408) 629-5189. Nimasianexelpasaleki. Thank you

Sincerely and Respectfully Yours,

Louise J. Miranda Ramirez, Chairperson
Ohlone/Costanoan-Esselen Nation
(408) 629-5189
Cc: OCEN Tribal Council

Distribution of Ohlone/Costanoan-Esselen Nation Tribal Rancherias, Districts, Landgrants and Historic Landmarks

OCEN DIRECT LINEAL DESCENT

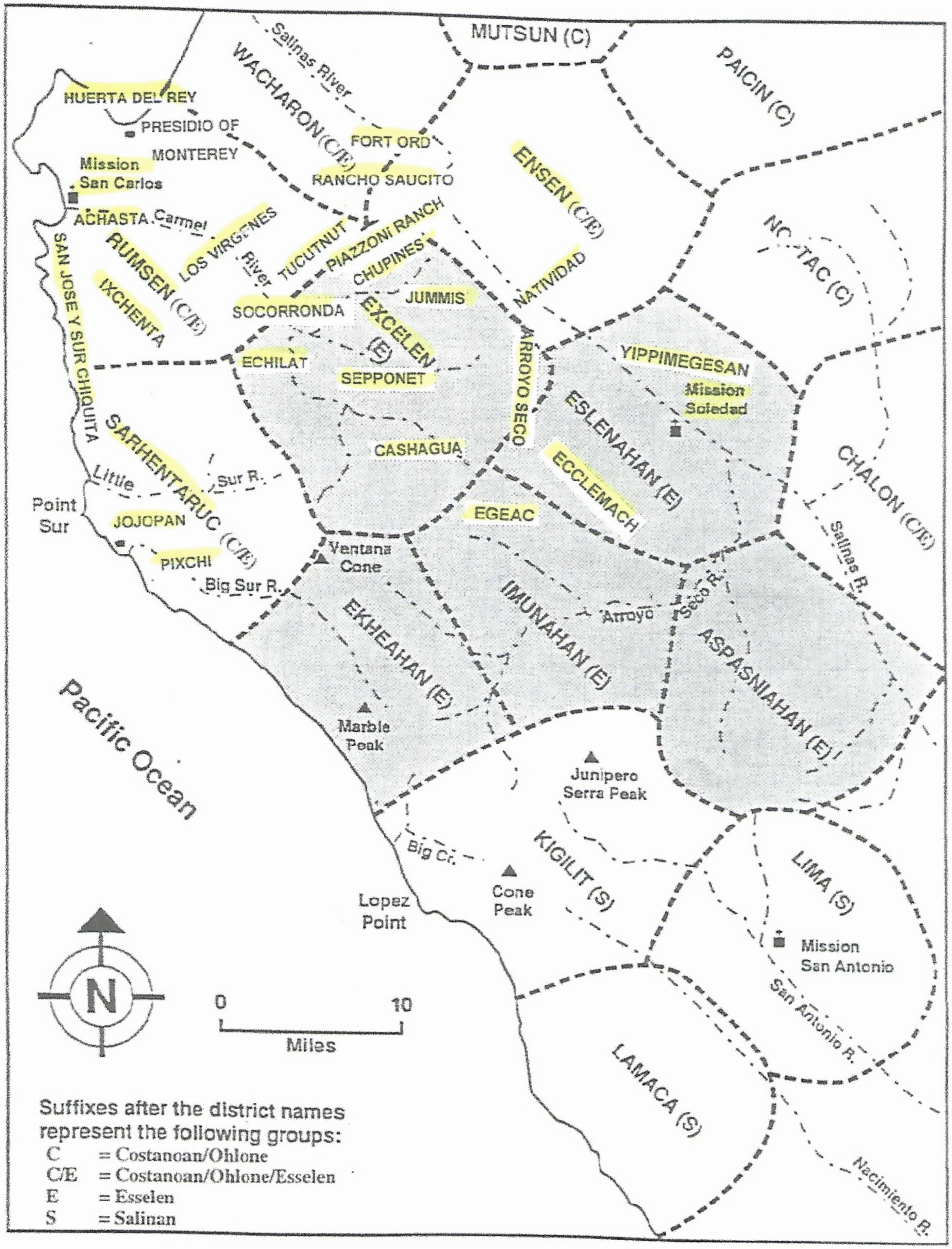

Figure 2:

Map after Taylor 1856; Levy 1973; Hester 1978; Milliken 1990

Responses to Comments on the Draft Environmental Assessment for Proposed Infield and Taxiway Improvements Project - Monterey Regional Airport, Monterey County, California

The two comment letters on the Draft EA have been annotated to identify specific comments, which have been responded to below. The comment numbering system identifies the comment letter C-1 for the Ohlone/Costanoan-Esselen Nation letter of July 6, 2018, and C-2 for the e-mail comments provided by Michael Weaver.

Responses to comments provided by the Ohlone/Costanoan-Esselen Nation (OCEN) by letter of July 6, 2018.

Comment C 1-1. The Ohlone/Costanoan-Esselen Nation objects to all excavation in known cultural lands, even when they are described as previously disturbed, and of no significant archaeological value.

Response C 1-1. Comment noted that the OCEN objects to all excavations on their known cultural lands for any purpose. However, abiding by this preference of the OCEN would preclude most future development and maintenance of aviation infrastructure at the Monterey Regional Airport, prevent the Monterey Peninsula Airport District (MPAD) from meeting the purpose and need for the project or continuing to operate and develop the airport in a manner that maintains the safety of airport infrastructure, and meets current and future aviation activity requirements.

Comment C 1-2a, 2b. The OCEN requested consultation with the lead agency regarding all soil disturbance and the project.

Response C 1-2a, 2b. The MPAD coordinated with the FAA and contacted the OCEN several times to arrange a mutually agreeable time and day to consult on the proposed project. These communications occurred on August 22, 2018, September 27, 2018, and October 2, 2018. The MPAD, FAA, and OCEN agreed to consult on October 23, 2018. No OCEN representative chose to participate in the October 23, 2018 meeting, nor subsequently contacted the MPAD or FAA seeking to reschedule that meeting, so the consultation process is considered complete. If unknown archaeological materials are discovered during project construction, the MPAD and FAA would attempt to reinitiate consultation with the OCEN regarding any such discovery.

Comment C 1-3. The OCEN requested copies of archaeological reports/surveys, including subsurface testing, and presence/absence testing. The *Monterey Regional Airport Proposed Infield and Taxiway Improvements Project – Cultural Resources Survey Report,* dated November 2017, was provided to the OCEN by FAA letter of December 21, 2017, and comments from the OCEN on the cultural resources report were requested.

Response C 1-3. No comments on the cultural resources report were received.

Comment C 1-4. The OCEN request to be included in mitigation and recovery programs.

Response C 1-4. No cultural resources mitigation and recovery programs have been identified as necessary at this time, as no historic properties have been identified in the Area of Potential Effect for the Infield and Taxiway Improvement Project. However, should an unanticipated discovery of cultural resources occur, the MPAD and FAA would contact the OCEN to determine if the OCEN would want to consult on monitoring of the unanticipated discovery and the disposition of the materials discovered.

Comment C 1-5. The OCEN request that Cultural and Tribe mitigation measures reflect request for OCEN Tribal monitor.

Response C 1-5. See response to comment C 1-4.

Comment C 1-6. OCEN wants reburial of any of our ancestral remains, burial artifacts.

Response C 1-6. The MPAD and FAA would follow California state law regarding disposition of any unanticipated discovery of ancestral remains and burial artifacts. The Monterey County Coroner and California Native American Heritage Commission would be contacted to determine whether any remains found were native American. The MPAD and FAA would subsequently contact the most likely descendent to establish their preference regarding the disposition of remained that were located before proceeding with any further action.

Comment C 1-7. Placement/return of all cultural items to OCEN.

Response C 1-7. See response to Comment C 1-4.

Comment C 1-8. A Native American Monitor of OCEN, approved by OCEN Tribal Council is used within our aboriginal territory.

Response C 1-8. See response to Comment C 1-4.

Comment C 1-9. We ask that a sacred lands search with the Northwest Information Center, Sonoma State University and the Native American Heritage Commission.

Response C 1-9. This information was included in the Monterey Regional Airport Proposed Infield and Taxiway Improvements Project – Cultural Resources Survey Report, dated November 2017, which was provided to the OCEN by FAA letter of December 21, 2017.

Judi Krauss

From:	Michael Weaver <>
Sent:	Thursday, July 26, 2018 4:47 PM
To:	Planning
Subject:	Fwd: Comments to both the EA and the proposed MND, for Monterey Regional Airport Infield and Taxiway Improvements Project

Begin forwarded message:

From: Michael Weaver <>
Subject: Comments to both the EA and the proposed MND, for Monterey Regional Airport Infield and Taxiway Improvements Project
Date: July 26, 2018 at 4:46:07 PM PDT
To: Daniel Johanson <djohanson@montereyairport.com>, morello Chris <cmorello@montereyairport.com>

Monterey Regional Airport Planning

c/o Daniel Johanson and Chris Morello
via email

July 26, 2018

Regarding the project description provided by AMBAG (attached), I have the following comments and questions below:

AMBAG REGIONAL CLEARINGHOUSE Association of Monterey Bay Area Governments, PO Box 2453 Seaside CA 93955 | ph. 831.883.3750 **Infield and Taxiway Improvements Project**

Monterey Regional Airport Chris Morello Notice of Availability

(831) 648-7000 planning@montereyairport.com

Other

Notice is hereby given that the Monterey Peninsula Airport District (District), as owner and operator of the Monterey Regional Airport ("Airport"), is seeking Federal Aviation Administration (FAA) approval of an Airport Layout Plan change for the Airport for the proposed Infield and Taxiway Improvements Project (Proposed Action).

The Proposed Action involves several construction activities including: -Rehabilitation of 15 infield areas;
-Removal of a non-standard segment of Taxiway "E";
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3.Elimina ng habitat for burrowing animals that a ract wildlife hazardous to aircra opera ons; and

COMMENT C2

4.Enhancing safety by regrading infield areas that do not currently meet FAA airport grading design standards, which both enhances airport drainage, and provides a smooth surface to roll across if an aircraft loses control and veers off of a runway or taxiway.

A Draft Environmental Assessment (EA) has been prepared to evaluate the potential environmental impacts of the Proposed Action described above pursuant to the requirements of Section 102(2)© of the National Environmental Policy Act (NEPA), and Section 509(b)(5) of the Airport and Airway Improvement Act of 1982, as amended. The FAA is the Lead Agency to ensure compliance with NEPA for airport development actions.

Public hearing information Public review period ends **Monday, July 30, 2018.**

Dear Mr. Johanson and Ms. Morello,

The project is described as both improvements to existing Infield and Taxiway areas, and also seeking changes to the MRA Airport Layout Plan.
The improvements to the existing infield and taxiway areas seem to this reader to be routine maintenance issues. My questions and comments are the following:

C2-1 **1) Why is the FAA being asked to approve airport layout plan changes (ALP) in conjunction with routine maintenance?**

C2-2 **2) Maybe I missed it, but is there a simple side-by-side highlighted diagram or overlay of the " before" and the proposed "after" Infield and Taxiway areas?**

C2-3 **3) Will any proposed changes to existing infield and taxiway areas make any existing MRA structures out of compliance with FAA recommended or required distances from these structures?**

C2-4 **4) What existing structures may be out of FAA recommended or required distance? What are their respective current locations?**

C2-5 **5) How much Federal or State Grant money is involved with these current proposed changes to Infield and Taxiway areas?**

C2-6 **6) Is any Federal or State Grant money secured or is it on an application basis?**

C2-7 **7) How many more Monterey Regional Airport Layout Plan change requests from the FAA are anticipated in the next three years? Five years?**

C2-8 **8) Mitigation measures on a previous MRA project, whereby the eastern wall appearance was to be softened with plantings on the step elevations, has, so far, pretty much failed. What assurances does the public have that threatened or rare native plant species, currently on airport property and to be affected by this project, will have ongoing continuing mitigation?**

Thank you for the opportunity to comment and ask questions.

Sincerely,

Mike Weaver

Responses to comments provided by the Michael Weaver by e-mail of July 26, 2018.

Comment Letter #2 - Received via email on July 26, 2018, from Mike Weaver

Comment C 2-1. Why is the FAA being asked to approve airport layout plan changes (ALP) in conjunction with routine maintenance?

Response C 2-1. The Proposed Action includes the reconfiguration of the Taxiway "F" and Taxiway "K" intersections with Taxiway "A" to enhance safety by meeting FAA taxiway and hold line design standards, these geometry changes must be depicted on an updated ALP, which must be submitted to the FAA for approval.

Comment C 2-2. Is there a simple side-by-side highlighted diagram or overlay of the "before" and the proposed "after" Infield and Taxiway areas?

Response C 2-2. This information is available in the Draft EA by comparing Exhibits 1B, Existing Facilities and 1C, Proposed Action.

Comment C 2-3. Will any proposed changes to existing infield and taxiway areas make any existing MRA structures out of compliance with FAA recommended or required distances from these structures?

Response C 2-3. No, the proposed changes will allow the Airport to meet FAA standards identified in Advisory Circular 150/5300-13A for hold line distances on Taxiways "F" and "K."

Comment C 2-4. What existing structures may be out of FAA recommended or required distances? What are their respective current locations?

Response C 2-4. The scope of this EA is to analyze the environmental effects of the proposed infield and taxiway improvements at MRY. As the scope of the project does not include modifications to existing structures, an evaluation of whether existing structures meet FAA airport design standards is beyond the scope of analysis of this EA.

Comment C 2-5. How much Federal or State Grant money is involved with these current proposed changes to Infield and Taxiway areas?

Response C 2-5. The MPAD may apply for federal and state grants for funding of the proposed infield and taxiway project evaluated in this EA. The MPAD will determine whether to seek federal and/or state financial assistance to complete the proposed action, and if so, what amount of financial assistance to request. Such decisions are made at the public meetings of the MPAD Board of Directors and the schedule of those meetings, and minutes of past meetings, can be viewed at the internet website https://montereyairport.specialdistrict.org/board-of-directors.

Comment C 2-6. Is any Federal or State Grant money secured or is it on an application basis?

Response C 2-6. The FAA cannot consider an Airport Improvement Program grant application for the design or construction of a proposed project until after the National Environmental Policy Act environmental impact evaluation process is completed.

Comment C 2-7. How many more Monterey Regional Airport Layout Plan change requests from the FAA are anticipated in the next three years? Five years?

Response C 2-7. The scope of this EA is to analyze the environmental effects of the proposed infield and taxiway improvements at MRY. It is beyond the scope of this EA to estimate how many MRY ALP changes might be required in future years. ALP changes are done on an as-needed basis.

Comment C 2-8. Mitigation measures on a previous MRA project, whereby the eastern wall appearance was to be softened with plantings on step elevations, has, so far, pretty much failed. What assurances does the public have that threatened or rare native plant species, currently on airport property and to be affected by this project, will have ongoing continuing mitigation?

Response C 2-8. Section 4.3.2 and Appendix D of the Final EA describe the measures identified by the United States Fish and Wildlife Service to mitigate for the removal of 0.015 acre of Monterey spineflower habitat associated with the project. These measures have been identified as acceptable by the United States Fish and Wildlife Service to address the impacts of the proposed action on the Monterey spineflower.

MRY
MONTEREY
REGIONAL AIRPORT

Dave Kessler
Federal Aviation Administration
777 S Aviation Blvd. Ste. 150
El Segundo, CA 90245

May 3, 2019

RE: OCEN Consultation Efforts for Infield and Taxiway Improvement Project

Dear Mr. Kessler:

The following is a account of the Monterey Regional Airport's (MRY) attempts for consultation with Ohlone/Costanoan-Esselen Nation (OCEN) regarding the Airport's proposed Infield and Taxiway Improvements Project. The Airport's efforts include:

- Chris Morello, Deputy Director of Strategy and Development, for MRY sent an email to Ms. Louise Ramirez, the recognized contact person for OCEN, dated August 22, 2018 inviting her to schedule a consultation with the Airport to discuss the project. The e-mail stated Louise had thirty (30) days from the date of the e-mail, until September 21, 2018, to respond. She did not.

- Dan Johanson, Project Manager, for MRY followed up with Ms. Ramirez on September 27, 2018, per FAA direction after the initial 30-day time frame had expired. During the call, Ms. Ramirez expressed an interest in having a consultation meeting with the Airport.

- On October 2, 2018, Mr. Johanson and Ms. Ramirez had an in-person conversation regarding scheduling a consultation with the Airport and the FAA. It was determined and agreed upon that it would take place on October 23, 2018 at 1:00 pm. Dan sent an e-mail on October 3, 2018 as a follow up and to confirm the date and time of the meeting.

- Ms. Ramirez failed to show up for the meeting scheduled for October 23, 2018 and or reach out to the Airport to reschedule the meeting. Jasmine Evains, FAA SFO ADO Community Planner, participated in the meeting via conference call.

- An e-mail was sent on October 23, 2018 to Doug Pomeroy, FAA SFO ADO, Environmental Specialist, stating that Ms. Ramirez failed to show up for the consultation and documenting the airport's efforts to date for consultation with OCEN.

C.C. EA Infield and Taxiway Improvements Project File

T (831) 648-7000
F (831) 373-2625
W www.montereyairport.com

200 Fred Kane Drive, Suite 200
Monterey, CA 93940

Coffman Associates
Airport Consultants

www.coffmanassociates.com

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4835 E. Cactus Road
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Scottsdale, AZ 85254