



# Revised Draft Environmental Impact Statement Commonwealth of the Northern Mariana Islands Joint Military Training



Appendices A through L



**June 2025**  
EISX-007-17-XMC-1747255459



# **APPENDICES A THROUGH L**

## **in Support of the**

### **Commonwealth of the Northern**

#### **Mariana Islands**

##### **Joint Military Training Environmental**

###### **Impact Statement**

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**June 2025**

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**APPENDIX G**  
**TERRESTRIAL BIOLOGY SURVEY REPORT**



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***Final***  
**Survey Report for**  
**Surveys of Federally Listed Species**

**Revised Environmental Impact Statement for the Proposed**  
**Commonwealth of the Northern Mariana Islands Joint Military**  
**Training on the Island of Tinian**



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*Prepared under:* Contract N62742-18-D-1802, Task Order N6274222F0161

August 2023

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***FINAL***  
**SURVEY REPORT FOR**  
**SURVEYS OF FEDERALLY LISTED SPECIES**

**REVISED ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED**  
**COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS JOINT MILITARY**  
**TRAINING ON THE ISLAND OF TINIAN**

**Prepared By:**

Cardno Government Services – AECOM Pacific  
Joint Venture

**Prepared For:**

Naval Facilities Engineering Systems  
Command, Pacific

**Purpose:** Surveys of Federally Listed Species in  
Support of the Revised Environmental Impact  
Statement for the Proposed Commonwealth of  
the Northern Mariana Islands Joint Military  
Training on the Island of Tinian

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**Final Survey Report for  
Surveys of Federally Listed Species**

**Revised Environmental Impact Statement for the Proposed Commonwealth of the  
Northern Mariana Islands Joint Military Training on the Island of Tinian**

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## **ACRONYMS AND ABBREVIATIONS**

CJMT	Commonwealth of the Northern Mariana Islands Joint Military Training	GPS	global positioning system
CNMI	Commonwealth of the Northern Mariana Islands	JV	Joint Venture
EIS	Environmental Impact Statement	NAVFAC	Naval Facilities Engineering Systems Command
GIS	geographic information system	U.S.	United States
		USFWS	United States Fish and Wildlife Service



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# CHAPTER 1

## INTRODUCTION

### 1.1 BACKGROUND AND OVERVIEW

In April 2023, the Cardno GS – AECOM Pacific Joint Venture (JV) team performed surveys of federally listed species (those listed as threatened or endangered under the Endangered Species Act) in support of environmental planning and analysis for the Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT) Revised Environmental Impact Statement (EIS) on the island of Tinian. Naval Facilities Engineering Systems Command (NAVFAC) Pacific is the administering agency for this task order. As outlined in the work plan prepared for the surveys (NAVFAC Pacific 2023), the JV conducted a presence/absence survey of the following federally listed species in the CJMT survey area:

- *Partula gibba* (humped tree snail) (federally endangered)
- *Solanum guamense* (berenghenas halomtano) (federally endangered)
- *Dendrobium guamense* (no common name) (federally threatened)
- *Heritiera longipetiolata* (ufa-halomtano) (federally endangered)

Previous surveys documented the presence of humped tree snail, *D. guamense*, and *H. longipetiolata* on Tinian (Table 1-1; Figures 1-1 and 1-2) (NAVFAC Pacific 2014, 2018, 2019). Historically, *S. guamense* likely occurred on Tinian; however, in recent decades it was only known from the island of Guam. Currently, all known populations of *S. guamense* have been extirpated, including historical populations on Tinian (United States [U.S.] Fish and Wildlife Service [USFWS] 2020).

Table 1-1 lists the three most recent surveys of federally listed species on Tinian, species surveyed for, and species detections.

**Table 1-1 Recent Surveys of Federally Listed Species on Tinian**

<i>Survey Type</i>	<i>Survey Year(s)</i>	<i>Federally Listed Species Surveyed for and Presence/Absence Results on Tinian</i>
Federally listed snail and plant species	2019	Humped tree snail ( <i>Partula gibba</i> ) (not detected) <i>Dendrobium guamense</i> (detected in the Mount Lasso region) <i>Heritiera longipetiolata</i> (detected in coastal karst limestone areas)
Federally listed plant species	2016-2018	<i>Solanum guamense</i> (not detected) <i>Dendrobium guamense</i> (detected in the Mount Lasso region) <i>Heritiera longipetiolata</i> (detected in coastal karst limestone areas) <i>Tuberolabium guamense</i> (not detected)
Terrestrial biological resources	2013	Micronesian megapode ( <i>Megapodius laperouse</i> ) (not detected) Mariana common moorhen ( <i>Gallinula chloropus guami</i> ) (detected at wetland locations) Humped tree snail (live individuals detected at Dump Coke region of Lamanibot Bay)

Sources: NAVFAC Pacific 2014, 2018, 2019.



Figure 1-1 CJMT Survey Area – Vegetation Communities





## 1.2 PURPOSE

The purpose of the federally listed species surveys was to document the presence and population status of the four federally listed species identified in Section 1.1. The results of the surveys summarized in this report, as well as data collected from past surveys, will be incorporated into the CJMT Revised EIS and supporting Biological Assessment to assess the potential environmental impacts of the proposed action and to develop avoidance, minimization, and conservation measures, where applicable.

## 1.3 PROJECT CONTACTS

The Cardno GS–AECOM Pacific Joint Venture Team members involved in performing the project tasks are listed in Table 1-2 along with their project-specific roles.

**Table 1-2 Personnel for Surveys of Federally Listed Species on Tinian**

<i>Role</i>	<i>Name</i>	<i>Organization</i>
<i>Project Management/Technical Support</i>		
TOCOR	Lesley Matsumoto	NAVFAC Pacific
Alternate TOCOR	Garwin Eng	NAVFAC Pacific
Project Manager	Douglas Gilkey	JV
Terrestrial Project Manager	Ben Berridge	JV
Lead Health and Safety Officer	Lynne Black	JV
GIS Specialist	Travis Gahm	JV
<i>In-Field Survey Leads</i>		
Lead Field Biologist and Onsite Health and Safety Officer	Clint Scheuerman	JV
Terrestrial Biology TPOC	Coralie Cobb	NAVFAC Pacific
<i>Additional Survey Personnel</i>		
Field Biologist	Josh De Guzman	JV
Field Biologist	John Lowenthal	JV
Field Biologist	Aja Reyes	JV
Field Biologist	Todd Finlayson	JV
Field Biologist	Colleen Smith	JV
Field Biologist	Claudine Camacho	Dueñas Camacho & Associates
Field Biologist	Jessica Gross	Dueñas Camacho & Associates
Field Biologist	Joney Rengiil	Dueñas Camacho & Associates
Field Biologist	Domanique Smith	Sundance Consulting Inc.
Field Biologist	Trevor Boykin	Sundance Consulting Inc.
Field Biologist	John Hapdei	Island Eco Services
Field Biologist	Dorian Hadoar	Island Eco Services
Field Biologist	Arnold Ulith	Island Eco Services
Field Biologist	Nicholas Lenger	Island Eco Services

Notes: GIS = geographic information system; JV = Joint Venture; TOCOR = Task Order Contracting Officer Representative; TPOC = Technical Point of Contact; NAVFAC = Naval Facilities Engineering Systems Command.

## 1.4 SURVEY AREA

The survey area components are located throughout the northern portion of the island, totaling approximately 1,543 acres, and the survey area components and names are reflected in Figure 1-3. For the purpose of this project, and in accordance with the final work plan, the survey area was divided into two distinct transect areas based on the required transect spacing between surveyors, either 30 feet (non-limestone habitats) or 15 feet (limestone habitats) apart. These distinct transect areas are represented in Figure 1-2 and are detailed in Table 1-3.



Figure 1-3 CJMT Survey Area Components

### 1.4.1 Vegetation Communities

Figure 1-1 depicts the distinct vegetation communities in the survey area. Table 1-1 provides the vegetation communities and acreages broken out by transect area within the survey area. The dominant vegetation type within the combined survey area is *Leucaena* forest, followed by limestone degraded forest, and, to a lesser degree, limestone native forest.

The vegetation communities in the survey area are described briefly below per the descriptions provided in NAVFAC Pacific (2019) that are based on Amidon (2017) with modifications from NAVFAC Pacific (2018).

#### Barren

This community classification applies to areas of barren, non-vegetated soil, sand, or rock, and occurs both inland and along the coastline.

#### Casuarina Forest

Ironwood or Australian pine (*Casuarina equisetifolia*) tolerates dry and salty or exposed conditions. It forms a sparse forest or woodland with little understory. Although it tends to function ecologically as an invasive species, ironwood is generally accepted as native to the Mariana Islands.

#### Coconut Forest

Coconut forest is a cover type almost exclusively dominated by coconut palm (*Cocos nucifera*). Stands of this forest type can have either minimal understory or can support a relatively diverse understory of mixed native and non-native shrubs, herbs, and/or ferns. Some of these stands may be remnants of previous coconut plantations while others may be the result of natural dispersion.

#### Developed

These are human-occupied or otherwise highly disturbed areas that include lawns and other anthropogenically landscaped or maintained areas (e.g., mowed fields, utility corridors), buildings, roads, parking lots, and other paved areas.

#### Leucaena Forest

This plant community is dominated by tangantangan (*Leucaena leucocephala*), and typically occurs on limestone where it can occur in pure stands. In areas where it is adjacent to native forest, *Leucaena* forest can be invasive, mixing with native woody species. While not considered a native vegetation community on Tinian, *Leucaena* forest does provide habitat for some native bird species.

#### Limestone Coastal Scrub

This native-dominated plant community is present on limestone terraces and cliff edges. The floristic composition may be either simple or complex and composed of a few or many species. Species may include some of those found in limestone native forest, such as fig species (*Ficus* spp.), but are stunted by climactic conditions. Other woody species such as bantigue (*Pemphis acidula*) and great woolly Malayan lilac (*Callicarpa candicans*) occur in this community near coastlines.

Table 1-3 Vegetation within the Survey Area Components												
Survey Area Component	Limestone Habitat (15-foot Transect Areas)			Non-limestone Habitats (30-foot Transect Areas)								TOTAL
	Limestone Coastal Scrub	Limestone Degraded Forest	Limestone Native Forest	Barren	Casuarina Forest	Coconut Forest	Developed	Leucaena Forest	Open Water	Other Scrub/ Grassland	Scrub/ Shrub	
Base Camp Alternative 1 <sup>1</sup>	-	62.74	-	-	19.73	-	1.92	0.16	-	30.87	-	115.42
Base Camp Alternative 2 <sup>2</sup>	-	61.17	-	-	11.70	-	0.23	0.01	-	25.31	-	98.42
ETR Options	-	1.41	-	-		-	-	5.01	-	3.31	-	9.73
LZ Areas	-	32.25	-	-	0.68	-	-	93.94	-	23.81	6.33	157.01
MPMR Perimeter Road and Firebreak	-	-	-	-	-	-	0.09	11.28	-	-	-	11.37
MPMR	-	-	-	-	-	-	0.12	13.75	-	-	-	13.87
New Roads	-	3.02	-	-	0.26	-	0.02	2.08	-	0.73	0.22	6.33
Primary Utility Corridor	0.07	16.84	-	0.02	0.11	0.03	25.27	21.60	-	19.93	0.42	84.29
Surface Radar Sites	0.08	0.10	-	0.07	0.02	-	0.14	0.03	-	-	-	0.44
Utilities and Access Corridor (Alternatives 1 and 2) <sup>3</sup>	-	-	-	-	-	-	-	-	-	-	-	0.00
Mount Lasso Limestone Forest	-	149.64	120.29	-	7.95	-	-	54.22	-	37.39	11.59	381.08
Pina Plateau Limestone Forest	20.51	46.36	57.36	0.53	-	-	2.24	122.67	-	6.68	2.46	258.81
Bateha Wetland Buffer	-	15.49	-	1.02	-	0.06	0.01	0.01	-	19.47	-	36.06
Chiget Limestone Forest	0.06	19.07	37.89	0.39	0.14	-	-	43.50	0.44	0.70	0.58	102.77
Unai Masalok	12.39	-	-	0.53	2.53	-	0.06	1.55	0.18	0.09	4.73	22.06
AHAs	-	1.20	-	-	-	-	-	1.39	-	0.19	-	2.78
North Field Drop Zone	-		-	-	8.12	-	12.52	190.75	-	0.02	28.52	239.93
Aircraft Shelter (North Field Drop Zone)	-		-	-	-	-	-	2.29	-	-	-	2.29
TOTAL	33.11	409.29	215.54	2.56	51.24	0.09	42.62	564.24	0.62	168.50	54.85	1,542.67

Legend: AHA = Ammo Holding Area; ETR = Explosive Training Range; LZ = Landing Zone; MPMR = Multi-purpose Maneuver Range.

Notes: <sup>1</sup>Total acreage includes Base Camp 1 and 2 areas of overlap.

<sup>2</sup>Total acreage excludes Base Camp 1 and 2 areas of overlap.

<sup>3</sup>Occurs in the Base Camp corridor (no additional acreage, and not shown on Figure 1-3).



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### Limestone Degraded Forest

This cover type consists of limestone forest plant communities that have been significantly disturbed by clearing, invasive plants, and introduced animals. This vegetation community tends to exhibit one or more of the following characteristics: (1) the dominance of a variety of non-native woody species; (2) substantial forest clearings (visible in aerial imagery); or (3) dominance of sea hibiscus (*Talipariti tiliaceum*) (NAVFAC Pacific 2018). Common non-native tree species in this type of disturbed limestone forest on Tinian include siris tree (*Albizia lebbbeck*), Formosan koa (*Acacia confusa*), flame tree (*Delonix regia*), and Madras thorn (*Pithecellobium dulce*). Native tree species in these forests often include one or more of the following species: headache tree (*Premna serratifolia*), screw pine (*Pandanus tectorius*), fingersop (*Meiogyne cylindrocarpa*), and mapunyo (*Aglaia mariannensis*).

### Limestone Native Forest

This native community type is a relatively undisturbed forest that occurs on shallow limestone soils dominated by native tree and shrub species. Forest clearings from ungulate or other disturbances tend to be absent or very limited. The term limestone native forest also describes areas that may have been cleared and have regrown to be dominated by native tree and shrub species. Dominant tree species in these forests usually include one or more of the following: twin-apple (*Ochrosia oppositifolia*), fig species, headache tree, screw pine, fingersop, sea hibiscus, cedar bay cherry (*Eugenia reinwardtiana*), mapunyo, and *Macaranga thompsonii* (no common name). On Tinian, the very large, canopy-emergent trees wrinkle pod mangrove (*Cynometra ramiflora*), *Mammea odorata* (no common name), *H. longipetiolata*, Marianas breadfruit (*Artocarpus mariannensis*), and yoga tree (*Elaeocarpus joga*) may be present.

### Open Water

Open water includes areas covered by water with no vegetative cover, such as ocean waters, rivers, and lakes.

### Other Shrub/Grassland

This largely, non-native community is characterized by the presence of shrubs and grasses. It may be present in degraded forest areas as clearings with herbaceous vegetation and scattered shrubs. Also included in this category are areas that have been recently cleared or that are actively mowed periodically to prevent forest regeneration. These areas may consist primarily of grassland with limited regrowth of woody species.

### Scrub/Shrub

This plant community is characterized by the predominance of low-stature woody vegetation that can occur as a mixture of native and non-native species. The vegetation may be a secondary thicket of woody species but may also include some interspersed herbaceous species. The woody vegetation tends to be too low or sparse to be characterized as forest. This low-stature character may be the result of human disturbance or physical conditions, such as fire, soil saturation, or poor soils.

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## CHAPTER 2

### SURVEY METHODOLOGY

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#### 2.1 SURVEY METHODS

Field surveys were conducted by 16 survey personnel divided into teams of three and one four-person team, for a total of five in-field survey teams. All survey personnel are experienced natural resources experts with the experience and identification skills to conduct surveys in the habitats of Tinian and identify the target species. Surveys were conducted Monday through Saturday from April 3, 2023 to April 24, 2023. Prior to the start of each survey day, the Lead Field Biologist (C. Scheuerman) assigned areas to be covered by each of the five teams. Every morning, the Lead Field Biologist conducted a tailgate safety meeting to discuss potential safety concerns, safety measures, and confirm logistics for the day with each survey team.

Using geographic information system (GIS)-provided boundaries, the field survey teams traversed the entirety of their assigned areas and surveyed along transects that were spatially delineated approximately 15 feet or 30 feet apart (as depicted in Figure 1-2). All accessible areas mapped as having higher quality limestone vegetation (i.e., limestone coastal scrub, limestone degraded forest, and limestone native forest) were surveyed using approximately 15-foot transects. All other vegetation and land cover types of lower habitat quality for the target species were surveyed using approximately 30-foot transects. Each survey team walked in relative parallel fashion along the established transects while the surveyor in the middle position (for 3-person teams) or far end (for the 4-person team) carried a portable global positioning system (GPS) unit with a tracking application to continuously track the movements of the survey team. All survey track logs were stored as polyline layers and are provided on figures in Appendix A.

For 15-foot transect surveys, line-of-sight observations were recorded up to 7.5 feet on each side of the survey transects. For 30-foot transect surveys, line-of-sight observations were recorded up to 15 feet on each side of the survey transect guidelines. Deviations from 15-foot and 30-foot transects were necessary in areas where there were obstacles such as buildings, impassable vegetation, or steep slopes (greater than 40 degrees). Certain areas did not require transect surveys due to lack of habitat, such as paved roads, structures, mowed/cleared fields, and monocultures of invasive/noxious plants (e.g., patches of swordgrass [*Miscanthus floridulus*] and common lantana [*Lantana camara*]). In addition, low-statured limestone coastal scrub habitat was not traversable due to steep, unsafe terrain and dense, stunted vegetation (i.e., Chiget limestone forest, Unai Masalok, and Pina Plateau limestone forest). In such areas, surveyors were able to gain visual observations from the tops of slopes/cliff lines where safe to do so. When areas were unable to be surveyed in full or according to transect guidelines, photos were taken for documentation and notes recorded as to why the area was not surveyed in full or why there was a deviation from the 15-foot or 30-foot transect spacing. Impassable areas are noted accordingly on figures in Appendix A.

When and where federally listed species were identified, surveyors stopped to map the location(s) of species and collect baseline data (refer to Section 2.3 for the types of data collected). Locations of federally listed species were mapped using portable GPS units. When individual plants or animals of interest were observed, a single point was collected on the GPS to map the location of that individual. For

*H. longipetiolata* groves, the boundaries of the local populations were mapped on the GPS in the form of a polygon.

## 2.2 SURVEY EQUIPMENT AND STANDARDS

Each survey team was equipped with a portable/handheld Trimble TDC 650 or Geo7x GPS unit with sub-meter level mapping accuracy.

All existing GIS data was preloaded onto the GPS units prior to surveys, including the survey area boundaries, previously mapped species locations, and transect area spacing. Following daily surveys, collected data was synced from the GPS units, backed up, and checked for completeness. Following daily checks of data completeness, survey teams were assigned new areas to cover so as to avoid overlap of survey effort and ensure that all accessible areas were surveyed.

## 2.3 DATA COLLECTED FOR FEDERALLY LISTED SPECIES

When and where federally listed species were detected, the field survey personnel documented the following on a GPS unit:

1. Species name.
2. GPS location (sub-meter level accuracy).
  - a. For individual occurrences of an organism, a single data point was collected, and relevant data noted.
  - b. For multiple *D. guamense* individuals found growing on the same substrate or host plant, a single data point was collected along with the number of individuals counted on the substrate or host plant.
  - c. For plant species detected that grew in clumps, groves, or stands, the locations were mapped in the form of a polygon along with the number of individuals within the polygon.
3. Host plant species (if applicable).
4. Life stage (e.g., adult, juvenile, sapling, seedling – if applicable and discernible in the field).
5. Reproductive stage (e.g., flowering, fruiting – if applicable and discernible in the field).
6. Condition (e.g., dead, poor, fair, good – if applicable and discernible in the field).

Focus was then temporarily put on habitat in the immediate vicinity, as opposed to continuing straight ahead on a transect path, to ensure that any and all other individuals were accounted for and mapped.

More specific species data types and observations are discussed in Chapter 4.

## CHAPTER 3

### RESULTS

Results of the 2023 surveys of federally listed species are summarized in Tables 3-1 through 3-3 and are depicted in Figures 3-1 through 3-6. Appendix B contains the complete data matrices for both point and polygon federally listed species observation data collected during the surveys. All survey GIS data collected in the field will be provided to NAVFAC Pacific with submission of the final survey report.

#### 3.1 FEDERALLY LISTED PLANT SPECIES RECORDED

Individuals of both *D. guamense* and *H. longipetiolata* were observed and mapped in multiple locations in 2023. Table 3-1 details the survey point data collected for each location of *D. guamense* that was observed and mapped, and each observation point is depicted in Figures 3-1, 3-2, and 3-3. In total, 208 individual *D. guamense* plants were observed at 23 unique locations, all within the Mount Lasso limestone forest survey area component.

**Table 3-1 Summary of *Dendrobium guamense* Observations**

<i>Substrate Type/Host Species</i>	<i>Vegetation Community</i>	<i>Number of Living Individuals<sup>1</sup></i>	<i>Overall Condition</i>	<i>Total by Substrate/Host</i>
Dead/downed tree/branch (unidentifiable)	Limestone Native Forest	1	Good	77
	Limestone Native Forest	1	Fair	
	Limestone Native Forest	6	Poor	
	Leucaena Forest	28	Fair	
	Leucaena Forest	10	Fair	
	Limestone Native Forest	5	Good	
	Limestone Native Forest	3	Fair	
	Limestone Native Forest	17	Good	
	Limestone Native Forest	6 <sup>2</sup>	Fair	
Dead shrub	Other Scrub/Grassland	6	Good	6
Leaf litter	Other Scrub/Grassland	3	Fair	3
Limestone (organic matter on limestone substrate)	Other Scrub/Grassland	16	Fair	44
	Other Scrub/Grassland	8	Fair	
	Other Scrub/Grassland	9	Good	
	Limestone Native Forest	7	Good	
	Limestone Native Forest	4	Fair	
<i>Ficus</i> sp.	Limestone Native Forest	8	Fair	16
	Limestone Native Forest	8	Fair	
<i>Premna serratifolia</i>	Other Scrub/Grassland	34	Fair	34
<i>Eugenia</i> sp.	Other Scrub/Grassland	4	Fair	16
	Limestone Native Forest	12	Fair	
<i>Meiogyne cylindrocarpa</i>	Limestone Native Forest	5	Fair	5
Unknown shrub	Limestone Native Forest	7	Fair	7
<b>TOTAL</b>				<b>208</b>

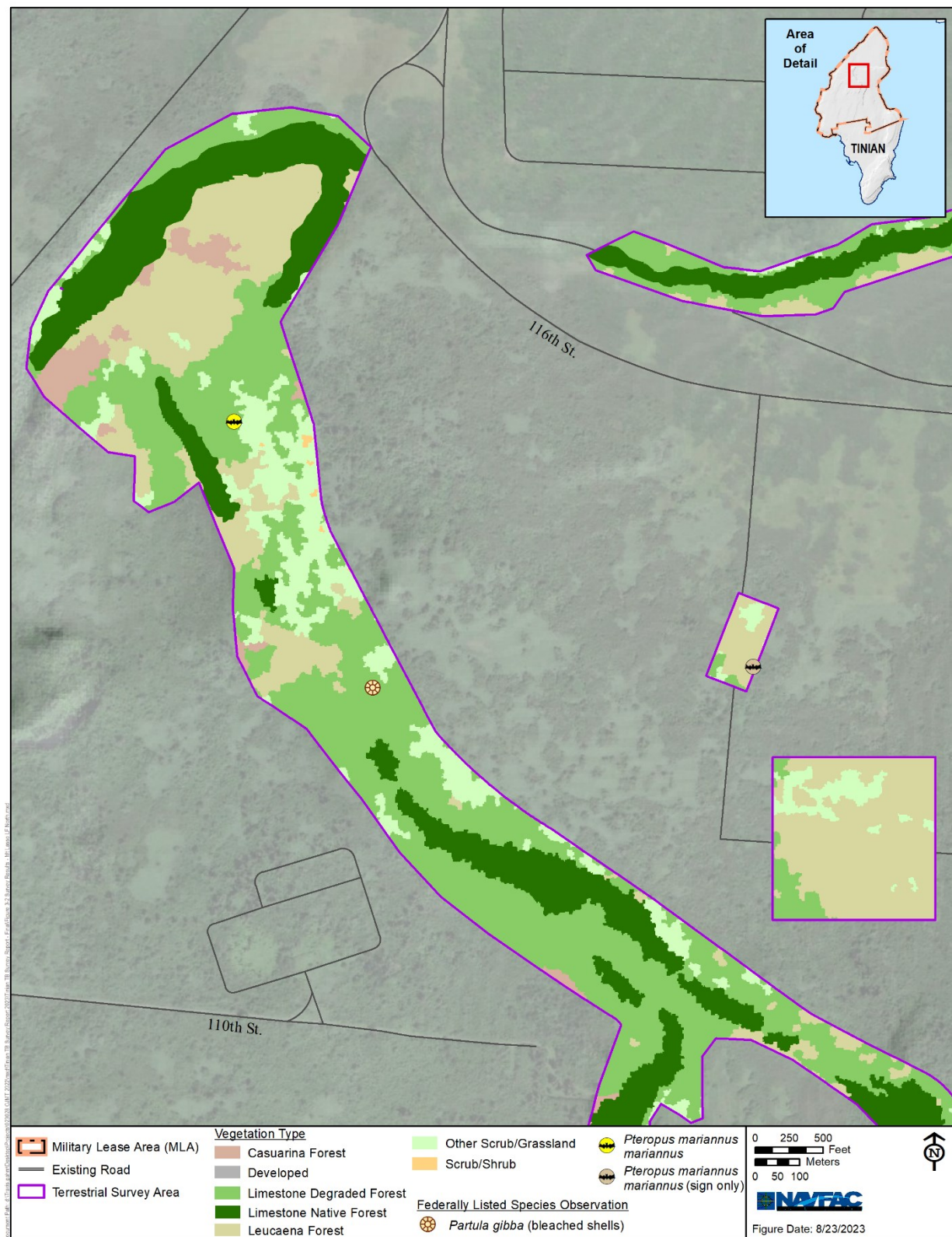
Notes: <sup>1</sup>Each row represents a single observation point.

<sup>2</sup>Nine individuals were located at this location; however, three were noted as dead.



Figure 3-1 Survey Results Overview





**Figure 3-2 Survey Results – Mount Lasso Limestone Forest North**



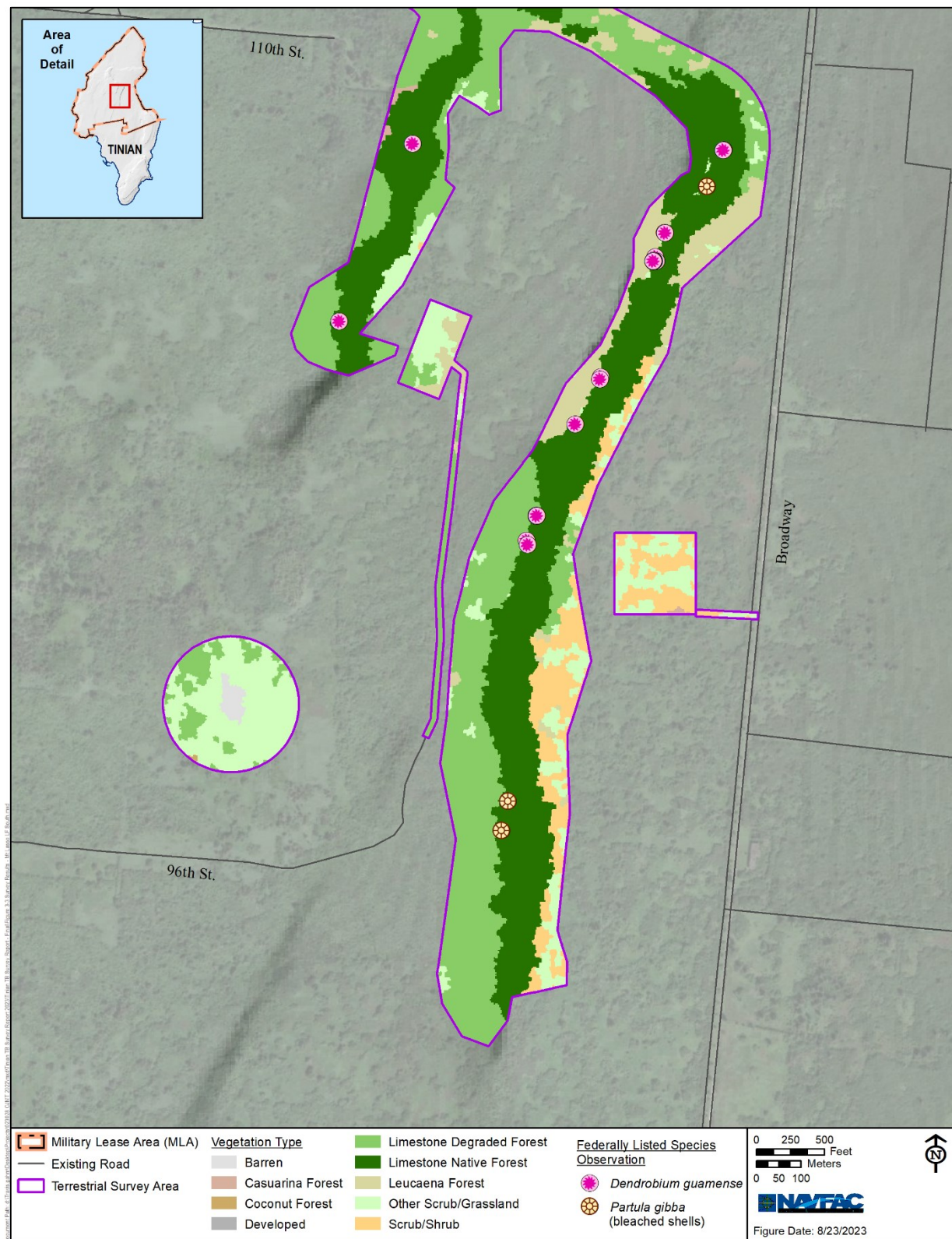


Figure 3-3 Survey Results – Mount Lasso Limestone Forest South

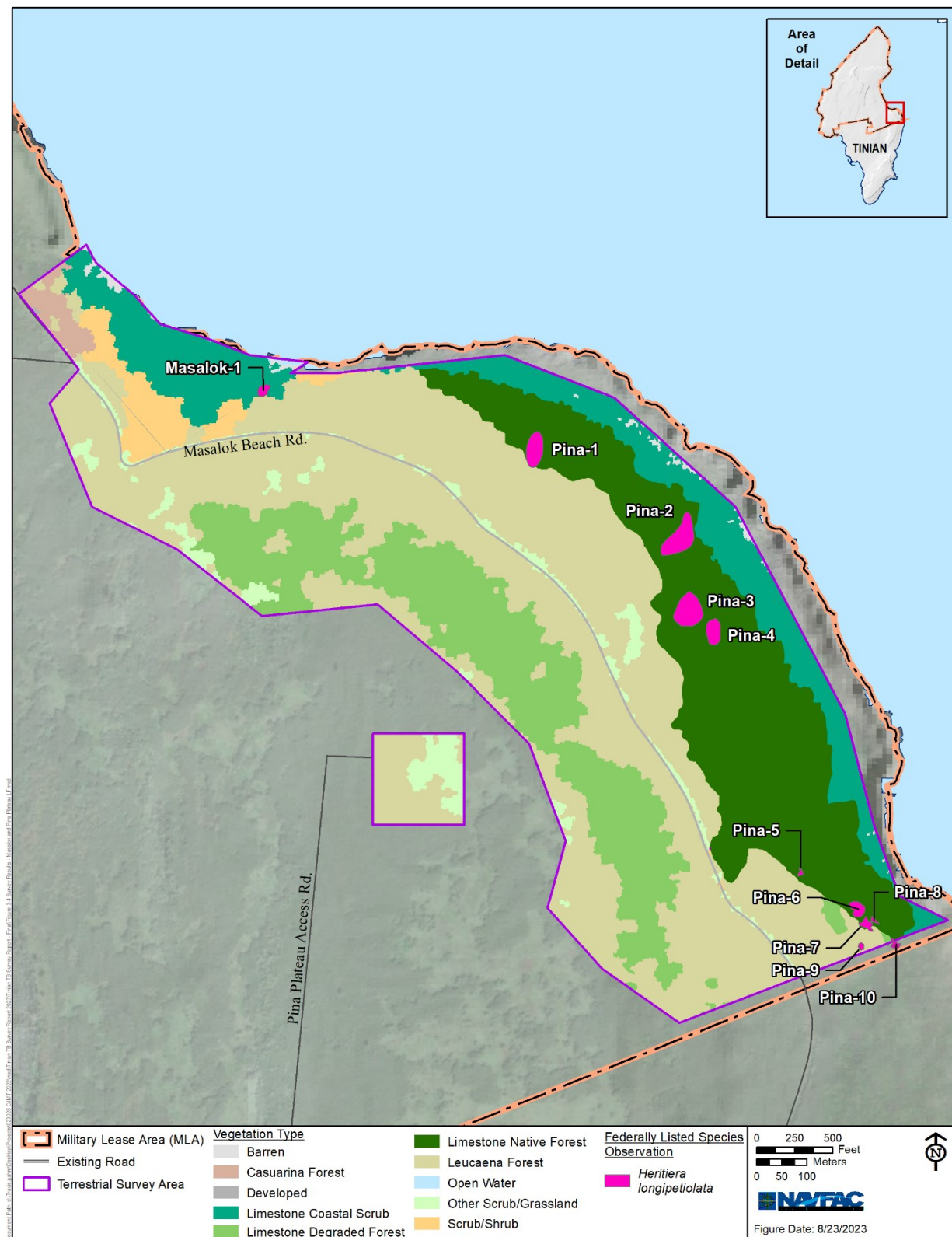


Figure 3-4 Survey Results – Unai Masalok and Pina Plateau Limestone Forest



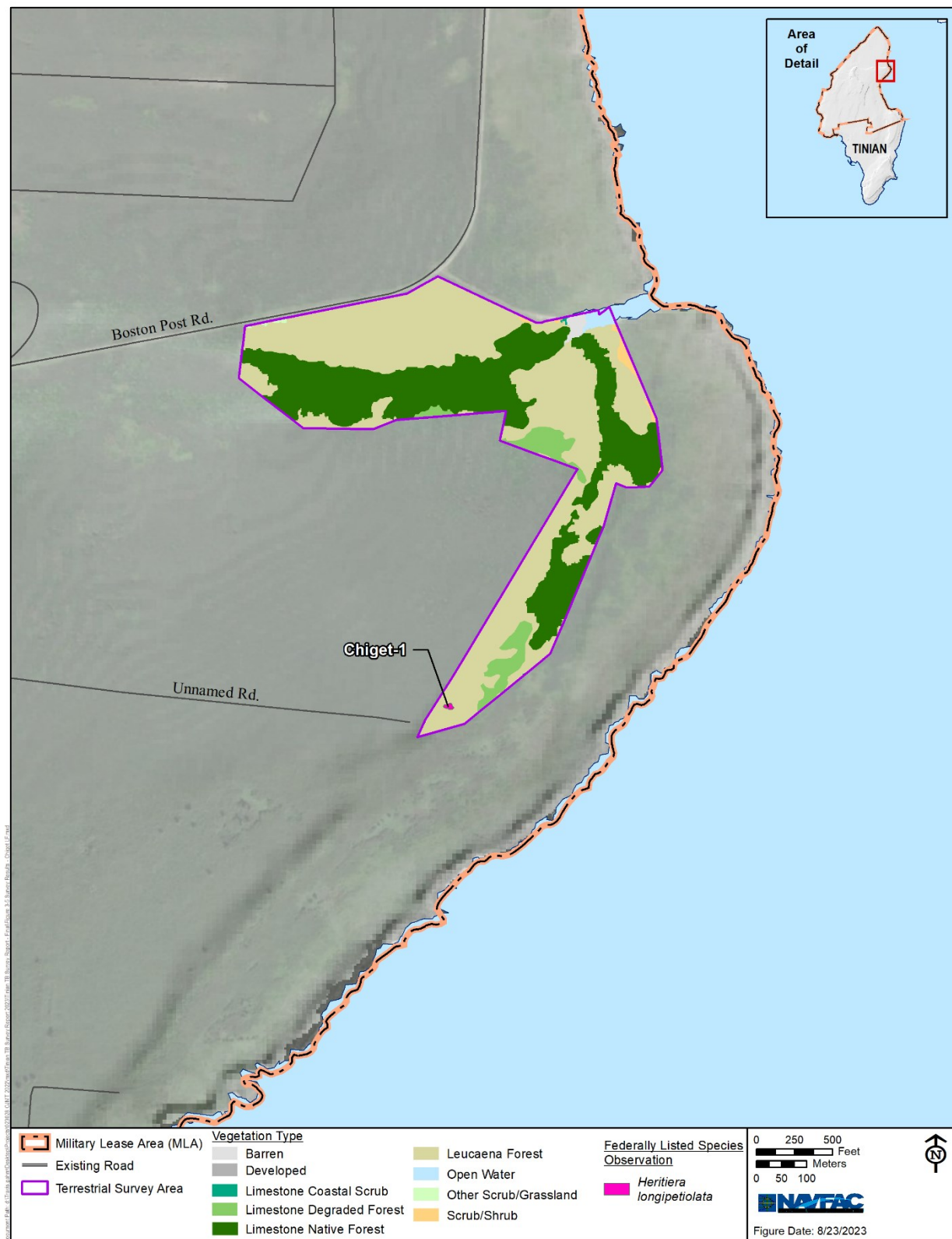
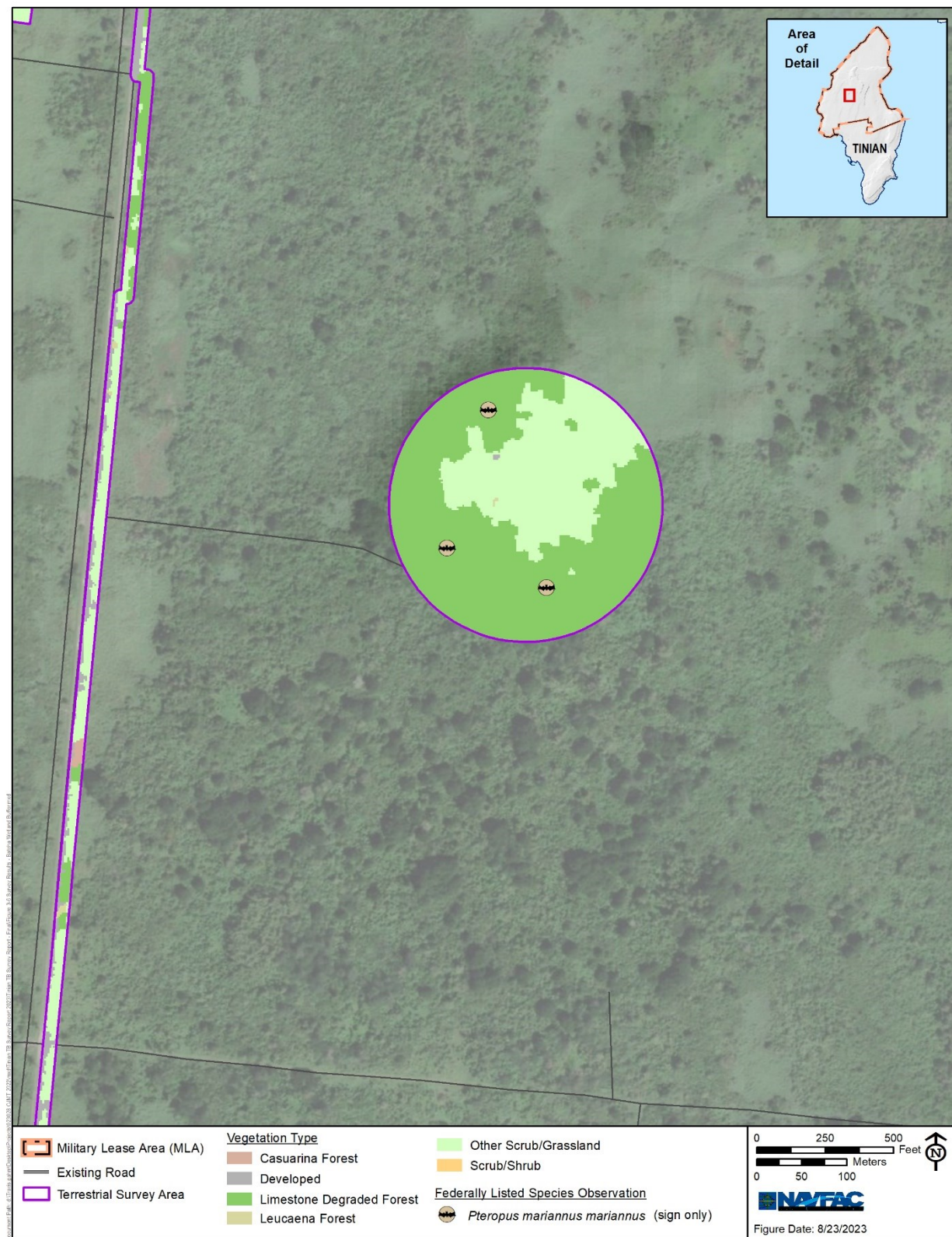


Figure 3-5 Survey Results – Chiget Limestone Forest



**Figure 3-6 Survey Results – Bateha Wetland Buffer**

Table 3-2 details the survey data collected for each grove of *H. longipetiolata* that was observed and mapped, and each grove is depicted in Figures 3-1, 3-4, and 3-5. In total, 290 living *H. longipetiolata* trees were observed within 12 unique grove locations. Ten groves occur in the Pina Plateau limestone forest survey area component, a single grove occurs in the Unai Masalok survey area component, and a single grove occurs in the Chiget limestone forest survey area component.

**Table 3-2 Summary of *Heritiera longipetiolata* Observations**

Grove ID	Survey Area Component	Vegetation Community	Number of Individuals		
			Mature	Seedling/ Sapling	Dying/ Dead
<i>Masalok-1</i>	Unai Masalok	<i>Leucaena</i> Forest	8	5	0
<i>Pina-1</i>	Pina Plateau Limestone Forest	Limestone Native Forest	45	0	0
<i>Pina-2</i>		Limestone Native Forest	40	0	0
<i>Pina-3</i>		Limestone Native Forest	21	0	0
<i>Pina-4</i>		Limestone Native Forest	12	0	1
<i>Pina-5</i>		Limestone Native Forest	6	0	0
<i>Pina-6</i>		Limestone Native Forest	19	5	0
<i>Pina-7</i>		Limestone Native Forest	11	7	1
<i>Pina-8</i>		Limestone Native Forest	20	0	0
<i>Pina-9</i>		<i>Leucaena</i> Forest	1	23	0
<i>Pina-10</i>		Limestone Native Forest	9	0	2
<i>Chiget-1</i>	Chiget Limestone Forest	Limestone Coastal Scrub	58	0	0
<b>TOTAL</b>			<b>250</b>	<b>40</b>	<b>4</b>

### 3.2 FEDERALLY LISTED WILDLIFE SPECIES RECORDED

Table 3-3 details the survey point data collected for each federally listed wildlife species that was observed and mapped, and each observation point is depicted on Figures 3-1 through 3-6. No living humped tree snails were observed in any survey area component during this 2023 survey. Only bleached, empty shells were observed in four locations in the Mount Lasso limestone forest survey area component.

Although the Mariana fruit bat (*Pteropus mariannus mariannus*) (federally threatened) was not a target species during 2023 surveys, incidental observations were recorded. A single Mariana fruit bat was observed flying over the Mount Lasso limestone forest survey area component (see Figure 3-2). In addition, sign of fruit bat occurrence (feces and/or ejecta) was observed in four separate locations (Figures 3-1, 3-2, and 3-6, and Table 3-3).

Discussions of mapped individuals and populations of federally listed wildlife species is provided in Chapter 4.

**Table 3-3 Federally Listed Wildlife Species Summary**

<i>Common Name</i>	<i>Observation Type</i>	<i>Survey Area Component</i>	<i>Mapped Individuals<sup>1</sup></i>	<i>Vegetation Community</i>	<i>Life Stage/Condition/Notes</i>
Humped tree snail	Bleached shell(s)	Mount Lasso Limestone Forest	4	Limestone Native Forest	All bleached, empty shells on ground – no living individuals observed
			1	Limestone Native Forest	
			1	Limestone Native Forest	
			1	Limestone Degraded Forest	
Mariana fruit bat	Single individual flying	Mount Lasso Limestone Forest	1	Limestone Degraded Forest	Single individual observed flying over the Mount Lasso limestone forest survey area component, appeared to be healthy
	Sign (ejecta/feces on leaves)	Bateha Wetland Buffer	1	Limestone Degraded Forest	Ejecta and/or feces of fruit bat found on various leaf types in 4 locations
			1	Limestone Degraded Forest	
			1	Limestone Degraded Forest	
		ETR Options	1	<i>Leucaena Forest</i>	

*Note:* <sup>1</sup>Each row represents a single observation point.

*Legend:* ETR = Explosives Training Range.

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## CHAPTER 4

### DISCUSSION

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This chapter provides discussion and details of mapped individuals and populations of federally listed species observed and mapped during the 2023 Tinian terrestrial surveys.

#### 4.1 *DENDROBIUM GUAMENSE*

All observations of *D. guamense* during 2023 surveys occurred in the Mount Lasso limestone forest survey area component, primarily in the southern portion of the survey area component (see Figures 3-1 and 3-3). In all, 23 occurrence data points were collected, ranging from single individuals to localized populations of up to 34 individual plants. As noted in Table 3-1, the majority of occurrence locations and individuals were observed growing on dead and/or downed trees or branches that were unidentifiable. Host plant species noted in Table 3-1 are all native species to Tinian, and the majority of *D. guamense* occurrences were in areas previously mapped as limestone native forest habitat (see Table 3-1 and Figure 3-3).

Consistent with past known locations of *D. guamense* in the Mount Lasso limestone forest survey area component (NAVFAC Pacific 2019), all recorded observations were located in the southern portion of the survey area component. However, during 2023 surveys, *D. guamense* occurrences were observed across a larger geographic area, occurring within both southern “legs” of the Mount Lasso limestone forest survey area component (see Figure 3-3), as opposed to only the westernmost of the “legs” (see Figure 1-1).

Example photographs of *D. guamense* individuals observed growing on various substrates during surveys are provided in Appendix C.

#### 4.2 *HERITIERA LONGIPETIOLATA*

All observations of *H. longipetiolata* during 2023 surveys were in the easternmost survey area components, occurring in jagged limestone (karst) habitat along the eastern coast of Tinian. *H. longipetiolata* groves had been previously assessed and mapped during past surveys (NAVFAC Pacific 2019) in the Unai Masalok and Pina Plateau limestone forest survey area components. These groves were revisited and mapped during the 2023 surveys.

A new *H. longipetiolata* grove was discovered during 2023 surveys in the southernmost portion of the Chiget limestone forest survey area component (see Table 3-2 and Figure 3-5). This grove contained 58 individual mature trees with no seedlings or saplings observed and is located at the top of a steep escarpment dominated by low-stature limestone coastal scrub, which was largely impenetrable by surveyors due to the density of vegetation and unsafe slope and terrain.

Although groves Masalok-1 and Pina-9 are noted as occurring in *Leucaena* forest (see Table 3-2 and Figure 3-4), it should be noted that all groves mapped in 2023 occurred in very distinct patches of karst habitat. Although these two groves may have been surrounded by larger areas of *Leucaena* forest, they were in fact observed growing in distinct karst limestone topography.

Across all groves mapped during the 2023 surveys, nearly every individual *H. longipetiolata*, both mature trees and seedlings/saplings, appeared to be vigorous and healthy. No individuals were observed flowering or fruiting during surveys. There were no evident signs of stress, stunted growth, loss of vigor, or stripped vegetation on any of the individuals, except for the four individual trees noted as dying or dead in Table 3-2.



Example photographs of *H. longipetiolata* individuals/groves observed during surveys are provided in Appendix C.

#### **4.3 HUMPED TREE SNAIL**

No living humped tree snails were observed during these surveys. Although humped tree snail shells were found in four locations in the Mount Lasso limestone forest survey area component, they were weathered, bleached, and consistent with previous surveys (NAVFAC Pacific 2019), likely many decades old (Table 3-3). Example photographs of the bleached, weathered shells that were discovered during surveys are provided in Appendix C.

#### **4.4 MARIANA FRUIT BAT**

A single adult Mariana fruit bat was seen flying on one occasion above the Mount Lasso limestone forest survey area component. Harassed by a pair of adult white terns (*Gygis alba*) that were presumably defending a nest, the fruit bat circled overhead for approximately 90 seconds before disappearing into the adjacent tree line.

Mariana fruit bat sign (ejecta and/or feces) was observed in three different locations in the westernmost Bateha Wetland Buffer survey area component and in one location in the northernmost Explosives Training Range options survey area component. Pteropodid bats feed by squeezing out the juices of plant parts, which they swallow, and then spit out pellets known as “ejecta” that contain the fibers and often seeds of the plant (Aziz et al. 2021). Presence of fruit bat feces/ejecta is a sign that the species is utilizing a given area for movement and/or foraging. Ejecta can also be an indicator of fruit bat day roost locations (Aziz et al. 2021). Example photos of fruit bat ejecta/feces observed and recorded during surveys are provided in Appendix C.

## CHAPTER 5

### CONCLUSIONS

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#### 5.1 SURVEY SUMMARY

The CJMT survey area components were thoroughly surveyed from April 3–24, 2023, as evidenced by the survey track data in Appendix A. As discussed in Section 2.1, certain portions of the survey area were either impassable due to dense and/or noxious patches of weedy vegetation (e.g., swordgrass and common lantana patches), steep slopes and/or cliffs, and habitats that were impenetrable due to safety concerns (e.g., low-statured, dense limestone coastal scrub in jagged, steep karst habitat). Dense patches of weedy vegetation did not contain a diversity of vegetation or high habitat suitability for federally listed species and were often avoided by having survey teams momentarily pause transects, move around them, and reinitiate transects once they were able to get around the patches. Where surveyors encountered steep slopes or cliffs, every effort was made to survey the areas using all means necessary (e.g., using binoculars from the top and bottom of the slope/cliff, finding alternate routes to get up or down, and conducting transects along safe portions of such areas). In the easternmost portions of the survey area components on the east coast, low-statured, dense limestone coastal scrub was often impenetrable and unsafe due to jagged karst topography that was too steep or had deep canyons and crevices. In such areas, surveyors conducted transects up to and along the areas that were accessible and were able to gain visual observations using binoculars over the canopies that stretched down to the coastline. Impassable areas are noted accordingly on figures in Appendix A. Example photographs of impassable areas and weedy vegetation that were avoided are provided in Appendix C.

During the course of conducting survey transects, where and when federally listed species were encountered, focus was temporarily put on habitat in the immediate vicinity, as opposed to continuing straight ahead on a transect path, to ensure that any and all other individuals were accounted for and mapped. This is evidenced by survey transect data presented in Appendix A, specifically in the survey area components that contained a high amount of federally listed species observations (e.g., Mount Lasso limestone forest and Pina Plateau limestone forest).

Consistent with past surveys (NAVFAC Pacific 2014, 2018, 2019), results of the 2023 surveys show high habitat value in the remaining limestone forest areas of Tinian. *D. guamense* was only observed in the Mount Lasso limestone forest survey area component and *H. longipetiolata* was only observed in the easternmost, coastal survey area components in jagged, limestone karst habitat. Although there were observations of these species that occurred in areas mapped as other than limestone habitat (see Tables 3-1 and 3-2), such occurrences were always in areas surrounded by limestone habitat that generally defined the local conditions. No observations of federally listed species occurred in the lowland survey area components that had high amounts of weedy vegetation (e.g., those areas dominated by *Leucaena* forest, *Casuarina* forest, and other areas with high amounts of non-native vegetation and signs of past disturbance).

The lack of *S. guamense* observations during 2023 surveys was expected and is consistent with the current known status of the species – all known populations of *S. guamense* have been extirpated (USFWS 2020). In multiple locations, *S. torvum*, a similar species that was introduced to Tinian (Raulerson 2006) was observed growing in disturbed and/or ruderal habitats.

Similarly, the lack of living humped tree snail observations in any of the 2023 CJMT survey area components is consistent with recent survey results; the species is only known to occur on Tinian in the southern portion of Lamanibot Bay, well outside of the 2023 survey area (NAVFAC Pacific 2014, 2019).

Although not a target species of the 2023 surveys, one Mariana common moorhen (*Gallinula chloropus guami*) (federally endangered) was incidentally observed foraging within a water retention structure on the northern end of the historic Japanese Communications Center, well outside of the survey footprint and outside of the survey window. No further evidence of moorhens (e.g., tracks, sign, calls) was detected anywhere else on the island during the remainder of the survey window.

## CHAPTER 6

## REFERENCES

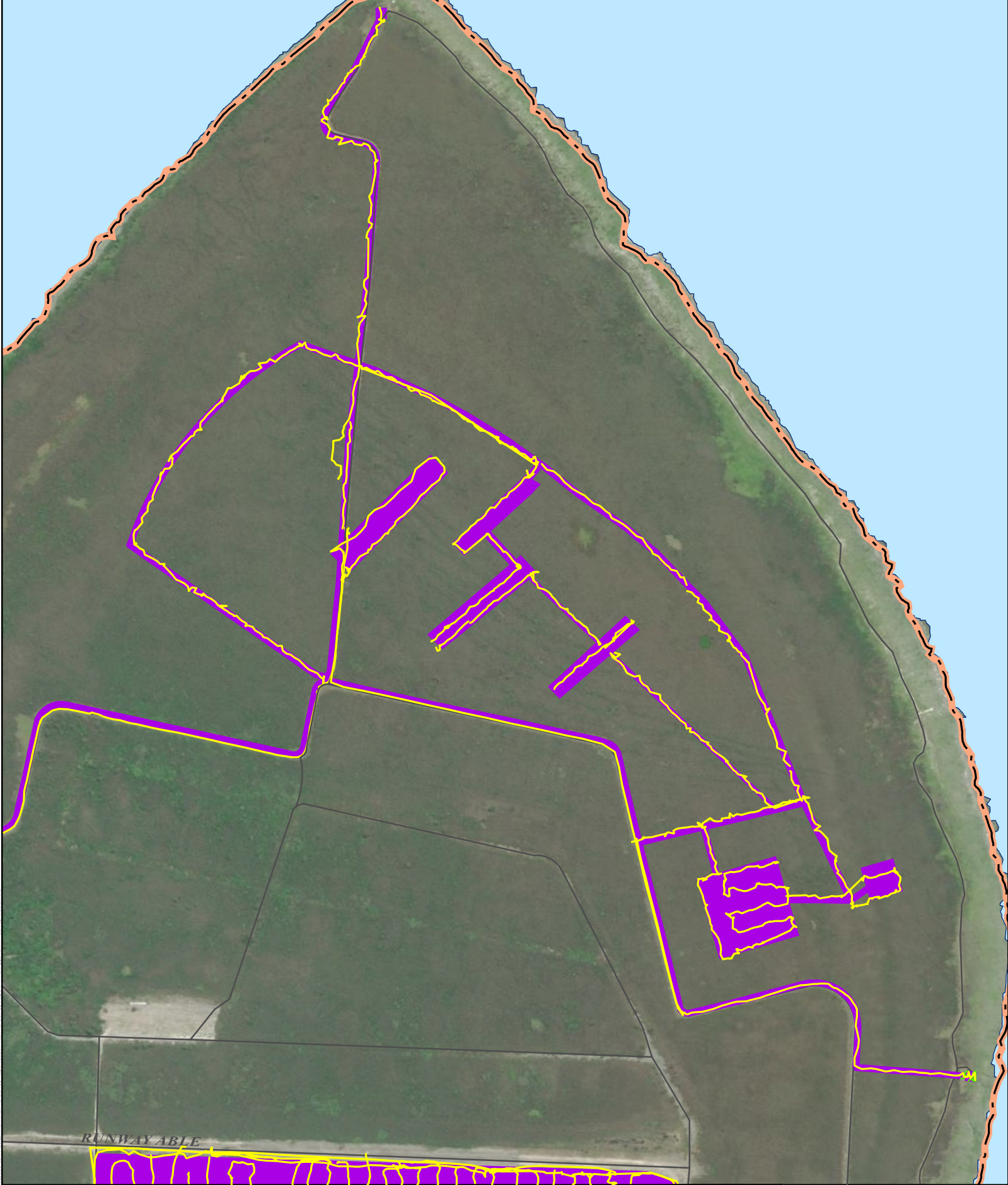
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- Amidon, F.A., M. Metevier, and S.E. Miller. 2017. Vegetation Mapping of the Mariana Islands: Commonwealth of the Northern Mariana Islands and Territory of Guam. Final Report, November 2017. U.S. Fish and Wildlife Service and the Pacific Islands Climate Change Cooperative, Honolulu, Hawaii, USA. 94 pp. November.
- Aziz, S.A., McConkey, K.R., Tanalgo, K., Sritongchuay, T., Low, M.R., Yong, J.Y., Mildenstein, T.L., Nuevo-Diego, C.E., Lim, V.C. and Racey, P.A. 2021. The critical importance of Old World fruit bats for healthy ecosystems and economies. *Frontiers in Ecology and Evolution*, 9, p.181.
- NAVFAC Pacific. 2014. Final Survey Report: Terrestrial Biological Surveys on Tinian in Support of the Commonwealth of the Northern Mariana Islands Joint Military Training Environmental Impact Statement/Overseas Environmental Impact Statement. Prepared by Cardno, Honolulu, Hawaii. July.
- NAVFAC Pacific. 2018. Final Survey Report: Endangered Species Act-Listed Plant Surveys on Tinian in Support of the Commonwealth of the Northern Mariana Islands Joint Military Training Environmental Impact Statement/Overseas Environmental Impact Statement. Prepared by Cardno, Honolulu, Hawaii. May.
- NAVFAC Pacific. 2019. Survey Report for Endangered Species Act-Listed Snail and Plant Surveys and Vegetation Mapping of the Tinian Military Lease Area, Draft V2. October.
- NAVFAC Pacific. 2023. Work Plan for Surveys of Federally Listed Species, Revised Environmental Impact Statement/Overseas Environmental Impact Statement for the Proposed Commonwealth of the Northern Mariana Islands Joint Military Training on the Island of Tinian. March.
- Raulerson, L. 2006. Checklist of Plants of the Mariana Islands. University of Guam Herbarium Contribution 38: 1-69.
- USFWS. 2020. *Solanum guamense* (hålom tåno', berenghenas) 5-Year Review Summary and Evaluation. Pacific Islands Fish and Wildlife Office Honolulu, Hawaii.

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## **APPENDIX A   SURVEY TRACKS LOG**

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Existing Road	<u>Terrestrial Survey Area</u>
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	30 ft Transects

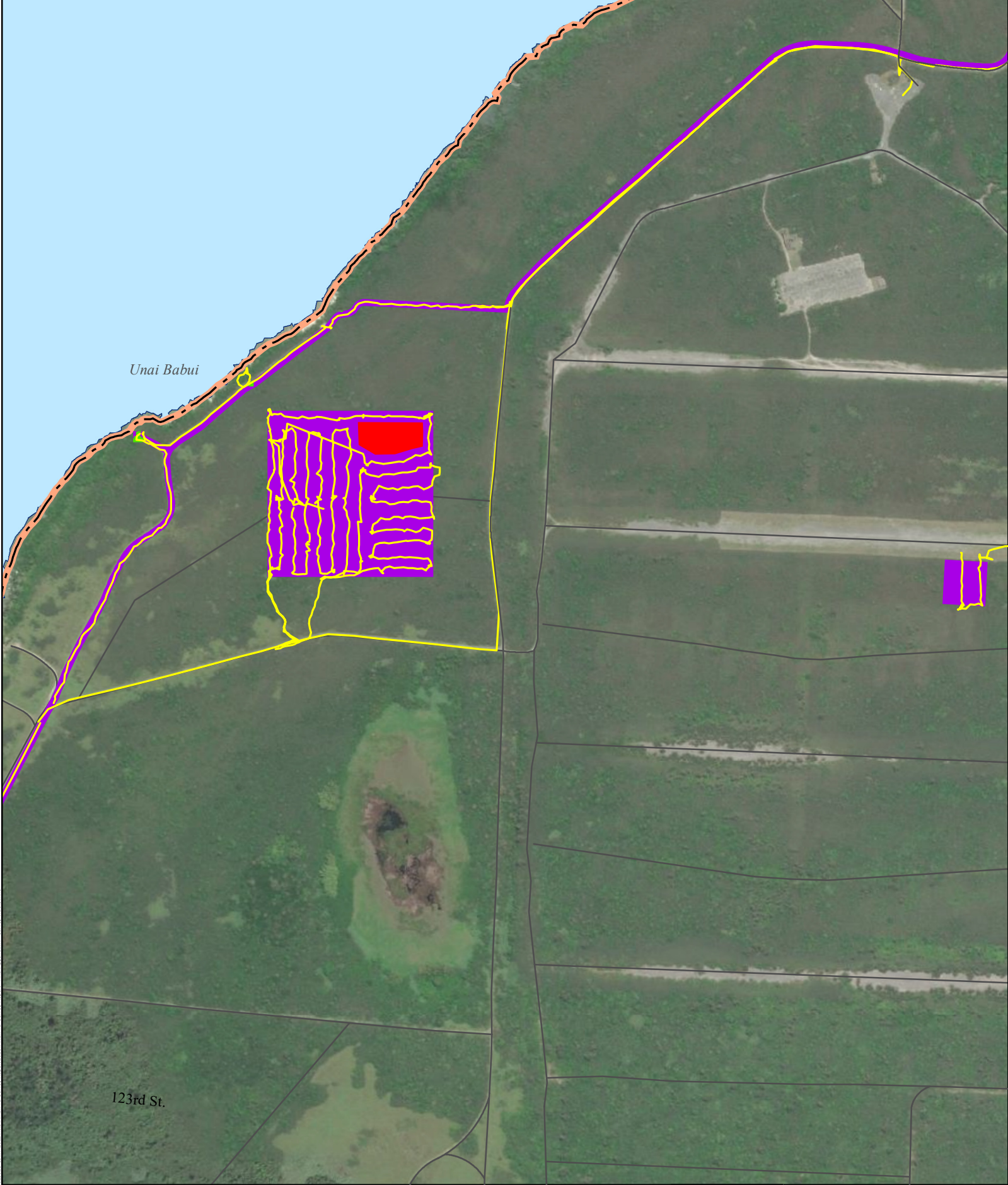
Area of Detail


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Figure Date: 8/23/2023


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 Military Lease Area (MLA)


 Existing Road

 Terrestrial Survey Track

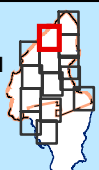
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 15 ft Transects

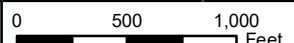
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**Area of Detail**



**02**



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0 100 200 Meters





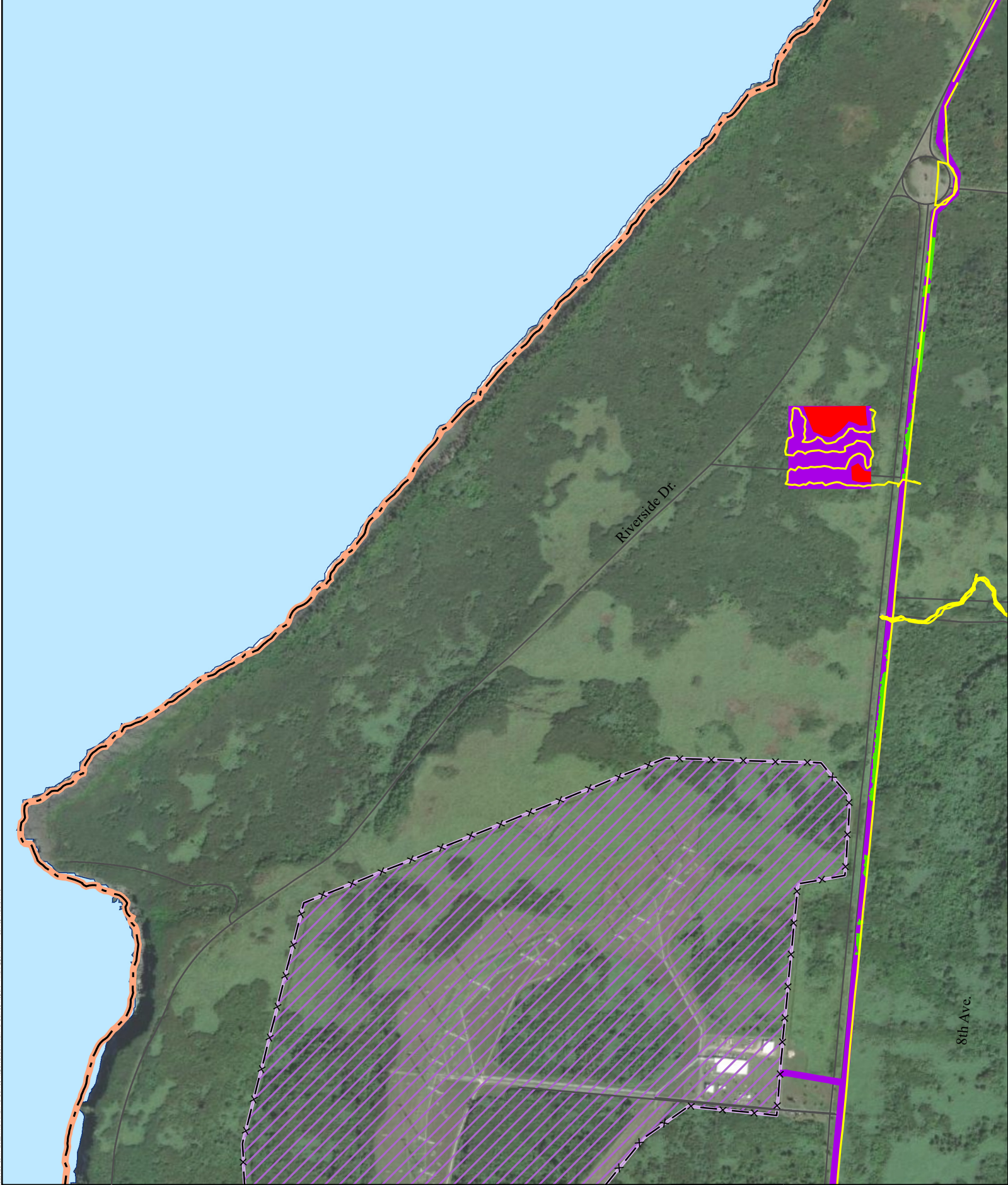
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	15 ft Transects	
	30 ft Transects	

**Area of Detail**

**03**

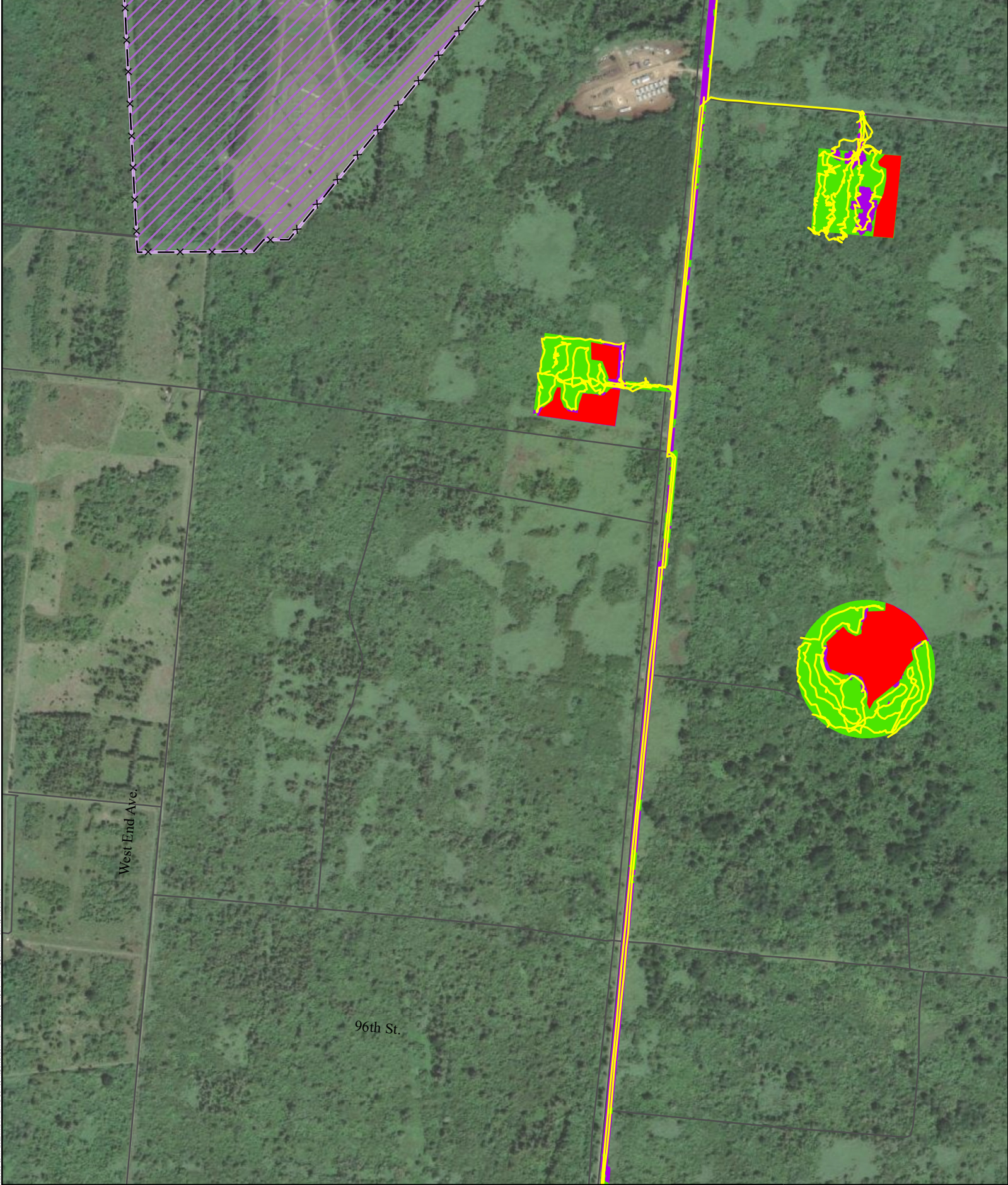
Feet







Meters

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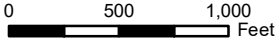


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 Existing Road	<u>Terrestrial Survey Area</u>	
	 15 ft Transects	
	 30 ft Transects	


Area of Detail



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0 100 200 Meters



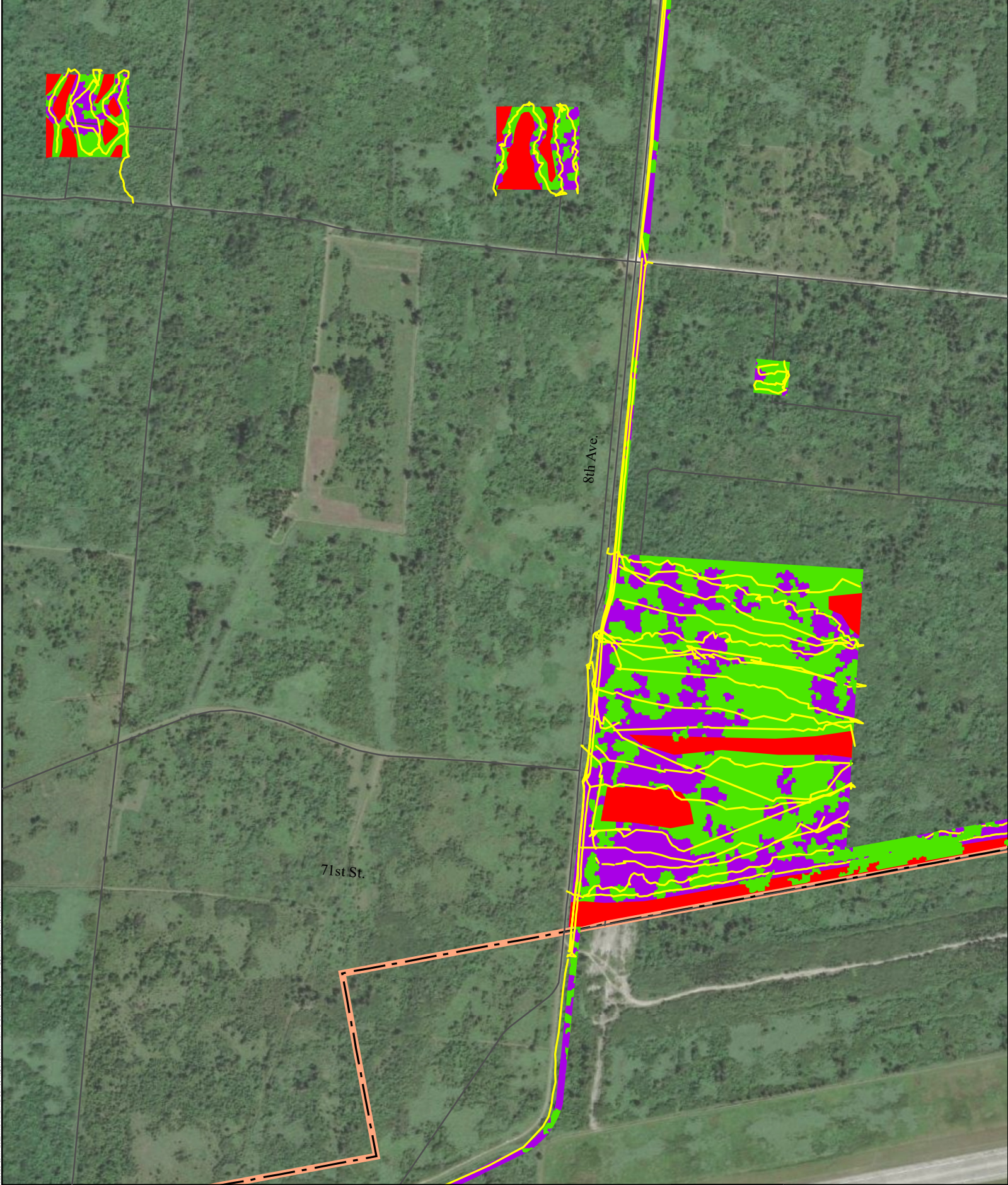




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



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 Existing Road

 Terrestrial Survey Track

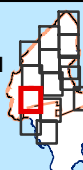
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 15 ft Transects

 30 ft Transects

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Area of Detail



05

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0 100 200 Meters



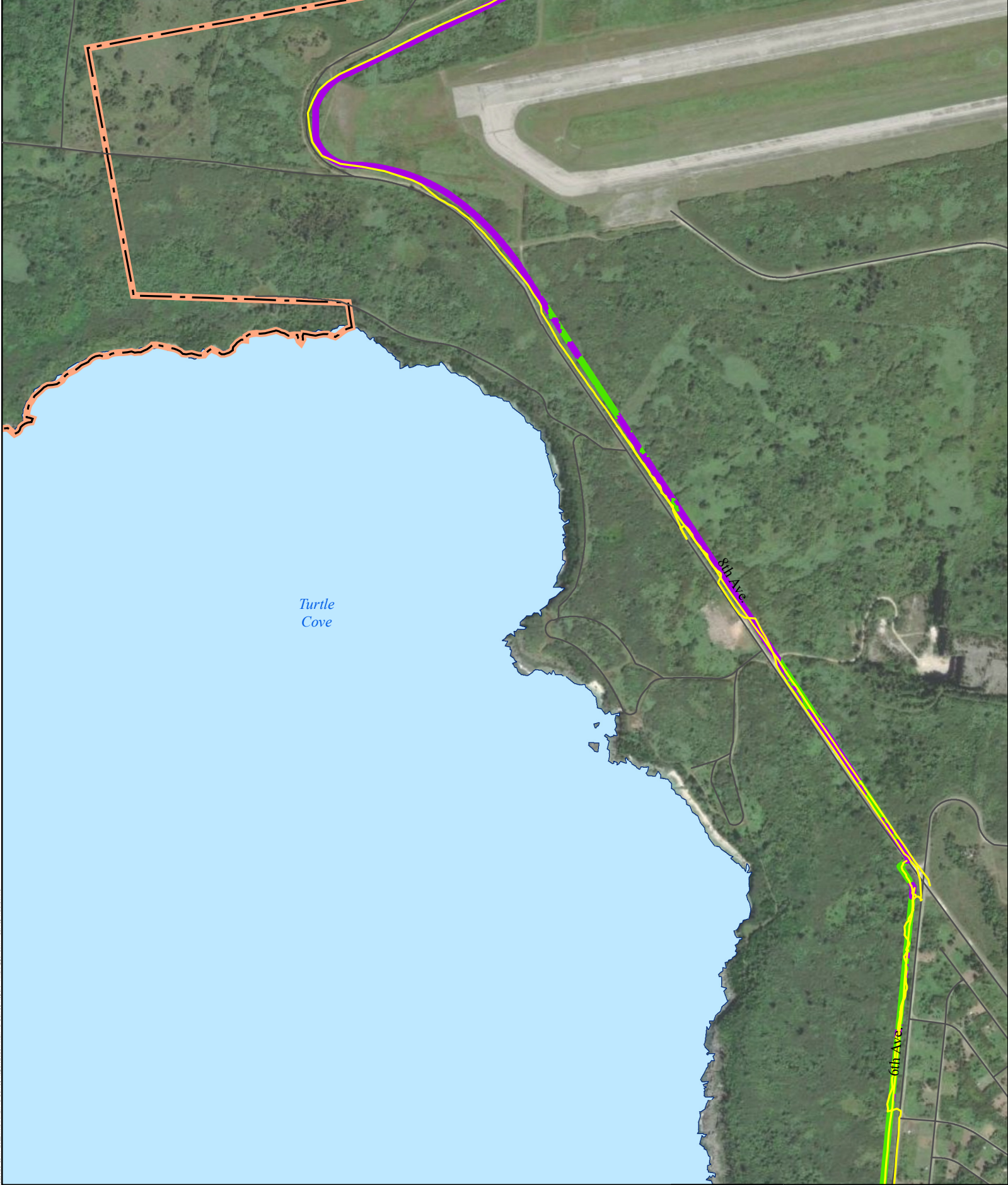



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



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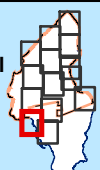
 Terrestrial Survey Track

Terrestrial Survey Area

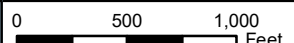
 15 ft Transects


 30 ft Transects


Area of Detail



06

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 0 100 200 Meters

 NAVFAC


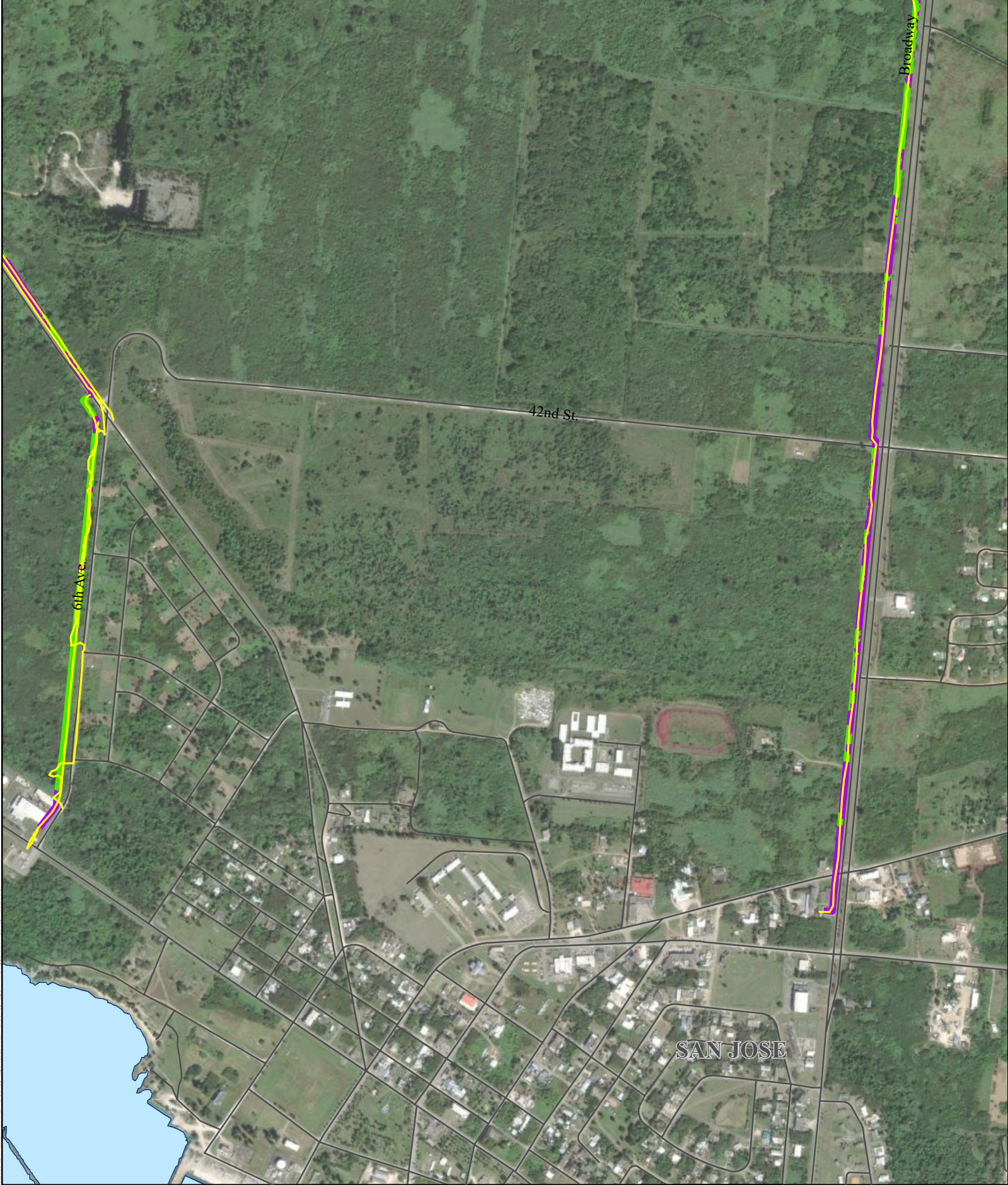


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 Military Lease Area (MLA)  
 Existing Road

 Terrestrial Survey Track  
Terrestrial Survey Area  
 15 ft Transects  
 30 ft Transects

**Area of Detail**



**07**



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0 100 200 Meters

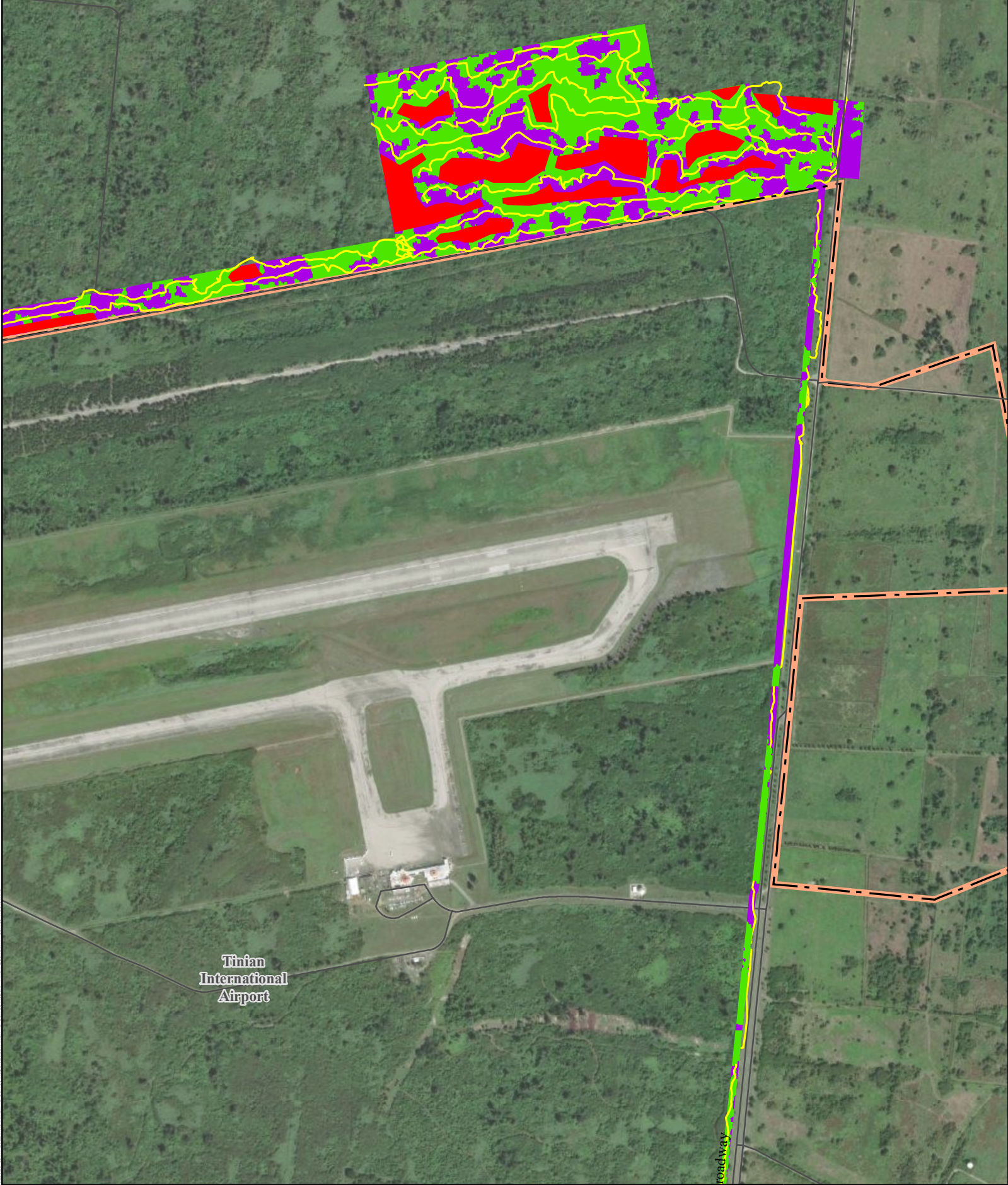



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 Military Lease Area (MLA)


 Existing Road

 Terrestrial Survey Track

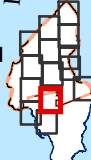
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Terrestrial Survey Area

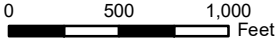
 15 ft Transects

 30 ft Transects


Area of Detail



08



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0 100 200 Meters



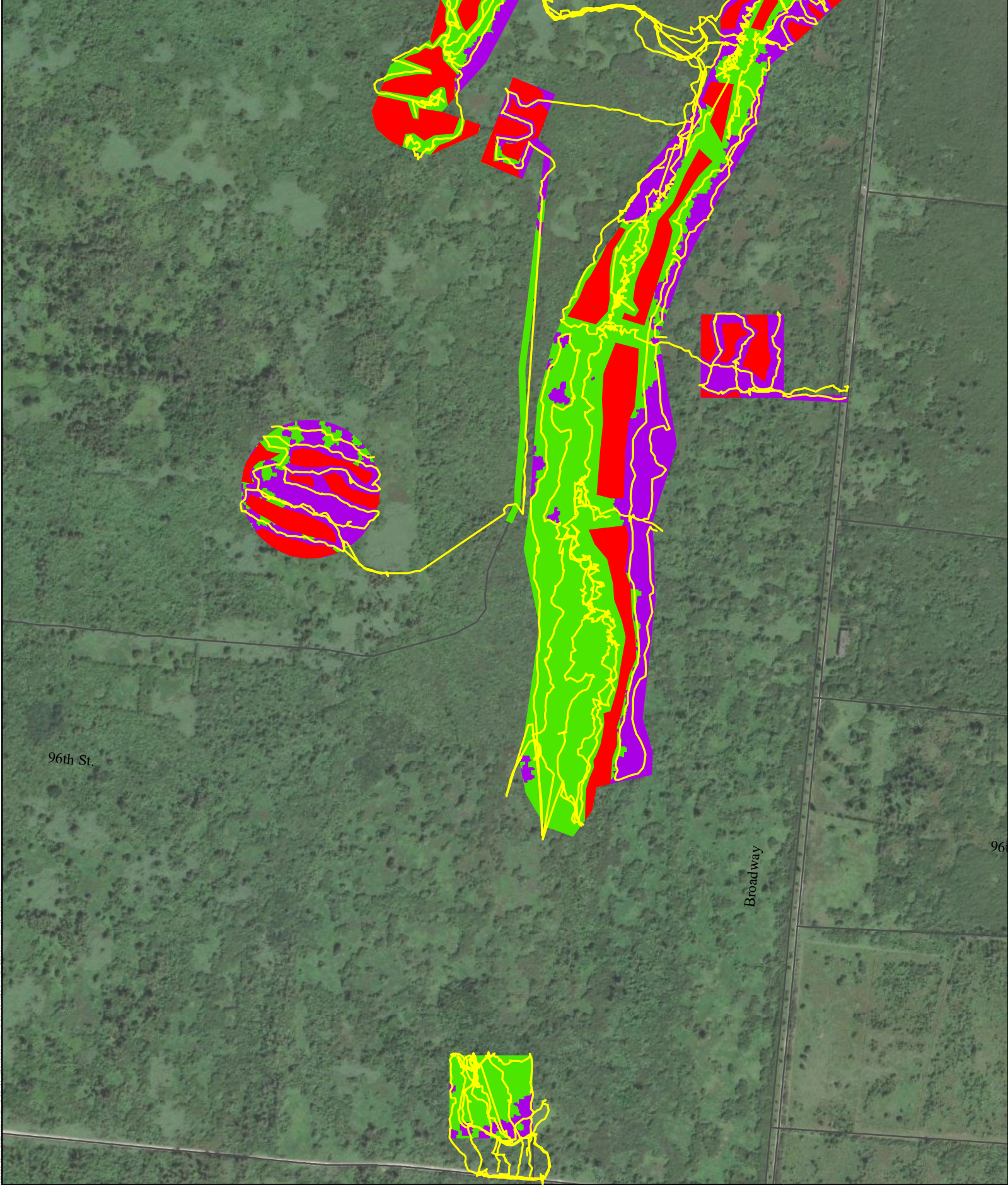


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Military Lease Area (MLA)	Terrestrial Survey Track	Not Surveyed - Impassable Area
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	30 ft Transects	

Area of Detail

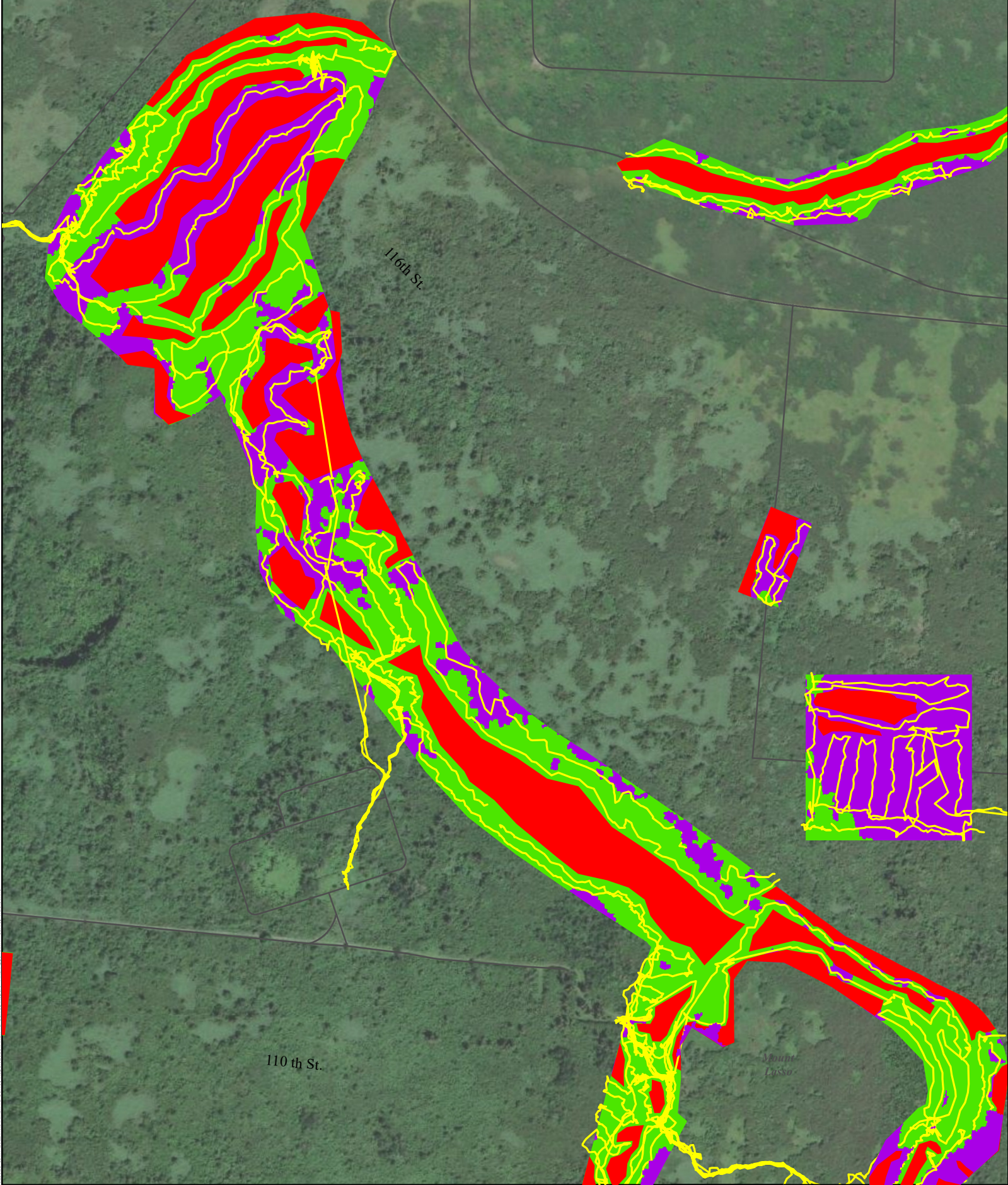
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0 100 200 Meters


Figure Date: 8/23/2023







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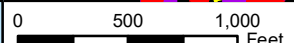
**Terrestrial Survey Track**


**Terrestrial Survey Area**


-  15 ft Transects
-  30 ft Transects

**Not Surveyed - Impassable Area**

**Area of Detail**  
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0 500 1,000 Feet

  
0 100 200 Meters

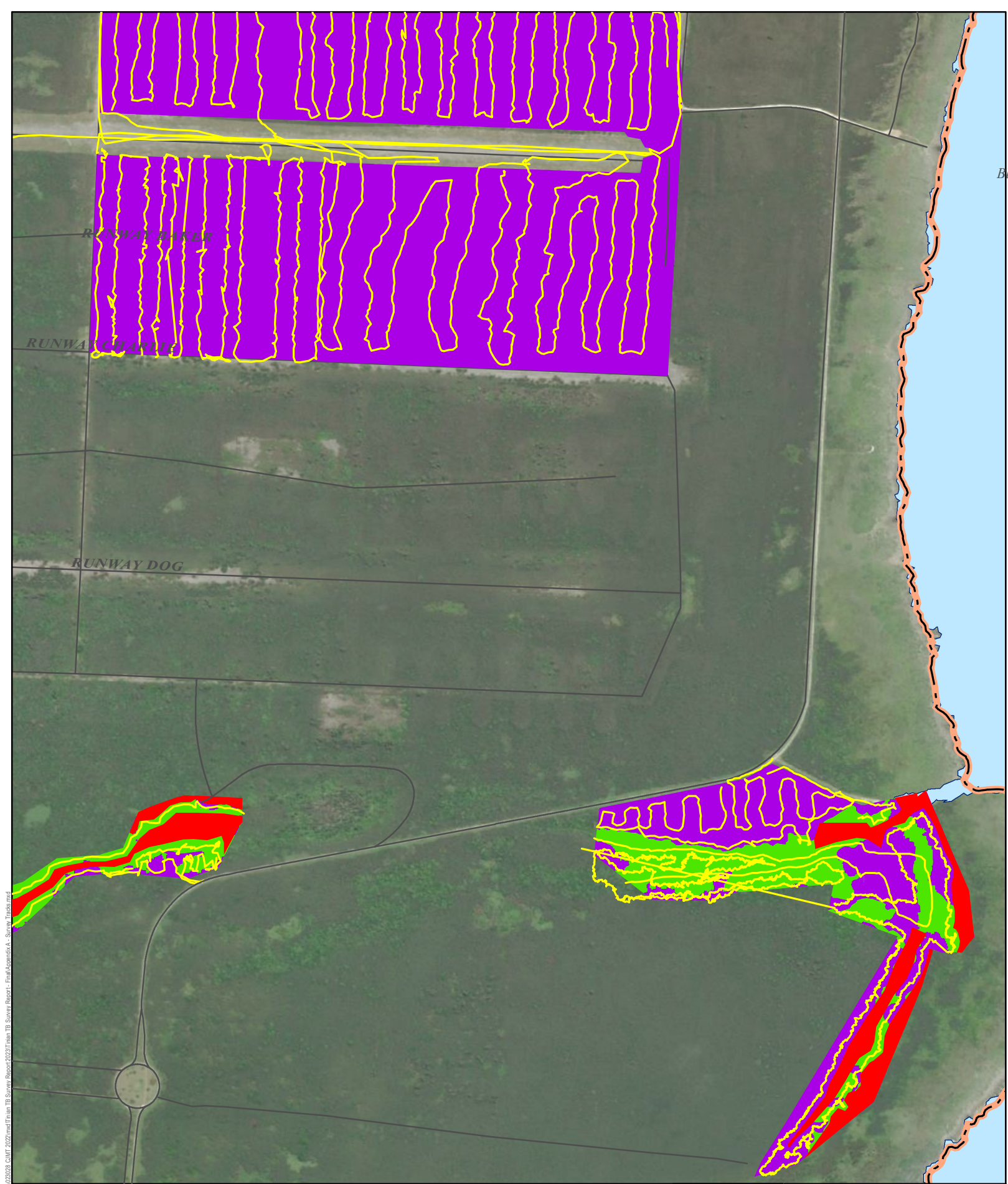
  
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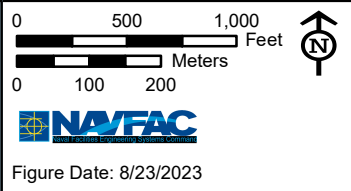
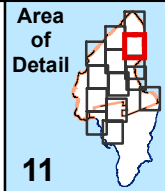
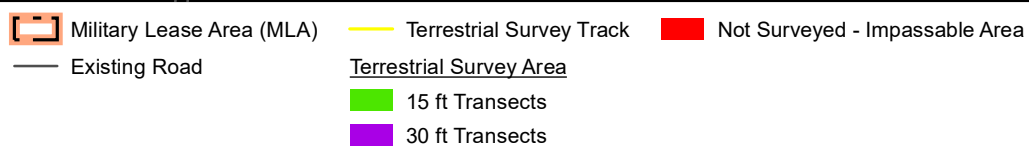
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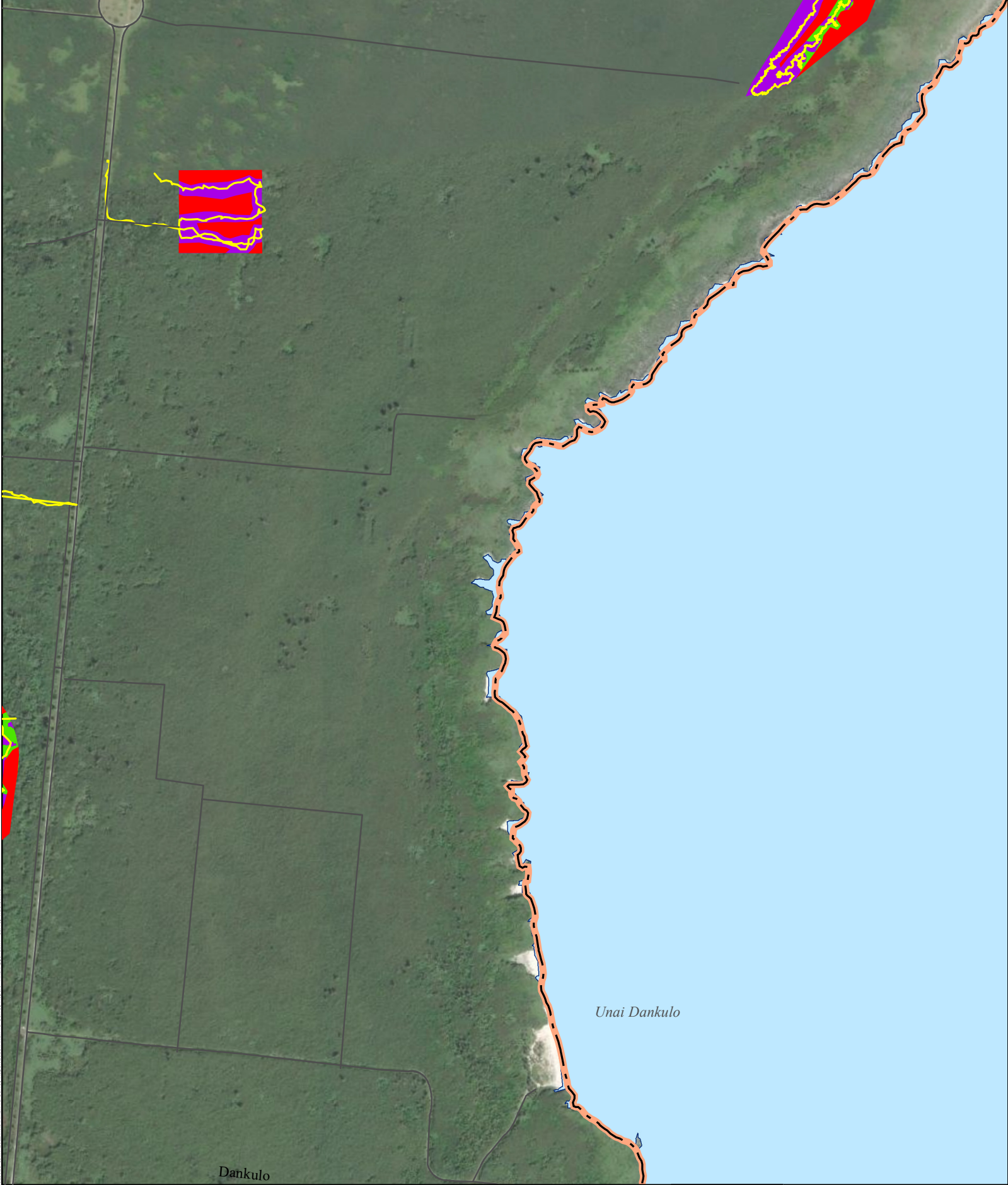
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






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 Military Lease Area (MLA)


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 Rd. Terrestrial Survey Track

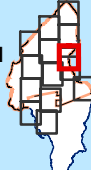
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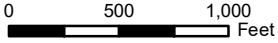
 30 ft Transects


 Not Surveyed - Impassable Area

Area of Detail



12

 0 500 1,000 Feet

 0 100 200 Meters





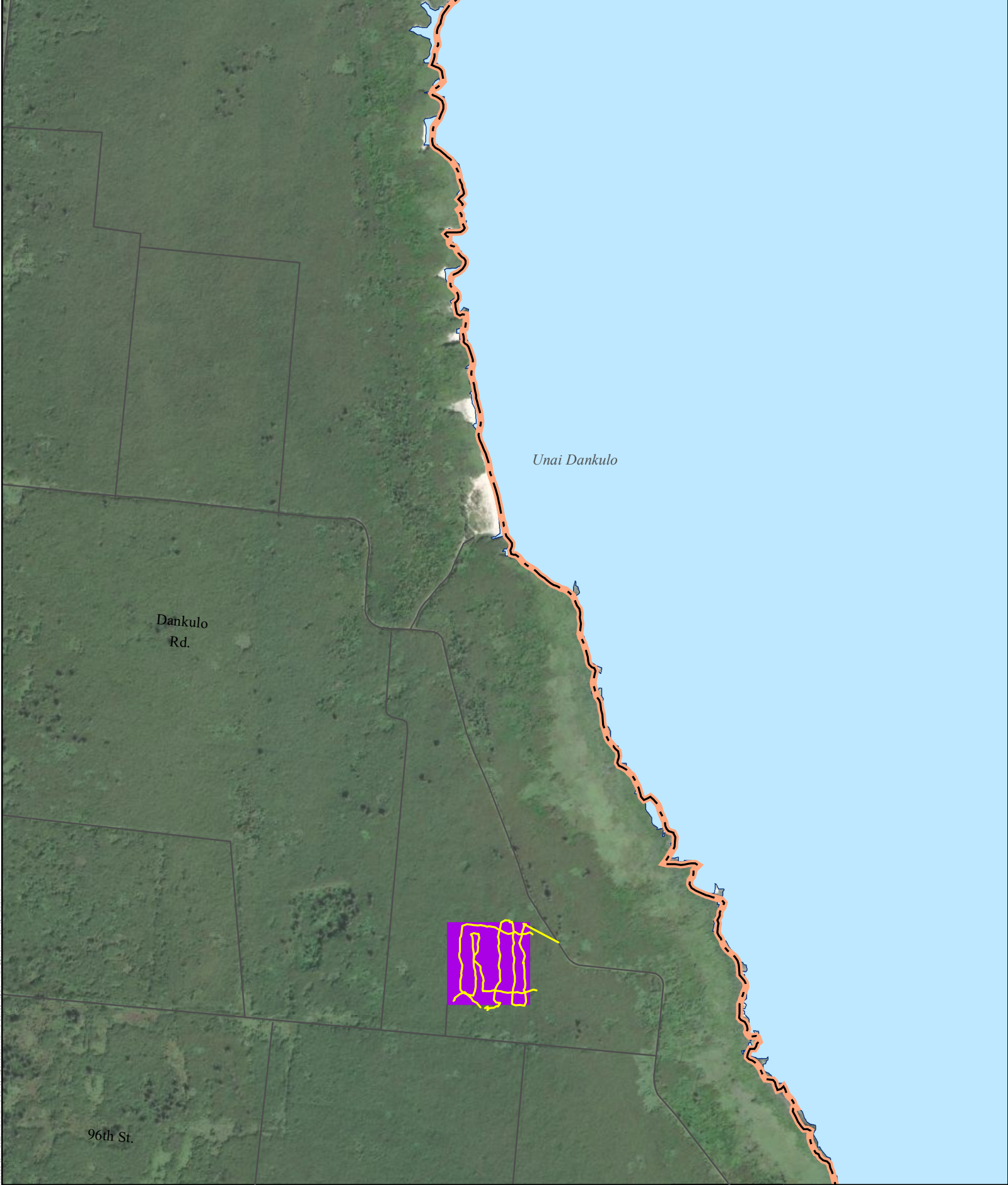
Figure Date: 8/23/2023






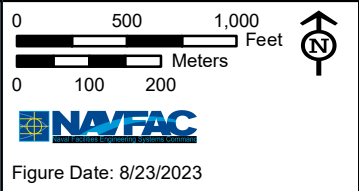
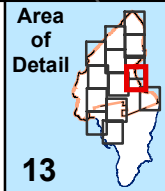
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- |   |  |
|---|--|
|  Military Lease Area (MLA) |  Terrestrial Survey Track |
|  Existing Road             |  |
| <u>Terrestrial Survey Area</u>  |  |
|  15 ft Transects         |  |
|  30 ft Transects         |  |



Unai Masalok

Pika  
Plavau

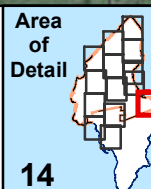
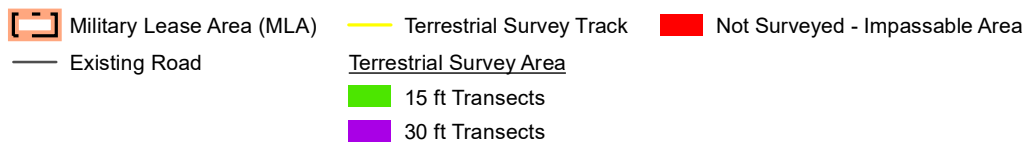


Figure Date: 8/23/2023



## **APPENDIX B    SURVEY OBSERVATION DATA MATRICES**

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## Survey Point Data

Object ID	Species	Quantity	Life Stage	Condition	Host Species/Substrate	Vegetation Community	Date Observed	Notes	Northing (m)	Easting (m)
41	Pteropus mariannus mariannus	1	N/A	N/A	N/A	Limestone Degraded Forest	4/4/2023	fruit bat feces	1662330.9097	351164.3989
42	Pteropus mariannus mariannus	1	Adult	Good	N/A	Limestone Degraded Forest	4/21/2023	Life Stage: 1 adult	1664877.0190	351867.8158
43	Pteropus mariannus mariannus	1	N/A	N/A	N/A	Limestone Degraded Forest	4/4/2023	fruit bat feces	1662484.6955	351210.5939
44	Pteropus mariannus mariannus	1	N/A	N/A	N/A	Leucaena Forest	4/5/2023	fruit bat feces	1664326.3732	353033.8675
45	Pteropus mariannus mariannus	1	N/A	N/A	N/A	Limestone Degraded Forest	4/4/2023	fruit bat feces on leaves	1662286.8285	351275.2580
46	Dendrobium guamense	1	Adult	Good	Dead/downed tree/branch	Limestone Native Forest	4/11/2023	Life Stage: 1 adult; Host: dead tree	1663237.4255	352722.3502
47	Dendrobium guamense	1	Adult	Fair	Dead/downed tree/branch	Limestone Native Forest	4/11/2023	Life Stage: 1 adult; Host: dead tree	1662839.6571	352557.4532
48	Dendrobium guamense	8	Adult	Fair	Ficus sp.	Limestone Native Forest	4/14/2023	Life Stage: 8 adults; Host: Ficus	1663224.4897	353419.3888
49	Dendrobium guamense	8	Adult	Fair	Ficus sp.	Limestone Native Forest	4/14/2023	Life Stage: 8 adults; Host: Ficus	1663223.3444	353418.9580
50	Partula gibba	1	Dead	Dead	Leaf litter	Limestone Native Forest	4/14/2023	Life Stage: 1 dead individual; Host: leaf litter	1663141.9799	353381.8203
51	Dendrobium guamense	16	Adult	Fair	Limestone	Other Scrub/Grassland	4/17/2023	Life Stage: 16 adults; Host: limestone	1663038.5448	353287.3134
52	Dendrobium guamense	8	Adult	Fair	Limestone	Other Scrub/Grassland	4/17/2023	Life Stage: 8 adults; Host: limestone	1663037.5578	353288.0682
53	Dendrobium guamense	34	Adult	Fair	Premna serratifolia	Other Scrub/Grassland	4/17/2023	Life Stage: 34 adults; Host: Premna serratifolia	1662983.8174	353266.0825
54	Dendrobium guamense	6	Adult	Poor	Dead/downed tree/branch	Limestone Native Forest	4/17/2023	Life Stage: 6 adults; Host: dead branch	1662974.7671	353268.5723
55	Dendrobium guamense	6	Adult	Good	Dead shrub	Other Scrub/Grassland	4/17/2023	Life Stage: 6 adults; Host: dead shrub	1662976.6954	353262.4872
56	Dendrobium guamense	7	Adult	Fair	Unknown shrub	Limestone Native Forest	4/17/2023	Life Stage: 7 adults; Host: shrub sp.	1662974.4010	353263.7818
57	Dendrobium guamense	9	Adult	Good	Limestone	Other Scrub/Grassland	4/17/2023	Life Stage: 9 adults; Host: limestone	1662974.4768	353261.9592
58	Dendrobium guamense	4	Adult	Fair	Eugenia sp.	Other Scrub/Grassland	4/17/2023	Life Stage: 4 adults; Host: Eugenia sp.	1662974.3785	353262.2385
59	Dendrobium guamense	28	Adult	Fair	Dead/downed tree/branch	Leucaena Forest	4/17/2023	Life Stage: 28 adults; Host: dead branch	1662974.2153	353261.4755
60	Dendrobium guamense	3	Adult	Fair	Leaf litter	Other Scrub/Grassland	4/17/2023	Life Stage: 3 adults; Host: leaf litter	1662975.3763	353261.9788
61	Dendrobium guamense	10	Adult	Fair	Dead/downed tree/branch	Leucaena Forest	4/17/2023	Life Stage: 10 adults; Host: dead branch	1662974.5615	353261.5257
62	Dendrobium guamense	5	Adult	Good	Dead/downed tree/branch	Limestone Native Forest	4/18/2023	Life Stage: 5 adults; Host: dead branch	1662715.5203	353143.8230
63	Dendrobium guamense	5	Adult	Fair	Meiogyne cylindrocarpa	Limestone Native Forest	4/18/2023	Life Stage: 5 adults; Host: Meiogyne cylindrocarpa	1662710.0770	353142.4288
64	Dendrobium guamense	3	Adult	Fair	Dead/downed tree/branch	Limestone Native Forest	4/19/2023	Life Stage: 3 adults; Host: dead tree	1662608.8206	353086.2493
67	Dendrobium guamense	17	Adult	Good	Dead/downed tree/branch	Limestone Native Forest	4/18/2023	Life Stage: 17 adults; Host: dead log	1662348.4927	352977.6099
68	Dendrobium guamense	7	Adult	Good	Limestone	Limestone Native Forest	4/13/2023	Life Stage: 7 adults; Host: limestone	1662404.7412	352999.5980
69	Dendrobium guamense	4	Adult	Fair	Limestone	Limestone Native Forest	4/18/2023	Life Stage: 4 adults; Host: limestone	1662403.6555	352999.7485
70	Dendrobium guamense	12	Adult	Fair	Eugenia sp.	Limestone Native Forest	4/18/2023	Life Stage: 12 adults; Host: Eugenia sp.	1662403.9472	353000.6160
71	Partula gibba	1	Dead	Dead	N/A	Limestone Native Forest	4/19/2023	Life Stage: 1 dead individual	1661764.6847	352935.4532
72	Partula gibba	4	Dead	Dead	N/A	Limestone Native Forest	4/20/2023	Life Stage: 4 dead individuals, bleached shells	1661699.1614	352921.1672
73	Partula gibba	1	Dead	Dead	N/A	Limestone Degraded Forest	4/21/2023	Life Stage: 1 dead individual	1664279.9677	352179.1110
74	Dendrobium guamense	9	Adult	Fair	Dead/downed tree/branch	Limestone Native Forest	4/21/2023	Life Stage: 6 adults, 3 dead individuals; Host: dead branch	1662339.0201	352979.9433



# Survey Polygon Data

Object ID	Species	Polygon ID	Quantity	Vegetation Community	Condition	Date Observed	Notes	Northing (m)	Easting (m)
13	Heritiera longipetiolata	Chiget-1	58	Limestone Coastal Scrub	Good	4/21/2023	Life Stage: 58 adults	1660722.8292	355854.7061
14	Heritiera longipetiolata	Masalok-1	13	Leucaena Forest	Good	4/14/2023	Life Stage: 8 adults, 5 saplings	1664760.2814	355188.1301
15	Heritiera longipetiolata	Pina-5	6	Limestone Native Forest	Good	4/17/2023	Life Stage: 6 adults	1659757.4559	356931.3529
16	Heritiera longipetiolata	Pina-7	19	Limestone Native Forest	Good	4/17/2023	Life Stage: 11 adults, 7 saplings, 1 dead	1659653.5412	357062.6814
17	Heritiera longipetiolata	Pina-10	11	Limestone Native Forest	Good	4/17/2023	Life Stage: 9 adults, 2 dead individuals	1659613.5268	357120.8897
18	Heritiera longipetiolata	Pina-9	24	Leucaena Forest	Good	4/17/2023	Life Stage: 1 adult, 23 saplings	1659609.1155	357052.4685
19	Heritiera longipetiolata	Pina-6	24	Limestone Native Forest	Good	4/19/2023	Life Stage: 19 adults, 5 saplings	1659684.0387	357044.4031
20	Heritiera longipetiolata	Pina-8	20	Limestone Native Forest	Good	4/19/2023	Life Stage: 20 adults	1659661.0531	357079.1356
21	Heritiera longipetiolata	Pina-1	45	Limestone Native Forest	Good	4/21/2023	Life Stage: 45 adults	1660604.2145	356398.0200
22	Heritiera longipetiolata	Pina-4	13	Limestone Native Forest	Good	4/20/2023	Life Stage: 12 adults, 1 dead individual	1660239.3082	356755.9566
23	Heritiera longipetiolata	Pina-3	21	Limestone Native Forest	Good	4/20/2023	Life Stage: 21 adults	1660282.9588	356706.0266
24	Heritiera longipetiolata	Pina-2	40	Limestone Native Forest	Good	4/21/2023	Life Stage: 40 adults	1660431.6038	356686.3722

## **APPENDIX C PHOTOGRAPHIC RECORD**

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Photo 1. *Dendrobium guamense* on a dense understory brush.



Photo 2. *Dendrobium guamense* on a dead branch.





Photo 3. *Dendrobium guamense* in leaf litter.



Photo 4. *Dendrobium guamense* on a live branch.





Photo 5. *Dendrobium guamense* on a limestone cliff.



Photo 6. Mariana fruit bat ejecta





Photo 7. Bleached *Partula gibba* shell.



Photo 8. Bleached *Partula gibba* shell





Photo 8. Bleached *Partula gibba* shell found on forest floor.



Photo 9. Bleached *Partula gibba* shell found in limestone choss.





Photo 10. *Heritiera longipetiolata* found in limestone karst forest.



Photo 11. *Heritiera longipetiolata* found in limestone karst forest.





Photo 12. *Heritiera longipetiolata* growing out of karst crevice at edge of canyon ledge.



Photo 13. Dense *Heritiera longipetiolata* grove growing in karst limestone.





Photo 14 *Heritiera longipetiolata* found amongst limestone karst.



Photo 15. Low-stature, impassable limestone coastal scrub, showing canopy overview





Photo 16. Swordgrass-dominated patch.



Photo 17. Dense patch of mixed invasives typical of clearings on Tinian.

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