Compañía de Turismo
San Juan, Puerto Rico

DECLARACIÓN DE IMPACTO AMBIENTAL PRELIMINAR (DIA-P)

Desarrollo Turístico-Residencial
Villas del Mar Hau Beach Resort
Barrio Bajuras de Isabela

Parte II

ENERO 2008

Apéndice E
Determinación Jurisdiccional Preliminar

PRELIMINARY JURISDICTIONAL DETERMINATION OF WATERS OF THE UNITED STATES

VILLAS DEL MAR HAU DEVELOPMENT

ISABELA, PUERTO RICO

Prepared for:

Myrna Hau Rodriguez
Isabela, Puerto Rico

Prepared by:

Environmental Hydrology Law Consultants
Urb. Valparaiso
15 Calle 3
Levittown, PR 00949
(787) 550-8126

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1.0 INTRODUCTION

This report presents the results of Environmental Hydrology Law Consultant's (EHLC) jurisdictional delineation (JD) of wetlands and other waters of the U.S., subject to the jurisdiction of the U.S. Army Corps of Engineers (COE) under Section 404 of the Clean Water Act (CWA) for the tourist complex of Villas del Mar Hau located at Montones Beach, Isabela, Puerto Rico. The owners and operators of Villas del Mar Hau are considering the improvement and expansion of the facilities to provide additional tourist services and accommodate a larger number of guests. The information from this report will be used for the planning of the potential expansion of the facility and to determine permit requirements for areas under the jurisdiction of the COE that could be impacted.

The results of this JD are based on the review of available documents and fieldwork necessary to determine the presence of waters of the U.S. areas within the study area. Potential wetlands and waters of the U.S. were identified using COE's wetland delineation and ordinary high water mark determination methods. This delineation of waters of the U.S. is conditional upon the review and final jurisdictional determination by the COE.

2.0 REGULATORY BACKGROUND

Water resources are governed by the CWA and are subject to state and federal regulations. The principal agency involved is the COE which holds regulatory jurisdiction over the waters of the U.S. The main state agencies involved in the permit process are the Puerto Rico Department of Natural and Environmental Resources (DNER), Puerto Rico Planning Board (PRPB) and the Puerto Rico Environmental Quality Board (EQB). Most of the permits issued by the COE are subject to compliance certifications and approvals by these state agencies. Other federal agencies which could also comment on the project include the U.S. Fish and Wildlife Service and NOAA National Fisheries Service. These agencies will review the project to determine the effects on the resources they regulate such as the threatened and endangered species and their habitat, and fisheries resources as applicable.

2.1 Definitions

The following are important definitions and concepts that conform the base for the methods used for this JD.

- **Waters of the U.S.**[1]: Waters of the United States means:
    1. All navigable waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
    2. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters;
    3. All impoundments of navigable waters otherwise defined as waters of the U.S.; and
    4. Tributaries of waters described above.

- **Intermittent stream**: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods,

intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.[7]

- **Perennial Stream:** A stream or reach of a stream that flows continuously. They are generally fed in part by springs. Surface water elevations are commonly lower than water table elevations in adjacent soils.

- **Ephemeral Stream:** A stream or stretch of a stream that flows only in direct response to precipitation. It receives no water from springs and no long-continued supply from melting snow or other surface source. Its stream channel is at all times above the water table. These streams do not normally flow for 30 consecutive days.

- **Ordinary high water mark** (**OHWM)**: Means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

- **Stream bed:** Is the substrate of the stream channel between the OHWM's. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.[2]

- **Wetlands**: Are areas which are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances, do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. In the absence of wetlands, the jurisdiction of the COE is limited to the OHWM of the U.S. The limit of COE's jurisdiction in non-tidal waters of the U.S. extends to the OHWM.

[1] 33 CFR Ch II 328.3

- **Non-wetlands:** Non-wetlands include uplands and lowland areas that are neither deepwater aquatic habitats, wetlands, nor special aquatic sites. They are seldom or never inundated, or if frequently inundated, they have saturated soils for only brief periods during the growing season, and, if vegetated, they normally support a prevalence of vegetation typically adapted for the life only in aerobic soil conditions.

- **Isolated waters:** In 2001, the U.S. Supreme Court ruled that the COE could no longer use the "Migratory Bird Rule" to extend its regulation over "waters of the U.S." to include isolated, non-navigable, intrastate waters.[3] This court decision, referred to as the SWANCC decision, clarified the definition of "isolated waters" by stating that they are waters that lack a hydrologic connection to other waters that are part of or adjacent to interstate waters, a tributary system, or traditionally navigable waters. The SWANCC decision affects any federal, state, or tribe implementing provisions of the Clean Water Act that apply the definition of "waters of the U.S." The following subsections of the regulatory definition of "waters of the U. S." are affected by SWANCC: intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds.

- **Traditional navigable waters** (TNW's):[4] In 2006, the U.S. Supreme Court addressed the term "the waters of the U.S." in the *Rapanos v. U.S.* and in *Carabel v. U.S* (referred to as *Rapanos*). The decision provides two new analytical standards for whether water bodies that are not traditional navigable waters (TNW's) including wetlands to those non-TNW's, are subject to CWA jurisdiction:

    1. if the water body is relatively permanent,, or if the water body is a wetland that directly abuts a relatively permanent water body (RPW), or
    2. if a water body, in combination with all wetlands adjacent to that water body, has a significant nexus with TNW's.

[2] Federal Register. March 9, 2000. Final Notice of Issuance and Modification of Nationwide Permits. Volume 65, Number 47, pages 12817-12899
[3] Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers, No. 99-1178, January 9, 2001
[4] U.S. Army Crops of Engineers. 2007. Jurisdictional Determination Form Instructional Guidebook.

3.0 GENERAL DESCRIPTION OF THE STUDY AREA

The hotel complex of Villas del Mar Hau is located in PR 4466, Km 8.9, Montones Beach, Isabela, Puerto Rico. Figure 1 shows the location and topography of the study area. The hotel accommodates their guests in fully furnished cottages and apartments. Recreational facilities include a swimming pool, tennis court, basketball court, restaurant and other amenities.

The property covers approximately 40 cuerdas of land that is bisected by PR 4466 into two tracts. The northern tract consists of approximately 30 cuerdas and is where the hotel complex is located. The hotel complex itself coves approximately 7.8 cuerdas. The southern tract covers approximately 10 acres of land.

The topography of the study area is a relatively flat with contours varying from 5 to 10 meters above the sea level. The limestone outcrop at the southern portion of the property rises up to 45 meters above sea level.

The average annual precipitation of Isabela is 63.71 inches. The maximum and minimum average temperatures are 84.8 and 68.4 degrees Fahrenheit, respectively.[5]

According to the life zones map of Ewel and Whitmore[6], the study area is within the subtropical moist forest zone. Most of the land in this zone has been deforested at one time or another for agricultural purposes and remains in non-forest use. Commonly found plant species include the Puerto Rico royal palm (*Roystonea borinquena*), white cedar (*Tabeuia heterephylla*), African tulip tree (*Spathodea campanulata*), mountain immortelle (*Erythrina poeppigiana,* "bucayo gigante"), "guaba" (*Inga vera*) and sweetpea (*Inga laurina*, "guama"). The vegetation species observed in the study area is listed in Table 1. Other details of the study area are discussed in the following sections.

[5] http://radar.meas.ncsu.edu/cgi-bin/sercc/cliMAIN.pl?pr4702
[6] Ewel, J. J. , and J. L. Whitmore. 1973. The ecological life zones of Puerto Rico and the U.S. Virgin Islands. Forest Service Research Paper ITF-18

4.0 METHODOLOGY

4.1 Preliminary Data Gathering and Synthesis

Preliminary work was conducted to obtain the information about the study site prior to the fieldwork. During this process, the following documents were reviewed:

- USGS Isabela Quadrangle Map (Figure 1)
- Soils:
    - Soil Survey[7]
    - Soils Map (Figure 2)
    - Hydric soils list[8]
- Environmental Sensitivity Index Map from NOAA (Figure 3)
- FEMA Flood Map (Figure 4)
- Hydrograhy Map (Figure 5)
- National Wetland Inventory map (Figure 6)[9]

The study area was located on the maps and documents mentioned above which were reviewed to make a preliminary analysis of the potential CWA jurisdictional areas.

4.2 Fieldwork

The fieldwork was conducted from on June 24, 2007. The methodology used to identify the wetland areas is summarized below.

[7] Gierbolini, R. E. 1975. Soil Survey of Mayagüez area of western Puerto Rico. USDA Soil Conservation Service
[8] NRCS. 2005. Hydric Soils, Mayagüez Area. http://www.pr.nrcs.usda.gov
[9] http://wetlandsfws.er.usgs.gov/NWI/index.html

4.2.1 Stream Channels Identification of the Ordinary High Water Mark (OHWM)

According to COE's Guidance[10], OHWM's determinations rely on physical evidence to ascertain the lateral limits of jurisdiction to the extent that the physical evidence can be found and deemed reliable. The physical characteristics that should be considered when making an OHWM limit determination include the following:

Natural line impressed on the bank	Sediment sorting
Shelving	Leaf litter disturbed or washed away
Changes in the character of soil	Scour
Destruction of terrestrial vegetation	Deposition
Presence of debris and litter	Multiple observed flow events
Wracking	Beds and banks
Vegetation matted down bent or absent	Change in plant community

The guidance indicates that there are no "required" physical characteristics that must be present to make an OHWM determination. However, when physical evidence alone will be used for the determination, COE should try to identify two or more characteristics, unless there is particular strong evidence of one. Evidence resulting from extraordinary events, including major flooding and storm surges, is not indicative of OHWM.

According to the CWA, the lateral limits of jurisdiction over non-tidal water bodies extend to the OHWM, in the absence of adjacent wetlands. When adjacent wetlands are present, the CWA jurisdiction extends beyond the OHWM to the limits of the adjacent wetland.

4.2.2 Identification of Wetlands

To determine the presence of wetlands, the methodology contained in the 1987 Corps of Engineers Wetlands Delineation Manual[11] (Manual) was followed. Jurisdictional wetlands must exhibit all three characteristics: hydrology, hydrophytes, and hydric soils. The accepted scientific methodology for examining all three characteristics is presented in the Manual. The following is a summary of the three parameters that must be met for an area to be considered as a wetland.

[10] U.S. Army Corps of Engineers. 2005. Regulatory Guidance Letter No. 05-05, 7 December 2005.

- **Hydrophytic vegetation:** Hydrophytic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present. Wetland vegetation was identified in the field based on species composition and corresponding wetland indicator status. Field investigators visually estimated the dominant species coverage for each plant community encountered during field surveys. The indicator status of each dominant species was determined based on the national list of plant species that occur in wetlands.[12] Plants are divided into 5 categories according to their probability to occur in wetlands (Table 1A).

- **Hydrology:** The term "wetland hydrology" encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season. Areas with evident characteristics of wetland hydrology are those where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic and reducing conditions, respectively. Wetland hydrology was observed in the field for each plant community. Visual indicators of hydrology included topographic contours (e.g. watercourses, swales, depressions and slopes), inundation, saturated soils, sediment deposits and water marks.

- **Hydric Soils:** Hydric soils are defined as soils that are saturated, flooded or ponded long enough during the growing season at some point in their history to develop anaerobic conditions in the upper part. These soils typically support hydrophytic vegetation. For a soil to be considered saturated, it must either be inundated or the groundwater must be within the root zone, typically 12 inches from the surface. However, not all areas having hydric soils will qualify as wetlands. Only when a hydric soil supports hydrophytic vegetation and the area has indicators of wetland hydrology may the soil be referred to as a "wetland" soil. Soil colors were determined with the Munsell color chart.[13]

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[11] U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1 (on-line edition)
[12] Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: Caribbean (Region C). U.S. Fish Wildl. Serv. Biol. Rep. 88(26.12). 82 pp.
[13] Kollmorgen Instruments Corporation, Macbeth Division. 2000. *Munsell Soil Color Charts*. Baltimore, Maryland.

The routine approach, which is normally used in the vast majority of determinations, for areas greater than 5 acres, was used for this work. Three transects were established in the study area. Sampling points (SP's) were established based on changes in vegetation or where wetland indicators were observed. Additional SP's were established as needed to determine the wetland limits. At each location the three parameters were evaluated and a data form was filled to make a wetland determination. Where positive indicators of wetlands were present, the jurisdictional boundary was established by the OHWM or by the limit of the wetland. Appendix A contains copies of the data forms for each SP.

4.3 Mapping and Acreage Calculations

All data collection points and wetland boundary were delineated in the field using a geospatial positioning system (GPS, Garmin Etrex Venture) using the NAD 83 coordinate system. The data gathered with the GPS (i.e., waypoints and tracks) was downloaded into the geographic information system (GIS) software. The GIS was used to map the jurisdictional areas on an overlay of both topography and geo-referenced aerial photography, using hydrological and vegetative signatures and topographic data. The area of the wetland polygon was obtained by a combination of field measurements and GIS analysis.

5.0 RESULTS

This section provides the results of the preliminary data gathering, fieldwork, and descriptions of the identified jurisdictional waters of the U.S.

5.1 Preliminary Data Gathering and Synthesis

Maps and documents containing information of the study area were reviewed during the preliminary work to identify its boundaries and determine any physical features that would indicate the presence of any jurisdictional area. The following is a discussion of the findings:

a) USGS quadrangle map (Figure 1) – The map shows a small ponded area in the northern tract forming a circumference. To the north, the beach area and Atlantic Ocean can be observed. These areas are outside the property. There are no stream beds or other wetland indicators within the study area.

b) Soils: The soil survey, the soils map (Figure 2), and the hydric soils list were reviewed. A total 4 soil series were identified within the study area: Catano sand (Cd), Coastal beach, Limestone outcrop (Lo), and Rio Lajas sand. Table 2 provides a summary of the soil series and the area of coverage. The Catano and Coastal beach series are included in the hydric soils list. These two soils cover approximately 43.5 percent of the study area. A brief description of each soil is provided below (see Appendix B for detail descriptions).

(1) The Catano series consists of very deep, excessively drained, rapidly permeable soils found in beach areas along the coast. The taxonomic class is Carbonatic, isohyperthermic Typic Udipsamments. Catano soils are in beach areas along the coast. Slopes range from 0 to 5 percent. Most areas of Catano soils are planted to coconuts with undergrowth of pasture. Thickness of the sand is more than 6.0 feet. The Catano sand (Cd) is nearly level. It occurs as strips along the coast in areas close to sea level. The soil is not suited to cultivalted crops. Its use of limited to pasture,

coconuts, or wildlife habitat. Some areas are used for residential sites and for recreational purposes.

The Catano soil series is listed in the hydric soils list. The hydric component of this soil is the Reparada soil series, which covers 3 percent of the soil map unit of the Catano series in Puerto Rico. It occurs on nearly level coastal lowlands with slope gradients of 0 to 2 percent. The taxonomic class is isohyperthermic Mollic Fluvaquents. It is poorly drained. Runoff is slow and permeability is very slow. Soils are saturated 3 months or more a year. Natural vegetation consists of hydrophytic plants, Para grass, and shrubs.

(2) Coastal beach (Ch) consists of narrow strips of light-colored beach sands along the coast. It occupies nearly level sand ridges and dunes caused by the action of waves on marine sands. The depth to salt water is variable. The sands, which are calcareous, contain numerous seashells, corals, and shell fragments throughout. Most areas lack vegetation, but in some areas there area scattered coconut palms. The most common vegetation consist of sea grapes and beach morning glory. This soil series is also listed in the list of hydric soils. The hydric component if Hydraquents covering 5 percent of the soil map unit of the Coastal beach soil series in Puerto Rico.

(3) Limestone outcrop (Lo) is in areas where hard, massive, gray and pinkish-gray limestone crops out on 75 to 100 percent of the surface. In areas not entirely covered by limestone, there are irregular shaped patches of gravelly soil material that has varying colors and is 2 to 5 inches thick. The slopes range from 0 to 60 percent. Included in mapping were small depressions in which there is soil material of variable texture, color and thickness. The use of this is limited. In most areas the vegetation consists of brushy forest or brushy pasture, and in semiarid areas it is chiefly cactus and low brush.

(4) The Rio Lajas (RiB) series consists of very deep, somewhat excessively drained, rapidly permeable soils formed in sandy coastal plains sediments. This nearly level to sloping soils is in the coastal plains. Slopes range from 2 to 12 percent. The taxonomic class is Mixed, isohyperthermic Psammentic Paleudalfs. It is mostly in pasture and food crops.

The hydric criteria code for Catano is 2B3, 4 and for Coastal beach is 2B3, 3, 4. The 2B3 criteria is defined as "Soils in Aquic suborders, great groups, or subgroups … that are: b. poorly drained or very poorly drained and have: (3) water table at less than or equal to 1.0 ft from the surface during the growing season if permeability is less than 6 in/ft in any layer within 20 in". The hydric components of these soil series, reparada and Hydraquents, vary from 3 to 5 percent, respectively. According to NRCS, map units with hydric criteria 2B3, in general, do not meet the definition of hydric soils because they do not have one of the hydric soils indicators. A portion of these map units, however, may include hydric soils. Onsite investigation is recommended to determine whether hydric soils occur at the location.[14]

The identification of a hydric soil is one of the three parameters required to determine the presence of wetlands. The hydric soil component is potentially present in approximately 43.5 percent of the study area. The probability of finding wetlands is higher in those areas. The hydric soil component has to be identified in order to identify the soil as hydric.

c) Environmental sensitivity index (ESI) map from NOAA (Figure 3). The ESI map is a good reference for identifying environmentally sensitively areas before conducting fieldwork. This map shows the same water features of Figure 1. The reader is referred to the comments made for Figure 1 above. The map does not show any other habitat or sensitive area within the study area.

d) FEMA flood maps (Figure 4): The map identifies the study area as Zone X. These are areas determined to be of outside the 0.2 percent annual chance floodplain. Based on this map, flooding events are not a major contributor to wetlands in this area.

[14] NRCS. 2002. Hydric Soils interpretations. Caribbean Area FOTG, Natural resources Information.

e) National Wetlands Inventory Map (Figure 5): This map identifies the pond area observed in Figure 1 with the wetland code PUBH which corresponds to Palustrine, unconsolidated bottom, permanently flooded area. According to the Cowardin[15] classification of wetlands, the Palunstrine System, which is one of the five major systems, includes nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent. This system groups the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. The Palustrine System is bounded by upland or by any of the other four systems. Based on this map, there are no other mapped wetlands within the study site.

On the northern edge of the property, the map shows an area identified as M2US2P (Marine, intertidal, unconsolidated shore, irregularly flooded). The Marine System consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides. This system extends from the outer edge of the continental shelf shoreward to one of three lines: (1) the landward limit of tidal inundation (extreme high water of spring tides), including the splash zone from breaking waves; (2) the seaward limit of wetland emergents, trees, or shrubs; or (3) the seaward limit of the Estuarine System, where this limit is determined by factors other than vegetation. Based on the map, the study area is outside the Marine System as the limit of the tidal inundation does not reach the property boundary and there are no adjacent wetlands.

f) Hydrograhy Map (Figure 6) – This map was obtained from the Puerto Rico Planning Board web site. It shows the same water features of Figures 1 and 5. The reader is referred to the comments made for these two figures above.

[15] Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. USFWS. 79 pp.

Conclusions of the Preliminary Data Gathering and Synthesis

Based upon the information gathered during the preliminary work, it can be concluded that there is a potential jurisdictional area within the study site. The potential jurisdictional area is consists of a small pond located in the northern tract of the property. Fieldwork is necessary to confirm the information obtained and identify any other potential jurisdictional areas not observed in the maps.

5.2 Fieldwork

The fieldwork was conducted on June 24, 2007. Prevailing weather conditions during the survey were sunny and dry. A walkthrough of the property was made. The pond area identified during the preliminary work located in the northern tract of Figure 1 was found. The first of three transects was established at this location to cover the pond and its adjacent areas. The other transects were established to the west (Figure 7).

A total 10 sample points (SP's) were established to make jurisdictional determinations. The approximate location of the SP's is shown in Figure 7. The SP's have been numbered in relation to their location in the figure to facilitate the discussion of the findings. The developed area was also inspected and a walkthrough the beach area conducted as part of this survey. The following is a discussion of the findings and the determinations made.

5.2.1 Transect 1

This transect was approximately 270 meters long. A total of 6 SP's were established of which 5 were in the northern tract and 1 in the southern tract. The pond was located. The area of the pond is fenced out with a chain link fence. The pond was inundated and covered with *Typha domingensis*, which is an obligated wetland species. This pond is by definition identified as waters of the United States. Therefore, SP's 1 through 4 were established to determine the extent of the wetland. SP-1 was determined to be a wetland as the three parameters were identified. SP'2 was located 2 meters from SP-1 resulting non-wetland as the hydrology and soil resulted negative for wetland. The same results were obtained with SP's 3 and 4, respectively. The non-wetland SP's were located next to the chain link fence. Therefore, it was decided to use the

fence line that encircles the wetland as the limit of the wetland area. The area of this wetland is approximately 1,930 m^2.

The surrounding areas of this wetland were inspected to determine if it was connected to any ditch or stream bed. No ditches or stream beds were observed. The surrounding areas are open and used for grazing and other agricultural and recreational purposes. The identified wetland area seems to be located in the lowest portion of this flat land, which led to the formation of this pond. Since the wetland lacks connectivity to any jurisdictional waters of the United States, it is considered isolated waters of the U.S. According to the 2001 U.S. Supreme Court decision (SWANCC decision), COE can no longer extend its regulation over isolated, non-navigable, intrastate waters. Therefore, this wetland area is not jurisdictional.

SP-5 was established south to the isolated wetland resulting non-wetland. There are coconut palms in this area and agricultural commodities such as cassava are being cultivated. No wetland indicators were observed.

SP-6 was established in the southern tract. It resulted non-wetland. This area is in proximity to the limestone outcrop. The lower soil layers are hard and dominated by the limestone. No wetland indicators were observed.

5.2.2 Transect 2

This transect was approximately 270 meters long. SP's 7 and 8 were established on the southern and northern tracts, respectively. Both SP's resulted non-wetlands. No wetland indicators were observed.

5.2.3 Transect 3

This transect was approximately 270 meters long. SP's 9 and 10 were established, on the southern and northern tracts, respectively. Both SP's resulted non-wetlands. No wetland indicators were observed.

5.2.3 Hotel Complex

The 7.8 cuerdas of the hotel complex were inspected. This is a developed area with several cabin and apartment buildings along the coastline, paved access road, recreational facilities, restaurant, swimming pool, and souvenir shop. Figure 8 shows photos of this area. The vegetation consists of large Casurina trees, palm trees, and other ornamental plants. No wetland indicators were observed.

5.2.4 Shoreline

The landward limits of tidal waters of the U.S. extend to the high tide line.[16] The shoreline was inspected to determine the proximity of the study area to the hide tide line. The northern boundary of the study area is at least at 20-30 meters above the high tide line. Figure 9 shows photos of this area. This shoreline is a bare sand dune used for recreational purposes. No ditches or streams were observed that could connect the study area with the sea. No wetland indicators were observed.

[16] 33 CFR 328.4(b)

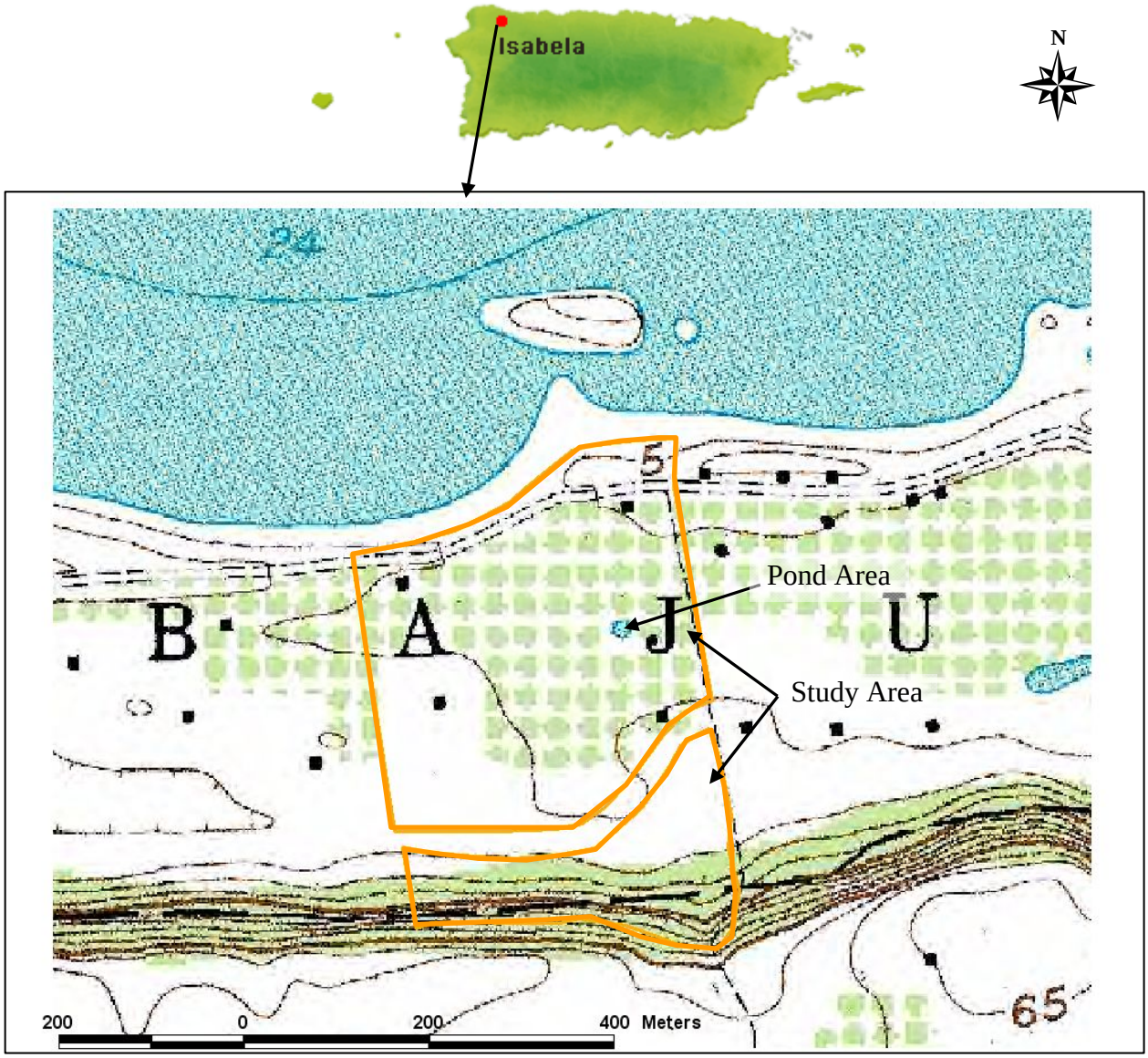
6. 0 CONCLUSIONS

This study resulted in the identification of an isolated wetland area of approximately 1,930 m^2 located in the northern tract of the study area. According to the 2001 U.S. Supreme Court decision (SWANCC decision), COE can no longer extend its regulation over isolated, non-navigable, intrastate waters. This wetland neither abuts to any tributary nor has any nexus to traditional navigable waters. Therefore, this wetland area is not jurisdictional.

Based on the results of the SP's established and the inspection of the areas of the hotel complex and shoreline, it is concluded that there are no jurisdictional waters of the U.S. within the study area.

This report documents the wetland boundary delineation and best professional judgment of EHLC's investigators. All results presented should be considered preliminary and subject to change, pending an official review and verification in writing by COE. Following the development of a preliminary comprehensive project design, consultations should be initiated with COE to review areas of agency jurisdiction, potential resource concerns for the agency, and applicable permit requirements.

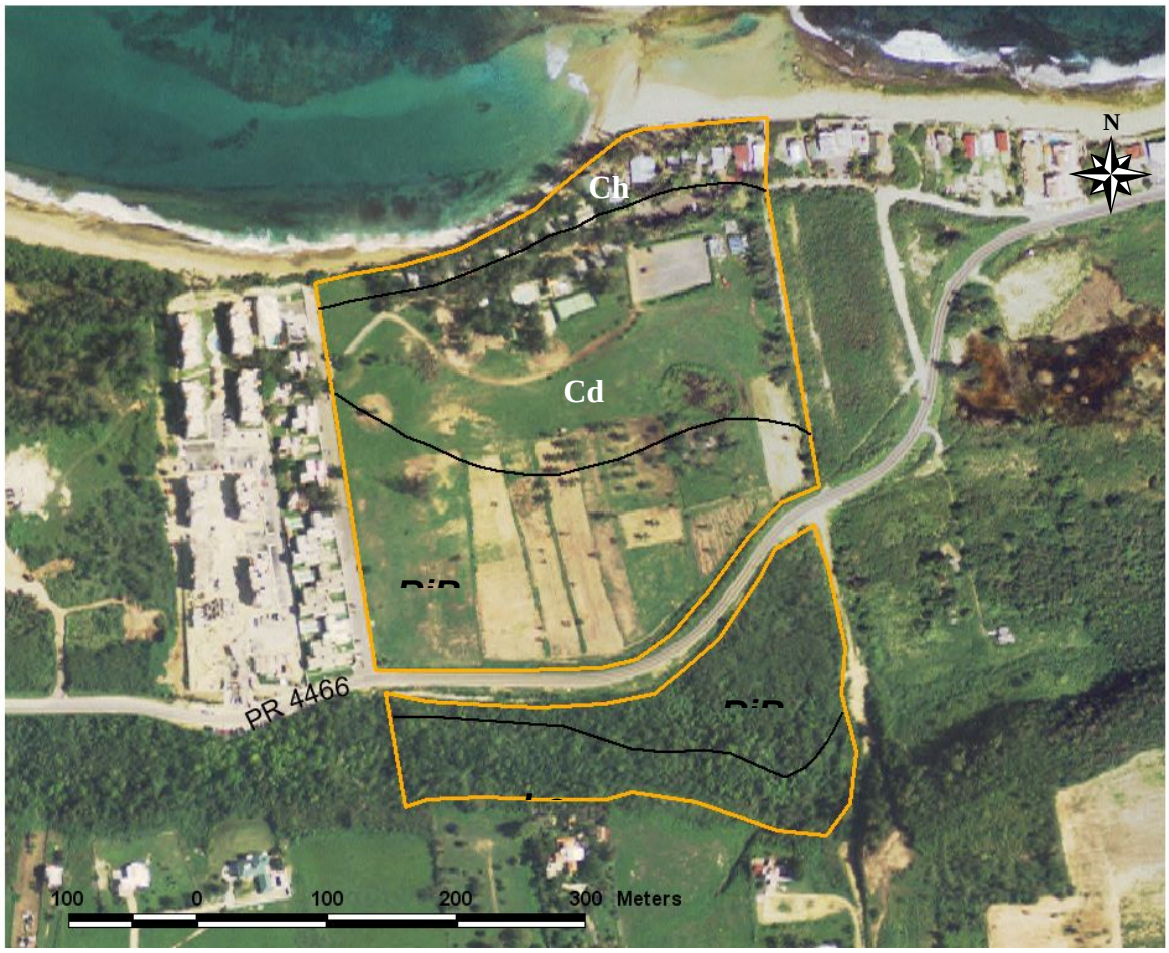
FIGURAS



Property boundary

Source: USGS Isabela Quadrangle

Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	**Figure 1** Location and Topographic Map



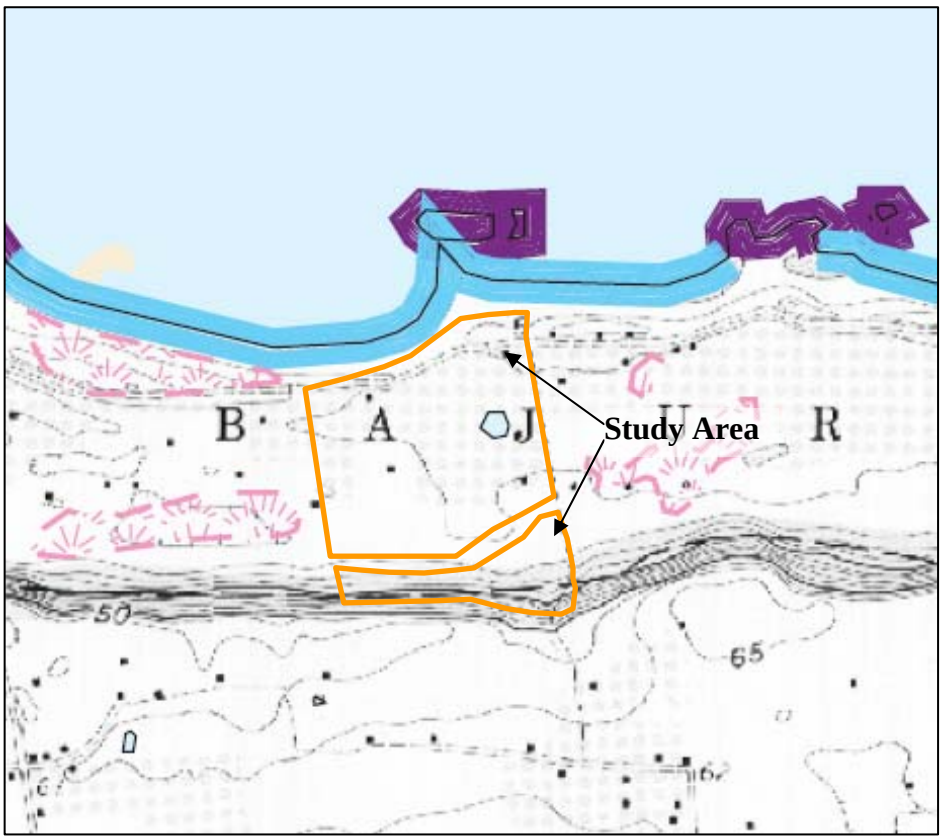
Property boundary
Soil lines

Soil series:

Cd – Catano sand
Ch – Coastal beach
Lo – Limestone outcrop
RiB – Rio Lajas sand, 2 to 5 percent slopes

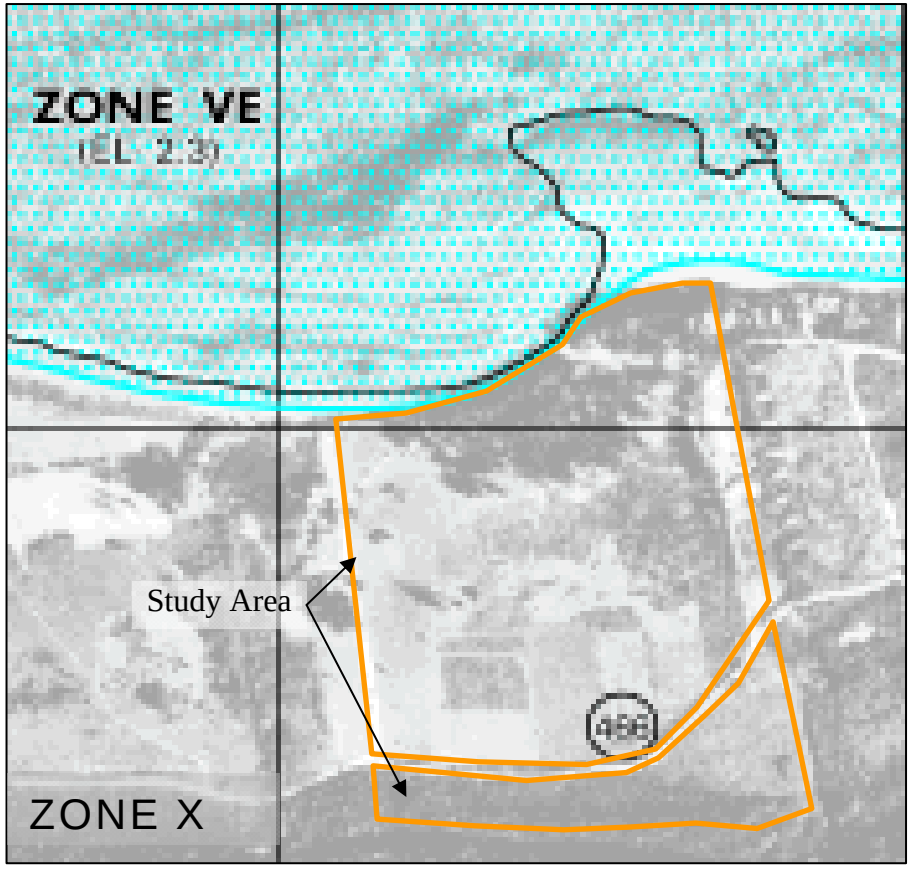
Source: USDA Natural Resources Conservation Service, http://soils.usda.gov

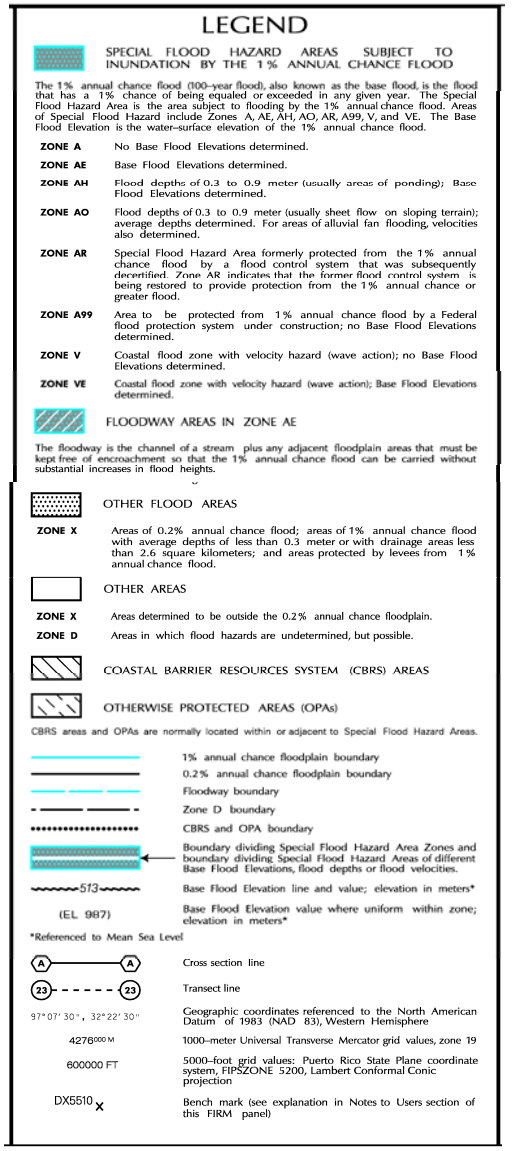
Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	**Figure 2** Soils Map



Source: NOAA Environmental Sensitivity Index Map. Map not to scale.

Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	**Figure 3** Environmental Sensitivity Index Map





Source: http://msc.fema.gov, map 72000C0040H. Map not to scale.

Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	Figure 4 FEMA Flood Map

N

— Property boundary

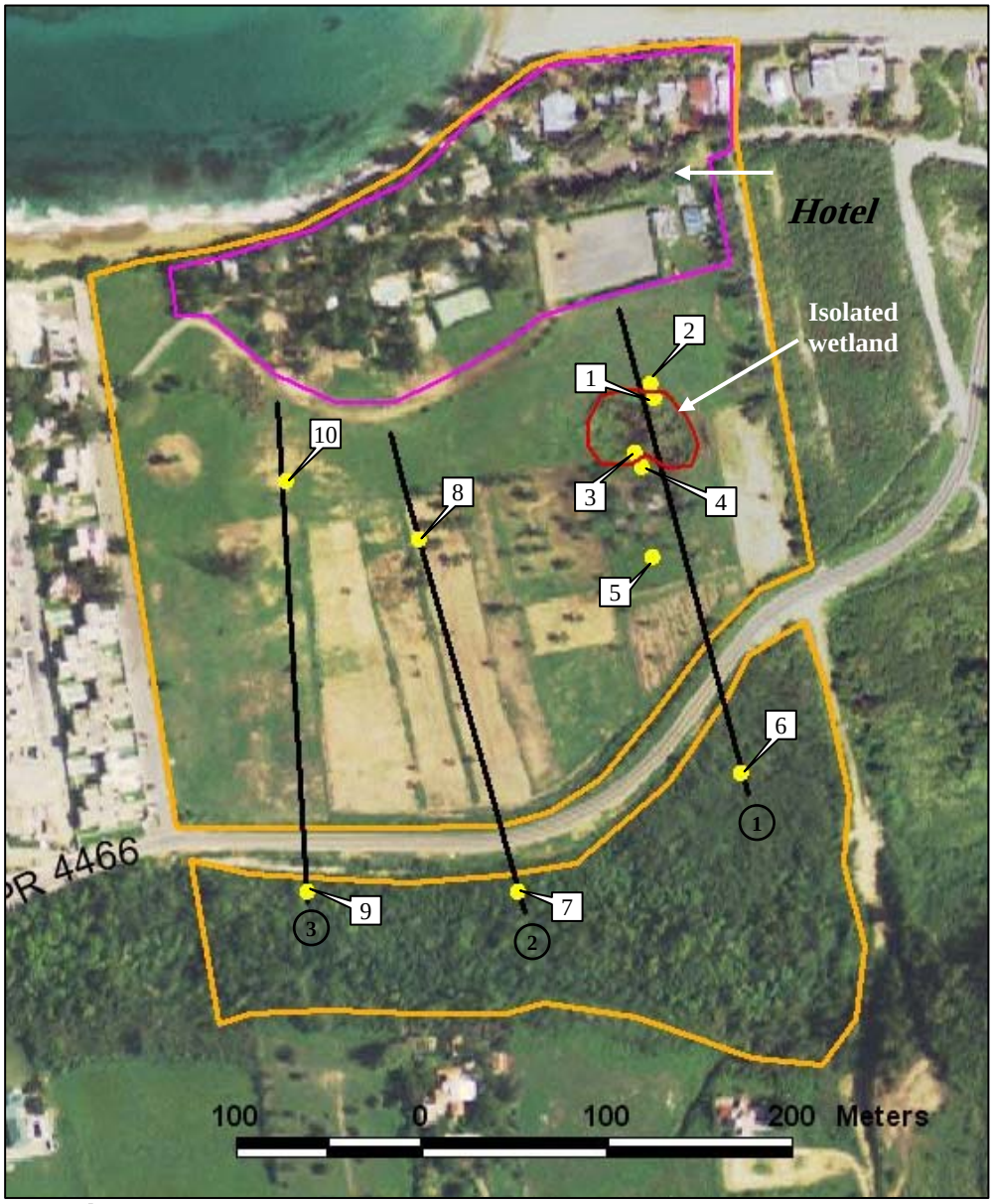
Wetland codes:

PUBH: Palustrine, unconsolidated bottom, permanently flooded.

M2US2P: Marine, intertidal, unconsolidated shore, irregulary flooded.

Source: http://wetlandsfws.er.usgs.gov/wtlnds/launch.html. (Map not to

Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	Figure 5 National Wetlands Inventory Map



Legend:

- Property boundary
- Transect
- (1) Transect number
- Sample point
- [1] Sample point number
- Hotel complex area
- Wetland limit

Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	Figure 7 Preliminary Jurisdictional Determination Map

8A. View of the paved access road and surrounding facilities.

8B. View of the apartment buildings and residential area.

Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	**Figure 8** Photos of the Hotel Complex

9A. View of the shoreline (looking north).

9B. View of the shoreline (looking west).

Preliminary Jurisdictional Determination Villas del Mar Hau Isabela, Puerto Rico	**Figure 9** Photos of the Shoreline

Table 1. Plant species observed in the study area.

Family	Scientific Name	Common Name	Regional Indicator*
Casuarinaceae	**Casuarina equisetifolia**	Australian pine (Casuarina)	FAC
Compositae	**Mikania congesta**	Falso guaco	FACW
Convolvulaceae	*Ipomoea setifera*	Wild morning glory (Bejuco de Puerco)	FACW
Leguminosae-Mimosoideae	**Desmanthus virgatum**	Desmanto	FACU
	Leucaena leucocephala	Tantan (Zarcilla)	FAC
Piperaceae	*Piper amalago*	Soot-soot (Higuillo de limón)	NL
Poaceae	*Brachiaria purpurascens (Urochloa mutica)*	Para grass (Malojillo)	FACW
	Digitaria eriantha	Pangola grass (Yerba pangola)	FACU
	Urochloa maxima	Guinea grass (Yerba guinea)	FACU-
Palmae	**Cocos nucifera**	Coconut palm (Palma de coco)	FACU
Polygonaceae	**Coccoloba diversifolia**	Redwood (Uvilla)	NL
Rutaceae	**Zanthoxylum caribaeum**	Espino rubial	NL
Typhaceae	**Typha domingensis**	Cat-tail (Eneas)	OBL

*See Table 1A below for the description of the wetland indicators.
**NL = Not listed in the national list of plant species that occur in wetlands.

Table 1A. Wetland indictors

Indicator Category	Indicator Symbol	Definition
Obligate Wetland Plants	OBL	Plants that occur almost always (estimated probability >99 percent) in wetlands under natural conditions, but which may also occur rarely (estimated probability <1 percent) in nonwetlands.
Facultative Wetland Plants	FACW	Plants that occur usually (estimated probability >67 percent to 99 percent) in wetlands, but also occur (estimated probability 1 percent to 33 percent) in nonwetlands.
Facultative Plants	FAC	Plants with a similar likelihood (estimated probability 33 percent to 67 percent) of occurring in both wetlands and nonwetlands.
Facultative Upland Plants	FACU	Plants that occur sometimes (estimated probability 1 percent to <33 percent) in wetlands, but occur more often estimated probability >67 percent to 99 percent) in nonwetlands.
Obligate Upland Plants	UPL	Plants that occur rarely (estimated probability <1 percent) in wetlands, but occur almost always (estimated probability >99

		percent) in nonwetlands under natural conditions.
The three facultative categories are subdivided by (+) and (-) modifiers.		

References used for the identification and classification of the plants

Logier, Alain H. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Editorial de la Universidad de Puerto Rico. Second edition.

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Martorell, L. F., A. H. Liogier, and R. O. Woodbury. 1981. Catálogo de los nombres vulgares y científicos de las plantas de Puerto Rico. Boletín 263. Estación Experimental Agrícola. UPR.

Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: Caribbean (Region C). U.S. Fish Wildl. Serv. Biol. Rep. 88(26.12). 82 pp.

University of Puerto Rico. 2001. Guide to identify common wetland plants in the Caribbean area: Puerto Rico and the Virgin Islands. Editorial de la Universidad de Puerto Rico.

Table 2. Summarized description of the soil series found in the study area.[1]

Item	Map Symbol	Soil Series	Hydric Component	Percent of Map Unit	Hydric Criteria	Area of Coverage (Cuerdas)	Percent of Coverage[2]
1	Cd	Catano sand	Reparada	3	2B3, 4	14.2	35.5

2	Ch	Coastal beach	Hydraquents	5	2B3, 3, 4	3.2	8.0
3	Lo	Limestone outcrop	N/A	N/A	N/A	4.6	11.5
4	RiB	Rio Lajas sand, 2-5 percent slopes	N/A	N/A	N/A	18.0	45.0
					Total	40.0	100

[1] See Appendix B for detailed soil series descriptions.
[2] Approximate percentage of coverage of each soil series in the study area including the hydric components.

Explanation of hydric criteria codes:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
   A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
   B. are poorly drained or very poorly drained and have either:
      1.) a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
      2.) a water table at a depth of 0.5 foot or less during the growing season if permeability is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
      3.) a water table at a depth of 1.0 foot or less during the growing season if permeability is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for long or very long duration during the growing season.
4. Soils that are frequently flooded for long or very long duration during the growing season.

APENDICES

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	1
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	1

GPS	Lat	Long
	18.51207219	-67.06427447

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Brachiaria purpurascens*	Herb	FACW	9.			
2.	*Mikania congesta*	Herb	FACW	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks: Sampling point located on the edge of a pond. The pond was covered with *Typha domingensis*.

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: 12 (in.)

Wetland hydrology Indicators:

Primary Indicators:

_____ Inundated
__X__ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Catano sand

Drainage Class: Poorly drained

Field Observations _____

Taxonomy (Subgroup): Isohyperthermic Typic Udipsamments

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10YR 2/1			Silty clay
5-16	B	10YR 3/1			Sandy loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
__X__ Gleyed of Low-Chroma Colors

_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
__X__ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ~~Yes~~ No (Circle) Wetland Hydrology Present? ~~Yes~~ No Hydric Soils Present? ~~Yes~~ No	(Circle) Is this Sampling Point Within a Wetland? ~~Yes~~ No
Remarks:	

Approved by HQUSACE 3/92

Photos of Sample Plot 1

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	1
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	2

GPS	Lat	Long
	18.51206431	-67.06427624

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Ipomoea setifera*	Vine	FACW	9.			
2.				10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks:

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Wetland hydrology Indicators:

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Remarks: No hydrology indicators observed.

SOILS

Map Unit Name (Series and Phase): Catano sand

Drainage Class: Poorly drained

Field Observations _____

Taxonomy (Subgroup): Isohyperthermic Typic Udipsamments

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10YR 2/2			Silty clay
5-15	B	10YR 3/2			Loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: Hydric component was not found.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	No	(Circle)		(Circle)
Wetland Hydrology Present?	Yes	No			
Hydric Soils Present?	Yes	No		Is this Sampling Point Within a Wetland?	Yes No

Remarks:

Approved by HQUSACE 3/92

Photos of Sample Plot 2

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	1
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	3

GPS	Lat	Long
	18.51176768	-67.06439459

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Brachiaria purpurascens*	Herb	FACW	9.			
2.	*Typha domingensis*	Herb	OBL	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks:

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: 13 (in.)

Depth to Saturated Soil: 0 (in.)

Wetland hydrology Indicators:

Primary Indicators:

_____ Inundated
__X__ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Catano sand

Drainage Class: Poorly drained

Field Observations

Taxonomy (Subgroup): Carbonatic, isohyperthermic Typic Udipsamments

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-16	A	10YR 3/1			Sandy clay loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
__X__ Gleyed of Low-Chroma Colors

_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
__X__ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ~~Yes~~ No (Circle) Wetland Hydrology Present? ~~Yes~~ No Hydric Soils Present? ~~Yes~~ No	(Circle) Is this Sampling Point Within a Wetland? ~~Yes~~ No
Remarks:	

Approved by HQUSACE 3/92

Photos of Sample Plot 3

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	1
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	4

GPS	Lat	Long
	18.51174530	-67.06436919

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Urochloa maxima*	Herb	FACU-	9.			
2.	*Ipomoea setifera*	Vine	FACW	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 50%

Remarks:

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Wetland hydrology Indicators:

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

_____ Oxidized Root Channels in Upper 12"
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Remarks: No hydrology indicators.

SOILS

Map Unit Name (Series and Phase): Catano sand

Drainage Class: Poorly drained

Field Observations _____

Taxonomy (Subgroup): Carbonatic, isohyperthermic Typic Udipsamments

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10YR 3/3			Sandy loam
6-16	B	10YR 3/3			Loamy sand

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: The hydric component was not found.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	~~Yes~~	No	(Circle)		(Circle)
Wetland Hydrology Present?	Yes	~~No~~			
Hydric Soils Present?	Yes	~~No~~		Is this Sampling Point Within a Wetland?	Yes ~~No~~

Remarks:

Approved by HQUSACE 3/92

Photos of Sample Plot 4

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	1
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	5

GPS	Lat	Long
	18.51100316	-67.06429610

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Urochloa maxima*	Herb	FACU-	9.			
2.	*Desmanthus virgatus*	Tree	FACU	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 0%

Remarks:

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Wetland hydrology Indicators:
Primary Indicators:
_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Remarks: No hydrology indicators.

SOILS

Map Unit Name (Series and Phase): Catano sand

Drainage Class: Poorly drained

Field Observations _____

Taxonomy (Subgroup): Carbonatic, isohyperthermic Typic Udipsamments

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-11	A	10YR 4/4			Silt loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: Hard soil.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	~~No~~ (Circle)			(Circle)
Wetland Hydrology Present?	Yes	~~No~~			
Hydric Soils Present?	Yes	~~No~~	Is this Sampling Point Within a Wetland?	Yes	~~No~~

Remarks:

Approved by HQUSACE 3/92

Photos of Sample Plot 5

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau		Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau		County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar		State:	Puerto Rico
Do Normal Circumstances Exist on the site?	☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐ Yes	☒ No	Transect ID:	1
Is the area a potential Problem Area? (If needed, explain on reverse.)	☐ Yes	☒ No	Plot ID:	6

	Lat	Long
GPS	18.51021669	-67.06386980

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Urochloa maxima*	Herb	FACU-	9.			
2.	*Leucaena leucocephala*	Tree	FAC	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 50%

Remarks:

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Wetland hydrology Indicators:
Primary Indicators:
_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Remarks: No hydrology indicators.

SOILS

Map Unit Name (Series and Phase): Rio Lajas

Drainage Class: Somewhat excessively drained

Field Observations _____

Taxonomy (Subgroup): Isohyperthermic Psammentic Paleudalfs

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-9	A	10YR 2/2			Silty clay loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: Limestone below 9”. Could not dig deeper.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ~~Yes~~ No (Circle) Wetland Hydrology Present? ~~Yes~~ No Hydric Soils Present? Yes ~~No~~	(Circle) Is this Sampling Point Within a Wetland? Yes ~~No~~
Remarks:	

Approved by HQUSACE 3/92

Photos of Sample Plot

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	2
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	7

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Leucaena leucocephala*	Tree	FAC	9.			
2.	*Piper amalago*	Tree	NL	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 50%

Remarks: NL = Not listed in the National List of Plant Species That Occur in Wetlands.

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Wetland hydrology Indicators:

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Remarks: No hydrology indicators.

SOILS

Map Unit Name (Series and Phase): Rio Lajas

Drainage Class: Somewhat excessively drained

Field Observations _____

Taxonomy (Subgroup): Isohyperthermic Psammentic Paleudalfs

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10YR 3/4			Sandy loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: Limestone below 5”. Could not dig deeper.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ~~Yes~~ No (Circle) Wetland Hydrology Present? ~~Yes~~ No Hydric Soils Present? Yes ~~No~~	(Circle) Is this Sampling Point Within a Wetland? Yes ~~No~~
Remarks:	

Approved by HQUSACE 3/92

Photos of Sample Plot 7

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	2
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	8

VEGETATION

GPS	Lat	Long
	18.51168159	-67.06616728

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Datura inoxia*	Herb	NL	9.			
2.	*Urochloa maxima*	Herb	FACU-	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 0%

Remarks: NL = Not listed in the National List of Plant Species That Occur in Wetlands.

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Wetland hydrology Indicators:

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Remarks: No hydrology indicators.

SOILS

Map Unit Name (Series and Phase): Catano sand

Drainage Class: Poorly drained

Field Observations _____

Taxonomy (Subgroup): Isohyperthermic Typic Udipsamments

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-13	A	10YR 3/3			Silty clay loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: Hydric component was not found.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	~~No~~	(Circle)		(Circle)
Wetland Hydrology Present?	Yes	~~No~~			
Hydric Soils Present?	Yes	~~No~~		Is this Sampling Point Within a Wetland?	Yes ~~No~~

Remarks:

Approved by HQUSACE 3/92

Photos of Sample Plot 8

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	3
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	9

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Zanthoxylum caribaeum*	Tree	NL	9.			
2.	*Leucaena leucocephala*	Tree	FAC	10.			
3.	*Coccoloba diversifolia*	Tree	NL	11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 33%

Remarks: NL = Not listed in the National List of Plant Species That Occur in Wetlands.

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Wetland hydrology Indicators:

Primary Indicators:

_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

_____ Oxidized Root Channels in Upper 12"
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Remarks: No hydrology indicators.

SOILS

Map Unit Name (Series and Phase): Rio Lajas

Drainage Class: Somewhat excessively drained

Field Observations _____

Taxonomy (Subgroup): Isohyperthermic Psammentic Paleudalfs

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-9	A	10YR 2/2			Silty clay loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: Limestone below 9". Could not dig deeper.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ~~Yes~~ No (Circle) Wetland Hydrology Present? ~~Yes~~ No Hydric Soils Present? Yes ~~No~~	(Circle) Is this Sampling Point Within a Wetland? Yes ~~No~~
Remarks:	

Approved by HQUSACE 3/92

Photos of Sample Plot 9

Soil pit.

General view of the observation point.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Villas del Mar Hau			Date:	June 24, 2007
Applicant/Owner:	Villas del Mar Hau			County:	Isabela
Investigator:	Alejandro Cubiña, Guillermo Fulcar			State:	Puerto Rico
Do Normal Circumstances Exist on the site?		☒ Yes	☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐ Yes	☒ No	Transect ID:	3
Is the area a potential Problem Area? (If needed, explain on reverse.)		☐ Yes	☒ No	Plot ID:	10

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1.	*Digitaria eriantha*	Herb	FACU	9.			
2.	*Stachytarpheta jamaicensis*	Herb	FACU	10.			
3.				11.			
4.				12.			
5.				13.			
6.				14.			
7.				15.			
8.				16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 0%

Remarks:

HYDROLOGY

__ **Recorded Data (Describe in Remarks):**

____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other
_X_ No Recorded Data Available

Wetland hydrology Indicators:
Primary Indicators:
_____ Inundated
_____ Saturated in Upper 12 inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
_____ Oxidized Root Channels in Upper 12”
_____ Water-Stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (Explain in Remarks)

Field Observations:

Depth to Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: _____ (in.)

Remarks: No hydrology indicators.

SOILS

Map Unit Name (Series and Phase): Catano sand

Drainage Class: Poorly drained

Field Observations

Taxonomy (Subgroup): Isohyperthermic Typic Udipsamments

Confirm Mapped Type: Yes (No)

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abbundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 3/3			Sandy loam

Hydric Soils Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed of Low-Chroma Colors
_____ Concretions
_____ High Organic Content In Surface Layer of Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks: Hard soil below 4”. Could not dig deeper.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	~~No~~	(Circle)		
Wetland Hydrology Present?	Yes	~~No~~			
Hydric Soils Present?	Yes	~~No~~		Is this Sampling Point Within a Wetland?	(Circle) Yes ~~No~~

Remarks:

Approved by HQUSACE 3/92

Photos of Sample Plot 10

Soil pit.

General view of the observation point.

APPENDIX B

SOILS DESCRIPTION

CATANO SERIES

The Catano series consists of very deep, excessively drained, rapidly permeable soils found in beach areas along the coast. They formed in regolith of beach sand deposits that consists of sand-size shell fragments, quartz grains, and miscellaneous volcanic subrounded fragments. Near the type location, the mean annual temperature is about 78 degrees F., and the mean annual precipitation is about 76 inches. Slopes range from 0 to 5 percent.

TAXONOMIC CLASS: Carbonatic, isohyperthermic Typic Udipsamments

TYPICAL PEDON: Catano sand--coconut grove (Colors are for moist soil).

A--0 to 4 inches; 50 percent light gray (10YR 7/2) and 50 percent very dark brown (10YR 2/2) sand that is composed of shell fragments and subrounded grains of quartz and miscellaneous volcanic rock fragments with organic matter coatings; very dark grayish brown (10YR 3/2) rubbed; single grain; loose; many fine roots; strongly effervescent; moderately alkaline; clear smooth boundary. (3 to 8 inches thick)

AC--4 to 10 inches; dark brown (10YR 3/3) sand; single grain; loose; common fine roots; many distinct light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous volcanic fragments; moderately alkaline; strongly effervescent; clear smooth boundary. (4 to 8 inches thick)

C1--10 to 50 inches; brown (10YR 4/3) sand; singly grain; loose; few fine roots; light gray (10YR 7/2) shell fragments and very dark brown (10YR 2/2) miscellaneous subrounded volcanic; strongly effervescent; moderately alkaline; clear smooth boundary. (30 to 60 inches thick)

C2--50 to 80 inches; grayish brown (10YR 5/2) sand; single grain; loose; very few fine roots; moderately alkaline; strongly effervescent.

TYPE LOCATION: Cabo Rojo Municipality, Puerto Rico; approximately 2.3 miles northwest from the intersection of P.R. Hwy. 114 and P.R. Hwy. 311, about 250 feet southeast from P.R. Hwy. 102 in an abandoned coconut plantation. Latitude 18 degr4ees 08 minutes 36 seconds N.; longitude 67 degrees 10 minutes 45 seconds W.

RANGE IN CHARACTERISTICS: Thickness of the sand is more than 6.0 feet. Content of silt plus clay ranges from 5 to 10 percent in the control section. The sand consists of shell fragments, quartz grains, and volcanic subrounded fragments. Effervescence with dilute HCL varies from slight to violent. Reaction ranges from slightly alkaline to moderately alkaline in the Ap horizon and moderately alkaline in the AC and C horizons.

The A or Ap horizon has hue of 10YR, value of 3 to 7, and chroma of 1 to 3. Texture is coarse sand or sand.

The AC horizon, where present, has hue of 10YR, value of 3 to 5, and chroma of 2 to 3. Generally, it is a mix of the A and C horizons. Texture is coarse sand or sand.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 to 4. Texture is coarse sand or sand.

COMPETING SERIES: There are no known series in the same family.
GEOGRAPHIC SETTING: Catano soils are in beach areas along the coast. Slopes range from 0 to 5 percent. They formed in regolith of beach sand deposits consisting of sand-size shell fragments, quartz grains, and miscellaneous volcanic subrounded fragments. The climate is humid tropical. The average annual precipitation ranges from 72 to 72 inches and the average annual temperature ranges from 76 to 80 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Aguadilla, Corcega, Coloso, and Espinal series. Aguadilla and Espinal soils are on similar positions and have mixed mineralogy. In addition, Aguadilla soils are acid. The somewhat poorly drained Corcega and Coloso soils are farther inland along river floodplains and terraces, have more clay in the control sections, and have cambic horizons.

DRAINAGE AND PERMEABILITY: Excessively drained; rapid permeability.

USE AND VEGETATION: Most areas of Catano soils are planted to coconuts with an undergrowth of pasture. A few small areas are in subsistence crops. The vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid coastal plains of Puerto Rico. The series is of moderate extent along the coast.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama.

SERIES ESTABLISHED: Puerto Rico, 1942; Soil Survey of Puerto Rico.

REMARKS: Diagnostic horizons and features recognized in this pedon:
Ochric epipedon - the zone from 0 to 10 inches (A and AC horizons).

REPARADA SERIES

The Reparada series consists of very dark brown, A horizons, gray mottled clay B horizons over black muck.

TAXONOMIC CLASS: Fine, mixed, superactive, nonacid, isohyperthermic Mollic Fluvaquents

TYPICAL PEDON: Reparada clay - pasture.
(Colors are for moist soil.)

Ap--0-8 inches; Very dark brown (10YR 2/2) clay; common medium distinct brown (7.5YR 4/4) and few medium distinct dark reddish brown (2.5YR 2/4) mottles; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; common fine roots; very dark gray (N 3/) coatings on ped surfaces; mildly alkaline; gradual smooth boundary. (6 to 10 inches thick)

B2g--8-18 inches; Very dark gray (N 3/) clay; many coarse prominent dark greenish gray (5G 4/1) mottles; massive; firm, slightly sticky, slightly plastic; few fine roots; few partially decomposed plant residues; mildly alkaline; gradual smooth boundary. (6 to 12 inches thick)

110C--18-6 inches plus; Black (10YR 2/1) decomposed, mildly alkaline organic soil material - muck.

TYPE LOCATION: Sudeste SCD, Puerto Rico, municipality of Arroyo, from kilometer marker 131.6 of Highway 3, 0.1 mile south, 0.14 mile east, 0.4 mile south on dirt road, 40 feet east of road; 250 feet north of coconut field.

RANGE IN CHARACTERISTICS: Depth to the organic horizon ranges from 12 to 20 inches. The soils are saturated for 3 months or more. The reaction of all horizons ranges from neutral through moderately alkaline.

The A horizon is very dark gray (10YR 3/1; N3/), black (10YR 2/1; N/4), very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2; 2.5Y 3/2). Mottles range from few through common and are in reddish hues and high chromas. Texture of A horizons is clay or silty clay.

The B horizon ranges from very dark gray (10HR 3/1; N 3/),through gray (10YR 6/1; N 6/), or the greenish and bluish hues of the gley chart. Structure is weak subangular blocky or structureless.

Organic layers range from hemic to sapric.

COMPETING SERIES: These are the Bajura, Coloso, Corcega, Fortuna, Igualdad, Maunabo, Perchas, Pinones, Santoni, Talante, and Vayas series. All these soils lack buried organic layers except the Pinones soils which have strongly through extremely acid reaction in the control section. The Bajura and Santoni soils have COLE values of more than .09 and slickensides in the control section. The Coloso and Corcega soils have subhorizons with colors of chroma 3 or more. The Fortuna, Manuabo, and Perchas soils have acid reactions in the control sections. Igualdad soils have sandy or sandy-skeletal lower control sections. The Talante soils have coarse-loam over sandy and Vayas have fine textured control sections.

GEOGRAPHIC SETTING: The Reparada soils occur on nearly level coastal lowlands with slope gradients of 0 to 2 percent. The regolith is clayey sediments of mixed origin which overlie decomposed and partially decomposed organic materials. The climate is semiarid tropical. Average annual rainfall is 30 to 40 inches. The mean annual temperature is about 79 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Catano and Poncena series and the land type Tidal flats. The Catano soils have sandy control sections. The Poncena soils are fine textured. The land type Tidal flats are flooded by the sea during high tide.

DRAINAGE AND PERMEABILITY: Poorly drained. Runoff is slow and permeability is very slow. Soils are saturated 3 months or more a year.

USE AND VEGETATION: Natural vegetation consists of hydrophytic plants, Para grass, and shrubs. These soils are used for sugarcane when drained.

DISTRIBUTION AND EXTENT: Semiarid coastal areas of Puerto Rico. The series is of small extent.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico: 1942.

REMARKS: The Reparada soils were placed in the Half-Bog great soil group.

RIO LAJAS SERIES

The Rio Lajas series consists of very deep, somewhat excessively drained, rapidly permeable soils formed in sandy coastal plains sediments. This nearly level to sloping soils is in the coastal plains. Slopes range from 2 to 12 percent. The mean annual precipitation is about 67 inches and the mean annual temperature is about 77 degrees F.

TAXONOMIC CLASS: Mixed, isohyperthermic Psammentic Paleudalfs

TYPICAL PEDON: Rio Lajas sand - cultivated. (Colors are for moist soil.)

A1--0 to 8 inches; dark reddish brown (5YR 3/4) sand; single grain; loose; few fine roots; slightly acid; gradual smooth boundary. (6 to 10 inches thick)

A2--8 to 24 inches; dark reddish brown (5YR 3/3) loamy sand; single grain; loose; nonsticky, nonplastic; very few fine roots; slightly acid; gradual smooth boundary. (12 to 18 inches thick)

A3--24 to 32 inches; dark reddish brown (5YR 3/4) loamy sand; single grain; loose; nonsticky and nonplastic; slightly acid; gradual smooth boundary. (8 to 12 inches thick)

Bt--32 to 60 inches; dark reddish brown (2.5YR 3/4) loamy fine sand; weak coarse subangular blocky structure parting to single grain; loose, nonsticky, nonplastic; slightly acid.

TYPE LOCATION: Noroeste SCD, Puerto Rico; 5.5 miles west of the town of Isabela; 125 yards south of junction of roads to Punta Jacinto and east-west dirt road along the beach; 50 feet west of highway and 300 yards south of the sea.

RANGE IN CHARACTERISTICS: Thickness of the solum is over 60 inches. Thickness of the argillic is more than 50 inches. These soils are loose, nonsticky and nonplastic throughout. Reaction ranges from medium acid to neutral throughout the profile. The mean annual soil temperature is 75 degrees F.
The A1 horizon has hues of 5YR, values of 3, and chroma of 3 and 4. Texture is dominantly sand. The A2 and A3 is sand or loamy sand. Thickness of the A horizons is 26 to 40 inches.
The Bt horizon has hues of 5YR or 2.5YR, values of 3 or 4, and chroma of 4 to 6. Texture is loamy fine sand.

COMPETING SERIES: There are no other know series in the same family. The Candelero, Cayagua, Fajardo, Islote, Juncal, Rio Arriba, San Sebastian, Tanama, Vega Baja and Via series are similar soils in related families. The Candelero, Cayagua and Vega Baja soils are finer textured and all have low chroma mottles in their profiles. The Fajardo and Rio Arriba soils have COLE value higher than 0.09 in their horizons. The Islote, Juncal, San Sebastian and Via soils all are finer textured. The Tanama soils are finer textured and shallower to the hard limestone.

GEOGRAPHIC SETTING: The Rio Lajas soils are gently sloping and sloping coastal plains. Slightly above sea level on slope gradients of 2 to 12. They formed in reworked sandy sediments of the coastal plains. The climate is sub-humid tropical. The average annual precipitation ranges from 60 to 70 inches and the mean annual termperature is 77 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Malaze, Jabos, Bajucos, Guerrero and Guanajibo series and the Carrizales, Coto, Cotito and Matanzas series. The Carrizales soils are sandy throughout and do not have argillic horizon.
DRAINAGE AND PERMEABILITY: Somewhat excessively drained, slow runoff, and rapid permeability.

USE AND VEGETATION: Mostly in pasture and food crops.

DISTRIBUTION AND EXTENT: Northwestern Puerto Rico. This series is of minor extent, with about 2,000 acres.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Soil Survey of Puerto Rico; 1942.

REMARKS: The classification was updated with the 4/91 draft from Loamy, mixed, isohyperthermic Typic Tropudalfs to Sandy, mixed, isohyperthermic Psammentic Paleudalfs. The previous OSED date was 4/67.

Diagnostic horizons and features recognized in this pedon:

Ochric epipedon - zone from 0 to 32 inches (A horizons)

Argillic horizon - zone from 32 to 60 inches (Bt horizon)

LABORATORY DATA: Available for the Type Location.
