



# **SURVEY REPORT OF GRAND BAIE WETLANDS GRAND BAIE, MAURITIUS**



*Prepared for:*

**MINISTRY OF THE ENVIRONMENT AND NDU  
GOVERNMENT OF MAURITIUS**



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APRIL 2008



*Republic of  
Mauritius*



THE  
WATERSHED  
COMPANY





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## EXECUTIVE SUMMARY

This report presents the findings of a wetland delineation study of freshwater wetlands in and around Grand Baie, Mauritius. It is a subset of the larger Study of Environmentally Sensitive Areas in Mauritius and Rodrigues being conducted in response to the need for implementation of management regulations in the face of ongoing development. This study includes wetland identification and characterization, wetland boundary delineation, flora and fauna surveys, and mapping that includes both wetland boundaries and land tenure. Wetland boundaries were mapped using a hand-held global positioning system (GPS), which collected coordinate units at selected intervals. This GPS data was subsequently incorporated into mapping software for display at 1:5,000 scale. Maps show land ownership both within wetlands and a surrounding 30-meter buffer area. The goal of the study is to provide guidance for use in developing a framework for wetland conservation.

The delineation of 12 Grand Baie wetlands revealed historic and ongoing pressures from backfilling and other disturbance. Evidence of the effects of this disturbance is present in the largely non-native and invasive plant and animal communities. Comparison to previous work also showed recent and past fragmentation of what were previously large, contiguous wetlands.

Wetland hydrology, soils, and habitat functions were found to be of generally poor or decreasing value in Grand Baie. This is due in most part to reductions in wetland size from backfilling, loss of functional buffers from backfilling and development, and vegetative cover made up primarily of non-native and invasive species. Ten wetlands are dominated by *Typha domingensis*, often in near-monocultures, and two are open-water-dominated. All wetlands function to store water, and most have had additional stormwater flooding pressure exerted on them due to decreases in wetland size and increasing impervious surface in surrounding areas. Habitat functions of wetlands are limited by the generally low vegetative structural and composition diversity and by buffers that are commonly disturbed and developed. Wetland buffers also tend to function poorly because of their common use for dumping construction materials and other debris, as well as their increasing urbanization.

A comparison of wetland area in Grand Baie over time reveals an estimated 23% decrease from 2000 to 2008. Previous inventories approximate that the wetlands decreased in area by 10% and 30% in the periods from 1980 to 1990 and from 1990 to 2000, respectively.

Backfilling of the Grand Baie wetlands has impacted and continues to impact wetland functions. Detrimental effects are likely to result if consideration is not given to wetlands in matters of development. It is therefore important that a framework for wetland management be implemented to avoid further wetland loss and degradation in Grand Baie.



## **WETLAND DELINEATION STUDY GRAND BAIE, MAURITIUS**

### **INTRODUCTION**

This report presents the results of a wetland delineation study conducted on wetlands in the Grand Baie area of Mauritius. This study is a subset of the larger Study of Environmentally Sensitive Areas in Mauritius and Rodrigues, which in turn is part of Mauritius' National Development Strategy and National Biodiversity Strategic Action Plan. The Grand Baie area includes previously unsurveyed freshwater wetlands. Fieldwork was conducted in February and March of 2008 and consisted of identifying and delineating wetlands; characterizing vegetation, soils, and hydrology; and locating wetland boundaries using a global positioning system (GPS).

### ***Background***

The Grand Baie area of northwest Mauritius supports a variety of land uses. These include residential, commercial, and recreational development, which have experienced rapid growth in the past 25 years.

Of particular concern is the increasing pressure on the area's coastal wetlands. As noted in the earlier Environmental Risk Report for Grand Baie (Government of Mauritius 2004) extensive backfilling of local wetland areas, road diversion works, and blocked drains, have resulted in reduced capacity to alleviate flooding conditions. The majority of the Grand Baie area is now subject to frequent flooding during periods of heavy rain, threatening both the health and safety of local residents.

The recent boom in tourism and general development in coastal areas has resulted in heavy pressure to develop land. Increased property values in these areas have created financial incentives to backfill previously unusable land with relative disregard for potential monetary penalties. The resulting loss of wetland area not only decreases potential water storage capacity and flood control, but also minimizes other wetland functions such as water quality improvement and wildlife habitat. The reduction of these latter functions may have future ramifications on the tourism industry as a result of decreased water quality in the surrounding coastal bays and reduction in wildlife, specifically migratory birds and other waterfowl.

### ***Goals and Objectives***

The overall goal of this study is to provide a document, including maps, for use in protecting and conserving freshwater wetlands in the Grand Baie area of Mauritius. Specific objectives of the project are:

- To locate and map previously unmapped non-coastal wetlands in the Grand Baie area;
- To characterize vegetative cover types, soils, and hydrology of the Grand Baie wetlands;
- To provide a resource for identifying land tenure of properties affected by the Grand Baie wetlands and potential wetland buffers; and
- To provide basic training in wetland identification, delineation, and mapping for NPCPS staff.

### ***Study Area and Characteristics***

For the purposes of this study of wetlands within the Grand Baie area, wetland inventories centered upon the known wetlands in and around Grand Mare Longue, Mare Michaux, and Mare Soyfoo. Additional wetlands that had been previously identified in earlier reports (Government of Mauritius 2004), as well as one large, previously un-inventoried wetland to the east of Grand Mare Longue, were also included in this study. Existing fragmented wetlands that historically comprised Grand Mare Longue, Mare Michaux, and Mare Soyfoo are labeled as such on the accompanying 1:5000 maps (Appendix C).

The northern portion of Mauritius, which includes Grand Baie, can generally be described as an undulating plain formed during the late volcanic period. Because lava flows around Grand Baie occurred during the dying phases of volcanic activity, the depressions were not filled by subsequent lava flows. This resulted in topographic height differentials of up to 10 m (Government of Mauritius 2004).

Mauritius experiences its greatest precipitation in the summer months from December to March. Precipitation records from weather stations nearest the northwest coast report average long-term (1971-2000) means of 250 mm for February, which is consistently the wettest month. Average long-term precipitation in the northwest reaches its lowest in summer, ranging from 51 mm in October to 150 mm in April. Yearly long-term means from this time period from the same stations average 1,418 mm (Central Water Authority 2006).

Prior to the development of the northern portion of the island, large depressional areas were likely present and contained historic wetlands. Over time, these depressional areas have been gradually filled, resulting in a fragmented wetland mosaic. As a result, the surface water hydrology in the island's northern region has become disjointed. The wetlands in and around Grand Baie receive the majority of their water from rainfall and adjacent surface water runoff. As continued development pressure leads to increased backfilling activity within these wetland areas, the capacity to store stormwater during periods of heavy rain continues to decrease.

The wetlands within Grand Baie have been found to be relatively impermeable with very little contribution to groundwater (Government of Mauritius 2004). The Northern Plains Aquifer, located in the northern region of the island north of the Port Louis mountain ranges, is fed primarily from the Central Plateau through a network of discontinuities in the northern rim of the central caldera. Additional sources come from rainwater and adjacent riverine systems. However, these latter items are not very significant since 1) the northern region receives relatively little precipitation compared to the rest of the island (approximately 1500 mm annually) and 2) the north has a relatively poor defined network of surface water channels due to its highly permeable lava flows.

The Study of Environmental Risks in Grand Baie (Government of Mauritius 2004) reported a total of 10 wetlands. Of these, three are part of the former Grand Mare Longue, three wetlands are part of the former Mare Michaux, two wetlands are part of the former Mare Soyfoo, one wetland is located adjacent to the Grand Baie Conference Center, and one wetland is located to the southwest of the Super U market, west of the intersection of Roads B11 (Plaines des Papayes Road) and B45 (Vingt Pieds Road). In that study, historical data of approximate wetland size was reported for the years 1975, 1988, 1998 and 2002. Data for 1975, 1988 and 1998 were based on aerial photo interpretation. Year 2002 data were based



on topographic surveys. Based on these values, estimated areas were projected for the years 1980, 1990 and 2000 (Figure 1).

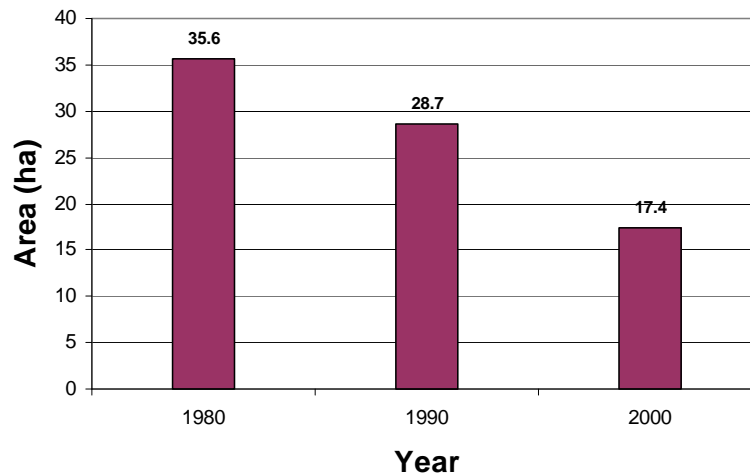


Figure 1. Comparison of Historical Wetland Area in Grand Baie.

This study uses these data to make a rough comparison to current conditions in Grand Baie (see Figure 26). The changing nature of the Grand Baie wetlands is apparent both from this analysis and from the results of the delineations described in this report.

## METHODS

### ***Wetland Determination and Delineation***

Existing survey information was utilized as a guide to locating wetlands in the field. Sources included a 1990 1:25,000 map of the Pamplemousses District (Government of Mauritius 1990), the Ministry of the Environment and NDU Final Technical Report entitled *Study of Environmental Risks in Grand Baie* (Government of Mauritius 2004), and Pamplemousses Development Strategy Maps (Government of Mauritius 2006).

Fieldwork was conducted in February and March 2008. Wetland presence was determined by a hierarchical examination of vegetation, hydrology, and soils. The presence of obligate wetland vegetation in a monoculture or near-monoculture was considered to be highly indicative of wetland conditions, although other wetland characteristics were recorded in all wetlands. Permanent standing water was also used as a primary hydrologic indicator of wetland presence, as was organic soil.

Where the three primary indicators listed above were absent, secondary indicators were assessed. Secondary indicators were as follows: common wetland vegetative species (native and non-native); evidence of wetland hydrology, such as water-stained vegetation, surface scouring, and oxidized root zones; and soils showing hydric characteristics such as sulfidic odor, gleying, redoximorphic features, an organic component, and oxidized rhizospheres. Wetland determinations were made when at least two primary indicators, one primary and two secondary, or three or more secondary indicators were observed.

Wetland boundaries were located where vegetation, hydrology, and soils transition from typically hydric to non-hydric. Where these parameters were highly disturbed or otherwise unreliable, the presence of fill, debris, or other disturbance was used to demark the wetland edge (Appendix A, Photo 1).

### ***Vegetation Sampling***

Vegetative composition and structure were measured using survey and line intercept techniques. Composition and richness of the vegetative community was assessed by a comprehensive count of all species occurring in each wetland. Vegetation was identified to species. A qualified botanist examined each site and recorded all species located. Samples of unknown species were collected and identified using herbarium resources.

### ***Soil and Hydrology Assessment***

Soil and hydrology characteristics were assessed by examination of numerous pits dug to a depth of 0.25m to 0.50m. Soil chroma and value were defined using Munsell Soil Color Charts (Kollmorgen Instruments Corporation 1992). Soil texture, structure, moisture, and other features were noted. Depth at which saturation or inundation appeared was recorded. Salinity of standing water, where it occurred, was measured using a salinity refractometer.

### ***Ecological Surveys***

Ecological surveys covered the wetland flora (angiosperms and pteridophytes), vertebrate fauna (mammals, birds, reptiles, amphibians, and fish) and invertebrate fauna (butterflies and molluscs).

Species lists for the wetlands and their immediate vicinity were based on the findings of active searching for plants, and for both the animals themselves and the various categories of signs characterizing them such as calls, burrows, feeding signs, prints, droppings, and bones. No quantification of abundance of vertebrates and invertebrates was made, due to the difficulties of interpreting the recorded sights and signs to actual abundance particularly given the limited time for the survey and the overwhelming dominance of the Mauritian fauna by alien species of no conservation importance (Cheke 1987). No night survey was conducted.

Plant and animal species were grouped as follows:

- Mauritian endemic: a native species known to occur only in Mauritius
- Native: a species known to occur naturally both in Mauritius and elsewhere
- Cryptogenic: a species that is possibly native to Mauritius
- Alien: a species introduced by human agency into Mauritius.

All native species were assessed for conservation status against the International Union for Conservation of Nature (IUCN) Red List criteria (IUCN 2001).

### **Flora Survey**

A sample of each angiosperm and fern species found was collected, pressed and dried. Identification was made using the Flore des Mascareignes volumes (Bossier *et al.* 1976-onwards) and comparison with collections held at the Mauritius Herbarium, MSIRI. The scientific names of the plant species follow the suprageneric classification of the Angiosperm Phylogeny Group with updates (Stevens 2001-onwards). Infrageneric names and their origin follow the Flore des Mascareignes (Bossier *et al.* 1976-onwards).

For the as yet unpublished families of the Flore des Mascareignes, including the Cyperaceae and Poaceae, other sources were used. For Cyperaceae, species origin was taken by crosschecking information from Bojer (1837), a manuscript from Vaughan (1932) and from an incomplete manuscript from Marais (198?), with genera and species names per the World Checklist of Cyperaceae (Govaerts *et al.* 2006). For Poaceae, the origin was determined by crosschecking information from Bojer (1837) and Hubbard and Vaughan (1940), with genera and species names per the GrassBase (Clayton *et al.* 2006-onwards).

The species classification was taken from the working-list of the National Native Threatened Plants Committee or otherwise an indication of each species' status was given when the species has not been officially assessed.

### **Fauna Survey**

Soil samples were taken only to survey certain molluscs. Other groups were identified on the field. Family and author names follow ITIS (2008), the reptile database (2007), Vinson and Vinson (1969) and the Catalogue of Life (Bisby *et al.* 2005).

When available, classification was taken from the IUCN Red List 2001 and 2007. Otherwise an indication of the species status was given if the species has not been officially assessed.

### **Vertebrate Survey**

#### ***Mammals and Birds***

Mammals and birds were surveyed during daylight. The surveys were carried out through both direct observation of the animals and through indirect cues such as foot prints, calls or nests found. Identifications were made on the spot using a pair of 10 x 42 binoculars and a detailed field guide relevant to the avifauna of Mauritius (Barré *et al.*, 1996). For the mammals, where only bats are native to Mauritius, Probst (1997) was used.

#### ***Fish***

Surveys for fish were carried out during daylight in the field. The survey was done by direct observation of the animals in the water. Identifications were made using a field guide relevant to the freshwater fish of Mauritius (ARDA 2003). It is worthwhile to note that the freshwater vertebrate fauna of Mauritius is markedly low in diversity and endemism, with a total of 18 fish species of which five are introduced.

#### ***Reptiles and Amphibians***

Diurnal reptiles and amphibians were surveyed during daylight hours by walking through the wetlands and their vicinities, and identifying all species observed in exposed positions. These data were supplemented by active search in appropriate microhabitats such as under tree bark where diurnal geckos tend to seek refuge when disturbed. Nocturnal reptiles were

actively searched for beneath stones, rotting tree trunks, tree bark and other objects such as the wide range of objects dumped in the wetlands like concrete slabs, rusting barrels, tires, etc. Indirect signs of presence such as shed skins were actively searched for. All species encountered were identified in the field. As a note, there is no native species of amphibians in Mauritius.

For reptiles, nomenclature follows Vinson and Vinson (1969) and the Reptile Database (2007).

### **Invertebrate Survey**

#### ***Butterflies***

Butterflies were surveyed by direct observation. Identification of Mauritian species on the wing is possible in most cases. Close examination of wing patterns of resting butterflies is necessary for some groups like the Hesperidae, Lycaenidae and Pieridae and this was done on resting butterflies in the field by eye or using binoculars and a field guide (Williams 2007).

#### ***Land Snails***

Land snail surveys were done for the freshwater snails by actively searching on submerged leaves of the vegetation and rocks in the wetlands. Shells scattered on the ground in partially or fully dried sections of the wetlands were also sampled.

The survey for the terrestrial species was done by actively searching for large species (> 0.5 cm) by overturning rocks and logs under which they would be expected to be aestivating or hiding during moist days. Indirect evidence of presence like slime trails, empty shells or shell fragments were searched for. Any large snail found was identified on the spot. For smaller species, several soil samples were taken. These were sieved on site using a 5mm mesh size sieve and stored in cloth bags where they were air-dried. Once dry, samples were immersed in water to concentrate shells in the floating fraction, which is then scooped, dried and examined for shells, snail eggs and shell fragments. Identification of micro species was done under a binocular microscope (up to 40x magnification). Classification, species status and distribution information follow Griffiths and Florens (2006).

### ***Wetland Mapping***

Mapping of wetland boundaries in Grand Baie was performed in the field during delineation activities using a hand-held GPS unit (Trimble GeoExplorer). The coordinate system used is UTM 40S and WGS 1984 datum. Upon determination of the wetland boundary location per soil, hydrology, and vegetative criteria, wetland point data was collected at inflection points along the wetland boundary in order to capture a high level of detail including small shifts in boundary direction. Typical horizontal distances between points ranged from 5 to 30 m. Point data were recorded with a final level of accuracy of approximately 2 to 5 m after post-processing. The wetland point data were subsequently downloaded and exported into Geographic Information System (GIS) shapefiles using Trimble GPS Pathfinder 3.10 software after undergoing post-processing (Trimble 2005). ArcView 9.2 software (ESRI 2006) was then used to create polygons of each wetland in order to assess total wetland area. These wetlands are depicted in plan view maps at 1:5000 scale, as well as maps showing land ownership and tenure within both the wetlands and 30-m buffers (see Appendix C). Land ownership and tenure information was obtained from the Ministry of Housing and Lands.

Each inventoried wetland was assigned a number (1 through 12) for reference throughout the project. Point data for each wetland was subsequently given a sequential identifier. For example, Wetland 1 data points begin with 1-1, 1-2...1-20, etc.

Maps of each of the 12 individual wetlands are provided in the results section to show greater detail, including bounding coordinates and approximate deepest point.

All GIS data are projected in both UTM 40S coordinates and the Mauritius National Grid. GIS projection files are provided in electronic format for use in viewing data files in either system.

### ***Wetland Training***

A wetland specialist and environmental engineer conducted a one-day course for NPCS staff on wetland identification, delineation, and mapping in the Grand Baie area. The course outline is included as Appendix B of this report. All instruction was conducted in the field at a large freshwater emergent wetland located north of Belle Mare.

## **RESULTS**

Twelve wetlands were identified and flagged within the study area (Appendix C). They are described below in terms of physical characteristics and functional value.

The classification of a number of plant species as cryptogenic is indicative of the relatively late commencement of botanical studies in Mauritius. Most studies were implemented in the 19<sup>th</sup> century, when large areas along the coast had already been deforested and deforestation rates were high elsewhere on the island. In the case of *Typha domingensis*, a dominant species in Grand Baie wetlands, most sources classified it as alien in the 19<sup>th</sup> century, whereas more recent studies (Marais 198X) on species distribution consider that the species is probably endemic to the Mascarenes. It is therefore classified as cryptogenic for the purposes of this report. Refer to Appendix D for a complete list of vegetative species identified in each wetland. Tables within the text contain only species of native and cryptogenic origin.

### ***Convention Centre***

#### **Wetland 1**

Wetland 1 is an emergent wetland 0.476 ha (4,761m<sup>2</sup>) in size (Figures 2 and 3; Appendix A, Photo 2) adjacent to the Grand Baie Conference Centre. Vegetative cover in Wetland 1 approaches 100% and is approximately 90% the emergent *Typha domingensis*. A shrub component totaling less than 10% is limited to wetland edges and a few scattered locations toward the center of the wetland. This provides the only structural diversity in the wetland. The total number of species identified in the wetland is 51, of which 17 are native, non-invasive species (Table 1). All vegetative species identified in Wetland 1 are listed in Appendix D.

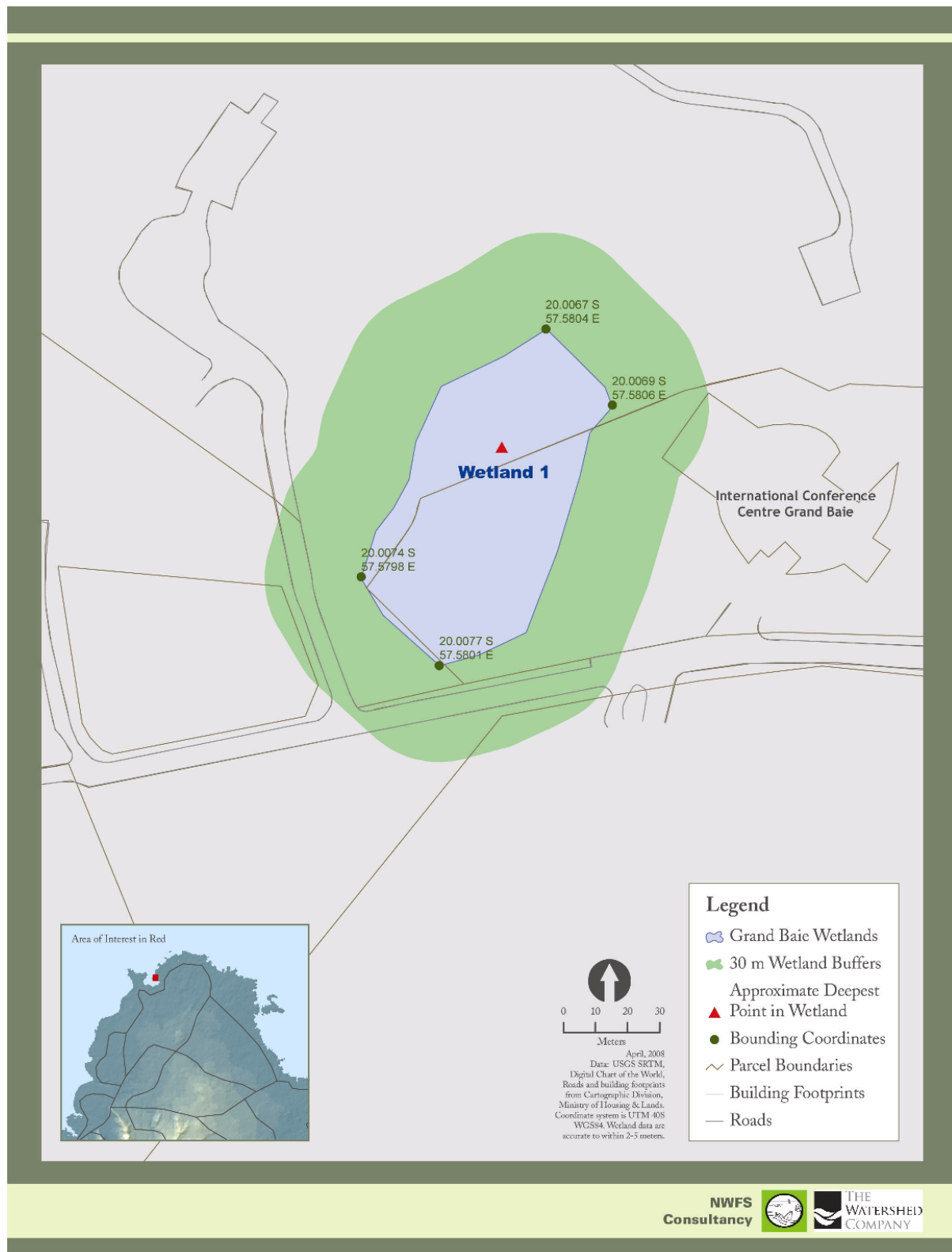


Figure 2. Plan view of Wetland 1 and 30-m buffer.

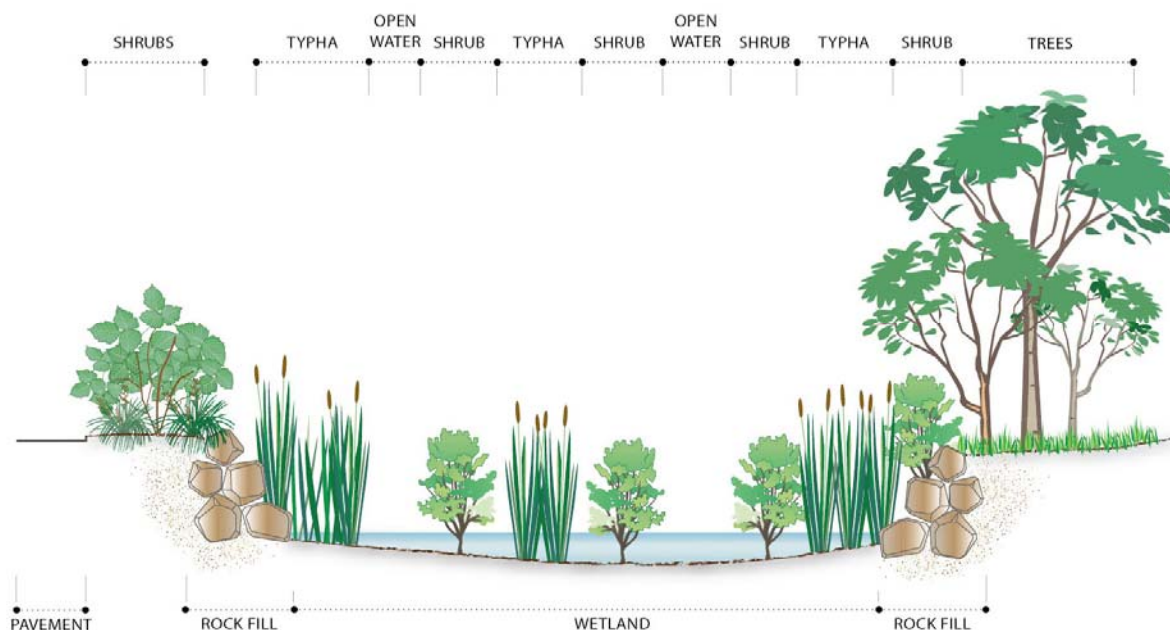


Figure 3. Typical cross-section view of Wetland 1 (not to scale [NTS]).

Soils in the wetland are mucky loam with a small clay component. Color is generally very dark grayish brown (10YR 3/2 and 2/2; 2.5Y 4/2 and 3/2). There is very little stratification in soil color and texture in the wetland. Soils are saturated and inundated throughout the wetland, and redoximorphic features are not evident.

Hydrology within the wetland is standing water of significant depth, as great as 0.50m at the wetland edges at the time of observation. Salinity was 3 parts per thousand (ppt) when it was measured in February 2008.

The Conference Centre parking lot is not fitted with stormwater control devices, and topography slopes slightly down from the Centre toward the wetland. This is a contributing source of hydrology to the wetland, along with direct precipitation and additional runoff from other boundaries. A drain cover located near a taxi stand adjacent to the wetland indicates underground drainage to the wetland from this area. The likely entry point of any such drainage is obscured by fill and other debris (Appendix A, Photo 3).

Faunal species located in Wetland 1 are shown in Table 2. The two identified native species, *Zosterops borbonicus mauritianus* and *Leptotes pirithous*, are both species of “least concern” for which adequate data have been collected to make this determination (IUCN 2001). Non-native species include seven bird, two amphibian, and one snail species.

Table 1. Native and cryptogenic plants identified in Wetland 1.

Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Aizoaceae	<i>Sesuvium ayresii</i>		Native	
Araceae	<i>Spirodela punctata</i> (G. F. W. Meyer) Thompson	Lentille d'eau	Native	DD
Boraginaceae	<i>Hilsenbergia petiolaris</i>	Bois pipe	Native	
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Convolvulaceae	<i>Ipomoea pes-caprae</i>	Batatan	Native	

Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Convolvulaceae	<i>Ipomoea violacea</i>		Native	
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Kyllinga polyphylla</i> Willd. ex Kunth		Native	DD
Cyperaceae	<i>Pycneus cf. polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lauraceae	<i>Cassytha filiformis</i> L.	Liane sans fin	Native	LC
Lemnaceae	<i>Lemna perpusilla</i>	Lentille d'eau	Native	
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern, DD = Data deficient

Table 2. Fauna identified in Wetland 1.

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Birds	Zosteropidae <i>Zosterops borbonicus mauritanus</i> (Gmelin, 1789)	Pic-pic	Native	LC
		Estrildidae <i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien	
		Fringilidae <i>Serinus mozambicus</i> (S. Muller, 1776)	Serin, Yellow-fronted Canary	Alien	
		Ploceidae <i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
		Ploceidae <i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow, Moineau	Alien	
		Pycnonotidae <i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien	
		Rallidae <i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien	
		Sturnidae <i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Amphibians	Ranidae <i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
		Bufo <i>Bufo gutturalis</i> (Power, 1927)	Toad, Krapo	Alien	
Invertebrates	Butterflies	Lycaenidae <i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
	Snails	Physidae <i>Phisa acuta</i> (Draparnaud, 1805)		Alien	

<sup>1</sup> LC = Least concern

The buffer of Wetland 1 is highly degraded over much of the wetland's perimeter. The wetland is contained by fill and intensive development, including roads, a parking lot, and residences. Construction of the Grand Baie Conference Centre resulted in an approximately 50% reduction in the size of Wetland 1 (Government of Mauritius 2004). A maintained lawn buffers the wetland from the Convention Centre parking lot. This provides some potential for



rainwater infiltration, but the lack of substantial vegetation in this area results in little protection of wetland functions.

Wetland 1 appears to be fairly well shielded from future backfilling. Bordered by the Conference Center and its adjacent parking lot, the Royal Palm Hotel, and its local access road, this wetland should not receive much additional development pressure. However, water storage function of this wetland has been noted to fail during periods of severe heavy rain.

### **Mare Michaux**

The Mare Michaux complex comprises three *Typha*-dominated wetlands, individually referred to as Wetlands 2, 3 and 4.

#### **Wetland 2**

The largest of the Mare Michaux wetlands, Wetland 2, is located north of the Super U supermarket (Figures 4 and 5). It is 0.758 ha (7,580 m<sup>2</sup>) in area and includes open water, emergent, and shrub cover types (Appendix A, Photo 4). Open water presently covers about 20% of the wetland. Shrub cover occurs in portions of the wetland's north and east edges and totals approximately 5% of the wetland. The remainder is emergent wetland dominated by *Typha domingensis*, with expanses of the invasive *Mikania micrantha* approaching 5% cover in total. Structural diversity is low. Native vegetative species in the wetland are listed in Table 3.

Table 3. Native and cryptogenic plants identified in Wetland 2.

Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Cyperaceae	<i>Cyperus stoloniferus</i> Retz.		Native	LC
Cyperaceae	<i>Pycneus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia cathartica</i> Thouars		Native	DD
Fabaceae	<i>Canavalia cathartica</i> Thouars		Native	DD
Nyctaginaceae	<i>Boerhavia coccinea</i> Miller	Herbe pintade	Native	LC
Orobanchaceae	<i>Striga asiatica</i> (L.) O. Kuntze	Herbe feu	Cryptogenic	LC
Poaceae	<i>Paspalidium germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Sporobolus virginicus</i> (L.) Kunth		Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern, DD = Data deficient

Soils in Wetland 2 are consistently black (2.5Y 2.5/1) clay loam with a strong sulfidic odor and distinct and prominent redoximorphic features. Soils transition to a brighter brown (10YR 4/3 and 5/3) clay loam with less distinct redoximorphic features toward the wetland edges. All parts of the wetland were either saturated or inundated during February 2008 site visits.

Hydrology in Wetland 2 originates from runoff and precipitation. The Super U complex has no stormwater control facilities and flooding during rain and storm events enters the wetland after running off the Super U property (Appendix A, Photo 5). Salinity averaged 3 ppt during testing.

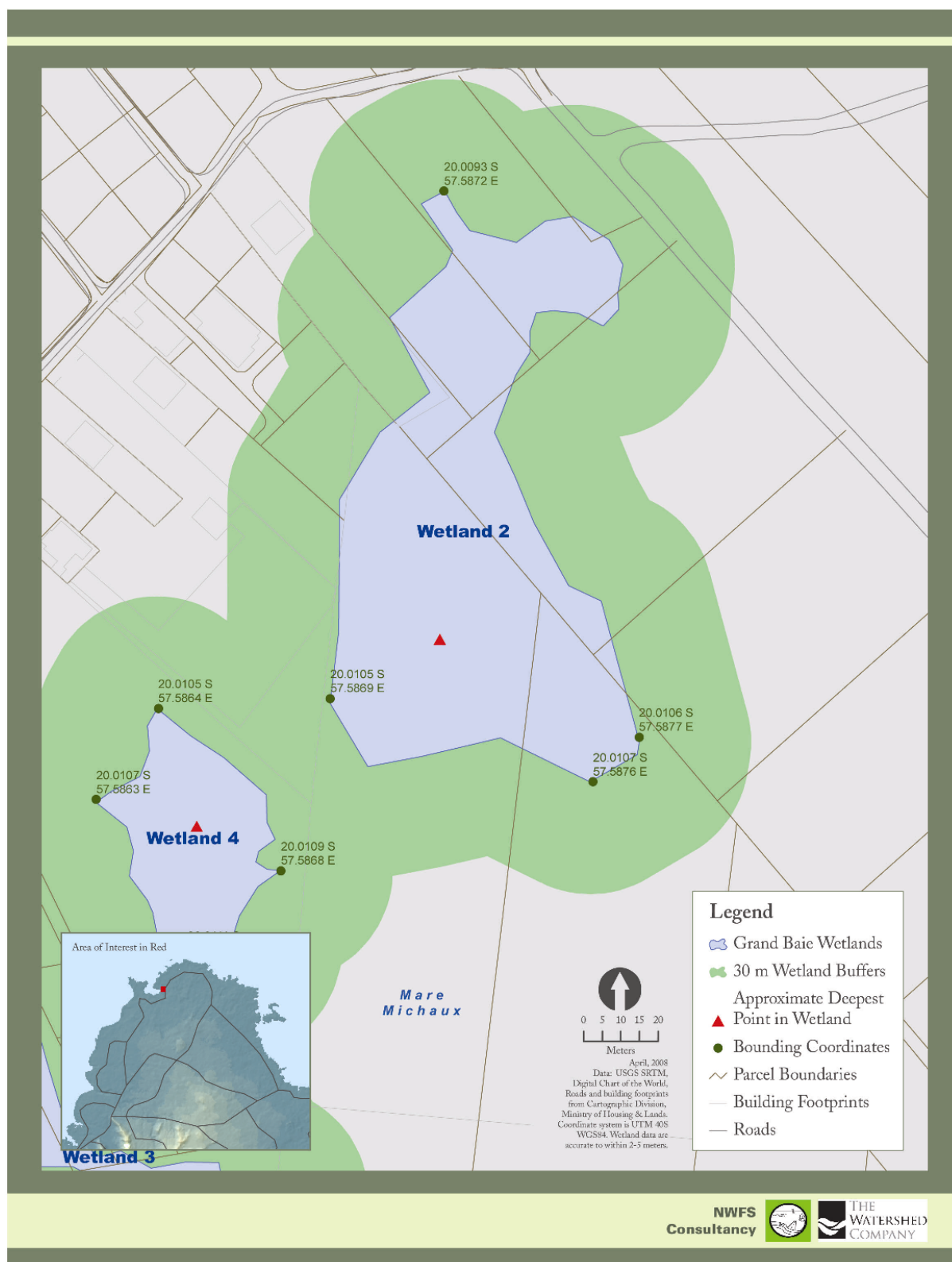


Figure 4. Plan view of Wetland 2 and a 30-m buffer.

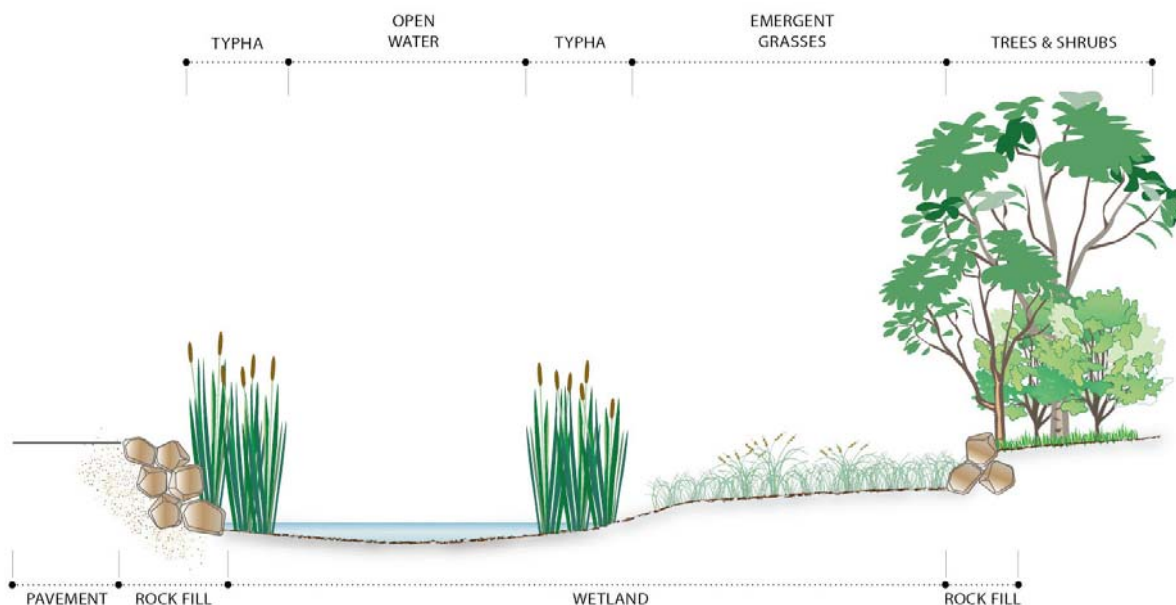


Figure 5. Typical cross-section view of Wetland 2 (NTS).

Seven vertebrate and three invertebrate species were identified in Wetland 2 (Table 4). The two butterfly species, *Borbo borbonica* and *Leptotes pirithous*, located in the wetland are the only observed native species. Both are classified as species of least concern by IUCN (2001).

Table 4. Fauna species identified in Wetland 2.

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Birds	Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Ploceidae	<i>Ploceus cucullatus</i> (Muller, 1776)	Serin, Yellow-fronted Canary	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien
Invertebrates	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien
	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native LC
	Snails	Ariophantidae	<i>Macrochlamys indica</i> (Pfeiffer, 1846)		Alien

<sup>1</sup> LC = Least concern, DD = Data deficient

The edges of Wetland 2 are largely defined by fill and the adjoining buffers are highly degraded. Little vegetation apart from weedy invasives and vines adjoin the wetland, and the buffer functions poorly for water quality and quantity control. Garbage and other debris line much of the wetland, particularly along the highly developed west and south edges.

**Wetland 3**

This portion of the Mare Michaux complex is 0.186 ha (1,856 m<sup>2</sup>) in area (Figures 6 and 7). Major cover types in the wetland are emergent vegetation and aquatic plants (Appendix A, Photo 6). Two *Typha* stands and one shrub area make up approximately 5% and 10% of the area, respectively, providing a small amount of structural diversity. Open water covers about 10% of the wetland, and the remaining area is emergent plant cover dominated by the native *Paspalidium geminatum* (Table 5), characterized as locally common (IUCN 2007). Salinity in the open water portions averaged 3 ppt.

Table 5. Native and cryptogenic plants identified in Wetland 3.

Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Cyperaceae	<i>Kyllinga polyphylla</i> Willd. ex Kunth		Native	DD
Hydrocharitaceae	<i>Hydrilla verticillata</i> (L. f.) Royle		Native	DD
Poaceae	<i>Paspalidium geminatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Ruppiaceae	<i>Ruppia maritima</i> L.		Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern, DD = Data deficient

Soils in Wetland 3 are stratified with an approximately 10-cm surface horizon of black and very dark grayish brown (10YR 2/1 and 3/2) loam, underlain by a 10-cm stratum of dark grayish brown (10YR 4/2) sand followed by pale brown (10YR 6/3) sand to at least a 0.5-m depth. Redoximorphic features are not evident. Gravel and construction debris are present in the soil along wetland edges and in a few disturbed areas toward the center of the wetland. Soils have a strong sulfidic odor throughout the wetland. Saturation or inundated was present throughout during site visits.

Hydrology is from precipitation and runoff. A hydrologic connection may still exist between Wetlands 3 and 4. Large rock fill and debris obscure any connection, but topography between the wetlands and the clear historic connection suggest that water still flows between them along a retaining wall (Appendix A, Photo 7). Drainage also flows through a series of concrete channels to the northwest during periods of overflow.

Table 6 lists fauna identified in Wetland 3. Four native butterfly species, *Borbo borbonica*, *Leptotes pinithous*, *Catopsilia florella*, and *Eurema floricola* were observed. All of these species are rated as species of least concern (IUCN 2001). One non-native species each of butterfly, reptile, amphibian, mammal, and birds were also noted in Wetland 3 during surveys.

The buffer of Wetland 3 is made up of commercial and residential development. The commercial areas provide little value as habitat or for water quality and flow functions. Residential areas along the eastern boundary of the wetland are vegetated with non-native and cultivated species, which serve to reduce stormwater flow and treat water quality to some extent. Wildlife habitat in the buffer is poor, but of somewhat higher value in the vegetated areas than the commercial areas.



Figure 6. Plan view of Wetland 3 and 30-m buffer.

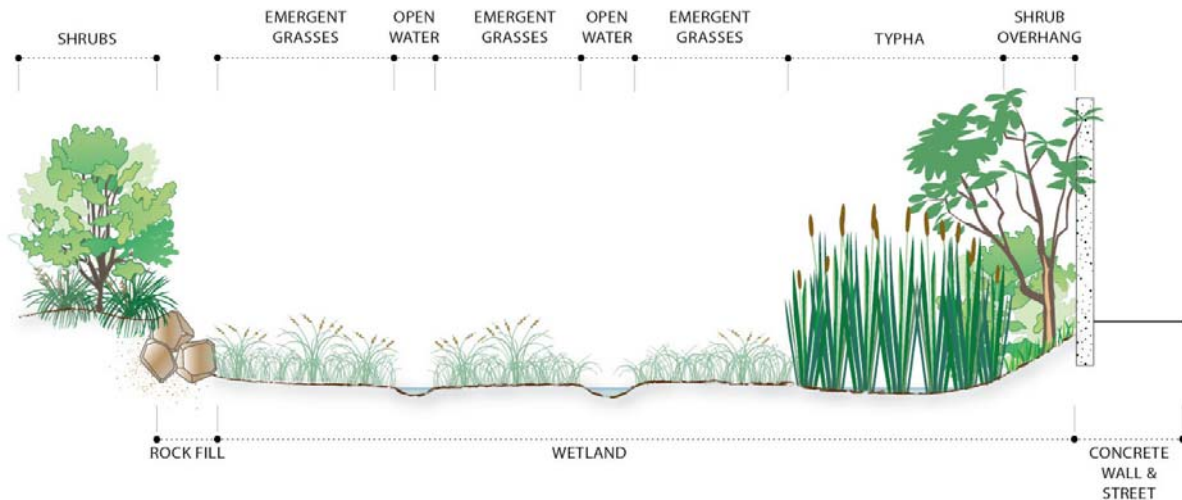


Figure 7. Typical cross-section view of Wetland 3 (NTS).

Table 6. Fauna species identified in Wetland 3.

	Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Mammals	Canidae	<i>Canis familiaris</i> (Linnaeus, 1758)	Dog	Alien	
	Birds	Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	

<sup>1</sup> LC = Least concern

### **Wetland 4**

This 0.180-ha (1,801 m<sup>2</sup>) *Typha*-dominated wetland is situated between Wetlands 2 and 3, along the southwest edge of the Grand Baie Bazaar structure (Figures 8 and 9; Appendix A, Photo 8). Open water constitutes approximately 5% of the wetland and salinity measured 2 ppt during the February 2008 site visits. Shrubs, particularly the invasive *Lantana camara*, make up approximately 5% cover of the area and are limited to a patch along the southeast wetland boundary. Emergent grasses, including the native *Paspalum vaginatum*, constitute 5-10% of the wetland area in the southern extent. A *Typha domingensis* monoculture covers the remainder of the area (Table 7).





Figure 8. Plan view of Wetland 4 and 30-m buffer.

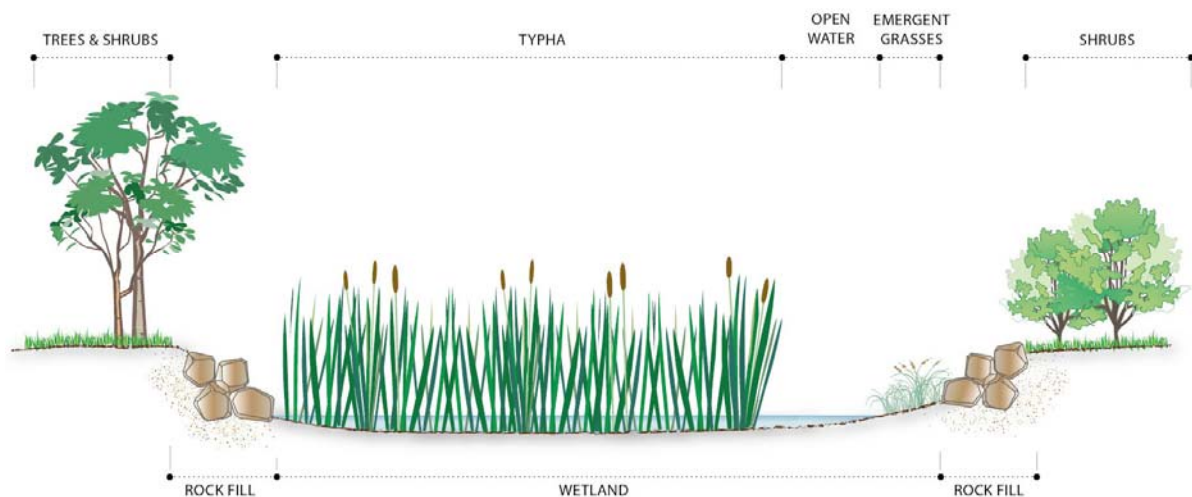


Figure 9. Typical cross-section view of Wetland 4 (NTS).

Table 7. Native and cryptogenic plants identified in Wetland 4.

Family	Species	Common name	Origin	IUCN <sup>1</sup>
Cyperaceae	cf. <i>Cyperus dubius</i> Rottb.		Native	LC
Cyperaceae	<i>Cyperus stoloniferus</i> Retz.		Native	LC
Fabaceae	<i>Abrus precatorius</i> L. var. <i>africanus</i> Verdc.	Herbe du diable	Native	LC
Poaceae	<i>Paspalidium germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Sorghum verticilliflorum</i> Stapf.	Millet sauvage	Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern, DD = Data deficient

A very thin surface layer of black (10YR 2/1) loam overlays very sandy soils with a small clay component. Soil color from the loam layer to about 0.1 m very dark grayish brown, turning to light gray to at least 0.5 m depth. No redoximorphic features are apparent. A sulfidic odor is present in soils throughout the wetland, and soils were saturated or inundated throughout during February 2008 site visits.

Sources of hydrology in Wetland 4 are similar to those for Wetlands 2 and 3, coming from precipitation and runoff from developed areas. Water also appears to flow from Wetland 4 to Wetland 3, although the suspected connection is filled with debris and water was not visible during February 2008 site visits. Surface water also appears to drain from the wetland toward the north.

Fauna located in Wetland 4 during ecological surveys include two native butterfly species (Table 8) and seven non-native vertebrate species. Both native butterfly species are considered to be of least concern (IUCN 2001).



Table 8. Fauna species identified in Wetland 4.

Group		Family	Species	common name	Origin	IUCN <sup>1</sup>
Vertebrates	Mammals	Felidae	<i>Felis silvestris</i> (Schreber, 1775)	Cat	Alien	
	Birds	Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
		Ploceidae	<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow, Moineau	Alien	
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien	
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien	
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC

<sup>1</sup> LC = Least concern

The entire boundary of Wetland 4 is demarcated by fill and development. Some vegetation exists along boundary, composed of invasive species growing atop construction fill. This sparse vegetation serves to slow stormwater flow somewhat to the wetland, but any such benefit is offset by the highly developed state of the remainder of the buffer. The wetland is being actively filled at the site of a house construction, and the wetland is nearly lost. Backfilling has left only a small patch of emergent vegetation and open water.

The proximity of Wetlands 2, 3, and 4 allows for the passage of faunal species among them. Thus, although the Mare Michaux wetlands are fragmented, they have value to vertebrates and invertebrates, particularly where a vegetated connection remains between them.

### **Mare Soyfoo**

Two wetlands make up the Mare Soyfoo complex. The wetlands, Wetlands 5 and 6, are the only wetlands of the Grand Baie area not dominated by *Typha*, but by open water.

### **Wetland 5**

Cover in the 0.499-ha (4,988 m<sup>2</sup>) Wetland 5 is predominately open water, surrounded by emergent grasses and other herbaceous species (Figures 10 and 11, Table 9). The open water component covers approximately 55% of the wetland, and the emergent component most of the remainder (Appendix A, Photo 9). Emergent cover is composed primarily of the native grass *Paspalidium geminatum*, with a smaller *Digitaria* sp. component. Shrub cover overhangs the wetland edges, but most shrub species are rooted outside of the wetland itself. There is little structural diversity in the vegetation within the wetland. The only substantial difference in vegetation height is between the grasses and one stand of *Typha* toward the east end of the wetland. Salinity in the open water averages 16 ppt, and a sulfidic odor is evident throughout.

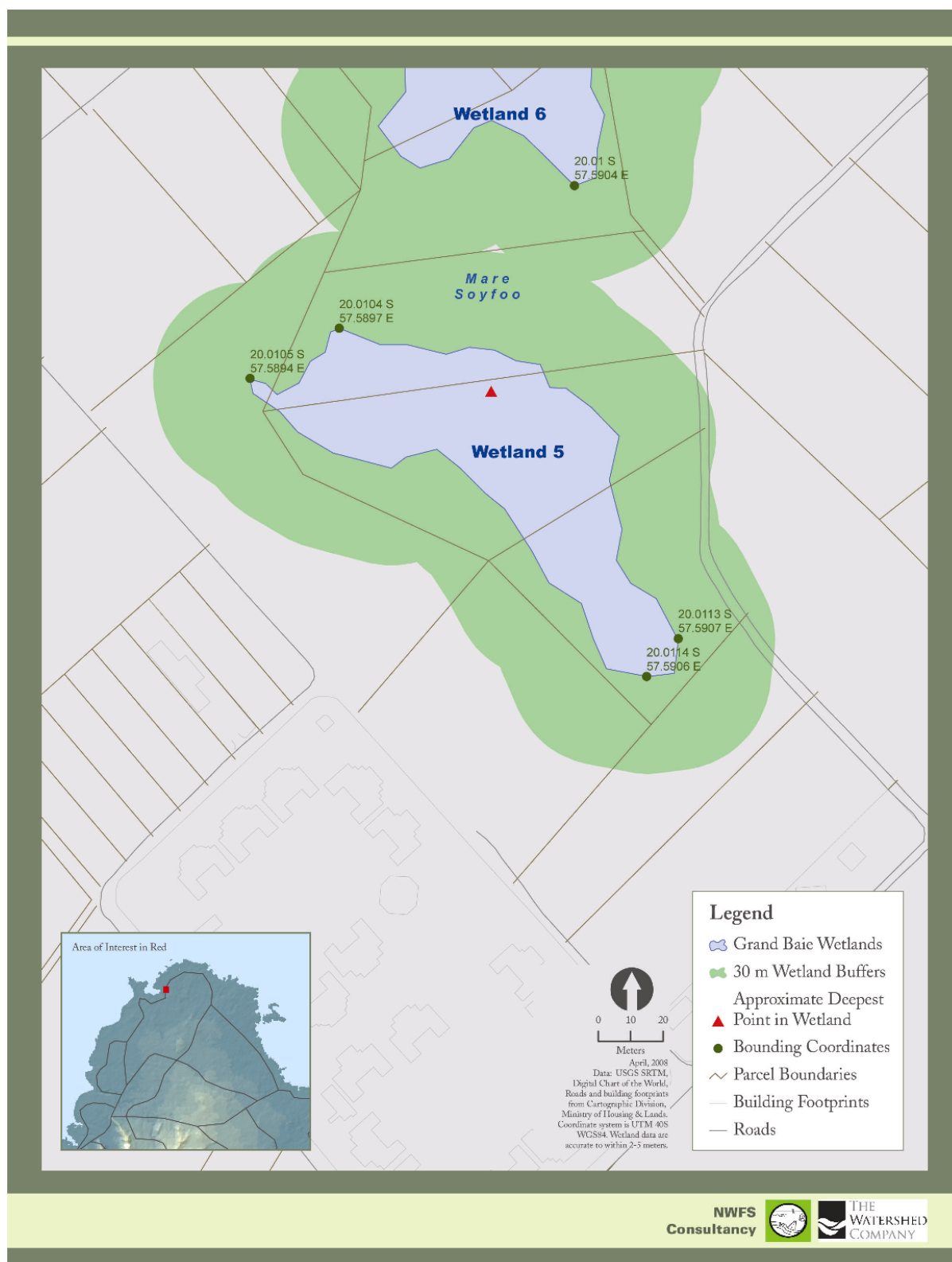


Figure 10. Plan view of Wetland 5 and a 30-m buffer.

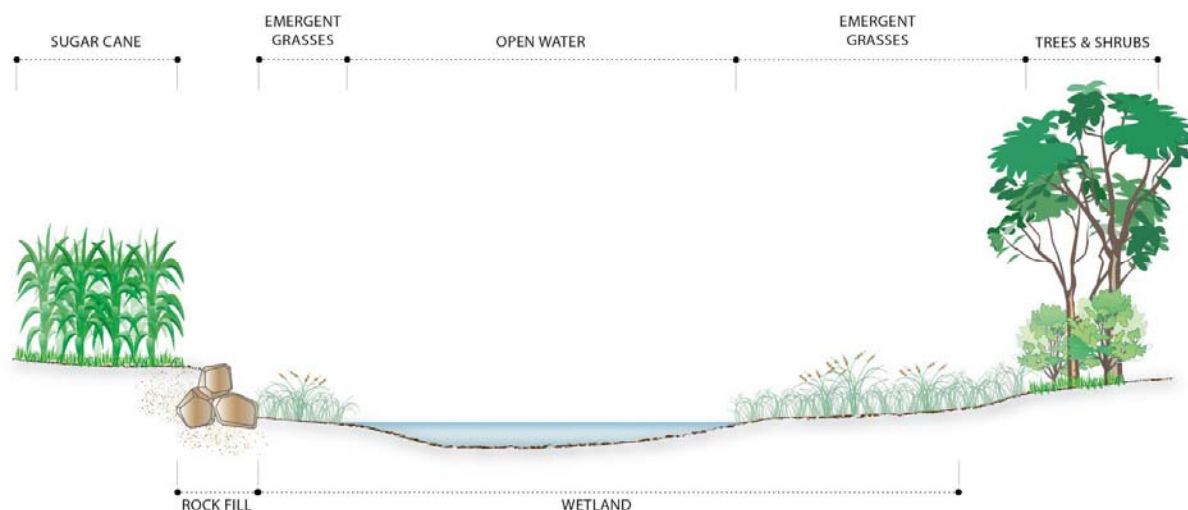


Figure 11. Typical cross-section view of Wetland 5 (NTS).

Table 9. Native and cryptogenic plants identified in Wetland 5.

Family	Species	Common name	Origin	IUCN <sup>1</sup>
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC
Asteraceae	<i>Vernonia cinerea</i> (L.) Less	Ayapana sauvage	Cryptogenic	LC
Cyperaceae	<i>Cyperus stoloniferus</i> Retz.		Native	LC
Cyperaceae	<i>Fimbristylis ferruginea</i> (L.) Vahl		Native	LC
Hydrocharitaceae	<i>Hydrilla verticillata</i> (L. f.) Royle		Native	DD
Malvaceae	<i>Thespesia populnea</i> (L.) Soland ex Correa	Porcher	Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Poaceae	<i>Dactyloctenium ctenoides</i> (Steud.) Bosser		Native	LC
Poaceae	<i>Paspalidium germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i>	Herbe bourrique	Native	
Poaceae	<i>Zoysia matrella</i>	Herbe pique fesse	Native	
Ruppiaceae	<i>Ruppia maritima</i> L.		Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC
Verbenaceae	<i>Premna serratifolia</i> L.	Bois sureau	Native	LC
Vitaceae	<i>Cissus quadrangularis</i> L.	Vanille du docteur Burke	Cryptogenic	LC
Vitaceae	<i>Cissus rotundifolia</i> (Forssk.) Vahl	Liane de boeuf	Cryptogenic	LC

<sup>1</sup> LC = Least concern, DD = Data deficient

A 0.05-m layer of black (10YR 2/1) loam covers the wetland. Beneath this is a layer of mixed soils composed of approximately 80% light gray (5Y 7/1) clay with a small loam component and the remainder greenish gray (5G 5/1) gleyed clay with brownish yellow (10YR 6/6) redoximorphic features ranging from few to many in abundance (Appendix A, Photo 10). This B horizon extends to at least a 0.30-m depth. Soil in all areas of the wetland were saturated or inundated during site visits.

Hydrology in Wetland 5 is largely from precipitation. While fill defines some of the wetland boundary, much of the buffer is vegetated with shrubs and small trees, and part of the eastern boundary is made up of cultivated species. Thus, stormwater is able to infiltrate in some of the wetland's surrounding buffer, tempering flood waters to the wetland.

The native butterfly species *Borbo borbonica* and *Melanitis leda* and native snail *Melanoides tuberculata* occur in Wetland 5 (Table 10). The native bird *Butorides striatus* and the migratory bird species *Tringa nebulana* were also observed using the wetland during March 2008 ecological surveys. Five non-native vertebrates were also noted. All native species are of classified as species of least concern (IUCN 2001).

Table 10. Fauna species identified in Wetland 5.

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Mammals	Leporidae	<i>Lepus nigracollis</i> (Cuvier, 1823)	Hare	Alien
	Birds	Ardeidae	<i>Butorides striatus</i> (Linnaeus, 1758)	Green Heron, Gasse	Native LC
		Scolopacidae	<i>Tringa nebularia</i> (Gunnerus, 1767)	Greenshank, Chevalier	Migratory LC
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native LC
		Satyridae	<i>Melanitis leda</i> (Linnaeus, 1758)	Evening brown	Native LC
	Snails	Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native LC

<sup>1</sup> LC = Least concern

The buffer of Wetland 5 provides some water quality and quantity protection for the wetland, as described above. As well, it buffers wildlife from surrounding developed areas and increases the wetland's functional value as habitat. The proximity of Wetland 6, described below, also adds to the value of the wetland as wildlife habitat.

### **Wetland 6**

This open water-dominated wetland is located north of Wetland 5, separated from it by fill covered by vegetation (Figures 12 and 13, Table 11). It is 0.707 ha (7,066 m<sup>2</sup>) in area. Cover is approximately 50% open water, 10% *Typha* (located in two distinct patches), and 40% emergent vegetation (Appendix A, photo 11). Dominant species in the wetlands are *Digitaria* sp. and *Paspalidium geminatum*, with a large expanse of the native *Sesuvium ayresii*, rated "least concern" (IUCN 2001). Structural diversity is low in the wetland, but interspersed of the cover types is high.

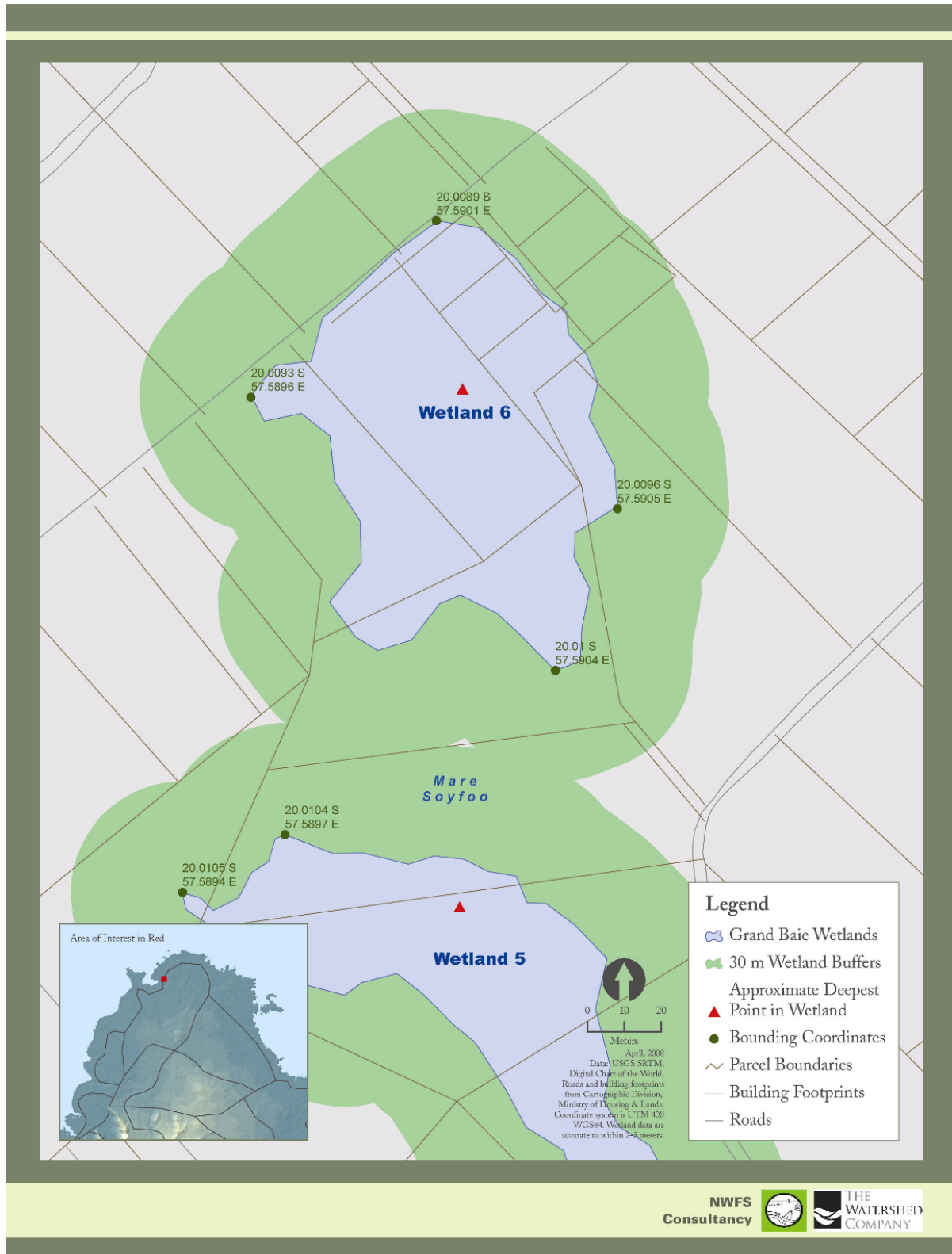


Figure 12. Plan view of Wetland 6 and 30-m buffer.

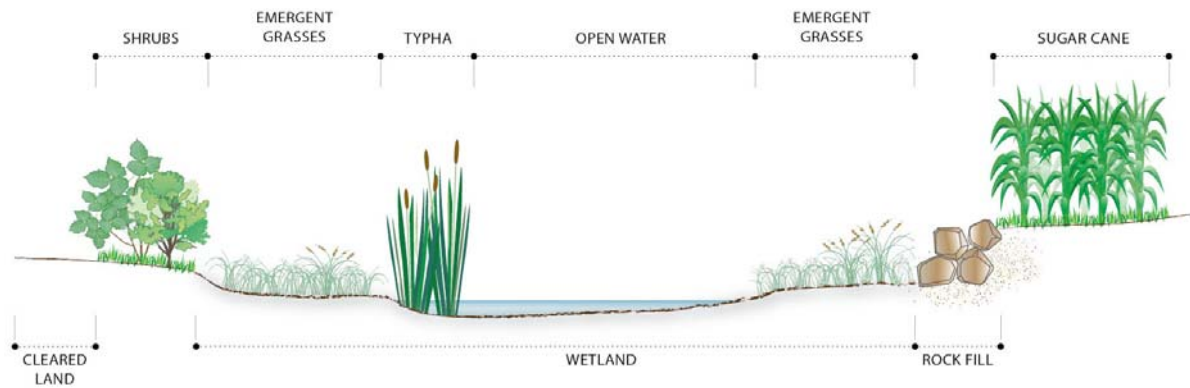


Figure 13. Typical cross-section view of Wetland 6 (NTS).

Table 11. Native and cryptogenic plants identified in Wetland 6.

Family	Species	Common name	Origin	IUCN <sup>1</sup>
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC
Boraginaceae	<i>Hilsenbergia petiolaris</i>	Bois pipe	Native	
Cyperaceae	<i>Fimbristylis ferruginea</i> (L.) Vahl		Native	LC
Fabaceae	<i>Caesalpinia bonduc</i> (L.) Roxb.	Cadoque	Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Poaceae	<i>Paspalidium germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Poaceae	<i>Zoysia matrella</i>	Herbe pique fesse	Native	
Ruppiaceae	<i>Ruppia maritima</i> L.		Native	DD
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC
Verbenaceae	<i>Premna seratifolia</i>	Bois surreau	Native	

<sup>1</sup> LC = Least concern, DD = Data deficient

Soils in Wetland 6 are area a mix of clays beneath a surface horizon of black and very dark grayish brown (10YR 2/1 and 3/2) loam. Below this, greenish gray and grayish green (5G 5/1 and 5/2) gleyed clay is mixed with a largely clay soil with a small loam component of slightly varying color, ranging from pale olive (5Y 6/3) to light brownish gray (2.5Y 6/2). Ratios of clay:clay loam range from 9:1 to 1:3, depending on location of the sample. Soils exhibit a sulfidic odor and soil pits showed inundation, although saturation in the dense clay was difficult to determine even in inundated areas.

Hydrology and salinity in Wetland 6 is similar to that in Wetland 5, and the wetlands may be hydrologically connected below the ground surface. Buffers also function similarly. As explained above, wildlife can be expected to travel between the wetlands, increasing the habitat values of each.

One mammal, three bird, one amphibian, one fish, and one snail species were observed in Wetland 6 (Table 12). These include one native bird (*Butorides striatus*) and one native snail (*Melanoides tuberculata*) species, both classified as species of least concern (IUCN 2001).

Table 12. Fauna species identified in Wetland 6.

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Mammals	Leporidae	<i>Lepus nigricollis</i> (Cuvier, 1823)	Hare	Alien
	Birds	Ardeidae	<i>Butorides striatus</i> (Linnaeus, 1758)	Green Heron, Gasse	Native LC
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Fringilidae	<i>Serinus mozambicus</i> (S. Muller, 1776)	Serin, Yellow-fronted Canary	Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien
	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien
Invertebrates	Snails	Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native LC

<sup>1</sup> LC = Least concern, DD = Data deficient

### **Grand Mare Longue**

The Grand Mare Longue wetland complex includes the largest wetlands in the Grand Baie area. All are *Typha*-dominated and highly influenced by surrounding development.

#### **Wetland 7**

This large (2.988 ha, 29,881 m<sup>2</sup>) emergent wetland (Figures 14 and 15) is approximately 95% herbaceous cover, of which more than 55% is *Typha domingensis*. Other common herbaceous species in the wetland are *Digitaria* sp., *Paspalidium genimatum*, *Ricinus communis*, *Cyperus alternifolius*, and *Leucaena leucocephala*. Native species supported in the wetland are shown in Table 13. About 5% of the area is in shrub cover, and most of this is in a cluster in the northern third of the wetland. *Typha* occurs throughout the southern two-thirds of the wetland. The northern third is predominantly the other herbaceous species listed above. The only structural diversity occurs in the shrub area. The western edge of the wetland is bordered by small houses, most of which are constructed on fill placed in the wetland itself (Appendix A, Photo 12). Fill, debris, and invasive species line the wetland along many of these houses (Appendix A, Photo 13).

Soils in Wetland 7 are predominantly sand and silty sand beneath a thin black loam horizon. Color in the B horizon is grayish brown to very pale brown (10YR 5/2, 6/3, and 7/3) with faint redoximorphic features. Soils near the homes along the southwest edge of the wetland are olive (2.5Y 4/3) clay loam with redoximorphic features. Areas of Wetland 7 with standing water exhibit a sulfidic odor.

Hydrology in Wetland 7 is from precipitation and runoff during storm events. Decreased water storage capacity resulting from filling portions of the wetland no doubt results in flooding of the nearby developed areas, and particularly the homes along the west edge. Several gardens and yards had standing water in them during the February 2008 site visits. Salinity averages 1 ppt in areas of standing water.





Figure 14. Plan view of Wetland 7 and 30-m buffer.



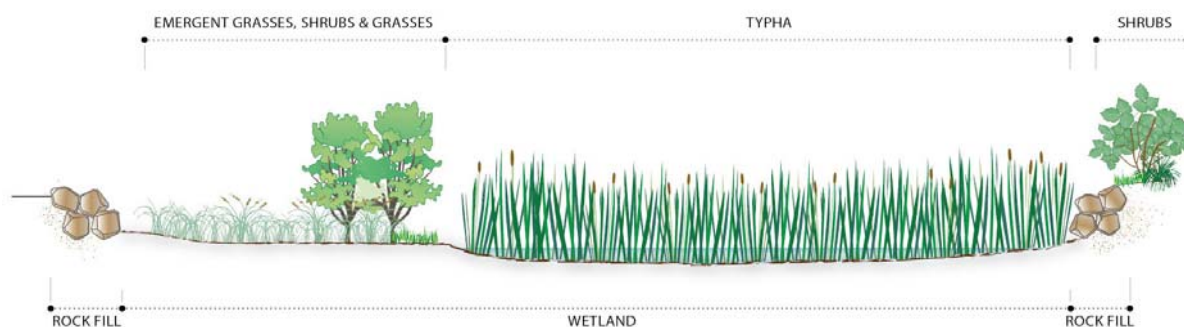


Figure 15. Typical cross-section view of Wetland 7 (NTS).

Table 13. Native and cryptogenic plants identified in Wetland 7.

Family	Species	Common name	Origin	IUCN <sup>1</sup>
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC
Convolvulaceae	<i>Ipomea violacea</i>		Native	
Convolvulaceae	<i>Ipomea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatan	Native	LC
Cyperaceae	<i>Fimbristylis cymosa</i> R. Br.		Native	LC
Cyperaceae	<i>Fimbristylis ferruginea</i>		Native	
Cyperaceae	<i>Pycnus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lythraceae	<i>Nesaea triflora</i> (L. f.) Kunth		Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalum germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Sorghum verticilliflorum</i> Stapf.	Millet sauvage	Native	DD
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern

Twenty-two fauna species were identified in Wetland 7. These are listed in Table 14 and include five native butterfly species and four native snail species. All are species of least concern (IUCN 2001).

Table 14. Fauna species identified in Wetland 7.

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Mammals	Canidae	<i>Canis familiaris</i> (Linnaeus, 1758)	Dog	Alien
	Birds	Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Columbidae	<i>Streptopelia chinensis</i> (Scopolis, 1786)	Grosse tourterelle, Spotted Dove	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien

Group		Family	Species	Common Name	Origin	IUCN <sup>1</sup>
		Ploceidae	<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow, Moineau	Alien	
		Ploceidae	<i>Ploceus cucullatus</i> (Muller, 1776)	Serin, Yellow-fronted Canary	Alien	
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien	
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Reptiles	Gekkonidae	<i>Phelsuma madagascariense</i> (Gray, 1831)		Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native	LC
		Lycaenidae	<i>Zizula hylax</i> (Fabricius, 1775)		Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	
	Snails	Planorbidae	<i>Gyraulus mauritanus</i> (Morelet, 1876)		Native	LC
		Ellobiidae	<i>Laemodonta bella</i> (Adams, 1854)		Native	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC
		Pomatiasidae	<i>Tropidophora fimbriata</i> (Lamarck, 1822)		Native	LC
		Planorbidae	<i>Bulinus cernicus</i> (Morelet, 1867)		Alien	
		Physidae	<i>Phisa acuta</i> (Draparnaud, 1805)		Alien	

<sup>1</sup> LC = Least concern

The function of Wetland 7's buffer is impaired by fill and development, and dumping is occurring presently. Filled areas along the east edge support invasive species and provide poor water quality and quantity protection, as well as no native habitat. Along the west edge, the fill is interspersed with gardens and vegetated areas, most of which support only invasive species but which may provide some protection from stormwater flooding. Although the wetland is no longer connected to Wetland 10 to the east, proximity to this other large wetland allows for wildlife passage between them and increases habitat function within both wetlands over their individual habitat values.

### **Wetland 8**

This small (0.134 ha, 1,342 m<sup>2</sup>), emergent wetland is separated from Wetland 7 by a berm of fill material with shrub vegetation (Figures 16 and 17; Appendix A Photo 14). Subsurface flow may occur between the wetlands, but no surface connection exists. Vegetative cover is

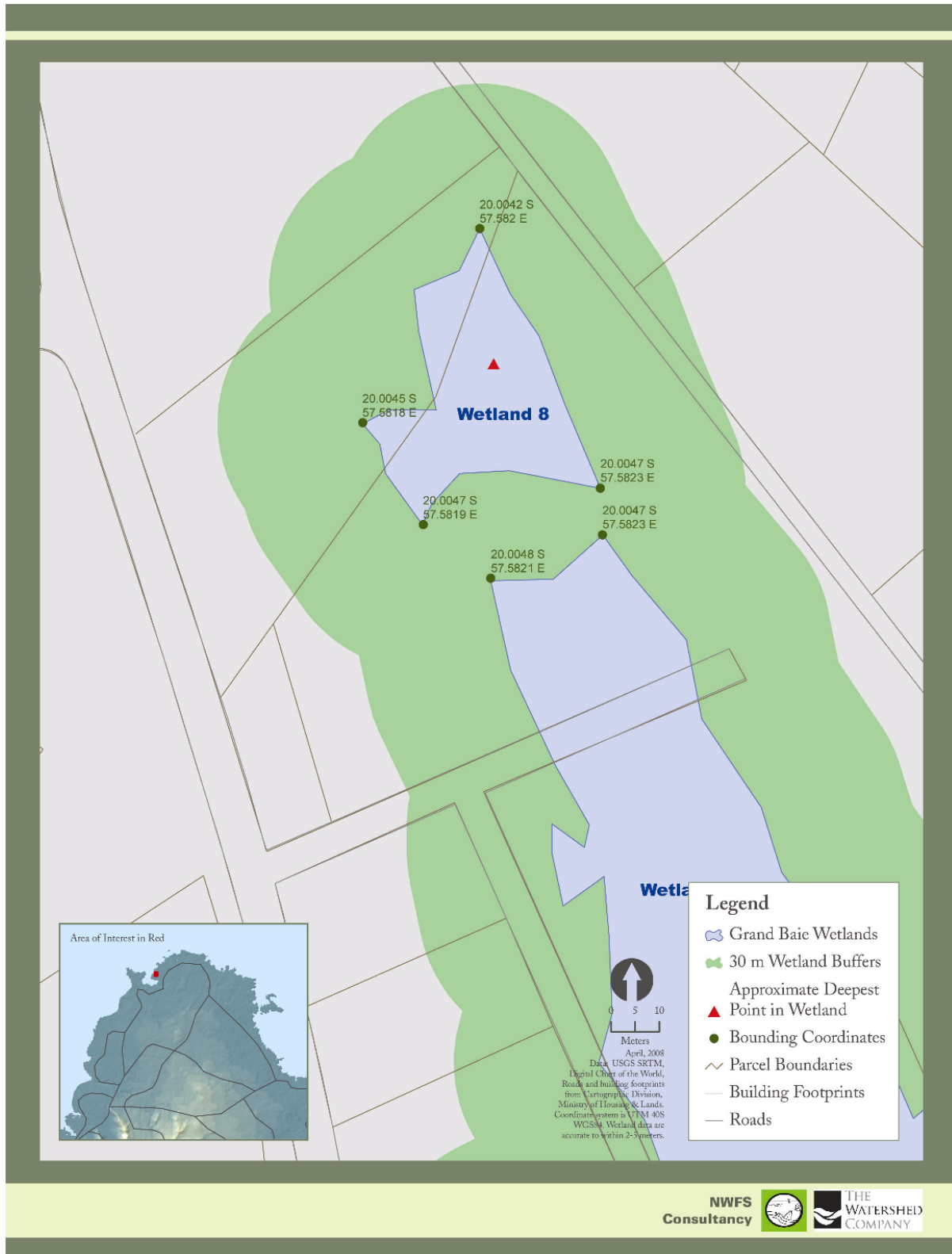


Figure 16. Plan view of Wetland 8 and a 30-m buffer.

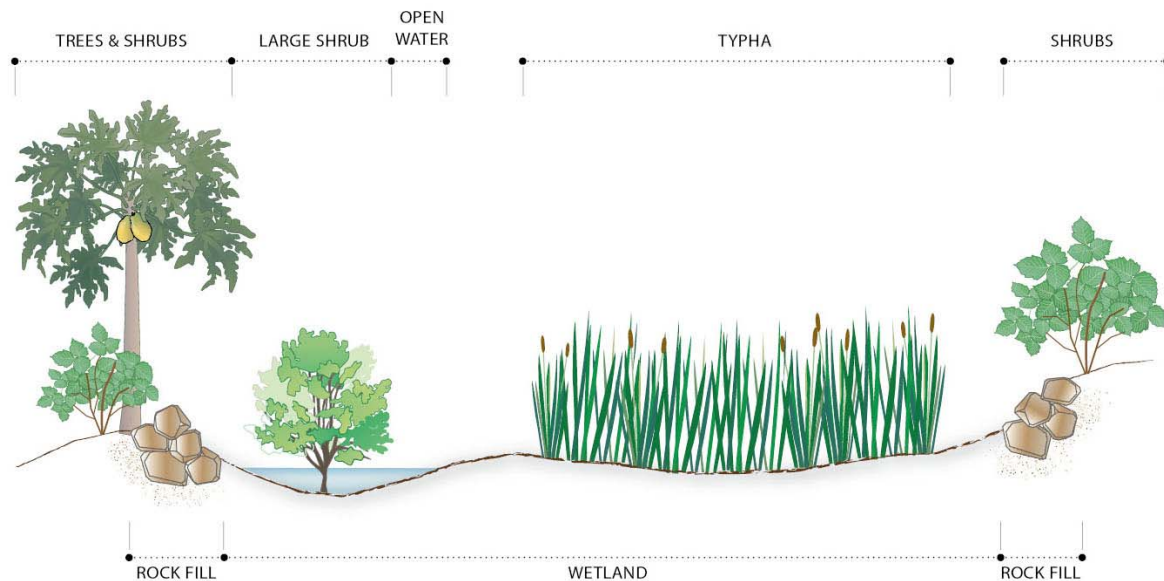


Figure 17. Typical cross-section view of Wetland 8 (NTS).

approximately 85% *Typha domingensis* with patches of *Digitaria* sp., *Paspaladium geminatum*, *Bacopa* sp., and *Cyanadon dactylon*, interspersed with scattered other native (Table 15) and non-native species. One area of ponding makes up approximately 5% of the wetland, and a single shrub patch covers about 10%. Salinity is 15 ppt in the ponded area. The shrub patch provides structural diversity in the wetland, as does the mixture of tall and short herbaceous species, to a lesser extent.

Table 15. Native and cryptogenic plants identified in Wetland 8.

Family	Species	Common name	Origin	IUCN
Boraginaceae	<i>Hilsenbergia petiolaris</i>	Bois pipe	Native	
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatran	Native	LC
Convolvulaceae	<i>Ipomoea violacea</i>		Native	
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Fimbristylis ferruginea</i>		Native	
Fabaceae	<i>Caesalpinia bonduc</i>	Cadoque	Native	
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lemnaceae	<i>Lemna perpusilla</i>	Lentille d'eau	Native	
Lythraceae	<i>Nesaea triflora</i> (L. f.) Kunth		Native	LC
Malvaceae	<i>Thespesia populnea</i>	Ste Marie	Native	
Oleaceae	<i>Jasminum fluminense</i>	Jasmin du pays	Native	
Onagraceae	<i>Ludwigia octovalvis</i>	Herbe les mares	Native	
Poaceae	<i>Paspalidium germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Ruscaceae	<i>Dracaena concinna</i> Kunth		Native	EN
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern, EN = Endangered

Wetland 8 soils show three distinctive strata. A thin black loam layer is underlain by a 0.25-m layer of grayish brown (10YR 5/2) sandy silt loam with yellowish brown (10YR 5/6) redoximorphic features. Beneath this stratum is a layer of light gray (10YR 7/2) sand that extends to at least 0.5 m depth. All soils in Wetland 8 were saturated in February 2008.

Hydrology in Wetland 8 is primarily from precipitation. Recent filling and development to the west and north has decreased water storage capacity of the wetland, and runoff now likely contributes water to the wetland.

Fauna species identified in Wetland 8 include one native bird, two native butterflies, and three native snails (Table 16). One of the snail species, *Tropidophora fimbriata*, was not observed in any of the other wetlands during the March 2008 surveys. All native species noted in Wetland 8 are species of least concern (IUCN 2001). The snail *Gyraulus mauritanus* may also be endemic to the island.

Table 16. Fauna species identified in Wetland 8.

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Birds	Ardeidae	<i>Butorides striatus</i> (Linnaeus, 1758)	Green Heron, Gasse	Native LC
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien
	Reptiles	Chamaeleonidae	<i>Calotes versicolor</i> (Daudin, 1802)	Agamid	Alien
Invertebrates	Butterflies	Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native LC
	Snails	Planorbidae	<i>Gyraulus mauritanus</i> (Morelet, 1876)		Native LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native LC
		Pomatiasidae	<i>Tropidophora fimbriata</i> (Lamarck, 1822)		Native LC
		Achatinidae	<i>Achatina fulica</i> (Bowdich, 1822)		Alien
		Lymnaeidae	<i>Lymnaea natalensis</i> (Krauss, 1848)		Alien
		Ariophantidae	<i>Macrochlamys indica</i> (Pfeiffer, 1846)		Alien
		Physidae	<i>Physa acuta</i> (Draparnaud, 1805)		Alien
		Subulinidae	<i>Subulina striatella</i> (Rang, 1831)		Alien

<sup>1</sup> LC = Least concern

The wetland buffer is highly developed and development actively continues. All such development decreases the protection of the wetland's functions. Wetland 7 to the south

provides a good buffer in this direction, as well and increasing the habitat value of Wetland 8. Other parts of the boundary provide poor protection of wetland functions, however.

### **Wetland 10**

At 5.301 ha (53,008 m<sup>2</sup>), Wetland 10 is the largest remaining Grand Baie wetland (Appendix A, Photo 15). It is nearly a *Typha* monoculture, with greater than 90% cover by *Typha domingensis*. Diversity, both compositional and structure, exists only along the winding edges (Figures 18 and 19, Table 17), created by fill in the wetland, where cultivated species, invasive vines, and shrubs are present.

Table 17. Native and cryptogenic plants identified in Wetland 10.

Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Convolvulaceae	<i>Ipomoea pes-caprae</i>	Batatran	Native	
Convolvulaceae	<i>Ipomoea violacea</i>		Native	
Cyperaceae	<i>Cyperus dubius</i> Rottb.		Native	LC
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Fimbristylis ferruginea</i>		Native	
Cyperaceae	<i>Pycnus</i> cf. <i>polystacheus</i> (Rottb.) P. Beauv.		Native	LC
Fabaceae	<i>Canavalia rosea</i>	Cocorico	Native	
Lytraceae	<i>Nesae triflora</i>		Native	
Malvaceae	<i>Thespesia populnea</i>	Ste Marie	Native	
Moraceae	<i>Ficus reflexa</i> Thunb	Lafouche bâtard	Native	LC
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalidium germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern

Soils in Wetland 10 are a consistent very dark grayish brown (2.5Y 3/2) sandy loam with no prominent redoximorphic features. A sulfidic odor is present throughout the wetland. Very rocky areas of fill and debris also occur within the wetland.

Hydrology is primarily runoff from the highly developed surrounding areas. Most nearby land use is residential, and most residences are constructed on fill. Construction is ongoing and wetland edges are subject to dumping fill and other materials. Stormwater runoff to the wetland is therefore likely higher than historic levels. Some flow may occur between Wetlands 10 and 7, although no channels are evident.

Five native and 12 non-native fauna species were identified in Wetland 10 (Table 18). Five butterfly and one snail species make up the natives observed, and all are characterized as species of least concern (IUCN 2001).

The functional value of Wetland 10 is highest for water storage. The buffer stresses this function by providing little water storage itself, due to excessive fill. Vegetated areas protect the wetland from flow somewhat, and protect the habitat value of the wetland. As described above, habitat functional value is enhanced by the proximity of Wetland 7.





Figure 18. Plan view of Wetland 10 and 30-m buffer.

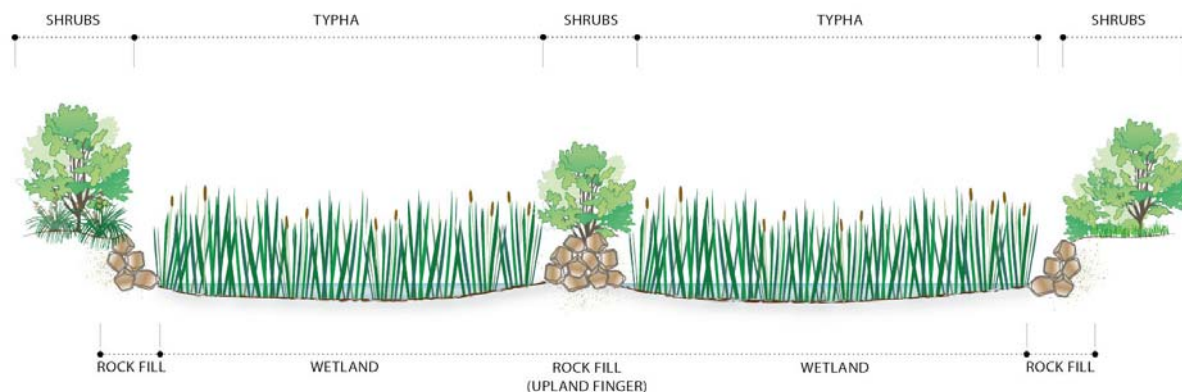


Figure 19. Typical cross-section view of Wetland 10 (NTS).

Table 18. Fauna species identified in Wetland 10.

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Birds	Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758)	Waxbill, Bengali	Alien
		Phasianidae	<i>Coturnix coturnix africana</i> (Temmink & Schlegel, 1849)	Common quail, Caille	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Ploceidae	<i>Ploceus cucullatus</i> (Muller, 1776)	Serin, Yellow-fronted Canary	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien
		Bufonidae	<i>Bufo gutturalis</i> (Power, 1927)	Toad, Krapo	Alien
	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien
Invertebrates	Butterflies	Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native LC
		Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien
	Snails	Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native LC
		Physidae	<i>Phisa acuta</i> (Draparnaud, 1805)		Alien

<sup>1</sup> LC = Least concern



**Wetland 11**

Wetland 11 lies at the center of the Grand Mare Longue complex and covers 1.218 ha (12,182 m<sup>2</sup>) (Figures 20 and 21). Like Wetland 10, it is a near-monoculture of *Typha domingensis* (Appendix A, Photo 16), with only small amounts of other species, the vast majority of which are non-native (Table 19, Appendix D). Structural and compositional diversity are extremely low, and the only interspersions of cover types occurs around two small non-wetland islands of fill in the northeast portion of the wetland. Salinity of standing water averages 2 ppt, and the wetland has a strong odor of sulfur.

Table 19. Native and cryptogenic plants identified in Wetland 11.

Family	Species	Common name	Origin	IUCN <sup>1</sup>
Convolvulaceae	<i>Ipomea pes-caprae</i>	Batatan	Native	
Cyperaceae	<i>Cyperus rotundus</i>		Native	
Cyperaceae	<i>Fimbristylis ferruginea</i> (L.) Vahl		Native	LC
Cyperaceae	<i>Kyllinga polyphylla</i> Willd. ex Kunth		Native	DD
Malvaceae	<i>Thespesia populnea</i>	Ste Marie	Native	
Oleaceae	<i>Jasminum fluminense</i>	Jasmin du pays	Native	
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Dactyloctenium ctenoides</i> (Steud.) Bosser		Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i>	Herbe bourrique	Native	
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern, DD = Data deficient

Soils in the wetland are black (2.5Y 2/1) sandy loam to a depth of approximately 0.20 m, and very dark grayish brown (2.5Y 3/2) sand below that. Inundation was present throughout the wetland during the February site visits. Hydrology sources are the same as those for the other Grand Mare Longue wetlands.

Wetland 11 supports at least eight native species observed in the Grand Baie wetlands during the 2008 ecological surveys (Table 20). None of the species is unique to the wetland, but the list does include the possible endemic *Gyraulius mauritanus*. All native species are rated as species of least concern (IUCN 2001).



Figure 20. Plan view of Wetland 11 and 30-m buffer.

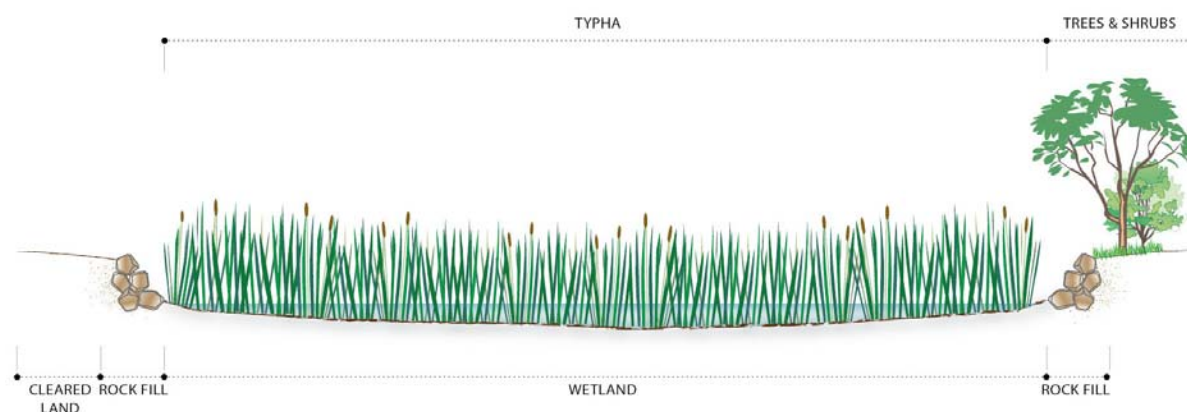


Figure 21. Typical cross-section view of Wetland 11 (NTS).

Table 20. Fauna species identified in Wetland 11.

Group		Family	Species	common name	Origin	IUCN <sup>1</sup>
Vertebrates	Birds	Columbidae	<i>Streptopelia picturata</i> (Temminck, 1813)	Turtle dove	Cryptogenic	LC
		Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien	
		Phasianidae	<i>Coturnix coturnix africana</i> (Temminck & Schlegel, 1849)	Common quail, Caille	Alien	
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien	
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
	Fish	Poeciliidae	<i>Gambusia affinis</i> (Baird & Girard, 1853)	Million	Alien	
Invertebrates	Butterflies	Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native	LC
		Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	
	Snails	Planorbidae	<i>Gyraulus mauritianus</i> (Morelet, 1876)		Native	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC

Group	Family	Species	common name	Origin	IUCN <sup>1</sup>
	Lymnaeidae	<i>Lymnaea natalensis</i> (Krauss, 1848)		Alien	
	Physidae	<i>Physa acuta</i> (Draparnaud, 1805)		Alien	

<sup>1</sup> LC = Least concern

Wetland 11 helps to protect surrounding areas by providing water storage. Like the other Grand Mare Longue wetlands, water storage functions are strained by ongoing filling and development in and around the wetland. Although habitat in the wetland and surrounding area is altered by fragmentation, the relative proximity of other large wetlands allow for Wetland 11 to function as wildlife habitat at a higher level than it would if it were more isolated from other wetland fragments.

### **Wetland 12**

Wetland 12 (Figures 22 and 23) is the northernmost wetland in the study area (Appendix A, Photo 17) and was not previously identified in the earlier Environmental Risk Assessment (Government of Mauritius 2004). It is 2.733 ha (27,332 m<sup>2</sup>) in size. Houses encroach on it on all sides, and roads closely border it in areas. It can be generally classified as a *Typha*-dominated wetland, although the outer portions support a diversity of species, most of which are cultivated species from the surrounding areas or invasives that have proliferated as a product of fill and disturbance (Table 21, Appendix D). The irregular wetland border provides some diversity to habitat, although most of the species found there are non-native and invasive. One island of upland shrub and tree species occurs within the wetland at the south end. Just north of this, the wetland narrows to a very small channel that connects to a larger *Typha* pond surrounded by houses constructed on fill.

Table 21. Native and cryptogenic plants identified in Wetland 12.

Family	Species	Common name	Origin	IUCN <sup>1</sup>
Arecaceae	<i>Dictyosperma album</i> (Bory) H. Wendl. et Drude ex Scheff	Palmiste blan, Hurricane palm	Native	CR (but commonly planted)
Convolvulaceae	<i>Ipomoea pes-caprae</i> (L.) R. Br subsp. <i>brasiliensis</i> (L.) Oostr.	Batatan	Native	LC
Cyperaceae	<i>Pycnus</i> cf. <i>polystachyus</i> (Rottb.) P. Beauv.		Native	LC
Oleaceae	<i>Jasminum fluminense</i>	Jasmin du pays	Native	
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) Raven subsp. <i>sessiflora</i> (M. Micheli) Raven	Herbe gandia, Herbe les Mares	Native	LC
Poaceae	<i>Paspalum germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Poaceae	<i>Stenotaphrum dimidiatum</i> (L.) Brongn.	Herbe bourrique	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC

<sup>1</sup> LC = Least concern, CR = Critically endangered

Wetland 12 soils vary from light brownish gray (10YR 5/2 and 6/2) sandy clay in areas of standing water to dark brown (10YR 3/3) clay loam with dark yellowish brown (10YR 4/6) redoximorphic features in saturated-only emergent areas. Salinity averages 2 ppt. Hydrology sources are runoff and precipitation.



Figure 22. Plan view of Wetland 12 and a 30-m buffer.

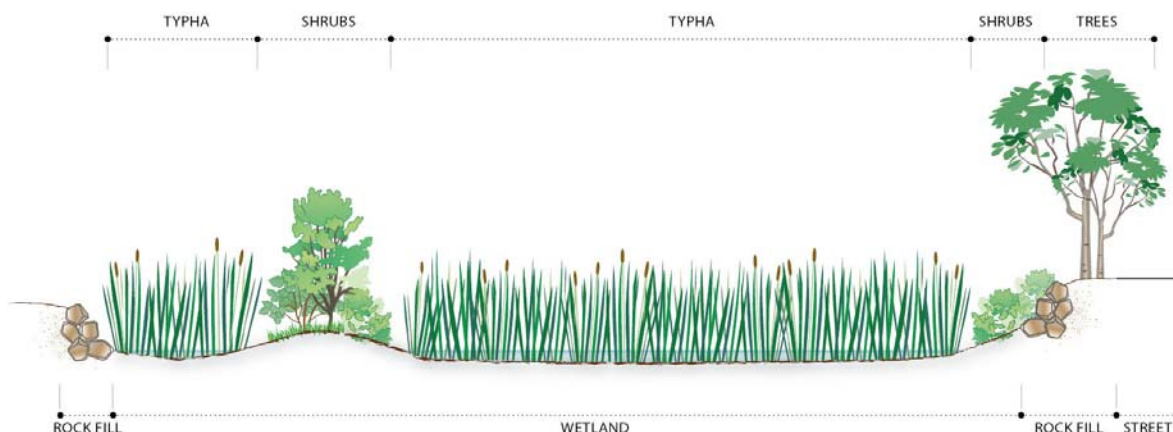


Figure 23. Typical cross-section view of Wetland 12 (NTS).

Five native fauna species, including the possible endemic *Gyraulus mauritianus*, were observed in Wetland 12 (Table 22). All are species of least concern (IUCN 2001).

Table 22. Fauna species identified in Wetland 12.

Group		Family	Species	Common Name	Origin	IUCN <sup>1</sup>
Vertebrates	Birds	Columbidae	<i>Streptopelia picturata</i> (Temminck, 1813)	Turtle dove	Cryptogenic	LC
		Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien	
		Columbidae	<i>Streptopelia chinensis</i> (Scopolis, 1786)	Grosse tourterelle, Spotted Dove	Alien	
		Estrildidae	<i>Estrilda astrild</i> (Linnaeus, 1758 )	Waxbill, Bengali	Alien	
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien	
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien	
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien	
		Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1758)	Mynah, Martin	Alien	
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien	
Invertebrates	Butterflies	Hesperiidae	<i>Borbo borbonica</i> (Boisduval, 1833)		Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Nymphalidae	<i>Phalantha phalantha</i> (Drury, 1773)	Common leopard	Native	LC
	Snails	Planorbidae	<i>Gyraulus mauritianus</i> (Morelet, 1876)		Native	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC

Group	Family	Species	Common Name	Origin	IUCN <sup>1</sup>
	Achatinidae	<i>Achatina fulica</i> (Bowdich, 1822)		Alien	
	Spiraxidae	<i>Euglandina rosea</i> (Ferrusac, 1818)		Alien	
	Lymnaeidae	<i>Lymnaea natalensis</i> (Krauss, 1848)		Alien	
	Ariophantidae	<i>Macrochlamys indica</i> (Pfeiffer, 1846)		Alien	
	Physidae	<i>Physa acuta</i> (Draparnaud, 1805)		Alien	
	Subulinidae	<i>Subulina striatella</i> (Rang, 1831)		Alien	

<sup>1</sup> LC = Least concern

The wetland buffer is highly developed and hinders wetland functions by draining stormwater to the wetland, providing little native vegetation, and fragmenting habitat.

## South Study Area

### Wetland 9

The southernmost wetland in the Grand Baie area is a fragment surrounded entirely by fill located near the junction of Plaines des Papayes Road B11 and Vingt Pieds Road B45 (Figures 24 and 25; Appendix A, Photo 18). *Typha domingensis* covers more than 90% of the 0.292-ha (2,919 m<sup>2</sup>) area. Other species occur at the wetland edges and in three small patches within the wetland (Table 23). Compositional and structural diversity are low in the wetland, and there is little interspersed cover types.

Table 23. Native and cryptogenic plants identified in Wetland 9.

Family	Species	Common name	Origin	IUCN <sup>1</sup>
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC
Convolvulaceae	<i>Ipomoea pes-caprae</i>	Batatan	Na	
Cyperaceae	<i>Cyperus rotundus</i>		Na	
Cyperaceae	<i>Fimbristylis ferruginea</i>		Na	
Lythraceae	<i>Nesaea triflora</i> (L. f.) Kunth		Native	LC
Moraceae	<i>Ficus reflexa</i> Thunb	Lafouche bâtard	Native	LC
Oleaceae	<i>Jasminum fluminense</i> Vell.	Jasmin du pays	Native	LC
Onagraceae	<i>Ludwigia octovalvis</i>	Herbe les mares	Na	
Poaceae	<i>Paspalum germinatum</i> Stapf.	Herbe de riz	Native	LC
Poaceae	<i>Paspalum vaginatum</i> Sw.	Herbe la mare	Native	LC
Typhaceae	<i>Typha domingensis</i> Pers.	Voune, Voundre	Cryptogenic	LC
Vitaceae	<i>Cissus quadrangularis</i> L.	Vanille du docteur Burke	Cryptogenic	LC
Vitaceae	<i>Cissus rotundifolia</i> (Forssk.) Vahl	Liane de boeuf	Cryptogenic	LC

<sup>1</sup> LC = Least concern





Figure 24. Plan view of Wetland 9 and 30-m buffer.



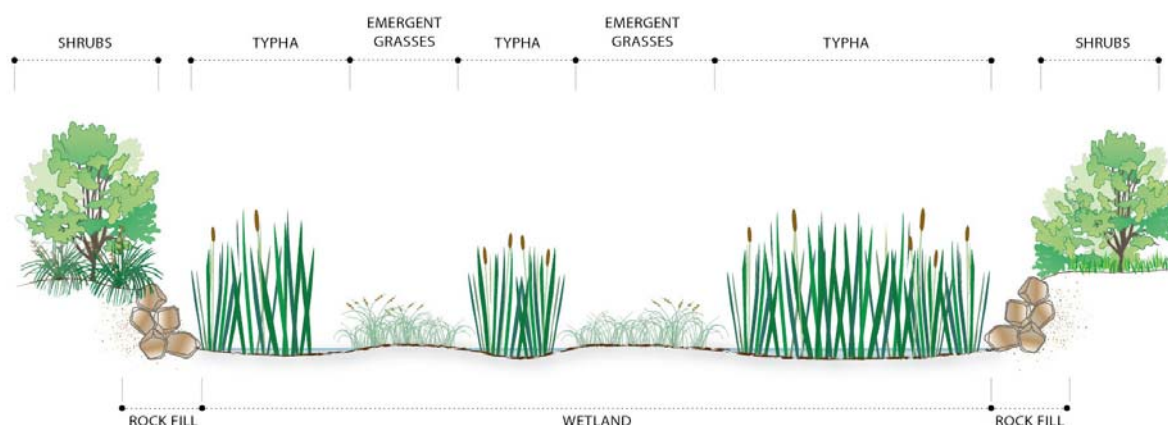


Figure 25. Typical cross-section view of Wetland 9 (NTS).

Soils in Wetland 9 are black (2.5Y 2.5/1) clay loam to approximately 0.30 m, and thereafter dark olive gray (5Y 3/2) clay loam. Redoximorphic features are not apparent. The wetland does not have a sulfidic odor, and salinity was 0 ppt during the February site visit, which took place after heavy rain.

Wetland 9 supports at least 10 native species, the highest species richness observed in the Grand Baie wetlands during the March 2008 surveys (Table 24). These include the endemic *Phelsuma ornata* gecko and endemic *Maureneia poutrini* snail. Two additional native snail species, *Quickia concise* and *Streptostele acicula*, and one butterfly, *Henotesia narcissus narcissus*, were not observed in other wetlands of Grand Baie during the 2008 surveys. All native species are species of least concern (IUCN 2001).

Table 24. Fauna species identified in Wetland 9.

Group	Family	Species	common name	Origin	IUCN <sup>1</sup>
Vertebrates	Mammals	Leporidae	<i>Lepus nigricollis</i> (Cuvier, 1823)	Hare	Alien
	Birds	Columbidae	<i>Streptopelia picturata</i> (Temminck, 1813)	Turtle dove	Cryptogenic LC
		Columbidae	<i>Geopelia striata</i> (Linnaeus, 1758)	Barred ground dove	Alien
		Fringilidae	<i>Serinus mozambicus</i> (S. Muller, 1776)	Serin, Yellow-fronted Canary	Alien
		Ploceidae	<i>Foudia madagascariensis</i> (Linnaeus, 1758)	Madagascar red fody, Cardinal de Madagascar	Alien
		Pycnonotidae	<i>Pycnonotus jocosus</i> (Linnaeus, 1758)	Bouloul, Konde	Alien
		Rallidae	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Moorhen, poule d'eau	Alien
	Reptiles	Gekkonidae	<i>Phelsuma ornate</i> (Gray, 1825)		Endemic LC
		Gekkonidae	<i>Hemidactylus frenatus</i> (Schlegel 1836)		Alien
	Amphibians	Ranidae	<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	Frog, grenouille	Alien

Group		Family	Species	common name	Origin	IUCN <sup>1</sup>
		Bufonidae	<i>Bufo gutturalis</i> (Power, 1927)	Toad, Krapo	Alien	
Invertebrates	Butterflies	Danaidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)	African monarch	Native	LC
		Lycaenidae	<i>Leptotes pirithous</i> (Linnaeus, 1758)	Common blue	Native	LC
		Pieridae	<i>Catopsilia florella</i> (Fabricius, 1775)	African migrant	Native	LC
		Pieridae	<i>Eurema floricola</i> (Boisduval, 1833)		Native	LC
		Satyridae	<i>Henotesia narcissus narcissus</i> (Fabricius, 1798)		Native	LC
		Papilionidae	<i>Papilio demodocus</i> (Esper, 1798)		Alien	
	Snails	Streptaxidae	<i>Maurennea poutrini</i> (Germain, 1918)		Endemic	LC
		Ellobiidae	<i>Melanoides tuberculata</i> (Müller, 1774)		Native	LC
		Succineidae	<i>Quickia concisa</i> (Morelet, 1868)		Native	LC
		Streptaxidae	<i>Streptostele acicula</i> (Morelet, 1877)		Native	LC
		Achatinidae	<i>Achatina fulica</i> (Bowdich, 1822)		Alien	
		Spiraxidae	<i>Euglandina rosea</i> (Ferrusac, 1818)		Alien	
		Subulinidae	<i>Subulina octona</i> (Bruguière, 1792)		Alien	
		Subulinidae	<i>Subulina striatella</i> (Rang, 1831)		Alien	

<sup>1</sup> LC = Least concern

Wetland 9 is relatively isolated from other wetlands and from valuable habitat patches. While this detracts from its functional value in most respects, it renders it value as a refuge within the developed area. Although the buffer is composed of fill, structures and roads do not directly border the wetland. The presence of a vegetated buffer, albeit on piles of fill and made up largely of invasive species, offers some screening to the habitat within the wetland.

## DISCUSSION AND FINAL REMARKS

Functions and values refer to the benefits provided by a wetland, and how well a wetland is able to provide these benefits. Functions can be categorized into three groups: water quality, hydrologic, and habitat functions. All wetlands perform some or all of these functions, to greatly varying extents. Water quality functions are performed when a wetland has the physical characteristics needed to slow and filter water, and when the need is present (i.e., untreated runoff or contaminated water is able to enter the wetland). Hydrologically, wetlands are important for flood and stormwater storage and aquifer recharge, and a wetland's value for these functions increases when there are homes or natural resources proximate to the wetland. Coastal marine wetlands provide erosion control functions; these wetlands are not included in the scope of this study.

Wetlands also supply habitat for the foraging, breeding, and rearing activities of wildlife. Habitat functional values are measured by considering vegetative structure and composition, presence of special features, buffer quality, and proximity of other natural areas.

Function of all Grand Baie wetlands is impaired by wetland and buffer filling and degradation. Due to their proximity to urban areas around Grand Baie, all of the inventoried wetlands are at continued risk of urbanization (i.e., conversion to non-agricultural uses such as residential, commercial, or industrial). Specifically, the wetlands in the Grand Mare Longue, Mare Michaux, and Mare Soyfoo complexes are highly threatened by the risk of urbanization. Backfilling of these wetlands is actively taking place, as observed during the present study.

In comparing total wetland area over time, it is clear that while wetland area is not decreasing as rapidly as it did between 1990 and 2000, loss of wetland area is still occurring. At first glance, it appears that much less change has occurred between 2000 (17.4 ha) and 2008 (15.4 ha). However, this 2008 study included the inventory of a 2.7-ha portion of Grand Mare Longue (Wetland 12) that was previously unsurveyed. Therefore, assuming the size of Wetland 12 is unchanged since 2000, the 2000 results would be 20.1 ha instead of 17.4 ha. Accounting for this adjustment, the percent loss of wetland area was 19% between 1980 and 1990, 30% between 1990 and 2000, and 23% between 2000 and 2008 (Figure 26).

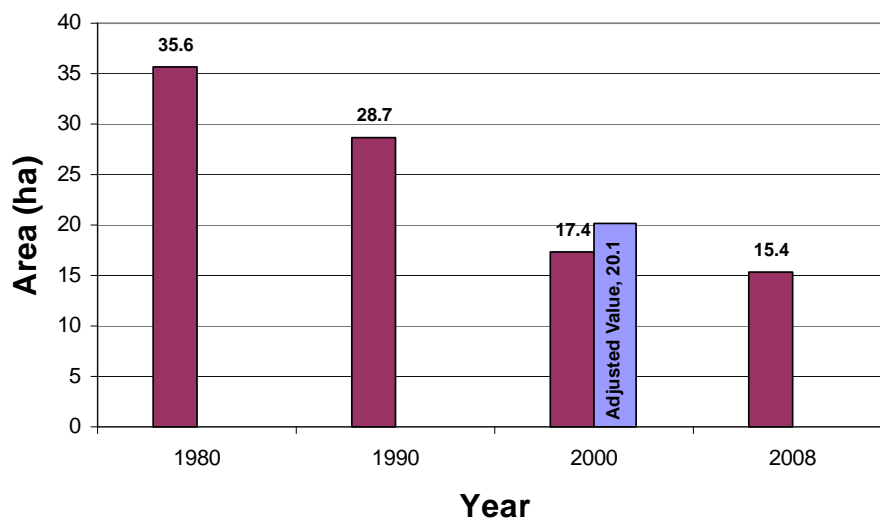


Figure 26. Comparison of Historical and Current Wetland Area in Grand Baie.

Backfilling of the Grand Baie wetlands has impacted and continues to impact wetland functions. Hydrology of the remaining wetland area is altered by the reduction in water storage available volume within the wetlands and by increased runoff as impervious surface in surround areas increases. Even a slight change in wetland hydrology can result in drastic changes in the plant species composition within the wetlands and ecosystem functions, including flood control and water quality control, and vertebrate and invertebrate habitat (UNESCO 1998). Changes in hydrology in turn alter soils, further impacting vegetation uniquely adapted to hydric soils. The proliferation of non-native and invasive plants and animals in the Grand Baie wetlands is evidence of past and likely permanent damage to these ecosystems.

Pressure to reclaim wetlands is especially intense in developing urban area, such as the Grand Baie study area. Ironically, the loss of wetlands in such areas can have the greatest detrimental effects, including flooding and increased pollution, in just such areas. Thus, it is vital that a framework for wetland management be implemented to avoid further wetland loss and degradation in Grand Baie.

## LITERATURE CITED

- ARDA. 2003. Premier inventaire des poisons et des macrocrustacés d'eau douce des principales rivières pérennes de l'île Maurice. Rapport de résultats. Ministère de l'Aménagement du Territoire et de l'Environnement, France. 53pp.
- Barré, N., A. Barau, and C. Joaunin. 1996. *Oiseaux de la Réunion*. Les éditions du Pacifique. Paris, France.
- Bisby, F. A., M.A. Ruggiero, K.L. Wilson, M. Cachuela-Palacio, S.W. Kimani, Y.R. Roskov, A. Soulier-Perkins, and J. van Hertum (eds). 2005. Catalogue of life: 2005. Annual checklist. CD-ROM. Reading, UK.
- Bojer, W. (1837). *Hortus Mauritianus*. Aimé Mamarot et Compagnie, Mauritius.
- Bosser, J., Cadet, Th., Gueho, J. and W. Marais. 1976-onwards. *Flore des Mascareignes*. MSIRI/ORSTOM-IRD/Kew. Government of Mauritius and IRD. Mauritius and Montpellier, France.
- Central Water Authority. 2006. National Hydrology Handbook. Water Resources Unit of the Central Water Authority, Mauritius.
- Cheke, A. S. 1987. An ecological history of the Mascarene Islands. Pages 5-89 in A. W. Diamond, ed. *Studies of the Mascarene Islands Birds*. Cambridge University Press. Cambridge, UK.
- Clayton, W. D., K.T. Harman, and H. Williamson. 2006-onwards. GrassBase - The Online World Grass Flora. <http://www.kew.org/data/grasses-db.html>.
- ESRI. 2006. ArcView 9.2. Geographic Information System (GIS) software. Redlands, CA. USA.
- Griffiths, O. L. and F. B. V. Florens. 2006. *A field guide to the non-marine molluscs of the Mascarene Islands (Mauritius, Rodrigues, Réunion) and the northern dependencies of Mauritius*. Bioculture Press, Mauritius.
- Govaerts R R., D.A. Simpson., P. Goetghebeur, K. Wilson, T. Egorova, and J. Bruhl. 2006. World Checklist of Cyperaceae. The Board of Trustees of the Royal Botanic Gardens, Kew. <http://www.kew.org/wcsp>.
- Government of Mauritius. 1990. *Pamplemousses* 1:25,000 Map (SHEET 1). Series Y881 (DOS 329). Edition 6-OSD 1990. Ordnance Survey (UK), Southampton, UK.
- Government of Mauritius. 2004. *Study of Environmental Risks in Grand Baie*. Final Technical Report. Ministry of Environment and NDU. Port Louis, Mauritius.
- Government of Mauritius. 2006. *Development Strategy Maps. Outline Planning Scheme for Pamplemousses /Rivière du Rempart District Council Area*. Final Version. Ministry of Housing and Lands (Planning Division). Port Louis, Mauritius.

- Hubbard, C. E. and R.E. Vaughan. 1940. *The grasses of Mauritius and Rodriguez*. Waterlow & Sons Limited. London, UK.
- IT IS. 2008. Integrated taxonomic information system. <http://www.itis.gov/index.html>.
- IUCN. 2001. IUCN Red List Categories and Criteria. Version 3.1. Gland, Switzerland.
- IUCN. 2007. IUCN Red List 2007. <http://www.redlist.org>.
- Kollmorgen Instruments Corps. 1992. Munsell Soil Color Charts. Newburgh, NY. USA.
- Marais, W. 198X. 202. Cyperacées. Flore des Mascareignes. Unpublished manuscript.
- Prosbt, J-M. 1997. *Animaux de La Réunion – guide d'identification des oiseaux, mammifères, reptiles et amphibiens*. Azalées éditions. La Réunion, France.
- Reptile Database 2007. <http://www.tigr.org/reptiles/search.php>.
- Stevens, P. F. 2001-onwards. Angiosperm Phylogeny Website. Version 8, June 2007. <http://www.mobot.org/MOBOT/research/APweb/>.
- Trimble. 2005. *GPS Pathfinder Office 3.10*. Global Positioning System (GPS) software. Trimble Navigation Limited. Westminister, CO. USA.
- UNESCO. 1998. Wetlands of the Humid Tropics. International Hydrological Programme Humid Tropics Programme Series No. 12.
- Vaughan, R. E. 1932. Cyperaceae of Mauritius. Unpublished manuscript.
- Vinson, J. and J-M. Vinson. 1969. The saurian fauna of the Mascarene Islands. *Mauritius Institute Bulletin* 6:203-230.
- Williams, J. R. 2007. *Butterflies of Mauritius*. 2<sup>nd</sup> ed. Bioculture Press, Mauritius.

## **APPENDIX A**

### **Photographs**







Photo 1: Wetland boundary defined by fill.



Photo 2: Wetland 1 at Grand Baie Conference Centre.





Photo 3: Possible location of in-flow to Wetland 1 obscured by debris.



Photo 4: Wetland 2 north of Super-U supermarket.





Photo 5: Impervious surface runoff from Super-U property to Wetland 2.



Photo 6: Wetland 3.





Photo 7: Probable hydrologic connection between Wetlands 3 and 4.



Photo 8: Wetland 4 bordering Grand Baie Bazaar.





Photo 9: Wetland 5.



Photo 10: Clay soils with gleying and redoximorphic features in Wetland 5.





Photo 11: Wetland 6.



Photo 12: House construction on fill bordering Wetland 7.





Photo 13: Fill and debris along the edge of Wetland 7.



Photo 14: Wetland 8 with berm of fill material in background.





Photo 15: Wetland 10.



Photo 16: Wetland 11.





Photo 17: Wetland 12.



Photo 18: Wetland 9.



## **APPENDIX B**

### **Wetland Delineation Course Outline**



## **DELINEATION TRAINING OUTLINE**

### **I Identifying wetlands and determining boundaries**

- A. Gathering preliminary data (easily observed primary indicators)
  - 1. Obligate vegetation (*Typha latifolia*)
  - 2. Hydrologic (presence of standing water outside of flooding or other stormwater events)
- B. Further investigation for determining the presence of wetlands
  - 1. Identifying other plants commonly found in wetlands
  - 2. Characterizing wetland soils
    - a. value and chroma
    - b. texture
    - c. redoximorphic features
    - d. other characteristics associated with reducing soil conditions
- C. Observing and/or inferring wetland hydrology
  - 1. Observation of saturation and inundation
  - 2. Inference of saturation/inundation outside of the growing season
- D. Other factors
  - 1. Assessing environmental conditions
  - 2. Topography
- E. Atypical conditions
  - 1. Disturbed wetlands
  - 2. Problem areas

### **II Surveying wetland boundaries**

- A. Use of professional judgment for boundary determination
- B. Flagging boundaries for survey crew
  - a. Numerical, alphabetical, or alphanumeric system
  - b. Locate transects for vegetative representation
  - c. Soil pit locations for verification by others
- C. Use of GPS for wetland boundary mapping
  - a. Coordinate systems (global vs planimetric)
  - b. UTM coordinate system using WGS 1984 datum



## **APPENDIX C**

### **1:5,000 Wetland Delineation and Land Ownership Maps**









# Grand Baie Wetland Survey

Survey Location

## Legend

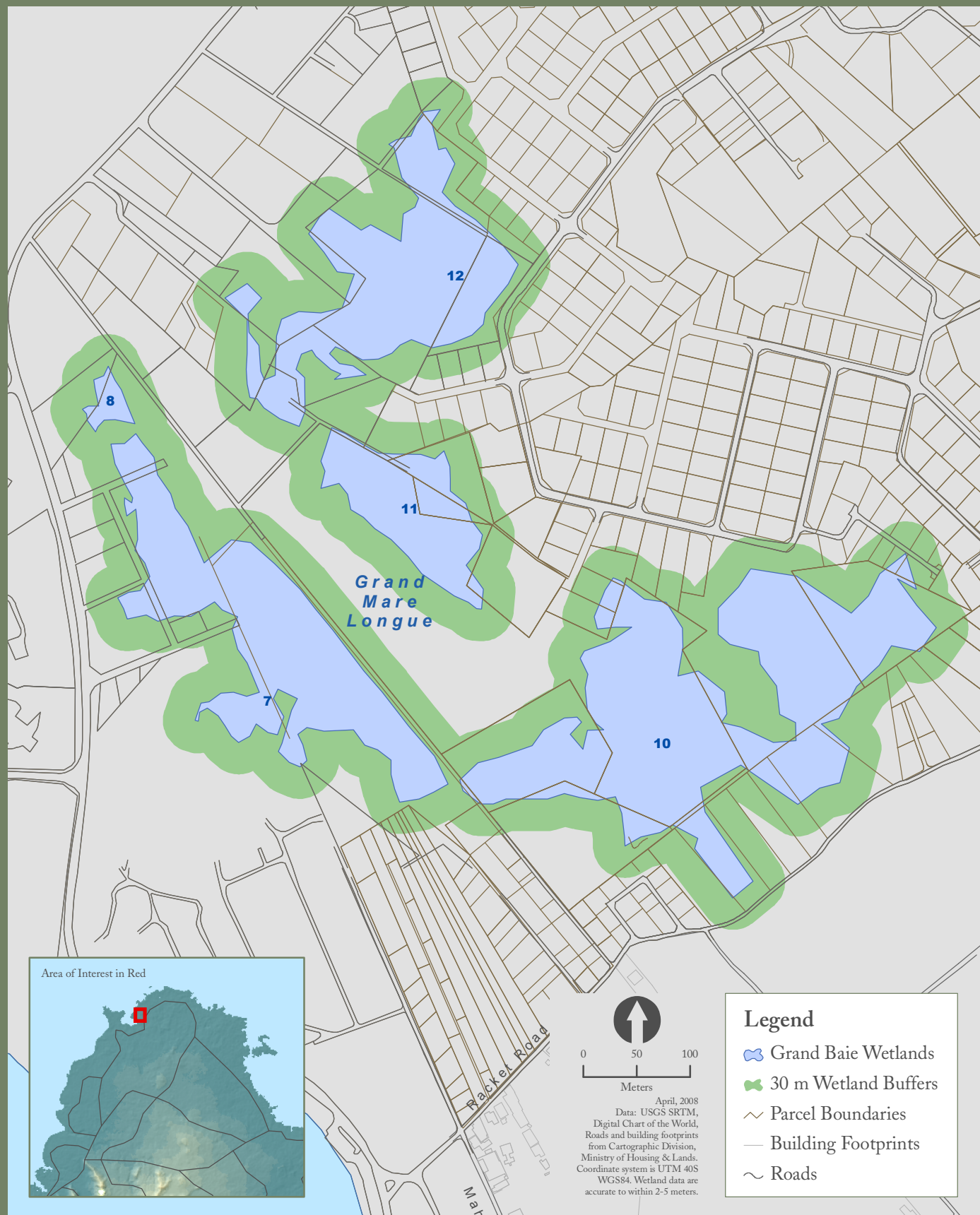
-  Project Area
-  Major Roads
-  Major Rivers
-  Lakes



April, 2008  
Data: USGS SRTM,  
Digital Chart of the World

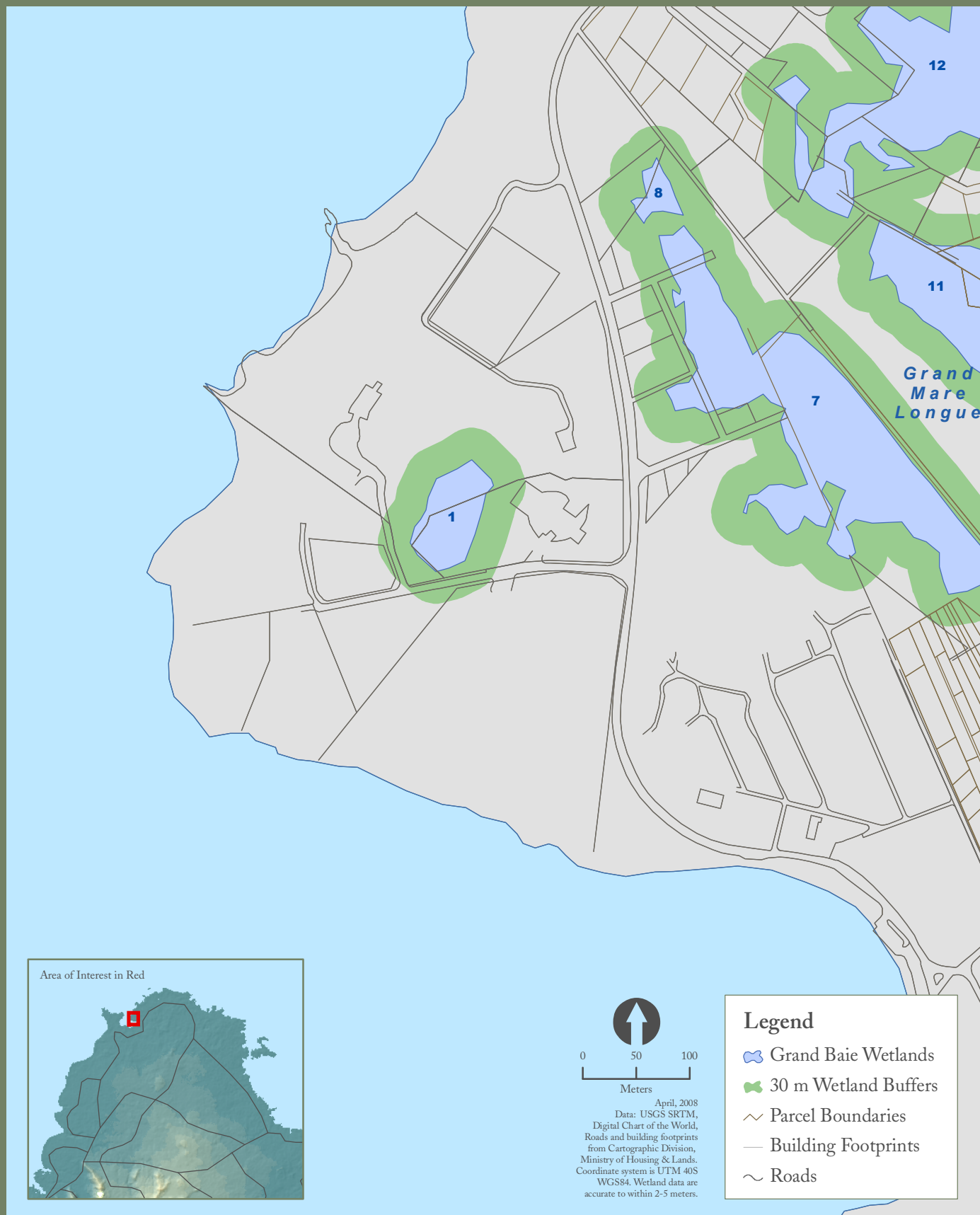
# Grand Baie Wetland Survey

Northern Extent, Part 1 of 2



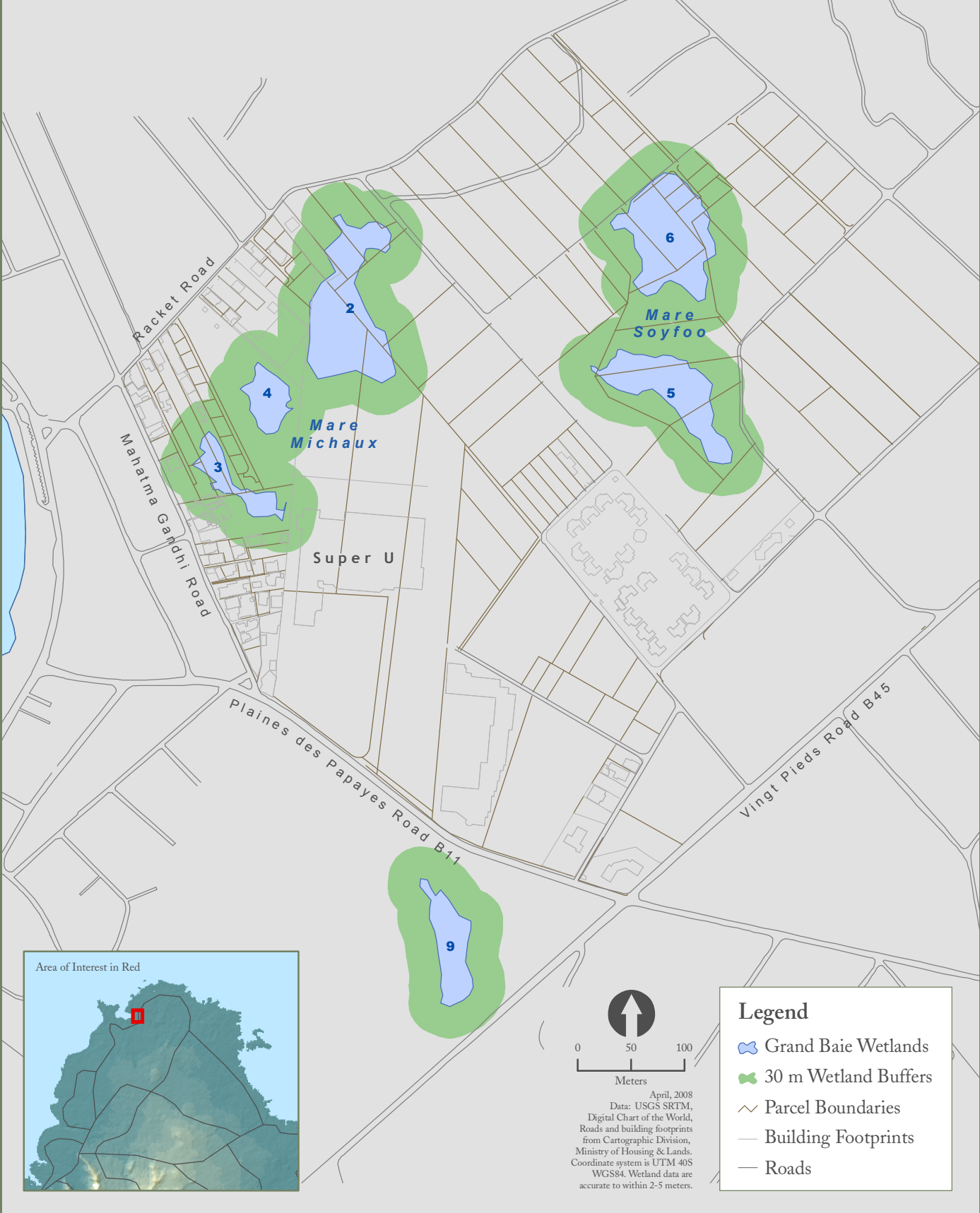
# Grand Baie Wetland Survey

Northern Extent, Part 2 of 2



# Grand Baie Wetland Survey

Southern Extent



# Grand Baie Wetland Survey:

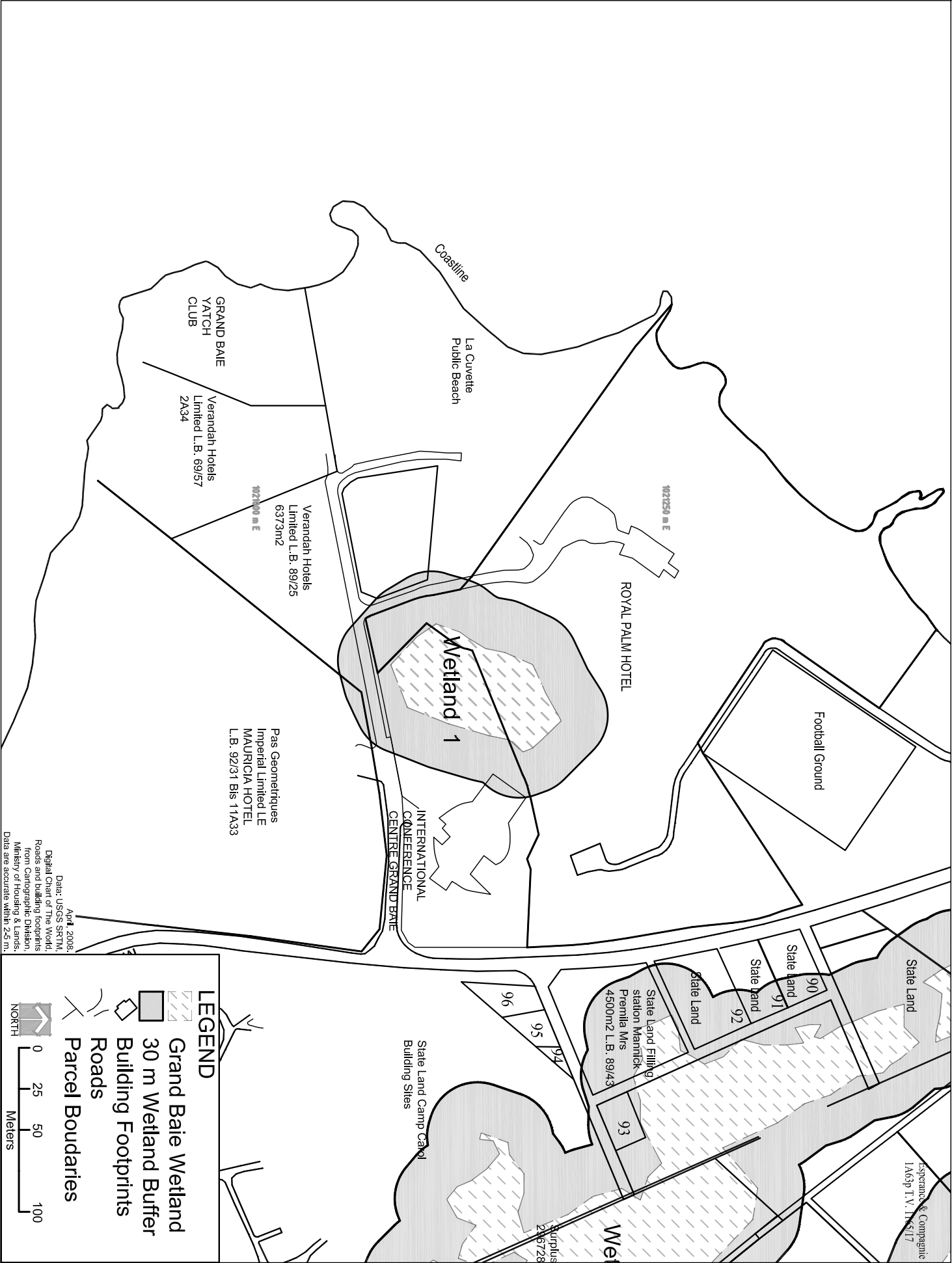
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S/N	Owner	Extent (arpent / m²)
1	Seewochurn Jugdis	686m2
2	Oodhan Dharamraj	686m2
3	Seewochurn Jugdis	686m2
4	Ramgothee Mahendra	686m2
5	Giannotti alan Lloyd	686m2
6	Seewochurn Jugdis	442m2
7	Busgeeth Sunkumath	254m2
8	Dookarun Coontee	343m2
9	Gookooluck Sunilduth	343m2
10	Seewochurn Jugdis	686m2
11	Seegoolam Veenaye & Jaysing	686m2
12	Burahee Hassem	2616.95m2
13	Burahee Beebee shaberah	1368.86m2
14	Edoo Abdool Latiff	1332.5m2
15	Burahee Beebee Taherah	2701.37m2
16	Burahee Bibi Saherah	2638.06m2
17	Burahee Swaley	2680.27m2
18	Burahee Hassen	593.05m2
19	Bundhun Mohammad Salim	509.85m2
20	Aumjeedally Mahmad Sidick	502.6m2
21	Burahee abdool Anwar	528.3m2
22	Burahee Anwar	523m2
23	Cassim Laila	4220.9m2
24	Kullup Mooneea	7175.51m2
25	Luchmunpersad Peewantee	2321.49m2
26	Kadayer Mahmad Rafeek	2427.01m2
27	Kadayer Mahmad Rafeek	2427.01m2
28	Gengadu Atchamah	3292.28m2
29	Jhumun Indranund	3292.28m2
30	Ghanty Anwar abdool Hamid	320m2
31	Yadallee Mohammad Shameer	320m2
32	Keenoo Abdool Taleb	320m2
33	Ruhomally Farook	320m2
34	Beegun Nazruddin	285m2
35	Moothoor Ambika	270m2
36	Thacoor Prialh	288m2
37	Noormamode Naguib	288m2
38	Goonah Abdool Rashid	358.78m2
39	Auleear Osman	534.36m2
40	Dooke Seewoochan	1329.58m2
41	Cie Technocom Limited	0A46 9/10
42	Cie Technocom Limited	0A47 1/2
43	Cie Technocom Limited	1750m2
44	Koosanny Jeekaria	4811.81m2
45	Poisson Willy	0A23.90p
46	De Rosnay Desire Gerard Jacques Fromet	0A17.60p
47	De Rosnay Desire Gerard Jacques Fromet	0A20.10p
48	Chithahal Goolam Farook	0A20.90p
49	Lot 92 Morc. Swan	0A51.90p
50	De Rosnay Desire Louis Jean Paul Fromet	0A64.70p
51	Sonoo Luximon	0A17p
52	Vithilingum Shomousoondrum Pillay	0A15.70p
53	Joomun Meean Farook	0A15.70p
54	Toulet Philippe Gerard	0A15.20p
55	Lew Yew Pha Jean Marie	0A18.10p
56	Societe du Nord	0A24.40p
57	Chung Kiong Kow Roland	0A18.80p
58	Leong Son Luc Patrick	0A15.70p
59	Chung Fat Michel	0A15.70p
60	Lot 79 Morc. Swan	0A15.70p
61	Mathieu Gerard Marcel	0A15.10p
62	Lim Yin Jimmy	0A15.30p
63	Soong Fat Ah Koon Henry	0A15.70p
64	Lot 73 Morc. Swan	0A15.70p
65	Ducasse Emile Guy Cyril Marcelin	0A15.70p
66	Societe Clofran	0A15.70p
67	Xavier Lucien Joseph Gilbert	0A17.70p
68	Law Yee Chin Roland Eugene	0A17.60p
69	Lot 69 Morc. Swan	0A17.60p
70	Sooben Radhakrishnan	0A17.20p

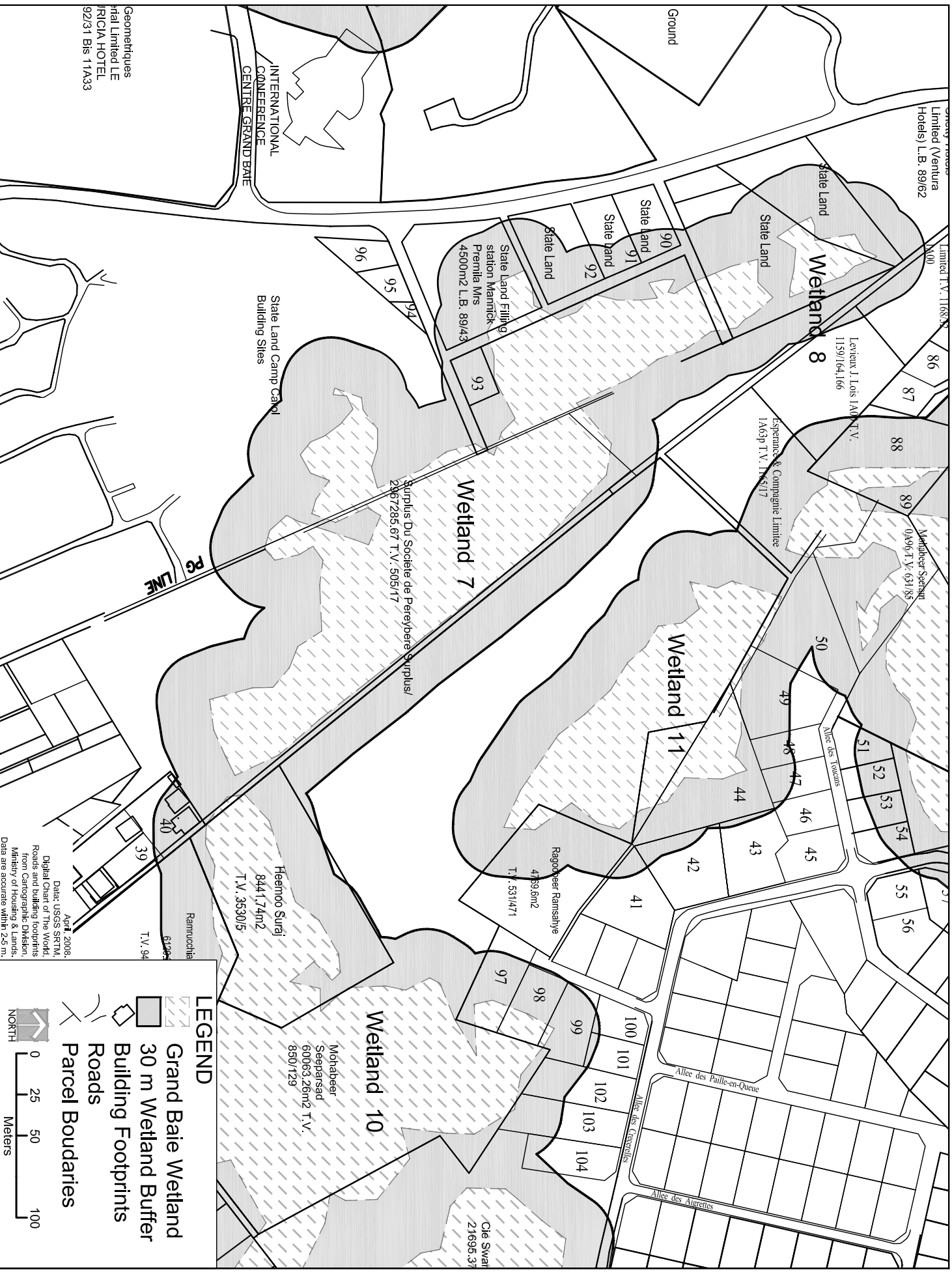
S/N	Owner	Extent (arpent / m²)
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71	Ganoo Alan	0A17.20p
72	Moossun Mohamed Eshan Said & Others	0A17.60p
73	Rambocus Chintaman	0A14p
74	Poirier Desire Lucien Robert	0A19.90p
75	Lot 58 Morc. Swan	0A20.50p
76	Margeot Marie Joseph Yves	0A15.70p
77	Felicite Marie Rosmay Benjamine	0A35p
78	L'Homme Alain Charles Mrs	0A73p
79	Antelme Leopold Edouard Mrs	3842m2
80	Dalais Marie Guy Robert Rey	3842m2
81	Wong Tong Chung	2A10.05p
82	Paturau Hector Roger France Mrs	0A74.65p
83	Baissac Gabriel Jean Claude	0A23.30p
84	Wiehe Henri Hyacinthe Geoges Mrs	2165.39m2
85	Rousset Marie Jean François Bernard	2355.08m2
86	Rousset Henri Joseph Jean François	635m2
87	Desvaux de Marigny Arnaud Fernand Maxime Mrs	635m2
88	Rousset Marie Michel Patrice	3583.94m2
89	Wong Tong Chung	0A24.50p
90	Onix Enterprise (Store 2000)	1120m2
91	Attraction Limited	600m2
92	Compagnie La Case Rodriguaise Ltd	2110m2
93	Auckloo C	600m2
94	Capiron Ignace	190m2
95	Veerapen Armoogum	330m2
96	Jewelry,Arts & Crafts Limited	800m2
97	Swan Properties Ltd.	0A36.7p
98	Swan Properties Ltd.	0A27.3p
99	Swan Properties Ltd.	0A78p
100	Jean Maurice Roger Julienne	0A15.8p
101	Swan Properties Ltd.	0A16.9p
102	Renganaden Soopramanien	0A91p
103	Swan Properties Ltd.	0A35.6p
104	Swan Properties Ltd.	0A28.4p



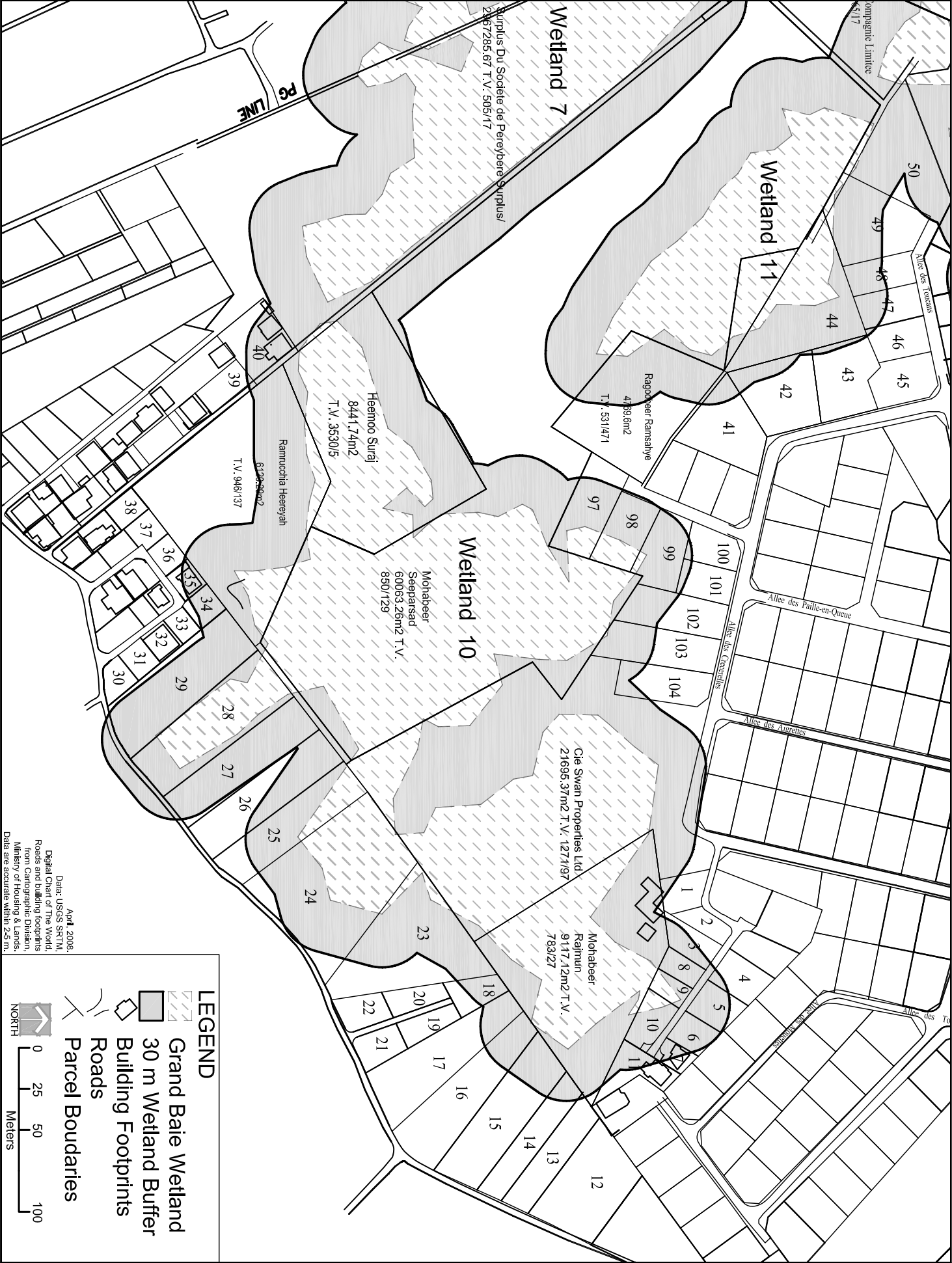
# Grand Baie Wetland Survey: Wetland 1 Property Ownership (North Extent)



# Grand Baie Wetland Survey: *Wetland 7 Property Ownership (North Extent)*

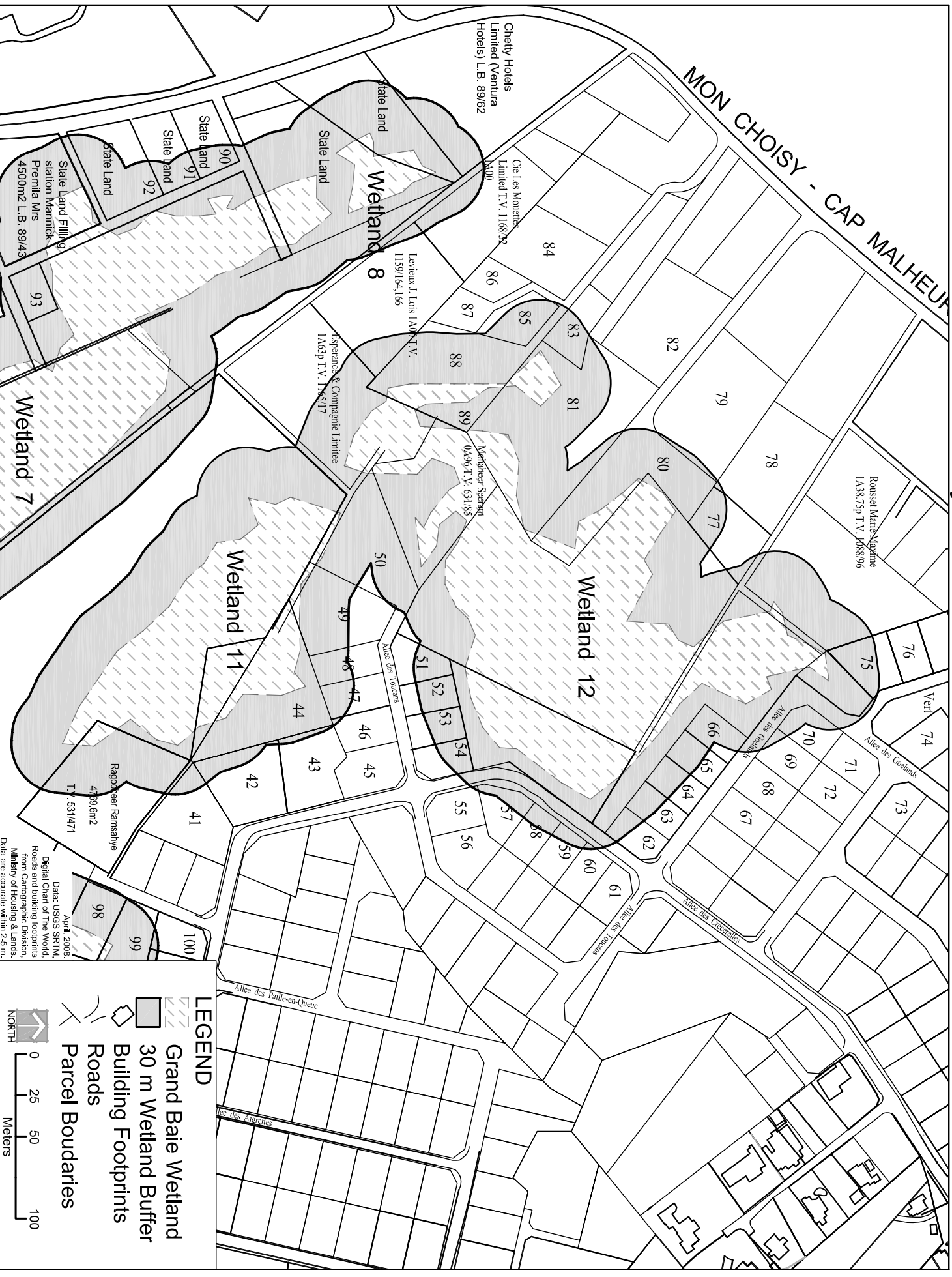


# Grand Baie Wetland Survey: Wetland 10 Property Ownership (North Extent)





## Grand Baie Wetland Survey: Wetlands 12, 11, 8 Property Ownership (North Extent)

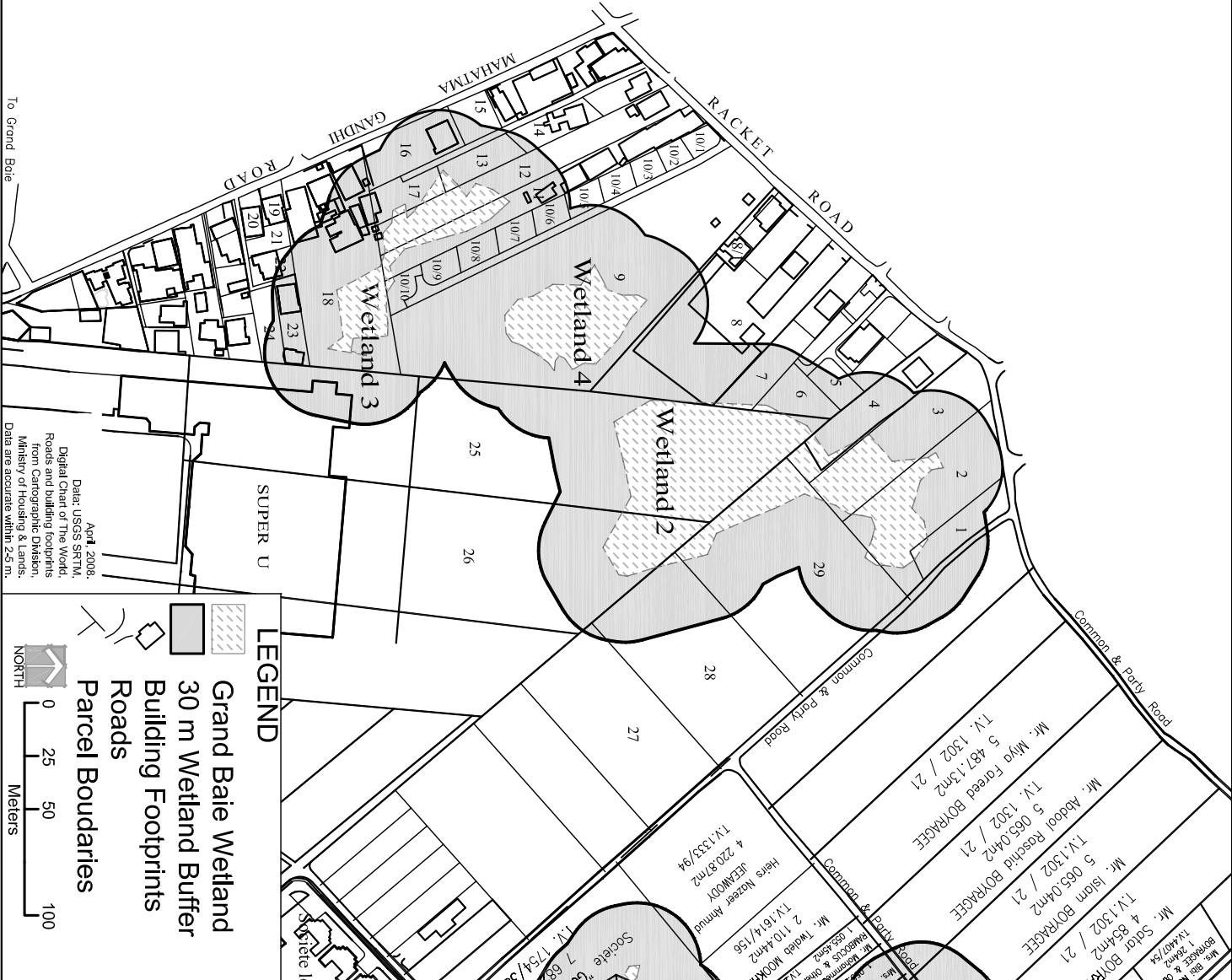


# Grand Baie Wetland Survey:

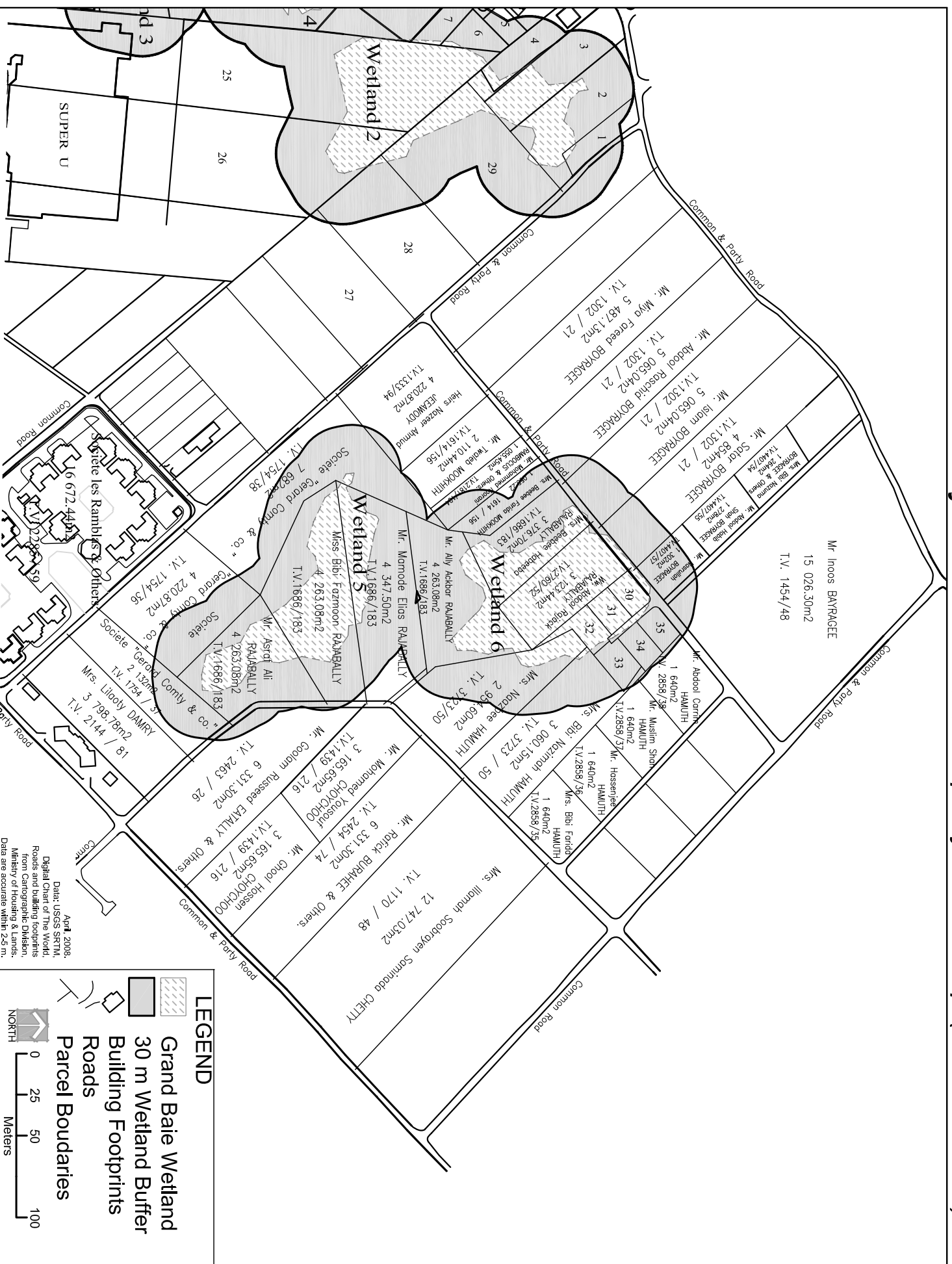
## *Property Owners South Extent*

No.	NAME OF OWNER	EXTENT (m <sup>2</sup> )	T.V No
1	Mr. Mohammad Ehsaan TOOFANNY & Others.	718.00	2401 / 38
2	Mrs. Bibi Sadeka EMAMBUX	3 503.33	1910 / 19
3	Mr. Issop DAMREE	2 110.44	1120 / 32
4	Mr. Mahomed Bhaye JOOSUB	1 266.26	1897 / 48
5	Mrs. Anourpattee RUGHONAUTH	317.40	3528 / 30
6	Mr. Soodaramdeo RUGHONAUTH	580.40	3528 / 30
7	Mr. Soubouwondeo RUGHONAUTH	580.40	3528 / 30
8	Mr. King On Leung Pah Hang	3 925.30	1781 / 8
8/1	Mr. Rajendra Kumar DURGA	169.00	3271 / 14
9	Mr. Ragoonundun SUMRAH	10 214.50	1808 / 97
10/1	Mr. Ramnarain MOOTHOR	586.13	1629 / 112
10/2	Mr. Sunilduth MOOTHOR	203.15	5520 / 19
10/3	Mr. Dewantee MOOTHOR	222.90	5520 / 19
10/4	Mr. Camla MOOTHOR	219.00	5520 / 19
10/5	Mr. Dhanwantee MOOTHOR	244.00	5520 / 19
10/6	Mr. Sohunlall MOOTHOR	228.85	5520 / 19
10/7	Mr. Amarnath MOOTHOR	227.85	5520 / 19
10/8	Mr. Mohunlall MOOTHOR	233.35	5520 / 19
10/9	Mr. Renukha MOOTHOR	242.30	5520 / 19
10/10	Mr. Sookunlall MOOTHOR	245.55	5520 / 19
11	Mr. Goorduth AGADOO	1 941.60	540 / 183
12	Mrs. Rajawantee CHUMMUN	1 983.81	1895 / 90
13	Mr. Nund Kishore NEERMAULL & Others.	440.00	4457 / 7
14	Mr. Lutchmee Narain CHUMMUN	569.82	1532 / 83
15	Mrs. Poolmutee RUGHONAUTH	411.53	1529 / 97
16	Mr. Premnath SOOPHUL	854.73	1590 / 23
17	Mrs. Chenarakala NEERMAULL & Others.	Solde 1 097.42	4457 / 7
18	Mr. Patee RAGOONATH	4 136.45	573 / 193
19	Mrs. Marie Veronique SAB	200.98	3526 / 60
20	Mr. Serge Gabriel SAB	278.26	3526 / 60
21	Mr. Jean Clifford SAB	308.52	3526 / 60
22	Mr. Jules Clement SAB	268.26	3526 / 60
23	Mrs. Marie Guilmette SAB	403.26	3526 / 60
24	Mrs. Marie Stella COMPASSIE	444.38	3526 / 60
25	Mr. Francois Philippe Barazer DE LANNURIEN	21 104.04	3907 / 72
26	Societe De Cepage	20 139.88	3910 / 62
27	Mr. Saherab KHODABUCCUS & Others.	4 094.37	4357 / 2
28	Mr. Patrick YEONG FONG TSIN SA AH VI & Others.	4 727.37	3627 / 18
29	Mr. Abdool Ahad DAMREE	5 402.71	1730 / 70
30	Mrs. Bibi Khairun Nesha RAJABALLY	373.35	3521 / 18
31	Mr. Nazim RAJABALLY	394.95	3521 / 18
32	Mrs. Bibi Aziza RAJABALLY	495.80	3521 / 18
33	Mr. Hassenjee RAJABALLY	373.35	3521 / 18
34	Mr. Abdass Salam RAJABALLY	394.95	3521 / 18
35	Mr. Adil RAJABALLY	485.35	3521 / 18
36	Mr Kritadeo RAMDASS	326	5389 / 57
37	Kcematee RAGOOBARSING	288.20	5569 / 70
38	Bibi Faroza MONEBAHAL	290.60	5420/ 57
39	Mr Nasser MOORADUN	292.40	5687/ 47
40	Mr Mohammad Reshad CHUMROO	294.60	6164 / 14
41	Mr Shariff RUMMUN	294.60	5949 / 54
42	Mr. Mohammad Reza NATHUDKHAN	298	5791 / 34
43	Mr. Mohammad Reza NATHUDKHAN	299.30	5791 / 34

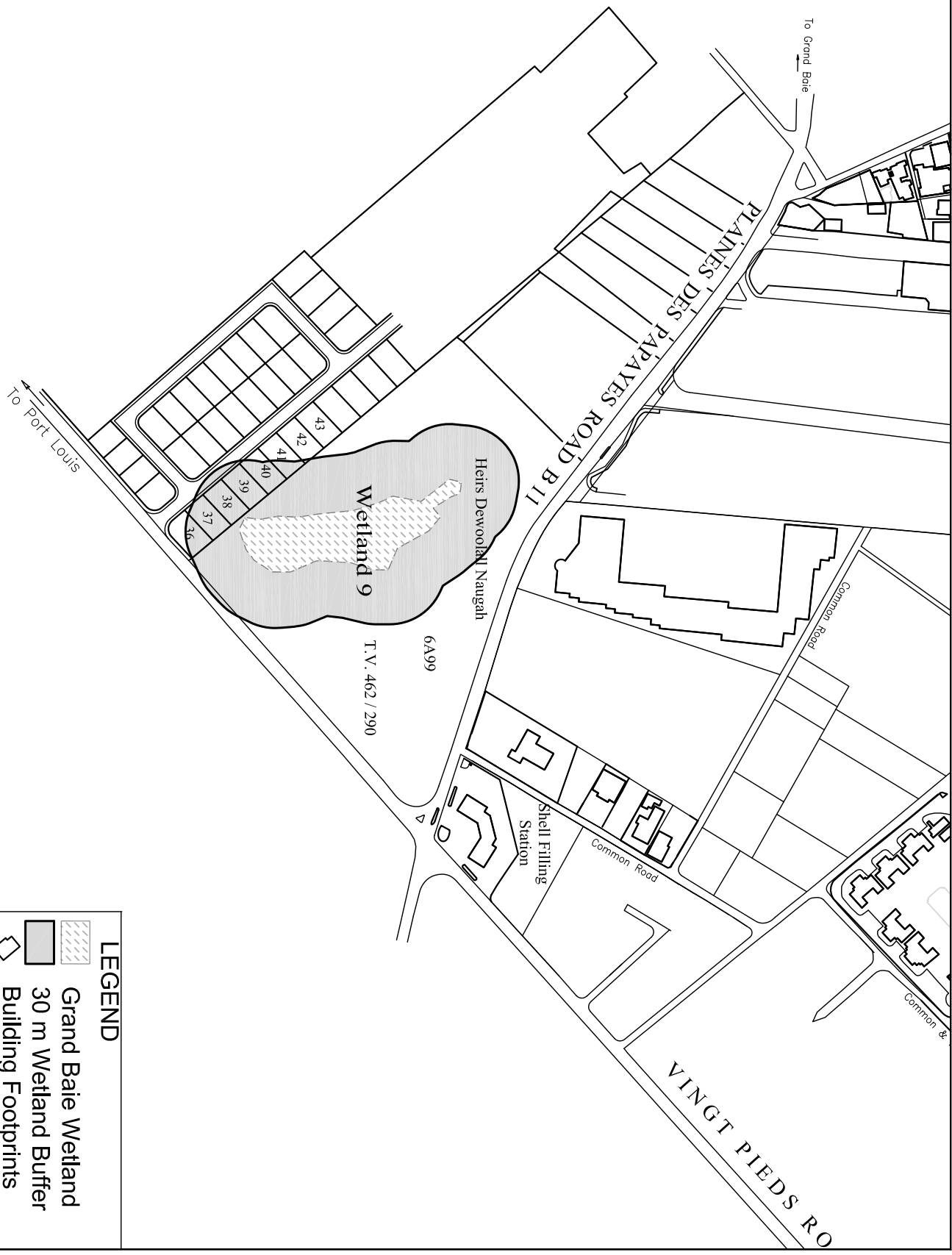
# Grand Baie Wetland Survey: Wetlands 2,3,4, Property Ownership (South Extent)



## Grand Baie Wetland Survey: Wetlands 5, 6, Property Ownership (South Extent)



# Grand Baie Wetland Survey: Wetland 9 Property Ownership (South Extent)



**LEGEND**

- Grand Baie Wetland
- 30 m Wetland Buffer
- Building Footprints
- Roads
- Parcel Boundaries

NORTH

0 25 50 100  
Meters

April, 2008.  
Data: USGS SRTM,  
Digital Chart of The World,  
Roads and building footprints  
from Cartographic Division,  
Ministry of Housing & Lands.  
Data are accurate within 2-5 m.



## **APPENDIX D**

### **List of Flora Species Identified in Grand Baie Wetlands**





Family	Species	Common name	Origin	IUCN	GB_1	GB_2	GB_3	GB_4	GB_5	GB_6	GB_7	GB_8	GB_9	GB_10	GB_11	GB_12
Acanthaceae	<i>Asystasia gangelica</i> (L.) T. Anders. ssp. <i>gangelica</i>	Herbe pistache	Alien		x	x	x	x	x	x	x			x	x	x
Acanthaceae	<i>Thunbergia laevis</i> Nees	Liane toupie	Alien		x	x				x	x	x	x	x	x	x
Agavaceae	<i>Furcraea foetida</i>	Aloes	Alien		x				x	x						
Aizoaceae	<i>Sesuvium ayresii</i> Marais		Native	LC	x				x	x	x					
Aizoaceae	<i>Trianthema portulacastrum</i>	Brede cacyanga	Alien		x				x	x	x			x		
Amaranthaceae	<i>Achyranthes aspera</i>	Herbe sergent	Alien		x	x	x	x	x		x			x		
Amaranthaceae	<i>Alternanthera sessilis</i> (L.) DC.	Brede emballage	Alien		x	x	x					x	x			
Amaranthaceae	<i>Amaranthus dubius</i>	Brede malabar	Alien		x				x		x					
Amaranthaceae	<i>Amaranthus spinosus</i>	Brede malbar piquants	Alien		x								x	x		
Araceae	<i>Spirodela punctata</i> (G. F. W. Meyer) Thompson	Lentille d'eau	Native	DD	x											
Araceae	<i>Typhonodorum lindleyanum</i> Schott	Via	Alien			x										
Araceae	<i>Colocasia esculenta</i>	Songe	Alien		x								x	x		
Araceae	<i>Phoenix dactylifera</i> L.	Dattier	Alien									x				
Araceae	<i>Typhonodorum lindleyanum</i>	Via	Alien		x	x			x		x	x	x	x		
Asclepiadaceae	<i>Cynanchum calliatum</i> Buch. - Ham. ex Wight et Arn.	Ipeca sauvage	Alien				x									
Asteraceae	<i>Ageratum</i> sp.										x					
Asteraceae	<i>Bidens pilosa</i> L.	Herbe villegague	Alien		x	x		x			x			x		
Asteraceae	cf. <i>Mikania micrantha</i> Kunth	Liane margoze	Alien		x	x	x	x	x	x	x	x	x	x	x	x
Asteraceae	<i>Chromolaena odorata</i> (L.) R. M. King et H. Robinson		Alien		x	x	x	x	x	x	x	x	x	x	x	x
Asteraceae	<i>Coryza canadensis</i>	Herbe gandia	Alien		x	x		x		x				x		
Asteraceae	<i>Coryza sumatrensis</i> (Retz) E. H. Walker	Herbe gandia	Alien							x						
Asteraceae	<i>Eclipta prostrata</i> (L.) L.		Alien										x			
Asteraceae	<i>Parthenium hysterophorus</i> L.	Herbe blanche	Alien								x					x
Asteraceae	<i>Senecio confusus</i>	Flame vine	Alien		x									x	x	
Asteraceae	<i>Sonchus</i> sp. (juvenile plant)	Lastron	Alien										x			
Asteraceae	Unidentified ornamental species		Alien												x	
Asteraceae	<i>Vernonia cinerea</i> (L.) Less	Ayapana sauvage	Cryptogenic	LC					x							
Basellaceae	<i>Basella alba</i>	Brede Gandolle	Alien											x		
Bignoniaceae	<i>Spathodea campanulata</i>	Tulipier du Gabon	Alien		x						x					
Boraginaceae	<i>Cordia curassavica</i> (Jacq.) Roem. et Schult.	Herbe condé	Alien		x	x	x	x	x	x	x	x	x	x	x	x
Boraginaceae	<i>Cordia myxa</i>	Bois savon	Alien		x					x		x				
Boraginaceae	<i>Hilsenbergia petiolaris</i>	Bois pipe	Native		x					x		x				
Cactaceae	<i>Hylocereus undatus</i>	Raquette de France	Alien		x							x				
Cannaceae	<i>Canna indica</i>	Canna	Alien		x							x			x	
Chenopodiaceae	<i>Chenopodium album</i> L.	Epinard sauvage	Alien					x								
Cleomaceae	<i>Cleome viscosa</i> L.	Brede Caya	Alien		x		x					x		x	x	
Combretaceae	<i>Terminalia catapa</i>				x	x			x		x	x		x	x	x
Combretaceae	<i>Terminalia mantaly</i>		Alien													
Commelinaceae	<i>Commelina benghalensis</i> L.	Herbe aux cochons	Cryptogenic	LC	x	x	x		x		x	x			x	x

[illegible]

[illegible]

[illegible]