

### 3.0 Southgate Watershed

This section summarizes baseline information specifically for the Southgate Watershed and includes a description of the unique watershed features, a summary of existing water quality conditions, descriptions of potential restoration sites investigated during field assessments, and neighborhood descriptions. Table 3.1 summarizes basic watershed features.

Appendix A contains a basemap of the Southgate watershed depicting locations of water quality impairments, roads, hydrology, topography, and potential restoration sites.

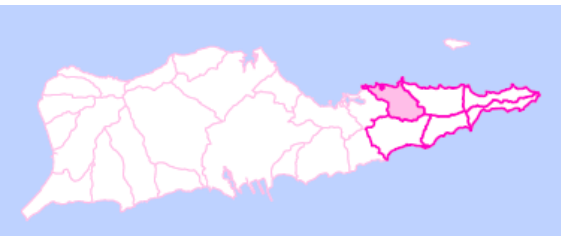
#### 3.1 General Description

The Southgate watershed is the northwestern-most of East End watersheds, is the closest to Christiansted, and contains the Southgate Pond—one of the largest salt ponds and ecologically significant habitats in the USVI (Figure 3.1). The Southgate Pond/Chenay Bay area was designated in 1979 and officially established in 1991 as an Area of Particular Concern (APC) and an Area of Preservation and Restoration (APR). It was also designated as a Significant Natural Area in 1982. The APC/APR extends from Shoy’s (Punnett Point) to Pull Point, including Green Cay National Wildlife Refuge, Southgate Pond’s eastern avian habitat, and the recreationally important Chenay Bay.

The Green Cay Marina at Tamarind Reef was created in the 1960’s on the western portion of the Pond by a constructed embankment. There are two primary guts draining the watershed: the West Gut, which discharges into Southgate Pond; and the East Gut, which discharges between the Chenay Bay Resort and the Southgate Reserve (Figure 3.2). Average rainfall is 35 in/yr.

The main roads in the watershed are the East End Rd. (Rt. 82), which runs east/west along the northern coast, and South Shore Rd. (Rt. 60), which is the main north/south corridor. The central portion of the watershed is relatively flat and consists mostly of large parcels of

**Table 3.1.** Watershed Summary

	
<b>Drainage area<sup>1</sup></b>	1,398 acres; 2.2 sq miles
<b>Length of guts<sup>2</sup></b>	3.79 miles
<b>Road length<sup>2</sup></b>	16.4 paved miles; 4.2 unpaved miles
<b># Road culverts<sup>2</sup></b>	27 mapped culverts
<b>Impervious Cover<sup>3</sup></b>	126 acres; 9% of watershed
<b>Dominant land use %<sup>4</sup></b>	Undeveloped: 50%
	Ag: 24%
	LDR: 22%
<b>Area within 100-yr floodplain<sup>5</sup></b>	546 acres; 39% of watershed
<b># Small ponds<sup>4</sup></b>	9 (does not include Southgate Pond)
<b># Mapped wells<sup>6</sup></b>	22
<b>Watershed erosion potential<sup>7</sup></b>	Vulnerability: Med-High
	Road-based: Med-High
	Mean Relative: High
<b>2010 WQ Impairments<sup>8</sup></b>	4 of 5 assessment units listed as impaired (turbidity, bacteria, DO); 2011 TMDL priorities
<sup>1</sup> IRF/UVI/USGS 2001 watershed boundaries <sup>2</sup> HW revised/or created, 2011 <sup>3</sup> NOAA CSC, CCAP data, 2005 <sup>4</sup> UVI-CDC data 2003 (land use) and 2001 (ponds) <sup>5</sup> DPNR, dated 2005 <sup>6</sup> Received from DPNR Feb, 2011 <sup>7</sup> WRI/NOAA, 2005 <sup>8</sup> DPNR, 2010 Integrated Waters Report	

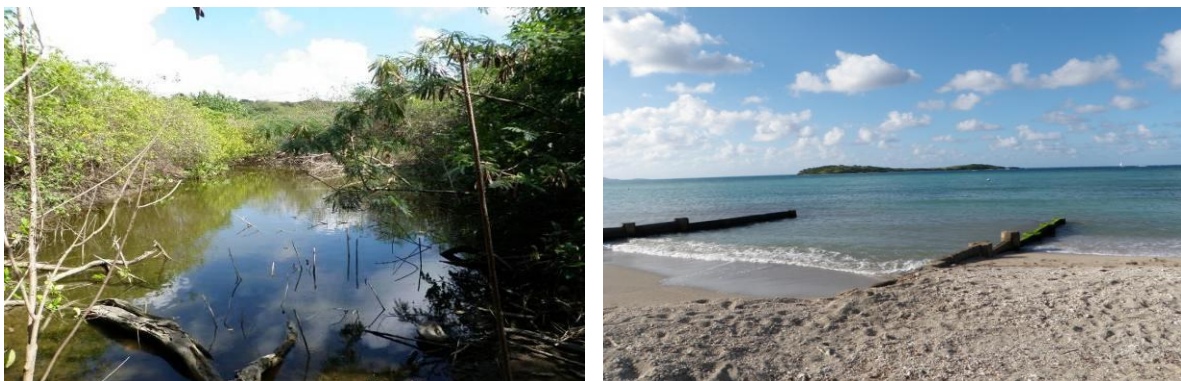
undeveloped pasture land, some of which has been subdivided or planned for future development, and low density residential neighborhoods. The southern and eastern boundaries of the watershed are more mountainous. Seven of nine small impoundments in the watershed are associated with pasture land—the other two are found at Plantation Condos and in the Tipperary area.

### Land Use

There are several single family neighborhoods in the watershed: All for the Better and Tipperary; Seven Hills; Parara; a portion of Union & Mt. Washington; Southgate Farm/Anna's Hope, and a portion of Punnett Bay (Shoy's). There are two multi-family condominiums: Southgate Condos and the Plantation. Commercial properties of interest include Cheeseburgers, the Seven Seas Water Supply Company, Chenay Bay Resort, Tamarind Reef, and the businesses at the Green Cay Marina. The Southgate Baptist Church is also a watershed landmark. Like the rest of the East End, there are no central sewer lines located in the watershed; therefore residential and small commercial areas rely on individual on-site septic systems, with small package plants used at resorts and condos. Cheeseburgers shares a wastewater system with the Southgate Condos.



**Figure 3.1.** Southgate Pond and Reserve, an ecologically sensitive wildlife area managed by the St. Croix Environmental Association.



**Figure 3.2.** East gut below East End Rd. culvert (left) and at the discharge location between the Chenay Bay Resort and Southgate Pond (right). Green Cay NWR can be seen in the distance.

### Water Quality

Of the five water quality assessment units associated with this watershed, four are listed by the USVI DPNR as impaired in the 2010 Integrated Waters Report (DPNR, 2010). Three of the impairment areas are designated as high priorities for development of a Total Maximum Daily Load (TMDL) in 2011 (Table 3.2).

**Table 3.2:** Water Quality Impairments (derived from DPNR, 2010)

Assessment Unit ID/Name	Monitoring Stations	Impairment	Source of Impairment	TMDL (Priority)
VI-STC-33 Punnett Bay	VI610321 Shoy's	Turbidity	Land Development, Erosion and Sedimentation	Low/2020
VI-STC-34 Punnett Point, East	None	(N/A)	(N/A)	(N/A)
VI-STC-35 Tamarind Reef Lagoon (Southgate Lagoon)	STC-4 Tamarind Reef Lagoon	Dissolved Oxygen, Fecal Coliform, Secchi Depth, Turbidity	unknown	High/2011
VI-STC-36 Green Cay Beach	VI563397 Chenay Bay Beach	Turbidity	Package Plants (Small Flows), Erosion and Sedimentation	High/2011
VI-STC-37 / Southgate subwatershed, offshore	STC-5 Green Cay Beach	Dissolved Oxygen, Fecal Coliform, Enterococci, Turbidity	Marina Boat Maintenance, Marina/Boating Sanitary On-vessel Discharges, Non-Point Source Discharges	High/2011

### 3.2 Potential Watershed Restoration/Project Sites

A number of sites were identified by project partners, local residents, and field assessment teams as potential sources of pollution or as drainage improvement opportunities. Table 3.3 summarizes candidate projects to be considered during the watershed planning process. A more detailed description of existing conditions and potential opportunities at these sites is provided below.

**Table 3.3.** Summary of Candidate Restoration/Project Sites

Project ID/Site Name <sup>1</sup>	Description	Initial Ranking
<b>Gut/Pond Restoration</b>		
East Gut-Adam's Family Farm (SG-G-2)	Active head cut and channel erosion, potentially a significant source of sediment loading to receiving waters; threat to property and infrastructure.	High
Southgate Pond/Reserve (SG-1)	SEA has a project to raise the embankment, expand pond and restore wetlands. Also potential construction of permeable parking lot and drive.	High

Project ID/Site Name <sup>1</sup>	Description	Initial Ranking
West Gut-Schuster (SG-G-3)	Gut stabilization project previously evaluated by North Carolina State University; appears relatively stable now.	Low
West Gut/behind Cheeseburger's (SG-G-1)	Small area upstream of culvert for bank stabilization to protect infrastructure and private property	Low
<b>Road Improvements</b>		
Seven Hills Rd. and Gut (SG-RC-22)	Address gut erosion by installing roadside swales, drain inlet, and stabilize outlet structure	Low
<b>Stormwater Retrofits/Pollution Prevention</b>		
Green Cay Marina (SG-R-3)	Retrofits to capture and treat polluted parking lot runoff; dumpster management	High
Chenay Bay Retrofits(SG-R-20)	Retrofit parking lot, restaurant, and trash cleanup	High
Green Cay Marina/Road (SG-R-4)	Retrofit to improve drainage and provide treatment along main road; highly visible	Medium
Tamarind Reef/Road (SG-R-5)	Retrofit to improve drainage and provide treatment along main road; highly visible demonstration site at tennis court	Low
Southgate Baptist Church (SG-R-6)	Potential rain garden demonstration; tree planting	Low
Cheeseburger Parking lot (SG-R-1)	Potential to capture/treat parking lot runoff in front along ditch; highly visible location	Low
Southgate Condos (SG-R-2)	Small rain gardens to capture and treat parking lot runoff	Low
<b>Culvert Maintenance and Repair</b>		
East Gut/East End Rd. Culvert (SG-RC-21)	Blocked and deteriorating infrastructure; on DPW project list for replacement	High
South Shore Rd/Tipperary New Culverts (SG-RC-31/32)	New culverts installed with no stabilized outlet structure or erosion/sediment control, wetland encroachment. Stabilize site, provide water quality device, replant wetland buffer.	High
Cheeseburger culvert (SG-RC-1)	Complete blockage/crushed on downstream end of double 18" RCP in ditch in front of Cheeseburgers	Medium
Seven Seas Culvert (SG-RC-2)	36" CMP is failing/evidence of piping and is blocked at downstream end with vegetation	Medium
Seven Hills Culverts (SG-RC-7)	Ten culverts, all require basic maintenance; private roads	Medium
Crescent Beach Rd. Culvert (SG-RC-6)	an undersized 24"RCP culvert has caused erosion and bank failure of a gut; private road	Medium
Southgate Baptist Church/East End Rd. Culvert (SG-RC-20)	Clean out 15" RCP that is almost completely blocked	Low
South Shore Rd./ West gut culverts (SG-RC-4; SG-RC-5; SG-RC-30)	Culverts need basic vegetative maintenance and debris removal. There will be continued issues in locations where the gut crosses/parallels South Shore Rd., particularly if additional area in the subwatershed is developed.	Low
Southgate Farm Culverts (SG-RC-35/36)	Two small culverts blocked in residential area	Low
<sup>1</sup> ID matches basemap locations and field sheets in the Appendix.		

### *East Gut – Adams Family Farm (SG-G-2)*

The East Gut flows east to west, draining the hillside into a small farm pond on the Ridgeway property, which overflows and re-concentrates across the Adams Family Farm property before crossing under East End Rd. and discharging at Chenay Bay. A severely eroded headcut and highly incised section of the gut was observed beginning just west of the cattle and horse stables (Figure 3.3). The headcut spans approximately 20-40 feet in width and 10-15 feet deep, and consists of three main branches which point in north-easterly, easterly, and southerly directions. The Adams family reported that the headcut has moved upstream from the Schuster property boundary since the 1970s at an estimated rate of 10-15 feet per year, although a more rapid migration has occurred since September, 2010. The most significantly eroded section of the gut is approximately 1,500 feet in length and ends just down gradient of the Adams-Schuster property boundary. The gut is highly incised and full of debris (i.e., cars, appliances, roofing tin), which are remnants of unsuccessful attempts to slow bank erosion over the years. At the end of this reach, the gut appears to be in a more stable condition with minimal bank erosion and no obvious signs of incision. Much of the upstream eroded sediments have been deposited at this location. It should be noted that the east gut does not connect with the Schuster’s farm pond.

The Adams’ primary concern with the gut erosion is that it will soon bisect their property and prevent access. Evidence of sedimentation from gut erosion is observable at the culvert on East End Rd. The ultimate discharge location is into Chenay Bay, which is impaired for turbidity. Due to these concerns, this site is likely a high priority restoration site. There are a number of potential restoration designs that could be used here, including construction of a concrete headwall structure to stop headcut migration, in channel step-pool drop structures to stabilize steep grades, reconnection to floodplain to reduce erosive velocities, and redesign of a new channel.



**Figure 3.3.** Top of East Gut headcut (left) and debris remnants in incised channel (right)

### *East Gut/East End Rd. Culvert (SG-RC-21)*

After passing through the Adams’ property, East Gut flows to the north and crosses beneath East End Rd. through a three culvert drainage system. The primary culverts are twin corrugated

metal pipe (CMP) arches with a 57" span and 38" rise which are highly deteriorated, partially submerged, and partially obstructed with detritus. There is a third 18" reinforced concrete pipe (RCP) culvert that appears to be a more recent installation than the twin CMPs. The invert of this culvert is at a slightly higher elevation than the others. Upstream of the culvert headwall, a thick layer of deposited fine sediments was observed. It is likely that flow restriction has caused eroded sediment from the Adams' property to fall out of suspension at this location. Sediments that do pass through the culvert system may be a significant portion of the sediment affecting Cheney Bay. Downstream is a large scour hole and sediment deposition. Deterioration of the headwalls, sinkholes between the road and headwalls, and damaged/loose guardrails were observed. The DPW identified this culvert as the next one scheduled for replacement in the East End, in a similar fashion to the one on the West gut behind Cheeseburgers. Culvert replacement at this location can have a significant impact on the stability of the East gut by establishing grade control and should be designed in combination with gut restoration activities.

### *Southgate Pond Preserve*

According to the St. Croix Environmental Association, there are a number of restoration activities being pursued at the Preserve including: 1) Raising the existing embankment which separates Southgate Pond from the marina, 2) removing the existing building near East gut, and 3) installing permeable pavers on the entrance road and relocated parking area (Figure 3.4). Raising the embankment is intended to increase capacity of the pond and help expand fringing vegetation and associated habitat. Reconnecting the floodplain of the East gut on the Preserve property may also be a restoration opportunity.



**Figure 3.4.** Standing water in the current road/parking area (left); the embankment (right).

### *Chenay Bay Hotel (SG-R-20)*

The Cheney Bay Hotel is a 50 unit, beachfront hotel comprised of small, detached housing cottages connected by paved paths. The resort includes a restaurant, package wastewater treatment plant and disposal area, onsite well for drinking water, paved parking lot, swimming pool, and tennis courts. The existing wastewater system, which is supposed to be a sequencing

batch reactor, handles 2,000-5,000 gpd and has been modified over the years and is currently inadequate. It is in the process of being upgraded (i.e., extended aeration, new pumps and blowers, upgraded float system, raised electric) to meet Biological Oxygen Demand (BOD) and solid removal requirements. The resort lacks significant drainage infrastructure, except for a newly installed culvert and concrete swale near the restaurant. Unlike many buildings on St. Croix, the roofs are not connected to rainwater cisterns. The general topography of the resort is moderate to steep. The only roadway is the access road from East End Rd. which is paved.

The wastewater system, parking lot, and lawns directly abut the East gut, and in some cases are within 25-feet from the wetland resource. There is a lot of trash and debris in the wetland. Very little erosion was found at the site; however, two locations for potential stormwater retrofits were identified including at the paved parking lot and near the restaurant, as well as trash and buffer management recommendations (Figure 3.5).



**Figure 3.5.** Two locations to capture and treat stormwater runoff (top); active upgrade of wastewater system (bottom, left); and trash/debris in adjacent wetland (bottom, right).

#### *South Shore Rd./Tipperary New Culverts(SG-RC-31/32)*

New culverts were recently installed along South Shore Rd. to assist in draining the saturated residential area from heavy rains and groundwater seepage. In both cases, a ditch was

excavated to expedite flow to the nearest gut/wetland. There was a missed opportunity to install water quality structures into the design, such as a sediment forebay or check dams. The outfall was not stabilized with riprap. Exposed soils, channel bottom, and sideslopes were not stabilized to prevent erosion. In addition, buffer vegetation was cleared up to the wetland boundary and no protective sediment barriers were installed to prevent sediment from migrating into the wetland vegetation (Figure 3.6).



**Figure 3.6.** Missed opportunity to demonstrate water quality designs and proper soil stabilization techniques at newly installed culverts.

#### *Seven Hills Road/Gut near Good Hope (SG-RC-22)*

A previously unmapped gut originates at a low point between the All for the Better and Seven Hills neighborhoods and flows into the Schuster property (Figure 3.7). The drainage area to this gut includes a portion of both neighborhoods, and the road draining here shows signs of degradation. Erosion gullies were present leading from the road into the gut with headcuts of approximately three feet deep. Minor bank erosion in the gut was also identified. The unnamed gut appeared stable beyond the confluence with the erosion gullies from the roadway, though it was not walked completely. Continued headcutting may eventually jeopardize the integrity of the road. Installation of concrete swales and dips, drop inlet, and stabilized outfalls from the road would help reduce gut erosion and road surface deterioration.



**Figure 3.7.** Road drainage from residential areas leading to gut erosion.



### *West Gut- Schuster Farm/South Shore Rd. Culverts (SG-G-3; SG-RC-4/5/30)*

The West gut flows from the south to the north while paralleling and crossing South Shore Rd. in a number of locations, flowing in and out of the Schuster Family Farm prior to emptying into a series of farm ponds south of East End Rd. Several bank failure locations along South Shore Rd were observed, which were likely the result of erosive flows downstream of road culvert crossings and in areas where the stream was channelized in association with the former road construction (Figure 3.8). There are a number of culverts along South Shore Rd. where the West gut was crossed; some are partially or significantly blocked with sediment and vegetative debris and will require active monitoring and repair over the long-term. Approximately 400 feet of gut within the Schuster property exhibited severe channel incision of 8-10 feet. Well established bank vegetation indicates that channel erosion may not be active and that this reach may not currently be a significant source of sedimentation. The gut empties into two farm ponds prior to reaching East End Rd., which serve as sediment traps. According to the owner, one pond was dredged in the 1980's and a large amount of sediment was removed. A restoration concept was developed by North Carolina State University and USDA-NRCS, but never implemented.



**Figure 3.8.** Well vegetated banks of west gut on Schuster's property (left) and example of on-going road repair and bank stabilization efforts along South Shore Rd. (right).

### *West Gut/East End Rd. Culvert (SC-RC-3; SC-G-1)*

The West gut crosses beneath East End Rd. near Cheeseburgers after passing through the Schuster farm and several condominium properties. The culvert was replaced three years ago with three, eight-ft by 8-ft concrete box culverts to alleviate flooding. The DPW reports this culvert was intentionally oversized to carry greater than the 25-yr storm. Some bank erosion was observed at the upstream end of the culverts which has resulted in a minor loss of property. A small-scale gut stabilization project could be designed here. There is a considerable amount of live vegetation at the upstream culvert end which may be limiting the available flow area and increasing velocities. Selective plant cutting and detritus removal may be an appropriate management strategy to improve flow conditions at this location; although,

there are habitat and water quality benefits of vegetation in guts and we would not recommend extensive clearing, particularly of canopy cover. Approximately three-five inches of deposited sediment was observed within all three culverts which may be a product of localized bank erosion.

*Cheeseburgers Restaurant Parking Lot and Culvert (SG-R-1, SC-RC-1)*

A popular local restaurant south of Southgate Pond, Cheeseburgers has a large gravel parking area that drains to the grassed roadside swales along East End Rd. that ultimately discharge through two small culverts under the street or directly to the West gut. The culverts under East End Rd. are completely blocked and crushed on the downstream end. When repaired, there is potential to easily retrofit the roadside swales to enhance water quality treatment, or to install a rain garden in the front corner of the parking lot to provide a landscaped stormwater demonstration, but these are low priorities. Drainage from the concrete pad under the dumpster appears to be causing minor erosion in the parking lot. Dumpster juice and other potential pollutants from the adjacent outdoor storage area may be coming into contact with stormwater (Figure 3.9).



**Figure 3.9.** Evidence of dumpster juice in stormwater runoff (left); location for swale enhancement to increase water quality treatment.

*Southgate Condos (SG-R-2)*

Adjacent to Cheeseburgers are the Southgate Condos. These units share a small wastewater treatment system that was installed within the last few years. The two open cells of the wastewater system separate the solids and provide for chlorination. The system should be covered. Effluent is stored in an adjacent pond, then spray-irrigated across the lawn area. A small channel was cut to improve drainage of saturated areas, with an ultimate discharge to the West gut from a white perforated pipe. The West gut has a narrow vegetated buffer, and bank sloughing was observed in one isolated area. This could be a remnant feature of back up conditions prior to culvert replacement; though it appears that erosion may still be active. This

could be a relatively minor bank stabilization effort using “soft” engineering practices. In addition, there are two open turf areas in the front and rear corners of the parking lot/drive aisles for the Condos where installation of a rain garden could be installed to capture and treat runoff (Figure 3.10).



**Figure 3.10.** (From top left to bottom right) Wastewater system, drainage channel and pipe, gut erosion, and potential location for a rain garden at the Southgate Plantation Condos.

### *Seven Seas Culvert (SC-R-2)*

Across the street from Cheeseburgers is the entrance drive to the Seven Seas Water Supply Company. The culvert under this driveway is a large, 36-inch corrugated metal pipe capturing a significant amount of drainage area. On inspection, it was noticed that there is pipe failure below the driveway (Figure 3.11).



**Figure 3.11.** Pipe failure evidenced in culvert.

### *Southgate Baptist Church (SG-R-6, SG-RC-20)*

There was no evidence of erosion in the gravel/grassed parking lots, around the basketball court, or along the site entrance. There are two large drain inlets in the lower parking lot that drain directly to the blocked/corroded culvert along East End Rd. (SG-RC-20). The lower parking lot sits above/behind a large concrete revetment along East End Rd. and appears to have been originally gravel, but now has extensive grass cover. Rooftop runoff is primarily collected in cisterns with the exception of a downspout at the entryway to the property, which could easily be converted into a demonstration rain garden (Figure 3.12). The Church could provide a convenient meeting location for watershed meetings. The area around the basketball court may be suitable for tree planting.



**Figure 3.12.** Drain inlet in lower parking lot (left); downspout to existing flowerbed that could be converted to a rain garden or collected for irrigation (middle); almost completely blocked culvert (right).

### *Green Cay Marina and Tamarind Reef Hotel (SG-R-3, SG-R-4, and SG-R-5)*

Green Cay Marina and the Tamarind Reef Hotel are located west of Southgate Pond and north of the Southgate Farm neighborhood. The hotel and marina occupy separate parcels but are run under the same corporate name and management personnel. Tamarind Reef is a 38 unit, beachfront hotel that is comprised of three main two-story housing structures. The resort includes a restaurant/bar, a package wastewater treatment plant and disposal area, several paved parking areas, a swimming pool, and tennis courts. Greywater is used to irrigate landscaping. The resort lacks significant drainage infrastructure which has contributed to standing water problems near the tennis court area.

Green Cay Marina is an active marina that contains 154 boat slips, about eight of which host 'live-aboard' residents, according to management. The marina provides a number of boater services including a refueling station, a sewage pump-out facility, and member washroom facilities. This marina does not provide boat maintenance and repair services. The marina is also host to a restaurant-dining facility. Employees are aware of, and able to quickly produce the marina Spill Prevention, Control & Countermeasure Plan. Field crews observed the oil spill containment measures at the refueling station. The paved parking lot has some drainage infrastructure including a drain inlet, piping, and a concrete flume that directs runoff to the marina/wetlands untreated. Poor runoff management from the docks at the southern section of the marina has contributed to an eroding embankment. Dumpsters located near the site

entrance were uncovered and contributing garbage to the adjacent wetlands. Standing water problems along the main road were described by marina administrative staff during the site visit. HW identified several retrofit locations at the marina facility and along the road to help with drainage problems and improve water quality. The proposed BMPs include a bioretention area, wet swales, oil-grit separators, dumpster management, and bank stabilization measures to reduce mass wasting at the marina docks (Figure 3.13).



**Figure 3.13.** (Top left to right) Areas for bioretention and oil grit separator, (middle left to right) dumpster management and bulkhead stabilization, and (bottom left to right) areas for road drainage improvements (SG-R4-5).

*Private/Neighborhood Culverts (SG-RC-6, SG-RC-35/36, Seven Hills)*

There are a number of private culverts that require maintenance in residential areas that are not the responsibility of DPW. In Punnett Bay, there is an undersized culvert at the northern end of the community that has caused erosion and bank failure of a gut (SG-RC-4). There are two culverts in Southgate Farm that are almost completely clogged (SG-35/36), and there were ten culverts in the Seven Hills neighborhood, all of which need basic maintenance (Figure 3.14).



**Figure 3.14.** Examples of collapse at road edge in the Punnett Bay area (left), and a completely clogged culvert in Southgate Farm/Anna’s Hope (right).

### 3.3 Neighborhood Summaries

A summary of general neighborhood conditions is provided below in order to identify which neighborhoods are likely to generate pollutants of concern, what the common sources are, and which areas/sources should be targeted for watershed stewardship activities. Unless otherwise noted, it is assumed that neighborhoods consist of single-family, detached residences, with cisterns, on-site septic systems, and open section/drainage roads (without curb and gutter). Table 3.4 is a comparative summary of each neighborhood, and more detail is provided below. Pollution source is determined by number of observed pollutants (1-2=Medium; >2 = High).

**Table 3.4.** Neighborhood Summaries

Name	Road/Driveway Condition	% Lots Un-developed	Pollution Source	Potential Stewardship Activities
Punnett Bay (Shoy’s)	Paved, Good condition	<25%	Med	Better lawn care/landscaping; on-lot demonstrations; culvert replacement
Southgate Farm/Anna’s Hope	Paved, Good condition	50%	Med	Better lawn care/landscaping; on-lot demonstrations; ROW retrofits
All for the Better/ Tipperary	Paved/ dirt; some deterioration	<25%	Med	Road drainage improvements; household hazardous waste; better lawncare/landscaping; gut buffer management; septics

Name	Road/Driveway Condition	% Lots Un-developed	Pollution Source	Potential Stewardship Activities
Seven Hills	Steep, paved roads in adequate condition	75%	Low	Culvert maintenance
Parara	Mostly unpaved	>50%	Low	Household hazardous waste
Mt. Washington (portion of Union & Mt. Washington)	Steep, Paved, good condition	>75%	Low	Trash cleanup; Single lot construction BMPs

### *Punnett Bay (Shoy's)*

Access to this neighborhood is granted through security gates at the Buccaneer Resort. The neighborhood is located directly west of Southgate Farm and consists of similar topography. One portion of the neighborhood is built in the hills and reaches elevations up to 200 feet. The second area is located near the ocean and is relatively flat. The parcels in the steeper terrain are one-half to three-quarter acres in size and are at least 75% developed. The parcels in the lowlands are larger one-acre parcels and also primarily developed. Most of the undeveloped parcels in the hills remain as forested land; whereas much of the area in the lowlands has been cleared and vegetated with grasses. The roadways are paved and most driveways are either paved or gravel. Some basic drainage infrastructure exists including paved swales, speed bumps, and culverts. Most of the roadways were in good condition, but an undersized culvert at the northern end of the community has caused erosion and bank failure of a gut (SG-RC-6).

### *Southgate Farm/Anna's Hope*

The Southgate neighborhood is a gated community located southwest of Southgate Pond on the way to the Tamarind Reef Hotel and Green Cay Marina. The neighborhood includes some steep topography, reaching up to 200 feet in elevation, and also flat topography in the lowlands near Southgate Pond. It consists of primarily one-acre lots that are approximately 50% developed. Developed lots generally have large homes, with swimming pools, extensive turf grass and landscaping features. Most of the natural forested area has been cleared and revegetated with tall grasses. The roadways are paved and most driveways are either paved or gravel. The main road is open section with shallow swales to convey stormwater. Some basic drainage infrastructure exists including paved swales, speed bumps (which provide similar benefits to waterbars), and driveway culverts. Most of the roadways are in good condition, but several gravel driveways are eroding and contributing sediment to a regional low-point near the entrance to the Green Cay Marina. Culvert maintenance is needed. There are examples of permeable pavers used in this neighborhood and opportunities for residential rain gardens.

### *All for the Better/Tipperary*

The All for the Better neighborhood is located north of Tipperary and south of the Schuster property. This area is very flat with about 25% remaining undeveloped lots. About half of the

parcels are one-quarter acre lots and the remainder is half acre lots. The developed parcels are primarily impervious or grass area and the undeveloped parcels are mostly forested. The roadways are generally paved. There are a few main roads that are unpaved. Minimal drainage infrastructure exists except for newly installed culverts that pass underneath South Shore Rd. Standing water was observed on individual lots, and upwelling was observed under roads and driveways. This is likely due to saturated soils, high groundwater, and seepage resulting from a lengthy and heavy rainy season. The constant flow of water has caused minor erosion gulling along roadway ditches, yard flooding, pavement heave, and the installation of new culverts to alleviate drainage. The DPW recently installed the culverts to help with the groundwater seepage issue; these installations have contributed to sediment loading into guts and wetlands. Soils in this portion of the watershed are not ideal for septic infiltration. Problems with systems are likely given the high water table and groundwater seepage occurring over the past few months (Figure 3.8). Water was observed flowing across South Shore Rd., likely the result of residential pumping. The constant flow of water has caused algae to grow on the road surface and minor erosion gulling along roadway ditches.



**Figure 3.8.** Green rectangular indicators of septic system on single family lot (left). Record high groundwater tables and resulting surface seepage in Tipperary/All for the Better residential areas may have resulted in failing septic systems (right).

### *Seven Hills*

The Seven Hills neighborhood is located atop the third highest peak in the Southgate Watershed and exhibits some of the steepest terrain. Elevations range from 200 to 570 feet above sea level. Approximately 75% of the parcels remain undeveloped and well-vegetated. The majority of the parcels are about one-half acre in size but range between one-third and one acre. Land clearing within the developed parcels is typically limited to the building, driveway, and septic construction. Nearly all roadways and driveways throughout the neighborhood are paved, and most are in adequate condition; although some raveling and potholes were observed. Roadways are typically graded into the cut-slopes with drainage primarily flowing in ditches along the cut-slopes. Culverts strategically placed at regional low-points allow the water to flow off of the roadways. Most culverts within the neighborhood are in need of



maintenance; partial blockage with rock and/or detritus was a common occurrence. Some erosion immediately downstream of culverts was found, but the existing vegetation limited the extent of the problems.

### *Parara*

The Parara neighborhood is located between Mt. Washington and Tipperary Rd. It can be broken into two distinct sections based on topography and development. The lowlands are flat, one-half to three-quarter acre parcels which are almost all developed. Much of the forested area in this location has been cleared and vegetated with grass. The roadways in the lowlands are primarily unpaved. Minimal drainage infrastructure exists but no major erosion problems were identified. A residential lot with an automobile maintenance garage was identified in this neighborhood. The upland portion of the Parara area is primarily undeveloped, forested land with moderate slopes. The parcels are mostly three-quarter to one acre in size. The roadways in the upland section of mostly paved. Minimal drainage infrastructure exists but no major problem areas were identified.

### *Union & Mt. Washington*

The Mt. Washington portion of this area is located atop the second highest peak in the Southgate Watershed and directly borders/crosses into the Great Pond Watershed. The Union portion of the community is considered part of the Great Pond Watershed. The topography is steep with elevations ranging from 200 to 500 feet. At least 90% of the parcels in this neighborhood remain undeveloped and well forested. The majority of the parcels are about one to one-and-one-half acres in size. Land clearing within the developed parcels is limited. Most of the roadways are paved, but with minimal drainage infrastructure.



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