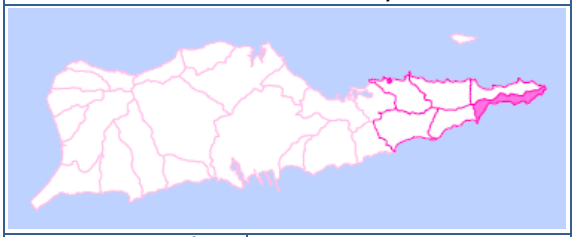
6.0 Turner Hole Watershed

This section summarizes baseline information specifically for the Turner Hole 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 6.1 summarizes basic watershed features.

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

Table 6.1. Watershed Summary



Drainage area[1]	714 acres; 1.1 sq miles
Length of guts[2]	0.3 miles mapped
Road length[2]	7.0 paved miles; 3.6 unpaved miles
# Road culverts[2]	9 mapped culverts
Impervious Cover[3]	70 acres; 10%
Dominant land use %[4]	Undeveloped: 66%
	LDR: 17% %
	Park/Open Space: 10%
Area within 100-yr floodplain[5]	80 acres; 11% of watershed
# Small ponds[4]	3
# Mapped wells[6]	4 (plus a rain gauge)
Watershed erosion potential[7]	Vulnerability: High
	Road-based: High
	Mean Relative: High
2010 WQ Impairments[8]	Two impaired areas subject to TMDLs

[1] IRF/UVI/USGS 2001 watershed boundaries
[2] HW revised/or created, 2011
[3] NOAA CSC, CCAP data, 2005
[4] UVI-CDC data 2003 (land use) and 2001 (ponds)
[5] DPNR, dated 2005
[6] Received from DPNR Feb, 2011
[7] WRI/NOAA, 2005
[8] DPNR, 2010 Integrated Waters Report

6.1 General Description

The Turner Hole watershed is in the southeastern portion of the East End watersheds and Point Udall is considered the eastern-most point on the U.S. Atlantic coast and the most arid region of St. Croix. Annual rainfall for this part of the island is less than 30 inches/year. Turner Hole is part of the East End APC that was designated in 1979 and adopted in 1991. The watershed drains to East End, Issac, Jack, and Grapetree Bays. There were no mapped guts in this watershed, based on the data provided by DPNR; however two small reaches were added after 2011 field assessments.

Land Use

The watershed's main access road is the South Shore Rd. /Rt. 60. Most of the watershed is very steep terrain with small low-laying portions of land along the south coast. Turner Hole has the highest percentage of watershed impervious cover than all other East End watersheds and has relatively high erosion potential. Land use in the western portion of the watershed consists of low density residential areas, Divi Carina Bay Resort and Casino, and the Villa Madeline condominium complex. The majority of the eastern portion of the watershed is park/open space and the lands associated with Point Udall and East End Bay. In fact, Turner Hole has the second highest overall percentage of watershed open space next to Madam Carty. Much of the open land is maintained by The Nature Conservancy (TNC). A low-density residential area is also located within the central portion of Turner Hole above Grapetree Bay.

Single family neighborhoods in the watershed are limited to Grapetree Bay. There is one multi-family condominium complex: Villa Madeline. Commercial properties of interest include Divi Carina Bay Resort and Casino and a small miniature golf course. 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.

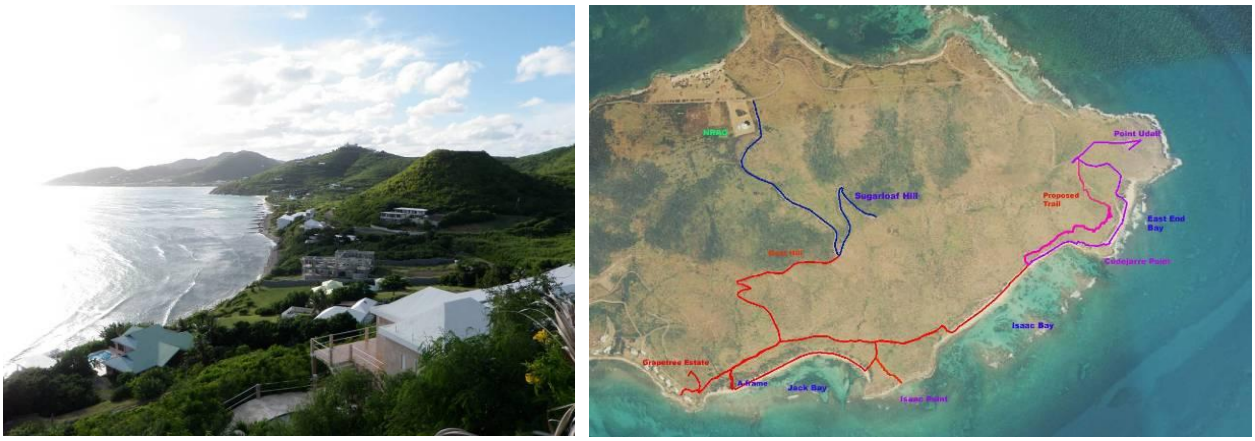


Figure 6.1. Looking west across Grapetree Bay and the Turner Hole watershed (left). The system of TNC hiking trails to Turner Bay beaches (right).

Water Quality

There are five water quality assessment units associated with this watershed, and two are currently listed in the 2010 Integrated Waters Report (DPNR, 2010) as impaired for Erosion and Sedimentation. VIRC&D is conducting sedimentation studies at East End Bay Trail with NOAA funding as part of the trail restoration project completed in 2011.

Table 6.2. Water Quality Impairments (from DPNR, 2010)

Assessment Unit ID/Name	Monitoring Station Name	Impairment	Source of Impairment	TMDL (Priority)
VI-STC-44 / Northeast St. Croix HUC14, offshore	STC-OFF8 North-3	(N/A)	(N/A)	(N/A)
VI-STC-45 / Isaac Bay	None	(N/A)	(N/A)	(N/A)
VI-STC-46 / Grapetree Bay	STC-11B Isaacs Bay Forereef	Dissolved Oxygen	Erosion and Sedimentation	Low/2029
VI-STC-47 / Turner Hole Backreef	STC-12 Grapetree Beach; VI297470 Grapetree Beach	Turbidity	Erosion and Sedimentation	Low/2029
VI-STC-48 / Turner Hole subwatershed, offshore	STC-OFF5 East-2	(N/A)	(N/A)	(N/A)

6.2 Potential Watershed Restoration/Project Sites

A number of specific sites were identified by project partners, local residents, and field assessment teams as potential sources of pollution or as drainage improvement opportunities. Table 6.3 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 6.3. Summary of Candidate Restoration/Project Sites

Project ID/Site Name[1]	Description	Initial Ranking
Stormwater Retrofits		
Point Udall (TH-R-1)	Surface runoff from road and parking area flowing to the East End Trail are causing erosion. Install arid rain garden and ditch at trail head adjacent to roadway.	High
Divi Casino (TH-R-2)	Stormwater sheet flows over parking to swales into detention pond. Retrofit detention pond and repair swales.	Medium
Divi Hotel & Resort (TH-R-3)	Existing drainage pipes direct water to detention basin. Enhance existing basin and install rain gardens in nearby parking areas.	Medium
Grapetree Bay Hotel Restoration (TH-R-4)	Stormwater flows over existing parking with construction related debris. Construct small bioretention area to collect sheet flow from parking lot.	Medium
Villa Madeline (TH-R-5)	Drainage sheet flows from development south to small bioretention area with 2 flumes. Enhance existing bioretention and construct forebay and raised berm.	Low
Culvert Repair/Maintenance		
New culvert/piped gut at South Shore Rd.	Investigate need for additional outlet stabilization from newly installed culvert to prevent slope erosion at discharge location	High

[1] ID matches basemap locations and field sheets in the Appendix.

Point Udall (TH-R-1)

The easternmost point in the U.S. Atlantic seaboard is Point Udall. NOAA and VIRC&D are currently sponsoring/managing a trail restoration project involving the closing and stabilization of an existing trail and the construction of a small parking lot and new pedestrian trail. Parking lot construction is almost complete and trail stabilization features (i.e., water bars, traps, and bleeders) have been installed. Drainage from the road and the parking lot currently drain to the trailhead. There is potential for a small arid rain garden facility to be installed adjacent to the parking area to capture and treat stormwater using a xeriscaped landscape design, serve as a highly visible demonstration project, and protect the trailhead from erosion (Figure 6.2).

Figure 6.2. Construction of small parking lot at East End Bay Trailhead (left). Rendering of xeriscaped bioretention facility adjacent to parking lot (right).

Divi Carina Bay Casino (TH-R-2)

The Divi Carina Bay Casino is a feature of the larger Divi Carina Bay Resort. The Divi Casino is located along the north side of South Shore Rd. (Rt. 60) and is located in a generally low-laying flat area. The casino and surrounding paved parking lots comprise approximately 5 acres in impervious area—the largest concentration of impervious cover in the East End. The rear parking lot, to the northwest of the casino, drains over land to a small paved flume in the southeastern corner of the parking lot. This water is then directed through a shallow swale (gravel accumulation was observed at flume outlet). Runoff flows eastward behind the casino to a storm drainage inlet/pipe that discharges to the drainage channel that flows along the eastern edge of the main parking area to a detention basin on the southwest corner of the casino property, adjacent to the Divi Management Office. Stormwater from the detention basin is discharged through twin reinforced concrete culverts that merge into one 24-inch ductile iron pipe that leads to the beach immediately east of the Divi Hotel complex.

Stormwater management in the rear parking lot may be improved by constructing additional paved flumes that will discharge to an existing shallow swale along the east edge of the parking lot (Figure 6.3). Additional stormwater management can be provided within the primary parking lot via installation of several rain gardens and/or bioswales between parking aisles, in existing grass areas. This would aid in disconnecting impervious area, reduce the velocity of stormwater, and would help to reduce sediment and other pollutants.

The existing drainage channel between the parking lot and roadway is filled with sediment. Modifying the existing detention basin to create a micropool wetland with a long flow path and baffle would increase storage and would help capture higher amounts of sediment. This would be an excellent location for a demonstration project, as the nearby facilities receive high amounts of public use.

Figure 6.3. Existing parking facilities at Divi Carina Bay Casino (top left and right). Existing detention basin at southwest corner of main parking lot (bottom left). Drainage channel around casino parking lot to the east and south (bottom right).

Divi Carina Bay Hotel & Resort (TH-R-3)

The Divi Hotel and Resort is located on the shores of Turner Hole in the western region of the watershed on South Shore Rd. The hotel, parking, and other appurtenant structures comprise approximately 4 acres of impervious area. An existing stormwater detention basin (one of the few in the East End) is located in front of the southwestern end of the main hotel building (Figure 6.4). A series of pipes convey drainage from the parking area as well as from a gut across the road. This gut flows between the tennis courts and Divi residential properties through three 16-inch PVC pipes beneath South Shore Rd. to the detention basin. The basin outlet is comprised of a 16-inch PVC pipe that discharges to the beach area behind the hotel.

The existing stormwater basin may be enhanced by expanding the basin to southwest, as feasible, then over-excavating and replacing excavated material with an organic soil to increase infiltration and storage capabilities. Expansion of the basin would require modification and relocation of the outlet structure.


Figure 6.4. Detention basin at Divi Carina Bay Hotel & Resort (left). View of Divi Hotel parking areas along South Shore Rd and potential area for a rain garden/swale (right).

Grapetree Bay Hotel Restoration (TH-R-4)

The existing Grapetree Bay Hotel building is located on South Grape Tree Rd. in the central portion of the Turner Hole Watershed overlooking Grapetree Bay and is currently in the process of being renovated. Extensive debris and demolition material from the interior of the building are being stockpiled in the parking lot. Stormwater sheet flows over this impervious area towards the ocean. There are currently no stormwater practices present on site. Installation of a rain garden within or adjacent to the parking area would assist in the treatment and attenuation of stormwater discharging to nearshore waters and would serve as a highly visible demonstration project for educational and outreach purposes, particularly since residential construction projects are also challenged by proper management of construction debris and material storage (Figure 6.5).


Figure 6.5. Parking lot and construction materials/debris storage at the Grapetree Bay Hotel (left). Material storage and staging at small residential construction site in Turner Hole (right).

Villa Madeline Condominiums (TH-R-5)

Villa Madeline is located along the ridgeline between Teague Bay and Turner Hole watersheds, with most of the area draining towards Turner Hole. Villa Madeline is accessed by Maggie Hill Rd. off East End Rd./Rt. 82 on the north shore, and by South Ridge Rd. of South Shore Rd./Rt. 60. Stormwater flows from the top of the development south to the base of the hill into an existing detention basin via two paved inlet flumes (Figure 6.6). The existing detention facility may be enhanced through minor improvements and maintenance activities. The existing basin seems to be undersized for the contributing drainage area; raising the berm surrounding the basin by approximately two feet would increase the storage capacity. In addition, a new forebay at the inlet location would facilitate easier maintenance and sediment removal.

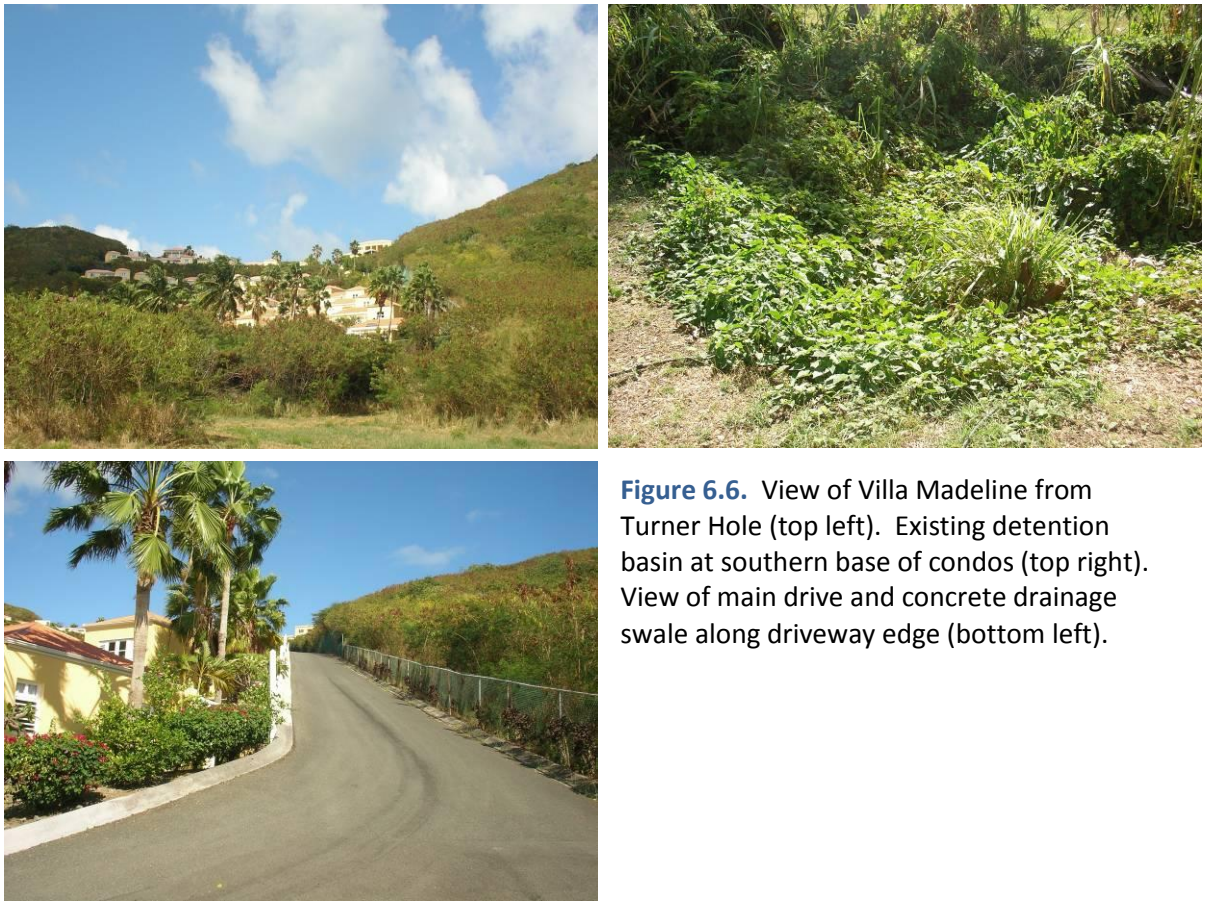


Figure 6.6. View of Villa Madeline from Turner Hole (top left). Existing detention basin at southern base of condos (top right). View of main drive and concrete drainage swale along driveway edge (bottom left).

TNC Easement

The TNC easement and hiking trails are well maintained and in very good condition (Figure 6.7). TNC personnel have been installing old marine mooring ropes anchored by rebar as water-bars to stabilize footpaths and prevent erosion. We have no recommendations for TNC trail management.

Figure 6.7. The Nature Conservancy signage and trail on the East End in Turner Hole.

New Culvert Installation/Gut Piping

Figure 6.8. Sediment plume in Grapetree Bay in July 2010 (photo courtesy of Kathy LeGrange/Dave Rivers)

A new culvert was installed in July, 2010 on a residential lot in an effort to reduce active erosion of an existing gut, which accepts drainage from South Shore Rd. A sediment plume in Grapetree Bay observed by residents during the heavy rain events on July 19-20, 2010 was reported to have originated from this location (Figure 6.8). Property owners report that since culvert installation was completed, no additional sedimentation issues have occurred. HW did not visit this site during our field assessment and are unable to verify these reports; however, EEMP staff did conduct a follow-up site visit in March to document conditions (Figure 6.9). Property owners report that because this culvert accepts secondary drainage from the road, the DPW was actively involved in the design/permitting of the project. HW has not reviewed hydrologic/hydraulic calculations used to size the culvert. From the photos, it is not clear if adequate outfall protection has been provided at the discharge location to prevent further erosion, although the property owners have indicated that during active construction, berms, rip rap, and haybales were used to prevent erosion and that the outfall is stable. This is another example illustrating a number of issues that should be addressed during the development of a comprehensive gut management strategy for the territory including policies related to piping of natural guts; gut buffer management; land subdivision, and permitting in relation to natural drainages.

Figure 6.9. (From top left to bottom right) Parcel location; aerial photo of site with location along channel/culvert where photos were taken by EEMP staff; looking at gut above road crossing; new culvert inlet on property, and culvert discharge to bay (photos from EEMP staff on March 14, 2011).

6.3 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 6.4 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 6.4. Summary of Neighborhood Restoration Opportunities

Name	Road/ Driveway Condition	% Lots Un-developed	Pollution Source	Potential Stewardship Activities
Villa Madeline	Paved/ Good condition	0%	Low	Enhance bioretention facility
Grapetree Bay	Mostly Paved/Good Condition	<50%	Med	Manage Residential Construction

Villa Madeline

The Villa Madeline luxury condominiums are located on the ridgeline between the Teague Bay and Turner Hole watersheds. Villa Madeline is a gated community and is accessed by Maggie Hill Rd. off East End Rd./Rt. 82 on the north shore, and by South Ridge Rd. of South Shore Rd./Rt. 60. Approximately six of the 43 units are located on the Teague Bay side of the drainage divide, and all runoff from these units and the community building and management office drain north to Maggie Hill Rd. above Reef Golf. The remaining units are located within the Turner Hole watershed and drain to a small detention structure located behind the condo units, east of the tennis court. Roadways within the condominium complex are entirely paved and curbed and in good condition. Road runoff is either diverted to a small shallow concrete swale that runs the length of the west side of the main drive or sheet flows over land downhill to the bioretention area. Runoff from the rooftops and gutters appears to discharge directly on the paved surfaces, though this could not be fully confirmed. It mostly likely sheet flows over the roadways to the existing detention facility. Average lot cover is approximately 10% turf, 20% landscaping, 60% rooftop, and 10% driveway and walkways. All sewage is directed to an on-site wastewater treatment system. This residential community does not appear to be a source of significant pollutants and/or sediment and no recommendations are suggested (Figure 6.10).

Figure 6.10. Condominium units and portion of parking area at Villa Madeline.

Grapetree Bay

The Grapetree Bay residential area (approximately 80 acres) is the eastern-most neighborhood within the Teague Bay watershed. This area may be accessed by South Shore Rd. to Sea Grape Rd. from the south, or by East End Rd. to Rt. 60 to either Deer Hill Rd. or Hibiscus Rd. from the north. The primary roadways within this residential area include Sea Grape Rd., South Grape Tree Rd., Bayview Rd., Sugarbird Rd., Deer Hill Rd., Terrace Rd., and Hibiscus Rd.. This area is sparsely developed, with most lots on the coast developed. A portion of the neighborhood sits atop a steep ridgeline, reaching up to about 270 feet in elevation at the steepest points, the remainder of the residences and vacant lots fill the valleys between these ridges. About 40% of the neighborhood is developed, and most homes are gated and set back from the street. There was one lot under construction along South Grape Tree Rd., east of the Grapetree Bay Hotel Restoration. No evidence of erosion or sediment control barriers or other sediment trapping practices were observed. The entire lot was comprised of exposed and unstabilized soils.

Roadways within the neighborhood are a mix of pavement (75%) and dirt/gravel (25%) and driveways are mostly paved. The roads are all open section, with no observed water bars, however at least two culverts were identified along with a concrete swale. The paved roads are in good condition and the dirt roads were observed to be very stable with little erosion. In addition, a gut runs from the ridgeline down across the terminus of Deer Hill Rd. down through a channel to a culvert (21-inch reinforced concrete pipe) at the bend on Sugarbird Rd. The culvert, gut channel, and outfall all appear to be in stable condition. The dirt roads and unmanaged construction sites may pose a source of sediment and other pollutants to Grapetree Bay.

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