Long Branch Creek

Dissolved Oxygen TMDL Implementation Plan

(WBID 1627)

Pinellas County NPDES MS4 Permit No. FLS000005-003

June 2017

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1.0 Background

1.1 Purpose

The United States Environmental Protection Agency (EPA) established a Total Maximum Daily Load (TMDL) for dissolved oxygen in Long Branch Creek, WBID 1627, in November 2012. Pinellas County submitted a TMDL prioritization report to the Florida Department of Environmental Protection (FDEP) in May 2013, as required in the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit No. FLS000005-003 issued January 1, 2013. Pinellas County selected Long Branch Creek as the number two priority for TMDL monitoring and implementation. A Monitoring and Assessment Plan was submitted in December 2013. The work associated with the plan and the final report was actually completed in 2012. The next step in the TMDL process is to develop an Implementation Plan for the TMDL, also referred to as a Supplemental Stormwater Management Program (SWMP), which will describe load reduction activities to be undertaken in the watershed.

This TMDL Implementation Plan fulfills the requirements in Part VIII.B.3.d of the NPDES MS4 permit for Pinellas County and the City of Largo and describes both ongoing and planned efforts to address dissolved oxygen impairment in Long Branch Creek.

1.2 Description of Long Branch Creek

The Long Branch Creek watershed is located in central Pinellas County and covers a total area of approximately 1,808 acres. Long Branch Creek is divided into a tidal segment (WBID 1627B) and a freshwater segment (WBID 1627), as indicated in Figures 1 and 2. The freshwater segment drains an area of approximately 1,290 acres and is the focus of this TMDL Implementation Plan.

Upstream segments of Long Branch Creek originate west of Belcher Road and extend in a general southwest to northeast direction approximately 3.3 miles, ultimately discharging into Old Tampa Bay. An additional 2.6 miles of conveyance channels provide inflow to the main channel from portions of the drainage basin. Near the headwaters of Long Branch Creek is Swan Lake (WBID 1627A), a small lake surrounded by residential homes, which is a significant contributor of flow to the stream. The vast majority of the creek consists of earthen open channels with underground storm sewers used to convey water beneath roadways and other obstructions.

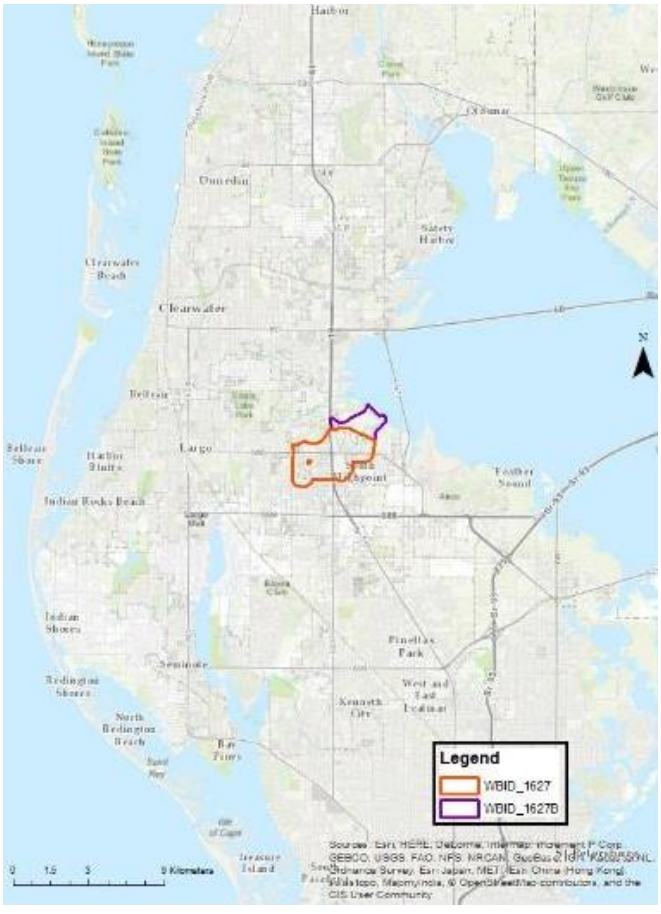


Figure 1. Location of Long Branch Creek watershed in Pinellas County.

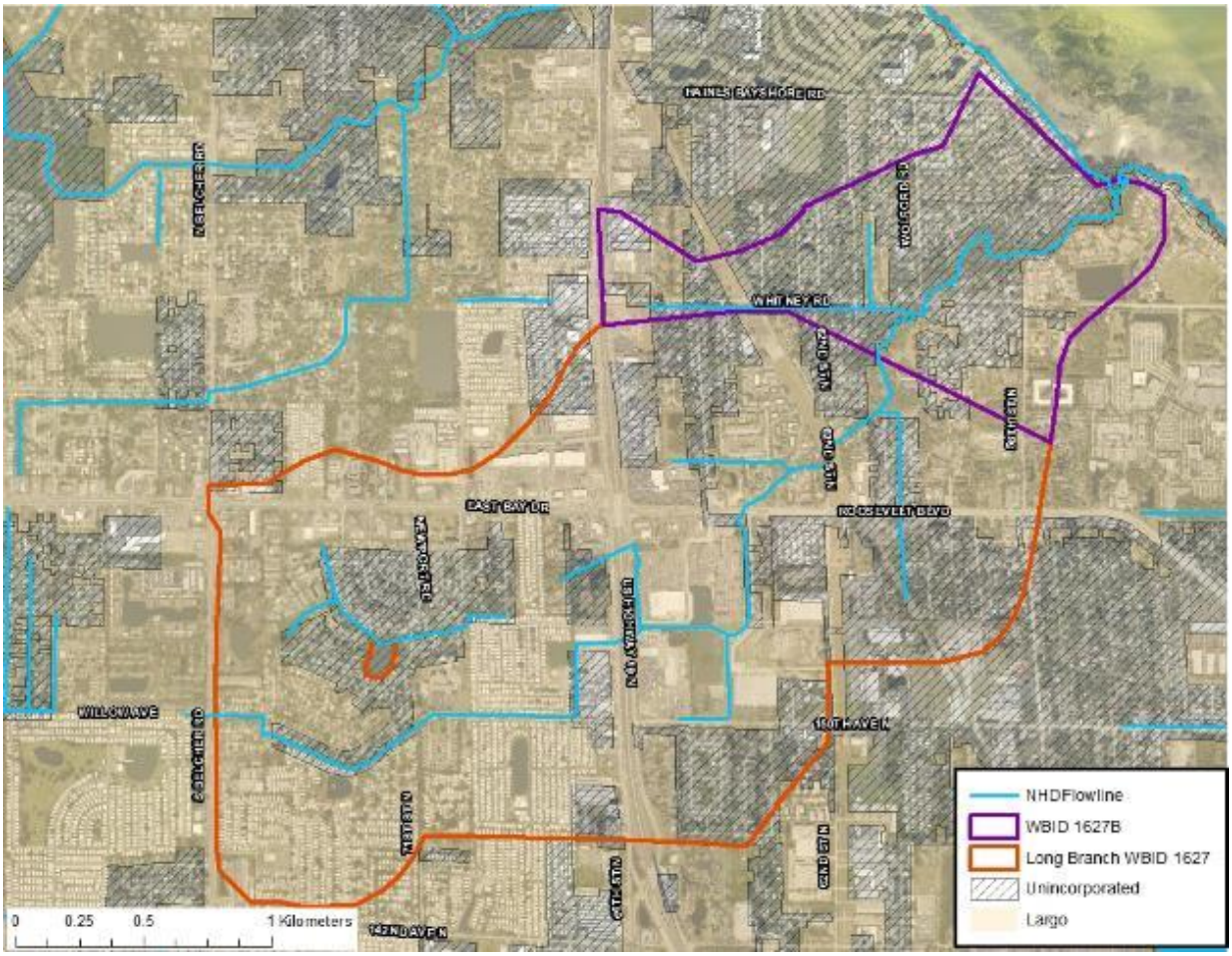


Figure 2. Long Branch Creek WBIDs.

The drainage basin is located in a highly urbanized area of Pinellas County, with approximately 87 percent of the landuse within the basin classified as commercial or residential. Another eight percent of the watershed area is used for transportation, communication, or utilities. The Long Branch watershed includes portions of unincorporated Pinellas County and the City of Largo, with the County having approximately 36% jurisdiction and the City of Largo having 64%.

1.3 Impairments and the TMDL

Long Branch Creek (WBID 1627) was identified as impaired for DO by FDEP and was included on the 1998 303(d) List of Impaired Waters. The waterbody was later placed on the 2009 Verified List of Impaired Waters based on data collected during the assessment period of 1999 to 2006.

Natural DO levels are a function of water temperature, water depth, and velocity, as well as the relative contributions of groundwater; however, the natural DO regime may be impacted by pollutants such as nutrients and oxygen-demanding substances. Replenishment of oxygen levels may be inhibited if excessive growth of aquatic plants above the water surface blocks sunlight from reaching submerged vegetation, reducing their ability to photosynthesize. Decomposition of organic matter, such as dead plants and animals, also consumes DO from the water. Nutrient levels affect DO concentrations directly and indirectly. The process of nitrification, in which bacteria convert ammonia-nitrogen to nitrate-

nitrogen, directly consumes oxygen from the water. Indirect effects of excessive nutrient loading involve over-stimulation of aquatic plant growth, which leads to exacerbated diurnal swings in DO, and decomposition of the algal biomass after it dies and settles to the bottom, a process that consumes oxygen.

Florida adopted revised water quality criteria after the development of the TMDL, but the following water quality criteria, as summarized from the Impaired Waters Rule Chapters 62-303 and 62-302 Florida Administrative Code (F.A.C.), were in effect and were the basis for the determination of the impairment:

- DO criterion: "In no case shall the concentration of dissolved oxygen average less than 5.0 in a 24-hour period and…shall not be less than 5 mg/L for fresh waters."
    - Approximately 76% of DO measurements obtained from Long Branch Creek from 2003 through 2011 were below the Class III freshwater criterion of 5 mg/L, more than the 10% allowed by the criterion, indicating DO impairment (EPA 2012).
- BOD criterion: BOD "shall not be increased to exceed values which would cause DO to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions."
    - The BOD values obtained from 2005 through 2011 averaged 2.18 mg/L, above the 2.0 mg/L screening level for Florida streams, with 20% of samples above 2.0 mg/L (EPA 2012).

In 2012, the EPA established a TMDL with the goal of setting loading limits to Long Branch Creek that would help restore the impaired waterbody to its Class III designated use. The TMDL allocations for DO were determined by analyzing the effects of BOD, TN, and TP loads on DO concentrations. The TMDL and the recommended load reductions for Long Branch Creek were based on data collected from 2003 to 2011. A LSPC model was used to predict both current and natural pollutant loadings and stream flows, and a WASP Eutrophication model was used to evaluate the in-stream impacts of these pollutant loads.

During the development of the TMDL, it was determined that the natural condition scenario (removal of all anthropogenic sources and landuses) would not meet the applicable Florida standard for DO, so the loadings prescribed in the TMDL were based on reducing loadings to the natural condition (which is below 5.0 mg/L) rather than the state DO water quality standard of 5.0 mg/L. This suggested that it would be appropriate to develop site-specific water quality standards for Long Branch Creek.

The adopted TMDL set a MS4 waste load allocation (WLA) of 86% reduction in TN, 95% reduction in TP, and 95% reduction in BOD. The load allocations (LA) for each constituent were equal to the WLAs. Since there are no permitted wastewater or industrial facilities located in the Long Branch Creek watershed, and since the watershed is highly developed, stormwater runoff from urban and suburban areas is considered to be the major contributor of the pollutants that cause the dissolved oxygen impairment. A large portion of the basin was developed prior to stormwater management system requirements, resulting in untreated runoff discharging directly to the creek.

The waterbody also is impaired for fecal coliform and has a TMDL adopted for that impairment. A Bacteria Pollution Control Plan (BPCP) was developed to specifically address that impairment, so this implementation plan will focus only on the DO impairment.

1.4 Revised Criteria

In 2013, FDEP adopted revised State water quality standards for DO and established numeric nutrient criteria for freshwater streams. The applicable revised water quality criteria, as summarized from the Impaired Waters Rule Chapters 62-303 and 62-302, Florida Administrative Code (F.A.C.), are:

- DO (Peninsula bioregion): "For…Class III…predominantly freshwaters, no more than 10% of the daily average percent DO saturation shall be below 38%."
- Chlorophyll-*a*: "Annual geometric mean threshold concentration of 20 ug/L for freshwater…Threshold geometric mean values are not to be exceeded more than once in any three calendar year period, and Geometric mean computation requires a minimum of four samples per year with at least one sample taken between May 1 and September 30."
- Numeric nutrient criteria: "Annual geometric mean TN threshold concentration of 1.54 mg/L; Annual geometric mean TP threshold concentration of 0.12 mg/L; Threshold geometric mean values are not to be exceeded more than once in any three calendar year period; Geometric mean computation requires a minimum of four samples per year with at least one sample taken between May 1 and September 30."
- Biological health assessment: "…the water shall be determined to be biologically impaired if…, given a minimum sample size of two temporally independent bioassessments…the average score of all the temporally independent SCIs is below 40, or either of the two most recent temporally independent SCI scores is less than 35…."

The criteria revisions prompted stakeholders to reevaluate the data for Long Branch Creek and other area waterbodies. Using DO data collected in WBID 1627 from January 2005 through June 2012, 49% of the samples did not attain the new DO criterion (ATM 2014). The TP criterion of 0.12 mg/L was exceeded in several years, indicating possible nutrient impairment; however, the TN criterion of 1.54 mg/L was not exceeded, and neither was the chlorophyll-a criterion (ATM 2014). **Based on recent analysis of data collected from 2008 through 2016, the TN criterion is being met, and long term trend analyses indicate stable concentrations of TN, TP, and chlorophyll-a.**

Currently, Long Branch Creek remains on the Verified Impaired List for DO, although the next cycle of assessment could result in changes. Regardless, BMPs are already ongoing and planned which will help to reduce the nutrient loads in the watershed and improve the DO levels in the watershed.

2.0 Water Quality Monitoring

Pinellas County has monitored water quality at various sites in the Long Branch Creek watershed since 1991 as part of the Ambient Water Quality Monitoring Program. In fulfillment of permit requirements, the County submitted a TMDL Monitoring and Assessment Plan for Long Branch Creek in June, 2014, which includes details on the current monitoring in the watershed. The County's data are regularly uploaded to FDEP STORET system and are also accessible through the Pinellas County Water Atlas website (http://www.pinellas.wateratlas.usf.edu/Default.aspx). Table 1 summarizes the ambient water quality monitored parameters and the sampling methods utilized.

In WBID 1627, there are currently three active sites (Figure 3), with sample collection typically occurring eight times per year, when flow is present. The continuous period of record extends from 2008 to the present for these sites:

- Site 22-12 located on Long Branch Creek at Roosevelt Blvd. and Michigan Dr. in Clearwater; this is the location of the USGS gaging station used for computation of annual pollutant load estimates for the basin.
- Station 22-15 located on Long Branch Creek at 150th St. and 3rd St. in Clearwater

One site was moved in 2014:

- Site 22-14 (data collected 2008-2014)
- Site 22-13 (data collected 2014-present)

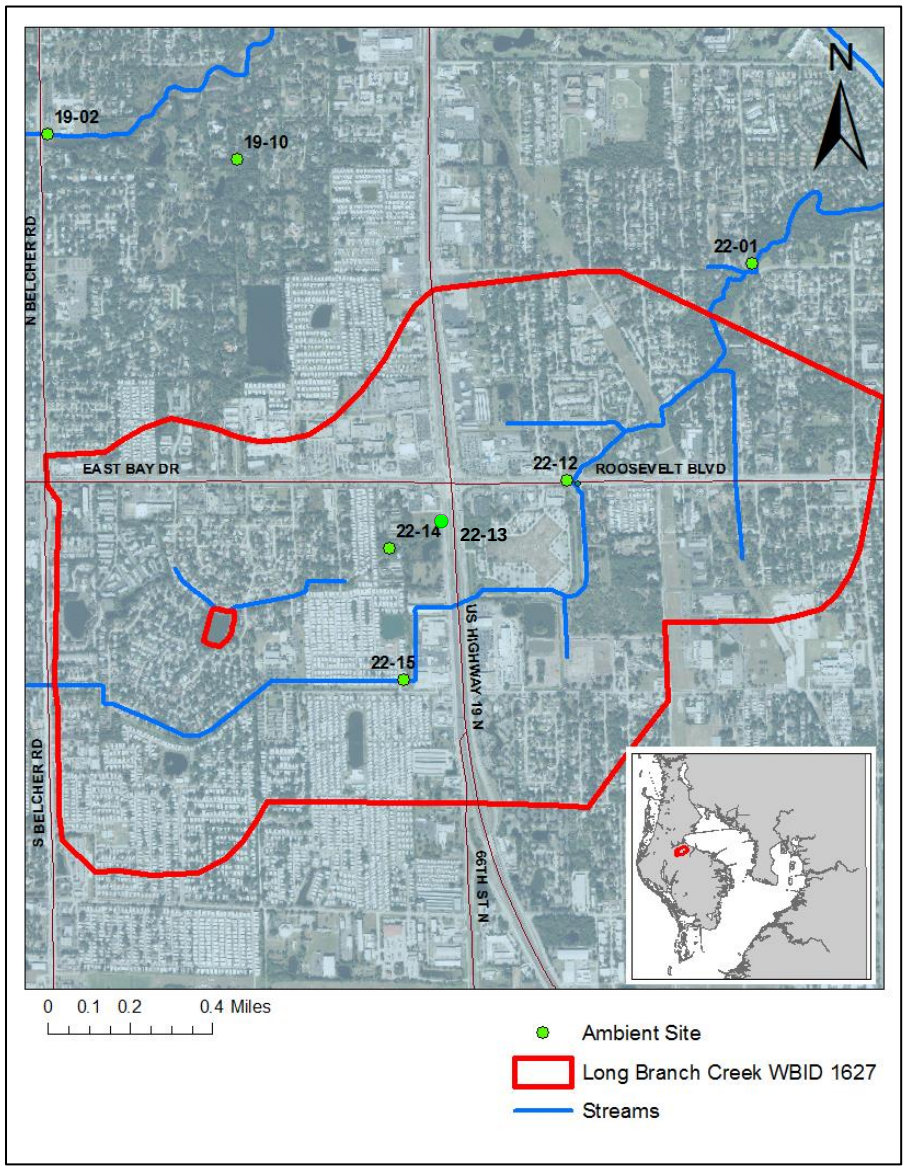


Figure 3. Pinellas County's ambient water quality monitoring stations in WBID 1627. Site 22-14 was replaced with 22-13 in 2014.

Table 1. Ambient water quality monitoring parameters and sampling methods.

Parameter	Method
Total depth	FDEP-SOP-001/01 FT 1000
Flow (Q)	PCSOP
Temperature (T)	FDEP-SOP-001/01 FT 1400
pH	FDEP-SOP-001/01 FT 1100
Dissolved Oxygen (DO)	FDEP-SOP-001/01 FT 1500
Specific Conductivity	FDEP-SOP-001/01 FT 1200
Salinity	FDEP-SOP-001/01 FT 1300
Total Kjeldahl Nitrogen (TKN)	EPA 351.2
Ammonia (NH_4)	SM 4500 NH3-H
Nitrate-Nitrite (NO_x)	SM 4500 NO3-F
Total Phosphorus (TP)	SM 4500-P E
Ortho-phosphorus (OP or PO_4)	SM 4500-P E
Chlorophyll *a*, corrected (Chl-a)	SM 10200-H
Chlorophyll *b* (Chl-b)	SM 10200-H
Chlorophyll *c* (Chl-c)	SM 10200-H
Total Suspended Solids (TSS)	SM 2540-D
Turbidity	SM 2130-B
Biochemical Oxygen Demand (BOD_5)	SM 5210-B
Enterococci (Ecoccus)	Enterolert
Fecal coliform (Fcoli)	SM 9222 D
Escherichia coli (Ecoli) *since 07/2015	SM 9213 D

Pinellas County also performs biological assessments of Long Branch Creek twice a year as part of its freshwater biological monitoring program. The program was established in 2014 to determine the biological health of the waterbody in support of assessment of the nutrient criteria. The stream sampling employs FDEP methods, all of which are cited in Chapter 62-160, F.A.C. The program includes:

1. Stream Condition Index (SCI) -- a composite macroinvertebrate index designed for use in flowing streams. Data generated from the taxonomy and relative abundance of these organisms is used to calculate ten biological metrics, each of which has been shown to respond predictably to human disturbance. Scores are assigned for each metric based on criteria which have been regionally calibrated (contained in DEP SOP LT7200).
2. Habitat Assessment (HA) – performed concurrent with each SCI collection to evaluate the amount of human disturbance.
3. Rapid Periphyton Survey (RPS) – measures the relative abundance of algae growing on stream substrate in a 100 meter stream segment.
4. Linear Vegetation Survey (LVS) – documents the plant community in a 100 meter stream reach. The average sensitivity of the plant community is calculated based upon each species' ecological tolerance to environmental changes and the percentage of invasive exotics.

Pinellas County will continue monitoring at the three existing sites in WBID 1627 eight times per year. Annual exceedances of the water quality standards will be used to track the success of this plan and included in the NPDES annual report. Investigations will be conducted to determine potential causes for results elevated above the typical range and corrective actions will be implemented as appropriate. If a

high number of annual exceedances occur over consecutive years, options for additional monitoring may be evaluated.

3.0 Pollutant Load Determinations

The TMDL assigned pollutant load allocations for waters in the freshwater portion of the Long Branch Creek watershed (WBID 1627) and estimated the loading amounts contributed by each general source. A TMDL provides a wasteload allocation (WLA) for point sources and a load allocation (LA) for nonpoint sources. Since there are no NPDES-permitted facilities with direct surface water discharges in the watershed, no WLA was given. It is not possible to calculate numeric WLAs for individual stormwater outfalls since discharges are highly intermittent and originate from diffuse sources; therefore, MS4 stormwater discharges were given a load reduction equal to the LA for each constituent: 86% TN reduction, 95% TP reduction, and 95% BOD reduction.

Table 2, below, shows the TN, TP, and BOD annual loads for the Long Branch watershed and the percent reductions to attain the natural condition DO concentration.

Table 2. TMDL load allocations for Long Branch Creek (from EPA 2012).

WBID 1997	Current Condition		TMDL Condition		MS4	LA
Constituent	Facility WLA (kg/yr)	MS4/LA (kg/yr)	Facility WLA (kg/yr)	MS4/LA (kg/yr)	Percent Reduction	Percent Reduction
Total Nitrogen	NA	2,507	NA	342	86	86
Total Phosphorus	NA	364	NA	19	95	95
BOD	NA	14,407	NA	717	95	95

Based on landuse in the watershed and the prevalence of organic TN and orthophosphate in the waterbodies, the TMDL suggested plant matter, animal wastes, septic systems, and sewer lines as the most likely sources of DO impairment.

The state of Florida Department of Health publishes data on new septic tank installations and the number of septic tank repair permits issued for each county in Florida. Since 1970, 23,878 septic systems have been installed in Pinellas County, and the total number of repair permits issued from 2001 to 2011 is 1,615 (EPA 2012). Only two active septic tanks are verified to be located in the Long Branch Creek watershed, so this is a very minor potential source. Reuse irrigation, another possible source of high nutrients, is only applied in a small area within the City of Largo.

Many of the Long Branch Creek conveyances run parallel and in close proximity to aging sanitary sewer infrastructure. The City of Largo has inspected areas of concern and found no leaks (Pinellas County 2016). The City of Largo will continue routine monitoring, and any failing systems will be addressed immediately.

Other non-point sources including pet waste, landscaping debris, poor fertilizer management practices, and construction site run off will be addressed through implementation of the County's fertilizer use and

landscape management ordinance, local stormwater pollution ordinances, and public outreach and education initiatives.

3.1 Long Branch Creek Targeted Monitoring Study

Pinellas County and the City of Largo conducted a targeted monitoring study in Long Branch Creek in 2010 to attempt to identify sources of elevated nutrients (ERD 2012a). Eighteen surface water sites were monitored biweekly from October 2010 through January 2011 to characterize the quantity and quality of discharges through each area. The site locations were located strategically along the flow path of the whole creek, including the tidal portion, with 12 sites located on the main branch and six tributary sites (Figure 4).

Nitrogen and oxygen isotopic signatures within the Long Branch Creek system indicated the presence of manure or sewage sources throughout the creek which is relatively consistent throughout the year and diluted during heavy rain events. This suggests that the nutrient inputs are not associated with runoff but rather are ongoing, direct inputs. Significant levels of pollutants could be entering the system through groundwater seepage. Most portions of the main channel and tributaries have been cut below the level of the existing land surface, so that the resulting water levels within the canal are substantially lower than the anticipated groundwater table elevations.

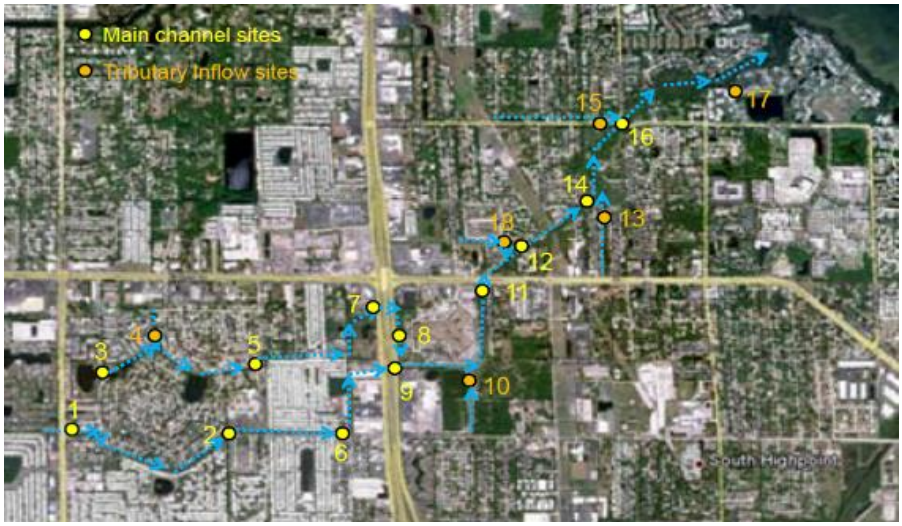


Figure 4. Targeted monitoring sites (ERD, 2012a).

Nutrient loadings generally increased with increasing distance downstream, with relatively minimal loads from tributary inflows. However, sections of the main channel appeared to provide significant nutrient assimilation, presumably due to vegetative uptake. Substantial increases in loadings of TN, TP, and fecal coliform bacteria were observed between sites 14 and 16, and elevated concentrations of TP were recorded in discharges from tributaries at sites 4 and 13.

3.2 Long Branch Creek Annual Load Estimates From Ambient Program

The USGS maintains a continuous flow gauge at the Pinellas County water quality station 22-12. Pinellas County uses this data along with the ambient monitoring water quality results to estimate annual loads for TN and TP at this site. At the other Long Branch sites, loads are estimated based on flow measured in the field instead of gauge data. To estimate loads, water quality metrics are assumed to be the same throughout a sample period (40.5 days for wet season periods and 50.75 days for dry season periods). Daily loads are estimated using the water quality data from the sample period and daily mean stream flow data calculated by the USGS at site 12 or by using the instantaneous flow recorded *in situ* at the other

sites. Then, daily loads are summed to estimate annual loads at each site (Table 3). Higher loads are associated with higher rainfall amounts.

Table 3. Annual loads for Long Branch Creek at ambient monitoring sites 22-12, 22-14/22-13, and 22-15. Site 22-14 was moved to 22-13 in 2013, and the data at the new site is indicated by an asterisk.

	Site 22-12		Site 22-14 / 22-13*		Site 22-15	
Year	TN (tons/yr)	TP (tons/yr)	TN (tons/yr)	TP (tons/yr)	TN (tons/yr)	TP (tons/yr)
2009	2.60	0.38	0.20	0.02	0.09	0.02
2010	2.71	0.51	0.11	0.02	0.37	0.06
2011	7.11	1.61	0.19	0.02	0.61	0.07
2012	2.94	0.60	0.07	0.01	0.29	0.07
2013	3.93	0.56	1.25	0.13	2.80	0.54
2014	3.05	0.54	0.18*	0.03*	0.10	0.01
2015	6.59	0.84	0.66*	0.08*	1.08	0.19
2016	5.87	0.89	1.07*	0.11*	0.60	0.17

3.3 Microbial Source Tracking

In 2015, targeted monitoring was initiated to identify sources of bacteria in the watershed. Samples from six sites were collected a single time during the wet season, dry season, and after a storm event. Samples were analyzed for *E. coli* and fecal coliform and were tested using genetic biomarkers to detect dog, bird, horse, and human sources. During the wet season, dog markers were found at all sites in moderate concentrations, and human markers were observed at two sites in moderate concentrations. During the dry season, only dog markers were detected, and those were only at two sites in low concentrations. Only human sources were tested in the storm event samples, and human markers were detected at three of the sites, suggesting a contribution from sanitary sewers. Following this study, Pinellas County staff conducted field investigations in the areas with high bacteria levels and found a few illicit connections from residential properties into the creek. These were reported for enforcement to NPDES personnel (Pinellas County 2017).

4.0 BMP Implementation

The TMDL assigned equal load reductions to nonpoint sources and stormwater sources in the freshwater portion of the Long Branch Creek watershed. Pinellas County and the City of Largo are actively implementing projects and programs addressing both of these types of pollution to improve the water quality in Long Branch Creek. Both structural and non-structural BMPs are being used to prevent or mitigate the discharge of pollutant loadings in the watershed. Conceptual management and/or treatment options were developed for selected areas, focused on tributary inflow sites 4, 13, and 15, based on the monitoring conducted by ERD (2012a).

4.1 Completed and Ongoing BMPs

Extensive research over several decades has resulted in a good understanding of the potential pollutant sources in the Long Branch Creek watershed. The following is a list of the **pollutant sources** and a

summary of the BMPs that have either been completed or are ongoing to reduce nutrient loads from each source:

- **Stormwater**
  - Ditch maintenance--removal of accumulated sediment and nuisance vegetation from areas in the Long Branch Creek watershed. Since 2012, nearly three miles of ditches have been cleaned out and then graded and sodded, representing about 31% of the total ditches in the watershed.
  - Cleanout of stormwater pipes and structures—about four miles cleaned out since 2012. Approximately 5,500 cubic yards of sediment and debris have been removed from the stormwater system (ditches, pipes, and structures), resulting in an estimated removal of 5,258 lbs of TP and 8,562 lbs of TN from the watershed.
  - Stormwater pond compliance and enhancement--Pinellas County began a Stormwater Pond Compliance and Enforcement Program and reestablished the Adopt-a-Pond program in 2014. Both programs are aimed towards improving privately owned stormwater ponds and providing education on proper pond maintenance.
  - Street sweeping--reduces total suspended solids and associated pollutant wash-off from urban streets. Pinellas County monthly street sweeping is estimated to result in annual removal of 19 lbs of TP and 29 lbs of TN in the Long Branch Creek watershed. The City of Largo sweeps its streets approximately every six weeks.
  - New Pinellas County Stormwater Manual and Code—employs the use of BMP trains in addition to standard stormwater treatment designs for nutrient reduction. Redevelopment of properties requires new or expanded stormwater management areas to reduce the pollutant contribution from stormwater runoff. This increases the water quality treatment required for projects that create new impervious surface.
  - City of Largo Stormwater Asset Management Plan—ongoing; will develop a stormwater program to meet regulatory water quality requirements.
  - City of Largo Stormwater Treatment Standards—requires more stringent standards than the Southwest Florida Water Management District (SWFWMD) for redevelopment. The City requires the treatment of the first ½ inch of runoff, as opposed to SWFWMD's requirement of ¼ inch.
- **Fertilizer and Landscape Management**
  - The County-wide fertilizer use and landscaped management ordinance which regulates the types of fertilizers that can be sold and used, as well as how and when fertilizers may be applied, is expected to minimize the nutrient loading from residential and commercial irrigation runoff. Additionally, the landscape management program requires all "mow and blow" type personnel to attend BMP training which includes extensive education on managing debris.
- **Sanitary Sewer Inspection and Maintenance**
  - City of Largo adopted a Sanitary Sewer Service Improvement Plan in 2007 to improve sanitary sewer systems to prevent failures and overflows.
  - City of Largo Interceptor Cleaning Program—initiated in 2008; annual pumping, cleaning, and video inspection of interceptor sewer pipe.
  - Influent and Headworks Project in 2016 upgraded the City of Largo wastewater treatment facility.
  - The Wet Weather Project provided seven new/reconstructed lift stations, 14 miles of new forcemain, and a monitoring and control system for storms.
  - Lining or replacing 39,696 linear feet of sanitary pipe in the City of Largo, inspecting at least 20% of sanitary sewer conveyances each year to prevent seepage, inflow, and

infiltration. Replacing 20 manhole rings and covers in the watershed in 2017 to prevent leaking.
    - City of Largo inspection of privately owned collection and transmission systems (POCTS) that connect to the municipal sewer system. 43 POCTS in the Long Branch Creek watershed, and approximately 33% failed inspection in 2016.
- **Pet Waste Ordinance**
    - Both Pinellas County and the City of Largo have ordinances requiring proper disposal of pet waste.
- **Public Outreach and Education**
    - Door-to-door distribution of educational materials on pet waste and water quality impacts
    - Displays at events
    - Stormdrain markers
    - Pinellas County Environmental Management website with environmental brochures, videos, and links
    - Pinellas County Watershed Education Campaign which includes billboards, PSAs at local movie theaters, social media, digital media, vehicle wraps, and other outreach efforts
    - Annual Lakes & Ponds Education Seminar related to the function and maintenance of stormwater ponds in Pinellas County
    - The City of Largo provides information on a variety of pollution topics through brochures, special event participation, and its website. The City also launched a social media campaign on topics related to pet waste, fertilizer, and proper management of grass clippings and yard waste. Largo estimates that it generated nearly 160,000 engagements related to these topics in 2016 alone.
    - Landscaping BMP certification--any person or company providing landscape services must obtain a Best Management Practices certification from Pinellas County. To be certified, individuals must attend a course in proper landscaping management, which includes content about ensuring that grass clippings are never blown into the road, ditch, or storm drain. Participants must pass an exam to receive a certification, and then receive a vehicle decal that must be displayed on any vehicle used during landscaping activities. The decal allows for enforcement of the certification requirement. Both Largo and County staff have been trained to verify that the decal is present when they observe landscaping crews working in the community.

4.2 Planned BMPs

With the progression of the NPDES programs and current stormwater management research, goals and objectives for stormwater treatment now include:

- Increased requirements for nutrient removal,
- Established requirements for discharges to impaired waters,
- Updated BMP design criteria and allowance for BMP treatment train credits,
- Encouragement of low impact or green infrastructure design, and
- Encouragement to seek retrofitting opportunities.

The Long Branch Best Management Practices Recommendations Report (ERD 2012b) identified areas in which to target BMP implementation to achieve the greatest load reductions, examined a number of

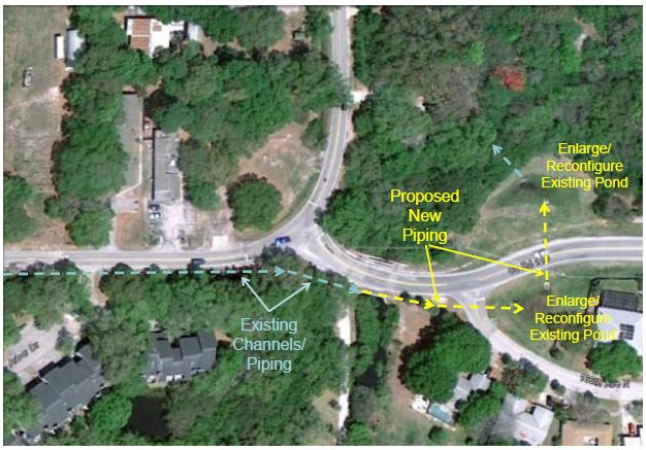
BMPs, and recommended options to achieve water quality improvements. The most feasible general types of BMPs for the Long Branch watershed were determined to be:

- Conversion of ponds / water features into wet detention ponds
- Enhancement and conversion of grassed swales into a series of linear retention ponds
- Inlet filters for curb and gutter systems

Specific projects recommended include:

- Removal of debris and organic muck near tributary inflow Site 4
- Conversion of borrow pit pond near Site 10 into a wet detention pond, with enhanced diversion of water into the pond for treatment

- Enhancement of an existing stormwater treatment pond and construction of a new pond for Whitney Road drainage



Funding for these projects will be pursued through capital improvement funds and possibly through grants with SWFWMD, Tampa Bay Estuary Program, and others. Nutrient loads will be reduced to the maximum extent possible, although dissolved oxygen levels are expected to remain impaired due in part to natural conditions, as described in the TMDL. The County may consider actions to determine a more appropriate DO criterion for this watershed. Pinellas County and its partners are actively refining methods to more accurately measure loads and load reductions and will continue to work toward water quality improvements in this watershed.

5.0 References

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