Project Overview

Multifamily Stormwater Development

- Located in unincorporated Hillsborough County, Fl
- 2.92 Ac Development
- Tampa Bay Tributary Watershed
    - Alternative Restoration Plan
    - Discharges to Outstanding Florida Water so under the Section 8.3.4 (effective December 28 2025) must meet ≥95% TP and ≥95% TN annual load reductions.

Stormwater System Design Highlights

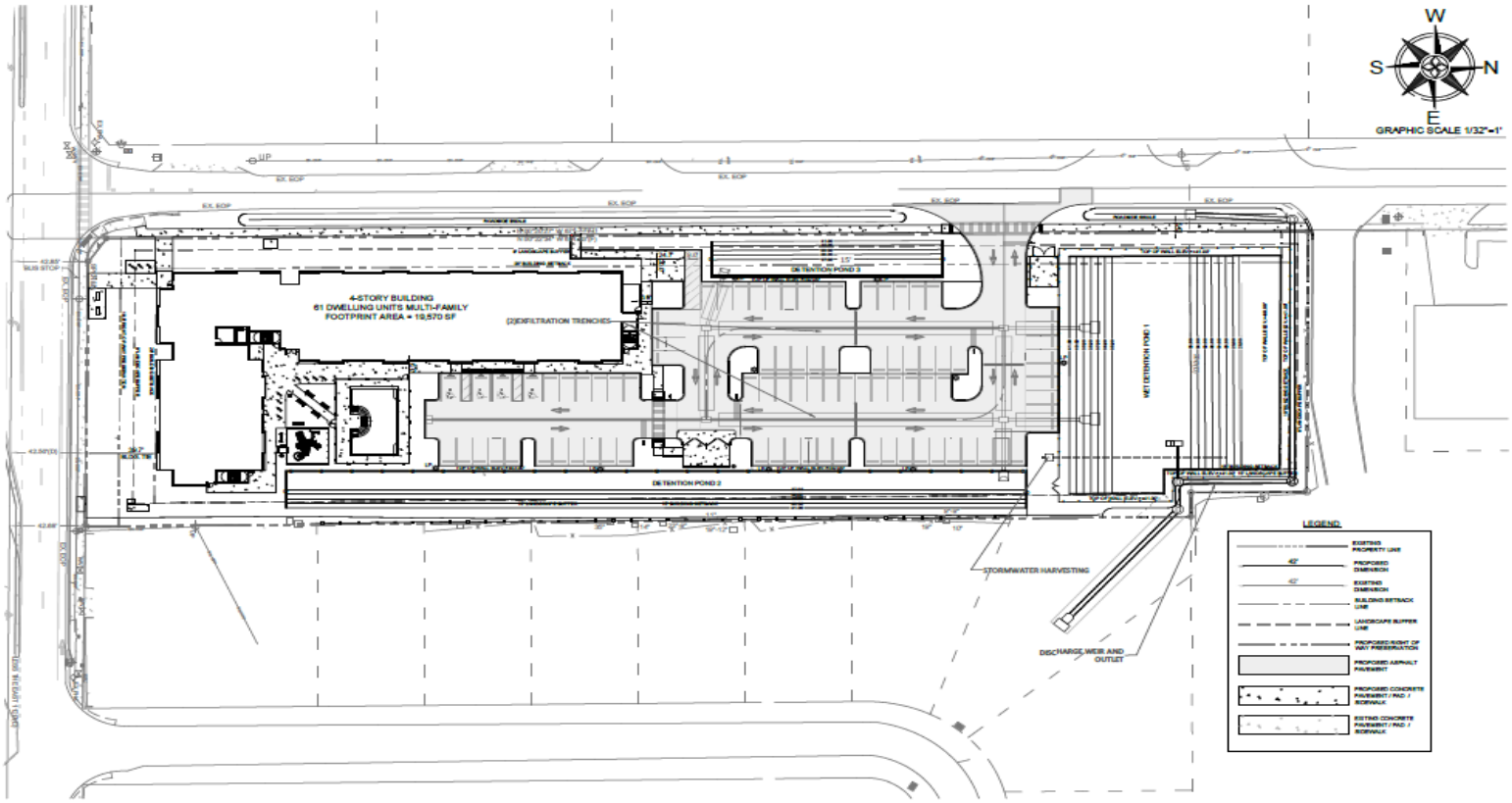
- Enhanced BMPs:
    - 952 LF exfiltration trenches (expanded from 643 LF)
    - Tree wells
    - Stormwater Harvesting
    - Littoral zone wetland planting

Project Description:

This real-world multi-family new development project is in an unincorporated area of Hillsborough County. The project includes one (1) four-story apartment building, a community pool, amenity areas, vehicular parking spaces, and stormwater treatment facilities.

The receiving waterbody is located within the Tampa Bay Tributaries watershed that is covered under an Alternative Restoration Plan (ARP) for nutrients. This plan outlines pollutant load reduction strategies to restore nutrient levels, specifically targeting Total Nitrogen (TN) and Total Phosphorus (TP). Projects located within this watershed are expected to support ARP objectives through site-specific design that contribute to overall nutrient load reductions.

The objective of this example is to analyze the net improvement design under presumptive criteria standards and establish how the example could be improved to achieve and meet the newly adopted performance standard requirements of Chapter 62-330 F.A.C., established on June 28, 2024, in both the Environmental Resources Permit Applicants Handbook Volume I and representative District Volume II’



Scenario 1 - Permitted Developed Conditions

Scenario 1 – Pre-Development and Permitted Developed Conditions:

The project site encompasses 127,103 square feet (2.92 acres) of undeveloped Ruderal/Upland Pines, situated within the Duck Pond Watershed, a sub-basin of the Tampa Bay Tributaries Watershed (HUC 12). This land cover is representative of upland pine systems interspersed with ruderal vegetation, typically found in areas with historic disturbance and passive vegetative regeneration.

According to the NRCS Soil Survey for Hillsborough County, the site contains soils of the Malabar, Myakka, and Zolfo fine sand series, which can be classified as Hydrologic Soil Group A/D.

Based on regional geotechnical data, the Seasonal High –Water Table (SHWT) is approximately 1 foot below existing grade (+37.00 ft NAVD). To accommodate this, approximately 4 feet of fill was added in low-lying areas to raise the finished grade to +41.00 ft NAVD.

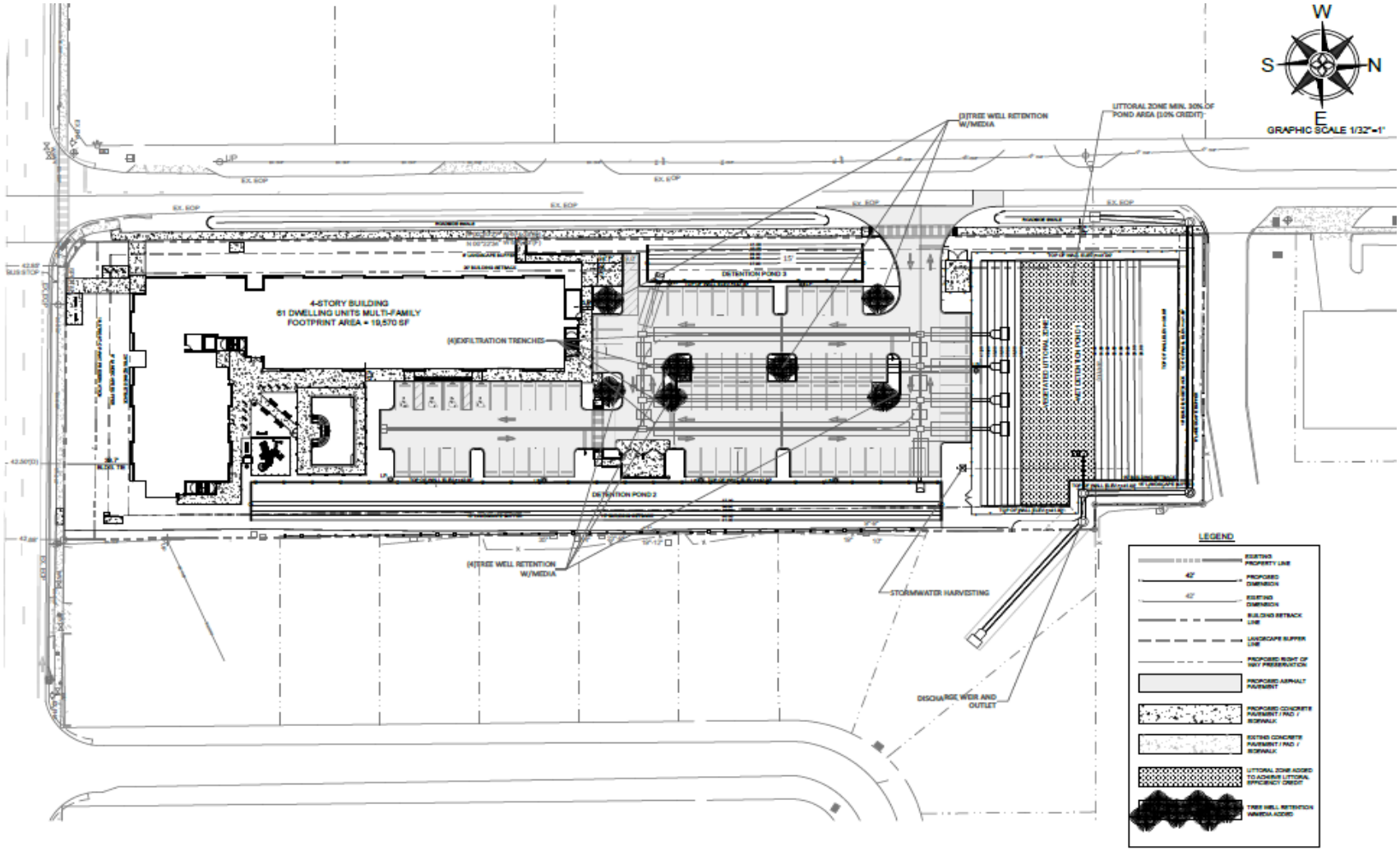
Stormwater runoff across the site generally sheet flows toward the center of the property, where it is detained until it reaches elevation +37.70 ft NAVD—the invert elevation of a 15-inch diameter corrugated metal pipe (CMP). Natural land overtopping weir, located in the northeast corner of the site adjacent to the Hillsborough County Drainage Seepage Basin, has an inverted elevation of +39.10 ft NAVD. Excess runoff is discharged offsite through a 43-linear-foot CMP.

The permitted development conditions include a four-story multifamily residential building, complemented by ground surface level parking, a community pool, and recreational amenity areas. The stormwater system design integrates native landscaping features and utilizes both exfiltration trenches and a wet detention facility to manage runoff on-site.

To control stormwater, the site will incorporate approximately 643 linear feet of exfiltration trenches. These trenches are designed to capture and direct runoff toward two grassed swales situated along the eastern and western boundaries of the property, as well as a wet detention pond located along the northern perimeter. Each trench will feature a rectangular profile measuring 2.5 foot in depth by 8.5 foot in width and will contain an 18-inch perforated HDPE pipe. The pipe will be encased in a coarse No. 57 aggregate layer and wrapped in a geotextile fabric to enhance filtration and promote infiltration.

Stormwater collected from the site will ultimately discharge into an existing seepage basin managed by Hillsborough County, located adjacent to the property's northeastern corner. This basin is part of drainage subbasin 623200. The current hydraulic connection between subbasins 623215 and 623200 will be preserved through an existing 15inch corrugated metal pipe. Additionally, a 30-inch pipe installed along the site's northern boundary

provides a bypass route for off-site flow, maintaining hydrologic continuity between developed areas situated to the north and east of the project area, including the county-maintained seepage basin.



Scenario 2 - 2024 Stormwater Rule Enhancement Conditions

Scenario 2 - 2024 Stormwater Rule Enhancement Conditions:

The project site is located upstream of the Hillsborough Reservoir and ultimately discharges to the Hillsborough River, which is classified as an Impaired Waterbody. in accordance with requirements for stormwater treatment systems located within a HUC 12 subwatershed that contains an impaired waterbody and lies upstream of an Outstanding Florida Water (OFW), the system must achieve at least a 95% reduction in the average annual loading of Total Phosphorus (TP) and an 95% reduction in Total Nitrogen (TN).

To comply with the minimum performance criteria outlined in Section 8.3.4, the proposed stormwater management system has been designed to exceed these standards, achieving a 99% reduction in the average annual loading of both TP and TN. The development is entirely contained within a single stormwater basin, designated PR-100, which encompasses approximately 127,103 square feet (2.92 acres).

A stormwater collection system, comprised of inlets, pipes, 952 linear feet of exfiltration trenches, and tree wells with media will convey runoff to the wet detention ponds located on the east end of the property.

On the eastern side of the property, the pond was reconfigured to incorporate a littoral zone with wetland plantings, allowing the project to receive credit for its implementation. Stormwater harvesting, originally included in the initial stormwater design, has been retained as part of the enhanced system to provide both additional treatment and an alternative water supply for green spaces.

Treatment:

The water quality treatment (WQT) volume for Basin PR-100 was initially estimated using the presumptive design criteria established by the previous Southwest Florida Water Management District (SWFWMD) presumptive criteria. This preliminary calculation was based on runoff generated by 1.5 inches of rainfall over the entire site, resulting in an estimated treatment volume of approximately 15,382 cubic feet. This volume represents the baseline requirement under the previous design practices.

To demonstrate compliance with the enhanced performance standards outlined in Section 8.3.4 and the updated statewide stormwater rule, a pollutant loading analysis was conducted in accordance with the guidance of Applicants Handbook Volume I. The site discharges to Duck Pond, a waterbody within the Tampa Bay Tributaries HUC 12 watershed, which is classified as impaired for nutrients and dissolved oxygen, therefore, the project must ensure a net improvement in water quality for these parameters.

A pre/post-development pollutant loading analysis was completed using BMPTRAINS Version 4.2.3 to quantify nutrient reductions and evaluate potential dissolved oxygen impacts. The analysis confirmed that a treatment volume of 15,382 cubic feet would be required to meet the pollutant reduction targets. The proposed wet detention system will provide a permanent pool volume of 45,426 cubic feet substantially exceeding the required volume. Additionally, approximately 35% of the pond surface area at the seasonal high-water level (SHWL) will be planted with native littoral wetland vegetation to enhance treatment efficiency and support ecological function.

Water quality treatment (WQT) volume for Basin PR-100 is based on a wet detention pond system consistent with the additional provisions outlined in the Southwest Florida Water Management District (SWFWMD) guidelines. To estimate the potential required size of the stormwater management systems, presumptive treatment volume was calculated as the runoff generated by 1.5 inch of rainfall over the entire site. This resulting treatment volume of approximately 15,382 cubic feet represents the potential baseline volume required per standard design criteria. The estimation of treatment volume was then analyzed through pollutant load analysis utilizing the equation 9-2 in Volume 1. Because the site discharges to Duck Pond, a waterbody located within the Tampa Bay Tributaries HUC 12 watershed and classified as impaired for nutrients and dissolved oxygen, mitigation measures are required to ensure a net improvement in water quality for those pollutants, exceeding state standards. The volume was determined through pollutant loading analysis.

Conclusion:

The proposed development complies with the revised stormwater regulations through the implementation of a series of Best Management Practices (BMPs). These included the expansion of existing exfiltration trenches, installation of tree wells, incorporation of littoral zone wetland vegetation, and stormwater harvesting. Collectively, these measures are estimated to achieve a 99% treatment efficiency for the reduction of nitrogen and phosphorus.

It should be noted the BMPs in this example can be adjusted based on land use limitations and design constraints. For instance, in this example, the designer could consider the removal of the littoral zone in the wet detention pond 1 or reducing the pond size and still achieve the nutrient removal requirements outlined in Section 8.3.4, *Minimum Performance Standards for Impaired Waters*.

BMP Trains Analysis Summary

This analysis evaluates the impact of land-use change and stormwater treatment on nutrient loading for a 2.92-acre development site in Florida Zone 4. The report compares pre- and post-development conditions, highlighting differences in wet pond area and the effectiveness of multiple Best Management Practices (BMPs) in nutrient removal.

Key Findings:

Pre-Development Conditions (Undeveloped - Ruderal/Upland Pine)

Runoff Volume: 0.521 ac-ft/yr

Nitrogen Loading: 1.088 kg/yr

Phosphorus Loading: 0.104 kg/yr

DCIA Percentage: 0.00%

Post-Development Conditions (Multi-Family Land Use)

Scenario 1: Wet Pond 0.69 acres

Runoff Volume: 3.863 ac-ft/yr

Nitrogen Loading: 11.05 kg/yr

Phosphorus Loading: 2.48 kg/yr

Scenario 2: Wet Pond 0.69 acres

Runoff Volume: 3.863 ac-ft/yr

Nitrogen Loading: 11.05 kg/yr

Phosphorus Loading: 2.48 kg/yr

DCIA Percentage for Both Scenarios: 48.90%

Effectiveness of Additional BMPs

Scenario 1 (0.69-acre pond, single BMP approach):

Overall TN Treatment Efficiency: 89%

Overall TP Treatment Efficiency: 95%

Provided Nitrogen Discharge Load: 1.22 kg/yr

Provided Phosphorus Discharge Load: 0.13 kg/yr

Scenario 2 (0.39-acre pond, multiple BMPs in series):

Overall TN Treatment Efficiency: 99%

Overall TP Treatment Efficiency: 99%

Provided Nitrogen Discharge Load: 0.15 kg/yr

Provided Phosphorus Discharge Load: 0.019 kg/yr

Project: Multi-family new development

Site and Catchment Information: Existing Pre-Development Conditions

Analysis: Net Improvement

Catchment Name: Pre- Condition Landuse

Rainfall Zone: Florida Zone 4

Annual Mean Rainfall: Pre- Condition Land Use: 51.00

Pre-Condition Landuse Information

Landuse: Undeveloped - Ruderal/Upland Pine: TN=1.694 and TP=0.162

Area (acres): 2.92

Rational Coefficient (0-1): 0.04

Non DCIA Curve Number: 60.70

DCIA Percent (0-100): 0.00

Nitrogen EMC (mg/l): 1.694

Phosphorus EMC (mg/l): 0.162

Runoff Volume (ac-ft/yr): 0.521

Nitrogen Loading (kg/yr): 1.088

Phosphorus Loading (kg/yr): 0.104

Pre- Condition Land Use: 0.104

Post-Condition Landuse Information

Land Use: Multi-Family: TN=2.320 and TP=0.520

Area (acres): 2.92

Rational Coefficient (0-1): 0.41

Non DCIA Curve Number: 39.00

DCIA Percent (0-100): 48.90

Wet Pond Area (ac): 0.69

Nitrogen EMC (mg/l): 2.320

Phosphorus EMC (mg/l): 0.520

Runoff Volume (ac-ft/yr): 3.863

Nitrogen Loading (kg/yr): 11.050

Phosphorus Loading (kg/yr): 2.477

Wet Detention

Contributing Catchment Area (acres): 2.230

Permanent Pool Area (acres): 0.69

Average Residence Time (days): 87

Average Annual Runoff Volume (ac-ft/yr): 3.86

Pre- Condition Land Use: 3.86

Permanent Pool Volume (ac-ft): 0.925

Provided Nitrogen Treatment Efficiency (%): 42

Provided Phosphorus Treatment Efficiency (%): 73

Exfiltration Trench Design

Pipe Span (in): 18.0

Pipe Rise (in): 18.0

Pipe Length (ft): 738.0

Trench Width (ft): 8.5

Trench Depth (ft): 2.5

Trench Length (ft): 643.0

Aggregate Void (%): 0.40

Storage Volume (Ac-ft): 0.14

Retention Depth (in over CA): 0.772

Provided TN Treatment Efficiency (%): 79

Provided TP Treatment Efficiency (%): 79

Stormwater Harvesting Design

Total Contributing Area to Harvesting (ac): 2.920

Total Area Available for Irrigation (ac): 2.230

Available Harvest Volume (ac-ft): 0.800

Harvest Rate (0.1-4.0 in/week): 0.243

Provided TN Treatment Efficiency (%): 35

Provided TP Treatment Efficiency (%): 35

BMP's Combined in Series

Overall Provided Nitrogen Treatment Efficiency (%): 89

Overall Provided Phosphorus Treatment Efficiency (%): 95

Overall Nitrogen Load (kg/yr): 1.220

Overall Phosphorus Load (kg/yr): 0.127

Project: Multi-family new development

Site and Catchment Information: 2024 Stormwater Rule Enhancement conditions

Analysis: Net Improvement

Rainfall Zone: Florida Zone 4

Annual Mean Rainfall: 51.00

Pre-Condition Landuse Information

Landuse: Undeveloped - Ruderal/Upland Pine: TN=1.694 and TP=0.162

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Runoff Volume (ac-ft/yr): 0.521

Nitrogen Loading (kg/yr): 1.088

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Post-Condition Landuse Information

Landuse: Multi-Family: TN=2.320 and TP=0.520

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Nitrogen EMC (mg/l): 2.320

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Runoff Volume (ac-ft/yr): 3.863

Nitrogen Loading (kg/yr): 11.05

Phosphorus Loading (kg/yr): 2.477

Wet Detention with Littoral Shelf Design

Permanent Pool Volume (ac-ft): 1.040

Permanent Pool Volume (ac-ft) for 31 days residence: 0.372

Annual Residence Time (days): 98

Littoral Zone Efficiency Credit: 10

Provided TN Treatment Efficiency (%): 47

Provided TP Treatment Efficiency (%): 75

Exfiltration Trench Design

Pipe Span (in): 18.0

Pipe Rise (in): 18.0

Pipe Length (ft): 1,072.0

Trench Width (ft): 8.5

Trench Depth (ft): 2.5

Aggregate Void %: 0.40

Storage Volume (Ac-ft): 0.21

Retention Depth (in over CA): 1.005

Provided TN Treatment Efficiency (%): 86

Provided TP Treatment Efficiency (%): 86

Tree Well retention with media Design

Vegetated Area (Tree Well) depth (ft): 4.00

Tree Well Storage (above media + canopy capture): 3.00

Vegetated Area (Tree Well) Length (ft): 16.00

Vegetated Area (Tree Well) Width (ft): 16.00

Sustainable water storage capacity of the soil (ft): 0.250

Number of Similar Areas in Watershed: 7

Retention Depth for Provided Hydraulic Capture Efficiency (in): 0.780

Provided TN Treatment Efficiency (%): 79

Provided TP Treatment Efficiency (%): 79

Stormwater Harvesting Design

Total Contributing Area to Harvesting (ac): 2.920

Total Area Available for Irrigation (ac): 0.800

Available Harvest Volume (ac-ft): 0.243

Harvest Rate (0.1-4.0 in/week): 1.00

Provided TN Treatment Efficiency (%): 40

Provided TP Treatment Efficiency (%): 40

BMPs Combined in Series

Catchment Area (acres): 2.92

Watershed Non-DCIA Curve Number: 39.00

Watershed DCIA Percent: 48.90

Rainfall Zone: Florida Zone 4

Calculated Annual Coefficient (0-1): 0.41

Catchment Area (acres): Total (accumulated) Retention Depth (in over watershed): 1.785

Overall Provided Nitrogen Treatment Efficiency (%): 99

Overall Provided Phosphorus Treatment Efficiency (%): 99

Overall Nitrogen Load (kg/yr): 0.167

Overall Phosphorus Load (kg/yr): 0.004