

DRAINAGE SUB-BASIN ANALYSIS

Methodology

To measure the performance of each drainage sub-basin, performance goals were identified in the Village's original Stormwater Master Plan.

Water Quality Treatment Performance Goal: Drainage sub-basins discharging into lakes should have minimum water quality pre-treatment equal to the volume of the first one-half inch of runoff. Drainage sub-basins discharging into canals should have minimum water quality pre-treatment equal to the greater of the volume of the first one-inch of runoff or 2.5-inches over the impervious area contained within the sub-basin. This goal ensures that the drainage improvements meet South Florida Water Management District (SFWMD) and Miami-Dade County Department of Regulatory and Economic Resources (DRER) formerly the Department of Environmental Resource Management (DERM) requirements for water quality pre-treatment.

Water Quantity Treatment Performance Goals: As part of the original Stormwater Master Plan process, the Village adopted several water quantity treatment performance goals designed to reduce the potential for flooding within the Village.

- During the five-year, 24-hour design storm event, flooding should not exceed the crown of the local roadways located within the sub-basin.
- During the ten-year, 24-hour design storm event, flooding should not exceed the crown of the arterial or collector roadways located within the sub-basin.
- During the 25-year, 72-hour design storm event, flood depth should be less than 12-inches above the crown of the road.
- During the 100-year, 72-hour design storm event, flooding should be below the building finish floor elevation.

Existing conditions in each of the priority sub-basins were modeled to determine the extent to which the performance goals are currently being met. When a performance goal was not being

met within a sub-basin, stormwater management improvements were proposed for the sub-basin to bring it into compliance with the performance goal.

For each priority sub-basin, the amount of existing paved area, building area, and pervious area was determined using existing aerial photographs and GIS data. Elevation information contained in the GIS data was used to estimate the average high and low elevation of the paved area, building area, and pervious area associated with the sub-basin. The available GIS elevation information was very limited for the sub-basins areas, but adequate for developing proposed schematic or conceptual improvements. This information along with information on existing drainage infrastructure located within the sub-basin was incorporated into a computer model. Existing flood routing and maximum flood stage produced by four different design storm events for each sub-basin was analyzed within the computer model. In addition to flood routing analysis, each sub-basin was analyzed for water quality pre-treatment capacity. SFWMD and DRER require stormwater runoff to be pretreated to minimize pollution prior to discharging into any water body. Typically, water quality pre-treatment in the Village of Palmetto Bay is provided by exfiltration trench (underground perforated pipes in a gravel bed, also known as French drain) or by retention in roadside grass swale areas. The pre-treatment capacity of existing infrastructure within each sub-basin was estimated based on available data and compared with required pre-treatment volumes.

Based on the priority sub-basins that were designed and permitted as part of the original Stormwater Master Plan, it was determined that the storm events



most applicable to public right-of-way stormwater improvement projects include the 5-year, 24-hour and 100-year, 72-hour. The stormwater system performance results associated with those two storm events provided the required information for permitting through DRER for water quantity and water quality. The 10-year, 24-hour and 25-year, 72-hour storm events are not required for public sector permitting and are more applicable for retaining stormwater onsite for private development projects. As a result, the stormwater event modeling for this Stormwater Master Plan Update only includes the 5-year, 24-hour and 100-year, 72-hour events.



The following is a summary of the findings for each of the ten priority sub-basins (two sub-basins from the original Stormwater Master Plan and eight new priority sub-basins).

Drainage Sub-basin #11

Location: Drainage sub-basin 11 is generally located south of SW 152nd Street, north of SW 156nd Street, west of SW 89th Avenue, and east of Dixie Highway (US 1). Drainage sub-basin 11 is part of the C100C-N-11 Miami-Dade County basin along SW 152nd Street. Drainage sub-basin 11 was analyzed as part of the original Stormwater Master Plan. This report includes an updated improvement approach and budget for the proposed improvements.

Existing and Future Conditions: Figure 6 shows existing conditions for drainage sub-basin 11. The sub-basin consists of approximately 48.37 acres of existing residential and commercial development with approximately 6,470 linear feet of roadway, including SW 92nd Avenue, SW 89th Court, SW 89th Avenue, SW 157th Street, SW 156th Street, and SW 155th Street. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 156th Street, SW 92nd Avenue, SW 89th Court, and SW 155th Street. The location of these deficiencies can be seen in Figure 6. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 9.00 feet to a high of approximately 9.90 feet NGVD. It was assumed that the building finish elevations range from 9.67 feet (eight inches above the lowest crown of road) to 10.67 feet (eight inches above highest crown of



road). The lowest edge of road is 8.75 feet. Pervious area elevations were assumed to range from 8.85 feet (one inch above the lowest edge of road) to 10.00 feet (highest edge of road).

Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 11 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 11, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

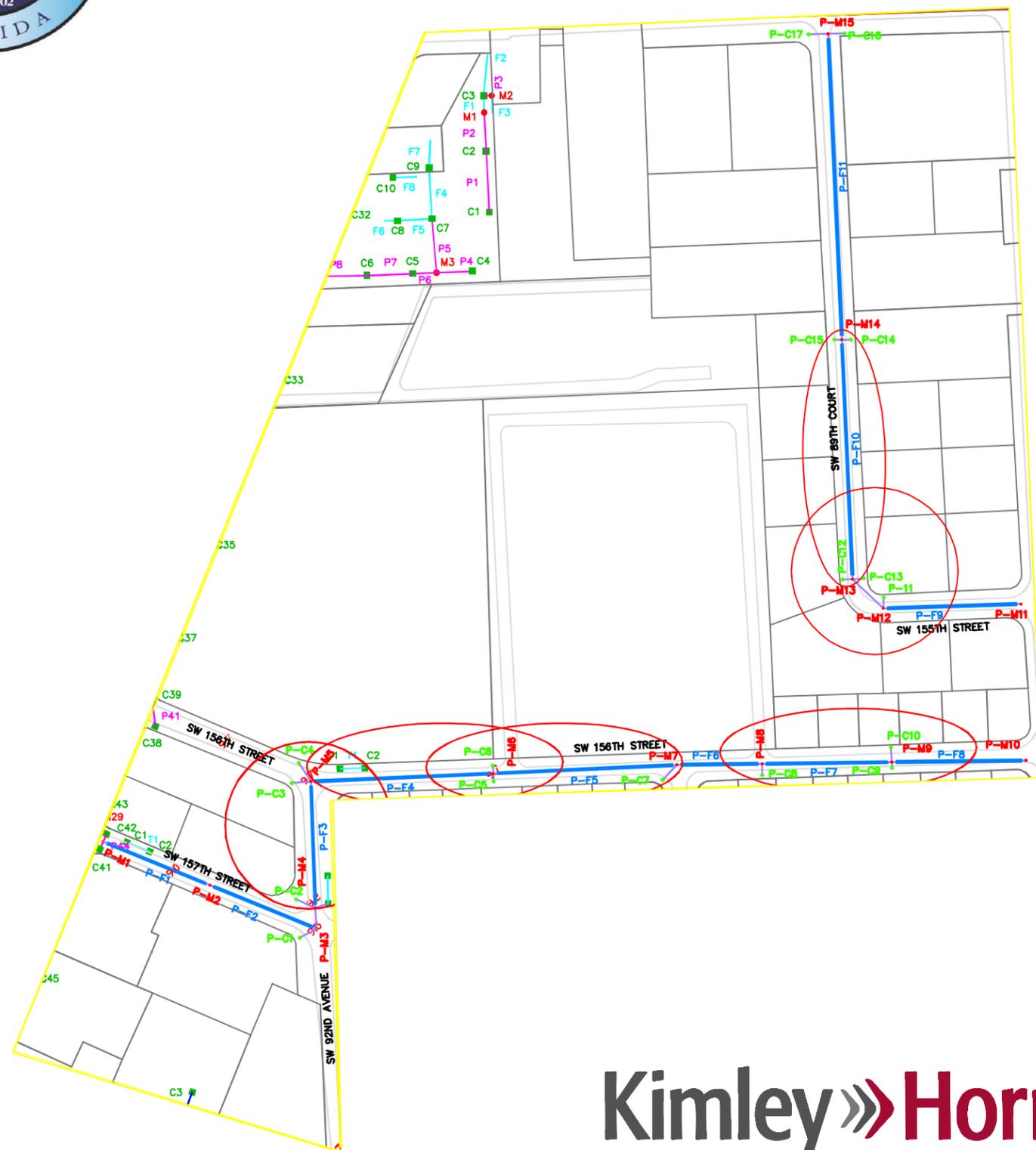
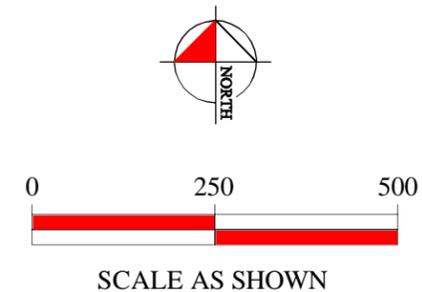
Table 1: Drainage Sub-basin 11 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	0.76 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	0.94 feet above lowest finish floor elevation (FFE.)
Total Above Goal	1.70 feet above performance goal criteria

The flood stages shown for drainage sub-basin 11 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 6: DRAINAGE SUB-BASIN #11 PROPOSED CONDITIONS



PROPOSED MODIFICATIONS

- Add 2,600 LF 18" French Drain / Exfiltration Trench
- Add 300 LF of 18" Storm Sewer Pipe (HDPE)
- Add 500 LF of 15" Storm Sewer Pipe (HDPE)
- Add 17 Catch Basins
- Add 15 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 8.75
- Min. Roadway Centerline Elevation 9.00
- Min. Building FFE 9.67

LEGEND

Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	0.00
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding across roadway observed by KHA	



Last Revised September 17, 2014

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.



Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 6. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how

the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 2: Drainage Sub-basin 11 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	28.75	26.64	2.11
Total Nitrogen	226.51	202.73	23.78
Total Suspended Solids	2,715.24	2,458.65	256.59

Capital Improvement Budget: An updated budget was developed for the proposed stormwater capital improvements.

Table 3: Drainage Sub-basin 11 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$18,345	\$19,000
2	Mobilization	1	L.S.	\$61,150	\$62,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,115	\$7,000
4	Asphalt Concrete Surface Course	11,000	S.Y.	\$8	\$88,000
5	Inlet Apron (Asphalt)	55	S.Y.	\$8	\$500
6	15" Diameter Polyethylene Pipe	500	L.F.	\$70	\$35,000
7	18" Diameter Polyethylene Pipe	300	L.F.	\$85	\$26,000
8	18" French Drain Exfiltration Trench	2,600	L.F.	\$100	\$260,000
9	Manhole	15	EA.	\$5,500	\$83,000
10	Catch Basin Inlet	17	EA.	\$6,000	\$102,000
11	Pollution Retardant Baffle	20	EA.	\$240	\$5,000
12	Utility Adjustments	1	L.S.	\$11,990	\$12,000
13	Professional Services	1	L.S.	\$118,915	\$119,000
14	Contingency	1	L.S.	\$69,950	\$70,000
TOTAL					\$890,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 12

Location: Drainage sub-basin 12 is generally located south of Richmond Drive (SW 168th Street), north of SW 170st Terrace (private road), west of Old Cutler Road, and east of SW 76th Avenue. Drainage sub-basin 12 is part of the C100C-E-11 Miami-Dade County basin. It includes portions of the Banyan Woods subdivision. Drainage sub-basin 12 was analyzed as part of the original Stormwater Master Plan. This report includes an updated improvement approach and budget for the proposed improvements.

Existing and Future Conditions: Figure 7 shows existing conditions for Drainage sub-basin 12. The sub-basin consists of approximately 25.26 acres of existing detached single-family residential development with approximately 2,290 linear feet of roadway, including SW 76th Avenue, SW 74th Court, SW 168th Terrace, SW 169th Terrace, SW 73rd Court, and SW 169th Street. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.

No complaints were reported in this area by the Village, but complaints from Miami-Dade County were identified as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 169th Terrace, SW 75th Avenue, and SW 74th Court. The location of these deficiencies can be seen in Figure 7. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 6.94 feet to a high of approximately 11.41 feet NGVD. It was assumed that the building finish elevations range from 7.61 feet (eight inches above the lowest crown of road) to 12.18 feet (eight inches above highest crown of road). The lowest edge of road is 6.69 feet.

Pervious area elevations were assumed to range from 6.79 feet (one inch above the lowest edge of road) to 11.51 feet (highest edge of road).

Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 12 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 12, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

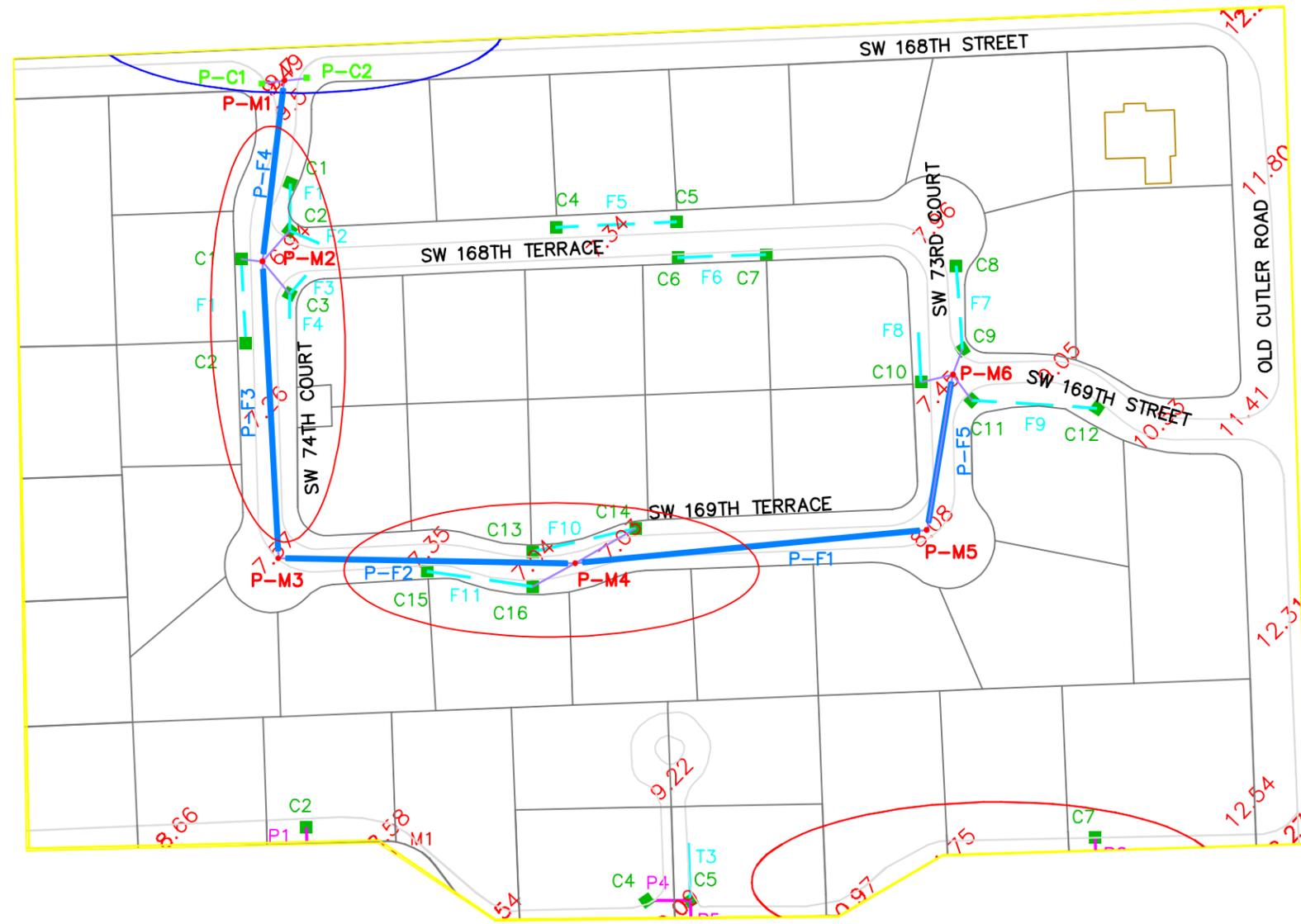
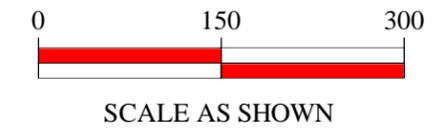
Table 4: Drainage Sub-basin #12 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.27 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.09 feet above lowest finish floor elevation (FFE)
Total Above Goal	3.36 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 12 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 7: DRAINAGE SUB-BASIN #12 PROPOSED CONDITIONS



PROPOSED MODIFICATIONS

- Add 1,200 LF 18" French Drain / Exfiltration Trench
- Add 50 LF of 18" Storm Sewer Pipe (HDPE)
- Add 400 LF of 15" Storm Sewer Pipe (HDPE)
- Add 2 Catch Basins
- Add 6 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 6.69
- Min. Roadway Centerline Elevation 6.94
- Min. Building FFE 7.61

LEGEND

Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding across roadway observed by KHA	
Flooding on Miami-Dade County roadways	

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Improvements to drainage infrastructure will be needed to address these inadequacies.

Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 7. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.



Table 5: Drainage Sub-basin 12 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	15.03	13.92	1.10
Total Nitrogen	118.40	105.97	12.43
Total Suspended Solids	1,419.33	1,285.20	134.13

Capital Improvement Budget: An updated budget was developed for the proposed stormwater capital improvements.

Table 6: Drainage Sub-basin 12 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$8,610	\$9,000
2	Mobilization	1	L.S.	\$28,705	\$29,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$2,871	\$3,000
4	Asphalt Concrete Surface Course	10,000	S.Y.	\$8	\$80,000
5	Inlet Apron (Asphalt)	6	S.Y.	\$8	\$50
6	15" Diameter Polyethylene Pipe	400	L.F.	\$70	\$28,000
7	18" Diameter Polyethylene Pipe	50	L.F.	\$85	\$5,000
8	18" French Drain Exfiltration Trench	1,200	L.F.	\$100	\$120,000
9	Manhole	6	EA.	\$5,500	\$33,000
10	Catch Basin Inlet	2	EA.	\$6,000	\$12,000
11	Pollution Retardant Baffle	10	EA.	\$240	\$3,000
12	Utility Adjustments	1	L.S.	\$5,621	\$6,000
13	Professional Services	1	L.S.	\$55,769	\$56,000
14	Contingency	1	L.S.	\$32,805	\$33,000
TOTAL					\$420,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 39

Location: Drainage sub-basin 39 is generally located south of SW 170th Terrace (private road), north of SW 173rd Street, west of Old Cutler Road, and east of SW 77th Avenue (Palmetto Road). Drainage sub-basin 39 is part of the C100C-E-11 Miami-Dade County basin.

Existing and Future Conditions: Figure 8 shows existing conditions for drainage sub-basin 39. The sub-basin consists of approximately 21.22 acres of existing detached single-family residential development with approximately 3,260 linear feet of roadway, including SW 172nd Street, SW 171st Street, SW 171st Terrace, SW 77th Avenue (Palmetto Road), SW 76th Avenue, and SW 74th Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.

No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 171st Street and SW 77th Avenue. The location of these deficiencies can be seen in Figure 8. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 6.19 feet to a high of approximately 13.83 feet NGVD. It was assumed that the building finish elevations range from 6.86 feet (eight inches above the lowest crown of road) to 14.60 feet (eight inches above highest crown of road). The lowest edge of road is 5.94 feet. Pervious area elevations were assumed to range from 6.04 feet (one inch above the lowest edge of road) to 13.93 feet (highest edge of road).

Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 39 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 39, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

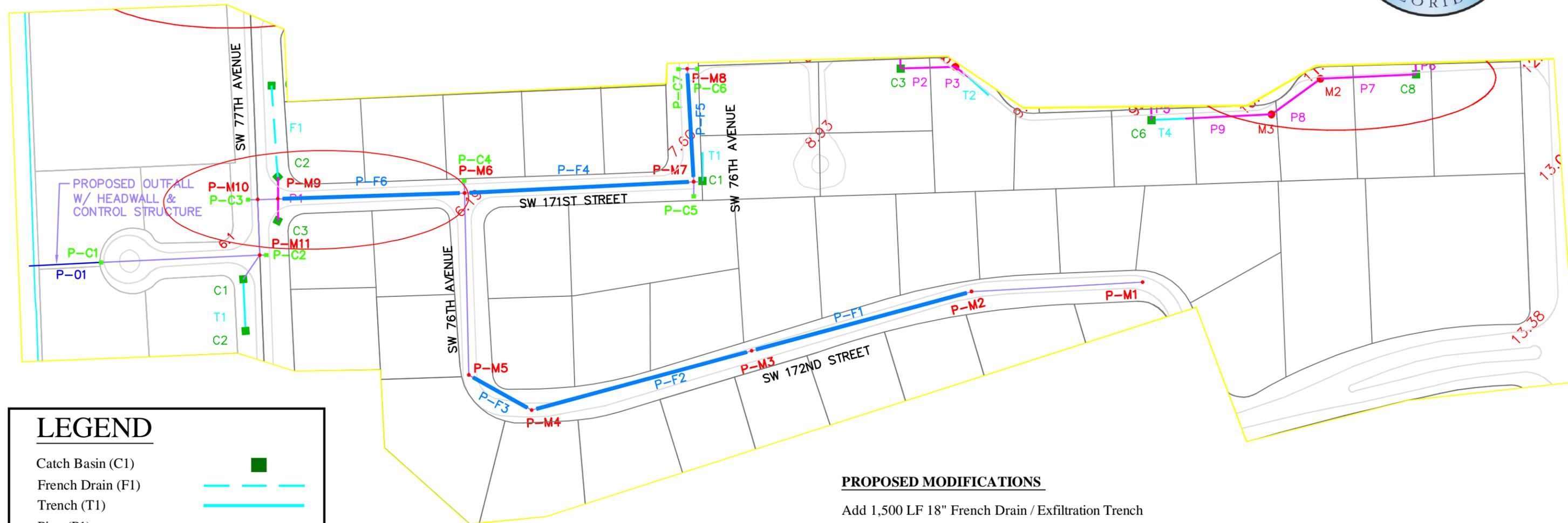
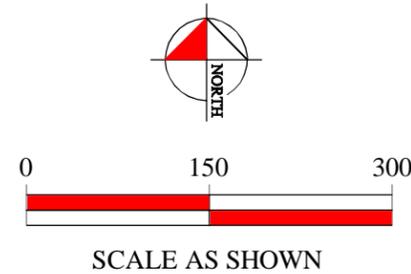
Table 7: Drainage Sub-basin #39 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.96 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	3.27 feet above lowest finish floor elevation (FFE)
Total Above Goal	5.23 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 39 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 8: DRAINAGE SUB-BASIN #39 PROPOSED CONDITIONS



LEGEND	
Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	0.00
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding across roadway observed by KHA	

PROPOSED MODIFICATIONS

- Add 1,500 LF 18" French Drain / Exfiltration Trench
- Add 1,050 LF of 18" Storm Sewer Pipe (HDPE)
- Add 150 LF of 15" Storm Sewer Pipe (HDPE)
- Add 7 Catch Basins
- Add 11 Manholes
- Add 1 Headwall
- Add 1 Control Structure

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 5.94
- Min. Roadway Centerline Elevation 6.19
- Min. Building FFE 6.86



Last Revised August 25, 2014

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Roadway settlement at the intersection of SW 171st Street and SW 77th Avenue was observed. Improvements to drainage infrastructure will be needed to address these inadequacies. SW 171st Street is a cul-de-sac with an opportunity to install an outfall connection. No existing outfall was observed.

Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 8. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins. This sub-basin has the possibility of a new outfall connection as well.

Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.



Table 8: Drainage Sub-basin 39 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	12.59	11.67	0.93
Total Nitrogen	99.22	88.80	10.42
Total Suspended Solids	1,189.32	1,076.93	112.39

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 9: Drainage Sub-basin 39 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$13,806	\$14,000
2	Mobilization	1	L.S.	\$46,020	\$47,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$4,602	\$5,000
4	Asphalt Concrete Surface Course	8,500	S.Y.	\$8	\$68,000
5	Inlet Apron (Asphalt)	20	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	150	L.F.	\$70	\$11,000
7	18" Diameter Polyethylene Pipe	1,050	L.F.	\$85	\$90,000
8	18" French Drain Exfiltration Trench	1,500	L.F.	\$100	\$150,000
9	Manhole	11	EA.	\$5,500	\$61,000
10	Catch Basin Inlet	7	EA.	\$6,000	\$42,000
11	Outfall Control Structure	1	EA.	\$10,000	\$10,000
12	Outfall Headwall	1	EA.	\$15,000	\$15,000
13	Pollution Retardant Baffle	12	EA.	\$240	\$3,000
14	Utility Adjustments	1	L.S.	\$9,004	\$10,000
15	Professional Services	1	L.S.	\$89,454	\$90,000
16	Contingency	1	L.S.	\$52,620	\$53,000
TOTAL					\$670,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 41

Location: Drainage sub-basin 41 is generally located south of SW 173rd Street, north of SW 174th Street, west of Old Cutler Road, and east of SW 77th Avenue. Drainage sub-basin 41 is part of the C100-C-20 Miami-Dade County basin.

Existing and Future Conditions: Figure 9 shows existing conditions for drainage sub-basin 41. The sub-basin consists of approximately 30.13 acres of existing detached single-family residential development with approximately 4,560 linear feet of roadway, including SW 173rd Street, SW 174th Street, SW 77th Avenue (Palmetto Road), SW 74th Avenue, SW 74th Court, and SW 73rd Court. The drainage system in this sub-basin includes two existing outfall connections on SW 174th Street, but the outfalls are only connected to local catch basins. Other areas of the sub-basin are closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 173rd Street, SW 174th Street, and SW 73rd Court. The location of these deficiencies can be seen in Figure 9.

The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process. The Village completed a local drainage repair on SW 174th Street just east of SW 77th Avenue (Palmetto Road).



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.92 feet to a high of approximately 13.83 feet NGVD. It was assumed that the building finish elevations range from 8.59 feet (eight inches above the lowest crown of road) to 14.60 feet (eight inches above highest crown of road). The lowest edge of road is 7.67 feet. Pervious area elevations were assumed to range from 7.77 feet (one inch above the lowest edge of road) to 13.93 feet (highest edge of road).



Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 41 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 41, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

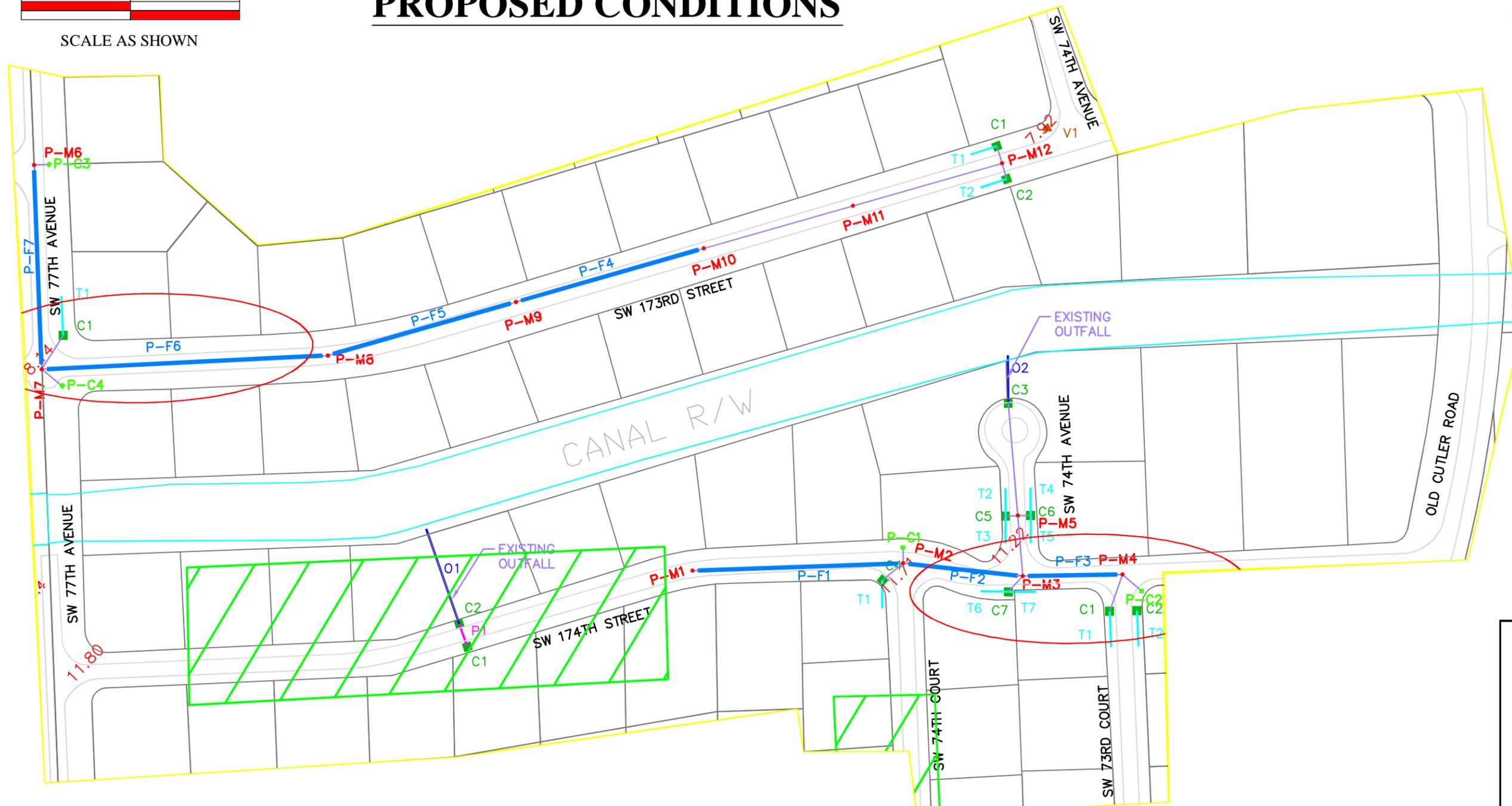
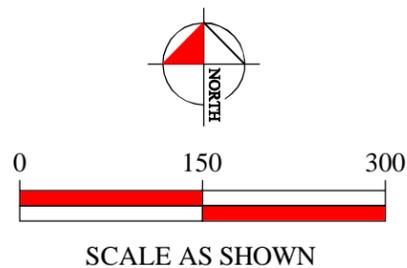
Table 10: Drainage Sub-basin 41 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.69 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.68 feet above lowest finish floor elevation (FFE)
Total Above Goal	4.37 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 41 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 9: DRAINAGE SUB-BASIN #41 PROPOSED CONDITIONS



LEGEND	
Catch Basin (C1)	■
French Drain (F1)	—
Trench (T1)	—
Pipe (P1)	—
Outfall (O1)	—
Sub-Basin Boundary	—
Manhole (M1)	●
Elevation	0.00
Proposed Catch Basin (P-C1)	■
Proposed French Drain (P-F1)	—
Proposed Manhole (P-M1)	●
Proposed Pipe	—
Flooding across roadway observed by KHA	○
Local drainage improvements complete	▨

PROPOSED MODIFICATIONS

- Add 1,700 LF 18" French Drain / Exfiltration Trench
- Add 2,000 LF of 18" Storm Sewer Pipe (HDPE)
- Add 350 LF of 15" Storm Sewer Pipe (HDPE)
- Add 4 Catch Basins
- Add 12 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 7.67
- Min. Roadway Centerline Elevation 7.92
- Min. Building FFE 8.59



Last Revised August 25, 2014

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales, outfalls, and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Improvements to drainage infrastructure will be needed to address these inadequacies. SW 77th Court is a cul-de-sac just west of the sub-basin 41 limits, but may provide an opportunity to install an outfall connection if needed. No existing outfall was observed.



Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins, pipes, outfalls, and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 9. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. An analysis of the existing outfall capacities should be performed to evaluate the need for potential outfall improvements as well as the benefits of an additional outfall on SW 77th Court. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.



Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins

using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 11: Drainage Sub-basin 41 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	17.88	16.57	1.31
Total Nitrogen	140.87	126.08	14.79
Total Suspended Solids	1,688.61	1,529.04	159.57

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 12: Drainage Sub-basin 41 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$17,253	\$18,000
2	Mobilization	1	L.S.	\$57,510	\$58,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$5,751	\$6,000
4	Asphalt Concrete Surface Course	13,000	S.Y.	\$8	\$104,000
5	Inlet Apron (Asphalt)	11	S.Y.	\$8	\$100
6	15" Diameter Polyethylene Pipe	350	L.F.	\$70	\$25,000
7	18" Diameter Polyethylene Pipe	2,000	L.F.	\$85	\$170,000
8	18" French Drain Exfiltration Trench	1,700	L.F.	\$100	\$170,000
9	Manhole	12	EA.	\$5,500	\$66,000
10	Catch Basin Inlet	4	EA.	\$6,000	\$24,000
11	Pollution Retardant Baffle	14	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$11,262	\$12,000
13	Professional Services	1	L.S.	\$111,707	\$112,000
14	Contingency	1	L.S.	\$65,710	\$66,000
TOTAL					\$840,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 42

Location: Drainage sub-basin 42 is generally located south of SW 168th Street (Richmond Drive), north of SW 171st Street, west of SW 76th Avenue, and east of SW 77th Avenue (Palmetto Road). Drainage sub-basin 42 is part of the C100C-E-11 Miami-Dade County basin.

Existing and Future Conditions: Figure 10 shows existing conditions for drainage sub-basin 42.

The sub-basin consists of approximately 17.37 acres of existing detached single-family residential development with approximately 3,160 linear feet of roadway, including SW 168th Terrace, SW 169th Street, SW 169th Terrace, SW 170th Street, SW 77th Avenue (Palmetto Road) and SW 76th Avenue. The drainage system in this sub-basin includes two existing outfall connections on the cul-de-sacs on SW 168th Terrace and SW 169th Terrace, but the outfalls are only connected to local catch basins. Other areas of the sub-basin are closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways. This sub-basin includes a two-way single lane section on SW 76th Avenue.



No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 170th Street and SW 77th Avenue and on SW 169th Street and SW 76th Avenue. The location of these deficiencies can be seen in Figure 10. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 6.32 feet to a high of approximately 9.60 feet NGVD. It was assumed that the

building finish elevations range from 6.99 feet (eight inches above the lowest crown of road) to 10.37 feet (eight inches above highest crown of road). The lowest edge of road is 6.07 feet. Pervious area elevations were assumed to range from 6.17 feet (one inch above the lowest edge of road) to 9.70 feet (highest edge of road).



Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 42 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 42, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

Table 13: Drainage Sub-basin 42 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.23 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	1.97 feet above lowest finish floor elevation (FFE)
Total Above Goal	3.20 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 42 exceed allowable levels and the sub-basin does not meet the performance goal criteria.

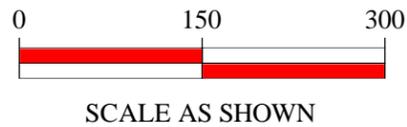
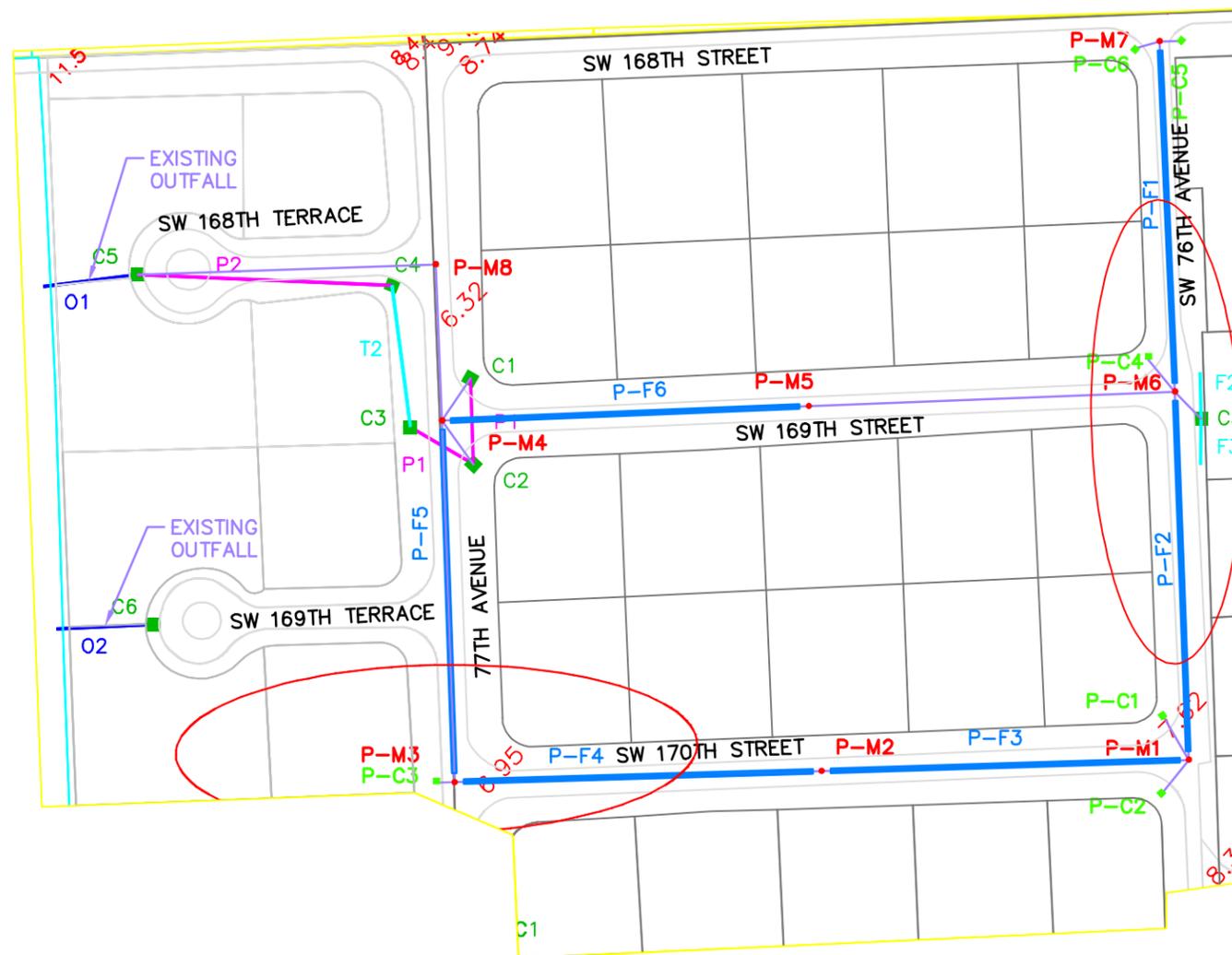


FIGURE 10: DRAINAGE SUB-BASIN #42 PROPOSED CONDITIONS



LEGEND

Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding across roadway observed by KHA	

PROPOSED MODIFICATIONS

- Add 1,800 LF 18" French Drain / Exfiltration Trench
- Add 800 LF of 18" Storm Sewer Pipe (HDPE)
- Add 300 LF of 15" Storm Sewer Pipe (HDPE)
- Add 6 Catch Basins
- Add 8 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 6.07
- Min. Roadway Centerline Elevation 6.32
- Min. Building FFE 6.99

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales, outfalls, and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.



Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins, pipes, outfalls, and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 10. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. An analysis of the existing outfall capacities should be performed to evaluate the need for potential outfall improvements. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 14: Drainage Sub-basin 42 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	10.34	9.58	0.76
Total Nitrogen	81.43	72.88	8.55
Total Suspended Solids	976.14	883.89	92.25

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 15: Drainage Sub-basin 42 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$12,996	\$13,000
2	Mobilization	1	L.S.	\$43,320	\$44,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$4,332	\$5,000
4	Asphalt Concrete Surface Course	9,000	S.Y.	\$8	\$72,000
5	Inlet Apron (Asphalt)	17	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	300	L.F.	\$70	\$21,000
7	18" Diameter Polyethylene Pipe	800	L.F.	\$85	\$68,000
8	18" French Drain Exfiltration Trench	1,800	L.F.	\$100	\$180,000
9	Manhole	8	EA.	\$5,500	\$44,000
10	Catch Basin Inlet	6	EA.	\$6,000	\$36,000
11	Pollution Retardant Baffle	12	EA.	\$240	\$3,000
12	Utility Adjustments	1	L.S.	\$8,484	\$9,000
13	Professional Services	1	L.S.	\$84,184	\$85,000
14	Contingency	1	L.S.	\$49,520	\$50,000
TOTAL					\$630,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 43

Location: Drainage sub-basin 43 is generally located south of SW 165th Terrace, north of SW 168th Street (Richmond Drive), west of SW 72nd Avenue, and east of SW 77th Avenue (Palmetto Road). Drainage sub-basin 42 is part of the C100C-E-10 Miami-Dade County basin.

Existing and Future Conditions: Figure 11 shows existing conditions for drainage sub-basin 43.

The sub-basin consists of approximately 40.87 acres of existing detached single-family residential development with approximately 8,350 linear feet of roadway, including SW 165th Terrace, SW 166th Street, SW 166th Terrace, SW 167th Street, SW 77th Avenue (Palmetto Road), SW 74th Court, SW 74th Avenue, and SW 72nd Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



Complaints were reported in this area by the Village at SW 167th Street and on Old Cutler Road. Complaints from Miami-Dade County were identified in drainage sub-basin 43 as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 166th Street, SW 166th Terrace and



SW 74th Court. The location of these deficiencies can be seen in Figure 11. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.10 feet to a high of approximately 12.80 feet NGVD. It was assumed that the building finish elevations range from 7.77 feet (eight inches above the lowest crown of road) to 13.57 feet (eight inches above highest crown of road). The lowest edge of road is 6.85 feet.

Pervious area elevations were assumed to range from 6.95 feet (one inch above the lowest edge of road) to 12.90 feet (highest edge of road).

Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 43 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 43, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

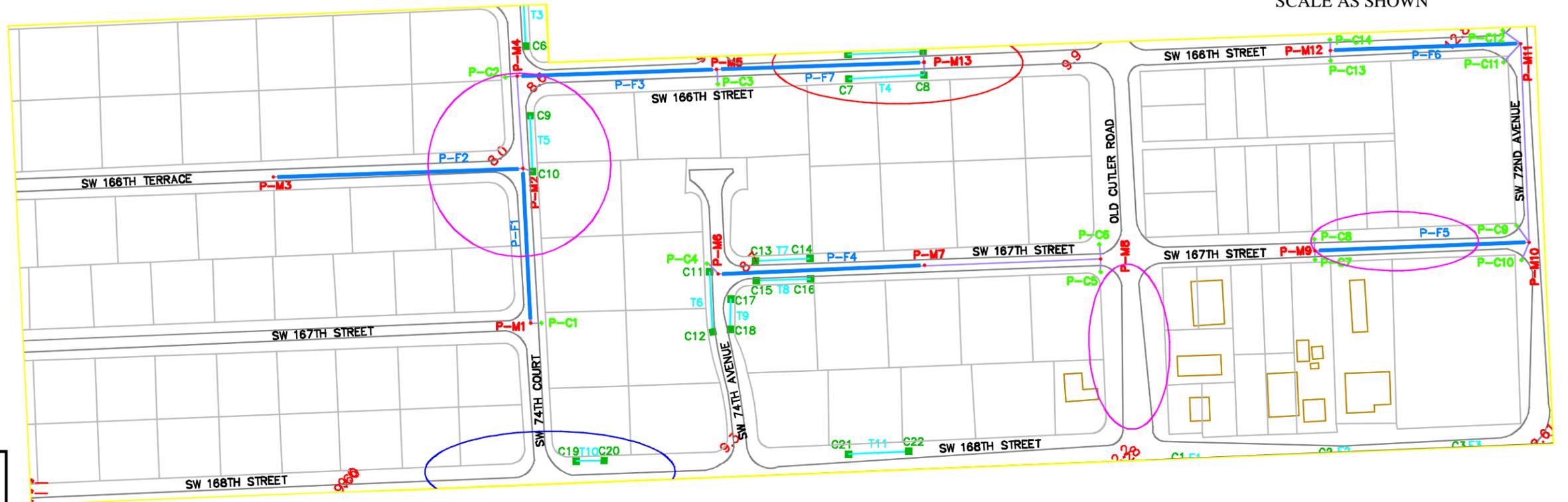
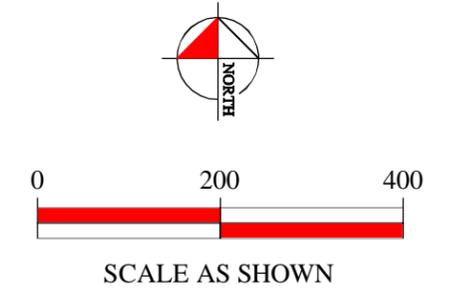
Table 16: Drainage Sub-basin 43 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.78 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.83 feet above lowest finish floor elevation (FFE)
Total Above Goal	4.61 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 43 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 11: DRAINAGE SUB-BASIN #43 PROPOSED CONDITIONS



LEGEND	
Catch Basin (C1)	■
French Drain (F1)	---
Trench (T1)	—
Pipe (P1)	—
Outfall (O1)	—
Sub-Basin Boundary	—
Manhole (M1)	●
Elevation	0.00
Proposed Catch Basin (P-C1)	■
Proposed French Drain (P-F1)	---
Proposed Manhole (P-M1)	●
Proposed Pipe	—
Flooding across roadway observed by KHA	○
Flooding on Miami-Dade County roadways	○
Flooding reported by the Village	○

PROPOSED MODIFICATIONS

- Add 2,350 LF 18" French Drain / Exfiltration Trench
- Add 850 LF of 18" Storm Sewer Pipe (HDPE)
- Add 400 LF of 15" Storm Sewer Pipe (HDPE)
- Add 14 Catch Basins
- Add 13 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 6.85
- Min. Roadway Centerline Elevation 7.10
- Min. Building FFE 7.77



Last Revised August 25 2014

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.



Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 11. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.



Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 17: Drainage Sub-basin 43 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	24.29	22.51	1.79
Total Nitrogen	191.41	171.31	20.10
Total Suspended Solids	2,294.49	2,077.66	216.83

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 18: Drainage Sub-basin 43 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$19,482	\$20,000
2	Mobilization	1	L.S.	\$64,940	\$65,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,494	\$7,000
4	Asphalt Concrete Surface Course	17,500	S.Y.	\$8	\$140,000
5	Inlet Apron (Asphalt)	39	S.Y.	\$8	\$400
6	15" Diameter Polyethylene Pipe	400	L.F.	\$70	\$28,000
7	18" Diameter Polyethylene Pipe	850	L.F.	\$85	\$73,000
8	18" French Drain Exfiltration Trench	2,350	L.F.	\$100	\$235,000
9	Manhole	13	EA.	\$5,500	\$72,000
10	Catch Basin Inlet	14	EA.	\$6,000	\$84,000
11	Pollution Retardant Baffle	14	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$12,728	\$13,000
13	Professional Services	1	L.S.	\$126,038	\$127,000
14	Contingency	1	L.S.	\$74,140	\$75,000
TOTAL					\$940,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 44

Location: Drainage sub-basin 44 is generally located south of SW 164th Street, north of SW 166th Street, west of SW 72nd Avenue, and east of SW 77th Avenue (Palmetto Road). Drainage sub-basin 44 is part of the C100C-E-10 Miami-Dade County basin.

Existing and Future Conditions: Figure 12 shows existing conditions for drainage sub-basin 44. The sub-basin consists of approximately 34.01 acres of existing detached single-family residential development with approximately 7,070 linear feet of roadway, including SW 164th Street, SW 164th Terrace, SW 165th Street, SW 165th Terrace, SW 77th Avenue (Palmetto Road), SW 76th Avenue, SW 75th Avenue, SW 74th Court, SW 74th Avenue, and SW 72nd Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways. SW 167th Street appears to be elevated compared to the adjacent roadways.



No complaints were reported in this area by the Village as part of this update or from Miami-Dade County as part of the original master plan. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 164th Street, and SW 74th Avenue. The location of these deficiencies can be seen in Figure 12. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 5.90 feet to a high of approximately 12.80 feet NGVD. It was assumed that the building finish elevations range from 6.57 feet (eight inches above the lowest crown of road) to 13.57 feet (eight inches above highest crown of road). The lowest edge of road is 5.65 feet. Pervious area elevations were assumed to range from 5.75 feet (one inch above the lowest edge of road) to 12.9 feet (highest edge of road).

Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 44 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 44, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

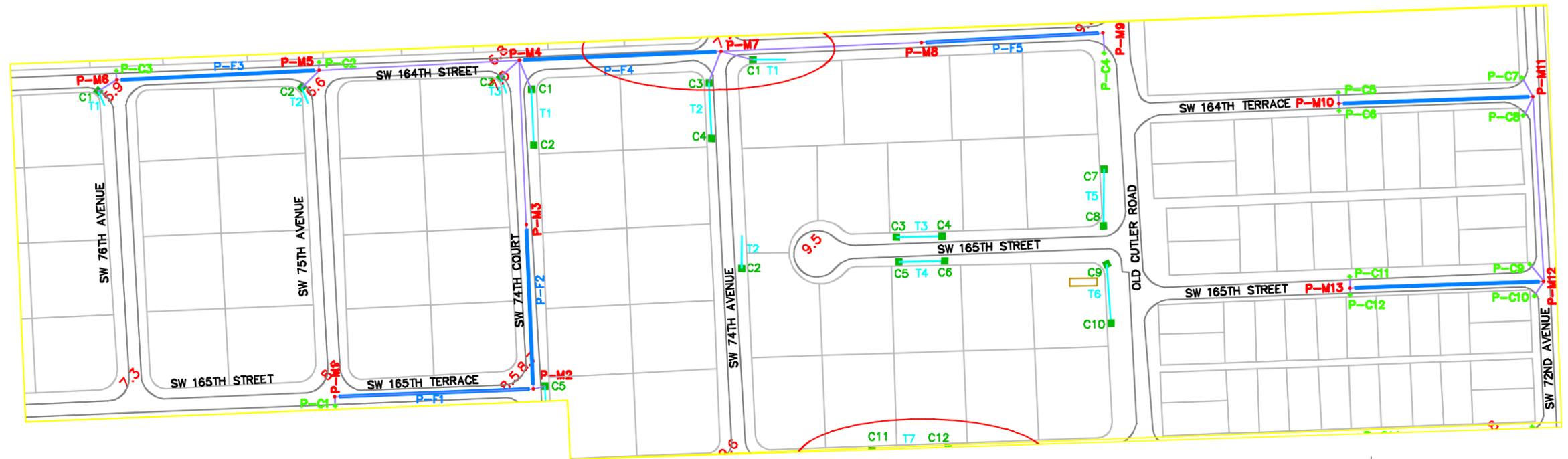
Table 19: Drainage Sub-basin 44 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.58 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.32 feet above lowest finish floor elevation (FFE)
Total Above Goal	3.90 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 44 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 12: DRAINAGE SUB-BASIN #44 PROPOSED CONDITIONS



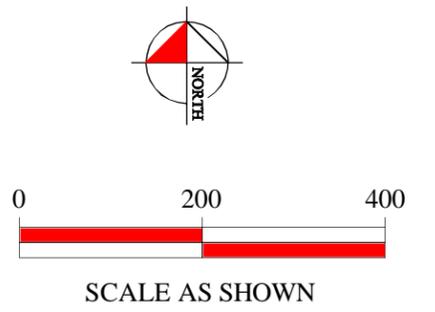
LEGEND	
Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding across roadway observed by KHA	

PROPOSED MODIFICATIONS

- Add 2,150 LF 18" French Drain / Exfiltration Trench
- Add 1,350 LF of 18" Storm Sewer Pipe (HDPE)
- Add 550 LF of 15" Storm Sewer Pipe (HDPE)
- Add 12 Catch Basins
- Add 13 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 5.65
- Min. Roadway Centerline Elevation 5.90
- Min. Building FFE 6.57



Last Revised August 25, 2014

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally in good condition, but would benefit from resurfacing. Improvements to drainage infrastructure will be needed to address these inadequacies.



Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 12. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.



Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 20: Drainage Sub-basin 44 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	20.20	18.71	1.48
Total Nitrogen	159.12	142.41	16.71
Total Suspended Solids	1,907.40	1,727.15	180.25

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 21: Drainage Sub-basin 44 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$20,739	\$21,000
2	Mobilization	1	L.S.	\$69,130	\$70,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,913	\$7,000
4	Asphalt Concrete Surface Course	20,000	S.Y.	\$8	\$160,000
5	Inlet Apron (Asphalt)	34	S.Y.	\$8	\$300
6	15" Diameter Polyethylene Pipe	550	L.F.	\$70	\$39,000
7	18" Diameter Polyethylene Pipe	1,350	L.F.	\$85	\$115,000
8	18" French Drain Exfiltration Trench	2,150	L.F.	\$100	\$215,000
9	Manhole	13	EA.	\$5,500	\$72,000
10	Catch Basin Inlet	12	EA.	\$6,000	\$72,000
11	Pollution Retardant Baffle	14	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$13,546	\$14,000
13	Professional Services	1	L.S.	\$134,181	\$135,000
14	Contingency	1	L.S.	\$78,930	\$79,000
TOTAL					\$1,000,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 57/96

Location: Drainage sub-basin 57/96 is generally located south of SW 155th Terrace, north of SW 160th Street, west of SW 92nd Avenue, and east of SW 87th Avenue. Drainage sub-basin 57/96 is part of the C100C-N-11 Miami-Dade County basin.

Existing and Future Conditions: Figure 13 shows existing conditions for drainage sub-basin 57/96. The sub-basin consists of approximately 55.34 acres of existing residential development with approximately 8,820 linear feet of roadway, including SW 155th Terrace, SW 156th Terrace, SW 157th Street, SW 158th Street, SW 159th Street, SW 160th Street, 92nd Avenue, SW 90th Avenue, SW 89th Avenue, SW 88th Court, SW 88th Avenue, SW 87th Court, and SW 87th Avenue. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



The Village reported extensive flooding on SW 88th Court and SW 159th Street in drainage sub-basin 96. In our investigation, Kimley-Horn found flooding extending across the entire roadway width on SW 87th Court. The location of these deficiencies can be seen in Figure 13. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process. The Village has a localized flooding project proposed at the intersection of SW 88th Avenue and SW 156th Terrace.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.70 feet to a high of approximately 10.00 feet NGVD. It was assumed that the building finish elevations range from 8.37 feet (eight inches above the lowest crown of road) to 10.77 feet (eight inches above highest crown of road). The lowest



edge of road is 7.45 feet. Pervious area elevations were assumed to range from 7.55 feet (one inch above the lowest edge of road) to 10.10 feet (highest edge of road).

Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 57/96 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 57/96, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

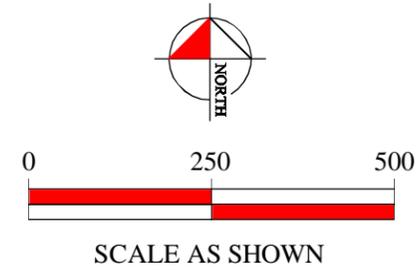
Table 22: Drainage Sub-basin 57/96 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.10 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	1.60 feet above lowest finish floor elevation (FFE)
Total Above Goal	2.70 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 57/96 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 13: DRAINAGE SUB-BASIN #57/96 PROPOSED CONDITIONS

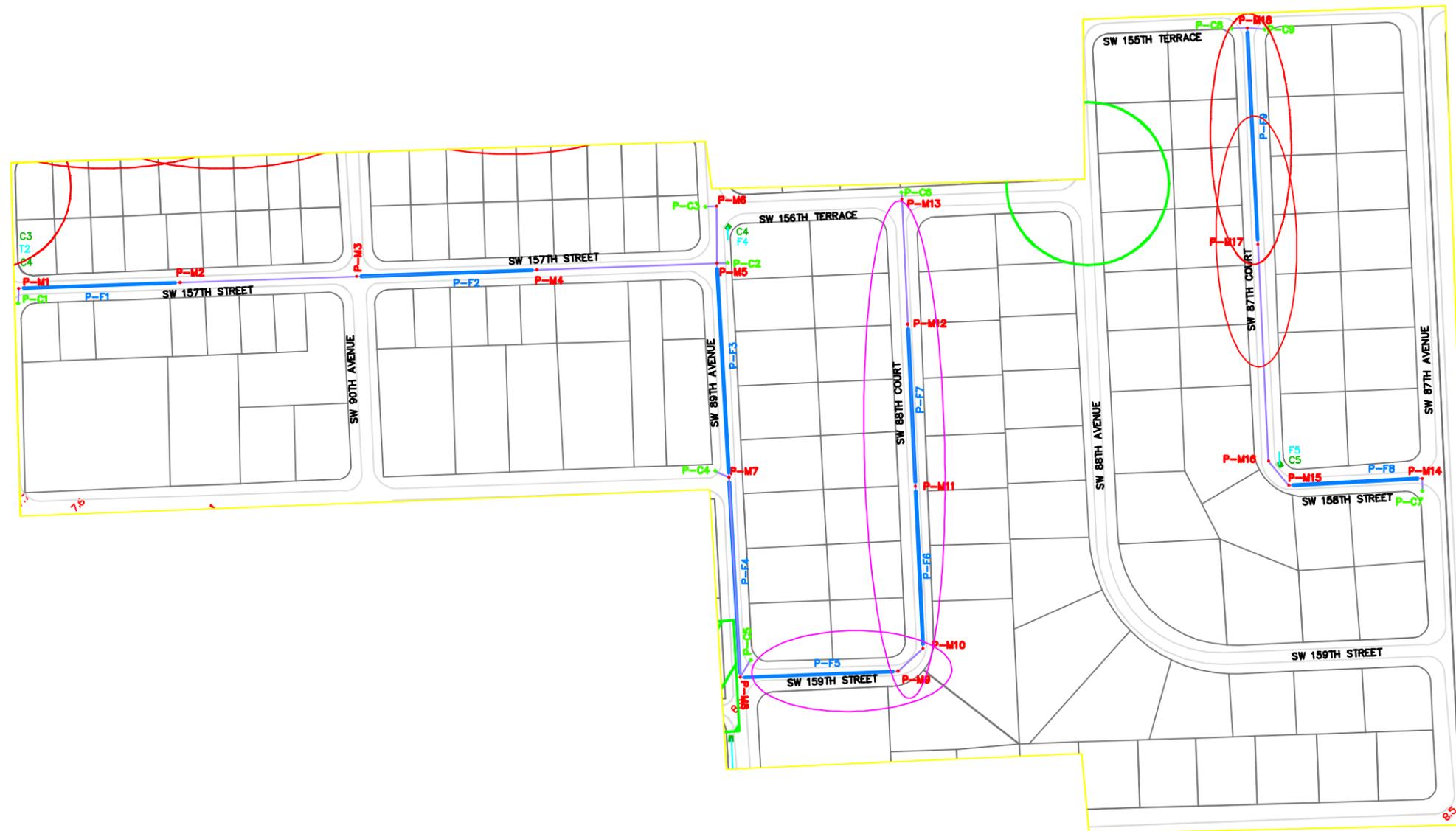


PROPOSED MODIFICATIONS

- Add 2,900 LF 18" French Drain / Exfiltration Trench
- Add 1,600 LF of 18" Storm Sewer Pipe (HDPE)
- Add 300 LF of 15" Storm Sewer Pipe (HDPE)
- Add 9 Catch Basins
- Add 18 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 7.45
- Min. Roadway Centerline Elevation 7.70
- Min. Building FFE 8.37



LEGEND

- Catch Basin (C1)
- French Drain (F1)
- Trench (T1)
- Pipe (P1)
- Outfall (O1)
- Sub-Basin Boundary
- Manhole (M1)
- Elevation 0.00
- Proposed Catch Basin (P-C1)
- Proposed French Drain (P-F1)
- Proposed Manhole (P-M1)
- Proposed Pipe
- Flooding reported by the Village
- Flooding across roadway observed by KHA
- Flooding to be mitigated by projects under design or construction.
- Local drainage improvements complete

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. SW 88th Avenue and SW 159th Street have recently been paved, but pavement condition within the remaining portions of the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.

Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 13. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 23: Drainage Sub-basin 57/96 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	32.85	30.43	2.41
Total Nitrogen	258.80	231.63	27.17
Total Suspended Solids	3,102.33	2,809.16	293.17

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 24: Drainage Sub-basin 57/96 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$22,686	\$23,000
2	Mobilization	1	L.S.	\$75,620	\$76,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$7,562	\$8,000
4	Asphalt Concrete Surface Course	17,000	S.Y.	\$8	\$136,000
5	Inlet Apron (Asphalt)	25	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	300	L.F.	\$70	\$21,000
7	18" Diameter Polyethylene Pipe	1,600	L.F.	\$85	\$136,000
8	18" French Drain Exfiltration Trench	2,900	L.F.	\$100	\$290,000
9	Manhole	18	EA.	\$5,500	\$99,000
10	Catch Basin Inlet	9	EA.	\$6,000	\$54,000
11	Pollution Retardant Baffle	18	EA.	\$240	\$5,000
12	Utility Adjustments	1	L.S.	\$14,824	\$15,000
13	Professional Services	1	L.S.	\$146,744	\$147,000
14	Contingency	1	L.S.	\$86,320	\$87,000
TOTAL					\$1,100,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 59/60

Location: Drainage sub-basin 59/60 is generally SW 82nd Avenue from NW 152nd Street to SW 160th Street and a localized improvement at the intersection of SW 160th Street and SW 81st Avenue. Drainage sub-basin 59/60 is part of the C100C-W-7 Miami-Dade County basin. It includes portions of the Cutler, Banyan Cove, Banyan Woods, and Old Cutler Palms subdivisions.

Existing and Future Conditions: Figure 14 shows existing conditions for drainage sub-basin 59/60. The sub-basin consists of approximately 40.97 acres of existing detached single-family residential development with approximately 7,520 linear feet of roadway, including SW 82nd Avenue, SW 81st Avenue, SW 155th Street, SW 156th Street, SW 158th Terrace, and SW 160th Street. The drainage system in this sub-basin is a closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways.



The Village of Palmetto Bay reported severe flooding complaints on SW 82nd Avenue and localized flooding on SW 160th Street west of SW 80th Avenue. The location of these deficiencies can be seen in Figure 14. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process. The Village installed a traffic circle with localized drainage improvements at the intersection of SW 160th Street and SW 82nd Avenue, as well as a second localized drainage improvement on SW 80th Avenue just south of SW 152nd Street.



Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 9.40 feet to a high of approximately 11.00 feet NGVD. It was assumed that the building finish elevations range from 10.07 feet (eight inches above the lowest crown of road) to 11.77 feet (eight inches above highest crown of road). The lowest edge of road is 9.15 feet. Pervious area elevations were assumed to range from 9.25 feet (one inch above the lowest edge of road) to 11.10 feet (highest edge of road).

Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 59/60 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 59/60, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

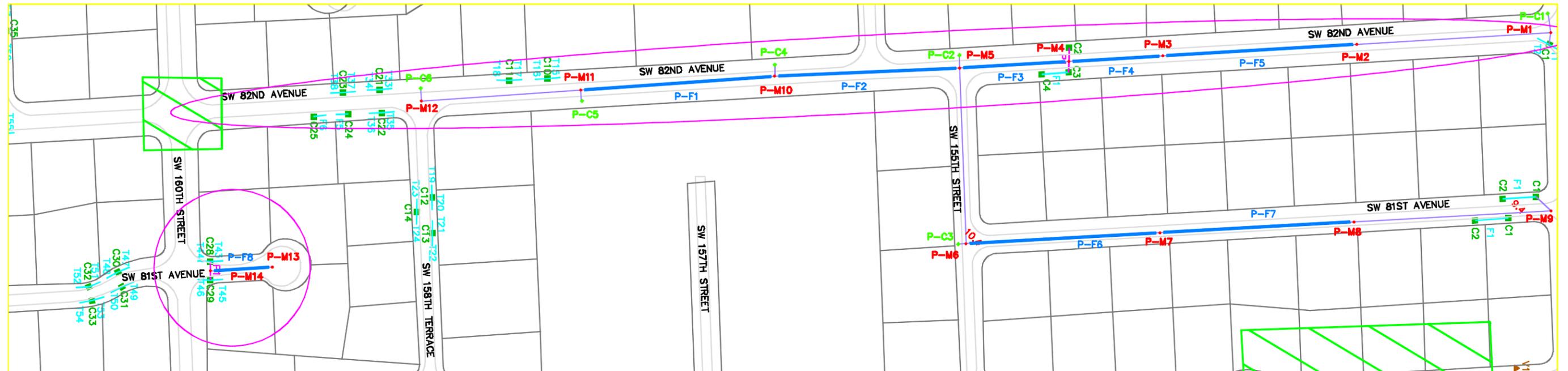
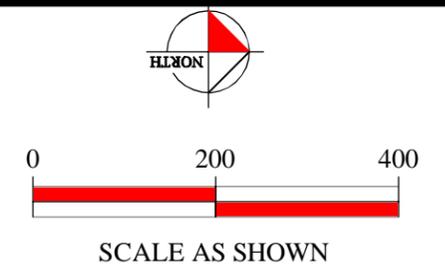
Table 25: Drainage Sub-basin 59/60 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	0.93 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	1.26 feet above lowest finish floor elevation (FFE)
Total Above Goal	2.19 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 59/60 exceed allowable levels and the sub-basin does not meet the performance goal criteria.



FIGURE 14: DRAINAGE SUB-BASIN #59/60 PROPOSED CONDITIONS



PROPOSED MODIFICATIONS

- Add 2,300 LF 18" French Drain / Exfiltration Trench
- Add 1,500 LF of 18" Storm Sewer Pipe (HDPE)
- Add 300 LF of 15" Storm Sewer Pipe (HDPE)
- Add 6 Catch Basins
- Add 14 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 9.15
- Min. Roadway Centerline Elevation 9.40
- Min. Building FFE 10.07

LEGEND

Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding reported by the Village	
Local drainage improvements complete	

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage



infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies.

Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins and pipes and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 14. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 26: Drainage Sub-basin 59/60 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	24.35	22.56	1.79
Total Nitrogen	191.88	171.73	20.15
Total Suspended Solids	2,300.10	2,082.74	217.36

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 27: Drainage Sub-basin 59/60 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$18,636	\$19,000
2	Mobilization	1	L.S.	\$62,120	\$63,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$6,212	\$7,000
4	Asphalt Concrete Surface Course	14,000	S.Y.	\$8	\$112,000
5	Inlet Apron (Asphalt)	17	S.Y.	\$8	\$200
6	15" Diameter Polyethylene Pipe	300	L.F.	\$70	\$21,000
7	18" Diameter Polyethylene Pipe	1,500	L.F.	\$85	\$128,000
8	18" French Drain Exfiltration Trench	2,300	L.F.	\$100	\$230,000
9	Manhole	14	EA.	\$5,500	\$77,000
10	Catch Basin Inlet	6	EA.	\$6,000	\$36,000
11	Pollution Retardant Baffle	16	EA.	\$240	\$4,000
12	Utility Adjustments	1	L.S.	\$12,164	\$13,000
13	Professional Services	1	L.S.	\$120,734	\$121,000
14	Contingency	1	L.S.	\$71,020	\$72,000
TOTAL					\$900,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.

Drainage Sub-basin 61

Location: Drainage sub-basin 61 is generally located south of SW 155th Street, north of SW 160th Street, west of SW 77th Court, and east of SW 79th Avenue. Drainage sub-basin 61 is part of the C100C-W-7 Miami-Dade County basin.

Existing and Future Conditions: Figure 15 shows existing conditions for drainage sub-basin 61. The sub-basin consists of approximately 26.29 acres of existing detached single-family residential development with approximately 4,770 linear feet of roadway, including SW 155th Street, SW 156th Street, SW 157th Street, SW 158th Street, SW 160th Street, SW 79th Avenue, SW 78th Place, SW 78th Avenue, and SW 77th Court. The drainage system in this sub-basin includes three outfall connections along SW 77th Court, but the outfalls are only connected to local catch basins. Other areas of the sub-basin are closed system with catch basins connected to exfiltration trench located in the vegetated swales along the sides of the roadways. Speed humps are also installed along SW 77th Court and the surrounding area.



The Village of Palmetto Bay reported flooding complaints on SW 156th Street, SW 160th Street, and SW 77th Court. The location of these deficiencies can be seen in Figure 15. The entire sub-basin area was modeled based on data collected as part of the Stormwater Master Plan process.

Based on available GIS data, the existing crown of road elevations ranges from a low of approximately 7.30 feet to a high of approximately 12.50 feet NGVD. It was assumed that the building finish elevations range from 7.97 feet (eight inches above the lowest crown of road) to 13.27 feet (eight inches above highest crown of road). The lowest edge of road is 7.05 feet. Pervious area elevations were assumed to



range from 7.15 feet (one inch above the lowest edge of road) to 12.60 feet (highest edge of road).

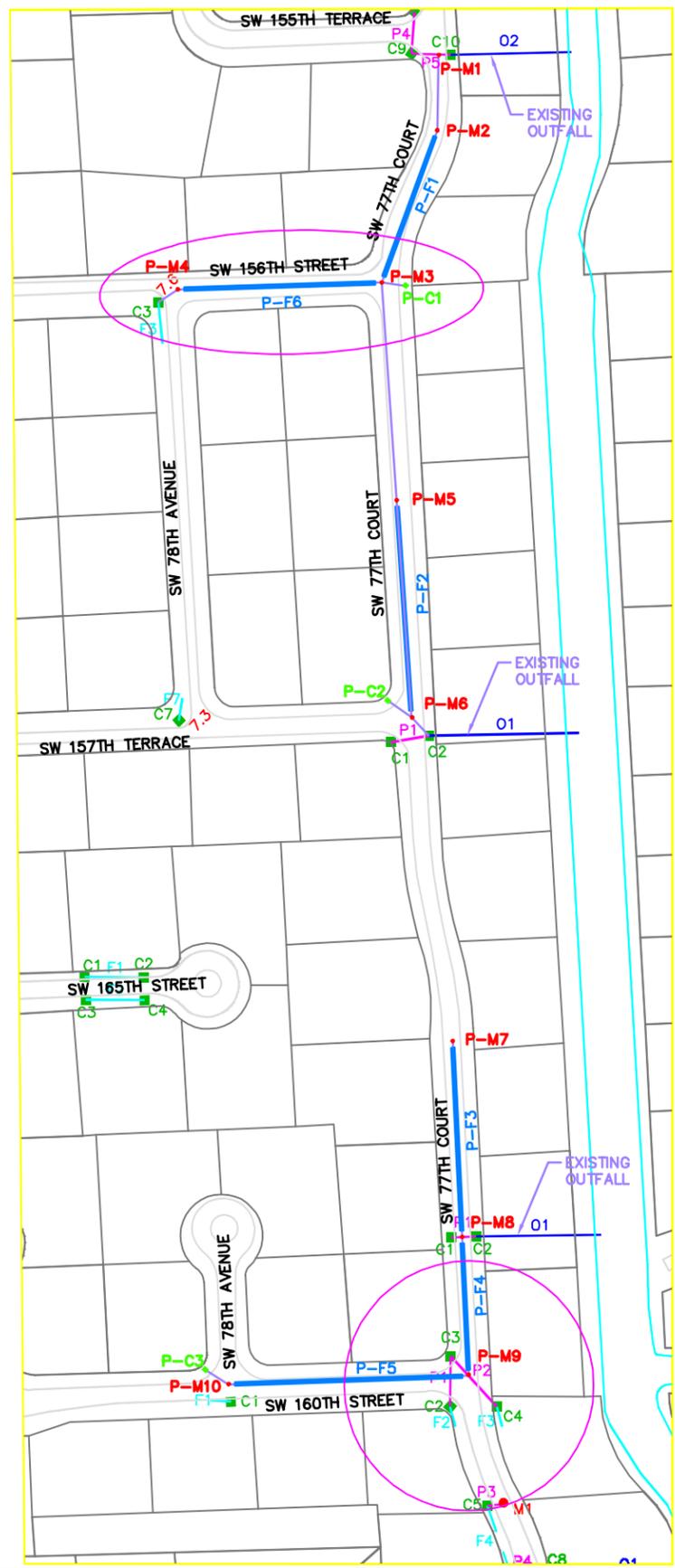
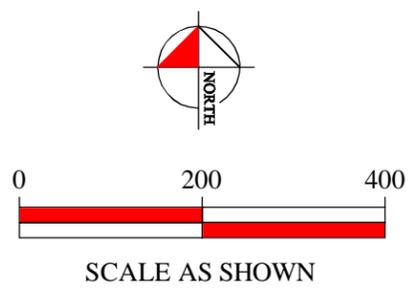
Performance Goal Analysis: Based on the available information described above, calculations were made for drainage sub-basin 61 to compare the existing conditions with the previously stated performance goals. The detailed calculations can be found in Appendix A. Based on the detailed hydrologic and hydraulic calculations for drainage sub-basin 61, the sub-basin is subject to flooding during all design storm events. The table below shows the performance of the sub-basin versus performance goals.

Table 28: Drainage Sub-basin 61 – Performance Goal Analysis for Existing Conditions

Design Storm Event	Flood Stage Elevation Above Performance Goal Criteria
5-year, 24-hour	1.81 feet above lowest crown of road for collector and local roadways
100-year, 72-hour	2.85 feet above lowest finish floor elevation (FFE)
Total Above Goal	4.66 feet above performance goal criteria

The flood stages shown above for drainage sub-basin 61 exceed allowable levels and the sub-basin does not meet the performance goal criteria.

FIGURE 15: DRAINAGE SUB-BASIN #61 PROPOSED CONDITIONS



PROPOSED MODIFICATIONS

- Add 1,300 LF 18" French Drain / Exfiltration Trench
- Add 400 LF of 18" Storm Sewer Pipe (HDPE)
- Add 150 LF of 15" Storm Sewer Pipe (HDPE)
- Add 3 Catch Basins
- Add 10 Manholes

PERFORMANCE GOAL CRITERIA

- Min. Roadway EOP Elevation 7.05
- Min. Roadway Centerline Elevation 7.30
- Min. Building FFE 7.97

LEGEND

Catch Basin (C1)	
French Drain (F1)	
Trench (T1)	
Pipe (P1)	
Outfall (O1)	
Sub-Basin Boundary	
Manhole (M1)	
Elevation	
Proposed Catch Basin (P-C1)	
Proposed French Drain (P-F1)	
Proposed Manhole (P-M1)	
Proposed Pipe	
Flooding reported by the Village	



Last Revised August 25, 2014

Storm Drainage Deficiencies: The catch basins inspected in this sub-basin were observed to be clean, with only limited debris and sediment. As a result, drainage deficiency issues are likely to be a function of limited system capacity and infrastructure age and or condition. Hydrologic and hydraulic calculations for this sub-basin confirmed the existing drainage infrastructure does not discharge adequate runoff to meet the desired performance criteria. The capacity of the existing swales, outfalls, and French drains is not sufficient to discharge the volume of runoff outlined in the performance criteria during the modeled storm events. Pavement condition within the sub-basin area is generally average and in need of resurfacing or rehabilitation. Improvements to drainage infrastructure will be needed to address these inadequacies. It is assumed that any speed humps impacted will require replacement as well.



Recommended Drainage Improvements: Clean and flush all sediment and debris from existing catch basins, pipes, outfalls, and adjust catch basin elevations and locations to minimize accumulation of sediment and debris. Install the additional infrastructure depicted in Figure 15. Existing catch basins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench. An analysis of the existing outfall capacities should be performed to evaluate the need for potential outfall improvements. Constructing additional catch basins, manholes, culverts, and exfiltration trench is recommended to interconnect the catch basins.

Environmental Impact of Proposed Improvements: A full analysis of the estimated pollutant loading for existing, future, and proposed conditions was prepared for the priority sub-basins using a spreadsheet developed for this purpose (see Appendix B). The table below shows how the proposed improvements will result in a significant reduction in the pollutant load contribution from this sub-basin to the Biscayne Aquifer for three major pollutants.

Table 29: Drainage Sub-basin 61 – Pollutant Loading Analysis

Pollutant	Existing Load (kg/yr)	Reduction (kg/yr)	Proposed Load (kg/yr)
Total Phosphorous	15.62	14.47	1.15
Total Nitrogen	123.04	110.12	12.92
Total Suspended Solids	1,474.87	1,335.49	139.38

Capital Improvement Budget: A budget was developed for the proposed stormwater capital improvements.

Table 30: Drainage Sub-basin 61 – Capital Improvement Budget

Item	Description	Qty.	Units	Unit Price	Sub-total
1	Maintenance of Traffic	1	L.S.	\$10,623	\$11,000
2	Mobilization	1	L.S.	\$35,410	\$36,000
3	Stormwater Pollution Prevention Plan (SWPPP)	1	L.S.	\$3,541	\$4,000
4	Asphalt Concrete Surface Course	12,000	S.Y.	\$8	\$96,000
5	Inlet Apron (Asphalt)	8	S.Y.	\$8	\$100
6	15" Diameter Polyethylene Pipe	150	L.F.	\$70	\$11,000
7	18" Diameter Polyethylene Pipe	400	L.F.	\$85	\$34,000
8	18" French Drain Exfiltration Trench	1,300	L.F.	\$100	\$130,000
9	Manhole	10	EA.	\$5,500	\$55,000
10	Catch Basin Inlet	3	EA.	\$6,000	\$18,000
11	Pollution Retardant Baffle	12	EA.	\$240	\$3,000
12	Utility Adjustments	1	L.S.	\$6,942	\$7,000
13	Professional Services	1	L.S.	\$68,867	\$69,000
14	Contingency	1	L.S.	\$40,510	\$41,000
TOTAL					\$520,000

Notes:

1. The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.
2. Costs do not include inflation or interest costs.
3. Sequence of improvements should be coordinated with roadway CIP.