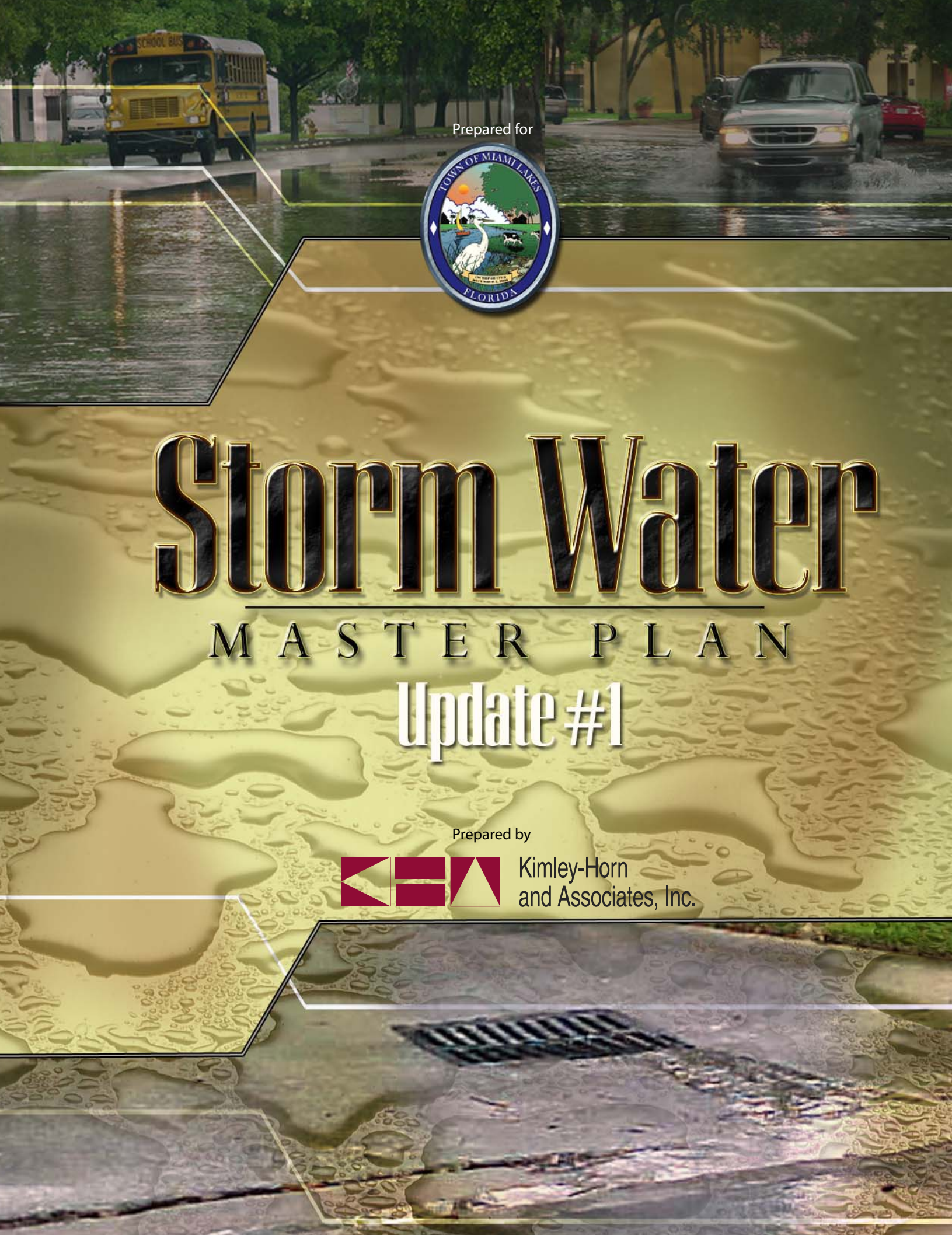


Prepared for

TOWN OF MIAMI LAKES
FLORIDA

Storm Water

MASTER PLAN

Update #1

Prepared by

Kimley-Horn
and Associates, Inc.

Storm Water Master Plan Update #1

Prepared for:

The Town of Miami Lakes,
Miami-Dade County, Florida

Prepared by:

Kimley-Horn and Associates, Inc.
Fort Lauderdale, Florida

April 2006
044533068

EXECUTIVE SUMMARY

The Town of Miami Lakes was incorporated in December 2000. Prior to this date the area within the Town boundaries was a part of unincorporated Miami-Dade County. In January 2003, Kimley-Horn and Associates, Inc. completed a Storm Water Master Plan for the Town in preparation of the Town assuming the responsibility for storm water management within its boundaries from Miami-Dade County. In March 2003, the Town adopted Ordinance 03-31 which established the Town's Storm Water Utility.

In the three years since the original Storm Water Master Plan was completed, the Town of Miami Lakes has implemented the recommended Operations and Maintenance Program and constructed several of the drainage projects included in the Capital Improvement Program utilizing grant funding and revenue from the Storm Water Utility. This Storm Water Master Plan Update will enable the Town to examine the effectiveness of the ongoing Operation and Maintenance Program, to evaluate progress in implementing the Capital Improvement Program, and to identify additional Capital Improvement Projects for future reduction of flooding and improvement of water quality within the Town of Miami Lakes.

In order to measure the performance of each drainage sub-basin, performance goals were identified in the Town's original Storm Water Master Plan. This report summarizes the performance against goal for each of eighteen priority sub-basins (ten sub-basins from the original Storm Water Master Plan and eight new priority sub-basins identified as a part of this Storm Water Master Plan Update). The report also recommends improvements that will improve performance in the priority sub-basins. The recommended improvements are the basis for the Capital Improvement Program contained at the end of the report.

The Capital Improvement Program contains approximately $700,000 in annual expenses related to ongoing Operation and Maintenance of the existing system in conformance with the mandates of Federal and State government agencies and the Town's desire to improve drainage conditions. The Capital Improvement Program also contains $11,000,000 worth of major Capital Improvement Projects recommended to be implemented over the next twelve years.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

INTRODUCTION

In January 2003, Kimley-Horn and Associates, Inc. completed a Storm Water Master Plan for the Town in preparation of the Town assuming responsibility for storm water management within its boundaries from Miami-Dade County. In March 2003, the Town adopted Ordinance 03-31 which established the Town's Storm Water Utility.

The first section of the original Storm Water Master Plan described existing conditions within the Town of Miami Lakes. Existing information on storm water management available from various sources including the Miami-Dade County Department of Environmental Resource Management (DERM), the Miami-Dade County Department of Public Works, the South Florida Water Management District (SFWMD), the Federal Emergency Management Agency (FEMA), the Florida Department of Environmental Protection (FDEP), and Town of Miami Lakes records was compiled in this section. In addition, the section included field information on the existing condition of Town drainage infrastructure and locations where street flooding was occurring.

The second section of the original Storm Water Master Plan contained drainage analysis of sixteen (16) sub-basins that were selected as priority areas for improvement by the Town. Drainage improvements for the priority sub-basins were recommended to meet performance goals associated with both reducing flooding and improving water quality. The third section of the original Storm Water Master Plan outlined a Capital Improvement/ Operations and Maintenance Program for the Town's Storm Water Utility. This information was utilized by the Town Council in determining the Storm Water Utility fee that is charged to Town property owners.

In the three years since the original Storm Water Master Plan was completed, the Town of Miami Lakes has implemented the recommended Operations and Maintenance Program and constructed several of the drainage projects included in the Capital Improvement Program utilizing grant funding and revenue from the Storm Water Utility. This Storm Water Master Plan Update will enable the Town to examine the effectiveness of the ongoing Operation and Maintenance Program, to evaluate progress in implementing the Capital Improvement Program, and to identify additional Capital Improvement Projects for future reduction of flooding and improvement of water quality within the Town of Miami Lakes.

DATA COLLECTION AND EXISTING CONDITIONS

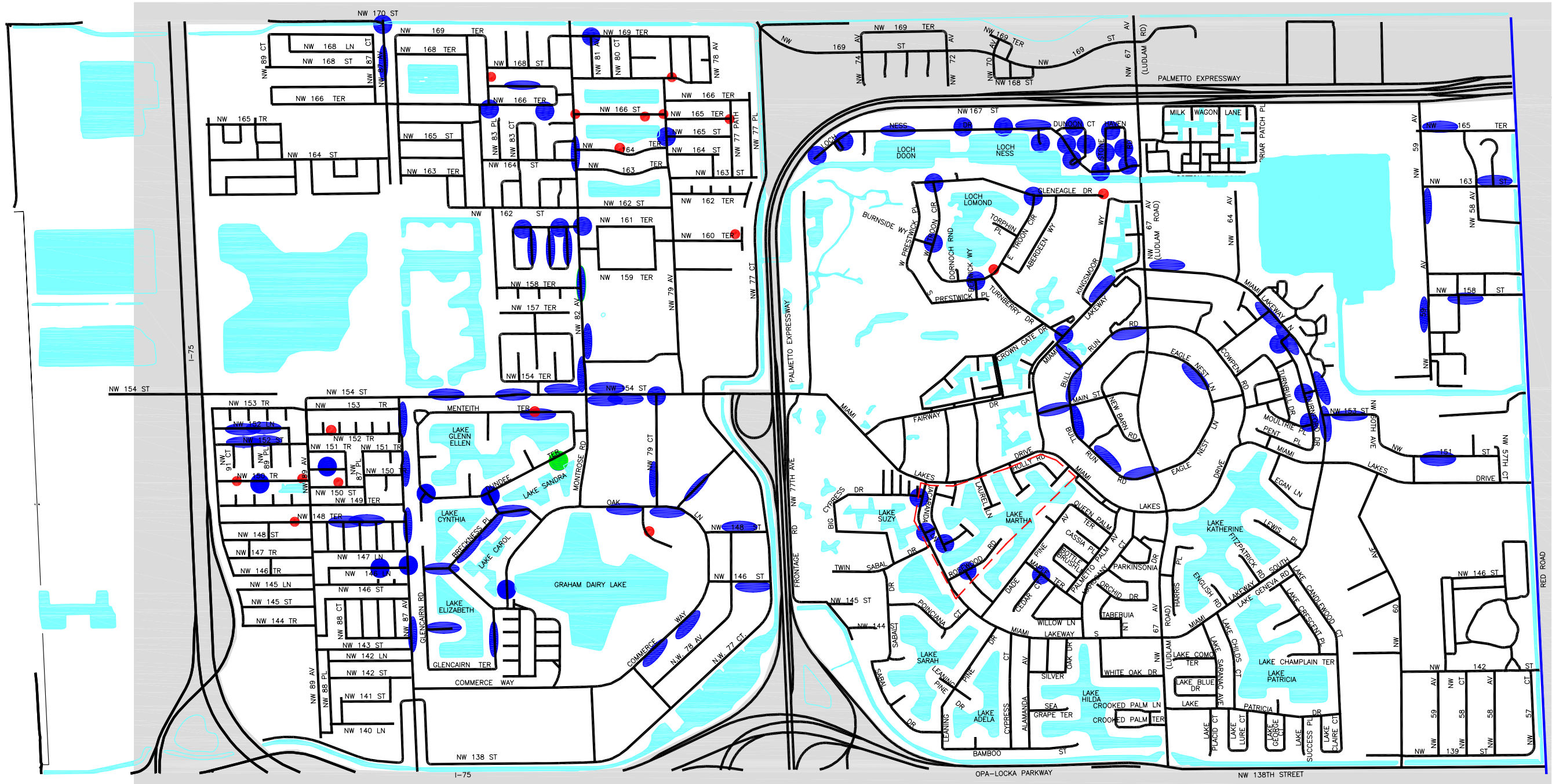
Available storm water management information for the Town of Miami Lakes was reviewed to provide a baseline for this Storm Water Master Plan Update. The information reviewed included the following:

1. The original Town of Miami Lakes Storm Water Master Plan.
2. National Pollutant Discharge Elimination System (NPDES) permit and Community Rating System (CRS) application information.
3. Town ordinances, regulations and guidelines for storm water management.
4. Storm water management GIS coverage.
5. Design and record drawings of completed and proposed storm water management/ drainage projects.
6. Citizen complaint records related to drainage and storm water management.
7. Field inventory of 50 existing storm water structures and facilities throughout the Town.
8. Field review of the Town during major storm events to identify storm water problem areas.

Town of Miami Lakes Storm Water Master Plan

The original Town of Miami Lakes Storm Water Master Plan was completed in January 2003. The first section described existing conditions within the Town of Miami Lakes. Figure 1 shows the location of storm water problem areas identified in the original Storm Water Master Plan.

The second section of the original Storm Water Master Plan contained drainage analysis of sixteen (16) sub-basins that were selected as priority areas for improvement by the Town. Drainage improvements for the priority sub-basins were recommended to meet performance goals associated with both reducing flooding and improving water quality. The location of the priority sub-basins identified in the original Storm Water Master Plan can be seen in Figure 2. The third section of the original Storm Water Master Plan outlined a Capital Improvement/ Operations and Maintenance Program for the Town's Storm Water Utility.



LEGEND

OBSERVED DRAINAGE DEFICIENCY

AREA OF PAVED SWALES

UNRESOLVED DRAINAGE COMPLAINT RECORDED BY MIAMI-DADE DERM OR TOWN OF MIAMI LAKES

No.	REVISIONS	DATE	BY

DESIGN ENGINEER:

FLORIDA REGISTRATION NUMBER:

Kimley-Horn and Associates, Inc.

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PHONE (954) 739-2233 FAX (954) 739-2247
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SCALE	AS NOTED
DESIGNED BY	HS
DRAWN BY	MAR
CHECKED BY	HS

TOWN OF MIAMI LAKES

MIAMI-DADE COUNTY FLORIDA

DATE 4/05/06

PROJECT NO. 044533068

FIGURE 1. DRAINAGE DEFICIENCIES IDENTIFIED IN 2003 STORM WATER MASTER PLAN

SHEET NUMBER

NPDES Permit and CRS Application Information

The Town of Miami Lakes is a co-permittee on the Miami-Dade County Multiple Separate Storm Sewer System Permit through the EPA's National Pollutant Discharge Elimination System (NPDES). The permit is administered by the Florida Department of Environmental Protection (DEP). Each year, the co-permittees are required to submit an annual report to DEP detailing progress on permit mandated activities. These activities range from inspecting storm water treatment facilities to conducting public awareness events to publicize the environmental consequences of illegal dumping. The permit is now entering Year 4 which covers the time period between October 8, 2005 and October 7, 2006. The annual report for Year 3 was submitted on March 28, 2006. MS4 permit mandated activities should be included in the Town's Storm Water Utility Operation and Maintenance Budget.

The Town of Miami Lakes recently applied to the National Flood Insurance Program (NFIP) Community Rating System (CRS) program. The NFIP offers flood insurance at more affordable rates than are generally available from private insurers. A better rating with the CRS will provide additional savings to Town residents on their flood insurance. The CRS rating is determined by activities implemented by the Town ranging from storm water infrastructure maintenance to public outreach programs. CRS activities should be included in the Town's Storm Water Utility Operation and Maintenance Budget.

Town Ordinances, Regulations and Guidelines

Upon incorporation, the Town of Miami Lakes adopted the entire Miami-Dade County Code. Since that time, the Town has passed a few additional ordinances pertaining to storm water management. In March of 2003, the Town passed Ordinances 03-31 and 03-32 which established the Town's Storm Water Utility and set the Storm Water Utility rate at $4.50 per Equivalent Residential Unit. These Ordinances, established the Town's Storm Water Utility as a source of funding for storm water related projects and maintenance activities within the Town. In April 2003, the Town adopted Ordinance 03-34-B which revised the Town's Floodplain Management Regulations. This Ordinance was subsequently revised by Ordinance 05-67 in March 2005. The Floodplain Management Ordinance sets flood protection minimum standards for new and substantially improved properties within the Town. In December 2003, the Town adopted the Comprehensive Plan for the Town of Miami Lakes under Ordinance 03-46. The Comprehensive Plan contains a section on Storm Water Management which sets storm water management Level of Service standards for development within the Town.

Storm Water Management GIS Coverage

As part of the original Town of Miami Lakes Storm Water Master Plan, KHA obtained Geographic Information System (GIS) information on existing storm water systems from Miami-Dade County Department of Environmental Resource Management (DERM). This information was in the form of an AutoCAD file showing the location of drainage infrastructure and several hard copy data sheets showing additional information on each drainage structure. As part of this Storm Water Master Plan Update, KHA has converted this information to ArcGIS format. Having the information in this format can facilitate improved tracking of storm water maintenance activities. Examples of the information contained in the GIS database are contained in Appendix A.

Summary of Completed Storm Water Management Projects

KHA obtained design and record drawings for storm water management projects that have either been completed or are under construction. The information contained in these drawings has been added to the Town's Storm Water Management GIS Coverage.

Citizen Complaint Records

KHA obtained copies of unresolved storm water related complaints from Town staff. The areas represented by these complaints are shown in Figure 1. Most of these areas correspond to drainage deficiencies observed during the field review of storm water problem areas.

Field Inventory of Existing Storm Water Structures

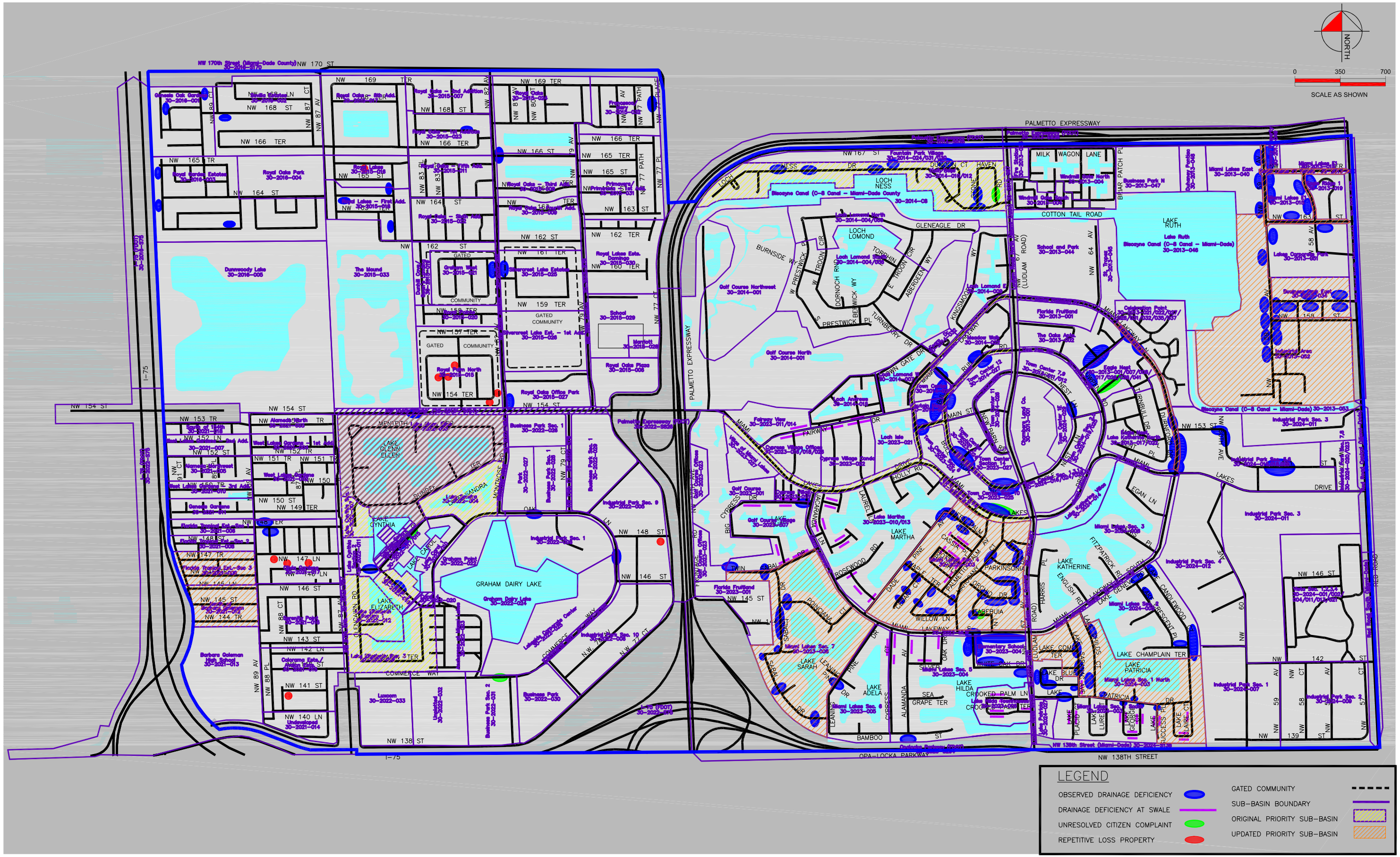
Fifty (50) existing drainage structures were inventoried. In general, the conditions of the existing drainage structures are better than the conditions observed under the Town's first Storm Water Master Plan. The majority of the catch basins were clean and in good condition. However, a few catch basins were full of sediment or covered with debris. Additional, catch basin cleaning and pipe flushing is recommended in the areas where these catch basins are located.

Field Review of Storm Water Problem Areas

The results of the field review can be seen in Figure 1. Based on this field review, it appears that some of the drainage deficiencies identified in the Town's original Storm Water Master Plan have been corrected by either improved maintenance by the Town or capital improvements projects completed by the Town under the Storm Water Utility or by Miami-Dade County under the FEMA/DORM program. However, there are still several areas within the Town where drainage deficiencies were observed.

Updated Sub-basin Prioritization

Based on observed flooding, complaints, road conditions and the other parameters noted above, the Town selected sixteen sub-basins for more in depth study under the original Storm Water Master Plan. Since the time that the original Storm Water Master Plan was finalized, the Town of Miami Lakes has implemented drainage projects in six of the original sixteen priority sub-basins: Miami Lakeway North (construction completed), NW 154th Street (construction completed), NW 82nd Avenue (in design), Lake Glenn Ellen (under construction), Lake Cynthia Section 1 (under construction) and Lake Elizabeth Section 1 (construction completed). The drainage projects for which construction has been completed have already improved conditions in the areas that they serve. The projects that are either in design or under construction are anticipated to have the same effect once they are completed. Therefore, these six sub-basins have been removed from the drainage basin analysis section of this Storm Water Master Plan Update. The ten remaining priority sub-basins from the original Storm Water Master Plan and the eight new priority sub-basins identified as part of this Storm Water Master Plan Update are the subject of hydraulic and hydrologic analysis as part of this Storm Water Master Plan Update. The eight new sub-basins proposed for modeling are highlighted in Figure 2. They include: Lake Patricia, NE Industrial, Business Park East, Industrial Areas, Lake Martha, Olivia Gardens, South Miami Lakeway North, and Lake Sarah. In addition to modeling these eight new priority sub-basins, the budget information associated with the ten remaining capital improvement projects from the Town's original Storm Water Master Plan will be updated.



No.	REVISIONS	DATE	BY

DESIGN ENGINEER:

FLORIDA REGISTRATION NUMBER:

Kimley-Horn and Associates, Inc.

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SCALE AS NOTED
DESIGNED BY HS
DRAWN BY MAR
CHECKED BY HS

TOWN OF MIAMI LAKES

MIAMI-DADE COUNTY FLORIDA

DATE 4/05/06

PROJECT NO. 044533068

FIGURE 2. DRAINAGE DEFICIENCIES AND PRIORITY SUB-BASINS

SHEET NUMBER

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DRAINAGE BASIN ANALYSIS

Methodology

In order to measure the performance of each drainage sub-basin, performance goals were identified in the Town's original Storm Water Master Plan. The performance goals consist of the following:

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 Environmental Resource Management (DERM) requirements for water quality pre-treatment.

Water Quantity Treatment Performance Goals

- During the 5-year, 24-hour design storm event, flooding should not exceed the crown of the local roadways located within the sub-basin.
- During the 10-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 not exceed building finish floor elevations.

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, storm water 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 utilizing existing aerial photographs and Geographic Information System (GIS) data obtained from the Miami-Dade County Department of Environmental Resource Management (DERM). Elevation

information contained in the DERM GIS data was utilized to estimate the average high and low elevation of the paved area, building area and pervious area associated with the sub-basin. This information along with information on existing drainage infrastructure located within the sub-basin was entered into a computer model. Existing flood routing for each sub-basin was analyzed utilizing the South Florida Water Management District (SFWMD) computer program "Routing Model Cascade 2001" version 1.0. The maximum flood stage for the priority sub-basins produced by four different design storm events was calculated using the computer model.

In addition to flood routing analysis, each sub-basin was analyzed for water quality pre-treatment capacity. SFWMD and DERM require storm water runoff to be pretreated to minimize pollution prior to discharging into any water body. Typically, water quality pre-treatment in the Town of Miami Lakes 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 for each sub-basin was estimated based on available data and compared with required pre-treatment volumes.

The following is a summary of the findings for each of the eighteen priority sub-basins (ten sub-basins from the original Storm Water Master Plan and eight new priority sub-basins identified as a part of this Storm Water Master Plan Update).

Loch Ness Sub-Basin

Existing Conditions

The Loch Ness sub-basin is generally located south of the Palmetto Expressway (826), south of Fountain Park Village, north of the C-8 Canal and west of Ludlam Road. It is part of the Loch Ness (C803-300) Drainage Basin and consists of approximately 43.2 acres of existing detached single family development with approximately 8,400 linear feet of roadway, including: Dunoon Court, Loch Ness Court, Loch Ness Drive, Loch Ness Lane and Stone Haven Road. The existing roads range in elevation from a low of approximately 5.7 to a high of approximately 7.5 feet.

The sub-basin was subdivided into nine areas for storm water modeling as shown in Figure 3. Some of these areas have catchbasins, short sections of exfiltration trench, interconnecting culverts and outfalls. There are three areas (1, 8 & 9) with direct outfalls into the C-8 Biscayne Canal, five areas (2, 3, 4, 5 & 7) with existing outfalls into the Loch Doon and Loch Ness Lakes (widened sections of the C-8 Biscayne Canal). Area 6 does not have an existing outfall. A few sections of road only have catchbasins with short (30 ± feet) sections of exfiltration trench without any outfall. Stone Haven Road and Dunoon Court are poorly drained roads with flat slopes and no drainage infrastructure. Based on the available information described above calculations were made for each area of the Loch Ness drainage sub-basin to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) currently meet the performance goals.

Table 1. Loch Ness Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	No	Yes	Yes	Yes	Yes	No*
2	No	Yes	Yes	Yes	Yes	No*
3	No	Yes	Yes	Yes	Yes	No*
4	No	Yes	Yes	Yes	Yes	Yes
5	No	Yes	Yes	Yes	Yes	No*
6	No	No	No	No	No	No*
7	No	Yes	Yes	Yes	Yes	No*
8	No	Yes	Yes	Yes	Yes	Yes
9	No	Yes	Yes	Yes	Yes	No*

*Flooding occurs in these areas because storm water runoff is not flowing to the existing catchbasins. The roadways are fairly flat with low spots where water accumulates. The storm water model cannot account for the low areas, because topographic survey information showing where they are located is not available.

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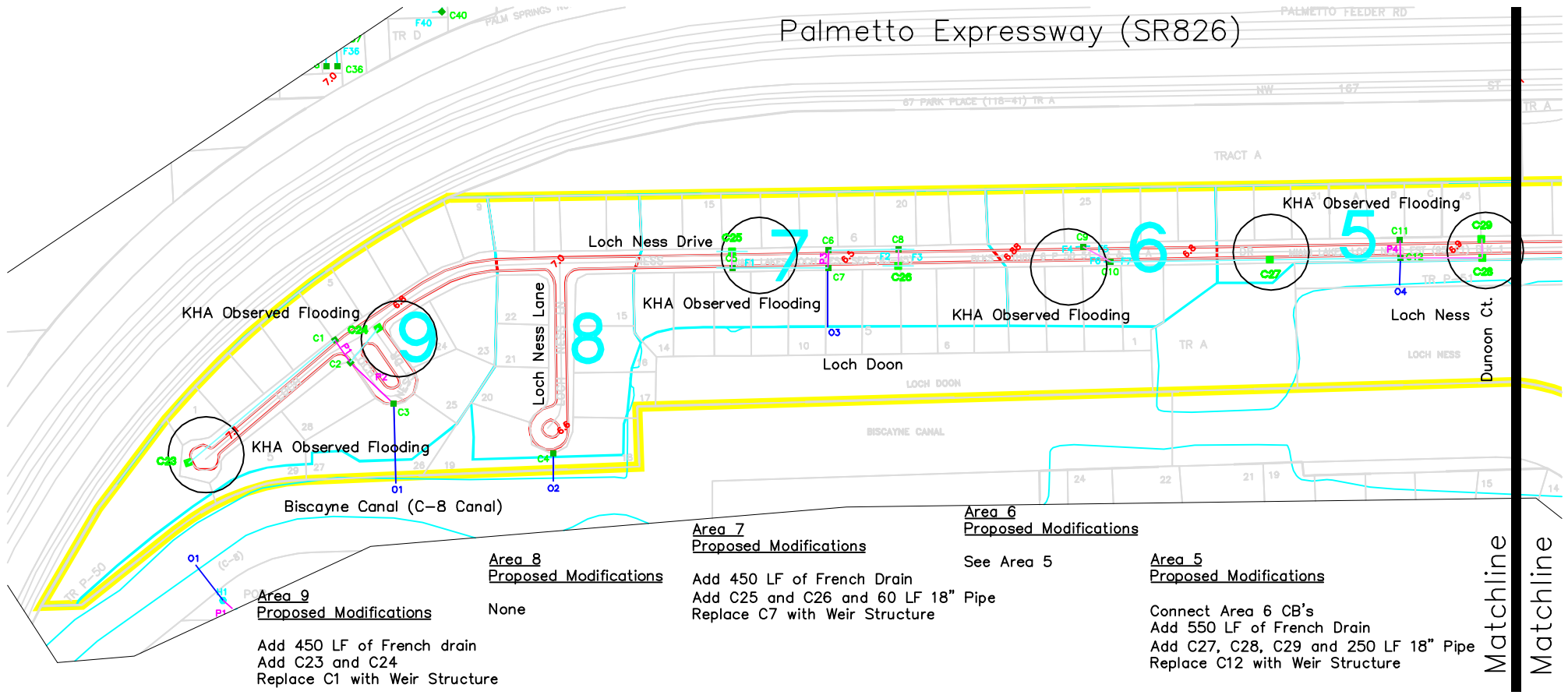

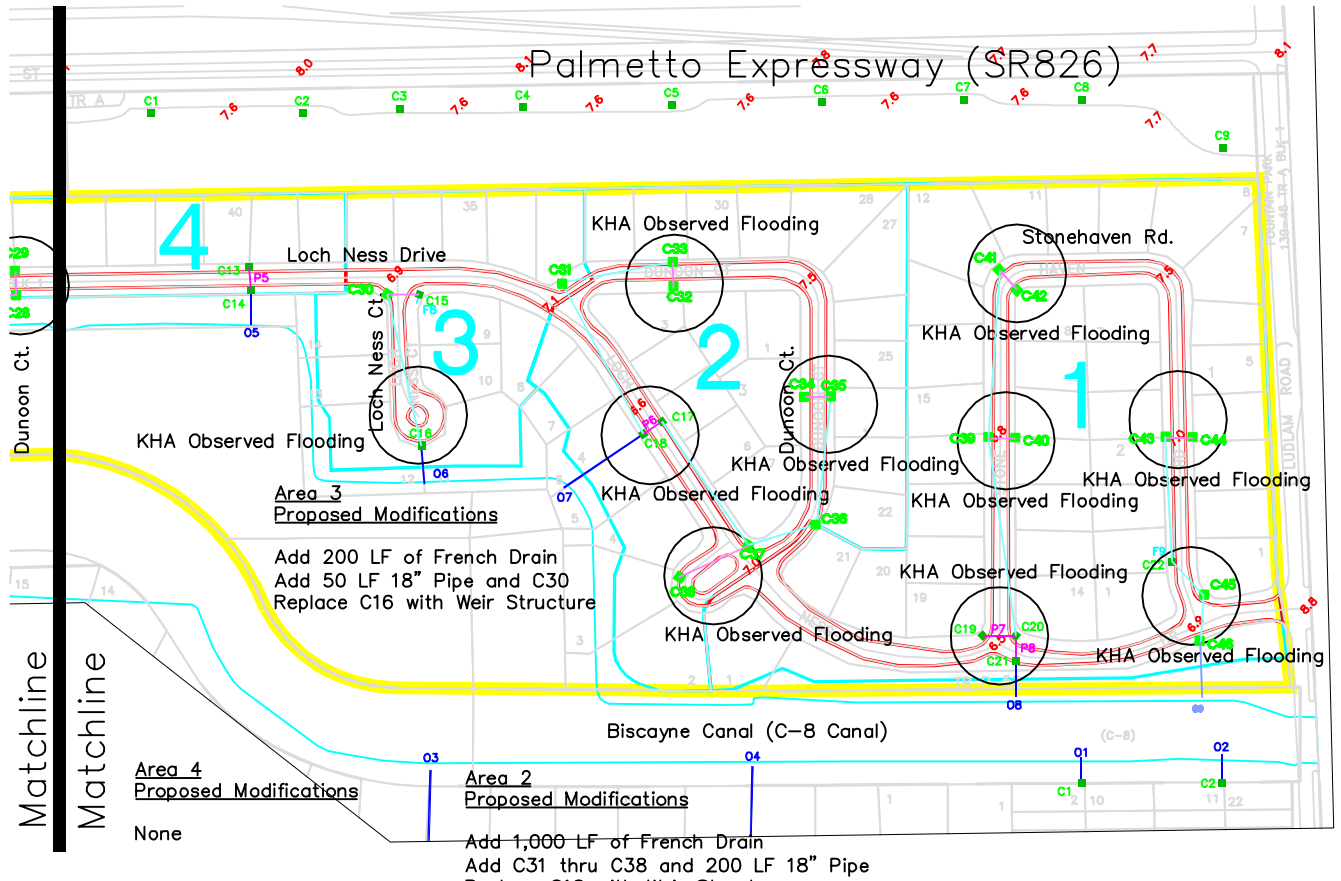

Summary of Proposed Modifications

Add 23 Catchbasins
Add 1 Weir Structure and Headwall
Add 3,550 LF French Drain
Add 780 LF 18" Pipe
Replace 6 Catchbasins with Weir Structures
Coredrill 18 Existing Catchbasins

NORTH

0 150 300

SCALE AS SHOWN

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLS
CHECKED BY: RRB

Kimley-Horn and Associates, Inc.

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DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 3.
Loch Ness Sub-basin
(30-2014-010)

SHEET NUMBER
1 OF 1

Observed Storm Drainage Deficiencies

Maintenance: There are a few catchbasins that were observed to be filled with debris and sediment such that water flow was blocked or highly restricted. This condition was observed at the catchbasins leading to the outfalls in drainage areas 1, 2, 3 and 9.

Lack of Infrastructure: There are several flat (minimum slopes) stretches of roadway that do not have any existing storm drainage infrastructure. These areas have several low points in the roadway that were observed to pond during storm events because runoff cannot flow to the existing catchbasins. This condition is found in Stone Haven Road (area 1) and Dunoon Court (area 2) and a few sections (areas 5, 7 and 9) of Loch Ness Drive.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and short sections of exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration (estimated to be 20 to 30 years old) trenches may be reduced due to sedimentation build up in the trenches and perforated pipes. Based on the hydraulic analysis the existing catchbasins and short exfiltration trenches in Area 6 are inadequate. Area 6 is the only area that does not have an existing positive outfall.

Areas 1 and 7 also have some isolated catchbasins with short length of exfiltration trench that are not connected to a positive outfall. Although it is beyond the scope (lack of detail survey data) of the Master Plan to hydraulically evaluate these small isolated areas, the results would be expected to be very similar to basin 6 results and frequent flooding would be expected, as has been observed in these areas.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be of sufficient size and capacity. This assumes that they are free of sediment, debris and structural defects. However, some outfalls were observed to be blocked by debris, sediment or concrete that highly restricts water flow. This condition was observed in drainage areas 1, 3, 7 and 9. The 21-inch diameter culvert outfall in area 3 appears to be restricted with only an 8-inch concrete slot opening. Also, the 21-inch diameter culvert outfall in area 7 appears to be restricted by a concrete block. These restrictions should be removed. Flooding was also observed at the outfall catchbasin in area 2. The outfall culverts should be inspected (tele-video), thoroughly cleaned, flushed and repaired (any structural defects) as necessary.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from catchbasins, culverts and outfalls. Existing catchbasins should be modified or reconstructed as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

Low Areas Without Drainage: Construct catchbasins at low points with exfiltration trench and connect them to an existing or proposed outfall.

Low Areas With Inadequate Drainage: Construct catchbasins at low points with exfiltration trench and connect them to an existing or proposed outfall. The isolated catchbasins in area 6 should be interconnected with exfiltration trench or culvert to the storm drainage outfall in area 5.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be of sufficient size and capacity, therefore, no improvements are required to the existing outfalls.
An additional outfall is recommended in Basin 1. An additional outfall is a potential alternative for the western end of Loch Ness Drive in area 9. This alternative should be evaluated when detail survey is available during the preliminary design phase.

Figure 3 notes proposed improvements for the Loch Ness sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the Loch Ness sub-basin.

Lake Sandra Sub-Basin

Existing Conditions

The sub-basin is generally located south of NW 154th Street, east of NW 87th Avenue and west of Montrose Road. Lake Sandra is adjacent to and southeast of Lake Glenn Ellen. Lake Sandra is located south of Dundee Terrace, north west of Rednock Lane, north of Balgowen Road and west of Montrose Road. The Lake Sandra sub-basin is part of the Sandra/Glenn (GDC1-201) Drainage Basin. The sub-basin consists of approximately 11.2 acres of residential townhouse development with approximately 600 linear feet of public roadway, including a portion of Balgowan Road. The majority of the paved area within this sub-basin consists of driveways and parking spaces for the development surrounding Lake Sandra. The existing roads range in elevation from a low of approximately 6.4 to a high of approximately 7.5 feet. The sub-basin was subdivided into 14 areas as shown in Figure 4. Each area has an existing

outfall into Lake Sandra. Typically, the low points have catchbasins with short (30 ± feet) sections of exfiltration trench on each side of the road connected to a positive outfall to Lake Sandra. Typically, the existing outfalls are 8-inch diameter pipes with a raised portion (gooseneck) that acts as an overflow weir. The 8-inch outfall pipes are typically located on lot lines between existing buildings. The status of drainage easement ownership for the outfalls must be verified. If drainage easements do not presently exist, they may have to be obtained. The ownership of the Lake and drainage rights should also be verified.

Based on the available information described above, calculations were made for each area of the Lake Sandra drainage areas to compare the existing conditions with the previously stated performance goals. The detailed summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 2. Lake Sandra Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	No	Yes	Yes	Yes	Yes
2	Yes	No	Yes	Yes	Yes	Yes
3	Yes	No	Yes	Yes	Yes	Yes
4	Yes	No	Yes	Yes	Yes	Yes
5	Yes	No	Yes	Yes	Yes	Yes
6	Yes	Yes	Yes	Yes	Yes	Yes
7	Yes	No	Yes	Yes	Yes	Yes
8	Yes	No	Yes	Yes	Yes	Yes
9	Yes	No	Yes	Yes	Yes	Yes
10	No	No	Yes	Yes	Yes	Yes
11	Yes	No	Yes	Yes	No	Yes
12	Yes	No	Yes	Yes	Yes	Yes
13	Yes	No	Yes	Yes	No	Yes
14	Yes	Yes	Yes	Yes	Yes	Yes

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements in all area except area 10. The existing outfalls fail to meet the water quantity performance

goals for the 5-year storm in all areas except 6 and 14. The existing outfalls meet goals for the 25-year storm in all areas. The existing outfalls fail to meet goals for the 100-year storm in areas 11 and 13.

Observed Storm Drainage Deficiencies

Maintenance: Due to the small existing 8-inch outfalls the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Water Quality Deficiencies: Area 10 does not have sufficient length of exfiltration trench to meet the water quality goals.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be under sized and do not have sufficient capacity to meet the majority of the performance goals.

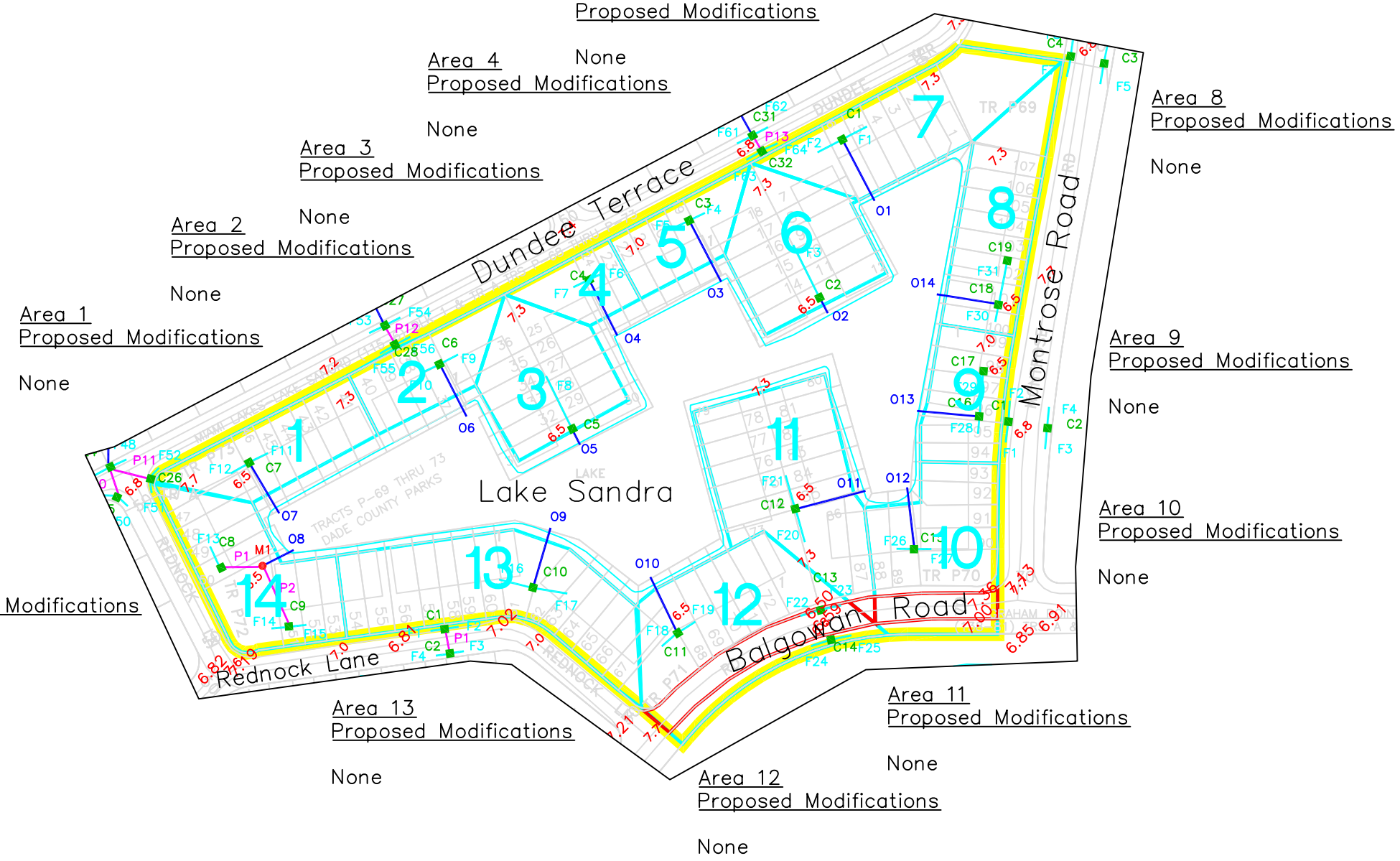
Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

Water Quality Deficiencies: Construct additional catchbasins and exfiltration trench and connect to the existing outfall in area 10 to meet the water quality requirements.

Since improved maintenance resulted in a decrease in observed drainage deficiencies in the Lake Sandra Sub-Basin, no capital improvements are proposed for this sub-basin. Any remaining drainage deficiencies will be addressed in projects serving the adjacent sub-basins. Figure 4 shows the location of the Lake Sandra sub-basin.

Drawing name: H:\044 Jobs\044533068\CADD\Concept\04Sandra.dwg sandra Oct 24, 2007 12:15pm by: margaret.mcdermott



Area 1
Proposed Modifications

None

Area 2
Proposed Modifications

None

Area 3
Proposed Modifications

None

Area 4
Proposed Modifications

None

Area 5
Proposed Modifications

None

Area 6
Proposed Modifications

None

Area 7
Proposed Modifications

None

Area 8
Proposed Modifications

None

Area 9
Proposed Modifications

None

Area 10
Proposed Modifications

None

Area 11
Proposed Modifications

None

Area 12
Proposed Modifications

None

Area 13
Proposed Modifications

None

Area 14
Proposed Modifications

None

NORTH

0 100 200

SCALE AS SHOWN

Summary of Proposed Modifications

No improvements are proposed for this sub-basin. After the Town's Stormwater Master Plan was completed and regular maintenance activities were introduced drainage conditions in this sub-basin improved. Any remaining drainage deficiencies will be addressed in projects serving the adjacent sub-basins.

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLS
CHECKED BY: RRB

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DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 4.
Lake Sandra Sub-basin
(30-2022-004)

SHEET NUMBER
1 OF 1

Lake Cynthia Section 2 Sub-Basin

Existing Conditions

The Lake Cynthia Section 2 sub-basin is generally located south of NW 154th Street, south of Lake Glenn Ellen, east of NW 87th Avenue and west of Lake Carol and Balgowan Road. The Lake Cynthia Section 2 sub-basin is part of the Sandra/Glenn GDC1-201 Drainage Basin. There are three Lake Cynthia sub-basins, including Sections 1, 2 & 3. Section 2 is located in the southwest portion of Lake Cynthia. The sub-basin consists of approximately 5.5 acres of detached single family development with approximately 300 linear feet of Breckness Place and 400 linear feet of Glencairn Road. The existing road ranges in elevation from a low of approximately 6.5 to a high of approximately 7.5 feet. The roadway has existing catchbasins, exfiltration trench, interconnecting culverts and two outfalls into Lake Cynthia. The Lake Cynthia Section 2 sub-basin is divided into two areas. Typically, the existing outfalls are 8-inch diameter pipes with a raised portion (goose neck) which acts as an overflow weir. The 8-inch outfall pipes are typically located on lot lines between existing houses or through parks.

Based on the available information described above, calculations were made for the Lake Cynthia Section 2 drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The detail summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 3. Lake Cynthia Section 2 Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	No	Yes	No	No	No
2	Yes	No	Yes	Yes	Yes	No

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements. The existing outfall in area 1 fails to meet the water quantity performance goals for the 5, 25 and 100-year storm events. The existing outfall in area 2 fails to meet the water quantity performance goals for the 5-year storm event.

Summary of Proposed Modifications

Add 1 Catchbasin
Add 1 Weir Structure and Headwall
Add 350 LF French Drain
Add 80 LF 30" Pipe
Coredrill 1 Existing Catchbasin

NORTH

0 100 200

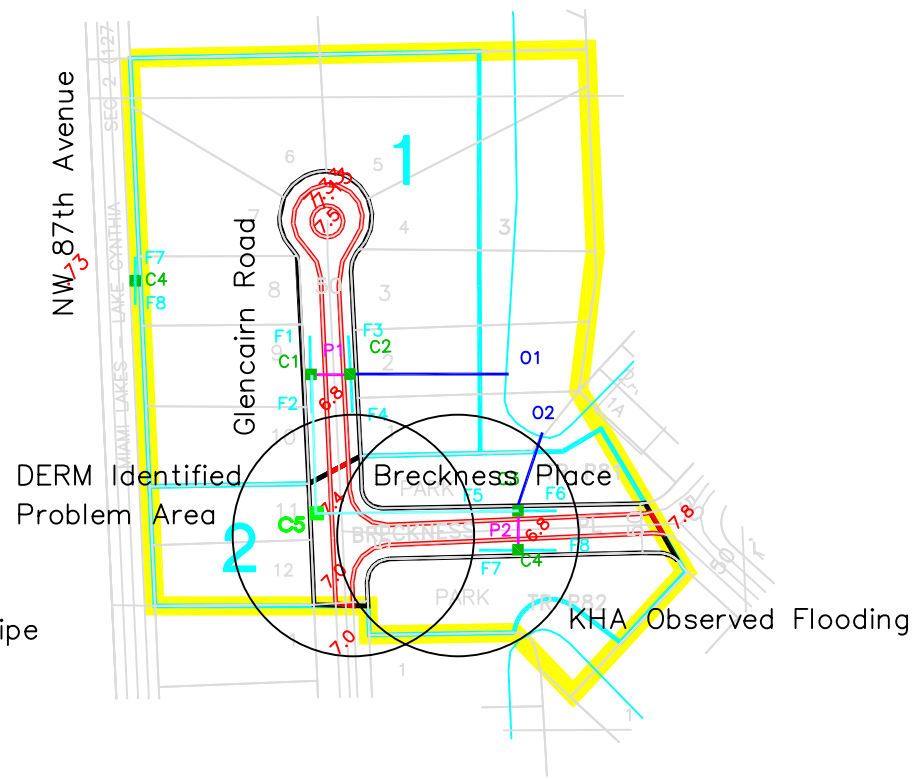
SCALE AS SHOWN

Area 1
Proposed Modifications

Add 150 LF of French Drain
and Connect to Area 2

Area 2
Proposed Modifications

Add 200 LF of French Drain and C5
Upgrade O2 from 8" pipe to 1-30" Pipe
Replace C3 with Weir Structure



No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLS
CHECKED BY: RRB

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WWW.KIMLEY-HORN.COM CA 00000696

DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 5.
Lake Cynthia Section 2 Sub-basin
(30-2022-011)

SHEET NUMBER
1 OF 1

Storm Drainage Deficiencies

Maintenance: Due to the small existing 8-inch outfalls the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted.
Frequent maintenance may is recommended for the existing system.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be under sized and do not have sufficient capacity to meet the performance goals.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

Undersized Outfall: Based on the hydraulic analysis the existing outfalls appear to be undersized and do not have sufficient capacity to meet the performance goals. The outfall in Area 2 should be replaced with a larger outfall. The final catchbasin prior to the outfall into the lake should be replaced with a control structure catchbasin. The control structure catchbasin should include a weir, pollution retardant baffle and a sedimentation sump.

Figure 5 notes proposed improvements for the Lake Cynthia Section 2 sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the Lake Cynthia Section 2 sub-basin.

Lake Cynthia Section 3 Sub-Basin

Existing Conditions

The Lake Cynthia Section 3 sub-basin is generally located south of NW 154th Street, south of Lake Glenn Ellen, east of NW 87th Avenue and west of Lake Carol and Balgowan Road. The Lake Cynthia Section 3 sub-basin is part of the Sandra/Glenn GDC1-201 Drainage Basin. There are three Lake Cynthia sub-basins, including Sections 1, 2 & 3. Section 3 is located in the southeast portion of Lake Cynthia. The sub-basin consists of approximately 3.2 acres of residential townhouse development with frontage on approximately 900 linear feet of Breckness Place. The existing road ranges in elevation from a low of approximately 6.5 to a high of approximately 7.8 feet. The roadway has existing catchbasins, exfiltration

trench, interconnecting culverts and three existing outfalls into Lake Carol. The townhouse parking area and development has three existing outfalls into Lake Cynthia. The Lake Cynthia Section 3 sub-basin is divided into three areas. Typically the exiting outfalls are 8-inch diameter pipes with a raised portion (goose neck) which acts as an overflow weir. The 8-inch outfall pipes are typically located on lot lines between existing buildings.

Based on the available information described above calculations were made for the Lake Cynthia Section 3 drainage sub-basin areas as shown in Figure 6 to compare the existing conditions with the previously stated performance goals. The detailed summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 4. Lake Cynthia Section 3 Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	No	No	Yes	Yes	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	No	Yes	Yes	Yes	Yes

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements. The existing outfall in area 1 fails to meet the water quantity performance goals for the 5, and 10-year storm events. The existing outfall in area 3 fails to meet the water quantity performance goals for the 5-year storm event.

Storm Drainage Deficiencies

Maintenance: Due to the small existing 8-inch outfalls the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted.
Frequent maintenance is recommended for the existing system.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be adequate and have sufficient capacity to meet the performance goals.

Summary of Proposed Modifications

No improvements are proposed for this sub-basin. After the Town's Stormwater Master Plan was completed and regular maintenance activities were introduced drainage conditions in this sub-basin improved. Drainage deficiencies on Breckness Place will be addressed in projects serving the adjacent sub-basins.

NORTH

0 100 200

SCALE AS SHOWN

TOWN OF MIAMI LAKES FLORIDA

Area 1
Proposed Modifications

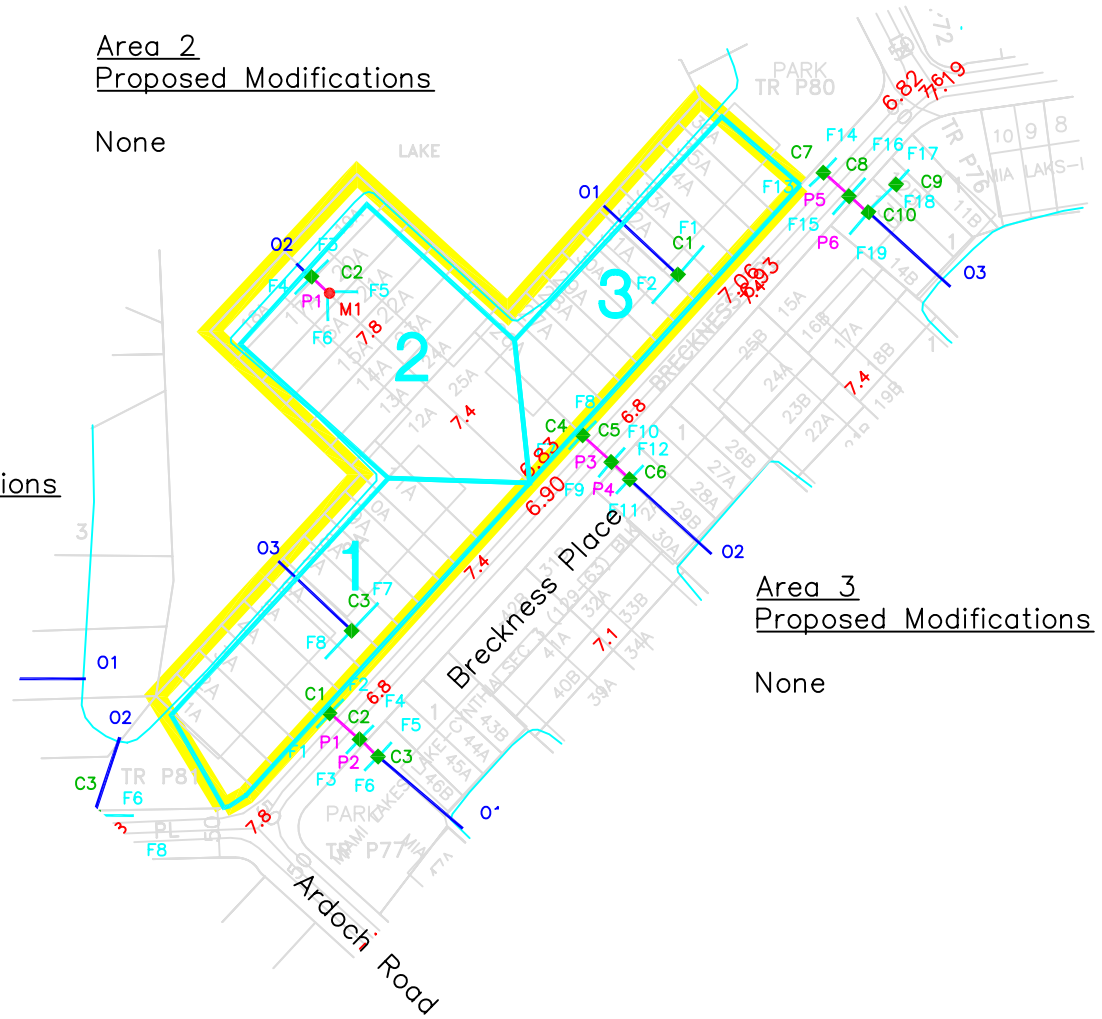
None

Area 2
Proposed Modifications

None

Area 3
Proposed Modifications

None



Drawing name: H:\044 Jobs\044533068\CADD\Concept\06Cynthia3.dwg cynthia3 Oct 24, 2007 12:49pm by: margaret.mcdermott

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

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DRAWN BY HLS
CHECKED BY RRB

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DATE 4/05/06

PROJECT NO. 044533068

Town of Miami Lakes

MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:

FLORIDA REGISTRATION NUMBER:

Figure 6.
Lake Cynthia Section 3 Sub-basin
(30-2022-013)

SHEET NUMBER 1 OF 1

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts.

Undersized Outfalls: None.

Since improved maintenance resulted in a decrease in observed drainage deficiencies in the Lake Cynthia Section 3 Sub-Basin, no capital improvements are proposed for this sub-basin. Any remaining drainage deficiencies along Breckness Place will be addressed in projects serving the adjacent sub-basins. Figure 6 shows the location of the Lake Cynthia Section 3 sub-basin.

Lake Carol Section 1 Sub-Basin

Existing Conditions

The Lake Carol Section 1 sub-basin is generally located south of NW 154th Street, east of NW 87th Avenue, southwest of Lake Sandra, southeast of Lake Cynthia, northeast of Lake Elizabeth and west of Balgowan Road. The Lake Carol Section 1 sub-basin is part of the Sandra/Glenn (GDC1-201) Drainage Basin. There are four Lake Carol sub-basins, including Section 1, 2, 3 & 4. Section 1 is located on the east side of Lake Carol. Section 1 is divided into six drainage areas as shown in Figure 7. The sub-basin consists of approximately 8.0 acres of existing residential townhouse development along approximately 1250 linear feet of Balgowan Road and 700 linear feet of Rednock Lane. The existing roads range in elevation from a low of approximately 6.5 to a high of approximately 7.6 feet. The roadway and townhouse parking areas have existing catchbasins, exfiltration trench, interconnecting culverts and six existing outfalls into Lake Carol. Typically, the existing outfalls vary in size from 8 to 18-inch diameter pipes with a raised portion (goose neck) which acts as an overflow weir. The 8-inch outfall pipes are typically located between existing townhouses.

Based on the available information described above calculations were made for the Lake Carol Section 1 drainage sub-basin areas to compare the existing conditions with the above stated performance goals. The detailed summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 5. Lake Carol Section 1 Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	Yes	Yes	Yes	Yes	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	No
4	Yes	Yes	Yes	Yes	Yes	No
5	Yes	Yes	Yes	Yes	Yes	No
6	Yes	Yes	Yes	Yes	Yes	No

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements. The existing outfalls also meet the water quantity performance goals. Flooding and complaints were observed in Areas 1, 3, 4, 5 and 6.

Storm Drainage Deficiencies

Maintenance: Due to the small existing 8-inch to 18-inch outfalls the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be under sized and do not have sufficient capacity to meet the performance goals.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be undersized and do not have sufficient capacity to meet the performance goals. The existing outfalls should be replaced with six larger outfalls. The final catchbasin prior to each outfall into the lake should be replaced with a control structure catchbasin. The control structure catchbasins should include a weir, pollution retardant baffle and a sedimentation sump.

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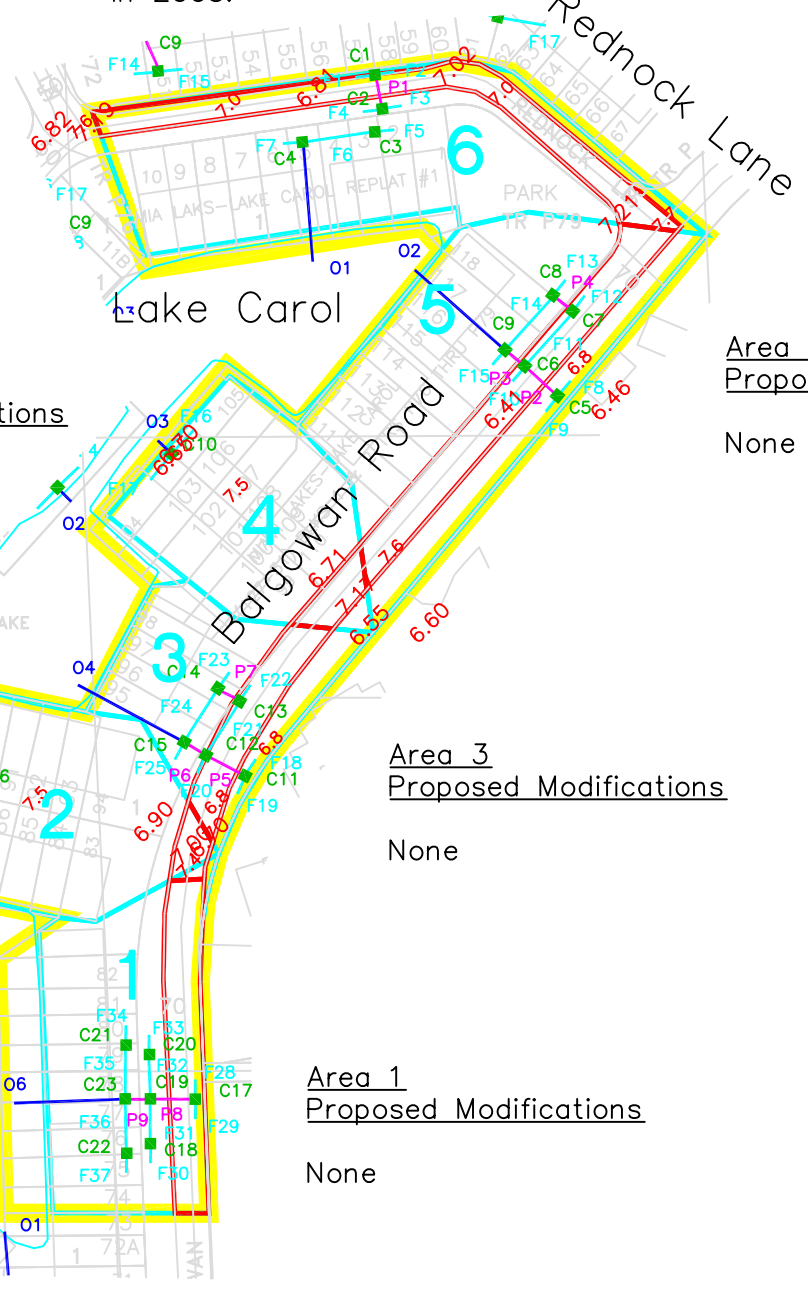
Area 6
Proposed Modifications

Improvements were constructed as part of Lake Glenn Ellen and Lake Cynthia project in 2005.



Area 4
Proposed Modifications

None

Area 5
Proposed Modifications

None

Area 2
Proposed Modifications

None

Area 3
Proposed Modifications

None

Area 1
Proposed Modifications

None

Summary of Proposed Modifications

No improvements are proposed for this sub-basin. After the Town's Stormwater Master Plan was completed and regular maintenance activities were introduced drainage conditions in this sub-basin improved. Any remaining drainage deficiencies will be addressed in projects serving the adjacent sub-basins.

NORTH

0 100 200

SCALE AS SHOWN

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

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DRAWN BY HLS
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DATE 4/05/06
PROJECT NO. 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 7.
Lake Carol 1 Sub-basin
(30-2022-010)

SHEET NUMBER
1 OF 1

Existing Infrastructure Modifications: Additional exfiltration trench is recommended in Areas 1, 5 and 6 to provide additional storage capacity for the system. New catchbasins or manholes will be required at the far end of the new exfiltration trench for maintenance purposes.

Since improved maintenance resulted in a decrease in observed drainage deficiencies in the Lake Carol Section 1 Sub-Basin, no capital improvements are proposed for this sub-basin. Figure 7 shows the location of the Lake Carol Section 1 sub-basin.

Lake Carol Section 2 Sub-Basin

Existing Conditions

The Lake Carol Section 2 sub-basin is generally located south of NW 154th Street, east of NW 87th Avenue, southwest of Lake Sandra, southeast of Lake Cynthia, northeast of Lake Elizabeth and west of Balgowan Road. The Lake Carol Section 2 sub-basin is part of the Sandra/Glenn (GDC1-201) Drainage Basin. There are four Lake Carol sub-basins, including Section 1, 2, 3 & 4. Section 2 is located on the northwest side of Lake Carol. Section 2 is divided into five drainage areas as shown in Figure 8. The sub-basin consists of approximately 5.0 acres of residential townhouse development along approximately 1250 linear feet of Breckness Place. The existing roads range in elevation from a low of approximately 6.5 to a high of approximately 7.6 feet. The roadway and townhouse parking areas have existing catchbasins, exfiltration trench, interconnecting culverts and five existing outfalls into Lake Carol. The Lake Carol Section 2 sub-basin is divided into five areas. Typically, the exiting outfalls vary in size from 8 to 12-inch diameter pipes with a raised portion (goose neck) which acts as an overflow weir. The outfall pipes are typically located between existing townhouses

Based on the available information described above, calculations were made for the Lake Carol Section 2 drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The detailed summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the areas that do (yes) and do not (not) meet the performance goals.

Table 6. Lake Carol Section 2 Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	Yes	Yes	Yes	Yes	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	No
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	No

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements. The existing outfalls also meet the water quantity performance goals. Complaints and flooding were observed in areas 1, 3 and 5.

Storm Drainage Deficiencies

Maintenance: Due to the small existing 8-inch to 18-inch outfalls the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be undersized and do not have sufficient capacity to meet the performance goals.

Lake Capacity: Lake Carol does not have the capacity to contain the 100-year storm and maintain a level below the finish floor elevation of the lowest houses surrounding the lake.

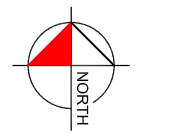
Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

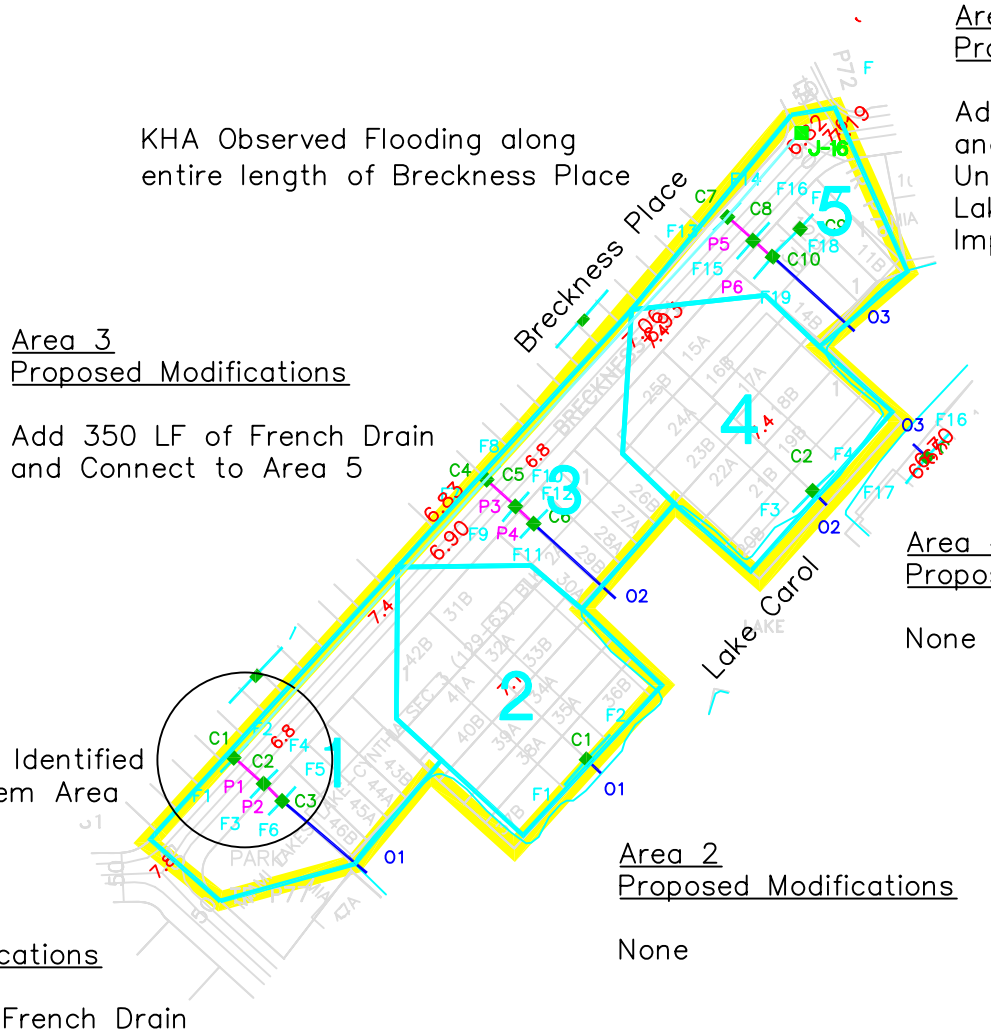
Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be under sized and do not have sufficient capacity to meet the performance goals. The drainage system should be connected to an outfall constructed under the Lake Glenn Ellen and Lake Cynthia Paving and Drainage Improvements project in 2005.

Summary of Proposed Modifications

Add 850 LF French Drain
Coredrill 3 Existing Catchbasins



KHA Observed Flooding along
entire length of Breckness Place



Area 1
Proposed Modifications

Add 250 LF of French Drain
and Connect to Area 3

Area 2
Proposed Modifications

None

DERM Identified
Problem Area

Area 3
Proposed Modifications

Add 350 LF of French Drain
and Connect to Area 5

Area 4
Proposed Modifications

None

Area 5
Proposed Modifications

Add 250 LF of French Drain
and Connect to J-16 Constructed
Under Lake Glenn Ellen and
Lake Cynthia Paving and Drainage
Improvements project in 2005.

Drawing name: H:\044 Jobs\044533068\CADD\Concept\08Carol2.dwg carol2 Oct 24, 2007 12:54pm by: margaret.mcdermott

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1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

SCALE AS NOTED
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DATE 4/05/06
PROJECT NO. 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 8.
Lake Carol Section 2 Sub-basin
(30-2022-017)

SHEET NUMBER
1 OF 1

Existing Infrastructure Modifications: Additional exfiltration trench is recommended in Areas 1, 3, and 5 to provide additional storage capacity for the system.

Figure 8 notes proposed improvements for the Lake Carol Section 2 sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the Lake Carol Section 2 sub-basin.

Lake Carol Section 3 Sub-Basin

Existing Conditions

The Lake Carol Section 3 sub-basin is generally located south of NW 154th Street, east of NW 87th Avenue, southwest of Lake Sandra, southeast of Lake Cynthia, northeast of Lake Elizabeth and west of Balgowan Road. The Lake Carol Section 3 sub-basin is part of the Sandra/Glenn (GDC1-201) Drainage Basin. There are four Lake Carol sub-basins, including Section 1, 2, 3, & 4. Section 3 is located on the southwest side of Lake Carol. Section 3 is divided into three drainage areas. The sub-basin consists of approximately 6.5 acres of residential townhouse development along approximately 700 linear feet of Ardoch Road. The existing roads range in elevation from a low of approximately 6.5 to a high of approximately 7.6 feet. The roadway and townhouse parking areas have exiting catchbasins, exfiltration trench, interconnecting culverts and three existing outfalls into Lake Carol. The Lake Carol Section 3 sub-basin is divided into six areas as shown in Figure 9. Typically the exiting outfalls vary in size from 8 15-inch diameter pipes with a raised portion (goose neck) which acts as an overflow weir. The 8-inch outfall pipes are typically located on lot lines between existing townhouses. The status of drainage easements for the outfalls must be verified. If drainage easements do not presently exist, they may have to be obtained. The ownership of the Lake and drainage rights should also be verified.

Based on the available information described above calculations were made for the Lake Carol Section 3 drainage sub-basin areas to compare the existing conditions with the above stated performance goals. The detailed summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the areas that meet the goals (yes) and those that do not (no).

Table 7. Lake Carol Section 3 Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	Yes	Yes	Yes	Yes	Yes
2	Yes	No	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	No

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements. The existing outfall in area 2 fails to meet the water quantity performance goal. Complaints and flooding were observed in area 3.

Storm Drainage Deficiencies

Maintenance: Due to the small existing 8-inch to 15-inch outfalls the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be undersized and do not have sufficient capacity to meet the performance goals.

Recommended Drainage Improvements

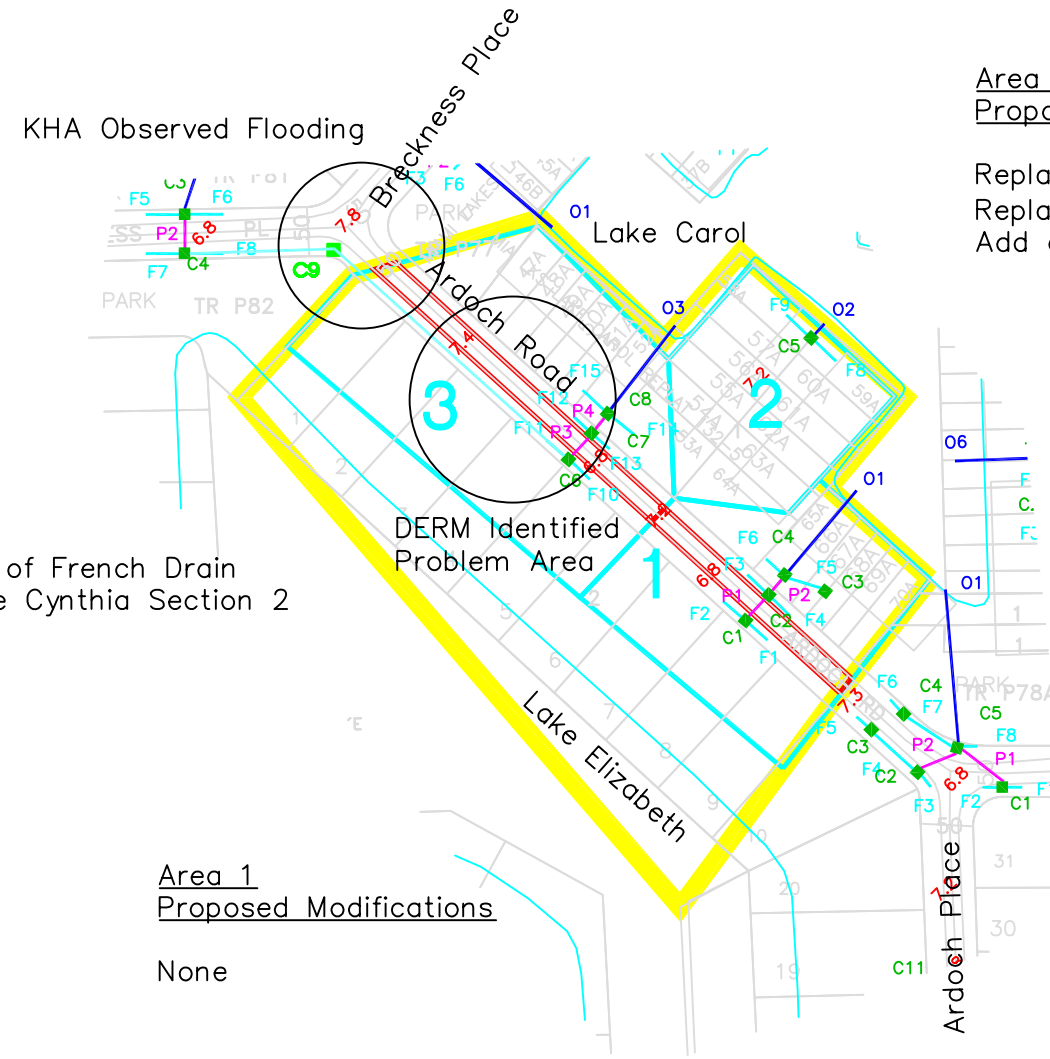
Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be under sized and do not have sufficient capacity to meet the performance goals. The existing outfalls should be replaced with larger outfalls. The final catchbasin prior to each outfall into the lake should be replaced with a control structure catchbasin. The control structure catchbasins should include a weir, pollution retardant baffle and a sedimentation sump.

Figure 9 notes improvements proposed for the Lake Carol Section 3 sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the Lake Carol Section 3 sub-basin.

Summary of Proposed Modifications

Add 2 Catchbasins
Add 1 Headwall
Add 500 LF French Drain
Add 30 LF 18" Pipe
Replace 1 Catchbasin with Weir Structure
Coredrill 2 Existing Catchbasin



Area 3
Proposed Modifications

Install C9 and 500 LF of French Drain
To connect C6 to Lake Cynthia Section 2 Sub-basin

Area 1
Proposed Modifications

None

Area 2
Proposed Modifications

Replace C5 with Weir Structure
Replace O2 with a 30 LF of 18" Outfall Pipe
Add a Headwall

NORTH
0 100 200
SCALE AS SHOWN

TOWN OF MIAMI LAKES FLORIDA

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DATE 4/05/06
PROJECT NO. 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 9.
Lake Carol Section 3 Sub-basin
(30-2022-018)

SHEET NUMBER
1 OF 1

Lake Carol Section 4 Sub-Basin

Existing Conditions

The Lake Carol Section 4 sub-basin is generally located south of NW 154th Street, east of NW 87th Avenue, southwest of Lake Sandra, southeast of Lake Cynthia, northeast of Lake Elizabeth and west of Balgowan Road. The Lake Carol Section 2 sub-basin is part of the Sandra/Glenn (GDC1-201) Drainage Basin. There are four Lake Carol sub-basins, including Section 1, 2, 3, & 4. Section 4 is located on the northwest side of Lake Carol. Section 4 is includes one drainage area. The sub-basin consists of approximately 1.9 acres of residential townhouse and single-family development along approximately 550 linear feet of roadway at the intersection of Ardoch Place, Ardoch Road and Balgowan Road. The existing roads range in elevation from a low of approximately 6.5 to a high of approximately 7.6 feet. The roadway has existing catchbasins, exfiltration trench, interconnecting culverts and one existing outfall into Lake Carol. The Lake Carol Section 4 sub-basin includes one area. The exiting outfall is a 12-inch diameter pipe with a raised portion (goose neck) that acts as an overflow weir. The 12-inch outfall pipe extends from the roadway to the lake through a park.

Based on the available information described above calculations were made for the Lake Coral Section 4 drainage sub-basin areas to compare the existing conditions with the above stated performance goals. The detail summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the performance goals that the areas meets (yes) and does not meet (no).

Table 8. Lake Carol Section 4 Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	Yes	Yes	Yes	Yes	No

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements. The existing outfall in area 1 meets the water quantity performance goals. Complaints and flooding were observed in area 1.

Storm Drainage Deficiencies

Maintenance: Due to the small existing 12-inch outfall the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted.

Frequent maintenance is recommended for the existing system.

Undersized Outfalls: Based on the hydraulic analysis the existing outfall appears to be under sized and does not have sufficient capacity to meet the performance goals.

Recommended Drainage Improvements

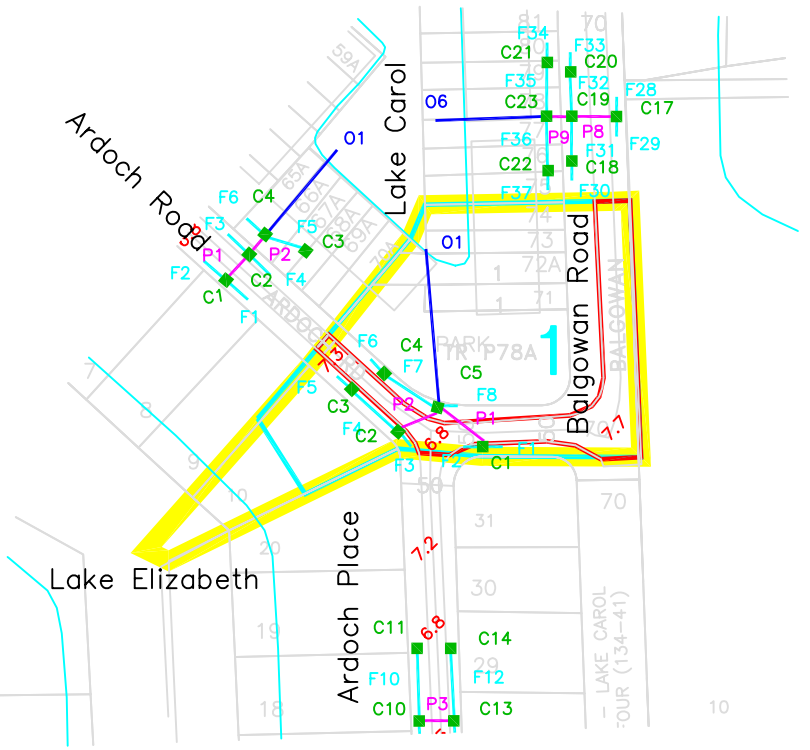
Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

Undersized Outfalls: Based on the hydraulic analysis the existing outfalls appear to be undersized and do not have sufficient capacity to meet the performance goals. The existing outfall should be replaced with two larger outfalls. The final catchbasin prior to each outfall into the lake should be replaced with a control structure catchbasin. The control structure catchbasins should include a weir, pollution retardant baffle and a sedimentation sump.

Figure 10 notes improvements proposed for the Lake Carol Section 4 sub-basin. Since improved maintenance resulted in a decrease in observed drainage deficiencies in the Lake Carol Section 4 Sub-Basin, no capital improvements are proposed for this sub-basin.

Summary of Proposed Modifications

No improvements are proposed for this sub-basin. After the Town's Stormwater Master Plan was completed and regular maintenance activities were introduced drainage conditions in this sub-basin improved. Any remaining drainage deficiencies will be addressed in projects serving the adjacent sub-basins.



Area 1
Proposed Modifications

None

NORTH
0 100 200
SCALE AS SHOWN

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLS
CHECKED BY: RRB

Kimley-Horn and Associates, Inc.

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WWW.KIMLEY-HORN.COM CA 00000696

DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 10.
Lake Carol 4 Sub-basin
(30-2022-020)

SHEET NUMBER: 1 OF 1

Lake Elizabeth Section 3 Sub-Basin

Existing Conditions

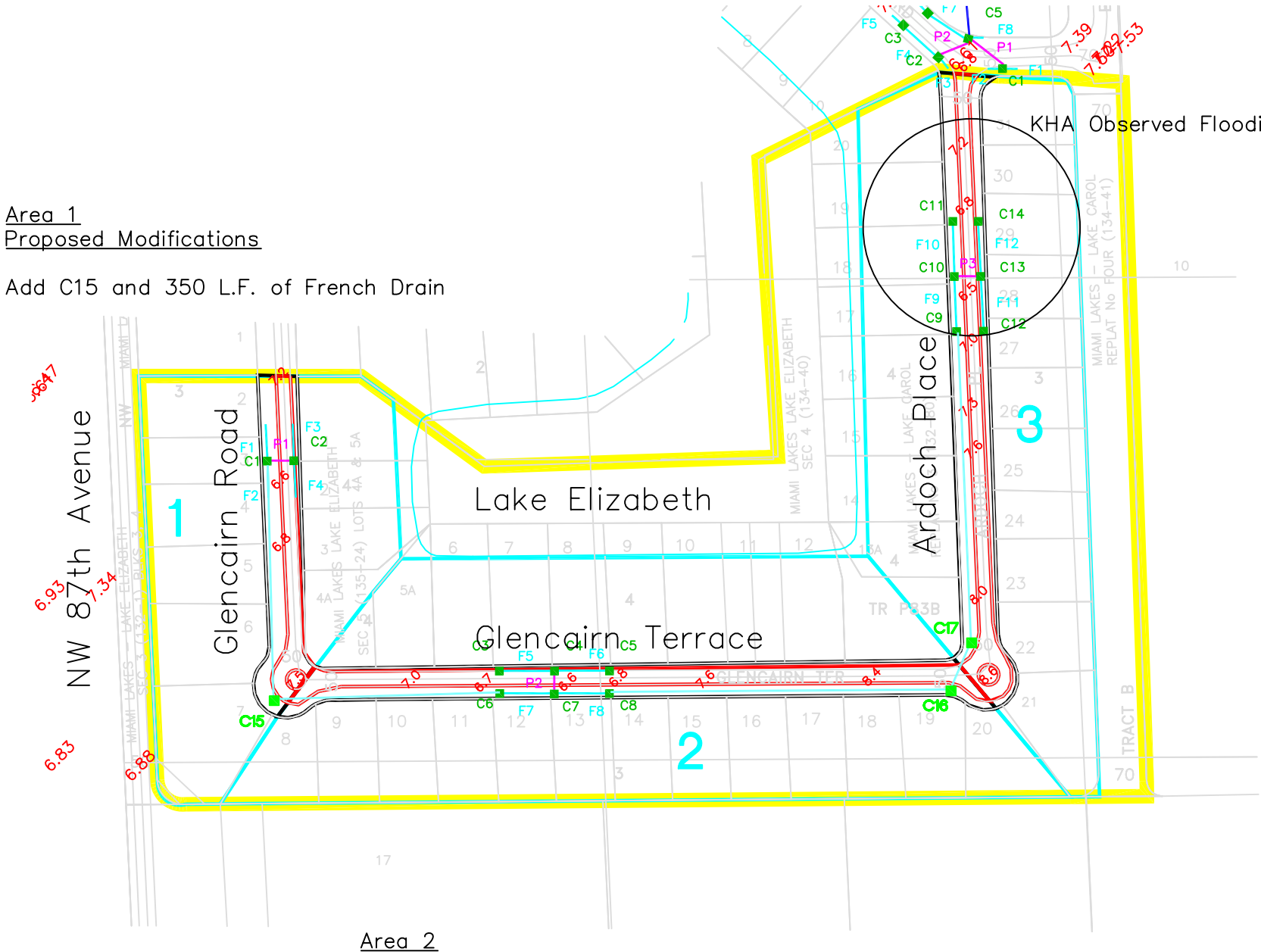
The Lake Elizabeth Section 3 sub-basin is generally located south of NW 154th Street, east of NW 87th Avenue, south of Lake Cynthia, southwest of Lake Carol and west of Balgowan Road. The Lake Elizabeth Section 1 sub-basin is part of the Sandra/Glenn (GDC1-201) Drainage Basin. Two Lake Elizabeth sub-basins include Sections 1 & 3. Section 3 is located on the south side of Lake Elizabeth. Section 3 is divided into three drainage areas as shown in Figure 11. The sub-basin consists of approximately 16.5 acres of single family residential development along approximately 1600 linear feet of Glencairn Road, Glencairn Terrace and Ardoch Place. The existing roads range in elevation from a low of approximately 6.2 to a high of approximately 7.5 feet. The roadway has existing catchbasins, exfiltration trench, interconnecting culverts and no existing outfalls into Lake Elizabeth. The Lake Elizabeth Section 1 sub-basin is divided into three areas.

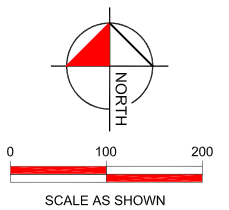
Based on the available information described above, calculations were made for the Lake Elizabeth Section 1 drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The detailed summary of the calculated values is shown in the appendices of the original Storm Water Master Plan. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 9. Lake Elizabeth Section 3 Sub-basin – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	No	No	No	No	Yes
2	Yes	No	No	No	No	Yes
3	Yes	No	No	No	No	No

The existing exfiltration trench drainage system, if properly maintained, meets the water quality requirements in areas 1, 2 and 3. The lack of existing outfalls to provide positive drainage means that areas 1, 2, and 3 fail to meet water quality performance goals for the 5, 10, 25, and 100-year storm events.





Area 1
Proposed Modifications

Add C15 and 350 L.F. of French Drain

Area 2
Proposed Modifications

Add C16 and 500 L.F. of French Drain

Area 3
Proposed Modifications

Add C17 and 450 L.F. of French Drain

Summary of Proposed Modifications

Add 3 Catchbasins
Add 1,300 LF French Drain
Coredrill 4 Existing Catchbasins

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLS
CHECKED BY: RRB

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DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 11.
Lake Elizabeth Section 3 Sub-basin
(30-2022-016)

SHEET NUMBER
1 OF 1

Storm Drainage Deficiencies

Maintenance: Due to the lack of outfalls the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted.
Frequent maintenance is required for the existing system.

Lack of Outfalls: Based on hydraulic analysis the system does not have sufficient capacity to meet the performance goals without positive outfalls to the Lake.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from catchbasins, exfiltration trench and culverts. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls.

Lack of Outfalls: Based on the hydraulic analysis, the existing system appears not have sufficient capacity to meet the performance goals. Outfall pipes cannot be added to provide positive drainage from each area to Lake Elizabeth since easements for the proposed outfalls do not exist.

Figure 11 notes improvements proposed for the Lake Elizabeth Section 3 sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the Lake Elizabeth Section 3 sub-basin.

Bull Run Sub-Basin

Existing Conditions

The Bull Run sub-basin is generally located west of Ludlam Road, in the west section of the Miami Lakes downtown area. Bull Run provides access to the Town Center area, the Fountain House Development, the Meadow Walk Development, and a 2.2-acre Town Park. The Bull Run sub-basin is part of the Downtown West (OLC1-802) Drainage Basin. Bull Run sub-basin is divided into nine drainage areas as shown in Figure 12. The sub-basin consists of approximately 3,500 linear feet of Bull Run Road and 400 linear feet of Main Street. It includes approximately 6.5 acres of road right-of-way and a 2.2 acre Town Park. The existing roads range in elevation from a low of approximately 6.2 to a high of approximately 7.5 feet. The availability of information on the existing roadway and storm drainage system is very limited. Plans could not be located within the Town or County records. From site observations the

roadway areas appear to have existing catchbasins and may have some existing exfiltration trench. There is no evidence of any existing outfalls or existing drainage wells.

Due to the lack of available information on the existing Bull Run storm drainage system, a computation for the comparison of the existing conditions with the above stated performance goals can not be made. However, based on the extent of the observed ponding (see Figure 2), it appears that many of the performance goals are not met in the Bull Run sub-basin.

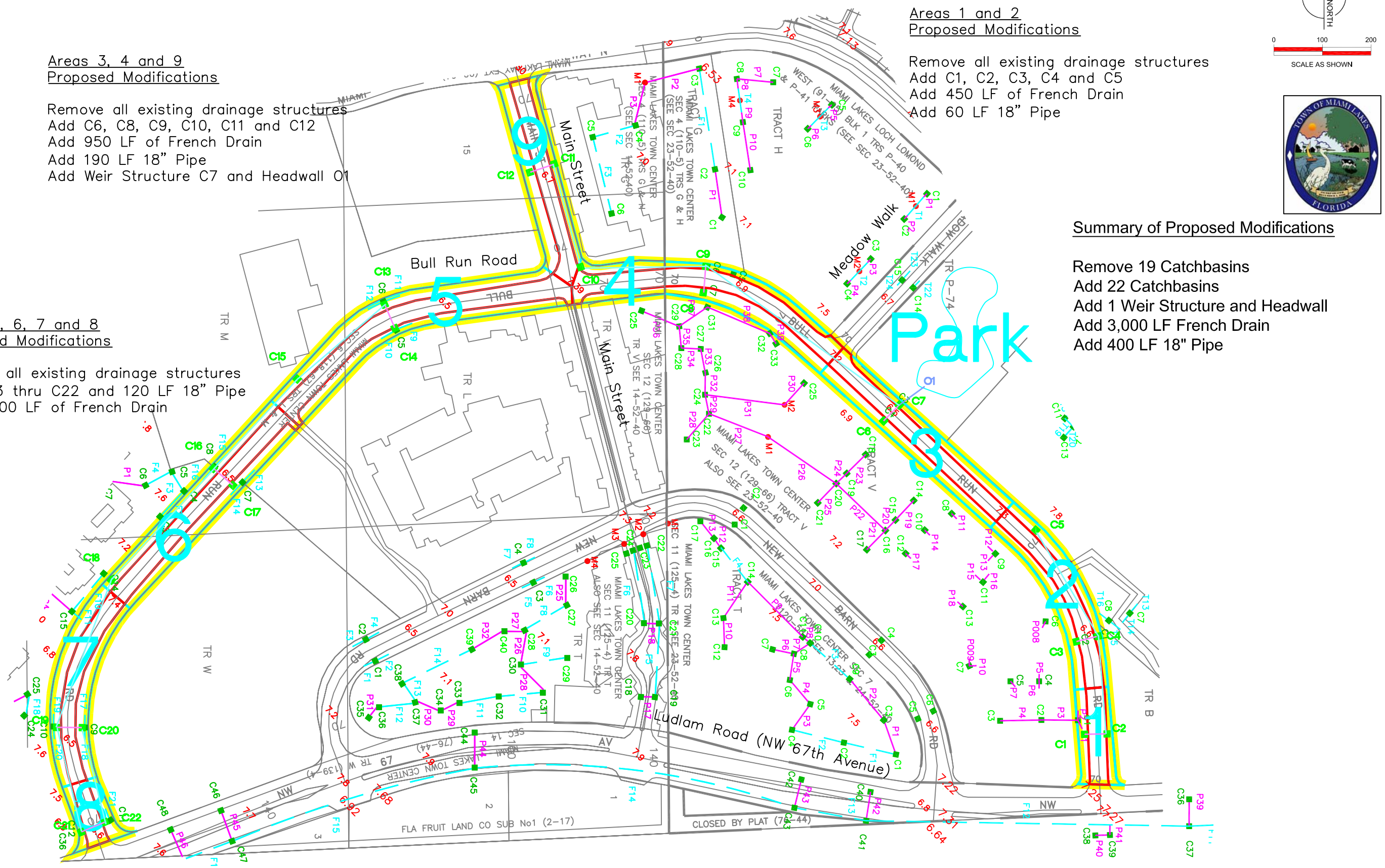
Storm Drainage Deficiencies

Maintenance: Due to the lack of an apparent outfall and the age of the existing system, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is required for the existing system.

Lack of Infrastructure: There are several areas with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and may have short sections of exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration (estimated to be 20 to 30 year old) trenches may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals.



Areas 1 and 2
Proposed Modifications

Remove all existing drainage structures
Add C1, C2, C3, C4 and C5
Add 450 LF of French Drain
Add 60 LF 18" Pipe

Summary of Proposed Modifications

Remove 19 Catchbasins
Add 22 Catchbasins
Add 1 Weir Structure and Headwall
Add 3,000 LF French Drain
Add 400 LF 18" Pipe

Areas 3, 4 and 9
Proposed Modifications

Remove all existing drainage structures
Add C6, C8, C9, C10, C11 and C12
Add 950 LF of French Drain
Add 190 LF 18" Pipe
Add Weir Structure C7 and Headwall O1

Areas 5, 6, 7 and 8
Proposed Modifications

Remove all existing drainage structures
Add C13 thru C22 and 120 LF 18" Pipe
Add 1,600 LF of French Drain

Drawing name: H:\044 Jobs\044533068\CADD\Concept\12BullRun.dwg bullrun Oct 24, 2007 1:42pm by: margaret.mcdermott

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	10/14/05	HLS

SCALE AS NOTED
DESIGNED BY HLS
DRAWN BY HLS
CHECKED BY RRB

Kimley-Horn
and Associates, Inc.

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DATE 4/05/06
PROJECT NO. 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 12.
Bull Run Road Sub-basin
(30-2014-BRR)

SHEET NUMBER
1 OF 1

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Lack of Outfalls: Based on the observed ponding the existing drainage system appears to be undersized and does not appear to have sufficient capacity to meet the performance goals. Exfiltration trench is recommended to provide positive drainage. In order to meet the water quantity performance goals, outfall pipes are recommended to provide positive drainage. Location of these outfall water bodies and pipes will need to be explored during the design phase. At this time, drainage easements and access do not currently exist. Easements for the proposed outfall pipes will also need to be obtained. The final catchbasin prior to each outfall should be a control structure catchbasin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 12 notes proposed improvements proposed for the Bull Run sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the Bull Run sub-basin.

Miami Lakeway North (Southern) Sub-Basin

Existing Conditions

The Miami Lakeway sub-basin is generally located east of Ludlam Road, in the northeast section of the Miami Lakes downtown area. Miami Lakeway provides access to the Middle School and Miami Lakes Park, St. Tropez, Celebration Point, Oaks Apartments, and Eagle Nest Developments. The Miami Lakeway sub-basin is part of the Downtown East (C803-203) Drainage Basin. A drainage project for the northern portion of Miami Lakeway North was completed under the original Storm Water Master Plan.

Figure 13 shows existing conditions for the South Miami Lakeway North Sub-basin. The sub-basin consists of approximately 4,100 linear feet of Miami Lakeway North NW 153rd Street, and Durnford

Drive roadway. It includes approximately 8.5 acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.3 feet to a high of approximately 7.4 feet. The southern Miami Lakeway sub-basin is divided into five areas as shown in Figure 13. The availability of information on the existing roadway and storm drainage system is very limited. Plans could not be located in the Town or County records. From site observations the roadway areas appears to have few existing catchbasins and may have some existing exfiltration trench. There is no evidence of any existing outfalls or existing drainage wells.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the southern Miami Lakeway North drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 10. Miami Lakeway North (Southern) – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	No	No	No	No	No	No
2	No	No	No	No	No	Yes
3	No	No	No	No	No	No
4	No	No	No	No	No	No
5	No	No	No	No	No	No

None of the drainage areas meet the water quality requirements. The lack of existing outfalls to provide positive drainage means that all of the areas fail to meet water quantity performance goals for the 5, 10, 25, and 100-year storm events.

Maintenance: Due to the lack of an outfall and the age of the existing system, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and may have short sections of exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration (estimated to be 20 to 30 year old trenches) may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Drainage wells or outfalls may be required.

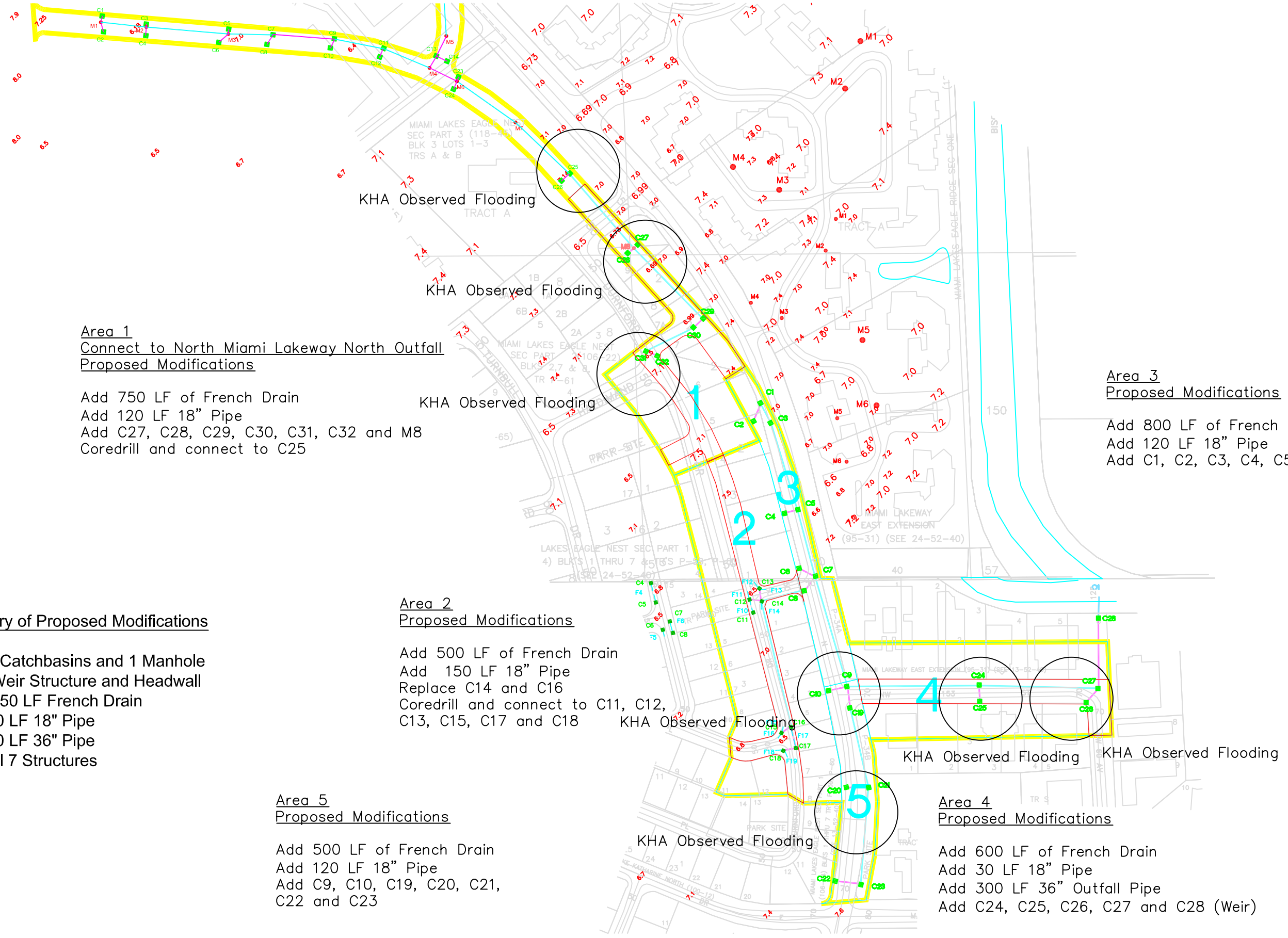
Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity to meet the performance goals. Exfiltration trench and an outfall to the C-8 Canal are recommended to provide positive drainage. At this time, a drainage easement and access do not currently exist. An easement for the proposed outfall pipe will need to be obtained. The final catchbasin prior to the outfall should be a control structure catchbasin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 13 notes proposed improvements proposed for the southern Miami Lakeway sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements.



Area 1
Connect to North Miami Lakeway North Outfall
Proposed Modifications

Add 750 LF of French Drain
Add 120 LF 18" Pipe
Add C27, C28, C29, C30, C31, C32 and M8
Coredrill and connect to C25

Area 3
Proposed Modifications

Add 800 LF of French Drain
Add 120 LF 18" Pipe
Add C1, C2, C3, C4, C5, C6, C7 and C8

Summary of Proposed Modifications

Add 27 Catchbasins and 1 Manhole
Add 1 Weir Structure and Headwall
Add 3,150 LF French Drain
Add 540 LF 18" Pipe
Add 300 LF 36" Pipe
Coredrill 7 Structures

Area 2
Proposed Modifications

Add 500 LF of French Drain
Add 150 LF 18" Pipe
Replace C14 and C16
Coredrill and connect to C11, C12,
C13, C15, C17 and C18

Area 5
Proposed Modifications

Add 500 LF of French Drain
Add 120 LF 18" Pipe
Add C9, C10, C19, C20, C21,
C22 and C23

Area 4
Proposed Modifications

Add 600 LF of French Drain
Add 30 LF 18" Outfall Pipe
Add 300 LF 36" Outfall Pipe
Add C24, C25, C26, C27 and C28 (Weir)

No.	REVISIONS	DATE	BY
1	STORMWATER MASTER PLAN UPDATE NO. 1	11/23/05	HLS

SCALE AS NOTED
DESIGNED BY HLS
DRAWN BY HLS
CHECKED BY RRB

Kimley-Horn and Associates, Inc.

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DATE 4/05/06
PROJECT NO. 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 13.
South Miami Lakeway North
(30-2013-SMLN)

SHEET NUMBER
1 OF 1

Lake Martha Sub-Basin

Existing Conditions

The Lake Martha sub-basin is generally located west of Ludlam Road and north of Miami Lakeway South, in the southeastern residential section of the Town. The Lake Martha sub-basin is part of the Lake Martha (OLC1-601) Drainage Basin.

Figure 14 shows existing conditions for the Lake Martha Sub-basin. The sub-basin consists of approximately 11,000 linear feet of Dade Pine Avenue, Palmetto Palm Avenue, Mahogany Court, Maple Terrace, Cedar Court, Willow Lane, Bottle Brush Lane, Cassia Place, Queen Palm Terrace, Parkinsonia Drive, Orchid Drive and Tabuia Lane roadway. It includes approximately 12.6 acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.3 feet to a high of approximately 8.0 feet. The Lake Martha sub-basin is divided into eleven areas as shown in Figure 14. The GIS information obtained from Miami-Dade County shows the area to have existing catchbasins and some existing exfiltration trench tied to outfalls to the Lake Martha and Lake Hilda.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the Lake Martha drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 11. Lake Martha – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	No	Yes	Yes	Yes	Yes	No
2	No	Yes	Yes	Yes	Yes	No
3	No	Yes	Yes	Yes	Yes	Yes
4	No	Yes	Yes	Yes	Yes	No
5	No	No	No	No	No	No
6	No	No	No	No	No	No
7	No	No	No	No	No	No
8	No	No	No	No	No	No
9	No	No	No	No	No	No
10	No	Yes	Yes	Yes	Yes	No
11	No	Yes	Yes	Yes	Yes	Yes

None of the drainage areas meet the water quality requirements and several of the areas either do not meet water quantity goals for the 5, 10, 25, and 100-year storm events or were observed to flood over the crown of road during an average summer storm.

Maintenance: Due to the age of the existing system, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

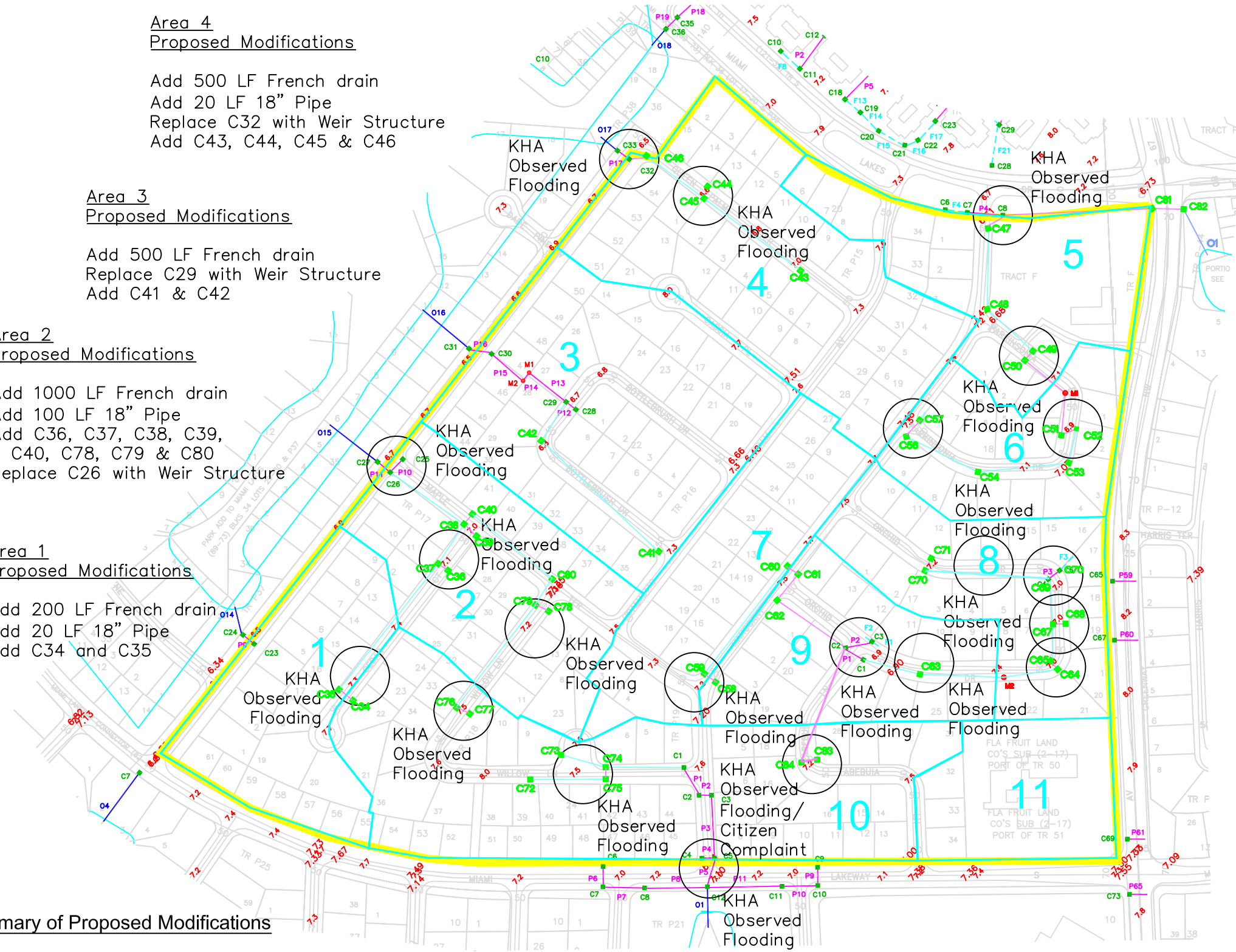
Inadequate Drainage Infrastructure: There are some low points in the roads which do not have existing catchbasin(s) and are not tied to a positive outfall. The capacity and performance of the existing exfiltration (estimated to be 20 to 30 year old trenches) may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Drainage wells or outfalls may be required.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.



Area 1
Proposed Modifications

Add 200 LF French drain
Add 20 LF 18" Pipe
Add C34 and C35

Area 2
Proposed Modifications

Add 1000 LF French drain
Add 100 LF 18" Pipe
Add C36, C37, C38, C39, C40, C78, C79 & C80
Replace C26 with Weir Structure

Area 3
Proposed Modifications

Add 500 LF French drain
Replace C29 with Weir Structure
Add C41 & C42

Area 4
Proposed Modifications

Add 500 LF French drain
Add 20 LF 18" Pipe
Replace C32 with Weir Structure
Add C43, C44, C45 & C46

Area 5
Proposed Modifications

Add 350 LF French drain
Add 500 LF 18" Pipe
Add C47, C48, C49, C50 & C81
Add Weir Structure C82
Add 150 LF 24" Pipe (Outfall O1)
Core Drill C8

Area 6
Proposed Modifications

Add 250 LF French drain
Add 200 LF 18" Pipe
Add M1, C51, C52, C53, C54, C55, C56 & C57

Area 7
Proposed Modifications

Add 300 LF French drain
Add 40 LF 18" Pipe
Add C58, C59, C60 & C61

Area 8
Proposed Modifications

Add 650 LF French drain
Add 60 LF 18" Pipe
Add C64, C65, C66, C67, C68, C69, C70, C71 & M2
Core Drill C4

Area 9
Proposed Modifications

Add 350 LF French Drain
Add 400 LF 18" Pipe
Add C62 & C63
Core Drill C1 & C2

Area 10 – Proposed Modifications

Add 600 LF French Drain
Add 100 LF 18" Pipe
Add C72, C73, C74, C75, C76, C77, C83 & C84
Replace C1 with Weir Structure

Area 11
Proposed Modifications

None

Summary of Proposed Modifications

Add 50 Catchbasins
Add 2 Manholes
Add 5 Weir Structures
Add 4,700 LF French Drain
Add 1,440 LF 18" Pipe
Add 150 LF 24" Pipe, Headwall for O1
Coredrill 4 Structures

NORTH
0 150 300
SCALE AS SHOWN

Drawing name: H:\044 Jobs\044533068\CADD\Concept\14LakeMartha.dwg Layout1 Oct 24, 2007 1:46pm by: margaret.mcdermott

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLW
CHECKED BY: RRB

Kimley-Horn and Associates, Inc.

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DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 14.
Lake Martha
(30-2023-003)

SHEET NUMBER
1 OF 1

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity in areas 5 and 6 to meet the performance goals. Exfiltration trench and a new outfall to Lake Hilda are recommended to provide positive drainage. The outfall can be constructed in road right-of-way and cross through the park at the southeast corner of Ludlam Road and Miami Lakes Drive. The final catchbasin prior to the outfall should be a control structure catchbasin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 14 notes improvements proposed for the Lake Martha sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements.

Lake Patricia Sub-Basin

Existing Conditions

The Lake Patricia sub-basin is generally located east of Ludlam Road and south of Miami Lakeway South, in the southeast residential area of the Town. The Lake Patricia sub-basin is part of the Lake Katherine (OLC1 -501) Drainage Basin.

Figure 15 shows existing conditions for the Lake Patricia Sub-basin. The sub-basin consists of approximately 7,300 linear feet of Lake Saranac Avenue, Lake Childs Court, Lake Candlewood Court, Lake Como Terrace and Lake Claire Court roadway. It includes approximately 8.4 acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.8 feet to a high of approximately 8.1 feet. The Lake Patricia sub-basin is divided into four areas as shown in Figure 15. The GIS information obtained from Miami-Dade County shows the area to have existing catchbasins and some existing exfiltration trench tied to outfalls at Lake Patricia and the Gratigny Canal.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the Lake Patricia drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 12. Lake Patricia – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	No	No	Yes	Yes	No	No
2	No	Yes	Yes	Yes	Yes	No
3	No	Yes	Yes	Yes	Yes	No
4	No	Yes	Yes	Yes	Yes	Yes

None of the drainage areas meet the water quality requirements and several of the areas either do not meet water quantity goals for the 5, 10, 25, and 100-year storm events or were observed to flood over the crown of road during an average summer storm.

Maintenance: Due to the age of the existing system, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

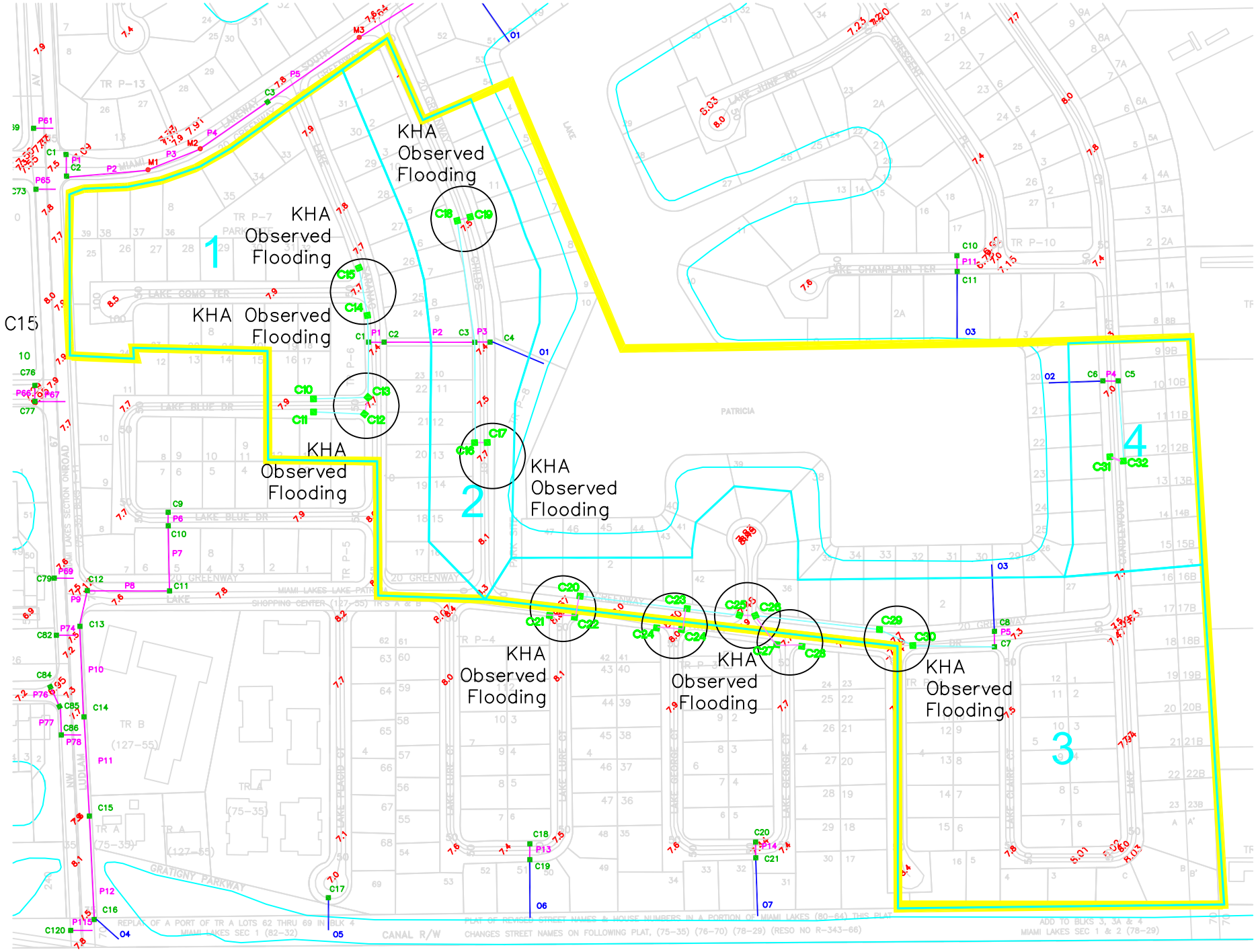
Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and may have short sections of exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration (estimated to be 20 to 30 year old trenches) may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Drainage wells or outfalls may be required.

<u>Recommended Drainage Improvements</u>

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.



Area 1
Proposed Modifications

Add 550 LF French Drain
Add 40 LF 18" Pipe
Add C10, C11, C12, C13, C14 & C15
Core Drill C1

Area 4
Proposed Modifications

Add 200 LF French Drain
Add 20 LF 18" Pipe
Add C31 & C32
Replace C5 with Weir Structure

Summary of Proposed Modifications

Add 23 Catchbasins
Add 3 Weir Structures
Add 2,210 LF French Drain
Add 280 LF 18" Pipe
Core Drill 1 Catchbasin

Area 2
Proposed Modifications

Add 520 LF French Drain
Add 40 LF 18" Pipe
Add C16, C17, C18 & C19
Replace C3 with Weir Structure

Area 3
Proposed Modifications

Add 940 LF French Drain
Add 180 LF 18" Pipe
Add C20, C21, C22, C23, C24, C25, C26, C27, C28, C29 & C30
Replace C7 with Weir Structure

Drawing name: H:\044 Jobs\044533068\CADD\Concept\15LakePatricia.dwg Layout1 Oct 24, 2007 1:47pm by: margaret.mcdermott

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLW
CHECKED BY: RRB

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DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 15.
Lake Patricia
(30-2024-003)

SHEET NUMBER
1 OF 1

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity to meet the performance goals. Additional exfiltration trench is recommended to provide water quality pretreatment and additional storage prior to positive drainage. The final catchbasin prior to the outfall should be a control structure catchbasin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 15 notes proposed improvements proposed for the Lake Patricia sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the sub-basin.

Miami Lakes Business Park East Sub-Basin

Existing Conditions

The Miami Lakes Business Park East sub-basin is generally located east of NW 59th Avenue north of NW 158th Street, in the northeast area of the Town. The Miami Lakes Business Park East sub-basin is part of the Business Park (C803- 101) Drainage Basin.

Figure 16 shows existing conditions for the Miami Lakes Business Park East Sub-basin. The sub-basin consists of approximately 4,000 linear feet of NW 156th Street, NW 155 Street, NW 59th Avenue and NW 57th Avenue roadway. It includes approximately 6.4 acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.3 feet to a high of approximately 7.4 feet. The Miami Lakes Business Park East sub-basin is divided into five areas as shown in Figure 16. The GIS information obtained from Miami-Dade County shows the area to have existing catchbasins and some existing exfiltration trench with no positive outfall.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the Miami Lakes Business Park East drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 13. Business Park East – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	No	No	No	No	Yes
2	Yes	No	No	No	No	No
3	Yes	No	No	No	No	Yes
4	Yes	No	No	No	No	No
5	Yes	No	No	No	No	No

All of the drainage areas meet the water quality requirements, but the lack of existing outfalls to provide positive drainage means that all of the areas fail to meet water quantity performance goals for the 5, 10, 25, and 100-year storm events and flooding across the roadways was observed following an average summer storm.

Maintenance: Due to the lack of an apparent outfall and the age of the existing system, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Drainage wells or outfalls may be required.

Summary of Proposed Modifications

Add 1 Manhole
Add 820 LF 18" Pipe
Add 50 LF 24" Pipe, Headwall
Replace 1 Catchbasin with Weir Structure
Coredrill 3 Existing Catchbasins

NORTH
0 100 200
SCALE AS SHOWN

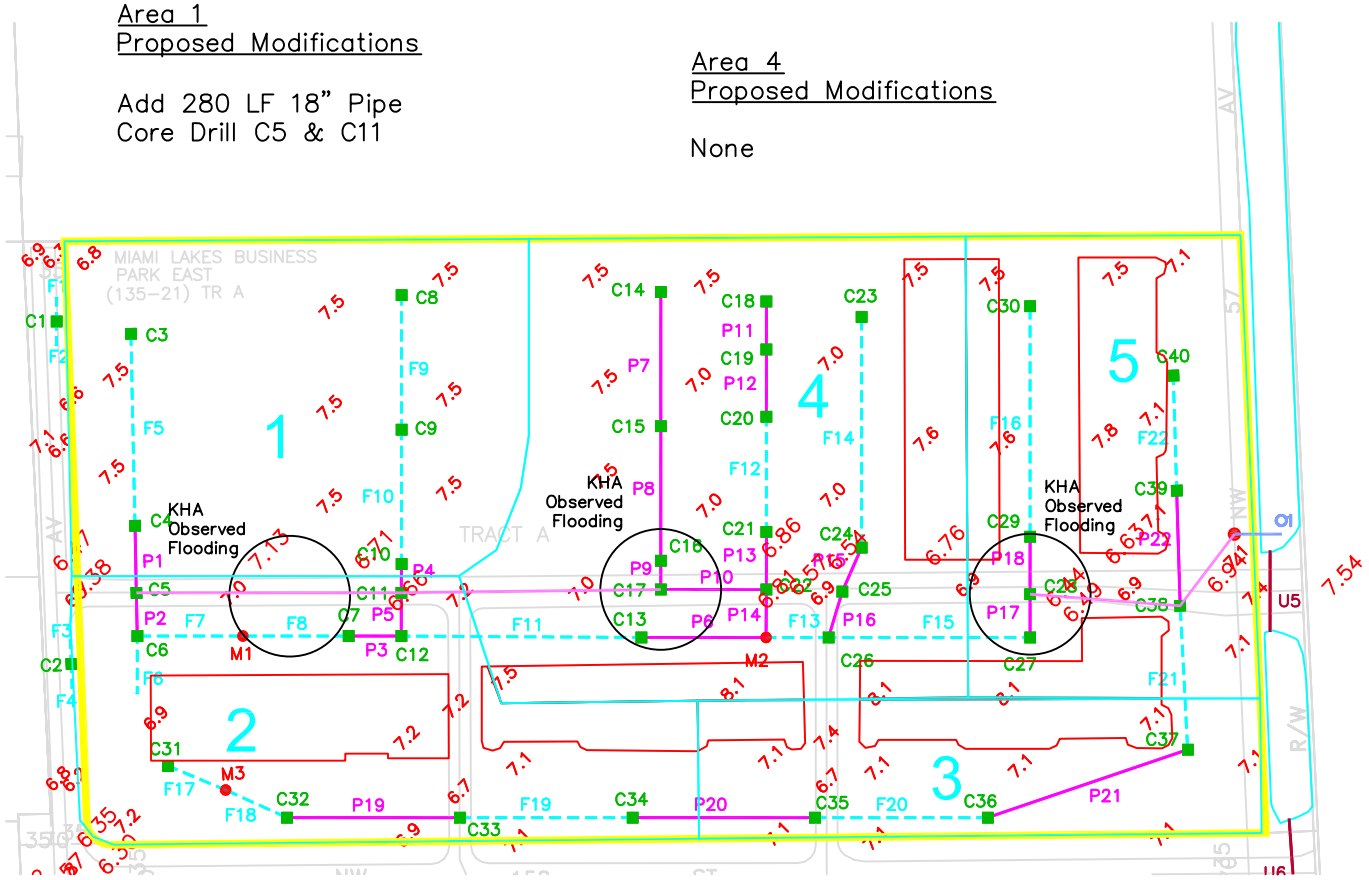
TOWN OF MIAMI LAKES FLORIDA

Area 1
Proposed Modifications

Add 280 LF 18" Pipe
Core Drill C5 & C11

Area 4
Proposed Modifications

None



Area 5
Proposed Modifications

Add 260 LF 18" Pipe
Replace C38 with Weir Structure
Add M1
Add 50 LF 24" Pipe for O1, Headwall

Area 2
Proposed Modifications

Add 280 LF 18" Pipe
Core Drill C17

Area 3
Proposed Modifications

None

No.	REVISIONS	DATE	BY

SCALE AS NOTED
DESIGNED BY HLS
DRAWN BY HLW
CHECKED BY RRB

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DATE 4/05/06
PROJECT NO. 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 16.
Business Park East
(30-2013-034)

SHEET NUMBER
1 OF 1

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity to meet the performance goals. Exfiltration trench and an outfall to the Red Road canal are recommended to provide positive drainage. The outfall could be installed in existing road right-of-way. The final catchbasin prior to the outfall should be a control structure catchbasin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 16 notes proposed improvements proposed for the Miami Lakes Business Park East sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the sub-basin.

NE Industrial Sub-Basin

Existing Conditions

The NE industrial sub-basin is generally located west of Red Road and north of NW 163rd Street, in the northeast section of the Town. The NE Industrial sub-basin is part of the Lake Ruth (C803 - 200) Drainage Basin.

Figure 17 shows existing conditions for the NE Industrial Sub-basin. The sub-basin consists of approximately 4,600 linear feet of NW 59th Avenue, NW 163rd Street, and NW 165th Street roadway. It includes approximately 7.4acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.3 feet to a high of approximately 7.5 feet. The NE Industrial sub-basin is divided into nine areas as shown in Figure 17. Drainage improvements in this area were constructed as part of the Miami-Dade County FEMA/DORM projects. However, flooding across the roadways still occurs during average summer storm events. From the plans for the FEMA/DORM projects, the roadway areas appear

to have existing catchbasins and existing exfiltration trench. There is one existing outfall that appears to be undersized.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the NE Industrial drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 14. NE Industrial – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	Yes	No	Yes	No	Yes	No
2	Yes	No	No	Yes	Yes	No
3	Yes	Yes	Yes	Yes	Yes	No
4	Yes	No	No	No	No	No
5	Yes	Yes	No	Yes	Yes	No
6	Yes	Yes	No	Yes	Yes	No
7	Yes	Yes	Yes	Yes	Yes	No
8	Yes	Yes	Yes	Yes	Yes	Yes
9	Yes	Yes	Yes	Yes	Yes	Yes

All of the drainage areas meet the water quality requirements. However, the outfall is undersized and the reduction in positive drainage means that some of the areas fail to meet water quantity performance goals for the 5, 10, 25, and 100-year storm events. Flooding was observed across the roadway during an average summer storm for most the areas within the sub-basin.

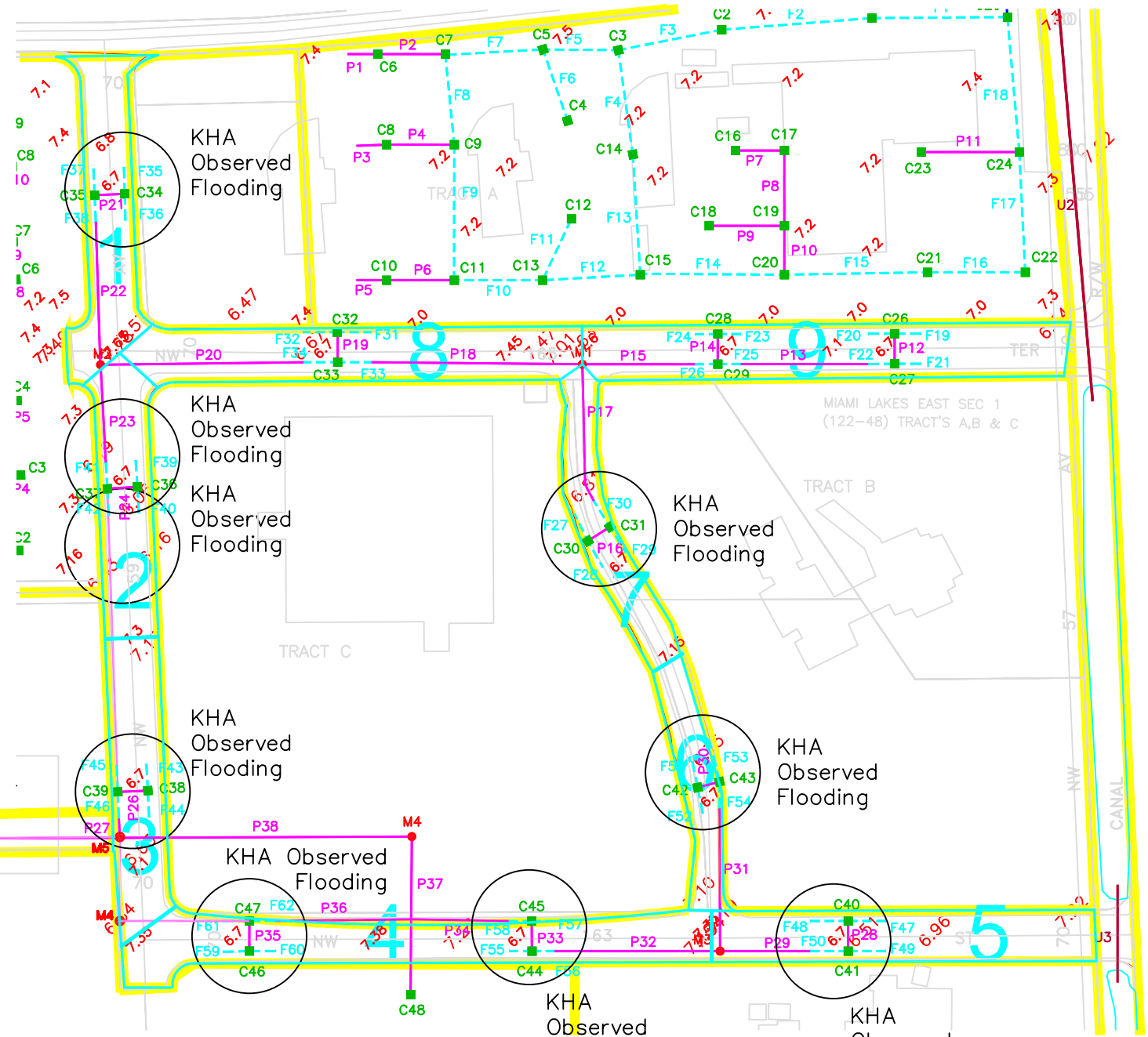
Maintenance: The culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Summary of Proposed Modifications

Add 2 Manholes
Add 180 LF 24" Pipe
Add 410 LF 27" Pipe
Add 270 LF 36" Pipe
Remove 860 LF 18" Pipe
Remove 210 LF French drain
Coredrill 3 Catchbasins

NORTH
0 100 200
SCALE AS SHOWN



Area 1
Proposed Modifications

None

Area 2
Proposed Modifications

Core Drill C37
Remove 70 LF of French Drain
Connect to Area 3

Area 3
Proposed Modifications

Replace 410 LF 18" Pipe with 27" Pipe
Core Drill C39
Remove 70 LF of French Drain
Replace 270 LF 18" Pipe with 36" Pipe
Add M4 and M5

Area 4
Proposed Modifications

Add 180 LF 24" Pipe
Remove 70 LF of French Drain
Coredrill C47

Area 5
Proposed Modifications

None

Area 6
Proposed Modifications

None

Area 7
Proposed Modifications

None

Area 8
Proposed Modifications

None

Area 9
Proposed Modifications

None

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLW
CHECKED BY: RRB

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DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 17.
NE Industrial
(30-2013-050)

SHEET NUMBER
1 OF 1

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and may have short sections of exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Drainage wells or outfalls may be required.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity to meet the performance goals. Exfiltration trench and an upgrade in the size of the outfall to Lake Ruth are recommended to provide positive drainage. At this time, a drainage easement and access cannot be confirmed. An easement for the proposed outfall pipe will need to be obtained if it does not already exist. The final catchbasin prior to the outfall should be a control structure catchbasin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 17 notes proposed improvements proposed for the NE Industrial sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the sub-basin.

Olivia Gardens Sub-Basin

Existing Conditions

The Olivia Gardens sub-basin is generally located between NW 89th Avenue and NW 87th Avenue and between NW 146th Street and NW 148th Terrace, in the southwest residential area Town. The Olivia Gardens sub-basin is part of the Barbara Goleman (GD01- 303) Drainage Basin.

Figure 18 shows existing conditions for the Olivia Gardens Sub-basin. The sub-basin consists of approximately 7,600 linear feet of NW 148th Terrace, NW 147th Lane, NW 148th Lane, NW 148th Street, NW 89th Avenue, NW 88th Place, NW 88th Court, NW 88th Avenue, NW 87th Place, NW 87th Court and NW 87th Avenue roadway. It includes approximately 8.7 acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.4 feet to a high of approximately 7.8 feet. The Olivia Gardens sub-basin is divided into seven areas as shown in Figure 18. The availability of information on the existing roadway and storm drainage system is very limited. Plans could not be located in the Town or County records. From site observations the roadway areas appears to have few existing catchbasins and may have some existing exfiltration trench. There is no evidence of any existing outfalls or existing drainage wells.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the Olivia Gardens drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 15. Olivia Gardens – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	No	No	No	No	No	No
2	No	No	No	No	No	Yes
3	Yes	No	No	No	No	Yes
4	Yes	No	No	No	No	No
5	Yes	No	No	No	Yes	Yes
6	Yes	No	No	Yes	Yes	No
7	Yes	No	No	No	Yes	No

A few of the drainage areas meet the water quality requirements. The lack of existing outfalls to provide positive drainage means that most of the areas fail to meet water quantity performance goals for the 5, 10, 25, and 100-year storm events.

Maintenance: Due to the lack of an apparent outfall, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and may have short sections of exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Drainage wells or outfalls may be required.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Summary of Proposed Modifications

Add 32 Catchbasins
Add 8,000 LF French Drain
Add 510 LF 18" Pipe
Coredrill 27 Structures

Area 1
Proposed Modifications

Add 1,400 LF French drain
Add 60 LF 18" Pipe
Add C28, C29, C30, C31, C32, C41 & C42
Core Drill C1, C2 & C3

Area 2
Proposed Modifications

Add 900 LF French drain
Add 90 LF 18" Pipe
Add C33, C34, C35 & C36
Core Drill C4, C5 & C6

Area 3
Proposed Modifications

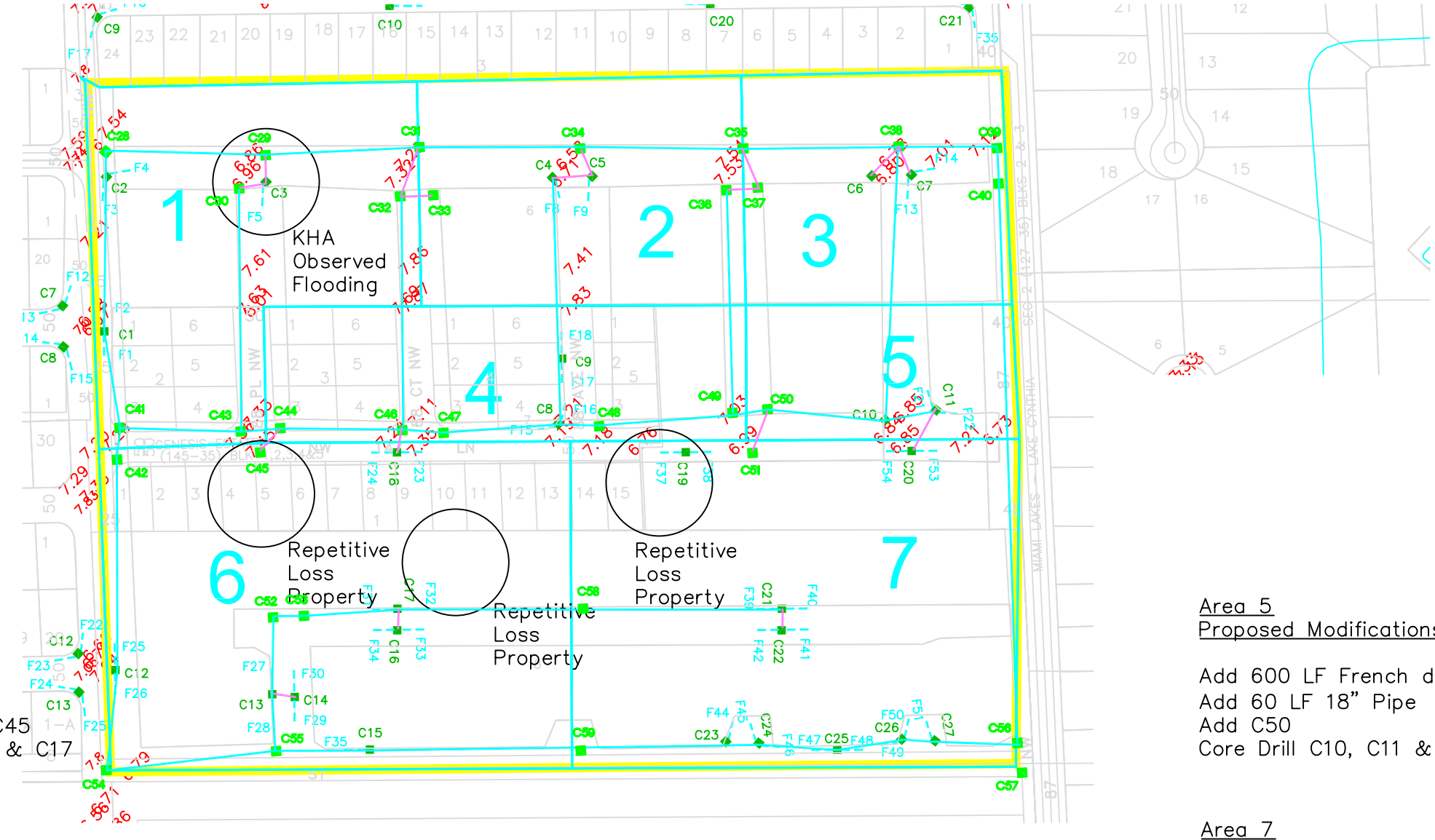
Add 800 LF French drain
Add 120 LF 18" Pipe
Add C37, C38, C39 & C40
Core Drill C6 & C7

Area 4
Proposed Modifications

Add 1,100 LF French drain
Add 60 LF 18" Pipe
Add C44, C46, C47, C48 & C49
Core Drill C18, C8 & C9

Area 6
Proposed Modifications

Add 1,800 LF French drain
Add 60 LF 18" Pipe
Add C54, C55, C52, C53, C42 & C45
Core Drill C12, C13, C14, C15, C16 & C17



Area 5
Proposed Modifications

Add 600 LF French drain
Add 60 LF 18" Pipe
Add C50
Core Drill C10, C11 & C20

Area 7
Proposed Modifications

Add 1,400 LF French drain
Add 60 LF 18" Pipe
Add C51, C58, C59, C57 & C56
Core Drill C21, C22, C23, C24, C25, C26 & C27

NORTH
0 100 200
SCALE AS SHOWN

TOWN OF MIAMI LAKES FLORIDA

Drawing name: H:\044 Jobs\044533068\CADD\Concept\180livdaGardens.dwg Layout1 Oct 24, 2007 1:52pm by: margaret.mcdermott

No.	REVISIONS	DATE	BY

SCALE AS NOTED
DESIGNED BY HLS
DRAWN BY HLW
CHECKED BY RRB

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DATE 4/5/06
PROJECT NO. 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 18.
Olivia Gardens
(30-2021-017)

SHEET NUMBER
1 OF 1

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity to meet the performance goals. Additional exfiltration trench is recommended to provide positive drainage. At this time, a drainage easement and access do not currently exist for an outfall, so an outfall is not proposed. However, if an easement could be obtained, it would help relieve the flooding in the area.

Figure 18 notes proposed improvements proposed for the Olivia Gardens sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the sub-basin.

Lake Sarah Sub-Basin

Existing Conditions

The Lake Sarah sub-basin is generally located between Miami Lakeway South and the Palmetto Expressway right-of-way and between Twin Sabal Drive and Leaning Pine Drive, in the southeast residential area of the Town. The Lake Sarah sub-basin is part of the Lake Martha (OLC1 – 601) Drainage Basin.

Figure 19 shows existing conditions for the Lake Sarah Sub-basin. The sub-basin consists of approximately 6,300 linear feet of Twin Sabal Drive, Sabal Drive, Poinciana Court and Leaning Pine Drive roadway. It includes approximately 7.2 acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.4 feet to a high of approximately 7.9 feet. The Lake Sarah sub-basin is divided into eight areas as shown in Figure 19. Based on GIS information obtained from Miami-Dade County, the roadway appears to have few existing catchbasins and some existing exfiltration trench. The existing outfalls connect to Lake Sarah and Lake Suzie.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the Lake Sarah drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 16. Lake Sarah – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	No	Yes	Yes	Yes	Yes	No
2	No	Yes	Yes	Yes	Yes	No
3	No	Yes	Yes	Yes	Yes	No
4	No	Yes	Yes	Yes	Yes	No
5	No	No	No	No	No	Yes
6	No	No	No	No	No	No
7	No	No	No	No	No	No
8	No	No	No	No	Yes	No

None of the drainage areas meet the water quality requirements. Low areas without catchbasins and insufficient storage in exfiltration trench contributes to several areas failing to meet performance goals for the 5-year, 10-year, 25-year and 100-year storms and observed drainage deficiencies during an average summer storm.

Maintenance: Due to the age of the existing system, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catch basin(s) and may have short sections of exfiltration trench, but no positive outfall. The capacity and performance of the existing exfiltration (estimated to be 20 to 30 year old trenches) may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Additional storage prior to discharge may be required.

Summary of Proposed Modifications

Add 27 Catchbasins
Add 1 Manholes
Replace 4 Catchbasin with Weir Structures
Add 2,010 LF French Drain
Add 2,100 LF 18" Pipe

Area 1
Proposed Modifications

Add 300 LF of French Drain
Add 940 LF 18" Pipe
Add C10, C11, C12, C13, C14, C15 & C16
Replace C1 with Weir Structure

Area 2
Proposed Modifications

Add 380 LF of French Drain
Add 900 LF 18" Pipe
Add C18, C19, C20, C21 & C25
Replace C3 with Weir Structure

Area 3
Proposed Modifications

Add 150 LF of French Drain
Add C17
Replace C5 with Weir Structure

Area 4
Proposed Modifications

Add 150 LF of French Drain
Add 60 LF 18" Pipe
Add C26, C27 & C28

Area 5
Proposed Modifications

None

Area 6
Proposed Modifications

Add 180 LF of French Drain
Add 30 LF 18" Pipe
Add C37, C38 & C39

Area 7
Proposed Modifications

Add 110 LF of French Drain
Connect to Area 2
Add 30 LF 18" Pipe
Add C23 & C24

Area 8
Proposed Modifications

Add 740 LF of French Drain
Add 140 LF 18" Pipe
Add C29, C30, C31, C32, C35, C36 & M1
Replace C9 with Weir Structure

KHA Observed Flooding

NORTH

0 150 300
SCALE AS SHOWN

Drawing name: H:\044 Jobs\044533068\CADD\Concept\19LakeSarah.dwg Layout1 Oct 24, 2007 1:53pm by: margaret.mcdermott

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLW
CHECKED BY: RRB

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DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 19.
Lake Sarah
(30-2023-008)

SHEET NUMBER
1 OF 1

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity to meet the performance goals. Additional exfiltration trench is recommended to provide additional storage prior to positive drainage. The final catchbasin prior to the outfall should be a control structure catch basin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 19 notes proposed improvements proposed for the Lake Sarah sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the sub-basin.

Industrial Area Sub-Basin

Existing Conditions

The Industrial Area sub-basin is generally located south of NW 163rd Street between the C-8 Canal and Red Road, in the northeast section of the Town. The Industrial Areas sub-basin is part of Business Park (C803 – 101) Basin.

Figure 20 shows existing conditions for the Industrial Areas Sub-basin. The sub-basin consists of approximately 4,200 linear feet of NW 59th Avenue and NW 158th Street roadway. It includes approximately 6.7 acres of road right-of-way. The existing roads range in elevation from a low of approximately 6.1 feet to a high of approximately 7.4 feet. The Industrial Areas sub-basin is divided into four areas as shown in Figure 20. The availability of information on the existing roadway and storm drainage system is very limited. Plans could not be located in the Town or County records. From site

observations the roadway areas appears to have few existing catchbasins and may have some existing exfiltration trench. There is no evidence of any existing outfalls or existing drainage wells.

Storm Drainage Deficiencies

Based on the available information described above, calculations were made for the Industrial Areas drainage sub-basin areas to compare the existing conditions with the previously stated performance goals. The following table highlights the areas that do (yes) and do not (no) meet the performance goals.

Table 17. Industrial Area – Performance Goal Analysis

Sub-basin Area	Water Quality	5-Year Storm	10-Year Storm	25-Year Storm	100-Year Storm	No Observed Flooding or Complaints
1	No	No	No	No	No	No
2	No	No	No	No	No	No
3	No	No	No	No	No	No
4	No	No	No	No	No	No

None of the drainage areas meet the water quality requirements. The lack of existing outfalls to provide positive drainage means that all of the areas fail to meet water quantity performance goals for the 5, 10, 25, and 100-year storm events.

Maintenance: Due to the lack of an apparent outfall and the age of the existing system, the culverts and catchbasins may frequently clog with debris and sediment such that water flow is blocked or highly restricted. Frequent maintenance is recommended for the existing system.

Lack of Infrastructure: There are several area with low points in the roadway, which frequently pond during storm events due to a lack of a positive outfall or drainage system.

Inadequate Drainage Infrastructure: There are some low points in the roads which have existing catchbasin(s) and may have short sections of exfiltration trench, but no positive outfall. The capacity and performance of any existing exfiltration may be reduced due to sedimentation build up in the rock trenches and perforated pipes. Based on the observed ponding the existing catchbasins and short exfiltration trenches are inadequate.

Drawing name: H:\044 Jobs\044533068\CADD\Concept\20IndustrialArea.dwg Layout1 Oct 24, 2007 1:59pm by: margaret.mcdermott

Area 1
Proposed Modifications

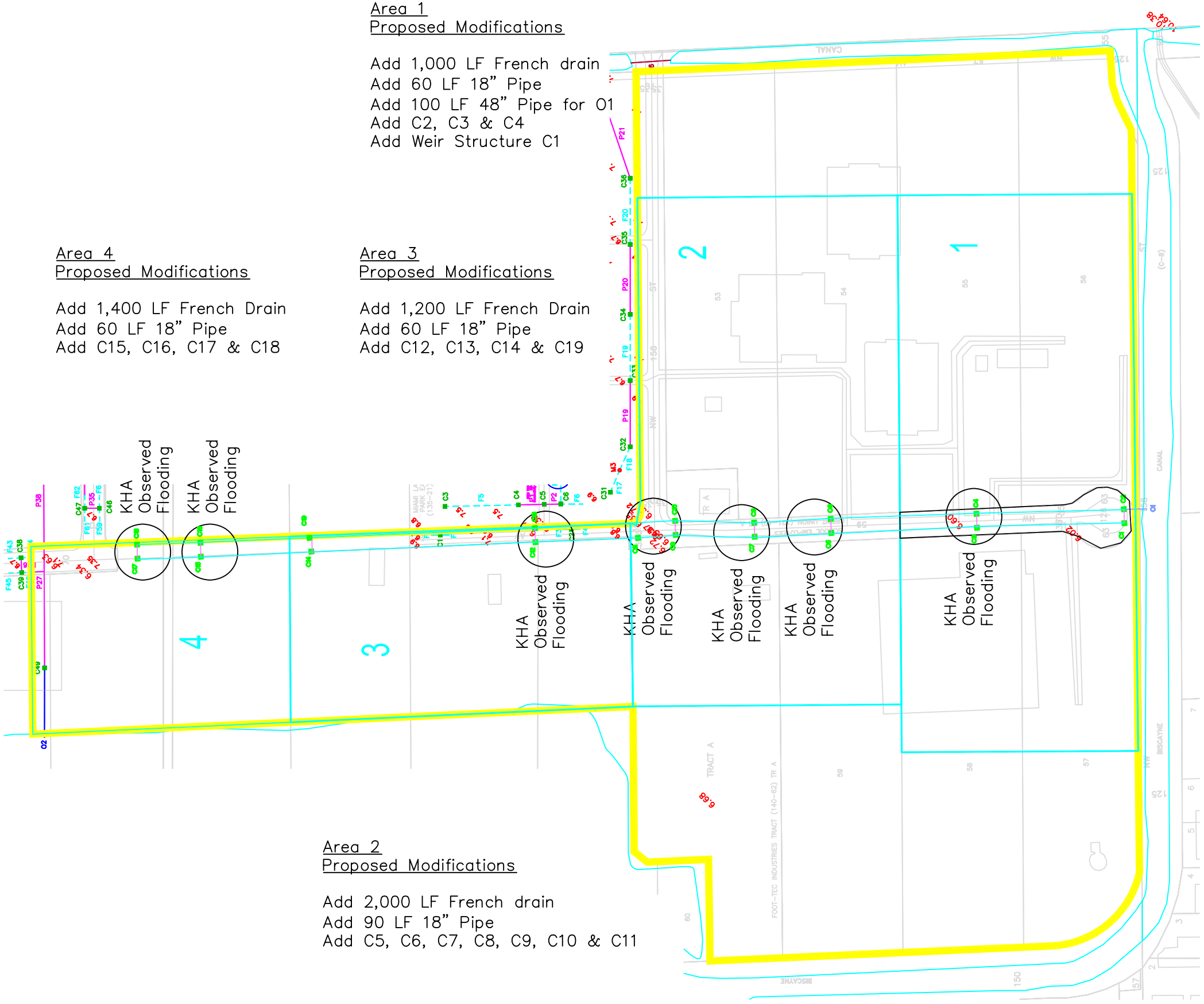
Add 1,000 LF French drain
Add 60 LF 18" Pipe
Add 100 LF 48" Pipe for O1
Add C2, C3 & C4
Add Weir Structure C1

Area 4
Proposed Modifications

Add 1,400 LF French Drain
Add 60 LF 18" Pipe
Add C15, C16, C17 & C18

Area 3
Proposed Modifications

Add 1,200 LF French Drain
Add 60 LF 18" Pipe
Add C12, C13, C14 & C19



Area 2
Proposed Modifications

Add 2,000 LF French drain
Add 90 LF 18" Pipe
Add C5, C6, C7, C8, C9, C10 & C11

NORTH

0 150 300

SCALE AS SHOWN

Summary of Proposed Modifications

Add 18 Catchbasins
Add 1 Weir Structure
Add 5,600 LF French Drain
Add 270 LF 18" Pipe
Add 100 LF 48" Pipe

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: HLS
DRAWN BY: HLW
CHECKED BY: RRB

Kimley-Horn and Associates, Inc.

5100 N.W. 33rd Avenue, Suite 157, Fort Lauderdale, FL 33309
Phone: (954) 739-2233 Fax: (954) 739-2247
WWW.KIMLEY-HORN.COM CA 00000696

DATE: 4/05/06
PROJECT NO.: 044533068

Town of Miami Lakes
MIAMI-DADE COUNTY FLORIDA

DESIGN ENGINEER:
FLORIDA REGISTRATION NUMBER:

Figure 20.
Industrial Area
(30-2013-052)

SHEET NUMBER
1 OF 1

Lack of Outfalls or Drainage Wells: Based on the observed ponding the existing drainage system appears to be undersized and does not have sufficient capacity to meet the performance goals. Drainage wells or outfalls may be required.

Recommended Drainage Improvements

Maintenance: Clean and flush all sediment and debris from any catchbasins to remain. Modify or reconstruct existing catchbasins as required to provide sediment traps (sumps) and pollution retardant baffles to protect the exfiltration trench and outfalls. Inspect any existing culverts or exfiltration trench to determine if they can be cleaned, or if they will have to be replaced.

Existing Infrastructure Modifications: Additional catchbasins/manholes, culverts and exfiltration trench are recommended to be constructed to interconnect the catchbasins.

Lack of Outfalls: Based on the observed ponding, the existing drainage system appears to be under sized and does not appear to have sufficient capacity to meet the performance goals. Exfiltration trench and an outfall to the C-8 Canal are recommended to provide positive drainage. The proposed outfall can be constructed in existing road right-of-way. The final catchbasin prior to the outfall should be a control structure catchbasin with a weir, pollution retardant baffle and a sedimentation sump.

Figure 20 notes proposed improvements proposed for the Industrial Areas sub-basin. The Capital Improvements Program section of this report contains the budget for these proposed improvements to the sub-basin.

CAPITAL IMPROVEMENT PROGRAM

Background

KHA prepared this Capitol Improvement Program (CIP) for Storm Water improvements to prioritize and set the budgets required to plan, construct, operate and maintain the Town's Storm Water Management Program. The CIP is a budgetary tool and is intended to provide an order of magnitude for the Town's yearly funding for the implementation of the Storm Water Utility.

The proposed Capitol Improvement Program is based on the findings of the assessment of existing drainage conditions within the town and the detailed analysis of the eighteen drainage sub-basins which where identified as priority basins. Two components of the capital improvement plan where identified. These are the operation and maintenance component and the capital improvements component.

The operation and maintenance component is based on the general assessment of the existing drainage conditions within the Town limits. Recommended operation and maintenance procedures were identified. The preliminary budget estimates are based on the implementation of these procedures over the next several years.

The Capital Improvement component is based on the findings of the analysis of the priority sub-basins. Recommended improvements to achieve the stated performance goals were identified for each sub-basin. The recommended improvements where quantified based on the available data and preliminary opinions of probable costs (preliminary budgets) where prepared for each sub-basin. Based on the preliminary budgets, the priority sub-basin improvements were grouped and phased to provide the proposed Capital Improvement Program. The following is a detailed explanation and summary of each component of the Capital Improvement Program.

Operation and Maintenance Plan

The intent of the operation and maintenance plan is to maintain the integrity of the storm water management system. This is accomplished by maintaining the existing storm water management system to provide the level of service that as it was originally designed. To achieve this goal, periodic observations, routine maintenance, and general improvements are required. This section of the overall report is not intended to provide a complete operation and maintenance manual, but to provide some of the key components and allow sufficient budget to implement these items. Unit costs associated with

these projects are taken from the Town's 2005 Stormwater Utility Budget and/ or existing contracts with service providers.

Street Sweeping

The Town should continue to invest resources in street sweeping. This activity cleans intake structures, reduces debris deposition within the pipe network, and contributes to the aesthetics of the Town. Generally, street sweeping is a positive maintenance activity that provides measurable benefits. Because pollutants such as hydrocarbons and metals adhere to dirt particles, removing this dirt from the street system will remove the pollutants before they are allowed to discharge into the Town's Lakes.

Catchbasin Maintenance

Catchbasin maintenance is a two-step process. This task includes cleaning the external grate to permit stormwater to enter the system and removing sand, silt and debris from the sedimentation chamber of the intake structure. The catchbasins will be cleaned using mechanical and manual methods. In the majority of cases, catchbasins will be cleaned/maintained in response to observations following significant rain events. Upon making such observations, the Town should evaluate the general area and perform the required maintenance on the inlets and pipes within a sub-basin. Under normal conditions, catchbasin maintenance is recommended every 12 months. However, because of foliage and other debris entering the system, the Town should consider conducting catchbasin maintenance more frequently in some areas. By maintaining and updating the GIS database created as part of this Storm Water Master Plan Update on a regular basis, the Town will be able to track catchbasin maintenance activities.

Pipe Flushing and Exfiltration Trench Cleaning

Pipe flushing and exfiltration trench cleaning are typically performed in conjunction with catchbasin cleaning and is usually contracted out on an as-needed basis. During this activity, a high-pressure water hose is inserted into the pipe network. This process flushes debris into the catchbasin where it can then be removed. Pipe flushing is required to be preformed semi-annually by the Town's MS4 permit. By maintaining and updating the GIS database created as part of this Storm Water Master Plan Update on a regular basis, the Town will be able to track pipe flushing and exfiltration trench cleaning activities.

Swale Inspection, Maintenance and Restoration

Grassed swales and landscaped medians play an important role stormwater disposal. Consistent mowing, inspection and restoration of such features promote stormwater retention and efficient percolation. The

Town maintains swales and medians within public roadways and parking lots. Individual business owners and residents are mandated through local codes to maintain their facilities. This activity should continue on a scheduled basis.

Canal Maintenance

Local canals play an important role stormwater disposal. The Town maintains the Golden Glades Canal on the south side of NW 170th Street, the Red Road Canal along the west side of NW 57th Avenue, the Graham Dairy Canal along the north side of I-75 and the Peter's Pike Canal along the west side of the southbound Palmetto Expressway while the South Florida Water Management District maintains the C-8 (Biscayne Canal).

Lake Inspection and Water Quality Monitoring

The Town of Miami Lakes is blessed with many lakes which give it its name. Consistent inspection and water quality monitoring procedures for the lakes should be established to ensure that they continue to provide both the flood protection and water quality treatment for which they were designed and to ensure the continued enjoyment of the lakes by Town residents.

Minor Repairs and Improvements

Maintaining the storm water collection system requires routine improvements and repairs. This task covers a significant spectrum of activities ranging from the repair of collapsed pipes and manholes to the replacements of catchbasin grates. Maintenance activities are performed in response to an immediate problem using the best methods available. These tasks often can not be foreseen or scheduled.

MS4 Permit and CRS Program Activities

In order to remain in good standing in the National Flood Insurance Program's Community Rating System (CRS) and to comply with the Miami-Dade County Multiple Separate Storm Sewer System Permit (MS4) administered by the U.S. Environmental Protection Agency and Florida Department of Environmental Protection, the Town must perform certain activities on an annual basis. The preceding maintenance activities all qualify for credit under CRS and the MS4 Permit. In addition these maintenance activities, the Town is required to monitor water quality in the canals and prepare a pollutant loading study as part of the MS4 Permit. The Town pays an annual fee to the Miami-Dade County Department of Environmental Resource Management (DERM) for water quality monitoring in the canals. The Town will need to contract with an outside engineering firm to prepare the pollutant loading study.

Both the MS4 Permit and the CRS Program require annual public outreach activities on water quality and the dangers associated with flooding such as mailings to residents and workshops for the general public, pesticide applicators and construction contractors.

WASD Utility Fee Collection

The Town of Miami Lakes has an agreement with the Miami-Dade County Water and Sewer Department (WASD) to include the Town's Storm Water Utility Fee on bills for water and sewer service within the Town. WASD bills customers on a quarterly basis and charges the Town a fee to collect the Town's Stormwater Utility Fee.

Administrative Expenses

There are two items noted in the budget to provide personnel to oversee the operation and maintenance of the stormwater system. These items are: "Professional Services" and "Storm Water Utility Administration". The Professional Services item will include the preparation and oversight of contracting services such as pipe and inlet cleaning and street sweeping. The Storm Water Utility Administration item includes general administration, clerical support, program planning and public awareness.

Storm Water Management Capital Projects

The Capital Improvement Program (CIP) is based on the findings of the analysis of the priority sub-basins. Recommended improvements to achieve the stated performance goals were identified for each basin. The recommended improvements were quantified based on the available data and preliminary opinions of probable costs (preliminary budgets) were prepared for each basin. Prior to each individual project being implemented, professional services such as surveying, engineering, and permitting will be required and are included within the budgets. The budget figures were developed by reviewing recent costs from similar projects. The CIP budgets include an adjustment for inflation in the cost of construction materials and labor of 5% annually.

The following assumptions have been made in the formulation of the budgets for the drainage improvements:

- The budgets include the recommended improvements identified in the analysis of the sixteen priority sub-basins.

- Projects were grouped by sub-basin.
- The budgets include restoration of the roadway impacted by the proposed trenching, but do not include any additional roadway resurfacing.
- The budgets do not include any costs of obtaining drainage or construction easements.
- The budgets include a 10% allowance for mobilization and maintenance of traffic for each project.
- The budgets include a 20% contingency for each project.
- The budgets include a 15% allowance for surveying, engineering, permitting, and limited construction phase assistance (site observations).
- The budgets do not include any landscape costs for improvements or restoration.

The budgetary numbers are an opinion of probable construction costs in the current marketplace. Unit pricing for similar projects constructed by the Town of Miami Lakes within the last year was used as the basis for the construction budgets**.** Based on the preliminary budgets, the priority sub-basin proposed improvements were grouped and phased to provide the capital improvement program.

Table 18. Sub-Basin Prioritization Matrix

Priority Ranking	Area	Hydraulic Analysis	Observed Flooding	Complaints	Roadway Condition	Traffic Volumes	Total Score
1	Lake Cynthia Section 2	5	5	1	4	1	16
2	South Miami Lakeway North	5	4	1	3	3	16
3	Bull Run	5	4	1	1	3	14
4	NE Industrial	5	4	1	1	3	14
5	Lake Elizabeth Section 3	5	2	1	4	1	13
6	Industrial Area	5	5	1	1	1	13
7	Lake Carol Section 2	1	5	1	4	1	12
8	Business Park East	3	4	1	1	3	12
9	Olivia Gardens	5	2	3	1	1	12
10	Lake Sarah	4	4	1	1	1	11
11	Lake Martha	3	4	2	1	1	11
12	Loch Ness	2	4	1	2	1	10
13	Lake Carol Section 3	2	2	1	4	1	10
14	Lake Patricia	2	4	1	1	1	9
15	Lake Cynthia Section 3	Condition Improved by Maintenance – No Capital Improvements Planned					
16	Lake Sandra	Condition Improved by Maintenance – No Capital Improvements Planned					
17	Lake Carol Section 1	Condition Improved by Maintenance – No Capital Improvements Planned					
18	Lake Carol Section 4	Condition Improved by Maintenance – No Capital Improvements Planned					

Table 18 shows the priority ranking for the capital improvement projects. Each project was given a score between 1 and 5 in each of the five categories: hydraulic analysis, observed flooding, complaints, roadway condition and traffic volumes. The scores were then totaled and the projects were ranked from highest to lowest. The basis for the category scores is detailed below.

Hydraulic Analysis

All water quantity performance goals met by existing conditions - 1

Water quantity performance goals failed in less than 1/3 of drainage areas in sub-basin - 2

Water quantity performance goals failed in1/3 to 1/2 of drainage areas in sub-basin - 3

Water quantity performance goals failed in1/2 to all but one of the drainage areas in sub-basin - 4

Water quantity performance goals failed in all of the drainage areas in the sub-basin - 5

Observed Flooding

No flooding observed in sub-basin - 1

Roadway flooding observed in less than 1/3 of drainage areas within sub-basin - 2

Roadway flooding observed in 1/3 to 1/2 of drainage areas within sub-basin - 3

Roadway flooding observed in 1/2 to all but one of the drainage areas within sub-basin - 4

Roadway flooding observed in all of the drainage areas within sub-basin - 5

Complaints

No complaints recorded - 1

Complaints recorded for less than 1/3 of drainage areas within sub-basin - 2

Complaints recorded for 1/3 to 1/2 of drainage areas within sub-basin - 3

Complaints recorded for 1/2 to all but one of drainage areas within sub-basin - 4

Complaints recorded for all drainage areas within the sub-basin - 5

Roadway Condition

Roadway rated as Fair 5 in Roadway CIP - 1

Roadway rated as Fair 3 in Roadway CIP - 2

Roadway rated as Fair 2 in Roadway CIP - 3

Roadway rated as Fair 1 in Roadway CIP - 4

Roadway rated as Poor in Roadway CIP - 5

The proposed CIP summary and schedule of work is contained in Table 19. Figure 21 shows the effect that the proposed projects would have on observed flooding areas and complaint areas throughout the Town. Tables 20-33 detail the budgets for the recommended drainage improvements for each sub-basin based on the analysis described in the preceding sections of this report. Table 34 details the operations and maintenance budget. The projects are recommended to be coordinated with the roadway CIP project scheduling to insure that the drainage improvements are complete before or at the same time as the roadway improvements in the same area. This may require some adjustment to the roadway CIP schedule.

APPENDIX A:
Storm Water Management GIS Coverage

STORM DRAINAGE ATLAS

Town of Miami Lakes

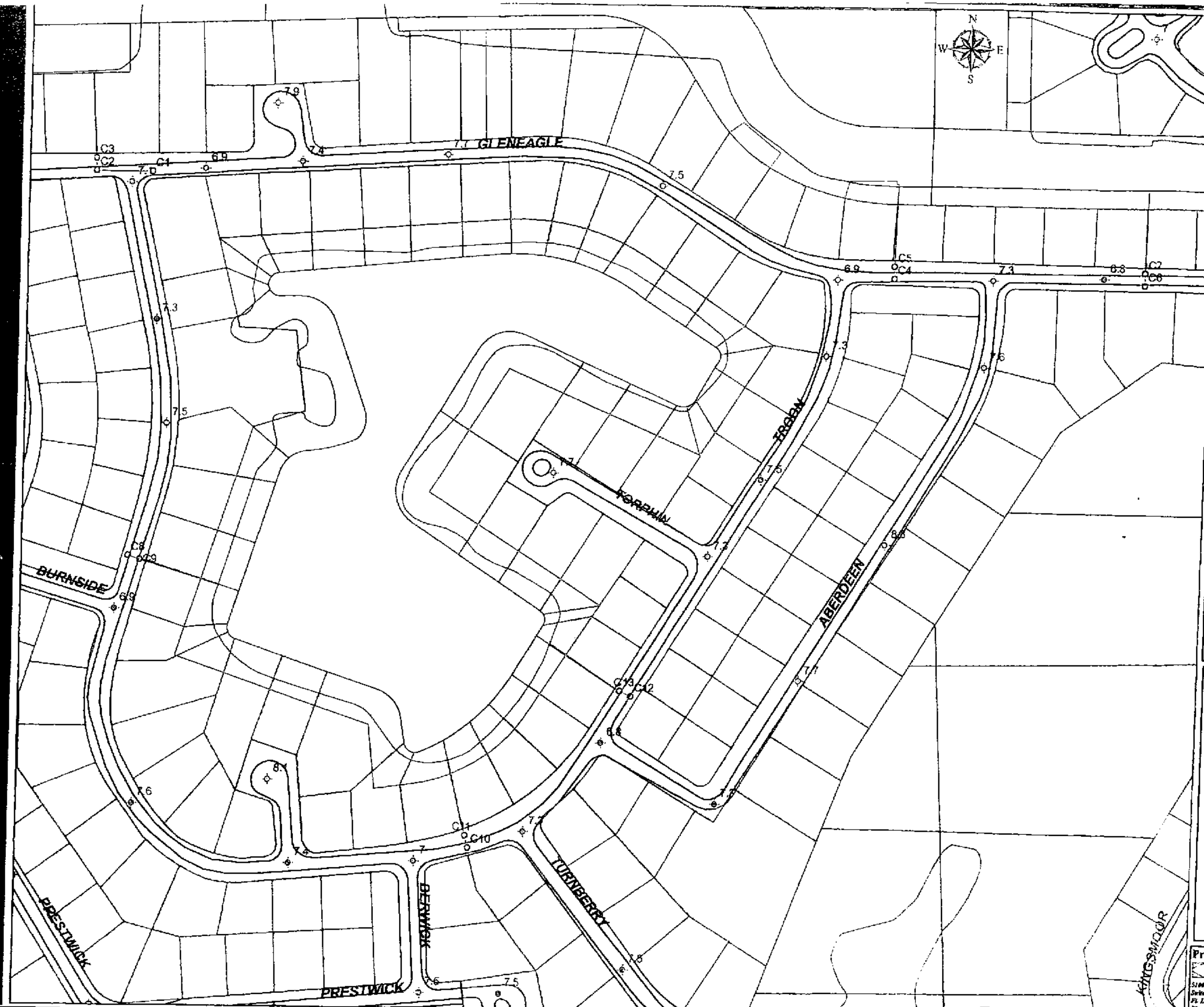
Key Map

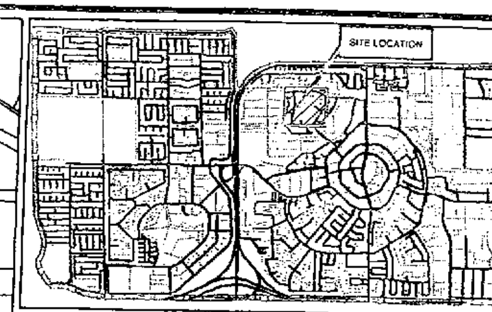
Prepared by:

Date: December 2005

STORM DRAINAGE ATLAS

Town of Miami Lakes





Key Map

Prepared by:

Kimley-Horn and Associates, Inc.

Date: December 2005