



Bound Reports

1720

Drainage Computations and Permit Application

NORTH HANCOCK ROAD (PHASE 2)

LAKE COUNTY, FLORIDA



Prepared For:

Lake County Public Works Department

123 N. Sinclair Avenue

Tavares, Florida 32778

Prepared By:

VANASSE HANGEN BRUSTLIN, INC

135 W. Central Boulevard, Suite 1150

Orlando, Florida 32801

February 4, 2000

RECEIVED

FEB 07 2000

48-069-134-106
PDS
ORLANDO
SJR WMD

Paul T. ...
2-6-00

TABLE OF CONTENTS

Executive Summary1

Introduction2

Project Location2

Soils Information2

Floodplain Information3

Existing Drainage Patterns3

Proposed Drainage Patterns and Design3

Design Criteria4

Analysis4

Summary and Results4

Appendix A – Permit Application

Appendix B - Soils Information (Included with Previous Permit)

Appendix C - Design Information

Appendix D - Calculations

RECEIVED
 FEB 07 2000
 42-069-1391AUGMA-ERP
 PDS
 ORLANDO
 SJR WMD

Paul W. Ferguson
 2-6-00

Figures

Figure No.	Description	Page
1	Location Map	6
2	Soils Map	7
3	Floodplain Map.....	8

EXECUTIVE SUMMARY

North Hancock Road is a new urban roadway being constructed from State Road (SR) 50 to County Road (CR) 50. The overall length of the project is approximately 2.0 miles, and it will be constructed in two phases. A permit has been issued for Phase 1A, which extends from station 100+00 to 117+00, has been issued by the St. Johns River Water Management District (SJRWMD) (Application Number 42-069-1391ANG-ERP); Phase 1B is proposed which extends from station 117+00 to station 140+64 is currently under review by the SJRWMD. It is now proposed to construct Phase 2, which extends from 140+64 to 205+00. The roadway will consist of a two lane urban typical section with provisions to accommodate a section of the South Lake Rails to Trails Project. As a result of the proposed roadway construction, no wetlands will be impacted and no portion of the roadway will encroach into the 100-year floodplain.

The new roadway will provide a closed storm sewer drainage system with dry retention ponds for the entire length of this phase of the project. The stormwater runoff from station 140+64 to 186+52 will be collected and conveyed to existing ponds within the Summit Greens Subdivision (Permit Number 40-069-62431-1). In addition, the stormwater runoff from station 186+52 to 205+00 will be collected and conveyed to an existing pond within the Skyridge Valley Subdivision (Permit Number 4-069-0356 ERP). The stormwater runoff along CR 50 will be collected in a storm sewer system and discharged to a swale at station 16+00. It should be noted that approximately 0.60 acres of existing will be removed from CR 50 and approximately 0.55 acres of impervious area will be constructed for CR 50. Therefore, there is a net reduction in impervious area of 0.05 acres.

Since the project will be permitted through the SJRWMD under 40C-42, treatment volume requirements will be met through the existing ponds mentioned above.

This project meets the requirements set forth by the SJRWMD, Lake County, and the Army Corps of Engineers.

INTRODUCTION

This report provides calculations and documentation to support the drainage design and an Environmental Resource Application (ERP) of Phase 2 of the North Hancock Road project. The proposed roadway is all new construction which will include the following: two 12 foot lanes, a 30 foot raised median, two 4 foot bike lanes, and curb and gutter with a closed storm sewer system. The ultimate section will include two additional 12 foot lanes. The improvements for Phase 2 of the project will extend from station 140+64 to station 205+00 with an overall length of this phase of approximately 1.2 miles.

This project meets the requirements set forth by the SJRWMD, Lake County, and the Army Corps of Engineers. The ERP application is included in Appendix A.

PROJECT LOCATION

This phase of the project is located within Sections 16 and 21 Range 26 East, Township 22 South in Lake County, Florida. Figure 1 is a location map that shows the limits of the project. The project area, for Phase 2, within right-of-way, is approximately 19.0 acres. The total project area of Phases 1A, 1B and 2, within right-of-way, is approximately 29.2 acres.

SOILS INFORMATION

The soils within the project limits are identified in the "Soil Survey of Lake County Area, Florida" as Astatula sands. These soils are nearly level to strongly sloping, excessively drained soils. Figure 2 is a copy of a portion of the soil survey, which shows the limits of the project. A summary of the soils information was included in the previous permit submittal.

A subsurface exploration was performed by Nodarse & Associates for the project. The exploration included a series of 18 auger borings along the centerline of the proposed roadway alignment, ranging in depth from 5 to 25 feet; 9 machine auger borings; and two falling head permeability tests. A copy of the report was included in the previous permit submittal.

FLOODPLAIN INFORMATION

Figure 3 is a copy of a portion of Panel 120421 325B and 375B of the Flood Insurance Rate Map for Lake County, Florida, dated April 1, 1982. As shown in Figure 3, the proposed roadway does not encroach into any areas designated as 100-year floodplain. Therefore, there will be no impacts to the 100-year floodplain.

EXISTING DRAINAGE PATTERNS

From station 140+64 to 186+52 stormwater runoff drains from west to east towards several existing lakes, north of SR 50. In general, from station 186+52 to station 205+00 stormwater runoff drains from east to west towards an existing depression, along the west side of North Hancock Road.

PROPOSED DRAINAGE PATTERNS AND DESIGN

Phase 2 is comprised of four basins. Runoff from these basins is collected via curb and gutter and conveyed to existing ponds at the Summit Greens and Skyridge Valley subdivisions. Since the project will be permitted through the SJRWMD under 40C-42, the treatment volume requirements will be met in the existing ponds.

Basin C runs from 140+74 to 169+55; Basin D extends from 169+55 to 186+52. Both of these basins drain to the existing ponds at the Summit Greens Subdivisions. The analysis was included with the previous submittal to the SJRWMD (Application Number 40-069-62431-1).

Basin E extends from station 186+52 to 205+00. The project drainage area of Basin B is approximately 4.0 acres. The stormwater runoff from Basin E is treated and attenuated in an existing pond in the Skyridge Valley Subdivision. The analysis was included with the previous submittal to the SJRWMD (Application Number 4-069-0356 ERP).

Basin F extends along CR 50 from North Hancock Road to approximately station 16+00. The project drainage area of Basin B is approximately 0.69 acres (0.55 acres of impervious area). Since approximately 0.60 acres of impervious area is being removed no treatment or attenuation is provided.

DESIGN CRITERIA

Regulations which govern the stormwater management design for the North Hancock Road project include: CH. 40C-42 F.A.C., administered by the SJRWMD; NPDES, an EPA regulation administered jointly by EPA and FDEP; National Flood Insurance Program, administered by FEMA, and Lake County.

A summary of the design criteria for the project is included with the previous permit application.

ANALYSIS

Hydrologic Analysis

The Rational Method was used to compute peak discharges. Times of concentration and runoff volumes were computed utilizing the methodology described in TR-55. Drainage areas were computed from the roadway plans. Runoff coefficients were determined utilizing Table 5-5 from the FDOT Drainage Manual, Volume 2A. Rainfall intensities were estimated from Figure 5-8 of the FDOT Drainage Manual, Volume 1. Copies of these tables and figures are included in Appendix C.

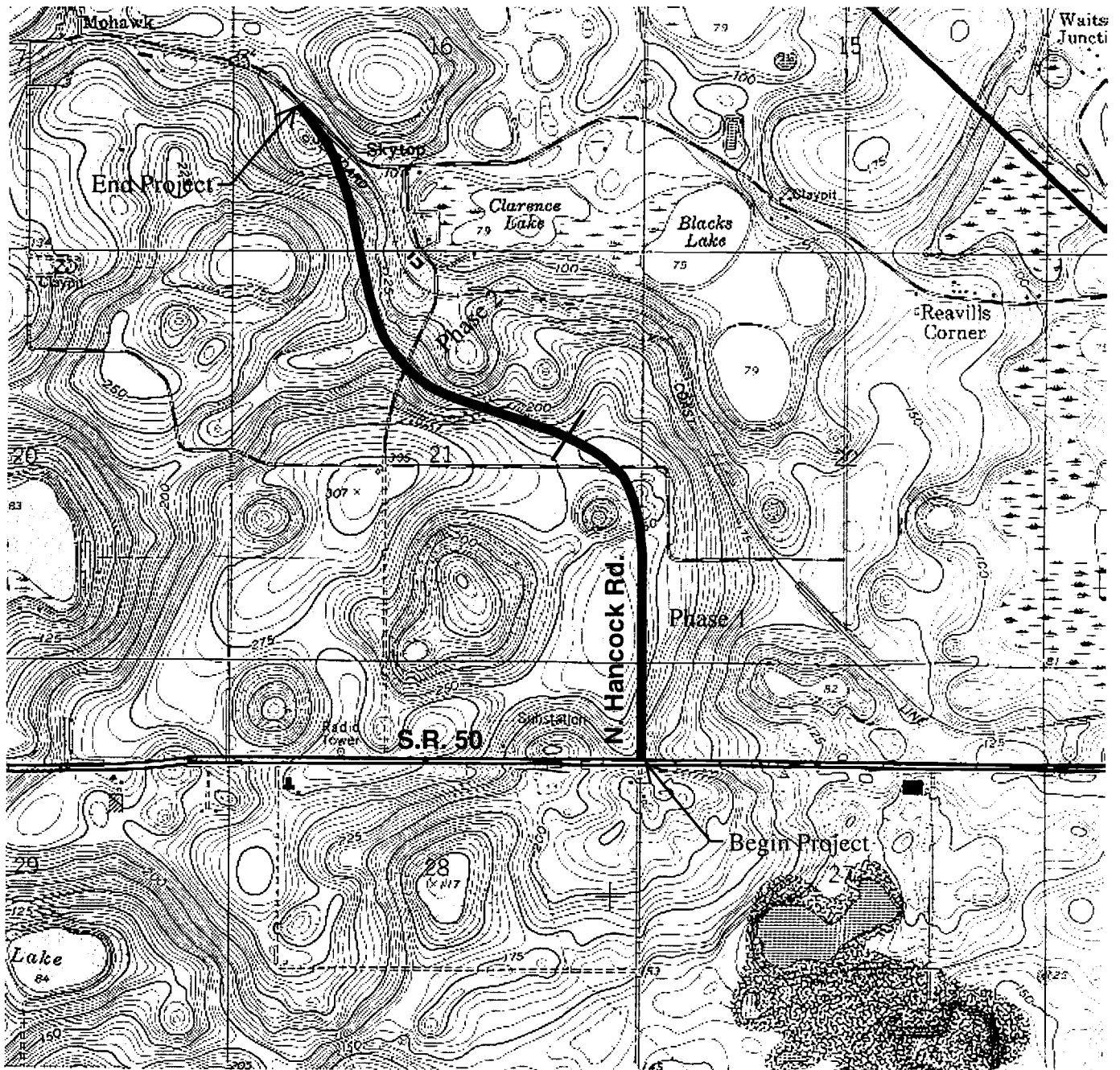
Hydraulic Analysis

The hydraulic analysis of the storm sewer systems was performed utilizing the hydraulic program, Automated Storm Sewer Analysis and Design (ASAD). The hydraulic analyses are included in Appendix D.

SUMMARY AND RESULTS

The storm sewer systems were designed so that the hydraulic grade line from the 10-year design storm is at least 1.0 foot below the gutter elevations of North Hancock Road. In addition, inlets were spaced so that the spread along the roadway is a maximum of one-half of the outside lane width. Stormwater treatment and attenuation is provided in existing ponds within Summit Greens and Skyridge Valley

Subdivisions. It should also be noted that 0.60 acres of impervious area is being removed from CR 50 and only 0.55 acres of impervious is being added.



Source

**USGS Quadrangle Map
Clermont East, Florida**

Sections 16,21,22,27,28, Township 22 South, Range 26 East

Scale: 1" = 2000'

1980

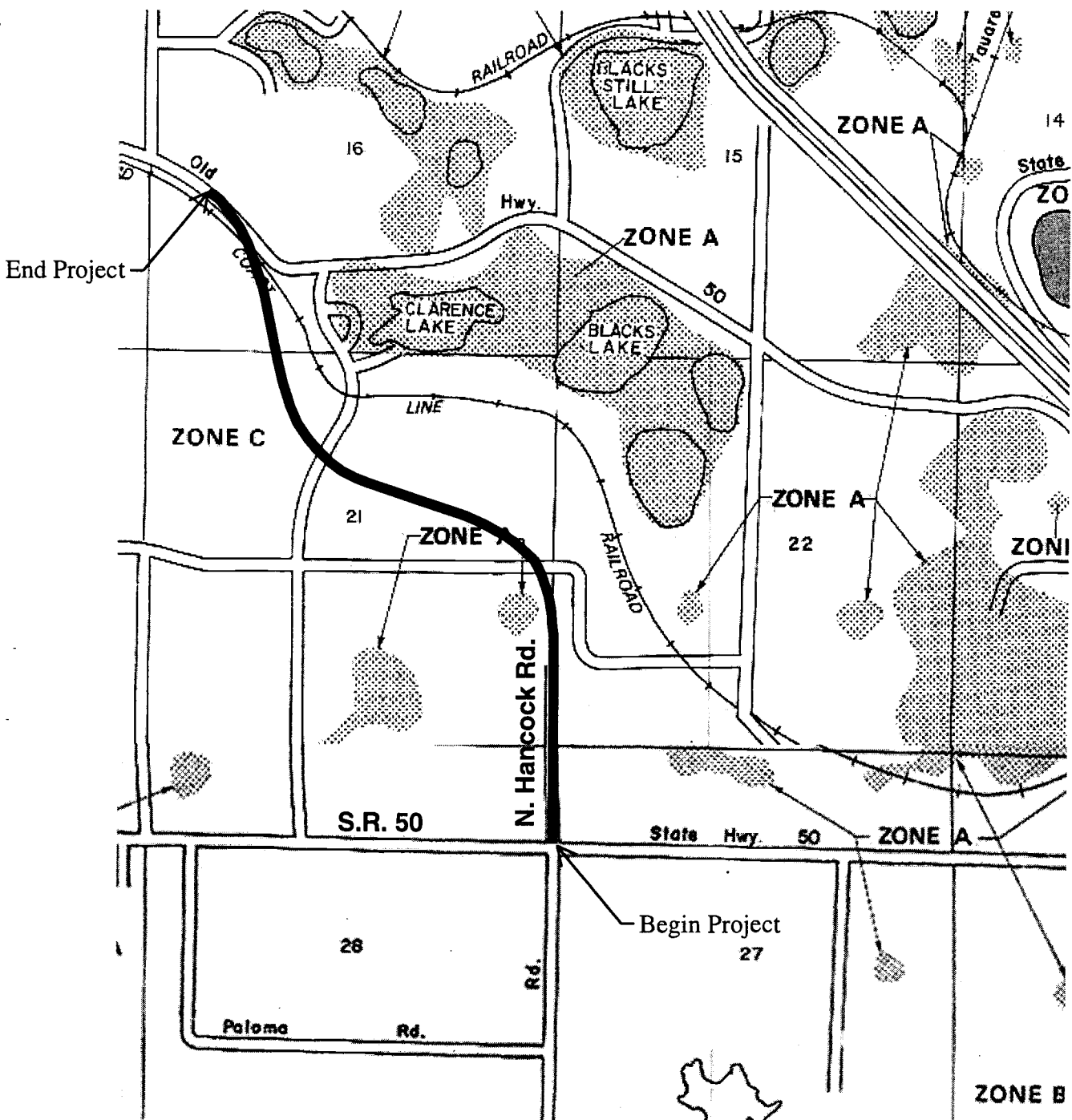


Vanasse Hangen Brustlin, Inc.

Drainage Area /
Location Map

Figure 1

North Hancock Road



Source

Lake County, FL FIRM Panel #120421 0325B

Lake County, FL FIRM Panel #120421 0375B

Dated 4/1/82

Scale: 1"=2000'



Flood Plain Map

Figure 3

Section H

- A. General site conditions
1. Recent aerial photo of project site. *Figure H.1 is an aerial photograph of the project site.*
 2. Map(s) or applicable construction plan(s) showing:
 - a. General location of project shown on USGS quad map(s), including points of discharge. *Figure 1 of the report is a general location map.*
 - b. Project area boundary. *Figure 1 of the report shows the limits of the project.*
 - c. Pre-development (existing) topography. *The existing profile of North Hancock Road is included in the attached plans.*
 - d. Pre-development drainage patterns including points of discharge for existing site drainage and drainage basin boundaries. *A copy of the pre-development was included in the previous permit.*
 - e. Off-site drainage area and flow patterns across project site. *A copy of the pre-development was included in the previous permit.*
 - f. Location of existing drainage right-of-way easements on-site. *The rights of way for North Hancock Road are shown on the attached plans.*
 - g. Location of private and public water supply wells on-site. *There are no private and public water supply wells on-site.*
 - h. All wetlands on the site. *There are no wetlands within or adjacent to the project limits.*
 3. SCS soils map and report and/or soil boring data for treatment facility locations. *Figure 2 of the report is a copy of the SCS soils map for the project area. Soils information is included in Appendix B.*
 4. Water table data
 - a. Date, location, and water table level of actual measurements (if collected) with estimated depth of antecedent rainfall during the previous one month period. *Water table elevations were collected and are included in the Soils Report in the previous permit application. No groundwater was encountered in any of the soil borings.*
 - b. Estimated normal dry and wet season water table elevation. *No groundwater was encountered in any of the soil borings. However, estimated wet season water table elevations are estimated to be deeper than 6 feet beneath the existing ground surface.*
- B. Post-development Project Site Conditions
1. Describe or document the legal outfall for point discharges of treated stormwater to adjacent property. *Roadway stormwater runoff will be collected in a closed storm sewer system and conveyed to one of several ponds. (Basins C and D-Summit Greens; Basin E – Skyridge Valley).*
 2. Identify and describe all on-site and off-site stormwater management systems, which discharge into or receive discharge from the proposed project. *Stormwater is conveyed to existing ponds.*

3. Provide the design tailwater elevation at all points of discharge. *Included in previous permits.*
4. Include the following on construction drawings for the project site:
 - a. Project land use and land cover.
 - b. Proposed construction, including erosion and sediment control plan for each phase. *Please see the attached construction plans. Please note this is a phased construction project.*
 - c. Vegetative cover plan for all on-site and off-site earth surfaces disturbed by construction. *All disturbed surfaces will either be sodded or seeded and mulched. Please see the attached construction plans.*
 - d. Legal reservations for access to the treatment system for maintenance and operation by future maintenance entities for subdivided projects. *Stormwater treatment will be provided in existing ponds. Lake County is entering an agreement with Summit Greens and Skyridge Valley Subdivisions.*
 - e. Provide locations for the following on construction plans:
 - (1) Drainage divide and area served by each hydraulically separate stormwater treatment system. *A drainage map for the project is included in the attached report.*
 - (2) Septic tank or other proposed on-site wastewater treatment facility. *Not applicable.*
 - (3) Wells and surface water withdrawals. *Not applicable.*
 - f. Provide plans, elevations and/or profiles, and details for the following:
 - (1) Roadway and parking pavements. *Please see the attached construction plans.*
 - (2) Floor slabs, walkways and other paved surfaces. *All proposed sidewalks are shown on the attached construction plans.*
 - (3) Earthwork grades for pervious landscaped areas. *Please see the attached construction plans.*
 - (4) All stormwater treatment and drainage facilities. *Please see the attached construction plans.*
 - (5) Show the following details for stormwater treatment systems construction plans.
 - a) All treatment systems:
 - (1) Show the elevations of normal wet season water table, design normal water elevation, and elevations for storage of the treatment volume. *See previously issued permits.*
 - (2) Details of oil and grease control mechanism, if required. *Not applicable.*
 - (3) Details of the outlet and overflow control structure. *See previously issued permits.*
 - (4) Details of treatment drawdown outlets. Show the design tailwater elevations on the outlet details. *Not applicable.*
 - (5) The minimum erosion and sediment control measures to be implemented during construction and all permanent control measures in post-development conditions. *Please see the attached construction plans.*

b) Retention/detention facilities:

- (1) Plan contours and/or cross section details showing bottom contours and elevations, all design dimensions, side slopes, and top of bank elevations. *Please see the attached construction plans.*
- (2) Grassing or planting of all treatment system earth surfaces. *Please see the attached construction plans.*

c) Exfiltration trench. *Not applicable.*d) Underdrain and filter systems. *Not applicable.*e) Wet detention systems. *Not applicable.*f) Wetland stormwater management systems. *Not applicable.*g) Karst Sensitive Areas. *Not applicable.*

6. Design analysis/calculations

- a. Provide the rational method runoff coefficient, drainage area, and impervious area for each treatment system. *The runoff coefficient, drainage area, and impervious area calculations are included in Appendix D.*
- b. Calculate treatment volume required for each separate system. *See previously issued permits.*
- c. Provide stage-storage tabulations... *See previously issued permits.*
- d. Demonstrate 72-hour drawdown... *See previously issued permits.*
- e. Demonstrate that the function of the proposed treatment systems does not adversely affect the treatment performance of all other stormwater management systems which serve or are served by the proposed project. *Not applicable.*
- f. Demonstrate no more than half the treatment volume is discharge within 48 to 60 hours... *Not applicable.*
- g. Design analysis for sizing wet detention permanent pool volume. *Not applicable.*
- h. Describe any additional management practices such as pretreatment, which will be used to enhance the water quality of the stormwater discharge. *Not applicable.*
- i. Peak discharge and conveyance calculations for pre-development and post-development conditions as follows:
 - (1) Runoff characteristics, including area, runoff curve number or runoff coefficient, SCS hydrologic soil group, and time of concentration for each drainage hydrologic unit. *Runoff coefficients and times of concentrations are included in Appendix D.*
 - (2) Design storms used including duration, frequency, and time distribution. *Included in Appendix D.*
 - (3) Runoff hydrographs for each drainage basin. *See previously issued permits.*
 - (4) Stage-storage computations. *See previously issued permits.*
 - (5) Stage-discharge computations. *See previously issued permits.*
 - (6) Flood routings through on-site conveyance and storage areas. *See previously issued permits.*

- (7) Water surface profiles and elevations in the primary surface water management system for the required design storm events. *Included in Appendix D.*
- (8) Runoff peak rates and volumes discharges from the system for the design storm event. *Included in Appendix D.*
7. **Operation and maintenance** *North Hancock Road will be owned and operated by Lake County. The existing ponds are owned and operated by Summit Greens and Skyridge Valley Subdivisions. Lake County will enter into an agreement with these subdivisions for the operation and maintenance of the depression area.*
8. **Alternative stormwater treatment** *Not applicable*
9. **Wekiva River Basin** *Not applicable*

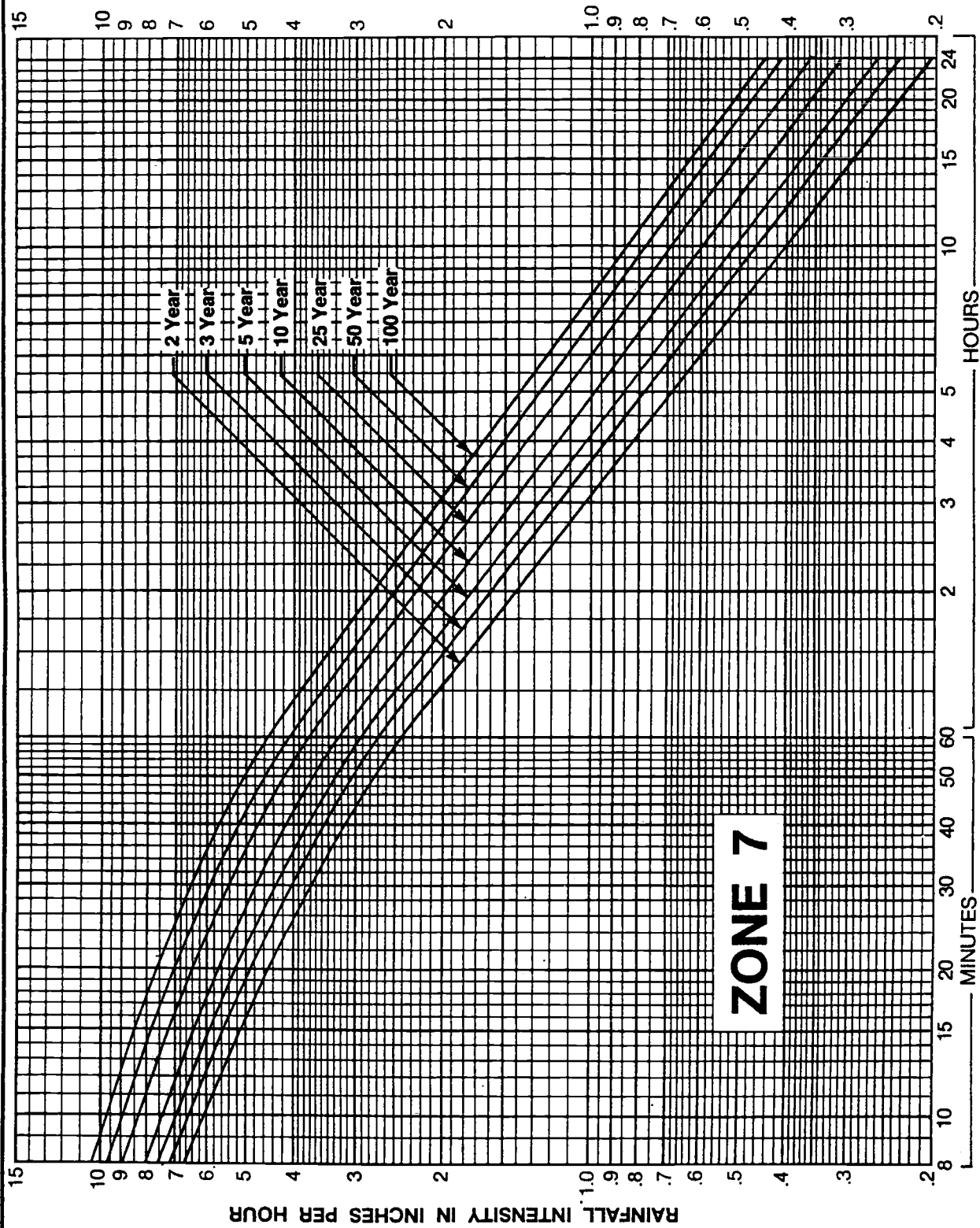


FIGURE 5-8
Rainfall Intensity-Duration-Frequency Curves for Zone 7

Table 5-5
 RUNOFF COEFFICIENTS^a FOR A DESIGN STORM RETURN
 PERIOD OF 10 YEARS OR LESS

Slope	Land Use	Sandy Soils		Clay Soils	
		Min.	Max.	Min.	Max.
Flat (0-2%)	Woodlands	0.10	0.15	0.15	0.20
	Pasture, grass, and farmland ^b	0.15	0.20	0.20	0.25
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements ^c	0.75	0.95	0.90	0.95
	SFR: ½-acre lots and larger	0.30	0.35	0.35	0.45
	Smaller lots	0.35	0.45	0.40	0.50
	Duplexes	0.35	0.45	0.40	0.50
	MFR: Apartments, townhouses, and condominiums	0.45	0.60	0.50	0.70
	Commercial and Industrial	0.50	0.95	0.50	0.95
Rolling (2-7%)	Woodlands	0.15	0.20	0.20	0.25
	Pasture, grass, and farmland ^b	0.20	0.25	0.25	0.30
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements ^c	0.80	0.95	0.90	0.95
	SFR: ½-acre lots and larger	0.35	0.50	0.40	0.55
	Smaller lots	0.40	0.55	0.45	0.60
	Duplexes	0.40	0.55	0.45	0.60
	MFR: Apartments, townhouses, and condominiums	0.50	0.70	0.60	0.80
	Commercial and Industrial	0.50	0.95	0.60	0.95
Steep (7%+)	Woodlands	0.20	0.25	0.25	0.30
	Pasture, grass, and farmland ^b	0.25	0.35	0.30	0.40
	Rooftops and pavement	0.95	0.95	0.95	0.95
	Pervious pavements ^c	0.85	0.95	0.90	0.95
	SFR: ½-acre lots and larger	0.40	0.55	0.50	0.65
	Smaller lots	0.45	0.60	0.55	0.70
	Duplexes	0.45	0.60	0.55	0.70
	MFR: Apartments, townhouses, and condominiums	0.60	0.75	0.65	0.85
	Commercial and Industrial	0.60	0.95	0.65	0.95

^a Weighted coefficient based on percentage of impervious surfaces and green areas must be selected for each site.

^b Coefficients assume good ground cover and conservation treatment.

^c Depends on depth and degree of permeability of underlying strata.

Note: SFR = Single Family Residential
 MFR = Multi-Family Residential

Table 5-8
SCS RUNOFF CURVE NUMBERS FOR SELECTED AGRICULTURAL, SUBURBAN, AND URBAN LAND USE

Land Use Description	Hydrologic Soil Group			
	A	B	C	D
Cultivated Land ^a :				
Without conservation treatment	72	81	88	91
With conservation treatment	62	71	78	81
Pasture or range land:				
Poor condition	68	79	86	89
Good condition	39	61	74	80
Meadow: good condition	30	58	71	78
Wood or Forest Land:				
Thin stand, poor cover, no mulch	45	66	77	83
Good cover ^b	25	55	70	77
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries:				
Good condition: grass cover on 75% or more of the area	39	61	74	80
Fair condition: grass cover on 50% to 75% of the area	49	69	79	84
Poor condition: grass cover on 50% or less of the area	68	79	86	89
Commercial and Business Areas (85% impervious)	89	92	94	95
Industrial Districts (72% impervious)	81	88	91	93
Residential ^c :				
Average lot size Average % Impervious ^d				
1/8 acre or less 65	77	85	90	92
1/4 acre 38	61	75	83	87
1/3 acre 30	57	72	81	86
1/2 acre 25	54	70	80	85
1 acre 20	51	68	79	84
Paved Parking Lots, Roofs, Driveways ^e :	98	98	98	98
Streets and Roads:				
Paved with curbs and storm sewers ^e	98	98	98	98
Gravel	76	85	89	91
Dirt	72	82	87	89
Paved with open ditches	83	89	92	93
Newly graded area (no vegetation established) ^f	77	86	91	94

^aFor a more detailed description of agricultural land use curve numbers, refer to Table 5-9.

^bGood cover is protected from grazing and litter and brush cover soil.

^cCurve numbers are computed assuming the runoff from the house and driveway is directed toward the street with a minimum of roof water directed to lawns where additional infiltration could occur.

^dThe remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

^eIn some warmer climates of the country, a curve number of 96 may be used.

^fUse for temporary conditions during grading and construction.

Note: These values are for Antecedent Moisture Condition II, and $I_a = 0.2S$.

Reference: USDA, SCS, TR-55 (1984).

STORM SEWER HYDRAULICS

System: basinc

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Outfall Tailwater Elevation:		Storm Event		CONDITIONS	
Number: 60633		Designed by: JOK		Exit Loss at Outfall:		Zone		Runoff Coefficients	
County: LAKE COUNTY		Checked by: PWY		Storm Sewer Control Elevation		FL		Area 1 Area 2 Area 3	
				171.50		7		0.95 0.20 0.61	

FROM Station Type	TO Offset Brls Len	Drainage Areas		Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (cfs) (Cb) Sum(Qb)	Inlet Elevations HGL	Inlet Clear. (ft)	Pipe Height (in)	HGL (%) FL (%)	Flow Type	Velocity Actual (fps)	Capacity (cfs)	Mann'g 'N'
		Inc. Total	Sub-Total													
S-300	S-301	0.06	0.06	10.00	1.20	7.41	0.19	0.00	251.48	0.22	18	0.0153	Full	0.80	8.60	0.0120
142+00	-40.25	0.02	0.02					1.41	248.02	0.800						
P-5	1	143.83	0.22	0.13				1.41	248.80	0.800	18	0.5681		4.86		
S-301	S-302	0.13	0.18	11.20	0.42	7.13	0.47	0.00	250.67	0.736	18	0.4957	Partial sub	5.96	12.33	0.0120
143+50	-40.25	0.04	0.06					3.38	247.04	0.800						
P-5	1	148.51	0.25	0.29				3.38	248.00	1.700	18	1.1683		6.97		
S-302	S-303	0.13	0.31	11.61	0.28	7.04	0.60	0.00	249.04	0.056	18	0.1391	Full	2.40	11.75	0.0120
145+00	-40.25	0.04	0.11					4.25	245.96	0.400	18	1.0596		6.64		
P-5	1	40.25	0.00	0.47	0.29			4.25	246.30	0.400	18		Partial super	3.62	5.87	0.0120
S-303	S-304	0.40	0.72	11.89	0.19	6.98	0.60	0.00	247.38	0.100	18	0.2484	Partial sub	6.51	11.53	0.0120
145+00	0.00	0.00	0.11					4.22	245.34	0.100	18			3.32		
DBI-C	1	40.25	0.00	0.47	0.29			4.22	246.30	0.100	18	0.2649		6.87		
S-304	S-306	0.19	0.30	12.08	0.36	6.94	1.03	0.00	249.04	0.853	18	0.5684	Partial sub	6.51	11.53	0.0120
145+00	40.25	0.00	0.00					7.13	245.15	0.200	18			3.27		
P-5	1	150.00	0.00	0.47	0.29			7.13	245.80	1.500	18	1.0204		5.80		
S-305	S-306	0.13	0.13	10.00	0.67	7.41	0.13	0.00	247.22	0.006	18	0.0072	Full	0.55	5.80	0.0120
146+50	-40.25	0.04	0.04					0.97	244.31	0.006	18			3.27		
P-5	1	80.50	0.00	0.00	0.00			0.97	244.50	0.200	18	0.2581		7.78		
S-306	S-308	0.17	1.01	12.44	0.32	6.87	1.33	0.00	247.22	1.246	18	0.8309	Partial sub	7.13	12.63	0.0120
146+50	40.25	0.08	0.42					9.14	243.75	1.800	18	1.2245		0.55		
P-5	1	150.00	0.00	0.47	0.29			9.14	244.30	0.006	18			3.27		
S-307	S-308	0.13	0.13	10.00	0.67	7.41	0.13	0.00	245.40	0.006	18	0.0073	Full	0.55	5.80	0.0120
148+00	-40.25	0.05	0.05					0.98	242.51	0.006	18			3.27		
P-5	1	80.50	0.00	0.00	0.00			0.98	242.70	0.200	18	0.2581		7.78		
S-308	S-310	0.17	1.31	12.76	0.30	6.80	1.64	0.00	245.40	1.900	18	1.2667	Partial sub	8.25	12.97	0.0120
148+00	40.25	0.08	0.55					11.13	242.07	1.900	18	1.2925		5.80		
P-5	1	150.00	0.00	0.47	0.29			11.13	242.50	0.200	18			3.27		
S-309	S-310	0.13	0.13	10.00	0.67	7.41	0.14	0.00	243.48	0.006	18	0.0079	Full	0.57	5.80	0.0120
149+50	-40.25	0.08	0.08					1.02	240.61	0.006	18			3.27		
P-5	1	80.50	0.00	0.00	0.00			1.02	240.80	0.200	18	0.2581		7.33		
S-310	S-312	0.17	1.60	13.07	0.31	6.75	1.95	0.00	243.48	4.300	18	2.1624	Partial sub	10.58	16.91	0.0120
149+50	40.25	0.08	0.70					13.14	240.09	4.300	18	2.1956		9.55		
P-5	1	198.85	0.00	0.47	0.29			13.14	240.60	0.012	18	0.0155	Full	0.80	5.80	0.0120
S-311	S-312	0.17	0.17	10.00	0.67	7.41	0.19	0.00	239.20	0.200	18	0.2581	Full	3.27	5.80	0.0120
151+50	-40.25	0.15	0.15					1.42	236.31	0.200	18			3.27		
P-5	1	80.50	0.00	0.00	0.00			1.42	236.50	0.200	18	0.2581		3.27		

STORM SEWER HYDRAULICS

System: basinc

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Storm Event		CONDITIONS	
Number:	60633	Outlet Tailwater Elevation:	0.00	Runoff Coefficients	Area 1	Area 2	Area 3
Description:	N. HANCOCK	Exit Loss at Outfall:	0.00	Storm Event	7	10	
County:	LAKE COUNTY	Storm Sewer Control Elevation:	171.50	Zone	7	10	

Organization: Vanasse Hangen Brustlin, Inc.
 Designed by: JOK
 Checked by: PWY

FROM Station Type	TO Offset Brls Len	Drainage Areas		Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (Ob) Sum(Qb) CIA TOTAL	Inlet Elevations	Pipe Elevations		Fall (ft)	Pipe Height Width (in)	HGL (%) FL (%)	Flow Type	Velocity Actual Physical (fps)	Capacity Mann 'N' (cfs)	
		Inc.	Sub-Total							Sub-Total	CA							Inlet HGL
S-312	S-314	0.22	1.99	1.89	13.38	0.25	6.69	2.37	0.00	239.20	235.78	229.28	6.500	18	3.2834	Partial	12.98	20.83
151+50	40.25	0.10	0.95	0.19					15.85	236.30	229.80					sub	11.77	0.0120
P-5	1	197.97	0.00	0.47	0.29				15.85	3.42	0.00	234.80	6.500	18	3.3339			
S-313	S-314	0.17	0.17	0.16	10.00	0.67	7.41	0.19	0.00	232.60	229.81	229.80	0.013	18	0.0158	Full	0.81	5.80
153+50	-40.25	0.15	0.15	0.03					1.43	2.79	0.00	228.50	0.200	18	0.2581			
P-5	1	80.50	0.00	0.00					1.43	232.60	229.27	218.20	11.067	18	4.4676	Partial	15.42	0.0120
S-314	S-316	0.22	2.38	2.27	13.63	0.27	6.64	2.79	0.00	221.11	218.23	218.20	0.028	18	0.0353	Full	1.21	5.80
153+50	40.25	0.10	1.21	0.24					18.56	3.34	0.00	216.70	11.600	18	4.7403			
P-5	1	247.71	0.00	0.47	0.29				18.56	221.11	218.23	218.20	0.028	18	0.0353	Full	3.27	24.84
S-315	S-316	0.21	0.21	0.20	10.00	0.67	7.41	0.29	0.00	2.88	0.00	216.90	0.200	18	0.2581			
156+00	-40.25	0.43	0.43	0.09					2.14	221.11	218.23	218.20	0.028	18	0.0353	Full	1.21	5.80
P-5	1	80.50	0.00	0.00					2.14	2.88	0.00	216.70	0.200	18	0.2581			
S-316	S-318	0.28	2.88	2.73	13.90	0.24	6.59	3.37	0.00	221.11	217.70	202.60	15.100	18	6.0400	Partial	17.67	28.21
156+00	40.25	0.13	1.77	0.35					0.00	3.40	0.00	203.10	15.100	18	6.1134	sub	15.94	0.0120
P-5	1	250.00	0.00	0.47	0.29				22.24	206.00	202.43	202.60	0.200	18	0.2484	Partial	3.03	5.80
S-317	S-318	0.21	0.21	0.20	10.00	0.44	7.41	0.29	0.00	3.57	0.00	201.60	0.200	18	0.2581	critical	3.27	5.80
158+50	-40.25	0.42	0.42	0.08					2.13	206.00	202.43	203.10	0.200	18	0.2484	Partial	16.75	25.99
P-5	1	80.50	0.00	0.00					2.13	3.57	0.00	201.60	0.200	18	0.2581	sub	14.69	0.0240
S-318	S-328	0.28	3.37	3.20	14.14	0.08	6.55	3.95	0.00	206.00	191.32	175.22	16.100	18	20.1098	Partial	16.75	25.99
158+50	40.25	0.13	2.32	0.46					25.88	14.67	0.00	174.00	16.100	18	20.7581	sub	14.69	0.0240
P-5	1	80.06	0.00	0.47	0.29				25.88	178.00	173.54	171.50	2.044	18	5.1219	Full	14.59	18.29
S-328	S-399	0.00	3.37	3.20	14.22	0.00	6.54	3.95	0.00	4.46	0.00	171.00	1.000	18	2.5707	Full	10.34	0.0120
158+50	120.31	0.00	2.32	0.46					25.82									
P-5	1	39.90	0.00	0.47	0.29				25.82									
DBI-C	1								25.82									

STORM SEWER HYDRAULICS

System: BASINC-1

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Outfall Tailwater Elevation: 0.00		Storm Event		CONDITIONS	
Description: N. HANCOCK		Designed by: JOK		Exit Loss at Outfall: 0.00		Zone		Runoff Coefficients	
County: LAKE COUNTY		Checked by: PWY		Storm Sewer Control Elevatio		Area 1		Area 2	
				151.55		7		0.95	
						0.20		0.61	

FROM Station Type	TO Offset	Drainage Areas		Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (cfs) (Qb) Sum(Cb) CIA TOTAL	Inlet Elevations		Pipe Elevations		Fall (ft)	Pipe Height Width (in)	HGL (%) FL (%)	Flow Type	Velocity Actual Physical (fps)	Capacity Mann 'N' (cfs)	
		Inc.	Sub-Total						Inlet Clear.	HGL	Crown Line	HGL							
S-319 161+00 P-5	S-320 -40.25 40.25	0.21	0.20	10.00	0.34	7.41	0.28	0.00	188.89	185.81	185.80	0.014	18	0.0339	Full	1.19	11.75	0.0120	
		0.42	0.08					2.10	3.08	0.00	184.70	185.80	0.400	18	1.0596		6.64		
S-320 161+00 DBI-C	S-321 0.00 40.25	0.00	0.20	10.34	0.22	7.33	0.28	0.00	187.00	184.92	184.82	0.100	18	0.2485	Partial critical	3.04	5.87	0.0120	
		0.42	0.08					2.08	2.08	0.00	185.80	185.70	0.100	18	0.2649		3.32		
S-321 161+00 P-5	S-322 40.25 247.58	0.28	0.47	10.56	0.39	7.28	0.58	0.00	188.67	184.61	173.70	10.913	18	4.4079	Partial sub	10.58	25.27	0.0120	
		0.13	0.11					4.19	4.05	0.00	185.70	173.70	12.000	18	4.9064		14.28		
S-322 163+50 P-5	S-323 40.25 209.59	0.28	0.73	10.95	0.38	7.19	1.07	0.00	176.43	172.92	169.68	3.244	18	1.5479	Partial sub	9.16	16.46	0.0120	
		0.12	0.13					7.69	3.51	0.00	173.70	169.40	4.300	18	2.0814		9.30		
S-323 165+64 P-5	S-324 40.25 54.93	0.24	0.95	11.33	0.15	7.10	1.50	0.00	172.11	169.68	169.20	0.476	18	0.8673	Full	6.00	7.08	0.0120	
		0.09	0.15					10.63	2.43	0.00	169.40	169.20	0.200	18	0.3851		4.00		
S-324 166+20.06 P-6	S-350 40.25 52.08	0.12	1.37	15.28	0.00	6.36	2.42	0.00	171.91	162.45	151.55	10.900	18	20.9304	Partial sub	26.03	52.97	0.0120	
		0.07	0.32					15.42	9.46	0.00	163.40	152.50	10.900	18	21.5511		29.93		
S-325 166+20.06 DBI-C	S-324 0.00 40.25	0.00	0.00	15.00	0.28	6.41	0.14	0.00	170.30	168.20	168.10	0.100	18	0.2485	Partial critical	2.39	5.87	0.0120	
		0.69	0.14					0.89	2.10	0.00	169.30	169.20	0.100	18	0.2649		3.32		
S-326 166+76 P-5	S-324 40.25 54.81	0.14	0.30	10.37	0.22	7.32	0.56	0.00	172.11	168.72	168.52	0.200	18	0.3649	Partial critical	4.16	7.09	0.0120	
		0.04	0.02					4.10	3.39	0.00	169.40	169.20	0.200	18	0.3860		4.01		
S-327 168+00 P-5	S-326 40.25 121.49	0.18	0.17	10.00	0.37	7.41	0.31	0.00	173.57	169.83	169.40	0.431	18	0.3545	Partial sub	5.49	12.84	0.0120	
		0.05	0.01					2.30	3.74	0.00	170.90	169.40	1.500	18	1.2660		7.25		
		0.22	0.13					2.30											

STORM SEWER HYDRAULICS

System: basind

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Outfall Tailwater Elevation:		CONDITIONS													
FROM Station Type	TO Offset Brts Len	Inc.	Sub-Total	CA	CA	Flow (cfs)	Inlet Elevations	Pipe Elevations	Fall	Pipe Height Width	HGL (%) FL	Flow Type	Velocity Actual Physical (fps)	Capacity (cfs)	Mann'n 'N'				
Number: 60633		N. HANCOCK		Designed by: JOK		Exit Loss at Outfall: 0.00		Storm Event Zone		7		Area 1		Area 2		Area 3			
County: LAKE COUNTY		Checked by: PWY				Storm Sewer Control Elevatio		98.18				10		0.95		0.20		0.74	

FROM Station Type	TO Offset Brts Len	Inc.	Sub-Total	CA	Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (Ob) Sum(Qb) CIA TOTAL	Inlet Elevations Clear. Jnc Loss	HGL	Pipe Elevations Crown Line Flow Line	Fall (ft)	Pipe Height Width (in)	HGL (%) FL	Flow Type	Velocity Actual Physical (fps)	Capacity (cfs)	Mann'n 'N'
E-1	S-499	0.00	3.01	2.86	16.63	0.00	6.15	3.67	0.00	128.00	109.95	98.18	11.770	18	4.2168	Partial	15.13	23.47	0.0120
176+37.44	85.00	0.00	1.76	0.35					22.58	18.05	0.00	108.77	11.770	18	4.2319	sub	13.26		
DBI-C	1	279.12	0.00	0.62	10.00	0.33	7.41	0.57	4.20	3.80	0.00	164.20	7.700	18	3.9307	Partial	9.83	22.80	0.0120
S-400	S-401	0.28	0.28	0.27	11.71	0.37	7.02	1.13	0.00	160.78	148.27	147.80	0.471	18	0.4811	Full	4.47	7.40	0.0120
173+00	40.25	0.10	0.10	0.02					7.91	12.51	0.00	146.30	0.400	18	0.4211	Full	4.18		
P-5	1	195.89	0.38	0.28	11.33	0.38	7.10	0.20	1.42	11.49	0.00	146.80	0.100	18	0.2339	Full	3.12	5.52	0.0120
S-401	S-414	0.18	0.62	0.59	16.23	0.37	6.21	2.54	0.00	156.83	154.47	154.00	0.467	24	0.4150	Full	5.03	10.47	0.0120
175+00	40.25	0.06	0.40	0.08					15.79	2.37	0.00	152.20	0.200	24	0.1824	Full	2.93	14.52	0.0120
P-5	1	97.99	0.24	0.46	10.00	0.43	7.41	0.19	1.44	157.42	154.71	154.70	0.008	18	0.0158	Full	0.81	5.18	0.0120
S-402	S-401	0.00	0.16	0.15	15.99	0.24	6.25	2.12	0.00	156.63	154.64	154.64	0.175	24	0.2924	Full	4.22	14.52	0.0120
175+00	-5.00	0.00	0.24	0.05					13.25	1.99	0.00	152.40	0.200	24	0.3510	Full	4.62	12.69	0.0120
DBI-C	1	45.25	0.00	0.00	10.00	0.43	7.41	0.21	1.56	157.22	154.65	154.64	0.010	18	0.0187	Full	0.88	12.69	0.0120
S-403	S-414	0.23	2.39	2.27	16.23	0.37	6.21	2.54	0.00	156.83	154.47	154.00	0.467	24	0.4150	Full	5.03	10.47	0.0120
177+15	40.25	0.04	1.36	0.27					15.79	2.37	0.00	152.20	0.200	24	0.1824	Full	2.93	14.52	0.0120
P-5	1	112.64	0.00	0.00	10.00	0.43	7.41	0.19	1.44	157.42	154.71	154.70	0.008	18	0.0158	Full	0.81	5.18	0.0120
S-404	S-403	0.19	0.19	0.18	15.99	0.24	6.25	2.12	0.00	156.63	154.64	154.64	0.175	24	0.2924	Full	4.22	14.52	0.0120
177+15	-11.25	0.07	0.07	0.01					1.44	2.71	0.00	153.30	0.100	18	0.2062	Full	2.93	14.52	0.0120
P-5	1	51.50	0.00	0.00	10.00	0.43	7.41	0.21	1.44	157.42	154.71	154.70	0.008	18	0.0158	Full	0.81	5.18	0.0120
S-405	S-403	0.14	1.97	1.87	15.99	0.24	6.25	2.12	0.00	156.63	154.64	154.64	0.175	24	0.2924	Full	4.22	14.52	0.0120
177+76.21	40.25	0.02	1.25	0.25					13.25	1.99	0.00	152.40	0.200	24	0.3510	Full	4.62	12.69	0.0120
P-6	1	59.98	0.00	0.00	10.00	0.43	7.41	0.21	1.56	157.22	154.65	154.64	0.010	18	0.0187	Full	0.88	12.69	0.0120
S-406	S-405	0.20	0.20	0.19	10.00	0.43	7.41	0.21	0.00	156.83	155.21	155.21	0.568	18	0.9530	Full	6.29	6.79	0.0120
177+76.21	-11.25	0.10	0.10	0.02					1.56	2.57	0.00	153.00	0.600	18	1.2371	Full	7.17	12.80	0.0120
P-6	1	51.50	0.00	0.00	15.83	0.16	6.27	1.78	11.14	1.62	0.00	152.60	0.200	18	0.3536	Full	3.83	6.79	0.0120
S-407	S-405	0.27	1.63	1.55	15.83	0.16	6.27	1.78	0.00	156.83	155.21	155.21	0.568	18	0.9530	Full	6.29	6.79	0.0120
178+37	40.25	0.02	1.13	0.23					11.14	1.62	0.00	152.60	0.200	18	0.3536	Full	3.83	6.79	0.0120
P-5	1	59.56	0.00	0.00	15.34	0.50	6.35	1.52	9.63	2.99	0.00	154.60	2.000	18	1.2577	Full	7.23	12.80	0.0120
S-408	S-407	0.18	1.36	1.29	15.34	0.50	6.35	1.52	0.00	159.35	156.36	156.36	1.153	18	0.7116	Full	5.44	12.80	0.0120
180+00	40.25	0.06	1.11	0.22					9.63	2.99	0.00	154.10	0.100	18	0.2010	Full	2.89	5.12	0.0120
P-5	1	162.03	0.00	0.00	10.00	0.44	7.41	0.31	2.33	3.17	0.00	154.80	0.100	18	0.2010	Full	2.89	5.12	0.0120
S-409	S-416	0.29	0.29	0.28	10.91	0.32	7.19	0.95	2.33	3.17	0.00	154.80	0.100	18	0.2010	Full	2.89	5.12	0.0120
180+00	-52.25	0.19	0.19	0.04					0.00	159.57	156.40	156.40	0.022	18	0.0416	Full	1.31	5.12	0.0120
P-5	1	52.25	0.00	0.00	10.91	0.32	7.19	0.95	2.33	3.17	0.00	154.80	0.100	18	0.2010	Full	2.89	5.12	0.0120
S-410	S-408	0.21	0.89	0.85	10.91	0.32	7.19	0.95	0.00	166.84	162.78	162.78	6.414	18	3.0541	Partial	10.93	21.86	0.0120
182+10	40.25	0.07	0.53	0.11					6.85	4.06	0.00	162.20	7.600	18	3.6715	sub	12.35	21.86	0.0120
P-5	1	210.00	0.00	0.00					6.85	4.06	0.00	162.20	7.600	18	3.6715	sub	12.35	21.86	0.0120

Units: ENGLISH

Automated Storm sewer Analysis & Design (ASAD), copyright 1992-1997, Hilteshew Engineering Systems, Inc. Ph: (352) 383-4191
Portions of ASAD were developed by Kenneth J. Leeming, P.E. at International Engineering Consultants, Inc.

STORM SEWER HYDRAULICS

System: basind

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Storm Event		CONDITIONS	
Number:	60633	Outfall Tailwater Elevation:	0.00	Zone	7	Area 1	0.95
Description:	N. HANCOCK	Exit Loss at Outfall:	0.00	Freq	10	Area 2	0.20
County:	LAKE COUNTY	Storm Sewer Control Elevation:	98.18			Area 3	0.74
		Designed by:	JOK				
		Checked by:	PWY				

FROM Station Type	TO Offset	Drainage Areas		Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (cfs) (Qb) Sum(OB) CIA TOTAL	Inlet Elevations Inlet HGL	Pipe Elevations HGL	Fall (ft)	Pipe Height Width (in)	HGL (%) FL (%)	Flow Type	Velocity Actual Physical (fps)	Capacity Mann'n 'N'
		Inc.	Sub-Total													
S-411	S-410	0.28	0.28	10.00	0.53	7.41	0.30	0.00	166.60	163.07	0.200	18	0.2162	Partial	2.91	5.39
182+10	-52.25	0.19	0.19					2.23	3.53	163.90	0.200	18	0.2235	super	3.05	0.0120
P-5	1 92.50	0.00	0.00					2.23	0.00	162.40	0.200	18				
S-412	S-410	0.18	0.41	10.45	0.45	7.30	0.44	0.00	175.27	171.29	7.590	18	3.1624	Partial	8.87	21.86
184+50	40.25	0.06	0.27					3.23	3.98	172.40	8.700	18	3.6709	sub	12.35	0.0120
P-5	1 240.00	0.00	0.00					3.23	0.00	170.90	0.200	18				
S-413	S-412	0.23	0.23	10.00	0.45	7.41	0.26	0.00	175.27	171.70	0.200	18	0.2485	Partial	2.95	5.80
184+50	-40.25	0.21	0.21					1.94	3.57	172.60	0.200	18	0.2581	critical	3.27	0.0120
P-5	1 80.50	0.00	0.00					1.94	0.00	171.10	0.200	18				
S-414	E-1	0.00	3.01	16.60	0.03	6.16	3.67	0.00	158.78	147.08	22.300	18	51.8605	Partial	24.47	42.60
176+00	45.50	0.00	1.76					22.59	11.70	147.80	22.300	18	55.7500	sub	24.07	0.0240
MHP-7T	1 43.00	0.00	0.62					22.59	0.00	146.30	22.300	18				
S-415	S-402	0.16	0.16	10.00	1.33	7.41	0.20	0.00	149.80	148.33	0.027	18	0.0169	Full	0.84	4.97
173+70.41	-94.47	0.24	0.24					1.48	1.47	148.60	0.300	18	0.1898		2.81	0.0120
DBI-C	1 160.09	0.00	0.00					1.48	0.00	147.10	0.300	18	0.0455	Full	1.38	0.0120
S-416	S-408	0.00	0.29	15.00	0.34	6.41	0.38	0.00	157.69	156.38	0.018	18	0.0455	Full	1.38	5.87
180+00	0.00	0.33	0.52					2.43	1.31	156.20	0.100	18	0.2649		3.32	0.0120
DBI-C	1 40.25	0.00	0.00					2.43	0.00	154.70	0.100	18				

STORM SEWER HYDRAULICS

System: **basine**

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Outfall Tailwater Elevation:		Storm Event		CONDITIONS		
Number:	60633	Designed by:	jk	Exit Loss at Outfall:	0.00	Zone	7	Area 1	Area 2	Area 3
County:	LAKE COUNTY	Checked by:	pwj	Storm Sewer Control Elevation	100.00	Zone	7	0.95	0.20	0.00

FROM Station Type	TO Offset Brls Len	Drainage Areas		Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (cfs) (Qb) Sum(OB) CIA TOTAL	Inlet Elevations		Pipe Elevations		Fall (ft)	Pipe Height Width (in)	HGL (%) FL (%)	Flow Type	Velocity Actual Physical (fps)	Capacity Mann 'N' (cfs)
		Inc.	Sub-Total						Inlet Clear.	HGL	Crown Line	HGL						
S-500	S-502	0.29	0.51	10.47	0.41	7.29	0.55	0.00	173.78	169.81	169.81	160.00	9.813	18	3.9252	Partial sub	10.07	23.97
189+25 P-5	-40.25 250.00	0.23	0.31	10.00	0.47	7.41	0.22	3.98	3.97	0.00	169.40	158.50	10.900	18	4.4130	Partial critical	13.54	0.0120
S-501	S-500	0.22	0.22	10.00	0.47	7.41	0.22	0.00	173.78	170.15	170.15	169.95	0.200	18	0.2485	Partial critical	2.83	5.80
189+25 P-5	40.25 80.50	0.08	0.08	10.89	0.30	7.20	1.06	1.66	3.63	0.00	169.60	169.40	0.200	18	0.2581	Partial sub	3.27	0.0120
S-502	S-504	0.27	1.00	10.00	0.77	7.41	0.22	0.00	163.26	159.02	143.70	15.324	18	6.1298	Partial sub	13.92	29.31	
191+75 P-5	-40.25 250.00	0.20	0.57	10.00	0.30	7.41	0.22	7.66	4.23	0.00	160.00	143.70	16.300	18	6.5992	Full	16.56	0.0120
S-503	S-502	0.22	0.22	10.00	0.77	7.41	0.22	0.00	163.02	160.02	160.02	160.00	0.019	18	0.0207	Full	0.93	6.61
191+75 P-5	52.25 92.50	0.06	0.06	11.19	0.30	7.13	1.60	1.64	3.00	0.00	158.80	158.50	0.300	18	0.3352	Partial sub	3.73	0.0120
S-504	S-506	0.27	1.52	10.00	0.77	7.41	0.25	0.00	146.85	142.87	127.10	15.765	18	5.7325	Partial sub	15.12	28.19	
194+25 P-5	-40.25 275.01	0.19	0.80	10.00	0.77	7.41	0.25	11.44	3.98	0.00	142.20	125.60	16.600	18	6.1027	Full	15.93	0.0120
S-505	S-504	0.25	0.25	10.00	0.62	7.41	0.24	0.00	146.61	143.72	143.72	143.70	0.023	18	0.0254	Full	1.03	5.39
194+25 P-5	52.25 92.50	0.04	0.04	11.49	0.30	7.07	2.21	1.82	2.88	0.00	142.40	142.20	0.200	18	0.2235	Partial sub	3.05	0.0120
S-506	S-508	0.36	2.13	10.00	0.62	7.41	0.24	0.00	129.93	126.54	117.74	8.800	18	3.6289	Partial sub	13.43	21.87	
197+00 P-5	-37.91 242.49	0.10	0.93	10.00	0.36	7.41	0.02	15.61	3.39	0.00	125.60	116.80	8.800	18	3.6744	Full	12.36	0.0120
S-507	S-506	0.25	0.25	10.00	0.62	7.41	0.24	0.00	129.96	127.12	127.10	0.019	18	0.0251	Full	1.02	6.05	
197+00 P-5	36.25 74.16	0.03	0.03	11.79	0.30	7.00	2.47	1.81	2.84	0.00	125.80	125.60	0.200	18	0.2811	Partial sub	3.42	0.0120
S-508	S-510	0.24	2.37	10.00	0.36	7.41	0.02	0.00	121.02	117.41	117.41	116.04	1.370	24	0.7873	Partial sub	9.65	29.03
199+45 P-5	-35.25 174.05	0.06	1.08	10.00	0.36	7.41	0.02	17.27	3.61	0.00	118.30	113.90	2.400	24	1.4031	Full	9.24	0.0120
S-509	S-508	0.00	0.00	10.00	0.36	7.41	0.02	0.00	121.50	118.30	118.30	118.30	0.000	18	0.0001	Full	0.08	13.94
199+45 P-5	7.96 43.21	0.09	0.09	12.09	0.17	6.94	2.66	0.13	3.20	0.00	117.40	116.80	0.600	18	1.4922	Full	7.87	0.0120
S-510	S-512	0.10	2.55	10.00	0.23	7.41	0.08	0.00	118.39	116.04	116.04	115.70	0.339	24	0.5661	Full	5.87	14.53
201+25 P-5	-29.36 59.91	0.05	1.18	10.00	0.23	7.41	0.08	18.44	2.35	0.00	115.90	113.70	0.200	24	0.3514	Full	4.62	0.0120
S-511	S-510	0.08	0.08	10.00	0.23	7.41	0.08	0.63	118.70	116.04	116.04	116.04	0.001	18	0.0031	Full	0.36	7.33
201+25 P-5	-2.10 27.26	0.05	0.05	10.00	0.23	7.41	0.08	0.63	2.66	0.00	114.50	114.40	0.100	18	0.4122	Full	4.14	0.0120

Units: ENGLISH

Automated Storm sewer Analysis & Design (ASAD), copyright 1992-1997, Hiteshew Engineering Systems, Inc. Ph: (352) 383-4191
 Portions of ASAD were developed by Kenneth J. Leeming, P.E. at International Engineering Consultants, Inc.

STORM SEWER HYDRAULICS

System: **basine**

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Storm Event		CONDITIONS	
Number:	60633	Outfall Tailwater Elevation:	0.00	Zone	7	Area 1	0.95
Description:	N. HANCOCK	Exit Loss at Outfall:	0.00	Freq	10	Area 2	0.20
County:	LAKE COUNTY	Storm Sewer Control Elevatio	100.00			Area 3	0.00

Designed by: jok
Checked by: pwj

FROM Station Type	TO Offset Brls Len	Drainage Areas		Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (Qb) (cfs)	Sum (Ob) CIA	TOTAL	Inlet Elevations		Pipe Elevations		Fall (ft)	Pipe Height Width (in)		HGL (%) FL (%)	Flow Type	Velocity Actual Physical (fps)	Capacity Mann 'N'	
		Inc.	Sub-Total								Inlet Clear.	HGL	Crown Line	Flow Line		Height	Width					
S-512	S-514	0.07	2.73	2.59	12.26	0.08	2.84	0.00	0.00	19.62	118.26	109.04	102.74	6.300	24	24	7.1677	Partial sub	18.49	66.76	0.0120	
201+86.57	-26.43	0.02	1.25	0.25		6.90		19.62	19.62		9.22	0.00	108.30	6.300	24	24	7.4210		21.25			
P-6	1	87.89	0.00	0.00							118.54	114.73	114.63	0.100	18	18	0.1614	Partial critical	2.01	4.70	0.0120	
S-513	S-512	0.11	0.11	0.10	10.00	0.51	0.11	0.00	0.83	0.83	3.81	0.00	115.80	0.100	18	18	0.1696		2.65			
202+50	-22.83	0.04	0.04	0.01		7.41					107.50	100.76	100.76	0.762	24	24	0.6378	Full	6.23	15.96	0.0120	
P-5	1	61.96	0.00	0.00	12.34	0.00	2.84	0.00	0.00	19.57	6.74	0.00	98.50	0.500	24	24	0.4241		5.08			
S-514	S-599	0.00	2.73	2.59				0.00	0.00	19.57												
201+97.08	-113.78	0.00	1.25	0.25		6.89							100.50	100.00								
MHP-7T	1	119.40	0.00	0.00				19.57	19.57	19.57			98.50	98.00								

STORM SEWER HYDRAULICS

System: basinf

PROJECT		Organization: Vanasse Hangen Brustlin, Inc.		Storm Event		CONDITIONS	
Number:	60633	Outfall Tailwater Elevation:	0.00	Zone	7	Area 1	Area 2
Description:	N. HANCOCK	Exit Loss at Outfall:	0.00	Freq	10	Area 3	Area 3
County:	LAKE COUNTY	Storm Sewer Control Elevation:	109.78			0.95	0.20
		Designed by:	PWY			0.20	0.00
		Checked by:					

FROM Station Type	TO Offset Brls Len	Drainage Areas		Tc (min)	Travel Time (min)	Inten. (in/hr)	Total CA (ac)	Flow (Qb) (cfs)	Inlet Clear. (ft)	Inlet HGL	Pipe Elevations		Fall (ft)	Pipe Height (in)	HGL (%)	Flow Type	Velocity Actual (fps)	Capacity (cfs)	Mann'g 'N'
		Inc.	Sub-Total								HGL	Crown Line							
S-600	S-601	0.22	0.22	0.21				0.00	131.71	126.75	126.65	0.100	18	0.2073	Partial	2.65	5.42	0.0120	
13+00	30.21	0.00	0.00	0.00	10.00	7.41	0.21	1.55	4.96	0.00	127.70	0.100	18	0.2260	critical	3.06			
GUT-S	1 48.25	0.00	0.00	0.00				1.55	131.21	126.37	126.20	0.100	18	9.1082	Partial	11.69	36.16	0.0120	
S-601	S-603	0.12	0.34	0.32	10.30	7.34	0.34	2.48	4.84	0.00	126.60	17.200	18	10.0408	sub	20.43			
13+00	18.04	0.08	0.08	0.02				2.48	119.60	114.99	114.89	0.100	18	0.2612	Partial	2.51	6.16	0.0120	
GUT-S	1 175.30	0.00	0.00	0.00	10.00	7.41	0.12	0.92	4.61	0.00	116.10	0.100	18	0.2916	critical	3.48			
S-602	S-603	0.13	0.13	0.12	10.00	7.41	0.12	0.92	119.60	109.98	109.98	0.200	18	0.1507	Partial	2.95	4.63	0.0120	
14+75.31	-20.24	0.00	0.00	0.00				0.92	119.60	109.98	109.78	0.200	18	0.1643	super	2.61			
GUT-S	1 38.29	0.00	0.00	0.00	10.55	7.28	0.55	4.03	9.62	0.00	110.40	0.200	18						
S-603	S-699	0.09	0.56	0.53				4.03			108.90	0.200	18						
14+75.31	18.04	0.05	0.13	0.03				4.03			108.90	0.200	18						
GUT-S	1 132.70	0.00	0.00	0.00				4.03											