

FROZEN MEET AND GREET AT EPCOT NORWAY PAVILION

STORMWATER CALCULATIONS

FOR

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

AND

REEDY CREEK IMPROVEMENT DISTRICT

Prepared by:
Heery International, Inc.
4700 Millenia Blvd. Suite 550
Orlando, FL 32839
407-992-6300
EB-0005176

Project No.
1413300

December 3, 2014
REVISED December 23, 2014
REVISED January 5, 2015

Table of Contents

Section 1.0	Overview
	Application Type
	Location
	Figure 1 Location Map
	Figure 2 Aerial Photograph
	Figure 3 Aerial Photograph
	Figure 4 Soils Map
Section 2.0	Project Site Description
Section 3.0	Proposed Project
Section 4.0	Land Use
	Existing Conditions Description
	Table 1 Existing Conditions Summary
	Geotechnical Investigation
	Proposed Conditions Description
	Table 2 Proposed Conditions Summary
	Water Quality Treatment Volume Calculations
	Water Quality Treatment Volume Required for Entire Limit of Work
Section 5.0	Surface Water Management Design Parameters – Computer Modeling
	Precipitation
	Tailwater Conditions
	Summary of Results
	Overall Drainage Basin Boundaries
	Critical Data Summary Tables
	Land Use – Basin Level Breakdown Within Project Limit of Work
	Water Quality Discharge Table
	Design Storm Stages
	Control Structures
Section 6.0	Drawdown Calculations
	Figure 4 Input Data for Drawdown Calculations
	Figure 5 Results of Drawdown Calculations
Section 7.0	Water Use Sources– Potable, Wastewater, Dewatering, Irrigation
Section 8.0	Water Resources
Section 9.0	Wetland Impacts
Section 10.0	Mitigation

Section 11.0 Cumulative Impacts

Section 12.0 Wetland Inventory

Section 13.0 Threatened and Endangered Species

Appendix 1: AdICPR Stormwater Routing Calculations

Appendix 2: Pre- and Post-Development RCID Drainage Basin Maps

Appendix 3: Geotechnical Report

Appendix 4: StormTech DC-780 Cumulative Storage Volume Calculations

Appendix 5: Pre- and Post-Development FLUCCS Maps

1.0 Overview:

This project proposes to modify SFWMD permit 48-00714-P for a 1.08 acre area within the area between the Norway and Mexico attractions at EPCOT, Walt Disney World, in Orlando, Florida. The project includes the following: construction of a 13,000 +/- sf building that will house a Disney guest attraction and a women's restroom; construction of a 2,000 sf modular type building to replace a similar building demolished for the project; construction of two small parking lots that have a total of 18 parking spaces; relocation of piping and mechanical equipment associated with a beverage dispensing kiosk; modification and addition of sidewalks and planters; new underground utilities; modification to the existing restroom in the Norway attraction building.

Water quality treatment will be provided in an exfiltration trench retention system. This retention systems is sized to provide treatment for the entire 1.08 acre project area. The exfiltration trenches will discharge to the existing storm sewer system that outflows into the master drainage system of EPCOT.

Application Type

Modification of SFWMD permit 48-00714-P.

Permit type: General permit modification

Location

Orange County

Section 30, Township 24S, Range 28E

Owner and Permittee: Walt Disney Parks and Resorts US, Inc., P.O. Box 10000, Lake Buena Vista, FL, 32830, Attn. Mr. Lee Schumde

Operating Entity: Walt Disney Parks and Resorts US, Inc., P.O. Box 10000, Lake Buena Vista, FL, 32830, Attn. Mr. Lee Schumde

Project Area: 1.08 acres

Project Land Use: Entertainment

Drainage Basin: Reedy Creek

Receiving Water Body: Reedy Creek via existing master system

Total Acres of Wetlands Onsite: 0

Total Acres of Wetland Impacts: None

Total Acres Preserved Wetlands: 0



Figure 1: Location Map – Walt Disney World, EPCOT, Between Norway and Mexico attractions, Section 30, Township 24S, Range 28E



Figure 2: Aerial Photograph – Walt Disney World, EPCOT between Mexico and Norway attractions



Figure 3: Aerial Photograph – Walt Disney World, EPCOT between Mexico and Norway attractions



Soil Map—Orange County, Florida

Map Unit Legend

Orange County, Florida (FL095)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
50	Urban land	1.0	100.0%
Totals for Area of Interest		1.0	100.0%

Figure 4: Soils Map – Walt Disney World, EPCOT, between Mexico and Norway attractions

2.0 Project Site Description

The 1.08 acre project is located between Mexico and Norway attractions of EPCOT, Walt Disney World in Orlando, Florida. Stormwater runoff from the site discharges through existing storm sewer piping to the EPCOT Master Drainage System.

3.0 Proposed Project

This project proposes construction of a new building, parking, sidewalks and utilities within a 1.08 acre project area. Stormwater treatment will be provided by the construction of a new underground retention (exfiltration trench) system.

4.0 Land Use

Existing Conditions Description

Refer to the Pre-Development Drainage Basin Map, drawing SK-101 in Appendix 2, for the delineation of the project area. The project area discharges to existing stormwater piping, but does not receive stormwater quality treatment.

Table 1: Existing Conditions Summary

	Existing Conditions
Total Area	1.08 ac
Pervious area	0.83 ac
Impervious area	0.25 ac

$$CN_{\text{impervious}} = 98$$

$$CN_{\text{pervious}} = 80 \text{ (from RCID Master Drainage Plan Update FOR Basin L403-17)}$$

$$\text{Composite CN} = 84.17$$

Geotechnical Investigation

Refer to Appendix 3 for the Geotechnical Investigation completed by PSI and dated October 23, 2014. The proposed exfiltration trench system will be located near geotechnical boring AB-2. The report found the following soil conditions at boring AB-2. These soil conditions are used in the drawdown calculations for the exfiltration trench system.

Base of Effective Aquifer Elevation = 86 feet

Estimated Seasonal High Water Table Elevation = 92 feet

Horizontal Permeability of Effective Aquifer = 10 feet/day

Vertical Permeability of Effective Aquifer = 6 feet/day

Soil Porosity = 25 percent.

Proposed Conditions Description

Refer to the Post-Development Drainage Basin Map, drawing SK-102 in Appendix 2, for the delineation of the project area. Stormwater treatment is provided in the underground exfiltration trench retention system.

As shown on Table 2, part of the project area drains offsite and does not receive treatment. Nearly all of this area is composed of walkways and planters that are located on the west side of the building. This area is not used for parking. A retention system was not placed in this area due to conflicts with underground utilities and retaining walls.

Table 2: Proposed Conditions Summary

	DRAINS TO RETENTION	DRAINS OFFSITE	Total Proposed Design Conditions for the Exfiltration System (Entire Limit of Work)
Total Area	0.80 ac	0.28 ac	1.08 ac
Pervious area	0.13 ac	0.12 ac	0.25 ac
Paved (impervious) area	0.33 ac	0.16 ac	0.49 ac
Roofed (impervious) area	0.34 ac	0.00 ac	0.34 ac

$CN_{\text{impervious}} = 98$

$CN_{\text{pervious}} = 80$ (from RCID Master Drainage Plan Update FOR Basin L403-17)

Composite CN: To Retention = 95.08, Drains Offsite = 90.29, Within Limit of Work = 93.83

Water Quality Treatment Volume Calculations

The following calculations size the underground retention system for the entire 1.08 acre limit of construction.

Per **Section 5.2.1** of the South Florida Water Management District Basis of Review for Environmental Resource Permit Application, “*Wet Detention volume shall be provided for the first inch of runoff from the developed project, or the total runoff of 2.5 inches times the percentage of imperviousness, whichever is greater. Retention volume shall be provided equal to 50% of the above amounts computed for wet detention.*”

Per **Section 5.2.2(c)**, “*Water surface and roofed areas can be deducted from site areas only for water quality pervious/impervious calculations.*”

Water Quality Treatment Volume Required for Entire 1.08 acre Limit of Work

1” over area

$$V = \left(\frac{1ft}{12in.} \times (1.08ac) \right) \times 0.50 = 0.045ac - ft$$

2.5” multiplied by the percent impervious

$$\text{Site area: total site} - (\text{roof} + \text{water body}) = 1.08ac - 0.34ac = 0.74ac$$

$$2.5” \text{ multiplied by the percent impervious: } 2.5inches \times \left(\frac{0.49ac}{0.74ac} \right) = 1.66inches \text{ to be treated}$$

Volume required for retention: inches to be treated x (total site – water body)

$$V = \left(1.66in \times \frac{1ft}{12in} \times 1.08ac \right) \times 0.50 = 0.075ac - ft$$

Treatment volume required for entire Limit of Work = 0.075 ac-ft or **3,267 ft³**

Treatment volume provided = 0.0806 ac-ft or **3,509 ft³**

See Appendix 4 for the storage calculations

The underground retention system is designed to utilize StormTech chambers and two control structures. The first control structure includes a weir that is intended to force the first flush of runoff into the “isolator row” chambers. The “isolator row” is composed of chambers like the other rows but contains extra filter fabric to allow for ease of maintenance/cleanout in the future. The control structure at the outlet end of the system includes an additional weir that backs up water into all of the chambers. The crest elevation of this weir is set at the elevation corresponding to the treatment volume of the system.

Runoff in excess of the treatment volume will generally discharge directly over the second control structure and bypass the treatment chambers in the system. This design is considered to be the preferred environmental solution because it does not dilute (or in the case of heavy flow, resuspend) pollutants in the treatment volume. Instead, it maximizes the pollutant loading in the treatment volume and the pollutant removal efficiency (through percolation into the ground) of the system.

5.0 Surface Water Management Design Parameters – Computer Modeling

Existing and proposed conditions are modeled with AdICPR version 3.10.

Precipitation

10yr/72hr = 10.19 inches

100yr/72hr = 14.27 inches

Tailwater Conditions

The exfiltration trench discharges to a new manhole that is constructed to intercept an existing 30” diameter storm pipe. The invert of the existing 30” diameter pipe is approximately 10 feet below the invert of the pipe from the exfiltration trench. It is concluded that tailwater in the existing 30” diameter pipe will not affect flow exiting the exfiltration trench.

Summary of Results

The results of the AdICPR routing are attached as Appendix 1 and summarized below.

Pre-Development:

10yr/72hr Peak Discharge Rate = 4.53 cfs

100yr/72hr Peak Discharge Rate = 6.63 cfs

Post-Development:

10yr/72hr Peak Discharge Rate = 4.73 cfs

100yr/72hr Peak Discharge Rate = 6.77 cfs

Underground Retention Chambers

10yr/72hr Peak Stage = 98.36’

100yr/72hr Peak Stage = 98.46’

Stormwater attenuation is not required for this project because attenuation takes place in the EPCOT master drainage system that is controlled by RCID. The calculations show that the post-development discharge rate is increased by less than 4% compared to the existing conditions.

Critical Data Summary Tables

Land Use – Development Level Breakdown within Project Limit of Work

Basin ID	Building (acres)	Pavement (acres)	Water Mgmt (acres)	Pervious (acres)	Total (acres)
Existing	0.05	0.20	0	0.83	1.08
Proposed	0.34	0.49	0	0.25	1.08

Water Quality Discharge Table within Project Limit of Work

WQ Volume Required (af)	WQ Volume Provided (af)	Overflow Elevation (feet)	Allowable Discharge (cfs)	Proposed Discharge	Receiving Body
0.075	0.081	See Control Elevation in Table Below	NA	NA	Reedy Creek via the EPCOT Master Drainage System

Design Storm Stages within Project Limit of Work

Basin ID	Control Elevation (feet)	10yr/72hr Stage (feet)	Proposed Min. Road Elevation (feet)	100yr/72hr Stage (feet)	Proposed Min FFE (feet)
RETENTION	98.00	98.45	NA	98.57	101

Control Structures within Project Limit of Work

Basin ID	Type	Low Water Control	Overflow Control (feet)	Receiving Body
RETENTION	4' Weir	NA	Weir elev = 98.00	Reedy Creek via the EPCOT Master Drainage System

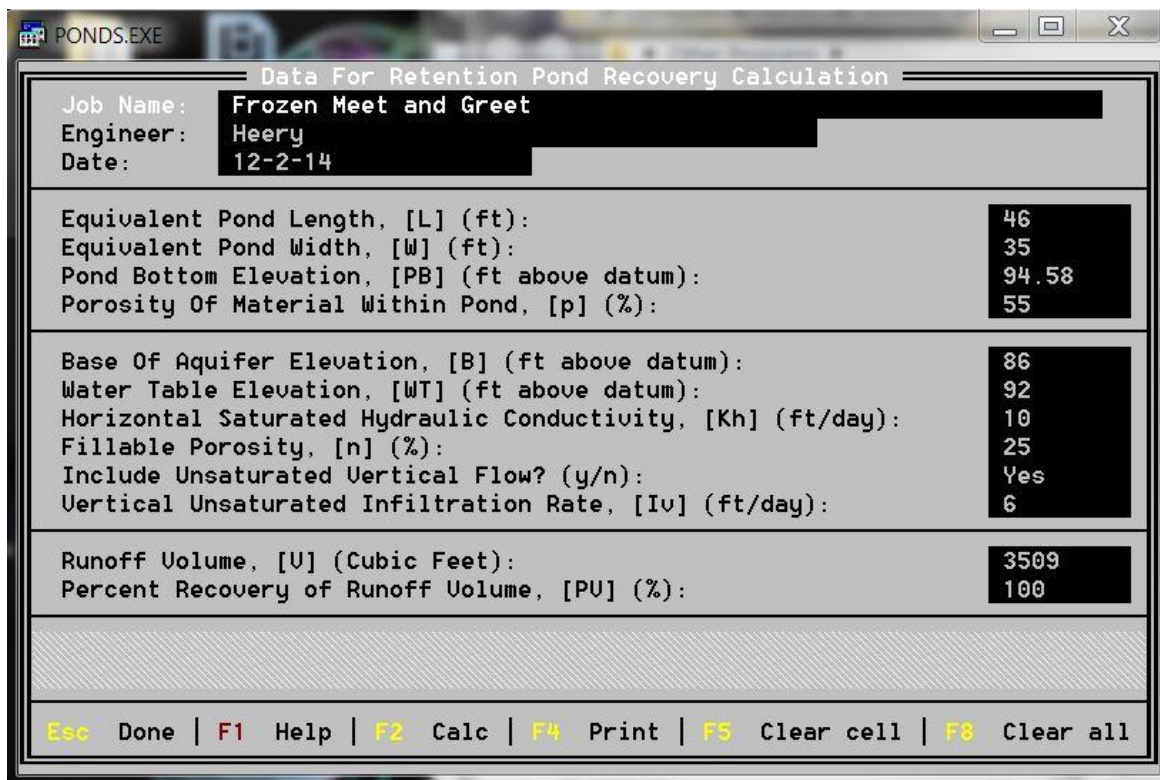
6.0 Drawdown Calculations

Per **Section 7.2(a)** of the South Florida Water Management District Basis of Review for Environmental Resource Permit Application, “District criteria require that gravity control devices shall be sized based upon a maximum design discharge of one half inch of the detention volume in 24 hours.” **Section 7.3(a)** states that “Dry retention/detention areas shall have mechanisms for returning the groundwater level in the area to the control elevation. The bleed-down rate for these systems is the same as in section 7.2(a).”

The program PONDS was used to calculate drawdown for the retention system. The geotechnical report contained in Appendix 3 is the basis for the input parameters in PONDS. See page 2 of the geotechnical report for a summary of the input parameters.

Volume required for drawdown = 3,398 cubic feet (See Water Quality Treatment Volume Calculations in Section 4 of this report)

Volume provided in retention system = 3,509 cubic feet (See Appendix 4 of this report)



The screenshot shows a window titled "Data For Retention Pond Recovery Calculation" from the application "PONDS.EXE". The window contains a form with the following input data:

Job Name:	Frozen Meet and Greet
Engineer:	Heery
Date:	12-2-14
Equivalent Pond Length, [L] (ft):	46
Equivalent Pond Width, [W] (ft):	35
Pond Bottom Elevation, [PB] (ft above datum):	94.58
Porosity Of Material Within Pond, [p] (%):	55
Base Of Aquifer Elevation, [B] (ft above datum):	86
Water Table Elevation, [WT] (ft above datum):	92
Horizontal Saturated Hydraulic Conductivity, [Kh] (ft/day):	10
Fillable Porosity, [n] (%):	25
Include Unsaturated Vertical Flow? (y/n):	Yes
Vertical Unsaturated Infiltration Rate, [Iv] (ft/day):	6
Runoff Volume, [U] (Cubic Feet):	3509
Percent Recovery of Runoff Volume, [PU] (%):	100

At the bottom of the window, there is a menu bar with the following options: Esc Done | F1 Help | F2 Calc | F4 Print | F5 Clear cell | F8 Clear all

Figure 4: Input Data for Drawdown Calculation



Figure 5: Results of Drawdown Calculation

The recovery time is 19 hours which is less than the 24 hours required.

In the above calculations, the bottom of the treatment volume is taken as elevation 94.58 feet which is 0.33 feet above the bottom of the rock elevation. For drawdown calculation reasons, the initial 0.33 feet of rock below the chambers is not counted in the storage volume calculations. See Appendix 4 for calculations of the amount of treatment volume provided in the system.

7.0 Water Use Sources – Potable, Wastewater, Dewatering, Irrigation

Potable Water supplier: Reedy Creek Utilities

Waste water system: Reedy Creek Utilities

If dewatering is needed, the contractor will submit the application to RCID at the time of construction. .

8.0 Water Resources

There will be no impacts to the floodplain.

9.0 Wetland Impacts

There are no wetlands within the limit of work. Therefore, there are no wetland impacts for this project.

10.0 Mitigation

Mitigation is not required. All wetlands impacted in this project have been mitigated for in the past.

11.0 Cumulative Impacts

Not applicable.

12.0 Wetland Inventory

There are no wetlands within the limit of work.

13.0 Threatened and Endangered Species

The available information indicates that the project site does not contain preferred habitat for wetland-dependent endangered/threatened species or species of special concern.

APPENDIX 1

Stormwater Calculations Results

From

Advanced Interconnected Channel & Pond Routing
Streamline Technologies, Inc.

EXISTING CONDITIONS

BASIN: EXISTING
(NOT ROUTED)

POST-DEVELOPMENT CONDITIONS

BASIN: EXFIL
NODE: EXFIL

BASIN: OFFSITE
NODE: OUT

DROP STRUCTURE
EXFIL-OUT
WEIR: 108.0'

BASIN: OUT
BOUNDARY TIME-STAGE
NODE: OUT

AdICPR Nodal Diagram

Input Information

=====
 Basins
 =====

```

Name: EXFIL           Node: EXFIL           Status: Onsite
Group: BASE          Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh256           Peaking Factor: 256.0
Rainfall File: Sfwmd72         Storm Duration(hrs): 72.00
Rainfall Amount(in): 10.190     Time of Conc(min): 10.00
Area(ac): 0.800               Time Shift(hrs): 0.00
Curve Number: 95.08           Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00
  
```

```

Name: EXISTING        Node: EXISTING        Status: Onsite
Group: BASE          Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh256           Peaking Factor: 256.0
Rainfall File: Sfwmd72         Storm Duration(hrs): 72.00
Rainfall Amount(in): 10.190     Time of Conc(min): 10.00
Area(ac): 1.080               Time Shift(hrs): 0.00
Curve Number: 84.17           Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00
  
```

```

Name: OFFSITE         Node: out             Status: Onsite
Group: BASE          Type: SCS Unit Hydrograph CN

Unit Hydrograph: Uh256           Peaking Factor: 256.0
Rainfall File: Sfwmd72         Storm Duration(hrs): 72.00
Rainfall Amount(in): 10.190     Time of Conc(min): 10.00
Area(ac): 0.280               Time Shift(hrs): 0.00
Curve Number: 90.29           Max Allowable Q(cfs): 999999.000
DCIA(%): 0.00
  
```

=====
 Nodes
 =====

```

Name: EXFIL           Base Flow(cfs): 0.000   Init Stage(ft): 95.000
Group: BASE          Warn Stage(ft): 98.500
Type: Stage/Volume
  
```

Stage(ft)	Volume(af)
95.000	0.0110
96.000	0.0398
97.000	0.0646
98.000	0.0806
99.000	0.0850

```

Name: out             Base Flow(cfs): 0.000   Init Stage(ft): 93.400
Group: BASE          Warn Stage(ft): 95.000
Type: Time/Stage
  
```

Time (hrs)	Stage (ft)
0.00	93.400
72.00	93.500

==== Drop Structures =====

Name: EXFIL-OUT	From Node: EXFIL	Length(ft): 126.00
Group: BASE	To Node: OUT	Count: 1
UPSTREAM	DOWNSTREAM	Friction Equation: Automatic
Geometry: Circular	Circular	Solution Algorithm: Most Restrictive
Span(in): 15.00	15.00	Flow: Both
Rise(in): 15.00	15.00	Entrance Loss Coef: 0.000
Invert(ft): 94.700	93.400	Exit Loss Coef: 1.000
Manning's N: 0.012000	0.012000	Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000	0.000	Inlet Ctrl Spec: Use dc
Bot Clip(in): 0.000	0.000	Solution Incs: 10

Upstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

Downstream FHWA Inlet Edge Description:
Circular Concrete: Square edge w/ headwall

*** Weir 1 of 1 for Drop Structure EXFIL-OUT ***

Count: 1	Bottom Clip(in): 0.000	TABLE
Type: Vertical: Mavis	Top Clip(in): 0.000	
Flow: Both	Weir Disc Coef: 3.200	
Geometry: Rectangular	Orifice Disc Coef: 0.600	
Span(in): 60.00	Invert(ft): 98.000	
Rise(in): 15.00	Control Elev(ft): 98.000	

==== Hydrology Simulations =====

Name: 100yr-72hr
 Filename: F:\14\HII-1413300\D_DSGN-DATA\D01-00-DESIGN_DATA\D01-07-Civil\Stormwater design\AdICPR\100yr-72hr.R32

Override Defaults: Yes
 Storm Duration(hrs): 72.00
 Rainfall File: Sfwmd72
 Rainfall Amount(in): 14.27

Time (hrs)	Print Inc (min)
24.000	15.00
48.000	10.00
72.000	5.00

Name: 10yr-72hr
 Filename: F:\14\HII-1413300\D_DSGN-DATA\D01-00-DESIGN_DATA\D01-07-Civil\Stormwater design\AdICPR\10yr-72hr.R32

Override Defaults: Yes
 Storm Duration(hrs): 72.00
 Rainfall File: Sfwmd72
 Rainfall Amount(in): 10.00

Time (hrs)	Print Inc (min)
------------	-----------------

24.000 15.00
48.000 10.00
72.000 5.00

==== Routing Simulations =====

Name: 100yr-72hr Hydrology Sim: 100yr-72hr
Filename: F:\14\HII-1413300\D_DSGN-DATA\D01-00-DESIGN_DATA\D01-07-Civil\Stormwater
design\AdICPR\100yr-72hr.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 72.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
72.000	5.000
Group	Run
BASE	Yes

Name: 10yr-72hr Hydrology Sim: 10yr-72hr
Filename: F:\14\HII-1413300\D_DSGN-DATA\D01-00-DESIGN_DATA\D01-07-Civil\Stormwater
design\AdICPR\10yr-72hr.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00 Delta Z Factor: 0.00500
Time Step Optimizer: 10.000
Start Time(hrs): 0.000 End Time(hrs): 72.00
Min Calc Time(sec): 0.5000 Max Calc Time(sec): 60.0000
Boundary Stages: Boundary Flows:

Time(hrs)	Print Inc(min)
72.000	5.000
Group	Run
BASE	Yes

Input Hydrographs

Basin Name: EXFIL
Group Name: BASE
Simulation: 100yr-72hr
Node Name: EXFIL
Basin Type: SCS Unit Hydrograph

Unit Hydrograph: Uh256
Peaking Fator: 256.0
Spec Time Inc (min): 1.33
Comp Time Inc (min): 1.33
Rainfall File: Sfwmd72
Rainfall Amount (in): 14.270
Storm Duration (hrs): 72.00
Status: Onsite
Time of Conc (min): 10.00
Time Shift (hrs): 0.00
Area (ac): 0.800
Vol of Unit Hyd (in): 1.000
Curve Number: 95.080
DCIA (%): 0.000

Time Max (hrs): 60.02
Flow Max (cfs): 5.06
Runoff Volume (in): 13.663
Runoff Volume (ft3): 39676

Basin Name: EXISTING
Group Name: BASE
Simulation: 100yr-72hr
Node Name: EXISTING
Basin Type: SCS Unit Hydrograph

Unit Hydrograph: Uh256
Peaking Fator: 256.0
Spec Time Inc (min): 1.33
Comp Time Inc (min): 1.33
Rainfall File: Sfwmd72
Rainfall Amount (in): 14.270
Storm Duration (hrs): 72.00
Status: Onsite
Time of Conc (min): 10.00
Time Shift (hrs): 0.00
Area (ac): 1.080
Vol of Unit Hyd (in): 1.000
Curve Number: 84.170
DCIA (%): 0.000

Time Max (hrs): 60.02
Flow Max (cfs): 6.63
Runoff Volume (in): 12.233
Runoff Volume (ft3): 47959

Basin Name: OFFSITE
Group Name: BASE
Simulation: 100yr-72hr
Node Name: out
Basin Type: SCS Unit Hydrograph

Unit Hydrograph: Uh256
Peaking Fator: 256.0
Spec Time Inc (min): 1.33
Comp Time Inc (min): 1.33

Rainfall File: Sfwmd72
Rainfall Amount (in): 14.270
Storm Duration (hrs): 72.00
 Status: Onsite
 Time of Conc (min): 10.00
 Time Shift (hrs): 0.00
 Area (ac): 0.280
Vol of Unit Hyd (in): 1.000
 Curve Number: 90.290
 DCIA (%): 0.000

 Time Max (hrs): 60.02
 Flow Max (cfs): 1.75
 Runoff Volume (in): 13.051
 Runoff Volume (ft3): 13265

Basin Name: EXFIL
Group Name: BASE
Simulation: 10yr-72hr
Node Name: EXFIL
Basin Type: SCS Unit Hydrograph

Unit Hydrograph: Uh256
 Peaking Fator: 256.0
 Spec Time Inc (min): 1.33
 Comp Time Inc (min): 1.33
 Rainfall File: Sfwmd72
Rainfall Amount (in): 10.000
Storm Duration (hrs): 72.00
 Status: Onsite
 Time of Conc (min): 10.00
 Time Shift (hrs): 0.00
 Area (ac): 0.800
Vol of Unit Hyd (in): 1.000
 Curve Number: 95.080
 DCIA (%): 0.000

 Time Max (hrs): 60.02
 Flow Max (cfs): 3.53
 Runoff Volume (in): 9.401
 Runoff Volume (ft3): 27302

Basin Name: EXISTING
Group Name: BASE
Simulation: 10yr-72hr
Node Name: EXISTING
Basin Type: SCS Unit Hydrograph

Unit Hydrograph: Uh256
 Peaking Fator: 256.0
 Spec Time Inc (min): 1.33
 Comp Time Inc (min): 1.33
 Rainfall File: Sfwmd72
Rainfall Amount (in): 10.000
Storm Duration (hrs): 72.00
 Status: Onsite
 Time of Conc (min): 10.00
 Time Shift (hrs): 0.00
 Area (ac): 1.080
Vol of Unit Hyd (in): 1.000
 Curve Number: 84.170
 DCIA (%): 0.000

 Time Max (hrs): 60.02
 Flow Max (cfs): 4.53

Runoff Volume (in): 8.048
Runoff Volume (ft3): 31550

Basin Name: OFFSITE
Group Name: BASE
Simulation: 10yr-72hr
Node Name: out
Basin Type: SCS Unit Hydrograph

Unit Hydrograph: Uh256
Peaking Fator: 256.0
Spec Time Inc (min): 1.33
Comp Time Inc (min): 1.33
Rainfall File: Sfwmd72
Rainfall Amount (in): 10.000
Storm Duration (hrs): 72.00
Status: Onsite
Time of Conc (min): 10.00
Time Shift (hrs): 0.00
Area (ac): 0.280
Vol of Unit Hyd (in): 1.000
Curve Number: 90.290
DCIA (%): 0.000

Time Max (hrs): 60.02
Flow Max (cfs): 1.22
Runoff Volume (in): 8.813
Runoff Volume (ft3): 8957

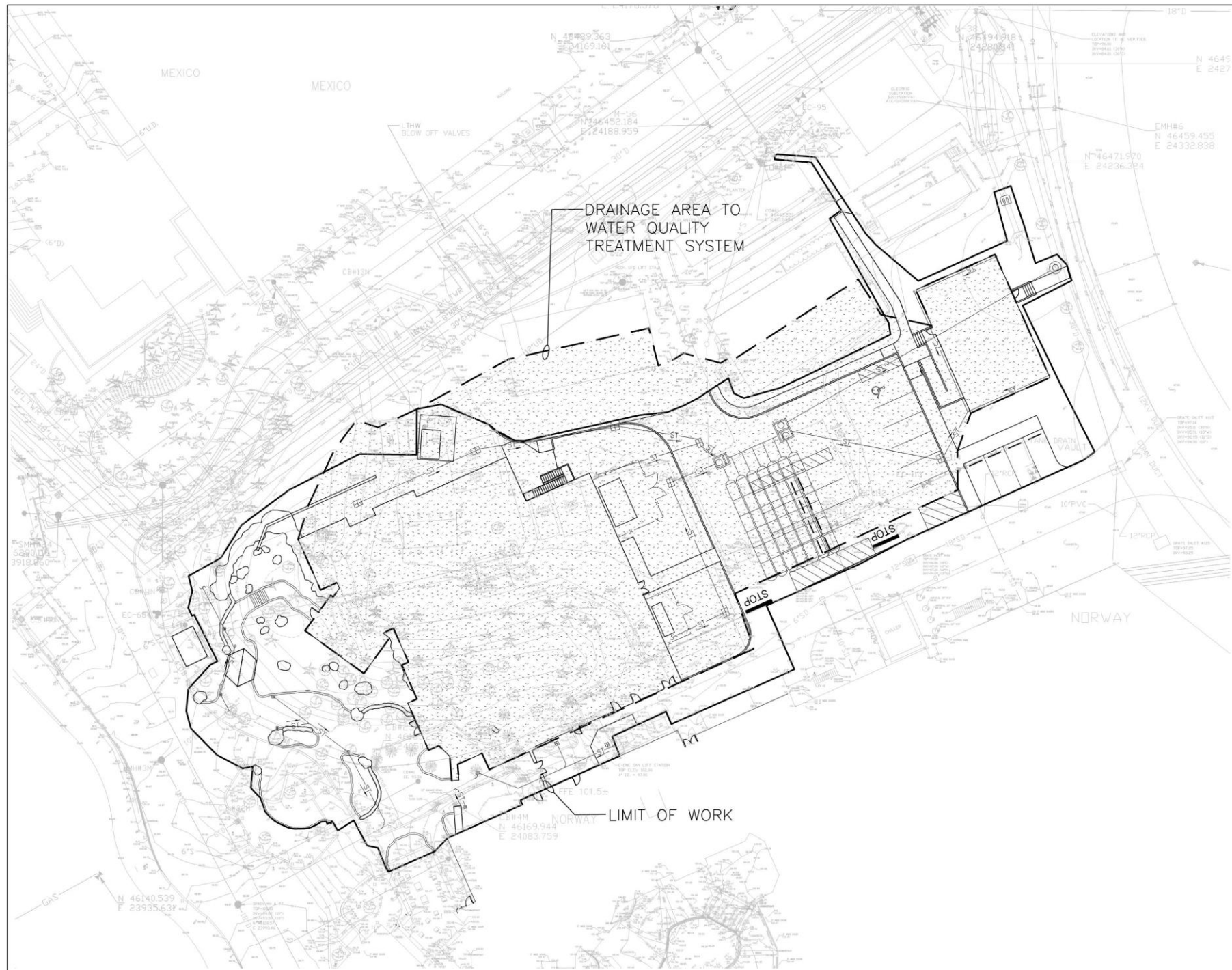
Output Summary

Post-development Conditions

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
EXFIL	BASE	100yr-72hr	60.00	98.46	98.50	0.0050	211	60.00	5.03	60.00	5.03
out	BASE	100yr-72hr	72.00	93.50	95.00	0.0000	0	60.00	6.77	0.00	0.00
EXFIL	BASE	10yr-72hr	60.00	98.36	98.50	0.0050	260	60.00	3.52	60.00	3.51
out	BASE	10yr-72hr	72.00	93.50	95.00	0.0000	0	60.00	4.73	0.00	0.00

APPENDIX 2

Pre- and Post-Development RCID Drainage Basin Maps



POST-DEVELOPMENT

LIMIT OF WORK
 AREA = 1.08 AC
 PERVIOUS = 0.25 AC
 IMPERVIOUS = 0.83 AC
 PAVEMENT = 0.49 AC
 ROOF = 0.34 AC

DRAINAGE AREA TO TREATMENT VOLUME
 AREA = 0.80 AC
 PERVIOUS = 0.13 AC
 IMPERVIOUS = 0.67 AC
 PAVEMENT = 0.33 AC
 ROOF = 0.34 AC

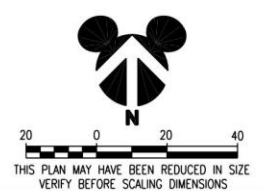
PROJECT MANAGER:	S. MURPHY	10	
PROJECT ARCHITECT:	M. JONES	9	
PROJECT ENGINEER:	K. KLIEH	8	
OTHER DESIGNEES:	K. KLIEH	7	
DRAWN:	E. WERMUTH	6	
CHECKED:	L. BENNETT	4	
APPROVED:	K. KLIEH	3	
JOB NUMBERS:	K. KLIEH	2	
		1	
		SM	
		ISSUED FOR	
		ISSUED DATE	12/19/14
		APPROVED DATE	
		APPROVED	
		DESCRIPTION	

NOTES
 The data in this document represents preliminary rights of way. Disney Parks and Resorts U.S., Inc. (DPR) is not responsible for the accuracy of the information in this document. Any party accepting this document does so in accordance with the terms and conditions of the license agreement between DPR and the licensee. The licensee shall be responsible for obtaining all necessary permits and approvals from the appropriate authorities.

UNIT NAME: FROZEN MEET AND GREET
 SHEET TITLE: POST-DEVELOPMENT DRAINAGE BASIN PLAN



HEERY design
 Heery International, Inc.
 2100 Main Street
 Suite 100
 Columbia, Florida 32810
 407 882 6300
 407 882 6300
 FAX 407 882 6300
 PROJECT # 1413300



ARCHITECT OR ENGINEER SEAL

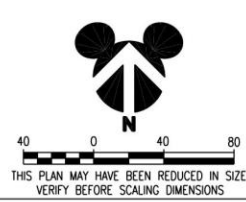
NAME: KEVIN G. KLIEH
 REG. NO. PE# 53566

PROJECT AREA
EPCOT NORWAY PAVILION

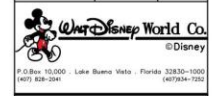
LAST FILED: EDMS PACKAGE CODE:
 WNR01-21

CAD DWG NAME:

SHEET NO. **SK-102** REV.



<p>NOTICE: The data in this document incorporates proprietary rights of Walt Disney World Company, 1375 Buena Vista Drive, Lake Buena Vista, Florida 32830. All other data is the property of the respective owners, which the consent of said owners is hereby acknowledged.</p>	
<p>PROJECT MANAGER: L. BENNETT 7</p>	
<p>PROJECT ARCHITECT: L. BENNETT 7</p>	
<p>PROJECT ENGINEER: L. BENNETT 7</p>	
<p>OTHER DISCIPLINES: E. WERMUTH 5</p>	
<p>DESIGNER: L. BENNETT 3</p>	
<p>CHECKER: L. BENNETT 2</p>	
<p>APPROVED: L. BENNETT 1</p>	
<p>JOB NUMBER: 1</p>	
10	ISSUED FOR
9	ISSUED DATE
8	ISSUED DATE
7	ISSUED DATE
6	ISSUED DATE
5	ISSUED DATE
4	ISSUED DATE
3	ISSUED DATE
2	ISSUED DATE
1	ISSUED DATE
<p>PROJECT AREA: EPCOT CENTER</p>	
<p>LAST FILED: EDMS PACKAGE CODE:</p>	
<p>CAD DWG NAME:</p>	
<p>SHEET NO.: SK-103</p>	<p>REV.: A</p>
<p>UNIT NAME: PROJECT 6 MEET AND GREET OVERALL DRAINAGE BASIN MAP</p>	
<p>PROJECT MANAGER: L. BENNETT 7</p>	
<p>PROJECT ARCHITECT: L. BENNETT 7</p>	
<p>PROJECT ENGINEER: L. BENNETT 7</p>	
<p>OTHER DISCIPLINES: E. WERMUTH 5</p>	
<p>DESIGNER: L. BENNETT 3</p>	
<p>CHECKER: L. BENNETT 2</p>	
<p>APPROVED: L. BENNETT 1</p>	
<p>JOB NUMBER: 1</p>	
10	ISSUED FOR
9	ISSUED DATE
8	ISSUED DATE
7	ISSUED DATE
6	ISSUED DATE
5	ISSUED DATE
4	ISSUED DATE
3	ISSUED DATE
2	ISSUED DATE
1	ISSUED DATE
<p>PROJECT AREA: EPCOT CENTER</p>	
<p>LAST FILED: EDMS PACKAGE CODE:</p>	
<p>CAD DWG NAME:</p>	
<p>SHEET NO.: SK-103</p>	<p>REV.: A</p>
<p>UNIT NAME: PROJECT 6 MEET AND GREET OVERALL DRAINAGE BASIN MAP</p>	
<p>PROJECT MANAGER: L. BENNETT 7</p>	
<p>PROJECT ARCHITECT: L. BENNETT 7</p>	
<p>PROJECT ENGINEER: L. BENNETT 7</p>	
<p>OTHER DISCIPLINES: E. WERMUTH 5</p>	
<p>DESIGNER: L. BENNETT 3</p>	
<p>CHECKER: L. BENNETT 2</p>	
<p>APPROVED: L. BENNETT 1</p>	
<p>JOB NUMBER: 1</p>	
10	ISSUED FOR
9	ISSUED DATE
8	ISSUED DATE
7	ISSUED DATE
6	ISSUED DATE
5	ISSUED DATE
4	ISSUED DATE
3	ISSUED DATE
2	ISSUED DATE
1	ISSUED DATE



HEERY design
Heery International
4700 Memorial Boulevard
Suite 500
Orlando, Florida 32839
407.902.4000
P.O. Box 1000
Orlando, FL 32816
PROJECT # 00000004

PROJECT AREA:
EPCOT CENTER

LAST FILED: EDMS PACKAGE CODE:

CAD DWG NAME:

SHEET NO.: SK-103

REV.: A

APPENDIX 3

Geotechnical Report

October 23, 2014

Walt Disney Imagineering
P.O. Box 10321
Lake Buena Vista, Florida 32830

Attention: Mr. Steven Murphy, AIA
Senior Design Manager

RE: Summary of Findings
Civil Engineering Borings
Stormwater Management Areas
Between Mexico and Norway Pavilions
Epcot Center (World Showcase)
Walt Disney World, Florida
PSI Project No. 07571232

Dear Mr. Murphy:

In general accordance with our proposal to you dated October 15, 2014, Professional Service Industries, Inc. (PSI) is providing geotechnical engineering services in connection with the referenced project. This letter provides a summary of findings of the three civil engineering borings that have been drilled in connection with the proposed stormwater management system and surface parking that will be built for the project.

The area under consideration is the parcel of land between the Mexico and Norway Pavilions in Epcot Center. The area has a berm that screens the World Showcase promenade from back of house areas. The berm is heavily landscaped and is on the order of 10 feet high. The area behind the berm is generally flat at around elevation +100± feet. This area contains trailers, pavements and storage/staging facilities. There are also some concrete slabs in this area of the site.

We understand that the new construction is to include a single-story building between the two pavilions, surface parking and stormwater management facilities. A plan view of the project area is included on **Sheet 1**. (The base map for this sheet is from Google Earth). We understand that the stormwater management for the project will comprise an exfiltration trench/underground storage system. From development plans provided to us, the stormwater chambers will be located near the middle of the site and in the east near the perimeter road.

On October 20, 2014, we drilled three auger borings at the site (AB-1 through AB-3) with these explorations being completed at the approximate locations shown on **Sheet 1**. Boring AB-1 was drilled by hand at the toe of slope of the berm on the guest side of the site and extended to a depth of 10 feet below grade. Borings AB-2 and AB-3 were drilled with a rig and advanced to depths of 15 feet below grade.

Samples recovered from the borings were visually stratified in our laboratory following guidelines contained in the Unified Soil Classification System (USCS). Records of the materials encountered in the borings are presented as soil profiles on **Sheet 2**. **Sheet 2** includes a legend describing the subsoils in USCS format.

Select samples from the borings have been tested to determine natural moisture content and percent fines passing the U.S. Standard No. 200 sieve. These tests were carried out following appropriate ASTM procedures. The results of the tests are included with the soil profiles on **Sheet 2**, adjacent to the depth increment of the test specimen.

A review of the soil profiles on **Sheet 2** indicates subsoils in the upper 10 to 15 feet to generally comprise a varying sequence of fine sands. The sands grade clean to slightly silty in composition (i.e. SP and SP/SM materials). The sands are both fill material that was placed to raise site grades during the construction of Epcot Center as well as natural mineral soils. The fill material was generated from nearby sites and consequently, it is very similar to the upper native/natural soils.

Groundwater was observed in the borings at depths varying from 9.0 to 9.9 feet below existing grade. Based on our understanding of grades at the site, we estimate that the water was at an elevation on the order of +93 feet in the west to +90 feet in the east. World Showcase Lagoon to the west of the site has a normal control water level of +94 feet. We would expect the normal wet season high groundwater table to be close to that elevation in the soil near the lagoon and slightly lower away from it.

It should be noted that water levels can be influenced by dewatering activities (i.e. permanent underdrains and drainage canals) or from irrigation activities.

For design of the stormwater system, we recommend that the following be used to represent the effective shallow water table aquifer in the area of borings AB-2 and AB-3. The analysis should be carried out using a computer model such as Ponds. Input parameters for such a program are

Base of Effective Aquifer	-	+86 feet
Estimated Seasonal High Water Table	-	+92 feet
Horizontal Permeability of Effective Aquifer	-	10 feet/day
Vertical Permeability of Effective Aquifer	-	6 feet/day
Soil Porosity	-	25 percent

We understand that Heery will be carrying out the stormwater recovery analyses. We are available to support Heery in this effort as may be necessary. Stormwater systems should be designed and constructed in accordance with Water Management District criteria.



With respect to the pavement design, we consider conditions suitable for a standard parking lot using a flexible asphaltic concrete surface. A typical light duty parking lot section would be

1.5 inches	Type S Asphaltic Concrete
6.0 inches	Limerock Basecourse, LBR = 100
12.0 inches	Stabilized Subgrade, LBR = 40

The noted section should be confirmed by the project civil engineer.

REPORT LIMITATIONS

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data.

The scope of the investigation was intended to evaluate soil conditions within the influence of the proposed stormwater system and parking lots and does not include an evaluation of potential deep soil problems such as sinkholes. The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. If any subsoil variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature or location of the proposed facilities.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.



CLOSURE

We appreciate the opportunity to be of continued service on this project and we trust that the foregoing and accompanying attachments are of assistance to you at this time. In the event that you have any questions or if you require additional information, please call.

Sincerely,

PROFESSIONAL SERVICE INDUSTRIES, INC.
Certificate of Authorization No. 3684



Ian Kinnear, P.E.
Chief Geotechnical Engineer
Florida License No. 32614

07571232 (Stormwater Mgmt Area, Epcot)O23.doc

cc: Mr. Kevin Klueh, P.E. – Heery Design
Mr. John Sansone, P.E. – PSI

Attachments

- Sheets 1 and 2





LOCATION PLAN

SCALE: 1"=60'



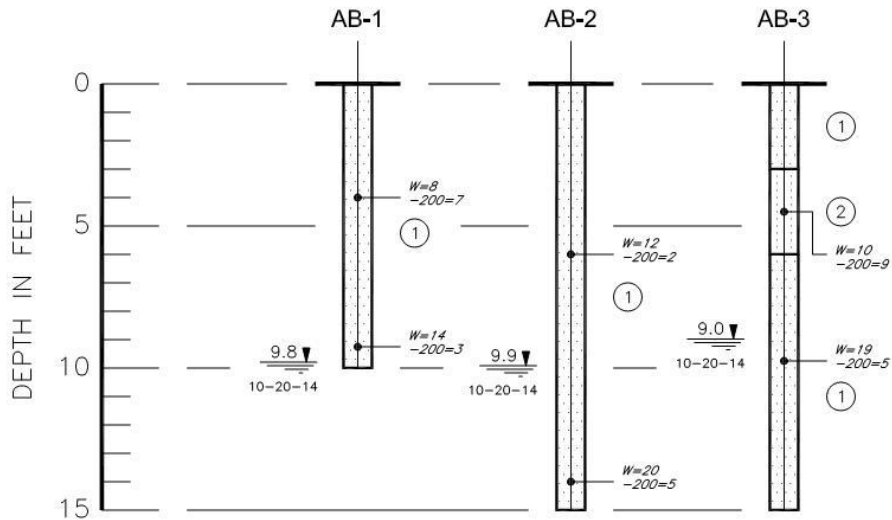
LEGEND


 APPROXIMATE LOCATION OF
 AUGER BORING

GEOTECHNICAL ENGINEERING SERVICES
CIVIL ENGINEERING BORINGS
BETWEEN MEXICO & NORWAY PAVILIONS
 EPCOT CENTER, WALT DISNEY WORLD, FLORIDA


Information
To Build On
 Engineering • Consulting • Testing

DRAWN:	DJW	SCALE:	NOTED	PROJ. NO:	07571232
CHKD:	SC	DATE:	10-22-14	SHEET:	1



SOIL PROFILES

SCALE: 1"=5'

LEGEND

- (1) GRAY-BROWN TO DARK BROWN FINE SAND TO SLIGHTLY SILTY FINE SAND, (SP), (SP-SM)
- (2) DARK BROWN SLIGHTLY SILTY FINE SAND, (SP-SM)
- (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
- 9.8 10-20-14 DEPTH TO GROUNDWATER LEVEL IN FEET WITH DATE OF READING
- W NATURAL MOISTURE CONTENT IN PERCENT
- 200 FINES PASSING #200 SIEVE IN PERCENT

GEOTECHNICAL ENGINEERING SERVICES
CIVIL ENGINEERING BORINGS
 BETWEEN MEXICO & NORWAY PAVILIONS
 EPCOT CENTER, WALT DISNEY WORLD, FLORIDA



DRAWN: DJW	SCALE: NOTED	PROJ. NO: 07571232
CHKD: SC	DATE: 10-22-14	SHEET: 2

APPENDIX 4

StormTech DC-780 Cumulative Storage Volume Calculations

Project: Frozen Meet and Greet

Chamber Model -	DC-780
Units -	Imperial Click Here for
Number of chambers -	42
Void in the stone (porosity) -	40 %
Base of Stone Elevation -	94.25 ft
Amount of Stone Above Cham	6 in
Amount of Stone Below Cham	9 in
Area of system -	1555 sf Min. Arc 1420 sf min. area

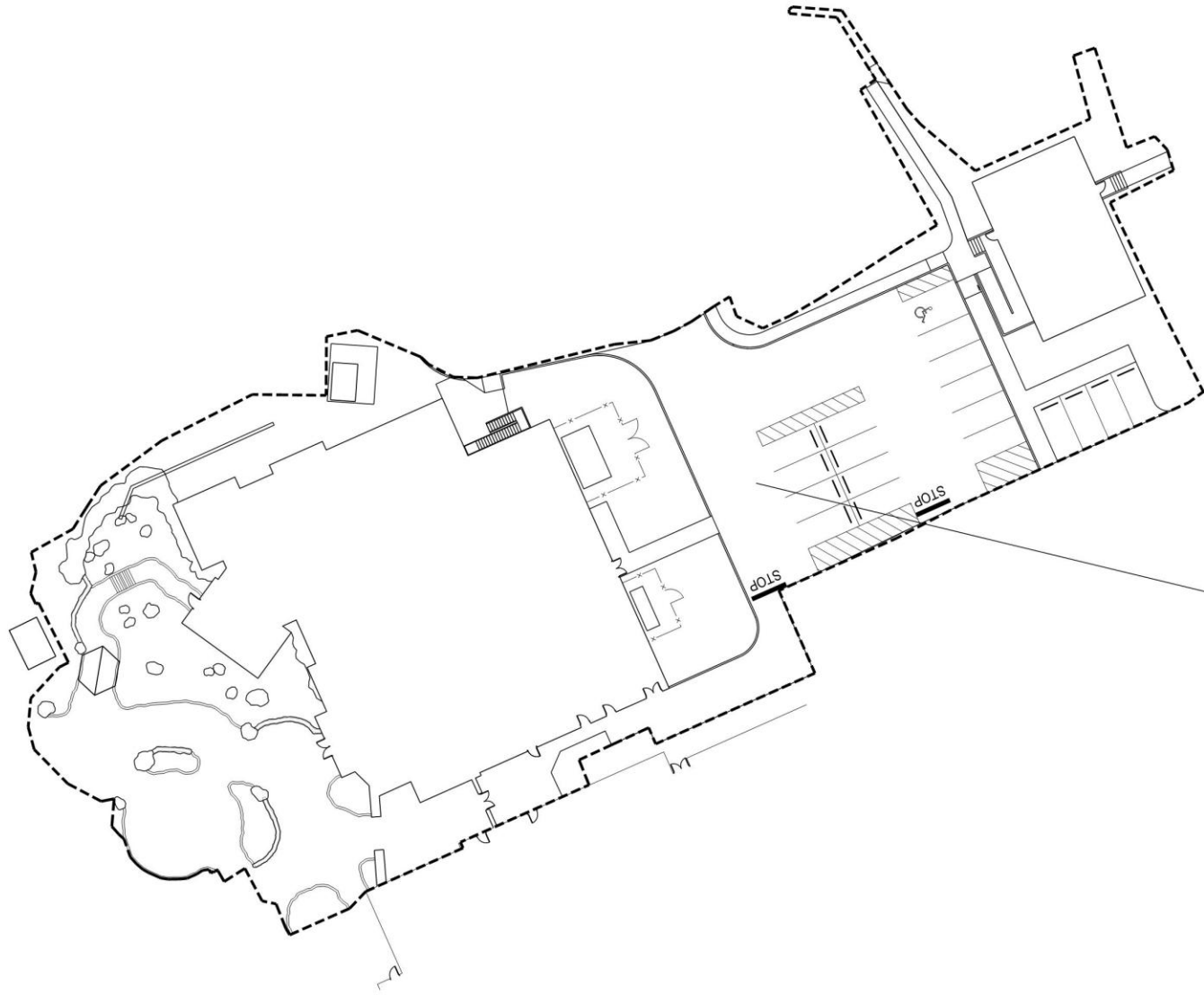


Height of System (inches)	Incremental Single Chamber (cubic feet)	Incremental Total Chamber (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch & St (cubic feet)	Cumulative Chamber (cubic feet)	Elevation (feet)	Cumulative storage counted toward treatment volume after not counting the first 0.33 feet of storage in the rock (cubic feet)	Cumulative storage after considering storage in the connecting 12 inch diameter piping (cubic feet)	Cumulative storage after considering storage in the connecting 12 inch diameter piping (acre-feet)
45	0.00	0.00	51.83	51.83	3498.46	98.00	3291.13	3509.13	0.080558564
44	0.00	0.00	51.83	51.83	3446.63	97.92	3239.30	3457.30	0.079368634
43	0.00	0.00	51.83	51.83	3394.79	97.83	3187.46	3405.46	0.078178705
42	0.00	0.00	51.83	51.83	3342.96	97.75	3135.63	3353.63	0.076988775
41	0.00	0.00	51.83	51.83	3291.13	97.67	3083.80	3301.80	0.075798845
40	0.00	0.00	51.83	51.83	3239.29	97.58	3031.96	3249.96	0.074608916
39	0.06	2.43	50.86	53.29	3187.46	97.50	2980.13	3198.13	0.073418986
38	0.17	7.00	49.03	56.03	3134.17	97.42	2926.84	3144.84	0.072195567
37	0.29	12.04	47.02	59.06	3078.13	97.33	2870.80	3088.80	0.070909199
36	0.61	25.66	41.57	67.23	3019.08	97.25	2811.75	3029.75	0.069553459
35	0.81	34.04	38.22	72.26	2951.85	97.17	2744.52	2962.52	0.06801003
34	0.96	40.28	35.72	76.00	2879.59	97.08	2672.26	2890.26	0.066351279
33	1.08	45.49	33.64	79.12	2803.59	97.00	2596.26	2814.26	0.064606526
32	1.19	49.88	31.88	81.76	2724.47	96.92	2517.14	2735.14	0.062790075
31	1.27	53.51	30.43	83.94	2642.70	96.83	2435.37	2653.37	0.060913059
30	1.36	57.29	28.92	86.21	2558.77	96.75	2351.44	2569.44	0.058986124
29	1.45	61.08	27.40	88.48	2472.56	96.67	2265.23	2483.23	0.057007066
28	1.53	64.14	26.18	90.31	2384.07	96.58	2176.74	2394.74	0.054975746
27	1.59	66.82	25.10	91.93	2293.76	96.50	2086.43	2304.43	0.0529024
26	1.65	69.36	24.09	93.45	2201.83	96.42	1994.50	2212.50	0.05079203
25	1.71	71.77	23.12	94.90	2108.38	96.33	1901.05	2119.05	0.048646686
24	1.76	74.03	22.22	96.25	2013.48	96.25	1806.15	2024.15	0.046468152
23	1.81	76.15	21.37	97.52	1917.23	96.17	1709.90	1927.90	0.044258532
22	1.86	78.13	20.58	98.71	1819.71	96.08	1612.38	1830.38	0.042019748
21	1.90	79.99	19.84	99.83	1721.00	96.00	1513.67	1731.67	0.039753652
20	1.95	81.74	19.14	100.88	1621.17	95.92	1413.84	1631.84	0.037461904
19	1.99	83.38	18.48	101.86	1520.29	95.83	1312.96	1530.96	0.035146101
18	2.02	84.92	17.87	102.79	1418.43	95.75	1211.10	1429.10	0.032807689
17	2.06	86.36	17.29	103.65	1315.65	95.67	1108.32	1326.32	0.030448061
16	2.09	87.72	16.75	104.46	1212.00	95.58	1004.67	1222.67	0.028068545
15	2.12	88.98	16.24	105.22	1107.53	95.50	900.20	1118.20	0.025670408
14	2.15	90.16	15.77	105.93	1002.31	95.42	794.98	1012.98	0.023254875
13	2.17	91.25	15.33	106.58	896.38	95.33	689.05	907.05	0.02082311
12	2.20	92.27	14.93	107.19	789.80	95.25	582.47	800.47	0.018376256
11	2.22	93.21	14.55	107.76	682.61	95.17	475.28	693.28	0.015915415
10	2.24	94.19	14.16	108.35	574.85	95.08	367.52	585.52	0.013441654
9	0.00	0.00	51.83	51.83	466.50	95.00	259.17	477.17	0.010954316
8	0.00	0.00	51.83	51.83	414.67	94.92	207.34	425.34	0.009764386
7	0.00	0.00	51.83	51.83	362.83	94.83	155.50	373.50	0.008574457
6	0.00	0.00	51.83	51.83	311.00	94.75	103.67	321.67	0.007384527
5	0.00	0.00	51.83	51.83	259.17	94.67	51.84	269.84	0.006194597
4	0.00	0.00	51.83	51.83	207.33	94.58	0.00	218.00	0.005004668
3	0.00	0.00	51.83	51.83	155.50	94.50			
2	0.00	0.00	51.83	51.83	103.67	94.42			
1	0.00	0.00	51.83	51.83	51.83	94.33			

The above table shows storage provided between the bottom and top of rock elevation is 3498 cf. For drawdown calculation reasons, the initial 0.33 feet of rock below the chambers is not counted in the storage volume calculations. In other words, the gravel bed from elevation 94.25 and 94.58 is not counted in the storage calculations. Subtracting this 0.33 feet or 207 cubic feet storage, the storage volume is 3291 cubic feet of storage provided. Storage that is provided in the 12” diameter storm piping that discharges into the system can be added to this volume. The volume provided in the 277 feet of 12” diameter storm piping, all of which is below the controlling weir elevation of the system, is 218 cubic feet. The total storage provided in the system is therefore 3509 cubic feet storage.

APPENDIX 5

Pre- and Post-Development FLUCCS Maps



FLUCFCS CODES

144 - CULTURAL AND ENTERTAINMENT

144

<p>NOTICE</p> <p>The data in this document incorporates proprietary rights of Walt Disney World Company, a subsidiary of Walt Disney World Company, 1375 Buena Vista Drive, Lake Buena Vista, Florida, 32830. Any party copying this document does so in confidence and agrees to hold the information herein confidential and not to disclose it to any other person without the consent of Walt Disney World Company.</p> <p>Walt Disney World Co. © Disney</p> <p># 0 000 10 000 Lake Buena Vista Florida 32830-1000 (407) 828-3541 (407) 828-1235</p> <p>HEERY design</p> <p>Heery International Inc. 210 Village Boulevard Suite 500 Orlando, Florida 32819 Tel: 407.828.1235 Fax: 407.828.1235 PROJECT # 141300</p>	<p>PROJECT MANAGER: S. MURPHY</p> <p>PROJECT ARCHITECT: M. JONES</p> <p>PROJECT ENGINEER: K. KLUEH</p> <p>OTHER DISCIPLINES:</p> <p>DRAWN: E. WERMUTH</p> <p>CHECKED: L. BENNETT</p> <p>APPROVED: K. KLUEH</p> <p>JOB NUMBER: 1</p>	<p>10</p> <p>9</p> <p>8</p> <p>7</p> <p>6</p> <p>5</p> <p>4</p> <p>3</p> <p>2</p> <p>1</p>	<p>ISSUED FOR</p> <p>DATE</p> <p>12/19/14</p> <p>DATE</p> <p>APPROVED BY</p> <p>DATE</p> <p>DESCRIPTION</p>
--	---	--	---

ARCHITECT OR ENGINEER SEAL

NAME: KEVIN G. KLUEH
REG. NO. PE# 53566

PROJECT AREA
EPCOT NORWAY
PAVILION

LAST FILED: EDMS PACKAGE CODE:
WNR01-21

CAD DWG NAME:

SHEET NO. SK-106

REV.