STARKEY ROAD BASIN
WATERSHED MANAGEMENT PLAN

BEST MANAGEMENT PRACTICES (BMP) ALTERNATIVES ANALYSIS

(TASK 2.1.4.8)

Prepared for:

Pinellas County,
Southwest Florida Water Management District
And City of Largo

Prepared by:

7650 West Courtney Campbell Causeway, Suite 700
Tampa, Florida 33607-1462

June 2013

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1.0 INTRODUCTION

Pinellas County, in cooperation with the City of Largo and the Southwest Florida Water Management District, are preparing a Watershed Management Plan for the Starkey Road Basin. The project is to be executed in general conformance with the Southwest Florida Water Management District's Watershed Management Program Guidelines and Specifications (G&S), and will consist of the following major elements: (1) Project Development and Digital Topographic Information, (2) Watershed Evaluation, (3) Watershed Management Plan, (4) Implementation of Best Management Plans (BMP), and (5) Database Maintenance and Watershed Model Updates.

This BMP alternative analysis is the final task to complete of the three elements of the Watershed Management Plan; comprised of a Floodplain Analysis, a Level of Service Evaluation and a BMP Alternatives Analysis. The watershed boundaries, storage, conveyance, flow paths and parameters have been developed and verified by field reconnaissance. The information has been used to create a computer model of the existing watershed conditions. This model was used to evaluate the BMPs considered herein.

This report addresses and describes the development of the BMP Alternatives Analysis component of the Watershed Management Plan element for the Starkey Road Basin in Pinellas County. Separate reports address the other elements associated with the Watershed Management Program.

1.1 Authorization

URS Corporation Southern (URS) has been contracted by Pinellas County to conduct the first five elements of the Watershed Management Program for the Starkey Road Basin in Pinellas County (**Figure 1.1)**. Tasks conducted under this Work Order are per Contract No. 090-0348-CN under the Scope of Services dated September 23, 2011.

1.2 Project Location and General Description

The Starkey Road Basin, Pinellas County Basin No. 25, is located in central Pinellas County, Florida. The total contributing area for the Starkey Road Basin is approximately 7,358 acres (11.5 square miles). Approximately 3,000 acres are within the unincorporated Pinellas County boundaries while the remaining areas are located within the boundaries of the City of Pinellas

Park, the City of Largo, City of Clearwater and the City of Seminole. It is generally bordered on the east by Belcher Road, on the north by Belleair Road, on the west by Ridge Road and Lake Seminole, and extends south of Park Boulevard, bordering along Long Bayou as shown in **Figure 1.2**. The Starkey Road Basin is comprised of largely urban land uses such as commercial and industrial establishments, golf courses, parks, and single-family and multi-family developments.

1.3 Purpose

The purpose of this analysis is to provide the Pinellas County Department of Environment and Infrastructure (PCDEI), the Pinellas County Public Works Department (PCPW) and the City of Largo with a list of BMPs that could be implemented to improve the water quality and to increase flood protection in the Starkey Watershed. BMPs are traditionally described in terms of water pollution prevention, reduction, and elimination. Novotny (2003) defined BMPs as "…methods, measures, or practices selected and implemented to meet the needs of nonpoint (diffuse) source control, BMPs include, but are not limited to, structural and nonstructural controls and operations and maintenance procedures. BMPs can be applied before, during, and after pollution producing activities to reduce or eliminate the introduction of pollutants from diffuse sources into receiving waters." This report expands the traditional definition to include not only water quality measures, but also flood protection and flood control measures. Implementation projects that improve natural systems and water quality are likely to be eligible for cooperative or Surface Water Improvement and Management (SWIM) District funding. Implementing BMPs to improve flood protection in regional or intermediate systems may also be eligible for cooperative funding from the District. The BMPs recommended herein may qualify for District funding.

Street and yard flooding has been an issue at several locations within the watershed. The Pinellas County Department of Environment and Infrastructure, Pinellas County Department of Public Works, City of Largo, and District Engineering and Operations staff worked together to develop a list of conceptual BMPs that could reduce the duration and depth of flooding in and along the Starkey Road Basin primary channels. Basin conditions represented in the watershed modeling are based on 2010 digital elevation models, 2009 land use/ land cover and aerial imagery, and an ERP As-built cut-off date of September 1, 2011.

Section 2.0 of this report contains information about the flood prone areas and areas of potential water quality concern for which conceptual BMPs have been considered. Section 3.0 describes the screening process for selection of modeled and priority BMPs, and the list of the BMPs selected for detailed analysis. Section 3.0 also describes the evaluation and the analysis of each of the selected BMPs. Section 4.0 contains a summary of findings and recommendations.

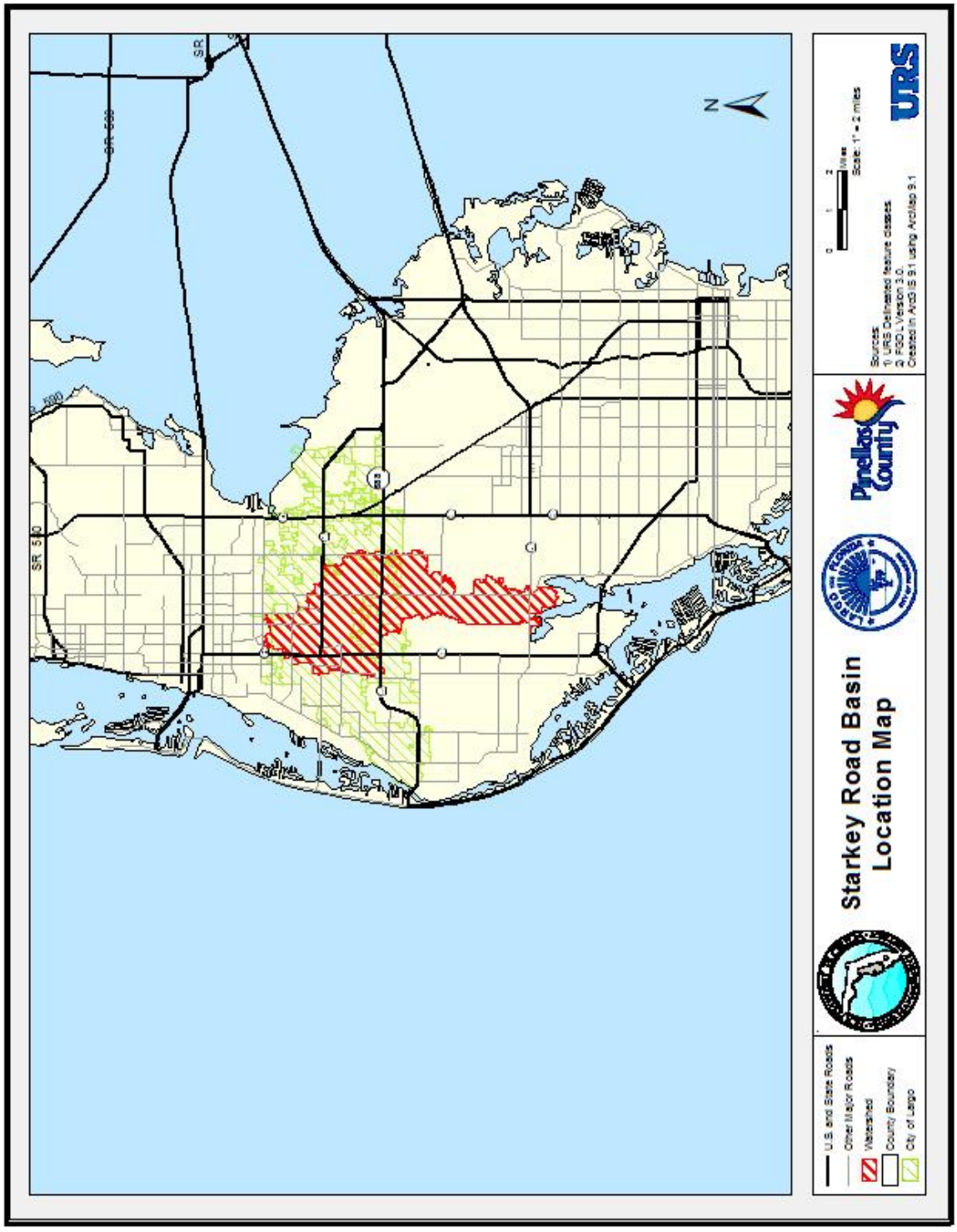

Figure 1.1 Location Map

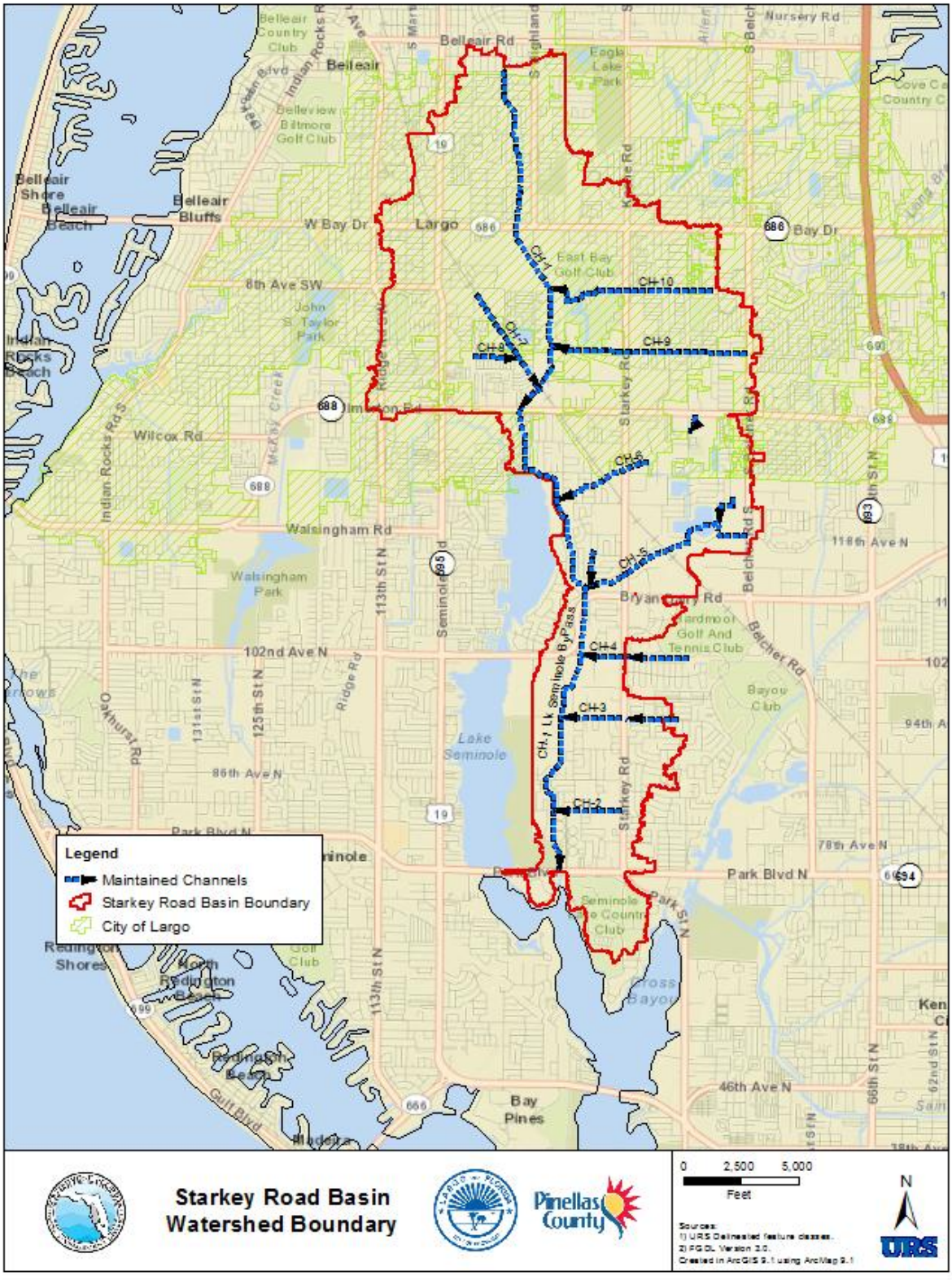

Figure 1.2 Starkey Road Basin Watershed Boundary

2.0 CHARACTERIZATION OF FLOOD PRONE AREAS

Areas of concern for flooding within the Starkey Road Basin have been identified using historical complaints and photos combined with the results of model simulations. Pinellas County's level of service (LOS) criteria was used to determine where surface inundation would be categorized as problematic. The target LOS criteria include:

- 100-year event habitable building protection (no flooding)
- 25-year event municipally-maintained ponds and channel peak stages within banks
- 25-year "passable" conditions for evacuation routes (less than 6 inches over road)
- 10-year "passable" conditions for other public roads (less than 6 inches over road)

Characterization of flood extent and depth is based on:

- 10-, 25- and 100-year modeled floodplains generated from the existing conditions ICPR model
- Aerial backdrop and DEM which allows identification of top-of-bank, low road and low site elevations (Finished floors assumed to be at grade for permanent buildings, although mobile homes are typically raised)

The areas of concern for Water Quality are based on:

- Septic and sewer line data from the Department of Health and Pinellas County
- Land use/land cover data coupled with drain pipe and pond locations to identify older development predating State water quality regulations such as 62-25, FAC
- City of Largo and Pinellas County identified water quality or operational problem areas

Primary areas of concern identified for flooding and water quality are presented in **Figure 2.1** and listed in **Table 2-1.** Priority status for flooding is designated in the table based on maximum depth and duration of flooding, with consideration of the associated road safety or property damage risk, areal extent of flooding, land use/cover, and the record of flood complaints. Descriptions of each flood prone area follow, grouped by municipality. Water quality concerns, common to all municipalities, are described in Section 2.4.

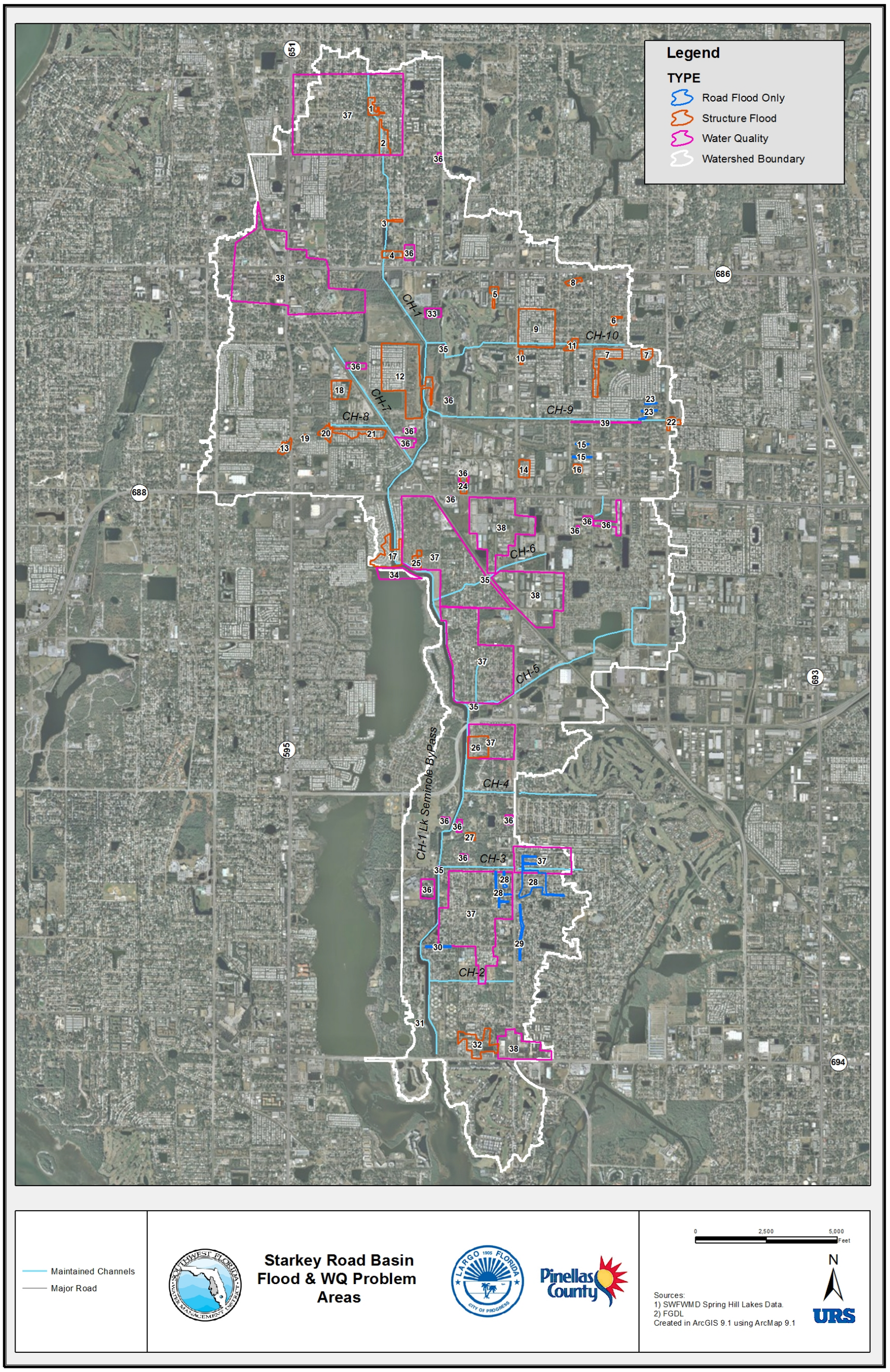

Figure 2.1 Starkey Road Basin Flood and Water Quality Problem Areas

Table 2-1 Starkey Road Basin Flooding and Water Quality Problem Areas

Area ID	Priority	Area Description	Problem/Severity
LARGO			
1	M	Eaton Dr NE from Croydan to Cambridge	Roadway inundated at 10-year. Flooding yards and potentially in homes at 100-year.
		Channel 1- adjacent parcels east of channel up to Canterbury Dr	Out-of-bank at 25-year; in yards and potentially in homes for 100-year.
		Dover Lane	Roadway flooding at 10-year and 1 possible home flood for 100-year.
		Cambridge Dr from Channel 1 east to Dover Ln	Roadway inundated at 10-year. South roadside yard flooding; potentially in homes for 100-year.
2	M	Channel 1 west of Balboa Lane from Cameo Way to Rosery Rd NE	Channel flow out of bank at 25-year.
		Balboa Lane and Paradise Lane from Cameo Way to Rosery Rd	Roadway inundated for 10-year; yards and $18^{+/-}$ homes flood at 25-year; 6 more homes flood for 100-year.
		Cameo Way between Balboa and Paradise	Roadway inundated at 10-year.
3	M	5^{th} Ave NE from Channel 1 to Highlands Ave	Roadway inundation-extensive parking lot flooding at 10-year. One potential home flood at 100-year.
4	M	2^{nd} Ave NE from Channel 1 to Highlands Ave	Roadway inundation-parking lot flooding at 10-year.
		Lots south of 2^{nd} Ave SE	6 buildings & large parking lot flooded at 25-year; 7 more buildings may flood at 100-year.
5	M	21^{st} Terrace SE south of East Bay Dr	Roadway inundation >1 ft for 10-year; 4 homes potentially flooding for the 25- and 100-year events.
6	H	Dahlia Place	Roadway inundated at 10-year; home flooding (2) at 25-year and 100-year.
		Gardenia Place & 34^{th} St SE between 6^{th} & 7^{th} Ave	Roadway inundation at 10-year; no structure flooding through 100-year.
7	L	Fairway Village Golfcourse/MHP	Ponds (NJ0090 and NJ0100) out-of-banks at 25-year with potential MH flood ($65^{+/-}$). 15 more MH may flood at 100-year.
		Eagle Dr N,W and S, Bogie Rd N, Fairway Blvd, Duffer Ln	Road inundation at 10-year.

Table 2-1 Starkey Road Basin Flooding and Water Quality Problem Areas

Area ID	Priority	Area Description	Problem/Severity
8	M	Lake Ave SE west of Fulton Dr	Yard flooding at 25-year. Some potential home flooding at 100-year.
9	H	East Bay Oaks MHP	Interior roads inundated at 10-year and many MH structures may flood at 25-year and 100-year.
10	L	MHP - Bermuda Way	Low MH lots west of Bermuda Way threatened at 25-year (13); 2 more at 100-year.
11	M	Lake Palms Drive at Willow Ave	Road inundation at 10-year. Residential lot/home flooding at 25-year (5) with 7 more at 100-year.
12	H	Apartments and MHP west of Channel 1 north of New Haven Dr and Donegan Road Waterview Dr near New Haven Dr	Interior roads/lots/buildings flooded at 25-year and 100-year. Pond (private ownership) west of Highland Ave out-of-banks (NE) for 25-year. 10-year road inundation – access to Apts. Pool/Recreation structure may flood for 25- and 100-year.
13	L	Palm Hill MHP - southern loop of Royal Palm Circle	2-3 low MH sites threatened for 25-year and 100-year.
14	L	Industrial Site at 20th Ave SE and Starkey Rd	Buildings/site flooded at 25-year and 100-year (low site).
15	L	Whispering Drive S and 138th Pl N between Tall Pines Dr and Wild Acres Rd	Road inundation for 10-year. No homes flooded at 25-year or 100-year.
16	L	Basin NE0010 pond at industrial site off Wild Acres Rd	Pond out-of-bank at 25-year. 25-year and 100-year flood potential for structure.
17	M	Four Seasons Estates (southern end)	Numerous lots flooded at 100-year. Low site elevations.
		Grosse Pointe Estates MHP on east side Channel 1	Numerous lots flooded at 100-year. Low site elevations.
UNINCORPORATED PINELLAS COUNTY			
18	M	Acorn MHP	Pond and channel out-of-banks at 25-year. $20^{+/-}$ MH sites flooded for 25-year, additional 30 sites flooded at 100-year.
19	L	Green Meadows MHP	1 private road inundated at 10-year and 3 lots threatened by 25-year and 100-year.

Table 2-1 Starkey Road Basin Flooding and Water Quality Problem Areas

Area ID	Priority	Area Description	Problem/Severity
20	H	Barrington Trace ALF west (upstream) of Twin Oaks Dr - Oak Crest MHP	Long duration Barrington Trace site flooding at 25-year and potential MH lot flooding at 25-year and 100-year due to tributary channel overbanking.
21	H	Oak Crest MHP along Channel 8	Basket Oaks Blvd (private) impassable for 10-year (>1 ft flood depth). Numerous Oak Crest lots adjacent to tributary channel threatened for 100-year.
22	L	Belcher Road at 142nd Ave	Belcher Square Carwash and Florida Central Credit Union structure flood potential at 25-year and 100-year. Road inundation.
23	L	14th Ave SE, 15th Ave SE, 15th Terrace SE	Road inundation at 10-year. No homes or yards impacted; no formal drainage system.
24	L	Cheryl Rd (north of Ulmerton)	Road inundation at 10-year. 5 parcels/ structures threatened at 25-year and 100-year.
25	M	126th Ave N and 98th St N (west of 97th St) Pond 650 ft north on 98th (behind lots)	Low-lying road inundated. Severe site and potential home flooding for 2 parcels at NE corner at 25-year. Empty parcels on west side flood at 25-year. 8 more homes potentially flood at 100-year. Pond overbanks at 25-year. 3 adjacent parcels/homes flood at 25- and 100-year.
26	M	92nd St N between 107th Ave N and 109th Ave N including western extent of 107th Ave, 108th Ave and 109th Ave	Potential home/garage flooding for the 100-year event ($21^{+/-}$ parcels).
27	L	98th Ave N east of Channel 1	Low road flooding. NA1690 private pond out-of-banks at 25-year. Site flooding and 1 potential carport/shed flooded at 25-year. One home may flood for 100-year.
28	L	93rd Ave N between 90th Way N and 86th Way N; 89th Way N and 90th St N south of 94th Ave N; 91st Terrace N and 95th Ave and Terrace N (Channel 3)	10-year road inundation. No structure flooding through100-year.

Table 2-1 Starkey Road Basin Flooding and Water Quality Problem Areas

Area ID	Priority	Area Description	Problem/Severity
29	L	Robin Rd between Rose Terrace and Jacaranda Ave	10-year road inundation. No structure flooding through 100-year.
SEMINOLE			
30	L	86th Ave N east of Channel 1 to 94th St N	Possible 10-year road inundation. No structure flooding through 100-year.
31	L	78th Ave west of Channel 1	10-year road inundation.
32	M	90th Way N, 91st St N and 92nd St N near (including) 76th Ave N. North of Park Blvd	10-year road inundation. Potential for structure flooding at 100-year.
WATER QUALITY (Watershed wide)			
33	L	Largo Alum Treatment Facilities	Treated flow currently baseflow (predominantly groundwater): 2.7-2.8 cfs with target 65% removal of fecal coliform & nutrients.
34	L	Pinellas County Alum Treatment Facility	Flow exchanges treated between Lake Seminole and Bypass Canal (Channel 1). Maintenance and operation issues.
35	L	Channel 10 near outfall; Channel 6 at Railroad; Channel 5 tributary at Fairweather Dr; Channel 3 near outfall	Potential non-point source runoff water quality issues from untreated runoff.
36	L	5 City of Largo parcels and 20 Unincorporated Pinellas County parcels identified with OSTDS/ Septic wastewater systems	None located near channel - not anticipated to be problematic provided they are properly maintained.
37	M	Large older residential areas (high density)	Little or no stormwater treatment prior to discharge into channels.
38	M	Older Commercial and Industrial Areas and Community Re-development Areas west of Seminole Blvd between 4th Ave NW and 4th Ave SW	Opportunity to reduce runoff and improve water quality through Low Impact Development (LID) design strategies during redevelopment or through source control and water quality retrofitting of existing areas.
39	M	Channel 9 near Coral Way	This area has a history of illegal dumping of debris.

2.1 City of Largo Flood Prone Areas

Seventeen flood prone areas were identified within the City of Largo limits which violated the target level of service described in Section 2.0. These areas (1 through 17) are identified in **Figure 2.1**. Causes of flooding vary by location and include under-designed secondary drainage components (both public and private), adverse tailwater conditions created by primary conveyance system flood stages (open channels, storm pipes and ponds), lack of formal drainage facilities in some older developments, and overgrowth/siltation of collector ditch/swale systems.

Northern Channel 1 flood prone areas include flood areas 1 through 4 in the northern portion of the watershed. Flooding appears to be associated with inadequate cross drain capacity resulting in out-of-bank flooding of Channel 1 and generally impacts residential streets and yards. Flooding is of fairly short duration. Several recommended culvert improvements have been implemented, in whole or in part, since the City of Largo Master Stormwater Management Plan was completed (1993), but remaining unconstructed projects, such as the Main Street (1st Ave NE) culvert upgrade, are still constricting flood flow.

Flood areas associated with the Channel 10 major subbasin include areas 5 through 11. Several are private drainage systems. Flood area 5 represents a 750-ft stretch of residential roadway north of East Bay golf course, 21st Terrace SE, that lacks formal drainage facilities and has a limited capacity ditch outfall resulting in ponding of water over the roadway and intrusion into yards during high intensity events. Flood area 6 includes Dahlia Place and Gardenia Place cul-de-sacs that drain westward to concrete swales discharging to an undersized or silted collector ditch for Channel 10. Road and site grading on the south side of the Dahlia Place cul-de-sac allow runoff to flow down driveways to low-lying yards/garage areas at elevations equal to or lower than the outfall swale. Flood area 8 is comprised of homes along Lake Avenue SE whose backyards and structures are threatened by high flood stages in a wetland located behind the parcels discharging to the Fulton Drive stormwater system, which is operating at full capacity for design events. High flood stages have a relatively short duration.

Along the primary Channel 10 conveyance, cross drain culverts constrict flow at Lake Palms Drive and at Starkey Road, creating interior roadway and site flooding for East Bay Oaks Mobile Home Park (area 9 and for adjacent residential parcels near Lake Palms Drive and Willow Avenue (area 11). Interior roadway and lot flooding also occurs for Fairway Village and Paradise Island mobile home areas (areas 7 and 10) but is associated with privately owned and designed stormwater ponds and outfall structures, rather than tailwater conditions/flood stages in Channel 10.

Flood area 12 impacts a large apartment complex and mobile home park located west of Channel 1 in the vicinity of New Haven Drive and Donegan Road. Although both New Haven Drive and Donegan Road are equipped with multiple pipe cross drains of large diameter, the main channel's construction is more pond-like in this region and banks are overtopped for the 25-year

design event. The eastern floodplain is primarily comprised of recreational/golf course property with some residential areas constructed above the 100-year flood level. Development seems to have been constructed at lower elevations on the western bank resulting in widespread yard/lot flooding for a 25-year event and potential structure flooding for a 100-year event. The Donegan Road cross drain appears to constrict flows to some degree, creating a 0.5 to 0.7 foot rise in the profile.

Flood area 13, west of Seminole Boulevard, represents Palm Hill Mobile Home Park private pond overbanking at the 25-year event and lot flooding (fairly shallow) for 10-11 units for a 100-year event. The pond is equipped with a weir outfall to Seminole Boulevard's double box culvert cross drain tributary to Channel 8. Flood areas 14 and 16 represent industrial sites east of Starkey Road within the Channel 9 major subbasin, not directly connected to City/County drainage systems, whose paved sites flood for 25-year and 100-year events with possible structure flooding. Also within the Channel 9 major subbasin, flood area 15, representing residential streets Whispering Drive and 138th Place between Tall Pines Drive and Wild Acres Road, experiences nuisance flooding for a 10-year event associated with high stages in the privately-owned pond located between these roads. Flooding through the 100-year event is restricted to the roadway and does not threaten structures.

The last flood area – 17 is located along Channel 1 just north of Pinellas County's alum treatment facility and the Lake Seminole – Bypass Canal pump station. Level of service is generally met with the exception of a small area of 25-year channel overbanking impacting five lots of the Four Seasons Estates mobile home park and 100-year lot flooding which may or may not impact raised structures on either side of the channel's eastward bend.

2.2 City of Seminole Flood Prone Areas

Three flood areas have been identified within the City of Seminole presented in Figure 2.1 as areas 30, 31 and 32. Flood area 30 represents a 900 foot stretch of 86th Avenue N on the east side of Channel 1which may be impassable for a short duration during a 10-year design event but meets 25-year and 100-year flood LOS. Flood area 31 is located between Lake Seminole and the Channel 1 Bypass Canal on 78th Avenue N. Channel 1 peak stage may create impassable conditions for a limited duration during a 10-year event. Private properties and structures are not threatened for the 25-year and 100-year events. Flood area 32 is located east of Channel 1 and north of Park Boulevard and impacts commercial and residential areas in the vicinity of 90th Way N, 91st Street N, and 92nd Street N near 76th Ave N. 10-year road inundation and potential structure flooding for the 100-year event appear to be caused by undersized storm pipes and are not tied to main channel peak stages.

2.3 Unincoporated Pinellas County Flood Prone Areas

Twelve flood areas, areas 18 through 29 on **Figure 2.1**, were identified for unincorporated Pinellas County. Flood areas are described below.

Flood area 18 represents mobile home lot flooding in Acorn Mobile Home Park associated with its private pond overbanking for the 10-year and 25-year event, as well as out-of-bank flooding of Channel 7 and a tributary to Channel 7 running along the north boundary of the park. Site flooding, even for the 100-year event is shallow but widespread. The Acorn stormwater pond discharge is controlled by a 12-inch diameter outfall pipe.

Flood area 19 represents very localized flooding of an interior road within the Green Meadows Mobile Home Park for the 10-year event and site flooding that may threaten 3 low-lying structures, depending on their foundation heights. A large upstream contributing area, with flow carried across Seminole Boulevard via two 10-ft x 5-ft box culverts is constricted at this point, with the majority of the flood flows being carried overland, rather than through the culvert, across the roadway and through upland green space.

Flood area 20 represents a 1.5^{+} acre undeveloped portion of the Barrington Trace Assisted Living Facility just downstream of area 19 where eastward flows entering Channel 8 pool behind a raised berm (utility easement/future road) with only a 42-inch CMP outfall. No structures on this property are threatened but site inundation is of long duration. Flow is predominantly carried overland across a low spot on the raised berm into a ditch which runs along the western boundary of the Oak Crest Mobile Home Park. Ditch capacity is exceeded for even a 10-year event, causing sheet flow through mobile home lots along Twin Oaks Drive, south of Channel 8 which can last for over 12 hours. Flow into Channel 8 is controlled by the double 36-inch x 48-inch elliptical cross drains beneath Twin Oaks Drive.

Flood area 21 reflects 100-year site flooding in Oak Crest Mobile Home Park on either side of Channel 8, which may or may not threaten mobile home structures depending on foundation designs. Roadways within Oak Crest Mobile Home Park meet the 10-year LOS and Channel 8 remains within banks for the 25-year design storm.

Flood area 22 is located at the intersection of Belcher Road and 142nd Avenue. Flood stages for the 25-year and 100-year events cause significant street and paved commercial area flooding which may threaten two commercial structures. Flood area 23 represents potentially impassable roadways for the 10-year design storm event at low areas along 14th and 15th Avenues SE and 15th Terrace SE. Street drainage is limited to concrete swale gutters without inlets, discharging to Channel 9 or tributary ditches thereof. No homes or yards are impacted through the 100-year event. Flood area 24, along Cheryl Road north of Ulmerton Road has limited access to Ulmerton Road drainage systems causing significant roadway and site inundation for the 10-year and 25-year events and potential structure flooding for the 100-year event. Review of approved Ulmerton Road improvement plans for this area indicates that this flood area will be addressed once new roadway inlets and pipes are constructed.

Flood area 25 represents significant 10-year roadway inundation at the low-lying intersection of 126th Avenue N and 98th Street N, as well as 25-year overbanking of small, poorly maintained ponds serving the Blue Water Cove residential area. Based on the available DEM, there may be a low bank section along Channel 1 that allows predominantly contained flood stages to spill into this area for the 25-year and 100-year events. Several low-lying homes may be threatened for the 100-year event.

Flood area 26, also associated with flood stages along Channel 1, represents potential 100-year design event home flooding along of 92nd Street N between 107th and 109th Avenues N as well as homes on the western ends of 107th, 108th and 109th Avenues. Roadway LOS is met for the 10-year event and Channel 1 remains within banks for the 25-year event.

Flood areas 27, 28, and 29 are low priority areas with roadway flooding for the 10-year event in excess of 6 inches, but of short duration. Properties and homes are not threatened through the 100-year event with the exception of area 27 where one shed/carport is in the floodplain and one home may flood for the 100-year event, depending on its finished floor elevation.

2.4 Water Quality Concerns

No significant point sources creating water quality concerns have been identified within the Starkey Road Basin. Areas of concern with respect to water quality within this watershed are called out in general terms based on the age and type of development and the absence of BMPs that are generally incorporated into modern construction.

Water quality area 33 represents the City of Largo alum treatment facility which diverts normal flows from Channel 1 roughly 1/3 mile south of East Bay Drive to a 3-acre pond located east of the channel. The diversion structure allows high flows to bypass the treatment facility. The primary objective of the treatment plant is to reduce nutrients and fecal coliform loading by 65 percent using alum dosing and settling. The City of Largo has indicated that the base flow which comprises the primary treatment volume is believed to be predominantly groundwater. The primary concern is maintaining sufficient operating and maintenance budget. No data were available regarding removal efficiencies realized since the facilities became operational.

Water quality area 34 represents the Pinellas County alum treatment and pumping facility, located at the northeast corner of Lake Seminole where flow exchange between the lake and the Lake Seminole Bypass Canal (Channel 1) occurs. During the dry season, water is pumped from the lake to the Bypass Canal. During the wet season, water is pumped from the bypass canal to the lake. Pumped water is treated with alum to remove nutrients and directed to a settling area. Alum floc is directed to the sanitary sewer system. The pumping and dosing facilities have experienced maintenance/operation problems that reduce system reliability.

Water quality areas labeled 35 are located near the outlets of tributary Channels 3, 5 and 10 and at the railway crossing of Channel 6. Each of these locations has potential for significant washoff loading from commercial, industrial, and/or residential land uses predating water quality regulation that could be monitored to obtain land use-specific pollutant loading characteristics.

Water quality areas labeled 36 represent parcels with on-site wastewater treatment and disposal systems or septic wastewater systems listed in the Health Department database. There are 5 parcels within the City of Largo and 20 within unincorporated Pinellas County. None are located in proximity to open stormwater conveyance channels and some appear to be close to municipal sanitary lines. Provided that the systems are properly maintained, they pose minimal concern. Consistent with Florida Statutes Chapter 381.0065, for on-site sewage flows in excess of 1,000 gallons per day with a sanitary easement/ROW abutting the property line or within 50 feet of the property line, property owners are to connect to public systems within 365 days. This applies even if parcels and the nearest available sewer lines are in different municipalities.

Water quality area 37 polygons on **Figure 2.1** represent large residential areas constructed prior to state storm water regulation. Most rely on small concrete or grassed swales at the edge of pavement to carry street runoff to the nearest ditch system by gravity flow. Often the original shallow grassed conveyance ways are obstructed by property owners as they perform landscaping or driveway improvements, unaware of the impact of their activities. Home and yard maintenance activities such as fertilizing, inappropriate disposal of grass clippings or raked/blown leaf litter, exposed soils, non-stormwater discharges (vehicle washwater, chemically treated pool drains, illegal dumping of household chemicals/oils) contribute a variety of pollutants, potentially high in nutrients, to the receiving water systems. Most of these areas are not served by retention or detention ponds, engineered filtering swale systems or similar treatment BMPs.

Water quality area 38 polygons on **Figure 2.1** represent various older commercial and industrial areas as well as identified Community Redevelopment Areas located west of Seminole Boulevard between 4th Avenue NW and 4th Avenue SW in the City of Largo. These areas were developed, for the most part, prior to state stormwater regulation and incorporate a high percentage of directly connected impervious area. Concentrated areas of vehicle parking and outdoor material storage create a potential for higher loadings of suspended solids, metals, oils and greases, and residue from chemical spills. Few storm water retention or detention facilities exist within these areas.

Water quality area 39 is located along Channel 9 near Coral Way and represents an area where illegally dumped household debris (furniture, trash, mattresses, etc.) has been observed or reported by the County. Improper disposal of solid waste has potential to cause water quality problems from residual chemicals or petroleum based products in discarded containers or pollutant leaching from appliances or furniture after prolonged exposure to water and flooding problems associated with physical obstruction of channels, cross drains and tributary ditches.

3.0 ALTERNATIVE BMP FORMULATION

The types of BMPs considered in this analysis included, Flood Control (FC), and Water Quality (WQ). The following list, while not exhaustive, shows the variety of available BMPs considered in this analysis.

- Detention ponds (FC & WQ)
- Add conveyance structures (Structural FC)
- Raise structures/roadways (Structural FC)
- Purchase flood affected areas (Non-Structural FC)
- Improve capacity of channels (Structural FC)

3.1 BMP Development Process

Following completion of the existing conditions model analysis, the level of service (LOS) evaluation and a review of past flood complaints within the watershed potential flood problem areas were identified as described in Section 2.0. The Pinellas County Department of Environmental Management, Pinellas County Department of Public Works, City of Largo, and District Engineering and Operations staff worked together to develop a list of over 30 conceptual BMPs that could reduce the duration and depth of flooding in and along the Starkey watershed channels and improve water quality. Problem areas and potential BMP approaches are summarized in **Table 3-1**. It is recommended that for problem areas with priority associated with undocumented structural flooding that actual floor elevations be verified before proceeding with design of engineered alternatives.

Identified areas of concern were cooperatively reviewed in meetings with Pinellas County, City of Largo and SWFWMD. A short list of structural BMPs to be modeled using ICPR was selected. **Figure 3.1** presents the location of structural BMPs selected for modeling. Water quality BMPs were also selected. The final short list of problem areas and associated BMPs is presented as **Table 3-2**.

Table 3-1 Problem Area BMP Options

Area ID	Area Description	BMP Options		
LARGO				
1	Channel 1 and Eaton Drive NE from Croydan to Cambridge	Upgrade Cambridge Drive cross drain.	Downstream channel conveyance improvement.	
2	Channel 1 west of Balboa Lane from Cameo Way to Rosery Rd NE	Check adequacy of upgraded Rosery Drive cross drain.	Expand Woodbrook CIP culvert upgrade (partially implemented) to recommended capacity (additional 42 sq. ft. opening).	
3	5th Ave NE from Channel 1 to Highlands Ave	Implement Main St/1st Ave NE CIP culvert upgrade.	Offset increased downstream flow, if needed, by additional retention/ detention on City parcel west of Alum treatment diversion weir - Basin A0870.	Create additional pond storage on City parcel east of existing pond.
4	2nd Ave NE from Channel 1 to Highlands Ave	Implement Main St/1st Ave NE CIP culvert upgrade.	Offset increased downstream flow, if needed, by additional retention/ detention on City parcel west of Alum treatment diversion weir - Basin A0870.	Create additional pond storage on City parcel east of existing pond.
5	21st Terrace SE south of East Bay Drive	More detailed study of local drainage ditch outfall required.	Provide piped outfall to primary channel (if absent).	
6	Dahlia Place and Gardenia Place	Cross section improvement for south flowing tributary ditch.	Correct local roadway swale/discharge flume grade to circumvent flow down driveways.	Purchase chronic flooding lots.
7	Fairway Village Golfcourse and Mobile Home Park	Flooding a result of private pond outfall sizing, not tailwater in primary channel.		

Table 3-1 Problem Area BMP Options

Area ID	Area Description	BMP Options		
8	Lake Avenue SE west of Fulton Drive	Improve existing outfall to Fulton Drive storm drainage system.	Raise wetland area's southern bank.	Portable pump floodwater relief, as required.
9	East Bay Oaks Mobile Home Park	Implement CIP culvert upgrade at Starkey Road and Channel 10		
10	Mobile Home Park - along Bermuda Way	Flooding a result of private pond outfall sizing, not tailwater in primary channel		
11	Lake Palms Drive at Willow Avenue	Implement CIP culvert upgrade at Starkey Road and Channel 10	Cleanout/improve Channel 10 from Lake Palms Drive to Starkey Road	Upgrade culvert at Lake Palms Drive
12	Apartments and Mobile Home Park west of Channel 1 north of New Haven Drive and Donegan Road	Implement CIP culvert upgrades at New Haven Drive and Donegan Road		
13	Palm Hill Mobile Home Park - southern loop of Royal Palm Circle	Private property and pond - No BMP		
14	Industrial Site at 20th Ave SE and Starkey Rd	Private property not connected to City system - No BMP		
15	Whispering Drive S and 138th Place N between Tall Pines Drive and Wild Acres Road	Existing pond is located within a private utility easement - expansion unlikely. No BMP	Raise local road grade to meet “passable” LOS criteria	
16	Basin NE0010 pond at industrial site off Wild Acres Road	Private property and pond discharging to Ulmerton Road system - No BMP		
17	Four Seasons Estates MHP (southern end) on west side of Channel 1 and Grosse Pointe Estates MHP on east side Channel 1	Lower Channel 1 profile by implementing CIP bridge culvert to span bridge upgrade at Park Boulevard – This BMP is under Pinellas County jurisdiction	Remove Channel 1 salinity barrier to lower Channel 1 profile (potential water quality impacts) – This BMP is under Pinellas County jurisdiction	

Table 3-1 Problem Area BMP Options

Area ID	Area Description	BMP Options		
UNINCORPORATED PINELLAS COUNTY				
18	Acorn Mobile Home Park	Implement CIP cross-section improvements for Channel 7 (BW=20' SS=2H:1V)	Increase culvert capacity of City of Largo Maintenance Facility driveway culverts on tributary ditch north of MHP	Re-assess adequacy of upgraded CIP culverts along Channel 7
19	Green Meadows Mobile Home Park	Upgrade 48-inch CMP in poor condition		
20	Barrington Trace ALF west (upstream) of Twin Oaks Drive - Oak Crest Mobile Home Park	Improve cross drain at Channel 8 and Twin Oaks Drive	Improve cross drain at Barrington Trace property boundary along with upstream ditch maintenance	
21	Oak Crest Mobile Home Park along Channel 8	Improve Channel 8 cross sections downstream of Twin Oaks Drive		
22	Belcher Road at 142nd Avenue	Upgrade Tall Pines Drive culvert on Channel 9	Implement Channel 9 CIP culvert upgrade at Starkey Road	
23	14th Avenue SE, 15th Avenue SE, 15th Terrace SE	Improve hydraulic profile in Channel 9 through channel cross section and/or pipe crossing upgrades	Design an improved local drainage system	
24	Cheryl Road (north of Ulmerton Road)	Upcoming Ulmerton Road widening and curb and gutter improvements solve this problem.		
25	Blue Water Cove ponds and roadway at 126th Avenue N and 98th Street N (west of 97th Street)	Restore original pond design depth and structure capacity	Increase Blue Water Cove pond storage and/or discharge capacity	Implement Park Blvd bridge culvert upgrade CIP and/or remove salinity barrier to lower Channel 1 profile

Table 3-1 Problem Area BMP Options

Area ID	Area Description	BMP Options		
26	92nd Street N between 107th Avenue N and 109th Avenue N including western extent of 107th Avenue, 108th Avenue and 109th Avenue	Implement Park Blvd bridge culvert upgrade CIP and/or remove salinity barrier to lower Channel 1 profile.		
27	98th Avenue N east of Channel 1	Private property and pond with low risk - No BMP		
28	93rd Avenue N between 90th Way N and 86th Way N; 89th Way N and 90th Street N south of 94th Avenue N; 91st Terrace N and 95th Avenue and Terrace N (Channel 3)	Flooding appears related to Channel 3 stage; Evaluate cross drain capacity along Channel 3.	Implement Park Blvd bridge culvert upgrade CIP and/or remove salinity barrier to lower Channel 1 profile.	
29	Robin Road between Rose Terrace and Jacaranda Avenue	Raise local road grade		
SEMINOLE				
30	86th Avenue N east of Channel 1 to 94th Street N	Raise local road grade		
31	98th Street N north of 78th Avenue	Implement Park Blvd bridge culvert upgrade CIP and/or remove salinity barrier to lower Channel 1 profile.	Raise local road grade	
32	90th Way N, 91st Street N and 92nd Street N near (including) 76th Avenue N north of Park Blvd	Evaluate culvert sizes	Implement Park Blvd bridge culvert upgrade CIP and/or remove salinity barrier to lower Channel 1 profile.	
WATER QUALITY (Watershed wide)				
33	Largo Alum Treatment Facilities	Research additional/alternative treatment protocols for more efficient stormwater runoff pollutant removal.	Expansion of existing pond limited by surrounding wetlands	Allocate more resources to ongoing operation and maintenance of the existing facility
34	Pinellas County Alum Treatment Facility	Research additional/alternative treatment protocols for more efficient stormwater runoff pollutant removal.	Allocate more resources to ongoing operation and maintenance of the existing facility	

Table 3-1 Problem Area BMP Options

Area ID	Area Description	BMP Options		
35	Channel 10 near outfall; Channel 6 at Railroad; Channel 5 tributary at Fairweather Dr; Channel 3 near outfall	Establish water quality monitoring stations to identify issues if they exist		
36	5 Largo parcels and 20 Unincorporated Pinellas County parcels identified with OSTDS/Septic wastewater systems	Per Florida Statute Title XXIX, Chapter 381.0065 require parcels within 50 feet of existing sanitary sewer lines to abandon septic and hook up to available sanitary sewer systems.		
37	Large older residential areas (high density)	Public awareness campaigns to encourage xeriscaping, low fertilization landscapes, pervious pavement for add-on patios, drives, rain barrel-rainwater collection/reuse, etc.	Installation of in-line water quality inlets (Stormceptor, Baffle Box, Vortex, etc)	Increase regular street sweeping programs in older residential areas - Current frequency (non-arterial) is 1x per 13 weeks
38	Older Commercial and Industrial Areas and Community Redevelopment Areas west of Seminole Blvd between 4th Avenue NW and 4th Avenue SW	Commercial/Public: functional landscaping and buffers for runoff infiltration, green-roofing, minimizing directly connected impervious areas, incentives for organic mulching over fertilizers	Industrial: Site review and periodic inspection of NPDES Industrial Activity stormwater pollutant prevention plans and practices where applicable	Install inline WQ inlets where possible (Stormceptor, Baffle Box,Vortex, etc)
39	Channel 9 near Coral Way	Install inline WQ Baffle Box/Debris filter at Tall Pines Dr pipe crossing (combine with Flood Control BMP)	Increase ditch inspection/ maintenance frequency	

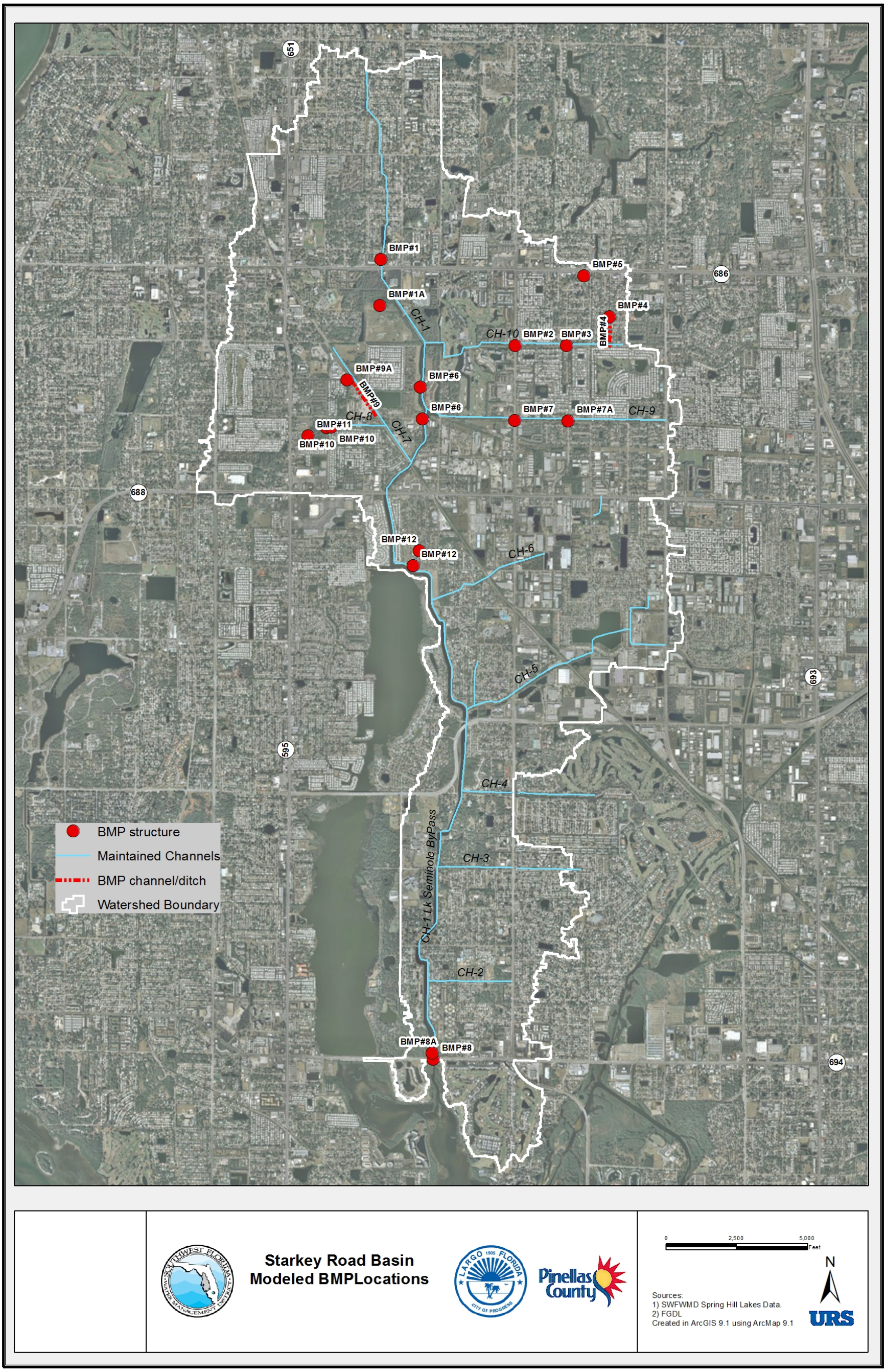

Figure 3.1 Modeled Flood Control BMP Locations

3.2 Alternative BMP Concepts

Twelve structural and two non-structural preferred alternatives were selected for detailed analysis from the problem areas and conceptual BMPs described in **Table 3-1**. The list includes additional culvert construction, conveyance improvements, low impact development (LID) water quality improvements. **Appendix A** contains several tables presenting pollutant reduction potential associated with various structural and non-structural storm water BMPs. In addition to the preferred BMP's, it is recommended that the areas within the watershed requiring maintenance as described in **Table 2-5** of the *StarkeyRoad Basin Watershed Evaluation Report* (October 2012), be addressed regardless of whether the BMPs are implemented or not.

3.3 Alternative BMP Evaluation

The preferred BMPs were evaluated based on cost, environmental benefits / impacts, permitting issues, and flood protection benefits. Environmental impacts were assessed qualitatively as low, medium, or high depending on the extent of the damage to natural systems, and if the damage would be permanent or temporary. Excluding minor impacts during construction, any impacts would be unacceptable.

The flood protection benefit was estimated as the reduction in peak flood levels and duration of flooding in the Starkey watershed main channel during passage of the 10-, 25- and 100-year flood events.

Permitting difficulty is designated as low, medium or high level of effort needed. A BMP that is difficult to permit is given a low priority for implementation. The difficulty in obtaining easements or land purchase was considered in assigning priority for implementation.

The off-site impact of implementing these BMPs was one of the evaluation criteria. If implementing the BMP would cause off-site impacts, the priority for development was lowered. Off-site impacts have been generally defined as increases in the water surface profile of hydraulically connected systems that create a new violation of the defined level of service for roads, sites, buildings, water storage areas or conveyances or increases existing exceedances of the desired level of service. A rise in peak water surface elevation within open water conveyances of greater than 0.1 foot for the 100-year design event is considered an "impact" unless it occurs at the immediate downstream end of upgraded culverts in municipal systems. These are evaluated on a case-by-case basis to assure that the rise does not create out-of-bank flooding or increased site flooding for connected systems. The difficulty in obtaining easements or land purchase was considered in assigning the priority for implementation. The designations of low, medium and high are used for the level of effort needed.

URS developed a detailed existing condition ICPR hydrologic and hydraulic model that estimates flood elevations throughout the watershed for various design storm events.

Twelve of the fourteen preferred BMP alternatives (1-12) were simulated by modifying the existing conditions model to include replacement structures, expanded storage or improved cross sections. For each BMP alternative, model parameters for structural elements were modified based on the proposed alternative and the model was rerun for the following three storm events:

- 10-year, 24-hour
- 25-year, 24-hour
- 100-year, 24-hour

The peak flood elevations for existing and proposed conditions for each of the modeled alternatives were compared to determine relative benefits and potential off-site impacts. Each BMP was initially tested independently from other proposed BMPs in order to assess the importance of BMP sequencing or interdependence in its effectiveness. The final Proposed Condition model for the Starkey Road Basin incorporates all of the preferred BMPs and also reflects basin curve numbers (CN) computed using the future land use condition, as requested by Pinellas County. Peak flood elevation comparisons are tabulated in **Appendix B** for the existing condition and proposed condition models.

Future implementation of BMPs and associated permitting will require more detailed assessment of local conditions and survey of local site and hydraulic structures representative of conditions at the time of final design. Preliminary construction quantities estimates were determined for each alternative following the model evaluation. Cost estimates were then performed using Florida Department of Transportation cost tables (2012) and pay items. Detailed cost sheets are provided in **Appendix C**.

ANALYSIS OF ALTERNATIVES

An evaluation of each of the preferred alternatives is given in this section. Existing and proposed conditions are presented. Important considerations are identified, model results are tabulated and discussed, and recommendations are provided.

ALTERNATIVE 1 – CULVERT UPGRADES AT MAIN STREET (CHANNEL 1)

Based on the existing conditions model and documented flood complaints, flooding was reported at 5th Avenue NE from Channel 1 to Highlands Avenue, 2nd Avenue NE from Channel 1 to

Highlands Avenue and in Lots south of 2nd Avenue SE in Largo north of East Bay Drive. The existing culverts at Main Street in the Willowbrook Apartments are a restriction to flow in Channel 1.

Three existing culverts at Main Street provide conveyance for the Starkey Channel 1 in this area. This alternative proposes replacing the existing culverts with new larger box culverts. The additional culverts will increase conveyance during major storm events.

Existing Conditions: (3) 48"x72" Elliptical Metal culverts

Proposed Conditions: Replace existing culverts with 3-12'x 6'box culverts for conveyance, as recommended in the previous stormwater management plan.

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of this alternative is approximately $400,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- 5th Avenue NE road flooding is reduced by 5 inches and meets the target LOS after implementing BMP#1
- 2nd Avenue NE road flooding is reduced by 5 inches
- 2nd Ave NE maximum road inundation over a 300 LF stretch local to the crossing still exceeds the target LOS depth of 6 inches

- 2nd Ave NE impassable conditions duration is reduced from 3 hours to 2 hours

Waterbodies and Waterways LOS Target = 25-year contained in banks

- The regional pond (NA1980) WSEL exceeds the top of bank elevation of 9.0 feet NAVD under existing and proposed conditions, however 25-year flood stage in the pond is reduced by 9 inches
- 25-year flow in the channel between 2nd Avenue and Main Street (NA1970) is reduced by 12 inches by BMP#1 but exceeds the low bank elevation of 9.0 feet NAVD by one foot. Duration of out-of-bank flooding is reduced from 4 hours to 1 hour
- 25-year flow stage in the downstream channel between Main Street and East Bay Drive (NA0500) rises 5 inches with BMP #1 but remains within banks under existing and proposed conditions. 100-year downstream flow stage is not impacted by this project.

Building LOS Target= 100-year below finished floor

- 100-year flood stages are reduced by 3 inches yet still predict flood depths approximately 6 inches (NA1970) above the low site elevation of 10.8 feet NAVD (buildings south of 2nd Ave NE between Channel 1 and Highlands Ave) with a flood duration reduced from 4 hours to 1 hour.

There are no negative offsite impacts associated with BMP#1. Refer to Appendix B for complete results.

Recommendations:

This alternative decreases the peak stages and duration of flooding in the Channel 1 area upstream of the culverts. An Environmental Resource Permit will be required. The permitting and land acquisition difficulty should be low.

ALTERNATIVE 2 – CULVERT UPGRADE AT STARKEY ROAD ON CHANNEL 10 NEAR EAST BAY OAKS MHP

Based on the existing conditions model and documented flood complaints, flooding was reported at East Bay Oaks MHP in Largo.

This alternative proposes to utilize the culvert upgrade recommended in the previous stormwater master plan at Starkey Road and Channel 10 (BMP#2). The additional culvert will increase conveyance during major storm events.

Existing Conditions: (1) 10’ x 5’ box culvert

Proposed Conditions: Construct one additional 10’ x 5’ box culvert under Starkey Road

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of Alternative 2 is approximately $263,000.

Model Results:

Road LOS Target =10-year “passable” (less than 6 inches over low road)

- Public roads, Starkey Rd and Willow Ave meet the 10-year LOS under existing and proposed conditions. Private roadways in the East Bay MHP are passable under existing and proposed conditions for the 10-year event

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Existing out-of-bank flooding of Channel 10 upstream of Starkey Road is reduced by 5-10 inches for the 25-year event, and associated mobile home park site/potential structure flooding (elevation 12.3 feet NAVD) is eliminated. Proposed peak WSEL is within banks at Starkey Road (NJ0160) but exceeds the top of bank elevation of 11.5 feet NAVD by 10 inches approximately 500 feet eastward (NJ0155). Out-of-bank flow conditions are reduced from 3 hours to 1.5 hours by Alternative 2.

Building LOS Target= 100-year below finished floor

- 100-year flood stages are reduced by 6 to 11 inches by BMP#2, leaving approximately 1.5 to 9.5 inches above the low site elevation of 12.3 feet NAVD (mobile home structures are typically elevated above the site but floor elevations are unknown). 100-year flood duration above 12.3 NAVD is reduced from 4 hours to 2 hours.

There are no negative offsite impacts associated with BMP#2. Downstream Channel 10 flows remain in banks for all events and the 100-year profile is not increased. Refer to Appendix B for complete results.

Recommendations:

This alternative reduces the peak stages and duration of flooding for Channel 10 near Starkey Road and for the East Bay Oaks mobile home park. Remnant 100-year site flooding may or may not result in structure flooding depending on mobile home foundation heights. An Environmental Resource Permit would be required. The permitting and land acquisition difficulty would be low.

ALTERNATIVE 3 – CULVERT UPGRADES AT LAKE PALMS DRIVE ON CHANNEL 10

Based on the existing conditions model and documented flood complaints, flooding was reported at Lake Palms Drive and Channel 10 and at Willow Ave in Largo.

This alternative is proposed in combination with the downstream culvert upgrade, Alternative 2, at Starkey Road and Channel 10. Alternative 3 proposes to upgrade the culverts at Lake Palms Drive. The additional culverts will increase conveyance during major storm events.

Existing Conditions: (2) 54" Circular culverts at Lake Palms Drive.

Proposed Conditions: Replace existing culverts with 12'x 5'box culvert for conveyance.

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of this alternative is approximately $223,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Starkey Rd and Willow Ave meet the 10-year LOS under proposed conditions with a 1.1-foot reduction in peak 10-year flood stage.

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Existing out-of-bank flooding of Channel 10 upstream of Lake Palms Drive (NJ0150) is reduced by 14 inches for the 25-year event, and associated low site/potential residential structure flooding (elevation 13.5 feet NAVD) is eliminated. Proposed peak WSEL exceeds the top of bank elevation of 12.5 feet NAVD by 6 inches with out-of-bank duration reduced from 3.5 hours to 1 hour by implementing Alternatives 3 and 2.

Building LOS Target= 100-year below finished floor

- 100-year flood stages are reduced by 8 inches by BMP#3, leaving approximately 3 inches above the low site elevation of 13.5 feet NAVD (actual finished floor elevations are unknown). 100-year flood duration above 13.5 NAVD is reduced from 4 hours to 1 hour.

There are no negative offsite impacts associated with BMP#3. Channel 10 downstream 100-year profile is not increased. Refer to Appendices A and B for complete results.

Recommendations:

This alternative, if implemented independently of Alternative 2 will cause unacceptable increases in flooding upstream of Starkey Road. If constructed concurrently or after construction of Alternative 2, Alternative 3 reduces the peak stages and duration of flooding for Willow Avenue residences upstream of Lake Palms Drive and meets the 10-year roadway level of service. Remnant 100-year flooding (3 inches) of low structures for a short duration is still possible. An Environmental Resource Permit would be required. The permitting and land acquisition difficulty would be low.

ALTERNATIVE 4 – CHANNEL 10 TRIBUTARY DITCH IMPROVEMENTS & DAHLIA PLACE AND GARDENIA PLACE OUTFALL IMPROVEMENTS

Based on the existing conditions model and documented flood complaints, significant road flooding of long duration was reported at Dahlia Place and Gardenia Place in Largo. Low home sites on Dahlia Place potentially flood for a 25-year return frequency event. Dahlia Place and Gardenia Place discharge to a south-flowing tributary ditch of Starkey Channel 10 which flows west to Channel 1.

This alternative proposes re-grading the south-flowing tributary ditch west of these roads to expand the bottom width and recreate a positive ditch bottom gradient. The Channel 10 tributary ditch is overgrown and undersized to provide adequate conveyance. New inlet/collection structures between the Dahlia Place and Gardenia Place cul-de-sac roadway are also proposed to fully convey roadway runoff through the collector system without overflow down driveways.

Existing Conditions: Concrete swales to overgrown and silted tributary ditch.

Proposed Conditions: Improve the Channel 10 tributary ditch from Dahlia Place outfall to confluence with Channel 10 (Bottom width=3.5 feet and bank slopes of 3H:1V). Add inlets and lower outfall from the Dahlia Place and Gardenia Place cul-de-sac roadway.

Environmental Concerns: Medium – Some potential wetland impacts from Channel 10 improvements.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of alternative 4 is approximately $99,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Dahlia Place and Gardenia Place road flooding is reduced by 7 inches and meets the target LOS after implementing BMP#4

Waterbodies and Waterways LOS Target = 25-year contained in banks

- The currently flooding tributary ditch near Dahlia and Gardenia Place (NJ0027) remains within the top of bank elevation of 13.5 feet NAVD under proposed conditions with peak 25-year stage reduced by 11 inches
- Existing structure flooding at Dahlia Place for the 25-year event is eliminated by BMP#4

Building LOS Target= 100-year below finished floor

- 100-year flood stages are reduced by 4 inches by BMP#4 alone, leaving approximately 2 inches (NJ0028N) above the low site elevation of 14.0 feet NAVD (residences on south side of Dahlia Place cul-de-sac. Flood duration is reduced from 3 hours to < 1 hour.
- 100-year flood stages are reduced by 7 inches if BMP#4 is combined with Channel 10 Alternatives 2 and 3, eliminating structure flooding for the 100-year event.

There are no negative offsite impacts associated with BMP#4. Refer to Appendix B for complete results.

Recommendations:

This alternative, when implemented independent of Alternatives 2 and 3 downstream, reduces the peak stages and duration of flooding at Dahlia Place and Gardenia Place to meet the roadway level of service and eliminate existing 25-year structure flooding. Remnant 100-year flooding of 2-inches for a short duration is still possible at Dahlia Place. Implementation of the culvert upgrades along Channel 10 (Alternatives 2 and 3) provide additional benefits that eliminate 100-year structure flooding altogether. An Environmental Resource Permit would be required. The permitting and land acquisition difficulty would be low.

ALTERNATIVE 5 – CULVERT UPGRADES FOR WETLAND OUTFALL TO FULTON DRIVE

Based on the existing conditions model, 25-year and 100-year out-of-bank flooding was reported for the wetland/waterbody (NJ0060) north of residences along Lake Ave SE west of Fulton Drive in Largo. Flood stages may cause structural flooding based on low site elevations near structures of 14.5 feet NAVD (finished floor elevations unknown). However, upsizing of the outfall culvert as a potential solution was removed from consideration due to adverse tailwater conditions.

A portable pumping alternative may be beneficial for this area but has not been modeled. Alternatively, the southern embankment might be raised to protect properties south of the pond. The adjacent FDOT pond has a top of bank elevation of 16 feet NAVD.

Implementation of Alternatives 2, 3 and 4, described above, do benefit this system with respect to flood duration. Benefits are described below.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Roadway LOS is achieved under existing and proposed conditions

Waterbodies and Waterways LOS Target = 25-year contained in banks

- The current 25-year peak flood stage of the waterbody (NJ0060) remains 7 inches above the top of bank (estimated as 14.0 feet NAVD) with the out-of-bank duration reduced from 4 hours to 3 hours.
- 25-year site flood stages are 1 inch above the low site elevation of 14.5 feet NAVD with duration reduced from 1 hour to ½ hour under proposed conditions

Building LOS Target= 100-year below finished floor

- 100-year flood stages are not reduced by Alternatives 2, 3, and 4 – with 4 inches of flooding above the low site elevations predicted.
- Duration of potential structure flooding is reduced by ½ hour.

Recommendations:

The potential damages and flood risk for the waterbody are low. Flood complaints have not been reported for this area. No specific action is currently recommended for this area.

ALTERNATIVE 6 – CULVERT UPGRADES ON CHANNEL 1 AT NEW HAVEN DRIVE (6A) AND DONEGAN ROAD (6B)

Based on the existing conditions model and documented flood complaints, flooding was reported at Apartments and MHP west of Channel 1 north of New Haven Drive and Donegan Road and Waterview Drive near New Haven Drive in Largo.

This alternative proposes to implement previously recommended culvert upgrades at New Haven Drive (6A) and Donegan Road (6B). The additional culverts will increase conveyance during major storm events. The local performance and downstream impacts of this alternative depend upon the implementation of Alternative 8A (removal of the Channel 1 salinity barrier) within Pinellas County's jurisdiction. Both cases are described in the Model Results section.

Existing Conditions: (4) 60" circular culverts and (2) 10' x 10' box culverts at New Haven Drive; (2) 13' x 10' Box culverts at Donegan Road.

Proposed Conditions: (3) 10' x 9' box culverts at New Haven Drive to replace the 60-inch circular culverts and existing (2) 10' x10' box culverts retained; (4) 12' x 10' box culverts at Donegan Road.

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of alternative 6A is approximately $311,000 and for alternative 6B is approximately $457,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Roadway LOS for New Haven Drive and Donegan Road is achieved under existing and proposed conditions

Waterbodies and Waterways LOS Target = 25-year contained in banks

- The top of bank elevation for the waterbodies north of New Haven Drive (NA1000) and between New Haven Drive and Donegan Road (NA1010) is approximately 7.0 feet NAVD and is exceeded by a foot under existing conditions. Construction of Alternative 6 lowers the 25-year WSEL by 4 inches with Alternative 8A and by 1 inch without Alternative 8A. Out-of-bank flood duration is reduced from 9 hours to 6.5 hours when combined with Alternative 8A. Duration is reduced by only one hour without Alternative 8A.
- 25-year low site elevations near structures are 7.7 – 7.8 feet NAVD (although finished floor elevations are unknown). Potential structure flooding for the 25-year event is eliminated by Alternative 6 combined with Alternative 8A. Alternative 6 alone has little impact.

Building LOS Target= 100-year below finished floor

- 100-year flood stages are reduced by Alternative 6 and Alternative 8A by 2 ½ inches, leaving 17 inches of flooding above the low site elevation. Alternative 6 alone reduces 100-year flood depth by 1 inch.
- Duration of potential structure flooding is reduced from 13 hours to 10 hours. Flood duration is reduced by only one hour without Alternative 8A.

There are no negative offsite or downstream impacts associated with Alternative 6 if Alternative 8A is also constructed. Implementation of Alternative 6 without removal of the salinity barrier results in increased 25-year and 100-year WSEL profiles of 1.5 to 4 inches for currently out-of-bank Channel 1 areas near Ulmerton Road (NA1185, NA1190, NA1195) and upstream of Bryan Dairy Road (NA1305, NA1310, NA1315). The rise in WSEL profile does not create violations of roadway LOS or threaten structures, but may increase yard flooding along the Channel 1 banks to a low degree. Refer to Appendix B for complete results.

Recommendations:

This alternative would slightly increase stages of flooding downstream in Channel 1 near Ulmerton Road and Bryan Dairy Road unless combined with implementation of Alternative 8A (Channel 1 salinity barrier removal). The project has a high cost but can increase the LOS for structures in the area to at least a 25-year level of protection if combined with Alternative 8A. It is not recommended for implementation alone. An Environmental Resource Permit would be required. The permitting difficulty would be moderate. Land acquisition difficulty would be low.

ALTERNATIVE 7 – CULVERT UPGRADES ON CHANNEL 9 AT STARKEY ROAD (7A) AND TALL PINES DRIVE (7B)

Based on the existing conditions model and documented flood complaints, flooding was reported at Belcher Road at 142nd Ave in Pinellas County with some potential for flood impact adjacent business structures for the 100-year event. Belcher Road is categorized as an evacuation route and does not meet the 25-year "passable" level of service under existing conditions, with 8.5 inches over the road instead of 6 inches or less. The length of Belcher Road failing the LOS is limited to 200 LF to the north and 200 LF to the south of 142nd Avenue.

This alternative proposes implementing the Channel 9 previous stormwater master plan recommended culvert upgrade of an additional 10' x 5'box culvert at Starkey Road and also evaluates a new BMP upgrading the Tall Pines Drive culvert on Channel 9. The additional culverts will increase conveyance during major storm events.

Existing Conditions: (1) 10' x 5' box culvert at Starkey Road; (2) 60" RCP at Tall Pines Drive

Proposed Conditions: Construct an additional 10' x 5' box culvert at Starkey Road and Channel 9 (BMP#7A). Replace existing culverts with (1) 10' x 5' box culvert at Tall Pines Drive (BMP#7B).

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of alternative 7A is approximately $263,000. The estimated construction cost of alternative 7B is approximately $186,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Belcher Road and 142nd Avenue meet the 10-year LOS under existing and proposed conditions with no change in peak 10-year flood stage.

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Existing 25-year out-of-bank flooding of Channel 9 at Belcher Road of up to 1 foot for 2.5 hours is unchanged by Alternative 7.
- The 25-year WSEL profile in Channel 9 between Wild Acres Road and Starkey Road are lowered by 3 to 6 inches by Alternative 7. Culvert upgrades produce a 1 to 1.5 inch rise in the 25-year profile that cause bank-full conditions in downstream Channel 9 between Lake Ave SE and Starkey Road (NI0360, NI0355, NI0205).

Building LOS Target= 100-year below finished floor

- 100-year flood stages at Belcher Road and 142nd Ave are not impacted by Alternative 7.
- The 100-year WSEL profile in Channel 9 between Wild Acres Road and Starkey Road are lowered by 3 to 6 inches by Alternative 7. Culvert upgrades produce a 0.5 to 2.0 inch rise in the 100-year profile in downstream Channel 9 between Lake Ave SE and Starkey Road (NI0360, NI0355, NI0205). No flooding of structures or significant site flooding is predicted.

There are slight negative offsite impacts associated with BMP#7 in Channel 9 downstream of Starkey Road.

Recommendations:

This alternative does not improve flood stages in areas that violate the target LOS and would increase stages of flooding downstream, although without risk of property damage. The benefits are low and the cost relatively high. An Environmental Resource Permit would be required and would be moderately difficult to obtain. The land acquisition difficulty would be low. Alternative 7 is not recommended for implementation.

ALTERNATIVE 8 – SALINITY BARRIER WEIR REMOVAL (8A) & CULVERT UPGRADES AT PARK BOULEVARD (8B)

Based on the existing conditions model and documented flood complaints, flooding was reported at Four Seasons Estates (southern end) and Grosse Pointe Estates MHP on west and east sides, respectively, of Channel 1 in Largo. This flooding is attributed to high water levels in Channel 1 during flood events and low elevations within the MHP areas. In addition, flooding was reported at 126th Ave N and 98th St N (west of 97th St) and at a residential pond located in Blue Water Cove approximately 650 feet north on 98th St N (behind lots) in Pinellas County. The Blue Water Cove stormwater system will be evaluated separately as part of Alternative 12.

Channel 1 is controlled at the downstream outfall to Long Bayou at Park Boulevard. There is currently a salinity barrier weir structure in the channel on the upstream side of Park Boulevard with a top weir elevation of 1.88 feet NAV88 and a weir length of 182 feet. This weir, owned and maintained by Pinellas County, provides a constant elevation upstream to maintain a freshwater system in Channel 1 upstream of Park Boulevard. It also raises the bypass channel flood profile for major storm events and essentially turns the deep bypass channel system into an elongated lake with large volumes of stagnant water likely to produce anoxic conditions for normal seasonal conditions. Downstream of the weir, Channel 1 is tidally influenced and crosses under Park Boulevard via (4)-12’ x 7’ box culverts.

This alternative evaluates the impact of removing the existing salinity barrier weir to lower the Channel 1 profile (Alternative 8A). In addition, implementation of the previous stormwater master plan’s Park Boulevard recommended culvert upgrade from the existing boxes to a span bridge structure (Alternative 8B) has been modeled. The removal of the salinity barrier weir and replacement of the culverts with a bridge structure will increase conveyance during major storm events.

Existing Conditions: 182-foot salinity barrier weir upstream of Park Boulevard. (4)- 12' x 7' box culverts

Proposed Conditions: Remove salinity barrier weir structure (BMP#8A) and/or replace existing culverts with a span bridge structure for conveyance. Bridge replacement low chord is proposed to be above the 100-year flood profile with a proposed bridge opening width of 80 feet (BMP#8B).

Environmental Concerns: High – Although removal of the salinity barrier weir would restore historic flow conditions in Channel 1, significant environmental impacts could also occur from the removal of the existing salinity barrier weir. Sediment from upstream areas which may contain contaminants has been accumulating on the upstream side of the weir in the Channel 1 over the last 40 years. By removing the salinity barrier this material may be flushed downstream into Long Bayou. On the positive side, anoxic conditions created by damming the deep channel could be improved by allowing the natural tidal fluctuation to increase circulation.

Land Acquisition Requirements: May require easement acquisition for construction (8B).

Cost Estimates: The estimated construction cost of alternative 8A is approximately $394,000. The estimated construction cost of alternative 8B is approximately $1,500,000.

Model Results:

Model simulations have been run for the following scenarios –

1. BMP#8A weir removal alone
2. BMP#8B bridge reconstruction alone, and
3. BMPs #8A and 8B combined

The upstream extent of discernible impact for these alternative lies between the Largo Alum Facility diversion weir and the Ulmerton Road crossing.

Implementing BMP#8B bridge reconstruction without BMP#8A weir removal yields no appreciable upstream benefit. The 10-, 25- and 100-year profiles are lowered 3 inches locally and less than an inch throughout the remaining channel.

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Roadways crossing Channel 1 in the area of influence meet the proposed LOS under existing and proposed conditions.
- Impassable road flooding at 126th Ave N and 98th St N, adjacent to Channel 1 and associated with Channel 1 (NA1195) flood levels, is eliminated by BMP#8A with a 4.5

inch reduction in peak WSEL. The 10-year WSEL is lowered by 7.5 inches if BMP#8A and 8B are combined.

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Channel 1 flood profile for the 25-year event is reduced by 10 inches at the downstream end (NA1960) and by 4 inches at the Largo diversion weir (NA0830) by BMP#8A alone. The flood reduction benefit is roughly doubled by combining BMP#8A and 8B.

Building LOS Target= 100-year below finished floor

- Channel 1 flood profile for the 100-year event is generally reduced by 2.5 to 4 inches between Park Boulevard (NA1960) and the Largo diversion weir (NA0830). The flood reduction benefit of combining BMP#8A and 8B reduces flood stages from 1 to 2 feet between Park Boulevard (NA1960) and downstream Bryan Dairy Road (NA1255), and from 2.5 to 7 inches between upstream Bryan Dairy Road (NA1315) and the Largo diversion weir (NA0830).

There are no negative offsite impacts associated with BMP#8A and 8B downstream of Park Boulevard as the outfall is tidal. Implementation of BMP#8A is required to prevent negative downstream impacts for Alternative 6, if constructed (discussed previously).

Recommendations:

Alternative 8A improves flood stages along Channel 1, allows 10-year roadway level of service to be achieved in low areas adjacent to the channel, and fully mitigates the downstream impact of Alternative 6 culvert upgrades near Donegan Road and New Haven Drive. Alternative 8B alone has no discernible benefit. Although combining Alternative 8A and 8B nearly doubles the WSEL reduction, the additional cost of bridge reconstruction is not justified by the flood reduction benefit. An Environmental Resource Permit would be required and may be difficult to obtain. The land acquisition difficulty would be low. Alternative 8A is recommended for implementation although removal of the salinity barrier may be controversial. The proposed condition BMP model includes Alternative 8A and does not include 8B.

ALTERNATIVE 9 – CULVERT UPGRADES AT LARGO MAINTENANCE FACILITY DRIVEWAY CULVERT (9A) AND CHANNEL 7 IMPROVEMENTS (9B)

Based on the existing conditions model and documented flood complaints, flooding was reported at the Acorn MHP in Pinellas County. A tributary ditch to Channel 7 runs on the north side of the Acorn MHP. During heavy rain events the tributary ditch backs up from the City of Largo Maintenance Facility driveway culverts and overtops into the Acorn MHP pond.

This alternative proposes to increase culvert capacity of City of Largo Maintenance Facility driveway culverts to a 12' x 5' box culvert (Alternative 9A) and implementing the channel 7 cross-section improvements recommended in the previous storm water master plan from the City of Largo Maintenance Facility driveway culverts south 1770 feet to 16th Ave SE (Alternative 9B). The upgraded culverts and ditch improvements will increase conveyance during major storm events.

City of Largo Maintenance Facility Culverts

Channel 7

Existing Conditions: (2) 24" x 42" elliptical culverts at City of Largo Maintenance Facility driveway

Proposed Conditions: Replace existing culverts with 12'x 5' box culvert for conveyance. Implement channel 7 cross-section improvements from the City of Largo Maintenance Facility driveway culverts south 1770 feet to 16th Avenue SE. Proposed channel bottom width=20 feet. Bank slopes at 2H:1V.

Environmental Concerns: Medium – Some potential wetland impacts (temporary) to Channel 7.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of alternative 9A is approximately $106,000 and alternative 9B is approximately $265,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Under current conditions the target LOS for roadways is just met within the MHP (6 inch flood depth) and the City of Largo Maintenance Facility driveway is submerged by nearly 12 inches. Tributary ditch and Channel 7 overflow their banks from the tributary confluence to 16th Avenue SE. Alternative 6 reduces flood stages by 11 inches in the tributary ditch and by15 to 21 inches in Channel 7. Roads and driveways are dry and channel flows are retained within banks.

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Implementation of BMP#6 reduces tributary and Channel 7 flood stages by 11 to 19 inches for the 25-year event. Channel 7 flows are fully contained within banks.
- Acorn MHP pond (NG0120) and the northern tributary ditch upstream of the driveway culvert (NG0130) exceed top of bank elevations of 11.0 feet NAVD by 10 inches after BMP#6 implementation (reduced from 21 inches) for a duration reduced from 6 hours to only 1.5 hours.

Building LOS Target= 100-year below finished floor

- 100-year flood stages (NG0120, NG0130) under current conditions rise 11.5 inches above the low site elevation of 12.6-12.7 feet NAVD near mobile home structures (finished floor elevations are not available). Construction of Alternative 6 reduces flood stages by 10 inches leaving 1.5 inches of flooding on low sites for ½ hour. This level of flooding is unlikely to result in structural flooding or property damage.

There are no negative offsite impacts associated with BMP#9A and 9B if implemented concurrently or with 9B constructed first. Alternative 9A should not be implemented without downstream Alternative 9B channel improvements due to unacceptable increases in Channel 7 flood stages which already exceed top of bank. Refer to Appendix B for complete results.

Recommendations:

This alternative effectively reduces the peak stages and duration of flooding at Acorn MHP and along the upper portion of Channel 7. Target LOS is achieved for most areas and the risk of flood damages is essentially eliminated. Implementation of Alternative 9B alone results in roughly 50% of the cited flood reduction benefit. An Environmental Resource Permit would be required. The permitting and land acquisition difficulty would be low.

ALTERNATIVE 10 – CULVERT UPGRADES AT OAK CREST MHP (10A), BARRINGTON TRACE AREA (10B)

Based on the existing conditions model and documented flood complaints, flooding of extended duration was reported at the Barrington Trace assisted living facility west (upstream) of Twin Oaks Drive, a private road within the Oak Crest MHP in Pinellas County. Flows draining eastward from west of Seminole Boulevard are carried through private properties by poorly maintained pipes and ditch systems to enter Starkey Channel 8 at the east/downstream end of the Twin Oaks Drive crossing. Channel 8 flows into Starkey Channel 7 approximately 2000 feet downstream.

This alternative proposes to improve the Twin Oaks Drive cross drain and downstream Channel 8 cross section (Alternative 10A) and to upgrade the cross drain at the Barrington Trace property boundary to a span bridge consistent with ERP concepts on file with the SWFWMD (Alternative 10B). The improved culvert designs will direct flood flows, which under current conditions are largely conveyed as overland flood flows, and confine the flow to defined channels and storm water pipes.

Oak Crest culverts at Twin Oaks Drive (downstream)

Barrington Trace Berm (Future Roadway) Culvert

Existing Conditions: (1) 42" CMP at Barrington Trace; (2) 36" x 48" elliptical concrete pipes at Twin Oaks Drive

Proposed Conditions: Replace the existing elliptical culverts at Twin Oaks Drive with (2) 10'x 6'box culverts (or equivalent) and expand the downstream Channel 8 bottom width from 3 feet to 10 feet with 2H:1V bank slopes for 800 linear feet to provide adequate conveyance (Alternative 10A). Construct a span bridge with an opening width of 30 feet and 105-110 square feet of flow area for the future roadway at Barrington Trace (Alternative 10B) for conveyance of upstream flows.

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of alternative 10A is approximately $239,000 and alternative 10B is approximately $149,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Under current and proposed conditions the target LOS for roadways is met for the 10-year event.

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Implementation of BMP#10A and 10B reduces 25-year flood stages by 14 inches for the Barrington Trace property and the tributary ditches upstream of Twin Oaks Drive. The BMPs eliminate current site flooding at Oak Crest MHP west boundary lots and at Barrington Trace nearly one foot deep and lasting 4 hours and confine tributary ditch flows to within banks.
- Downstream Channel 8 profiles rise as conveyance pipes are upgraded but remain within top of bank. No appreciable increase in stage (< 0.1 ft) is seen at the confluence with Channel 7

Building LOS Target= 100-year below finished floor

- 100-year flood stages for the Barrington Trace site (NG0170) and the ditches upstream of Twin Oaks Drive (NG0180) are reduced by 5 to 7 inches and do not threaten structures.
- Downstream Channel 8 located within the Oak Crest MHP experiences a 6 inch rise in the 100-year profile at the immediate downstream end of the Twin Oaks Drive culvert (NG0185) but remains within banks
- At the downstream end of proposed channel improvements (NG0188), the 100-year profile is anticipated to rise approximately 3.5 inches without threatening adjacent properties or structures.
- 450 feet upstream of the confluence of Channel 8 with Channel 7, impact to the 100-year profile is less than 0.1 feet.

There are no significant offsite impacts associated with BMP#10A and 10B if implemented concurrently or with 10A constructed first. Alternative 10B should not be implemented without downstream Alternative 10A culvert and channel improvements. Refer to Appendix B for complete results.

Recommendations:

This alternative effectively reduces the peak stages and significantly reduces duration of peak flood stages upstream of the Twin Oaks Drive cross drain. The high flow rates associates with even a 10-year design event (600+ cfs) that currently wash over the Barrington Trace berm/future road right-of-way, and subsequently sheetflow through low-lying lots in the Oak Crest MHP for extended durations, are confined to defined channels and structural BMPs for this alternative. An Environmental Resource Permit would be required. The permitting and land acquisition difficulty would be moderately difficult.

ALTERNATIVE 11 – CULVERT IMPROVEMENTS AT GREEN MEADOWS MHP

Based on the existing conditions model and documented flood complaints, flooding was reported at Green Meadows MHP in Pinellas County. Two large box culverts drain flows into the Green Meadows MHP from Seminole Boulevard and basins west of Seminole Boulevard. The culverts discharge to a small pond which outfalls downstream via a 48" CMP. The Green Meadows MHP is immediately upstream of the Barrington Trace and Oak Crest MHP areas.

This alternative proposes to replace the 48-inch CMP in poor condition with (2) 10' x 5' box culverts. The additional culverts will allow the transfer of predominantly overland conveyance of high flows to controlled conveyance through subsurface pipes during major storm events.

Green Meadows MHP Culvert

Existing Conditions: 48" circular CMP

Proposed Conditions: Replace existing culvert with (2) 10'x 5'box culverts for conveyance.

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of this alternative is approximately $600,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Under current conditions the target LOS for pubic roadways is met for the 10-year event but the private roadway of Green meadows MHP at the pipe crossing (currently flooding up to 18 inches above the road for 3 hours). Alternative 11 eliminates private road flooding for the 10-year event.

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Implementation of BMP#11 (combined with BMP#10A and 10B) reduces 25-year flood stages by 21 inches and eliminates current flooding of low sites (20.0 – 20.4 feet NAVD)

for depths of 5 to 10 inches at the 25-year event. Finished floor elevations for mobile home are unknown.

- The small pond (NG0160) top of bank is estimated as 19.0 feet NAVD and is bank full for the 25-year event after implementation of BMP# 11. This is a reduction in flood stage of 21 inches.

Building LOS Target= 100-year below finished floor

- 100-year floor elevations within the Green Meadows MHP are unknown, however low sites have been identified (20.0 – 20.4 feet NAVD). The 100-year flood stage (NG0160) is 20.2 NAVD after implementing BMP# 11 – reduced by 13 inches.

There are no significant offsite impacts associated with BMP#11, which may be implemented independently of BMPs 10A and 10B as existing flows and volumes are not increased by the project, but are simply transferred from overland flow to controlled piped flow. The full stage reduction benefits of Alternative 11 will not be realized, however, unless BMP 10 and 10A are constructed. Refer to Appendix B for complete results.

Recommendations:

This alternative effectively transfers uncontrolled overland flow (not associated with significant property owner complaints) at Green Meadows MHP to controlled pipe flow prior to discharge into the Barrington trace property. The improvement can be expected to reduce TSS loads to the Channel 8 system. An Environmental Resource Permit would be required. The permitting and land acquisition difficulty would be moderately difficult.

ALTERNATIVE 12 – IMPROVEMENTS TO EXISTING PONDS AT BLUE WATER COVE

Based on the existing conditions model and documented flood complaints, flooding was reported at the Blue Water Cove subdivision in Pinellas County. This is an older subdivision constructed in the late 1970s to early 1980s. Simulated flooding is related to Channel 1 tailwater stages as well as inadequately designed and poorly maintained local drainage facilities. The subdivision has two detention ponds that outfall to the bypass canal (Channel 1) near 126th Avenue N. An adjacent subdivision to the north, Pine Bluff Acres, also directs stormwater runoff through the Blue Water Cove pond system. The existing ponds have silted in over time, thus reducing their volume. In addition, pond outfall structures are overgrown and apparently non-functional.

This alternative proposes to improve the Pond 1 and 2 outfall structures and restore original pond design depth and capacity.

Existing Conditions: Pond #1 is approximately 0.33 acres at TOB (6.6 feet NAVD) with 3H:1V banks slopes and up to 2 feet of original storage depth lost (silted). Outfall #1 is controlled by an overtopping grate inlet with bleeder pipe which reportedly has a tree growing inside. A 15" RCP with backflow prevention (likely blocked) ties this pond to downstream Pond #2.

Pond#2 is approximately 0.46 acres at TOB (4.4 feet NAVD) with 2H:1V bank slopes and up to 1.5 feet of original storage depth lost (silted). Outfall #2 is controlled by an overtopping grate inlet with bleeder pipe. A 24" RCP with backflow prevention throttle ties this pond to Channel 1.

Proposed Conditions: Construct new Type D inlet structure and 150' of 36" RCP for Pond 1. Construct new Type G inlet and 85' of 48" RCP for Pond 2. Include backflow prevention devices. Excavate Pond 1 and Pond 2 to their original design depths of 2.6 feet NAVD and 1.4 feet NAVD, respectively.

Environmental Concerns: Low – Minimal wetland impacts.

Land Acquisition Requirements: May require easement acquisition for construction.

Cost Estimates: The estimated construction cost of this alternative is approximately $167,000.

Model Results:

Road LOS Target =10-year "passable" (less than 6 inches over low road)

- Under current conditions the target LOS for roadways is met for the Pond #1 (NA1210) basin. 10-year LOS is not quite achieved for the Pond #2 basin (NA1212N) event but flood depth over the "passable" road elevation is improved by 14 inches and lasts for less than an hour.

Waterbodies and Waterways LOS Target = 25-year contained in banks

- Implementation of BMP#12 does not eliminate out-of-bank flooding for the ponds during the 25-year event, however Pond#1 flood stages are reduced by 9 inches and produce flooding of 4 inches above the bank for only ½ hour.
- Pond #2 peak flood stages are reduced by 5 inches and remain out of banks from 1 to 23 inches for a duration of 12 hours.
- Pond #2 flood stages currently threaten flooding of low residential structures. Alternative 12 reduces the peak stage sufficiently to eliminate 25-year structure flooding potential.

Building LOS Target= 100-year below finished floor

- 100-year floor elevations are unavailable but low site elevations of 7.7 feet NAVD are indicated near Pond #1 (NA1210) and 6.5 feet NAVD near Pond#2 (NA1212N). Alternative 12 reduces peak 100-year flood stage at Pond#1 by 2 inches, below the low site elevation.
- Alternative 12 reduces the peak 100-year WSEL of Pond#2 by 6 inches but leaves residual flooding above the low site of up to 9 inches for a duration of 12 hours.

There are no offsite impacts associated with BMP#12, which may be implemented independently of other BMPs. Refer to Appendix B for complete results.

Recommendations:

This alternative reduces the peak stages of flooding at Blue Water Cove to nearly provide the 10-year LOS for passable roads and to remove the threat of structural flooding through the 25-year event. An Environmental Resource Permit will be required to improve the outfall structures. The permitting and land acquisition difficulty should be low.

ALTERNATIVE 13 – WATER QUALITY IMPROVEMENTS AT OLDER HIGH DENSITY RESIDENTIAL AREAS

Large older residential areas (high density) were developed prior to the implementation of rules for stormwater treatment from areas of new development. These areas include numerous mobile home parks and small subdivision areas. These areas discharge untreated stormwater runoff from large residential areas that have a high amount of impervious surfaces which could contain numerous pollutants directly to the Starkey Road Basin channels and ditches.

Recommendations:

While it is not feasible to retrofit these large residential areas to provide required stormwater treatment, there are several options that could be implemented to reduce pollutant loads to the Starkey Road Basin. Implementation of these options will improve compliance with NPDES permits and address potential FDEP TMDL issues within the watershed. These options could include:

- Public awareness campaigns to encourage xeriscaping, low fertilization landscapes, pervious pavement for add-on patios, drives, rain barrel-rainwater collection/reuse, etc.
- Installation of in-line water quality inlets (Stormceptor, Baffle Box, Vortex, etc.) on outfalls
- Increase regular street sweeping programs in older residential areas - Current frequency (non-arterial) is once per 13 weeks

Pollutant removal efficiencies will vary depending on the type of Stormwater Best Management Practice (BMP) implemented. Pollutant removal efficiencies of various non-structural and structural BMP’s are included in Appendix A. Pollutant removal efficiencies range from 85%TSS, 85% TP and 50% NO3 removal for street sweeping to 60%TSS, 50% TP and 20% NO3 removal for water quality filters.

Costs for these options will vary depending on what is implemented.

ALTERNATIVE 14 – WATER QUALITY IMPROVEMENTS AT OLDER COMMERCIAL AND INDUSTRIAL AREAS AND COMMUNITY REDEVELOPMENT AREAS

Older Commercial and Industrial Areas and Community Redevelopment Areas west of Seminole Blvd between 4th Ave NW and 4th Ave SW within Largo were developed prior to the implementation of rules for stormwater treatment. These area discharge untreated stormwater runoff from commercial and industrial areas that have a high amount of impervious surfaces which could contain numerous pollutants directly to the Starkey watershed channels and ditches.

Recommendations:

While it is not feasible to retrofit these older commercial and industrial areas to provide required stormwater treatment, there are several options that could be implemented during redevelopment to reduce pollutant loads to the Starkey watershed. Implementation of these options will improve compliance with NPDES permits and address potential FDEP TMDL issues within the watershed. These options could include:

- Commercial/Public/Redevelopment: Low Impact development (LID) options, functional landscaping and buffers for runoff infiltration, green-roofing, minimizing directly connected impervious areas, incentives for organic mulching over fertilizers
- Industrial: Site review and periodic inspection of NPDES Industrial Activity stormwater pollutant prevention plans and practices where applicable
- Installation of in-line water quality inlets (Stormceptor, Baffle Box, Vortex, etc.) on outfalls

Pollutant removal efficiencies will vary depending on the type of Stormwater Best Management Practice (BMP) implemented. Pollutant removal efficiencies of various non-structural and structural BMP's are included in Appendix A. Pollutant removal efficiencies range from 85%TSS, 85% TP and 50% NO3 removal for street sweeping to 60%TSS, 50% TP and 20% NO3 removal for water quality filters.

Costs for these options will vary depending on what is implemented.

Table 3-2 Starkey Road Basin Flooding and Water Quality BMPs Selected for Modeling

BMP No.	Problem Area ID	Problem Area	Location	Jurisdiction	BMP	Existing Structure Size	Proposed Structure Size	Number	Length (ft.)	Estimated Construction Cost	Comments
1	**3 & 4**	5th Ave NE from Channel 1 to Highlands Ave and 2nd Ave NE from Channel 1 to Highlands Ave including lots south of 2nd Ave SE	Main Street (1st Ave)	Largo	Structure Replacement	(3) - 48" x 72" ECMP	12'x6' Box Culverts	3	80	$400,000	
1A			City parcel west of Alum treatment diversion weir - Basin A0870	Largo	Create additional pond storage						Not Required for peak attenuation. Could be used for water quality treatment
2	**9**	East Bay Oaks Mobile Home Park	Starkey Road and Channel 10	Largo	New Structure	10'x5' Box Culvert	10'x5' Box Culvert	1	110	$263,000	Add additional box culvert. Can be constructed with future Starkey Road improvements
3	**11**	Lake Palms Drive at Willow Ave	Lake Palms Drive and Channel 10	Largo	Structure Replacement	(2)-54" RCP	12'x5' Box Culverts	1	80	$222,000	Must be constructed concurrently or after BMP #2
4	**6**	Dahlia Place, Gardenia Place & 34th St SE between 6th & 7thAve	Tributary ditch (south flowing)	Largo	Tributary ditch (south flowing): increase bottom width and regrade				1700	$99,000	BW=3.5' SS=3H:1V. Add inlets and pipes at Dahlia Place and Gardenia Place cul-de-sacs
5	**8**	Lake Ave SE west of Fulton Drive	Outfall to Fulton Drive storm drainage system	Largo	Structure Replacement						Removed from consideration due to adverse tail water. Consider raising southern wetland embankment instead

Table 3-2 Starkey Road Basin Flooding and Water Quality BMPs Selected for Modeling

BMP No.	Problem Area ID	Problem Area	Location	Jurisdiction	BMP	Existing Structure Size	Proposed Structure Size	Number	Length (ft.)	Estimated Construction Cost	Comments
6A	**12**	Apartments and Mobile Home Park west of Channel 1 north of New Haven Drive and Donegan Road and Waterview Drive near New Haven Drive	New Haven Drive	Largo	Structure Replacement	(4)-60" RCP *(2)-10'x10' Box Culverts to remain	10'x9' Box Culverts	3	50	$311,000	Culvert improvements do not attain LOS and cause unacceptable downstream impacts unless combined with Pinellas County BMP 8A/8B
6B			Donegan Road	Largo	Structure Replacement	(2)-13'x10' Box	12'x10' Box Culverts	4	50	$457,000	Culvert improvements do not attain LOS and cause unacceptable downstream impacts unless combined with Pinellas County BMP 8A/8B
7A	**22**	Belcher Road at 142nd Ave	Starkey Road and Channel 9	Pinellas County	New Structure	10'x5' Box Culvert	10'x5' Box Culvert	1	110	$263,000	Add additional Box culvert. Can be constructed with future Starkey Road improvements
7B			Tall Pines Drive	Pinellas County	Replacement	(2)-60" RCP	10'x5' Box Culvert	1	80	$186,000	Must be constructed concurrently or after BMP #7A

Table 3-2 Starkey Road Basin Flooding and Water Quality BMPs Selected for Modeling

BMP No.	Problem Area ID	Problem Area	Location	Jurisdiction	BMP	Existing Structure Size	Proposed Structure Size	Number	Length (ft.)	Estimated Construction Cost	Comments
8A	**17 &**	Four Seasons Estates Mobile Home Park on west side of Channel 1 (southern end) and Grosse Pointe Estates Mobile Home Park on east side Channel 1 (in City of Largo).	Salinity barrier upstream of Park Boulevard	Pinellas County	Salinity Weir Structure Removal	182-foot concrete weir				$394,000	May have negative WQ impacts
	25	Blue Water Cove pond and roadway flooding.									
	26	92nd Street between 107th and 109th Avenues									
8B	**28**	93rd Ave N between 90th Way N and 86th Way N; 89th Way N and 90th St N south of 94th Ave N	Park Boulevard	Pinellas County	Structure Replacement	(4)-144" x 84" Box Culverts	3-Span Bridge			$1,500,000	Will require detailed Maintenance of Traffic Plan.
	31	98th St N north of 78th Ave									
	32	90th Way N, 91st St N and 92nd St N near and including 76th Ave N. North of Park Blvd (in City of Seminole)									
9A	**18**	Acorn Mobile Home Park	City of Largo Maintenance Facility driveway culverts	Pinellas County	Structure Replacement	(2)- 24" x 42" ECMP	12' X 5' Box Culvert	1	32	$106,000	Maintenance clearing of upstream tributary ditch system may improve performance (not modeled)
9B			Channel 7	Pinellas County	Channel 7 cross-section improvements				1770	$265,000	BW=20' SS=2H:1V

Table 3-2 Starkey Road Basin Flooding and Water Quality BMPs Selected for Modeling

BMP No.	Problem Area ID	Problem Area	Location	Jurisdiction	BMP	Existing Structure Size	Proposed Structure Size	Number	Length (ft.)	Estimated Construction Cost	Comments
10A	**21**	Twin Oaks Drive - Oak Crest Mobile Home Park	Twin Oaks Drive and Channel 8	Pinellas County/ Private	Structure Replacement	(2)- 36" x 48" ECMP	10' x 6' Box Culverts	2	35	$239,000	Potential conflict with 10" sanitary sewer line (10"). BMP includes improvement of Channel 8 downstream of culvert (800 feet)
10B	**20**	Barrington Trace ALF	Barrington Trace Berm	Pinellas County/ Private	Structure Replacement	42" CMP	30- ft Span Bridge or equivalent	1	30	$149,000	
11	**19**	Green Meadows Mobile Home Park	Green Meadows MHP	Pinellas County/ Private	Structure Replacement	48" CMP	10'x5' Box Culverts	2	220	$600,000	
12	**25**	126th Ave N and 98th St N (west of 97th St) Blue Water Cove ponds	Blue Water Cove	Pinellas County	Improve outfall structure capacity Restore original pond design depth	15" & 24"	36" & 48"	1	150 and 85	$167,000	Modify Control Structures in Pond 1 and Pond 2 Excavate Pond 1 and Pond 2 to original depth

Table 3-2 Starkey Road Basin Flooding and Water Quality BMPs Selected for Modeling

BMP No.	Problem Area ID	Problem Area	Location	Jurisdiction	BMP	Existing Structure Size	Proposed Structure Size	Number	Length (ft.)	Estimated Construction Cost	Comments
WQ-1A	**37**	Large older residential areas (high density)	Watershed-Wide	Watershed-Wide	Public awareness campaigns to encourage xeriscaping, low fertilization landscapes, pervious pavement for add-on patios, drives, rain barrel-rainwater collection/reuse, etc.					Varies	Attend home owners' association meetings. Distribute flyers/pamphlets. Construct demonstration projects
WQ-1B		Large older residential areas (high density)	Watershed-Wide	Watershed-Wide	Installation of in-line water quality inlets (Stormceptor, Baffle Box, Vortex, etc.)					Varies	Install at critical inlet locations and outfall from tributaries
WQ-1C		Large older residential areas (high density)	Watershed-Wide	Watershed-Wide	Increase regular street sweeping programs in older residential areas - Current frequency (non-arterial) is 1x per 13 weeks					Varies	Recommend 1x per 6 weeks
WQ-2A	**38**	Older Commercial and Industrial Areas and Community Redevelopment Areas west of Seminole Blvd between 4th Ave NW and 4th Ave SW	Watershed-Wide	Watershed-Wide	Commercial/Public: functional landscaping and buffers for runoff infiltration, green-roofing, minimizing directly connected impervious areas, incentives for organic mulching over fertilizers					Varies	Attend home owners' association meetings. Distribute flyers/pamphlets. Construct demonstration projects. Require re-development areas to utilize LID practices.
WQ-2B		Older Commercial and Industrial Areas and Community Redevelopment Areas west of Seminole Blvd between 4th Ave NW and 4th Ave SW	Watershed-Wide	Watershed-Wide	Industrial: Site review and periodic inspection of NPDES Industrial Activity stormwater pollutant prevention plans and practices where applicable					Varies	Monitor compliance with NPDES stormwater requirements especially following rain events of 0.5 inches or greater.
WQ-2C		Older Commercial and Industrial Areas and Community Redevelopment Areas west of Seminole Blvd between 4th Ave NW and 4th Ave SW	Watershed-Wide	Watershed-Wide	Install inline WQ inlets where possible (Stormceptor, Baffle Box, Vortex, etc.)					Varies	Install at critical inlet locations and outfall from tributaries.

4.0 SUMMARY OF FINDINGS

Based on the BMP analysis of the benefits, costs, and issues to be addressed in planning future implementation projects, a summary is provided of recommended prioritization for the selected set of BMPs.

High Priority for Implementation - The alternatives with a high priority for implementation are Alternatives 2, 3 along Channel 10 and Alternative 4 (Dahlia Place and Gardenia Place tributary ditch improvements). These are ranked high because they provide significant flood stage reduction benefits along a County-maintained channel that causes significant potential for site and building flooding under current conditions. These BMPs can be implemented without negative downstream impacts. Permitting and land acquisition are not considered to be major issues. The cost of implementation of these alternatives is less than the cost of property acquisition. Costs are $263,000 for Alternative 2, $222,000 for Alternative 3, and $99,000 for Alternative 4. The County owns the channel easements where Alternatives 2 and 3 are located.

Alternative 1 Main Street culvert upgrade and Alternative 8A Salinity Barrier removal on Channel 1 are also recommended as high priorities for implementation. Both projects yield a significant flood reduction benefit for their cost, can be constructed within City or County controlled easements, involve no negative downstream impacts and are expected to be straightforward with respect to wetland and water quantity permitting. As previously, discussed, the removal of the salinity barrier (Alternative 8A) may be controversial from a water quality perspective.

Medium Priority for Implementation - The alternatives with a medium priority for implementation are Alternative 12 (Blue Water Cove), Alternative 9A/B in Channel 7, and Alternatives 10A/B and 11 in Channel 8. These are ranked medium because the areas impacted are predominantly private roadways and properties with privately owned or controlled stormwater systems. Generally the flood risks do not entail structural damage, roadway travel safety or emergency access. The alternatives can be implemented without significant environmental or downstream flood impacts. The cost of implementing these alternatives ranges from $167,000 for Blue Water Cove improvements, $370,000 - $380,000 for Alternative 9A/B or 10A/B to $600,000 for Alternative 11 (a lower ranking Medium Priority alternative).

Low Priority for Implementation – The alternatives with a low priority for implementation are Alternative 5 within the Channel 10 drainage area, Alternative 7A/B on Channel 9 and Alternatives 6 and 8B on Channel 1. These are ranked low because of high cost (6 and 8B) associated with a low benefit (5, 6, 7, 8B), combined with potential permitting difficulties (6) or maintenance of traffic issues (8B). The cost of implementing these alternatives ranges from $449,000 for Alternative 7A/B to $768,000 for Alternative 6A/B and $1,500,000 for 8B.

Appendix A

Pollutant Load Removal for BMPs

Appendix B

BMP Model Results

Appendix C

Cost Estimates

Appendix A

Pollutant Load Removal for BMPs

Table A-4 Summary of Pollutant Removal Percent Efficiencies of Stormwater BMPs

COMPREHENSIVE BMP LIST	Pollutant Removal Efficiency %		
	TSS	TP	NO_3
Non-Structural BMP			
5.1 Protect Sensitive / Special Value Features	SC	SC	SC
5.2 Protect / Conserve / Enhance Riparian Areas	SC	SC	SC
5.3 Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design	30	20	0
5.4 Cluster Uses at Each Site; Build on the Smallest Area Possible	SC	SC	SC
5.5 Concentrate Uses Areawide through Smart Growth Practices	SC	SC	SC
5.6 Minimize Total Disturbed Area - Grading	40	0	0
5.7 Minimize Soil Compaction in Disturbed Areas	30	0	0
5.8 Re-vegetate and Re-forest Disturbed Areas using Native Species	85	85	50
5.9 Reduce Street Imperviousness	SC	SC	SC
5.10 Reduce Parking Imperviousness	SC	SC	SC
5.11 Rooftop Disconnection	30	0	0
5.12 Disconnection from Storm Sewers	30	0	0
5.13 Streetsweeping	85	85	50
Structural BMP			
6.1 Porous Pavement with Infiltration Bed	85	85	30
6.2 Infiltration Basin	85	85	30
6.3 Subsurface Infiltration Bed	85	85	30
6.4 Infiltration Trench	85	85	30
6.5 Rain Garden / Bioretention	85	85	30
6.6 Dry Well / Seepage Pit	85	85	30
6.7 Constructed Filter	85	85	30
6.8 Vegetated Swale	50	50	20
6.9 Vegetated Filter Strip	30	20	10
6.10 Infiltration Berm and Retentive Grading	60	50	40
6.11 Vegetated Roof	85	85	30
6.12 Rooftop Runoff - Capture and Reuse	100	100	100
6.13 Constructed Wetland	85	85	30
6.14 Wet Pond / Retention Basin	70	60	30
6.15 Dry Extended Detention Basin	60	40	20
6.16 Water Quality Filter	60	50	20
6.17 Riparian Buffer Restoration	65	50	50
6.18 Landscape Restoration	85	85	50
6.19 Soils Amendment and Restoration	85	85	50
6.20 Level Spreader	20	10	5
6.21 Special Detention Areas - Parking Lot, Rooftop	0	0	0

*SC, Self Crediting: The BMP reduces the pollutant load, thus is self-crediting. BMPs with this designation are labeled as "**Preventive**" in Section 5.*

*** All values shown represent professional interpretation, based on best available data as provided in Appendix A.***

Pollutant Removal Efficiencies for Best Management Practices for Use in Pollutant Loading Analysis					Values Accepted for Loading Analyses		
BMP Type	**BMP**	**Notes**	**Lit. Ref.**	**Runoff Reduction Efficiency**	**TSS**	**TN**	**TP**
Stormwater Ponds	Wet Pond		B, F, P	0%	70%	35%	45%
	Wet Extended Detention Pond		A, B, P	0%	80%	55%	68%
	Micropool Extended Detention Pond	TBA					
	Multiple Pond System	TBA					
	Pocket Pond	TBA					
Stormwater Wetlands	Shallow Wetland		A, B, F, I, P	0%	80%	55%	45%
	Extended Detention Wetland		A, B, F, I, P	0%	80%	55%	45%
	Pond/Wetland System	TBA					
	Gravel Wetland		H, P, Q	90%	99%	85%	64%
Infiltration Practices	Infiltration Trench (≥75 ft from surface water)		B, D, I, P	90%	90%	55%	60%
	Infiltration Trench (<75 ft from surface water)		B, D, I, P	90%	90%	10%	60%
	Infiltration Basin (≥75 ft from surface water)		A, F, B, D, I, P	90%	90%	60%	65%
	Infiltration Basin (<75 ft from surface water)		A, F, B, D, I, P	90%	90%	10%	65%
	Dry Wells		P	90%	90%	55%	60%
	Drip Edges		P	90%	90%	55%	60%
Filtering Practices	Aboveground or Underground Sand Filter that infiltrates WQV (≥75 ft from surface water)		A, F, B, D, I, P	0%	90%	60%	65%
	Aboveground or Underground Sand Filter that infiltrates WQV (<75 ft from surface water)		A, F, B, D, I, P	0%	90%	10%	65%
	Aboveground or Underground Sand Filter with underdrain		A, I, F, G, H, P, Q	0%	51%	10%	33%
	Tree Box Filter	TBA	P, Q	15%	99%		
	Bioretention System		I, G, H, P, Q	80%	99%	65%	65%
	Permeable Pavement that infiltrates WQV (≥75 ft from surface water)		A, F, B, D, I, P	75%	90%	60%	65%
	Permeable Pavement that infiltrates WQV (<75 ft from surface water)		A, F, B, D, I, P	75%	90%	10%	65%
	Permeable Pavement with underdrain		Use TN and TP values for sand filter w/ underdrain and outlet pipe, P	45%	90%	10%	45%

Pollutant Removal Efficiencies for Best Management Practices for Use in Pollutant Loading Analysis					Values Accepted for Loading Analyses		
BMP Type	**BMP**	**Notes**	**Lit. Ref.**	**Runoff Reduction Efficiency**	**TSS**	**TN**	**TP**
Treatment Swales	Flow Through Treatment Swale	TBA	P	60%			
Vegetated Buffers	Vegetated Buffers		A, B, I		73%	40%	45%
Pre-Treatment Practices	Sediment Forebay	TBA	P	0%			
	Vegetated Filter Strip		A, B, I, P	50%	73%	40%	45%
	Vegetated Swale		A, B, C, F, H, I, P	60%	65%	20%	25%
	Flow-Through Device - Hydrodynamic Separator		A, B, G, H, Q		27%	10%	42%
	Flow-Through Device - ADS Underground Multichamber Water Quality Unit (WQU)		G, H, Q		99%	10%	81%
	Other Flow-Through Devices	TBA					
	Off-line Deep Sump Catch Basin		J, K, L, M		15%	5%	5%

Sources	
Sources A - F are as reported in the EPA Region 5 Model	
A	Appendix D Model Best Management Practice Selection Methodology & Lake County Decisions Making Dramework, NIPC. July 1994.
B	www.epa.gov/owowwtrl/NPS/MMGI/chapter4/table401.gif
C	http://ohioline.ag.ohio-state.edu/aex-fact/0467.html
D	Athayde. 1983.
E	Schueler. 1987.
F	Model Stormwater Regulations. Duxbury, Marshfield, and Plymouth, MA. Horsley Witten Group. December 31, 2004. (suggested Average ssumes no practice is greater than 90% efficient. Median values are shown in parentheses).
G	2005 Data Report. University of New Hampshire Stormwater Center. and personal communication with Dr. Robert Roseen.
H	Roseen, R., T. Ballestero, J. Houle, P. Avelleneda, J. Briggs, G. Fowler, R. Wildey. Unpublished 2007 Draft Report. Seasonal Variations for Stormwater Management Systems in Cold Climate Conditions. University of New Hampshire.
I	http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm
Sources J - M and P are as reported in Stormwater Center Website	
J	Pitt, R., M. Libum, S. Nix, S. Durrans, and S. Burian. 1997. Guidance Manual for Integrated Wet Weather Flow Cllection and Treatment Systems for New Urbanized Areas. USEPA. Office of Research and Development. Cincinnato, OH.
K	Aronson, F., D. Watson, and W. Pisaro. 1983. Evaluation of Catch Basin Performance for Urban Stormwater Control. EPA-600/2-83-043.
L	Pitt and Shawley, 1982.
M	Mineart, P. and S. Singh. 1994. Storm Inlet Pilot Study. Woodward Clyde Consultants. Alameda County Urban Runoff Clean Water Program. Oakland, CA.
P	Winer, Rebecca. 2000. National Pollutant REmoval Performance Database for Stormwater Treatment Practices. 2nd Edition. Center for Watershed Protection. Elliot City, MD.
Source N is as reported in Low Impact Development Center Website	
N	Yu, S.L., X. Zhang, A. Earles and M. Sievers. 1999: Field Testing of Ultraurban BMPs. Proceedings of the 26th Annual Water Resources Planning Conference ASCE, 609 June, Tempe, AZ.
Source O is as reported in EPA's National Management Measures to Control Nonpoint Source Pollution	
O	Herson-Jones, L.M., M. Heary, and B. Jordan. 1995. Riparian Buffer Strategies for Urban Watersheds. Metropolitan Washington Council of Governments, Washington, DC.
Q	2009 Biannual Report. University of New Hampshire Stormwater Center.

BMPs and Phosphorous Removal Efficiencies

Water Quality BMP	Target Phosphorus Removal Efficiency
Vegetated Practices	
Vegetated Filter Strip – Min Std. 3.14	10%
Grass Swale (with check dams) - Min Std. 3.13	15%
Water Quality Swale - Min Std. 3.13	35%
Detention Practices and Wetlands	
Extended Detention (30-hr draw down of 2 x WQV) - Min Std. 3.07	35%
Enhanced Extended Detention (30-hr draw down of 1 x WQV, and 1 x WQV shallow marsh) - Min Std. 3.07	50%
Constructed Wetlands (2 x WQV) - Min Std. 3.09	30%
Retention Practices	
Retention Basin I (3 x WQV) - Min Std. 3.06	40%
Retention Basin II (4 x WQV) - Min Std. 3.06	50%
Retention Basin III (4 x WQV, aquatic bench) - Min Std. 3.06	65%
Infiltration Practices	
Infiltration Facility (storage volume = ½" runoff from impervious areas) - Min Std. 3.10	50%
Infiltration Facility (storage volume = 1" runoff from impervious areas) - Min Std. 3.10	65%
Bioretention/Biofiltration Practices – Min Std. 3.11, 3.11a, 3.11b	
Bioretention Basin (capture/treatment volume = ½" runoff from impervious areas)	50%
Bioretention Basin (capture/treatment volume = 1" runoff from impervious areas)	65%
Bioretention Filter (capture/treatment volume = ½" runoff from impervious areas)	50%
Bioretention Filter (capture/treatment volume = 1" runoff from impervious areas)	65%
Green Alleys (capture/treatment volume = ½" runoff from impervious areas)	50%
Green Alleys (capture/treatment volume = 1" runoff from impervious areas)	65%
Sand Filters	
Intermittent Sand Filter (treating ½" runoff from impervious areas) – Min Std. 3.12	65%
Manufactured BMPs – Min Std. 3.15	
Hydrodynamic Structures (*Stormceptor, Vortechs, Downstream Defender, BaySaver*)	15-20%
Filtering Structures (*StormFilter, StormTreat System*)	50%

NOTES:

WQV = Water quality volume (first ½" of runoff from the impervious surfaces)

The 30-hour draw down time of water quality volume pertains to the brim draw down time, beginning at the time of peak storage of the water quality volume. Brim draw down time means the time required for the entire calculated volume to drain out of the basin. See Virginia Stormwater Management Handbook Section 5-6.2 for methods to verify the draw down time and design performance.

Design Standards and Specification for the BMPs referenced in the table above can be found in the Virginia Stormwater Management Handbook.

Appendix B

BMP Model Results

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0010	C_YR10HR2	12.24	66.85	12	16.51	12.24	13.59		0.0			
NA0020	C_YR10HR2	12.42	35.99	12.17	184.39	12.41	147.48		0.1			
NA0030	C_YR10HR2	12.81	61.6	12	35.11	12.8	9.25	TOB/LOW RD=64.5 ok	0.4	IMPACT		
NA0040	C_YR10HR2	12.66	31.11	12	5.96	15.04	5.73		0.1			
NA0050	C_YR10HR2	12.74	30.88	12.17	146.43	12.06	100.84		0.1			
NA0060	C_YR10HR2	12.18	33.52	12.17	149.28	12.18	147.75		0.0			
NA0070	C_YR10HR2	12.51	35.44	12.38	259.37	12.51	238.58		0.1			
NA0075	C_YR10HR2	12.66	31.13	12.41	165.92	12.5	117		0.1			
NA0080	C_YR10HR2	12.74	30.86	12.59	456.12	12.74	428.1		0.1			
NA0090	C_YR10HR2	14.74	20.71	12	12.09	14.74	1.17		-0.5		BENEFIT	
NA0100	C_YR10HR2	12.06	16.97	12	26.26	12.06	24.81		0.0			
NA0110	C_YR10HR2	13.44	64.35	12	143.79	13.44	18.16		0.0			
NA0120	C_YR10HR2	12.79	16.09	12	30.74	12.93	7.21		0.0			
NA0130	C_YR10HR2	12.88	17.05	12	35.15	12.88	6.82	LOW RD=18.8; TOB=17.5 ok	0.5	IMPACT		
NA0140	C_YR10HR2	12.62	41.74	12	4.01	12.62	1.64		0.0			
NA0150	C_YR10HR2	13.09	13.13	12	10.36	14.8	6.96		0.0			
NA0160	C_YR10HR2	12.08	15.39	12	70.05	12.08	69.11		0.0			
NA0170	C_YR10HR2	12.74	15.89	12.02	56.25	12.73	15.8		0.0			
NA0180	C_YR10HR2	12.52	15.24	12	40.96	12.52	21.94		0.0			
NA0190	C_YR10HR2	13.15	14.69	12.55	24.25	12.99	15.25	LOW RD=16.4 Ballfields ok	0.2	IMPACT		
NA0200	C_YR10HR2	23.62	13.45	12	40.12	23.62	0.81		0.0			
NA0210	C_YR10HR2	12.73	17.32	12.72	454.52	12.73	454.44	LowRd=20; TOB=21 OK	0.7	IMPACT		
NA0220	C_YR10HR2	12.03	67.29	12	32.03	12.03	31.36		0.0			
NA0230	C_YR10HR2	12.24	56.47	12.17	265.41	12.24	255.6		0.0			
NA0240	C_YR10HR2	12.19	57.06	12	53.54	12.19	51.15		0.1			
NA0250	C_YR10HR2	12.17	49.33	12.13	111.58	12.17	110.86		0.0			
NA0255	C_YR10HR2	13.08	7.63	12.01	287.16	12.28	155.76		0.0			
NA0270	C_YR10HR2	12.25	54.4	12.22	75.12	12.25	74.9		0.0			
NA0275	C_YR10HR2	13.1	7.6	12.01	282.55	12.03	215.72		0.0			
NA0290	C_YR10HR2	12.7	12.56	12.69	566.23	12.7	566.13	LOW RD=15.5;TOB=15.5 ok	0.3	IMPACT		
NA0300	C_YR10HR2	12.48	13.06	12	29.24	12.48	13.99		0.0			
NA0310	C_YR10HR2	14.72	10.85	12.03	23.72	12.56	12.78		0.0			
NA0320	C_YR10HR2	14.72	10.85	12.01	156.03	12.15	48.81		0.0			
NA0330	C_YR10HR2	14.73	10.84	12.11	86.69	20.18	30.45		0.0			
NA0340	C_YR10HR2	12.51	11.24	12	14.78	12.51	6.51		0.0			
NA0350	C_YR10HR2	12.25	11.02	12.14	62.3	12.25	59.64		0.0			
NA0360	C_YR10HR2	12.45	11.66	12	12.63	12.45	6.88		-0.1			
NA0370	C_YR10HR2	14.66	10.68	14.88	45.02	15.12	45.35		0.0			
NA0380	C_YR10HR2	12.61	10.04	12	15.54	12.59	5.61		-0.2			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0390	C_YR10HR2	12.31	10.5	12.2	31.51	12.33	30.73		0.0			
NA0395	C_YR10HR2	12.21	11.2	12	61.19	12.18	49.13		0.0			
NA0400	C_YR10HR2	12.19	10.3	12.14	19.35	12.21	19.24		0.0			
NA0410	C_YR10HR2	12.97	10.09	14	51.4	13.58	51.71		-0.2			
NA0420	C_YR10HR2	12.84	9.92	13.57	51.92	13.53	52.1		-0.3		BENEFIT	
NA0430	C_YR10HR2	12.05	29.75	12	13.43	12.05	12.9		0.0			
NA0440	C_YR10HR2	12.37	9.78	12	16.97	12.41	10.59		-0.4		BENEFIT	
NA0450	C_YR10HR2	12.7	11.89	12.7	569.9	12.7	569.88		0.1			
NA0470	C_YR10HR2	12.7	11.55	12.69	580.71	12.7	580.64		0.1			
NA0480	C_YR10HR2	12.71	10	12.69	587.15	12.69	587.03		-0.3		BENEFIT	
NA0490	C_YR10HR2	12.45	11.48	12	26.16	12.45	23.05		0.0			
NA0500	C_YR10HR2	12.3	8.41	12.26	1035.67	12.28	1033.05	in banks=10	0.5	IMPACT		ds culvert bm
NA0505	C_YR10HR2	13.02	7.68	12.05	428.44	12.11	401.02	in banks=8.6	0.0			
NA0510	C_YR10HR2	12.77	10.88	12	25.02	12.77	6.08		0.0			
NA0515	C_YR10HR2	12.54	14.88	12	31.03	12.52	13.14		0.0			
NA0520	C_YR10HR2	12.53	13.3	12	185.5	12.53	110.46		0.0			
NA0525	C_YR10HR2	12.48	15.35	12	131.29	12.48	63.03		-0.1			
NA0530	C_YR10HR2	12.54	12.76	12.28	108.17	12.68	107.45		0.0			
NA0540	C_YR10HR2	12.52	10.05	12.47	157.44	12.52	156.73		0.0			
NA0550	C_YR10HR2	22.61	14.37	12	92.39	22.61	2.23		0.0			
NA0570	C_YR10HR2	13.56	28.18	12	20.04	14.31	3.76		-0.1			
NA0580	C_YR10HR2	12.42	28.98	12.06	42.32	12.42	27.86		0.0			
NA0590	C_YR10HR2	12.19	13.07	12	52.49	12.19	44.12		0.0			
NA0600	C_YR10HR2	12.81	10.51	12	134.29	12.81	39.03		-0.1			
NA0610	C_YR10HR2	12.19	37.73	12.17	44.74	12.19	44.09		0.0			
NA0620	C_YR10HR2	12.04	14.6	12	5.13	12.04	4.95		0.0			
NA0630	C_YR10HR2	12.92	13.11	12	81.27	12.92	15.66		-0.1			
NA0640	C_YR10HR2	12.16	10.21	12.14	303.2	12.16	302.44		0.0			
NA0650	C_YR10HR2	14.54	5.97	12	21.56	12.13	21.03		-0.2			
NA0660	C_YR10HR2	14.53	5.96	12	20.27	12.17	13.88		-0.2			
NA0670	C_YR10HR2	14.54	5.97	12.12	25.38	12.03	18.05		-0.2			
NA0680	C_YR10HR2	14.53	5.96	12.16	32.58	12.2	26.33		-0.2			
NA0690	C_YR10HR2	12.91	9.24	12	17.53	13.9	3.46		0.0			
NA0700	C_YR10HR2	12.62	9.88	12	11.82	12.81	5.08		-0.4		BENEFIT	
NA0710	C_YR10HR2	13.15	7.58	12	43.45	12.09	36.7		0.0			
NA0720	C_YR10HR2	12.71	8.42	12	29.52	12.73	8.18		0.0			
NA0730	C_YR10HR2	12.38	7.67	12	38.13	12.38	23.93		0.0			
NA0740	C_YR10HR2	12.17	9.14	12.02	121.34	12.17	116.09		0.0			
NA0750	C_YR10HR2	13.28	11.64	12	64.47	13.13	9.15		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0760	C_YR10HR2	14.23	7.19	13.02	38.01	14.28	11.63		-0.1			
NA0770	C_YR10HR2	12.32	10.67	12.11	86.95	12.32	77.08		0.0			
NA0780	C_YR10HR2	12.56	8.01	12.28	99.57	12.56	81.2		0.0			
NA0790	C_YR10HR2	12.58	7.28	12.46	220.56	12.49	216.66		-0.1			
NA0800	C_YR10HR2	13.15	7.57	12.1	50.17	12.19	24.85		0.0			
NA0810	C_YR10HR2	13.18	7.55	12.32	22.76	15.12	7.86		0.0			
NA0820	C_YR10HR2	13.17	7.55	18.41	7.03	18.6	8.47		0.0			
NA0830	C_YR10HR2	13.17	7.55	12.65	1170.07	12.71	1125.13		0.0			
NA0835	C_YR10HR2	14.2	7.22	12.53	617.23	12.51	579.42		-0.1			
NA0840	C_YR10HR2	12.47	8.16	12.41	47.14	12.47	46.91		0.0			
NA0850	C_YR10HR2	12.25	8.35	12.11	171.1	12.25	161.34		0.0			
NA0860	C_YR10HR2	14.23	7.19	12.33	192.34	21.1	115.98		-0.1			
NA0870	C_YR10HR2	13.12	7.6	12.3	983.53	12.45	639.25		0.0			
NA0880	C_YR10HR2	12.17	10.01	12	1.91	12.07	1.68		0.1			
NA0890	C_YR10HR2	12.51	10.37	12	14.81	12.51	6.55		0.1			
NA0900	C_YR10HR2	13.35	9.72	12	46.52	12.02	11.58	LOW RD=11 NO FLOOD	0.2	IMPACT		
NA0910	C_YR10HR2	12.3	9.85	12.04	2.6	12.14	2.21		0.1			
NA0920	C_YR10HR2	13.35	9.72	12.02	26.24	12.45	11.53	LOW RD=10.8 NO FLOOD	0.2	IMPACT		
NA0930	C_YR10HR2	12.34	9.78	12.06	3.59	12.47	3.19		0.1			
NA0940	C_YR10HR2	13.37	9.71	12.4	20.48	18.6	9.34	LOW RD=10.5 NO FLOOD	0.6	IMPACT		
NA0950	C_YR10HR2	13.12	7.61	12	137.07	11.97	38.92		0.0			
NA0960	C_YR10HR2	14.53	7.06	12	93.61	12.36	40.91		-0.2			
NA0970	C_YR10HR2	14.23	7.18	12.35	418.47	14.7	217.45		-0.2			
NA0980	C_YR10HR2	12.59	10.1	12	41.6	12.59	15.48		0.1			
NA0990	C_YR10HR2	16	6.99	12	211.26	17.24	25.13		-0.3			
NA1000	C_YR10HR2	14.22	7.16	16.16	992.73	16.43	1039.69	rd=7.2 bank=7 low site=7.7	-0.2			
NA1010	C_YR10HR2	14.13	7.11	14.69	1236.81	16.06	1264.36	rd=9 bank=7 low site=7.7	-0.1			
NA1020	C_YR10HR2	14.05	6.97	14.95	1287.25	14.99	1299.41	bank=7n, 9.5 s	0.1			
NA1030	C_YR10HR2	12.61	17.25	12	55.97	12.61	19.36		0.0			
NA1040	C_YR10HR2	12.96	13.81	12	14.14	12.96	2.42		0.0			
NA1050	C_YR10HR2	12.91	13.11	12	15.67	12.25	8.69		0.0			
NA1060	C_YR10HR2	12.09	13.77	12	21.35	12.09	19.59		0.0			
NA1070	C_YR10HR2	12.88	13.05	12.13	25.95	12.88	7.43		0.0			
NA1110	C_YR10HR2	13.04	16.12	11.65	15.06	13.28	6.56		0.0			
NA1120	C_YR10HR2	12.99	15.72	12	26.19	12.08	10.18		0.0			
NA1130	C_YR10HR2	13.07	15.38	12	45.39	13.07	14.67		0.0			
NA1140	C_YR10HR2	13.09	14.9	12.27	10.52	13.21	10.39		0.0			
NA1150	C_YR10HR2	12.17	13.67	12	115.06	12.17	104.78		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1160	C_YR10HR	12.22	15.85	12.16	18.54	12.22	18.29		0.0			
NA1170	C_YR10HR	13.32	15.51	12	145.97	13.32	29.89		0.0			
NA1180	C_YR10HR	14.04	6.91	14.96	1320.77	14.97	1324.29	in bank=9	0.0			
NA1185	C_YR10HR	14.03	6.88	13.13	1881.32	13.28	1839.7	in bank=8	0.0			
NA1190	C_YR10HR	14.06	6.63	13.28	1844.12	13.39	1830.38	in bank=7.5	0.0			
NA1195	C_YR10HR	14.5	5.96	13.13	1922.68	13.39	1827.48	in bank=7.5-7 low rd=4.9 low str=6.5	-0.2			
NA1200	C_YR10HR	12.5	12.81	12	14.51	12.5	6.53		0.0			
NA1210	C_YR10HR	12.45	6.39	12	37.27	12.07	21.99	pond bank=6.6 low rd=9.5 low str=7.7	-1.3		BENEFIT	
NA1212N	C_YR10HR	14.56	5.99	12	123.25	12.13	79.73	pond bank=4.4 low rd=5 low str=6.5	#N/A	#N/A	#N/A	
NA1220	C_YR10HR	13.04	15	12	142.93	13.04	21.01	in bank=16; no flood	0.2	IMPACT		
NA1230	C_YR10HR	12.89	12.25	12	60.53	12.89	11.44	in bank=14; no flood	0.2	IMPACT		
NA1240	C_YR10HR	12.55	8.91	12	70.21	12.55	36.83		0.0			
NA1250	C_YR10HR	14.62	5.78	12	188.55	12.24	135.94		-0.3		BENEFIT	
NA1255	C_YR10HR	14.93	5.29	13.91	2289.32	14.03	2270.89	in bank=6, low site 7.5	-0.4		BENEFIT	
NA1260	C_YR10HR	15.08	11.49	12	41.58	15.41	6.49		0.0			
NA1270	C_YR10HR	16.51	5.72	12	54.24	21.64	5.94		-0.2			
NA1280	C_YR10HR	12.2	10.98	12	51.96	12.2	41.31		0.0			
NA1290	C_YR10HR	12.12	9.11	12	11.53	12.12	10.24		0.0			
NA1300	C_YR10HR	14.58	5.84	13.25	2152.61	13.38	2091.79	in bank = 9+, 8 low	-0.3			
NA1305	C_YR10HR	14.63	5.78	13.37	2135.75	13.79	2091.12	in bank=7	-0.3		BENEFIT	
NA1310	C_YR10HR	14.69	5.68	13.38	2287.5	13.92	2228.44	in bank=6 low site 7.2	-0.3		BENEFIT	
NA1315	C_YR10HR	14.7	5.67	13.88	2277.77	13.92	2271.36	in bank=5, low site 7.5	-0.3		BENEFIT	
NA1320	C_YR10HR	12.29	6.42	12	47.6	12.29	33.99		0.0			
NA1340	C_YR10HR	14.94	5.29	12	24.54	20.18	6.71		-0.4		BENEFIT	
NA1350	C_YR10HR	15.78	8.82	12	85.07	15.84	4.29		0.1			
NA1360	C_YR10HR	14.97	5.25	12	186.78	19.94	48.27		-0.4		BENEFIT	
NA1365	C_YR10HR	14.96	5.25	14.19	2262.77	14.29	2247.13	in bank=4	-0.4		BENEFIT	
NA1370	C_YR10HR	15.78	8.82	12	29.55	15.78	5.78		0.1			
NA1380	C_YR10HR	12.1	9.32	11.78	38.38	12.1	12.88		0.0			
NA1390	C_YR10HR	14.98	5.22	12	40.1	12.25	33.55		-0.5		BENEFIT	
NA1410	C_YR10HR	14.96	5.25	12	12.8	19.75	5.9		-0.4		BENEFIT	
NA1420	C_YR10HR	24.35	8.24	12	46.1	24.35	0.24		0.0			
NA1430	C_YR10HR	12.55	8.96	12	44.12	12.55	18.28		0.0			
NA1440	C_YR10HR	12.54	9.79	12	37.87	12.54	15.87		0.0			
NA1450	C_YR10HR	15.01	5.12	12.41	58.81	12.44	58.35		-0.5		BENEFIT	
NA1460	C_YR10HR	16.31	6.66	12.08	55.18	21.58	6.39		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1465	C_YR10HR2	15.01	5.1	14.24	2690.08	14.26	2687.38	in bank=6	-0.5		BENEFIT	
NA1470	C_YR10HR2	25.24	6.68	12	8.87	0	0		0.0			
NA1480	C_YR10HR2	25	7.45	12	31.43	0	0		0.1			
NA1490	C_YR10HR2	12.82	6.97	12	28.29	13	6.29		0.1			
NA1500	C_YR10HR2	13.67	5.28	12	43.36	14.71	7.99		-0.3		BENEFIT	
NA1520	C_YR10HR2	13.68	5.28	12	8.44	20.4	3.38		-0.3		BENEFIT	
NA1550	C_YR10HR2	13.06	5.62	12	89.35	12.58	22.57		-0.1			
NA1560	C_YR10HR2	12.44	6.51	12	64.25	12.17	58.42		0.0			
NA1570	C_YR10HR2	12.59	6.56	12	37.41	12.09	19.89		0.0			
NA1580	C_YR10HR2	12.61	6.57	12.06	66.58	12.01	16.91		0.0			
NA1590	C_YR10HR2	13.01	6.42	12	52.46	20.44	21.68		-0.1			
NA1600	C_YR10HR2	12.74	6.27	12.22	72.13	12.31	40.39		-0.1			
NA1610	C_YR10HR2	13.12	5.8	12	50.29	11.89	9.1		0.0			
NA1620	C_YR10HR2	12.9	5.97	12.17	179.32	12.13	140.55		-0.2			
NA1630	C_YR10HR2	13.8	5.31	12	50.37	12.1	25.46		-0.3		BENEFIT	
NA1640	C_YR10HR2	13.67	5.28	12.17	164.92	12.32	133.84		-0.3		BENEFIT	
NA1650	C_YR10HR2	12.24	7.45	12.17	109.37	12.24	104.63		0.0			
NA1660	C_YR10HR2	15.66	4.62	12	9.93	16.03	2.26		-0.6		BENEFIT	
NA1670	C_YR10HR2	14.3	4.74	12.3	138.01	12.24	129.24		-0.4		BENEFIT	
NA1680	C_YR10HR2	17.33	5.37	12	29.52	18.06	1.33		-0.3		BENEFIT	
NA1690	C_YR10HR2	12.63	6.52	12	82.4	12.1	31.27		0.0			
NA1700	C_YR10HR2	12.67	11.61	12	28.5	12.67	8.66		0.0			
NA1720	C_YR10HR2	25	6.68	11.94	5.19	0	0		0.0			
NA1730	C_YR10HR2	12.63	6.52	12.1	73.34	12.64	51.01		0.0			
NA1740	C_YR10HR2	12.62	6.06	12.63	48.38	12.71	48.94		0.0			
NA1750	C_YR10HR2	25	8.32	12	14.12	0	0		0.0			
NA1760	C_YR10HR2	12.14	6.27	12	112.6	12.14	111.44		0.0			
NA1770	C_YR10HR2	12.2	7.87	12	52.72	12.12	43.76		0.0			
NA1780	C_YR10HR2	12.18	7.5	12	2.5	12.18	2.09		0.0			
NA1790	C_YR10HR2	12.29	7.73	12.08	61.2	12.29	54.05		0.0			
NA1800	C_YR10HR2	12.32	5.14	12	12.18	12.37	8.98		-0.5		BENEFIT	
NA1810	C_YR10HR2	12.46	6.95	12	19.07	12.6	9.78		0.0			
NA1820	C_YR10HR2	15.02	5.12	12	5.12	12.39	4.22		-0.5		BENEFIT	
NA1830	C_YR10HR2	15.02	5.12	12.08	43.59	12.33	42		-0.5		BENEFIT	
NA1840	C_YR10HR2	13.09	5.82	12	12.36	17.93	2.32		-0.1			
NA1845	C_YR10HR2	15.01	5.12	13.82	2721.6	14.24	2678.63	in bank=4.5	-0.5		BENEFIT	
NA1850	C_YR10HR2	13.09	5.82	12	45.05	12.11	15.78		-0.1			
NA1860	C_YR10HR2	13.12	5.81	12.11	17.61	12.88	11.73		-0.1			
NA1870	C_YR10HR2	12.61	7.08	12.45	29.1	12.61	25.91		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1880	C_YR10HR2	15.19	4.65	12	43.54	17.39	9.54		-0.6		BENEFIT	
NA1890	C_YR10HR2	15.9	4.6	12	19.46	12.25	5.33		-0.6		BENEFIT	
NA1900	C_YR10HR2	15.15	4.52	15.19	6.26	15.42	6.5		-0.6		BENEFIT	
NA1910	C_YR10HR2	14.94	11.85	12	20.95	25	1.87		0.0			
NA1920	C_YR10HR2	14.93	11.85	12	10.35	20.79	2.52		0.0			
NA1930	C_YR10HR2	13.54	11.76	12	21.97	12.68	3.83		0.0			
NA1940	C_YR10HR2	14.2	10.82	12	23.38	14.2	5.24		0.0			
NA1950	C_YR10HR2	14.97	5.22	13.82	2698.78	14.16	2643.27	in bank=5	-0.4		BENEFIT	
NA1960	C_YR10HR2	15.15	4.45	15	2820.15	15.15	2819.31	in bank=4	-0.6		BENEFIT	
NA1965	C_YR10HR2	15.15	4.52	14.58	2751.71	15.17	2737.48	in bank=4	-0.6		BENEFIT	
NA1970	C_YR10HR2	12.31	8.71	12.72	708.98	12.73	709.14		-1.4		BENEFIT	
NA1980	C_YR10HR2	12.72	9.74	12.66	693.86	12.72	690.74	pond tob=9.0	-0.5		BENEFIT	
NA1990	C_YR10HR2	12.47	7.29	12	35.07	12.75	33.44		0.0			
NA2000	C_YR10HR2	12.46	6.35	12.17	131.84	12.45	97.3		0.0			
NA2005	C_YR10HR2	15.12	4.66	14.51	2670.12	14.57	2662.12	in bank=6	-0.6		BENEFIT	
NA2070	C_YR10HR2	12.02	37.35	12	53.05	12.02	52.32		0.0			
NA2080	C_YR10HR2	13.21	36.54	12.17	215.51	13.21	43.38		0.1			
NA9000	C_YR10HR2	0	1.5	15.13	2830.35	0	0		0.0			
NA9001	C_YR10HR2	0	2	12.02	47.08	0	0		0.0			
NA9002	C_YR10HR2	0	2	0	0	0	0		0.0			
NA9003	C_YR10HR2	0	2	12.61	1.84	0	0		0.0			
NA9005	C_YR10HR2	0	2	0	0	0	0		0.0			
NA9006	C_YR10HR2	0	2	12.04	4.67	0	0		0.0			
NA9007	C_YR10HR2	0	2	0	0	0	0		0.0			
NA9008	C_YR10HR2	0	2	14.69	5.19	0	0		0.0			
NB0010	C_YR10HR2	12.98	12.52	12	187.46	13	30.92		0.1			
NB0020	C_YR10HR2	12.39	10.75	12	236.42	12.39	153.5		0.0			
NB0030	C_YR10HR2	12.45	8.61	12	85.55	12.13	61.99	no flood -openland	0.2	IMPACT		
NB0040	C_YR10HR2	12.45	8.55	12.12	63.24	12.52	62.24	in banks; rd=9.8	0.2	IMPACT		
NB0050	C_YR10HR2	12.44	8.32	12.14	63.3	12.54	63.33	in banks;rd=9.5	0.2	IMPACT		
NB0060	C_YR10HR2	12.44	8.13	12.11	81.93	12.12	75.93	in banks rd=9.0	0.2	IMPACT		
NB0070	C_YR10HR2	12.45	7.79	12.11	78.55	12.37	77.09	in banks; rd=9.0	0.2	IMPACT		
NB0080	C_YR10HR2	13.26	8.83	12	20.08	13.26	2.41		-0.1			
NB0090	C_YR10HR2	12.16	6.09	12	57.64	12.16	51.48		0.0			
NB0100	C_YR10HR2	12.53	5.45	12	37.38	12.71	17.21		-0.1			
NB0110	C_YR10HR2	12.37	5.13	12.63	18.92	12.65	19.85		-0.2			
NB0120	C_YR10HR2	12.11	4.95	12.13	250.22	12.11	268.89		-0.2			
NB9000	C_YR10HR2	0	2	12.39	67.05	0	0		0.0			
NC0010	C_YR10HR2	12.82	12.37	12.17	270.32	12.4	135.98		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NC0020	C_YR10HR2	12.9	12.3	12	229.98	11.99	66.99		0.1			
NC0030	C_YR10HR2	12.9	12.28	12	87.16	11.99	78.27		0.1			
NC0040	C_YR10HR2	12.43	12.47	12	5.91	12.58	3.45		0.0			
NC0050	C_YR10HR2	12.36	12.33	12	6.99	12.42	7.04		0.0			
NC0060	C_YR10HR2	13.06	11.99	12.14	171.21	12.26	124.53		0.0			
NC0070	C_YR10HR2	13.1	11.88	12.15	173.11	13.12	128.32		0.0			
NC0080	C_YR10HR2	12.96	10.15	12.9	116.39	12.98	116.29		0.1			
NC0090	C_YR10HR2	12.1	8.04	12.2	133.04	12.22	134.1		0.0			
NC0100	C_YR10HR2	12.47	6.66	12.09	184.43	12.51	160.22		0.0			
NC0110	C_YR10HR2	14.79	5.77	12.53	158.72	12.51	159.19		-0.4		BENEFIT	
NC9000	C_YR10HR2	0	2	0	0	0	0		0.0			
ND0010	C_YR10HR2	12.8	9.66	12	21.67	12.92	11.85		-0.1			
ND0020	C_YR10HR2	12.28	10.57	12.25	482.91	12.28	461.99		0.0			
ND0030	C_YR10HR2	12.47	7.3	12.2	457.77	12.47	411.4		0.0			
ND9000	C_YR10HR2	0	2	0	0	12.25	490.55		0.0			
NE0050	C_YR10HR2	12.04	16.67	12	19.72	12.04	18.99		0.0			
NE0060	C_YR10HR2	24.22	17.22	12	58.95	24.22	0.52	in banks;rd=18+	0.2	IMPACT		
NE0070	C_YR10HR2	17.84	17.07	12	11.39	12.01	6.33		0.1			
NE0080	C_YR10HR2	12.28	17.32	12	56.45	12.19	41.46		0.0			
NE0090	C_YR10HR2	17.84	17.07	12	138.38	17.84	5.55		0.1			
NE0200	C_YR10HR2	20.91	17.3	12	89.84	18.05	6.03		0.0			
NE0210	C_YR10HR2	13.25	17.6	12	88.13	13.01	12.54		0.0			
NE0220	C_YR10HR2	12.84	17.76	12	3.08	12.82	2.12		0.1			
NE0230	C_YR10HR2	12.72	16.45	12	18.98	13.03	5.51		0.0			
NE0240	C_YR10HR2	12.67	16.41	12	16.21	13.16	5.6		0.0			
NE0250	C_YR10HR2	12.5	15.97	12	13.45	11.95	9.18		0.1			
NE0260	C_YR10HR2	12.95	17.82	12.33	2.26	14.64	1.93		0.1			
NE0270	C_YR10HR2	14.8	17.98	12	24.15	15.77	1.76		0.1			
NE0280	C_YR10HR2	14.8	17.98	13.73	0.2	16.84	0.2		0.1			
NE0290	C_YR10HR2	14.8	17.98	11.93	1.59	16.87	0.17		0.1			
NE0300	C_YR10HR2	14.8	17.98	12	1.97	11.92	0.96		0.1			
NE0310	C_YR10HR2	12.49	16.07	11.94	7.2	0	0		0.1			
NE0320	C_YR10HR2	12.51	15.94	12	20.93	0	0		0.0			
NE0330	C_YR10HR2	24.08	15.67	12	208.95	24.59	4.11		0.0			
NE0340	C_YR10HR2	12.19	13.33	12	24.73	12.19	20.27		0.0			
NE0350	C_YR10HR2	12.22	14.84	12	10.81	12.22	8.57		0.0			
NE0360	C_YR10HR2	17.64	11.76	12.18	644.98	18.92	68.67		0.1			
NE0370	C_YR10HR2	12.46	14.84	12	73.77	12.46	37.42		0.0			
NE0375	C_YR10HR2	16.54	11.16	16.5	74.05	16.56	74.04		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NE0380	C_YR10HR2	18.76	16.6	12	25.07	18.76	0.78		0.1			
NE0390	C_YR10HR2	17.19	14.71	12	43.74	27.08	2.33		0.0			
NE0400	C_YR10HR2	16.54	11.02	16.5	74.45	16.54	74.45		0.0			
NE0410	C_YR10HR2	12.77	12	12	16.23	12.77	3.92		-0.1			
NE0415	C_YR10HR2	21.17	9.02	12.62	99.77	12.29	105.17		0.0			
NE0420	C_YR10HR2	24.08	13.25	12	78.6	12.01	25.12		0.0			
NE0430	C_YR10HR2	12.83	15.94	12	78.18	12.83	16.39		0.0			
NE0440	C_YR10HR2	12.63	15.67	12	89.83	12.63	30.52		0.0			
NE0450	C_YR10HR2	24.08	13.25	12.02	96.03	24.08	3.68		0.0			
NE0470	C_YR10HR2	24.08	13.25	12	155.59	12.05	50.04		0.0			
NE0480	C_YR10HR2	14.85	5.8	12	42.53	18.71	11.55		-0.3		BENEFIT	
NE0490	C_YR10HR2	12.78	7	12	29.63	12.78	7.22		-0.1			
NE0500	C_YR10HR2	12.53	15.29	12	14.44	12.54	6.18		0.0			
NE0510	C_YR10HR2	12.49	15.59	12.17	42.76	12.48	26.86		0.0			
NE0520	C_YR10HR2	12.57	15.14	12.25	34.74	12.57	26.22		0.0			
NE0530	C_YR10HR2	12.61	14.51	12.49	30.07	12.61	29.38		0.0			
NE0540	C_YR10HR2	12.48	14.03	12.48	34.8	12.55	35.04		0.0			
NE0550	C_YR10HR2	12.34	13.96	12.53	35.54	12.54	36.07		0.0			
NE0555	C_YR10HR2	12.32	13.93	12.17	81.07	12.32	76.64		0.0			
NE0560	C_YR10HR2	12.37	7.09	12.28	192.28	12.34	183.76		0.0			
NE0570	C_YR10HR2	14.67	5.71	12.17	434.41	12.24	395.74		-0.3		BENEFIT	
NE0575	C_YR10HR2	12.42	6.01	12.34	201.78	12.4	198.83		-0.1			
NE0580	C_YR10HR2	12.56	17.71	12	21.34	12.57	8.62		0.0			
NE0590	C_YR10HR2	13.3	15.74	12	245.18	14.84	30.64		0.0			
NE0600	C_YR10HR2	12.47	15.71	12	15.85	12.49	7.75		0.0			
NE0610	C_YR10HR2	12.43	14.99	12	64.6	12.41	53.62		0.0			
NE0620	C_YR10HR2	12.61	15.37	12	87.3	12.82	33.61		0.1			
NE0630	C_YR10HR2	12.71	15.78	12	57.82	12.71	16.23		0.0			
NE0640	C_YR10HR2	12.36	16.54	12	31.16	12.36	19.53		0.0			
NE0650	C_YR10HR2	12.14	15.39	12	18.34	12.11	16.36		0.0			
NE0660	C_YR10HR2	12.09	15.05	12	4.79	12.09	4.38		0.0			
NE0670	C_YR10HR2	12.26	14.1	12	130.32	12.08	120.87		0.1			
NE0680	C_YR10HR2	12.36	13.22	12.17	359.69	12.45	326.98		0.1			
NE0690	C_YR10HR2	12.26	13.89	12	9.57	12.26	7.05		0.0			
NE0710	C_YR10HR2	12.48	17.21	12	13.33	12.48	6.54		0.0			
NE0720	C_YR10HR2	12.71	16.43	12.94	5.68	13.09	6.1		0.0			
NE0730	C_YR10HR2	12.3	13.75	12.08	149.81	12.09	145.99		0.1			
NE9000	C_YR10HR2	0	2	12.54	2.18	0	0		0.0			
NE9001	C_YR10HR2	0	2	18.76	0.78	0	0		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NF0010	C_YR10HR2	20.28	18.13	12	100.35	20.28	0.63		0.0			
NF0020	C_YR10HR2	14.27	15.62	12	115.32	19.41	10.82		-0.1			
NF0030	C_YR10HR2	12.78	15.86	12	29.31	12.14	25.54		0.0			
NF0040	C_YR10HR2	12.98	16.02	12	9.46	13.78	1.85		0.0			
NF0050	C_YR10HR2	12.78	15.87	12	8.83	12.09	8.12		0.0			
NF0055	C_YR10HR2	12.15	16.33	12	7.44	12.15	6.43		0.0			
NF0060	C_YR10HR2	12.79	15.86	12.22	74	12.74	13.02		0.0			
NF0070	C_YR10HR2	13.01	15.92	12	12.9	12.11	3.19		0.1			
NF0080	C_YR10HR2	12.79	15.86	12.11	15.24	12.13	14.72		0.0			
NF0090	C_YR10HR2	12.38	16.04	12	21.63	12.33	13.32		0.0			
NF0100	C_YR10HR2	12.92	15.84	12	20.52	13.39	7.46		0.1			
NF0110	C_YR10HR2	12.86	15.83	13.41	57.57	13.57	64.04		0.1			
NF0120	C_YR10HR2	12.75	15.78	12	11.78	13.04	3.06	in banks; rd-site=17.5	0.2	IMPACT		
NF0130	C_YR10HR2	12.31	16.1	12	63.72	12.05	50.97		0.0			
NF0140	C_YR10HR2	12.44	15.86	12.04	65.86	12.05	63.48		0.0			
NF0150	C_YR10HR2	12.55	15.72	12.1	85.64	12.18	78.31		0.0			
NF0160	C_YR10HR2	12.6	15.26	12.01	187.04	12.22	128.78		0.0			
NF0165	C_YR10HR2	12.61	15.23	12.2	144.12	12.25	130.97		0.0			
NF0180	C_YR10HR2	12.74	16.48	12	18.67	13.1	5.02		0.0			
NF0190	C_YR10HR2	12.42	16.25	12	9.86	12.47	8.36		0.0			
NF0200	C_YR10HR2	12.25	15.89	12	27.94	12.36	25		0.0			
NF0210	C_YR10HR2	12.69	17.09	12	13.5	12.68	3.88		0.0			
NF0220	C_YR10HR2	12.65	14.99	12.24	168.85	12.26	159.95		0.0			
NF0230	C_YR10HR2	13.02	14.5	12	178.7	14.18	41.75		0.0			
NF0240	C_YR10HR2	12.77	17.22	12	32.89	12.84	8.1		0.0			
NF0250	C_YR10HR2	12.43	16.77	12	11.31	12.43	9.2		0.0			
NF0260	C_YR10HR2	13.58	15.45	12	20.23	12.83	2.11		0.0			
NF0270	C_YR10HR2	12.13	15.22	12	18.55	12.13	17.75		0.0			
NF0280	C_YR10HR2	12.75	14.46	12.21	208.17	13.2	166.12		0.0			
NF0290	C_YR10HR2	12.24	15.25	12	33.27	12.19	27.32		0.0			
NF0300	C_YR10HR2	12.97	14.16	12	24.02	14.85	8.93		0.0			
NF0310	C_YR10HR2	12.77	14.77	12	12.07	13.34	3.19		0.0			
NF0320	C_YR10HR2	13.49	15.95	12	4.37	12.13	1.5		0.0			
NF0325	C_YR10HR2	12.69	11.2	12.53	284.58	12.69	526.43		0.0			
NF0330	C_YR10HR2	13.53	11.02	12	4.93	13.95	1.56		0.0			
NF0340	C_YR10HR2	13.47	15.95	12	5.88	12.09	2.2		0.0			
NF0350	C_YR10HR2	12.34	13.31	12	23.8	12.34	15.57		0.0			
NF0360	C_YR10HR2	12.7	14.06	12.52	268.77	12.71	264.53		0.0			
NF0370	C_YR10HR2	12.49	10.15	12.25	570.65	12.53	313.85		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NF0380	C_YR10HR2	12.32	10.13	12	114.89	12.32	95.56		0.0			
NF0390	C_YR10HR2	12.39	16.28	12	9.93	12.19	7.22		0.0			
NF0395	C_YR10HR2	12.79	15.87	12.25	25.92	0	0		0.0			
NF0400	C_YR10HR2	12.79	15.86	12.24	40.3	12.27	13.26		0.0			
NF0405	C_YR10HR2	12.47	9.73	12.38	357.5	12.47	354.17		0.0			
NF0410	C_YR10HR2	13.36	15.94	12	7.21	0	0		0.0			
NF0415	C_YR10HR2	12.47	7.51	12.45	364	12.47	363.77		0.0			
NF0420	C_YR10HR2	12.42	6.96	12.33	502.85	12.42	496.37		0.0			
NG0010	C_YR10HR2	12.02	47.15	12	307.06	12.02	301.38		0.0			
NG0015	C_YR10HR2	12.54	41.02	12.02	297.65	12.25	203.65	site recreational-ok	0.6	IMPACT		
NG0030	C_YR10HR2	12.76	41.44	12	201.51	13.3	92.65	banks=44; rd=46+	0.8	IMPACT		
NG0040	C_YR10HR2	12.31	35.27	12	23.66	12.31	17.97		0.0			
NG0050	C_YR10HR2	12.61	33.15	12.25	142.39	12.3	139.43		0.1			
NG0060	C_YR10HR2	12.09	37.45	12	18.33	12.09	16.84		0.0			
NG0070	C_YR10HR2	12.05	23.08	12.04	39.78	12.05	39.72		0.0			
NG0075	C_YR10HR2	12.12	13.54	12	115.15	12.12	264.55		0.0			
NG0080	C_YR10HR2	12.76	28.06	12.62	104.47	12.76	93.46	in banks; no rd-site flood	0.3	IMPACT		
NG0090	C_YR10HR2	12.89	23.91	12.75	87.87	12.89	75.27	in banks; no rd-site flood	0.6	IMPACT		
NG0095	C_YR10HR2	12.21	13.4	12.12	292.59	12.2	122.63		-0.1			
NG0100	C_YR10HR2	12.52	14.84	12	28.27	12.52	14.37		0.0			
NG0110	C_YR10HR2	12.08	12.44	12	6.98	12.08	6.45		-0.1			
NG0115	C_YR10HR2	12.36	10.77	12.21	551	12.29	540.07	banks 12	-1.7		BENEFIT	
NG0120	C_YR10HR2	12.32	11.65	12	82.41	12.37	56.8	low rd 11.9, pondbanks=11, low site12.6	-0.9		BENEFIT	
NG0130	C_YR10HR2	12.32	11.64	12.11	420.22	12.11	409.79	driveway=11-11.5, banks=11	-0.9		BENEFIT	
NG0140	C_YR10HR2	12.03	23.37	12	26.41	12.03	25.73		0.0			
NG0150	C_YR10HR2	12.01	17.76	12	78.1	12.04	87.61		0.0			
NG0160	C_YR10HR2	12.16	15.41	12.04	30.41	12.16	28.81		0.0			
NG0170	C_YR10HR2	12.53	13.6	12.14	33.69	12.53	29.3		0.1			
NG0180	C_YR10HR2	12.11	12.95	12	28.5	12.11	25.58		0.0			
NG0185	C_YR10HR2	12.39	9.91	12.25	616.16	12.33	605.26	in banks=11	-1.1		BENEFIT	
NG0190	C_YR10HR2	12.4	9.38	12.33	606.17	12.5	605.85	in banks=10.1 ok	0.5	IMPACT		bmp#9B ds ir
NG0200	C_YR10HR2	12.64	33.09	12.27	25.48	13.68	43.24		0.1			
NG0210	C_YR10HR2	12.63	33.1	11.99	323.96	12.63	282.52		0.1			
NG0220	C_YR10HR2	12.32	10.6	12	4.87	12.32	3.25		0.0			
NG0230	C_YR10HR2	12.34	9.64	12	7.82	12.34	6.59		0.0			
NG0240	C_YR10HR2	12.41	8.7	12.33	616.36	12.33	614.41	tob=10.5 ok	0.3	IMPACT		ds of bmp 9a

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NG0250	C_YR10HR2	12.42	8.57	12.37	1361.22	12.4	1359.24	tob=10.3 ok	0.2	IMPACT		ds of bmp#9a
NG0260	C_YR10HR2	13.05	7.18	12.39	1363.04	12.41	1359.97	tob=11	0.0			ds of bmp#9a
NH0010	C_YR10HR2	23.56	65.49	12.33	2.62	23.56	0.23		0.0			
NH0030	C_YR10HR2	12.19	38.25	12	84.16	12.19	69.11		0.0			
NH0040	C_YR10HR2	12.03	34.68	12	44.44	12.03	43.3		0.0			
NH0050	C_YR10HR2	12.28	34.87	12.24	134.81	12.28	134.17		0.0			
NH0060	C_YR10HR2	25	32.2	12	2.49	0	0		-0.3		BENEFIT	
NH0070	C_YR10HR2	25	35.71	12	7.57	0	0		0.1			
NH0080	C_YR10HR2	12.25	38.89	12	103.36	12.24	88.6		0.1			
NH0090	C_YR10HR2	12.27	37.42	12.23	91.54	12.27	91.32		0.0			
NH0100	C_YR10HR2	12.26	35.8	12.18	193.61	12.26	190.14		0.0			
NH0110	C_YR10HR2	12.46	29.91	12.2	336.85	12.23	328.49		0.0			
NH0120	C_YR10HR2	12.5	29.76	12.19	638.86	12.5	504.34		0.1			
NH0130	C_YR10HR2	12.22	15.31	12	146.86	12.22	115.18		0.0			
NH0140	C_YR10HR2	12.2	30.87	12.17	185.8	12.2	185.32		0.0			
NH0150	C_YR10HR2	12.04	16.81	12	31.05	12.04	30		-0.1			
NH0160	C_YR10HR2	12.43	17.76	12.42	544.17	12.42	544.06	low rd=19priv, tob=19, low site 20-20.4	-2.8		BENEFIT	
NH0170	C_YR10HR2	12.37	12.66	12.34	581.09	12.38	580.71	lowfloor=18.14, site=13.5, rd=15.7 mhp	-1.6		BENEFIT	
NH0180	C_YR10HR2	12.39	11.27	12.27	640.85	12.35	635.8	rd=13.7 5th st 12.6 oak, bank=12, low site 11.6	-1.2		BENEFIT	
NH0185	C_YR10HR2	12.42	10.41	12.31	656.01	12.41	650.11	in bank=11.0, low rd 11.5 ok	1.3	IMPACT		bmp#10a ds
NH0188N	C_YR10HR2	12.42	9.88	12.41	650.11	12.46	650.88	low bank= 10.5	#N/A	#N/A	#N/A	
NH0195	C_YR10HR2	12.4	9.12	12.34	745.61	12.37	741.62	low bank= 10.5, low rd=10, site=10.5 ok	0.1	IMPACT		bmp#10a
NI0020	C_YR10HR2	13.14	15.73	12	34.59	14.07	6.99		0.0			
NI0025	C_YR10HR2	12.6	15.67	12.17	160.59	12.62	120.32	low rd 15.3, bank=15	0.0			
NI0030	C_YR10HR2	12.54	17.28	12	5.31	12.54	2.18		0.1			
NI0040	C_YR10HR2	12.78	16.78	12	86.95	12.79	21.23		0.0			
NI0045	C_YR10HR2	12.71	14.45	12.61	178.48	12.74	177.65	bank=16	-0.4		BENEFIT	
NI0050	C_YR10HR2	23.79	18.34	12	39.08	23.79	0		0.0			
NI0060	C_YR10HR2	14.23	17.55	12	17.79	12.01	11.87		0.0			
NI0065	C_YR10HR2	14.25	17.54	12	116.5	12.36	20.28		0.0			
NI0070	C_YR10HR2	12.45	17.5	12	32.72	12.42	16.96		0.0			
NI0075	C_YR10HR2	14.26	17.54	12	154.99	14.16	16.33		0.0			
NI0080	C_YR10HR2	12.53	17.39	12.18	32.68	12.49	25.26		0.0			
NI0090	C_YR10HR2	12.54	17.35	12.37	30.85	12.47	29.68		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NI0095	C_YR10HR2	12.7	14.2	12.65	201.81	12.8	202.45	bank=15	-0.5		BENEFIT	
NI0100	C_YR10HR2	12.55	17.31	12.25	40.37	12.53	36.63		0.0			
NI0110	C_YR10HR2	12.59	17.13	12.49	38.04	12.52	37.86		0.0			
NI0120	C_YR10HR2	12.63	17.05	12.28	58.63	12.59	48.99		0.0			
NI0130	C_YR10HR2	12.72	16.76	12.45	57.12	12.65	53.12		0.0			
NI0140	C_YR10HR2	12.76	16.41	12.64	53.89	12.76	53.39		0.1			
NI0150	C_YR10HR2	23.58	17.6	12	14.89	23.58	0.31		0.0			
NI0170	C_YR10HR2	12.74	17.31	12	15.1	13.15	4.48		0.0			
NI0180	C_YR10HR2	17.17	17.07	12	16.21	30	1.6		0.0			
NI0190	C_YR10HR2	17.15	17.07	12	38.94	30	4.4		0.0			
NI0200	C_YR10HR2	14.14	14.66	12	118.18	14.14	12.3		0.0			
NI0205	C_YR10HR2	12.76	11.82	12.45	464.08	12.55	454.97	in bank=11.3	0.2	IMPACT		ds of bmp#7a
NI0210	C_YR10HR2	12.94	14.82	12	24.59	12.31	5.25		0.0			
NI0220	C_YR10HR2	12.48	14.22	12	17.01	12.48	8.11		0.0			
NI0230	C_YR10HR2	12.8	15.29	12	28.12	14.12	7		0.0			
NI0240	C_YR10HR2	12.63	14.15	12	41.26	12.55	17.94		0.0			
NI0245	C_YR10HR2	12.66	13.24	12.64	279.6	12.73	280.05	bank=15	-0.2			
NI0250	C_YR10HR2	12.74	16.52	12	68.47	13.48	18.69		0.1			
NI0260	C_YR10HR2	12.9	16.5	12	57.91	13.99	19.01		0.0			
NI0270	C_YR10HR2	14.26	17.54	12.45	18.57	14.26	17.45		0.0			
NI0280	C_YR10HR2	12.69	14.09	12.63	215.4	12.73	215.27	bank=17	-0.5		BENEFIT	
NI0285	C_YR10HR2	12.67	13.6	12.65	239.65	12.72	239.82	bank=17	-0.2			
NI0290	C_YR10HR2	12.65	13.1	12.65	321.52	12.72	321.82	bank=15, rd=17	-0.3		BENEFIT	
NI0295	C_YR10HR2	12.64	15.69	12	65.08	12.18	36.74		0.0			
NI0300	C_YR10HR2	16.63	6.78	12	32.72	17.61	4.02	tob=9+	-0.2			bmp#7a
NI0310	C_YR10HR2	12.62	12.59	12	80.26	0	0		0.0			
NI0320	C_YR10HR2	13.09	13.66	12	17.59	13.09	2.44		-0.1			
NI0325	C_YR10HR2	12.64	12.79	12.51	439.61	12.55	437.73	bank=15, rd=17	0.1			ds culvert bm
NI0330	C_YR10HR2	13.08	15.92	12	54.64	13.37	9.85		0.0			
NI0340	C_YR10HR2	12.64	12.52	12	30.41	12.78	12.73		0.0			
NI0350	C_YR10HR2	12.71	15.3	12	25.78	12.75	7.13		0.0			
NI0355	C_YR10HR2	12.78	10.71	12.47	464.33	12.59	455.48	in bank=11.0	0.3	IMPACT		ds bmp#7a
NI0360	C_YR10HR2	12.78	10.64	12.56	550.49	12.59	538.14	in bank=10.5	0.3	IMPACT		ds bmp#7a
NI0370	C_YR10HR2	12.43	16.77	12	18.88	12.1	13.06		0.0			
NI0380	C_YR10HR2	12.4	15.57	12.27	107.18	12.34	105.12		0.1			
NI0390	C_YR10HR2	12.57	16.42	12.15	4.13	12.57	3.55		0.0			
NI0400	C_YR10HR2	12.43	16.78	12.07	25.29	12.18	3.45		0.0			
NI0410	C_YR10HR2	12.23	15.85	12	27.59	12.23	21.51		0.0			
NI0415	C_YR10HR2	13.04	16.12	12	30.45	11.65	9.26		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NI0420	C_YR10HR2	12.32	15.09	12.12	58.97	12.3	52.57		0.0			
NI0430	C_YR10HR2	12.35	14.92	12.17	112.37	12.35	103.16		0.0			
NI0440	C_YR10HR2	12.48	17.22	12	60.21	12.48	5.15		0.0			
NI0450	C_YR10HR2	12.78	16.4	12	93.45	11.7	36.23		0.0			
NI0455	C_YR10HR2	12.38	16.55	12	88.6	12.01	76.54	site=18	0.1			
NI0460	C_YR10HR2	14.29	14.68	12	16.56	16.3	1.35		0.0			
NI0470	C_YR10HR2	12.82	17.05	12	43.48	16.07	8.01		0.0			
NI0480	C_YR10HR2	12.24	17.15	12	18.88	12.24	14.46		0.0			
NI0490	C_YR10HR2	14.5	17.1	12	64.84	14.5	4.4		0.0			
NI0500	C_YR10HR2	12.69	17.31	12	27.67	12.8	8.3		0.0			
NI0510	C_YR10HR2	12.53	17.57	12	47.79	12.32	13.83		0.0			
NI0520	C_YR10HR2	12.57	17.29	12	36.36	12.65	13.39		0.0			
NI0530	C_YR10HR2	23.23	17.12	12	38.36	30	1.66		0.0			
NI0540	C_YR10HR2	23.23	17.12	12.38	25.73	25.34	1.39		0.0			
NI0550	C_YR10HR2	12.48	17.36	19.23	6.62	19.21	6.6		0.0			
NI0560	C_YR10HR2	12.42	17.88	12	10.43	12.02	5.96		0.0			
NI0570	C_YR10HR2	12.47	18.48	12	6.33	12.47	3.1		0.0			
NI0580	C_YR10HR2	12.53	17.16	12.13	16.98	13.19	20.12		0.0			
NI0590	C_YR10HR2	12.78	14.76	12	14.3	11.73	4.33		0.0			
NI0600	C_YR10HR2	12.69	17.61	12	19.99	12.95	12.27		0.0			
NI0610	C_YR10HR2	12.68	17.82	12	25.67	12.17	8.25		0.0			
NI9000	C_YR10HR2	0	2	13.14	0.94	0	0		0.0			
NJ0010	C_YR10HR2	12.67	16.15	12	211.67	12.65	49.82		0.0			
NJ0020	C_YR10HR2	13.27	15.46	12	29.41	13.27	3.37		0.1			
NJ0025	C_YR10HR2	12.64	12.85	12.24	239.65	12.79	193.43		-1.0		BENEFIT	
NJ0026N	C_YR10HR2	12.61	12.88	12.16	68.86	12.21	61.49		#N/A	#N/A	#N/A	
NJ0027N	C_YR10HR2	12.46	13.01	12.13	71.65	12.16	68.86		#N/A	#N/A	#N/A	
NJ0028N	C_YR10HR2	12.41	13.04	12	85.92	12.12	60.18	low site=14	#N/A	#N/A	#N/A	
NJ0030	C_YR10HR2	12.87	15.52	12	35.11	13.06	12.35		0.0			
NJ0040	C_YR10HR2	12.68	15.34	12	3.22	13.38	1.47		0.0			
NJ0050	C_YR10HR2	12.62	15.31	12	19.75	12.62	7.87		0.0			
NJ0060	C_YR10HR2	13.48	13.89	12	29.26	15.76	7.84	bank= 14 ,site/str=14.5	-0.4		BENEFIT	
NJ0070	C_YR10HR2	12.82	14.11	12.6	48.58	13.97	43.59		-0.5		BENEFIT	
NJ0080	C_YR10HR2	13.32	13.9	12	118.15	13.25	14.04		0.0			
NJ0090	C_YR10HR2	12.43	16.16	12	121.45	12.43	51.41		0.0			
NJ0100	C_YR10HR2	16.81	15.74	12	191.96	16.81	7.9		0.0			
NJ0110	C_YR10HR2	12.75	15.31	12	50.42	12.75	24.25		0.0			
NJ0120	C_YR10HR2	14.2	15.46	12	55.87	17.4	6.21		0.0			
NJ0130	C_YR10HR2	12.91	15.37	12	37.7	14.62	11.24		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NJ0135	C_YR10HR2	12.58	12.92	12.39	57.13	12.43	54.08		-0.9		BENEFIT	
NJ0140	C_YR10HR2	12.73	14.3	12	101.96	12.8	27.91		0.0			
NJ0150	C_YR10HR2	12.41	12.46	12.6	240.39	12.64	245.36	low rd/bank=12.5 low site13.5	-1.3		BENEFIT	
NJ0155	C_YR10HR2	12.33	12	12	502.09	12.38	429.27	bank=11.5	-0.3		BENEFIT	
NJ0160	C_YR10HR2	12.29	10.85	12.1	651.73	12.27	626.47	bank=11.5	-1.1		BENEFIT	
NJ0170	C_YR10HR2	12.25	13.81	12	101.25	12.25	76.65		0.0			
NJ0180	C_YR10HR2	14.24	7.18	12	20.07	18.52	13.52		-0.2			
NJ0185	C_YR10HR2	14.23	7.18	12.74	251.85	12.95	161.04		-0.2			
NJ0190	C_YR10HR2	14.22	7.16	12	30.51	20.98	29.76		-0.2			
NJ0195	C_YR10HR2	14.23	7.17	14.7	698.94	14.7	707.04		-0.2			
NJ0200	C_YR10HR2	12.59	8.45	12	40.45	12.52	16.19		0.0			
NJ0210	C_YR10HR2	14.24	7.18	12	37.53	18.51	21.68		-0.2			
NJ0215	C_YR10HR2	14.23	7.18	14.39	322.39	14.52	325.08		-0.2			
NJ0220	C_YR10HR2	12.65	12.8	12	56.48	12.65	17.96		0.0			
NJ0230	C_YR10HR2	12.79	7.84	12.17	21.72	12.77	15.82		0.0			
NJ0240	C_YR10HR2	13.21	7.58	12	43.68	18.3	6.06	pond tob=9.8-10	-0.1			ok
NJ0250	C_YR10HR2	12.65	10.87	12	26.33	12.65	8.3		0.0			
NJ0260	C_YR10HR2	13.11	7.56	12	16.63	18.2	8.76	pond tob=9.6	-0.1			ok
NJ0265	C_YR10HR2	12.3	9.65	12.2	723.79	12.26	718.7	in bank=12.3 OK	0.8	IMPACT		ds culvert bm
NJ0270	C_YR10HR2	14.52	7.69	12	59.87	15.46	20.07		-0.1			
NJ0280	C_YR10HR2	12.74	7.6	11.87	9.81	18.14	10.79	pond tob=9.6	0.0			ok
NJ0290	C_YR10HR2	12.37	8.11	12.21	717.56	12.39	701.85	in bank= 8.5 low rd 7.7	0.5	IMPACT		ds channel br
NJ0300	C_YR10HR2	14.24	7.19	12.12	758.29	12.66	497.69		-0.1			
NJ0310	C_YR10HR2	14.24	7.18	12.03	181.83	24.35	74.23		-0.2			
NJ0320	C_YR10HR2	14.24	7.18	12.65	337.07	12.66	240.64		-0.2			
NJ0330	C_YR10HR2	15.88	6.95	14.22	132.33	21.18	3.92		-0.4		BENEFIT	
NJ0340	C_YR10HR2	12.41	16.37	12	165.28	12.41	93.35		0.0			
NJ0350	C_YR10HR2	12.87	15.52	12	23.51	13.33	4.92		0.0			
NJ9000	C_YR10HR2	0	12.5	12.41	14.36	0	0		0.0			
NK0010	C_YR10HR2	18.27	6.93	12	11.27	18.74	0.41		0.0			
NK0020	C_YR10HR2	16.93	7.19	12	12.73	19.27	0.6		0.0			
NK0030	C_YR10HR2	13.93	4.12	12	21.68	13.93	1.76		0.0			
NK0040	C_YR10HR2	18.79	7.41	12	19.18	20.22	0.61		0.0			
NK0050	C_YR10HR2	12.82	8.15	12	60.19	12.83	13.45		0.0			
NK0060	C_YR10HR2	12.66	4.99	12	94.78	12.61	30.46		0.0			
NK0070	C_YR10HR2	13.94	4.12	12	67.56	14.05	5.58		0.0			
NK0080	C_YR10HR2	12.98	7.33	12.1	45.24	12.97	15.94		0.0			
NK0090	C_YR10HR2	13.93	4.12	12	11.97	14.03	8.64		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NK0100	C_YR10HR	12.79	7.66	12	64.63	12.82	27.64		0.0			
NK0110	C_YR10HR	12.65	3.91	12	41.6	12.65	16.36		0.0			
NK0120	C_YR10HR	12.14	6.16	12	24.23	12.14	23.2		0.0			
NK0130	C_YR10HR	12.88	5.32	12	69.19	12.88	20.83		0.0			
NK0140	C_YR10HR	14.01	4.94	12.17	301.2	12.87	81.1		0.0			
NK0150	C_YR10HR	14.04	4.91	12.31	102.05	14.04	80.78		0.0			
NK0160	C_YR10HR	12.14	7.51	12	11.61	12.14	10.07		0.0			
NK0170	C_YR10HR	13.2	7.52	12	67.02	13.6	8.63		0.0			
NK9000	C_YR10HR	0	2	13.64	94.37	0	0		0.0			
NK9001	C_YR10HR	0	2	0	0	0	0		0.0			
NA0010	D_YR25HR	12.12	66.96	12	23.78	12.12	21.75		0.0			
NA0020	D_YR25HR	12.26	36.21	12.17	257.02	12.25	238.92		0.1			
NA0030	D_YR25HR	12.58	62.19	12	50.95	13	22.06	TOB/LOW RD=64.5 ok	0.4	IMPACT		
NA0040	D_YR25HR	12.45	31.45	11.93	6.41	15.77	4.55		0.1			
NA0050	D_YR25HR	12.48	31.21	12.22	220.44	12.43	160.2		0.1			
NA0060	D_YR25HR	12.22	33.66	12.19	222.89	12.22	218.28		0.0			
NA0070	D_YR25HR	12.34	35.64	12.23	406.02	12.34	388.26		0.0			
NA0075	D_YR25HR	12.45	31.49	12.22	219.45	12.36	131.36		0.1			
NA0080	D_YR25HR	12.49	31.18	12.4	807.89	12.49	781.84		0.1			
NA0090	D_YR25HR	13.68	21.81	12	19.39	13.68	2.4		-0.5		BENEFIT	
NA0100	D_YR25HR	12.05	17	12	34.57	12.05	32.93		0.0			
NA0110	D_YR25HR	12.7	64.65	12	190.47	12.7	70.88		0.0			
NA0120	D_YR25HR	12.58	16.37	12	39.67	12.58	15.17		0.0			
NA0130	D_YR25HR	12.93	17.54	12	45.51	12.93	7.99	LOW RD=18.8; TOB=17.5 ok	0.5	IMPACT		
NA0140	D_YR25HR	12.32	41.79	12	5.95	12.32	4.37		0.0			
NA0150	D_YR25HR	13.03	13.4	12	13.21	15.1	7.13		0.0			
NA0160	D_YR25HR	12.05	15.48	12	99.36	12.05	98.14		0.0			
NA0170	D_YR25HR	12.54	16.12	12.01	75.34	12.52	34.62		0.0			
NA0180	D_YR25HR	12.25	15.32	12	50.39	12.25	40.28		0.0			
NA0190	D_YR25HR	12.85	15.55	12.38	52.64	12.61	15.65	LOW RD=16.4 Ballfields ok	0.0			
NA0200	D_YR25HR	17.5	14.01	12	51.59	17.5	1.99		0.0			
NA0210	D_YR25HR	12.5	19.89	12.47	844.41	12.5	840.78	LowRd=20; TOB=21 OK	0.5	IMPACT		
NA0220	D_YR25HR	12.02	67.37	12	42.76	12.02	42		0.0			
NA0230	D_YR25HR	12.23	56.6	12.17	358.4	12.23	348.21		0.0			
NA0240	D_YR25HR	12.15	57.13	12	72.85	12.15	70.92		0.0			
NA0250	D_YR25HR	12.09	49.4	12.05	156.63	12.09	155.42		0.0			
NA0255	D_YR25HR	13.11	8.55	12.13	414.55	12.09	195.27		0.0			
NA0270	D_YR25HR	12.22	54.55	12.2	104.15	12.22	104.02		0.0			
NA0275	D_YR25HR	13.13	8.52	11.79	306.81	11.79	251.15		-0.1			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0290	D_YR25HR	12.48	14.52	12.47	1042.15	12.48	1041.24	LOW RD=15.5;TOB=15.5 ok	0.3	IMPACT		
NA0300	D_YR25HR	12.33	13.14	12	37.73	12.33	24.88		0.0			
NA0310	D_YR25HR	14.42	11.67	11.92	27.94	12.22	6.95		-0.1			
NA0320	D_YR25HR	14.42	11.67	11.91	167.48	11.94	45.39		-0.1			
NA0330	D_YR25HR	14.43	11.67	12	100.95	24.51	32.53		-0.1			
NA0340	D_YR25HR	12.59	11.51	12	18.9	12.3	7.11		0.0			
NA0350	D_YR25HR	12.22	11.14	12.11	80.23	12.22	76.98		0.0			
NA0360	D_YR25HR	12.35	11.75	12	17.13	12.35	11.15		0.0			
NA0370	D_YR25HR	14.4	11.46	12.5	64.41	14.92	61.53		-0.1			
NA0380	D_YR25HR	12.66	10.56	12	20.21	12.92	15.63		-0.6		BENEFIT	
NA0390	D_YR25HR	12.76	10.72	12.17	44.19	12.2	40.64		-0.4		BENEFIT	
NA0395	D_YR25HR	12.19	11.3	12	78.96	12.16	64.96		0.0			
NA0400	D_YR25HR	12.69	10.44	12.11	23.9	12.15	23.69		-0.5		BENEFIT	
NA0410	D_YR25HR	12.76	10.7	12.28	71.18	13.18	77.24		-0.4		BENEFIT	
NA0420	D_YR25HR	12.66	10.56	13.18	77.59	13.14	80.72		-0.6		BENEFIT	
NA0430	D_YR25HR	12.04	29.8	12	18.1	12.04	17.54		0.0			
NA0440	D_YR25HR	12.66	10.55	12	22.15	13	28.27		-0.6		BENEFIT	
NA0450	D_YR25HR	12.48	13.28	12.47	1049.55	12.48	1049.16	TOB/RD=13.3 ok	0.2	IMPACT		
NA0470	D_YR25HR	12.49	12.19	12.47	1072.81	12.48	1072.09		0.0			
NA0480	D_YR25HR	12.57	10.96	12.47	1086.24	12.48	1080.99		-0.4		BENEFIT	
NA0490	D_YR25HR	12.36	11.6	12.19	44.28	12.36	40.08		0.0			
NA0500	D_YR25HR	12.66	9.73	12.54	1415.81	12.57	1403.43	in banks=10 ok	0.6	IMPACT		ds culvert bm
NA0505	D_YR25HR	13.08	8.6	12	443.38	12.02	417.62	in banks=8.6	0.0			
NA0510	D_YR25HR	12.78	11.21	12	32.07	12.93	8.6		0.0			
NA0515	D_YR25HR	12.55	15.08	12	40.04	12.54	16.41		0.0			
NA0520	D_YR25HR	12.4	13.52	12	239.83	12.38	128.81		0.0			
NA0525	D_YR25HR	12.48	15.71	12	170.67	12.11	82.18		0.0			
NA0530	D_YR25HR	12.43	12.98	12.08	109.87	12.39	107.49		0.0			
NA0540	D_YR25HR	12.53	11.27	12.36	237.98	12.49	219.78		0.0			
NA0550	D_YR25HR	13.72	14.53	12	119.21	13.72	10.56		0.0			
NA0570	D_YR25HR	13.16	29.21	12	29.08	14.18	11.54		-0.2			
NA0580	D_YR25HR	12.46	30.15	12.04	63.26	12.46	34.07		0.0			
NA0590	D_YR25HR	12.05	13.11	12	70.79	12.05	67.96		0.0			
NA0600	D_YR25HR	12.65	10.93	12	181.12	12.65	71.67		-0.1			
NA0610	D_YR25HR	12.19	37.8	12.17	69.03	12.19	68.2		0.0			
NA0620	D_YR25HR	12.03	14.63	12	6.6	12.03	6.4		0.0			
NA0630	D_YR25HR	12.94	13.48	12	109.04	12.94	19.69		0.0			
NA0640	D_YR25HR	12.08	10.37	12.06	438.02	12.08	436.83		0.0			
NA0650	D_YR25HR	15.21	6.79	12	27.61	11.98	22.34		-0.1			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0660	D_YR25HR	15.17	6.78	12	25.91	11.99	18.08		-0.1			
NA0670	D_YR25HR	15.2	6.78	11.99	28.42	12.14	20.11		-0.1			
NA0680	D_YR25HR	15.17	6.78	11.99	37.43	12.02	28.48		-0.1			
NA0690	D_YR25HR	12.94	9.55	12	22.4	12.75	4.15		0.0			
NA0700	D_YR25HR	12.98	10.37	12	15.2	13.34	9.34		-0.1			
NA0710	D_YR25HR	13.14	8.51	12	55.7	12.06	41.68		-0.1			
NA0720	D_YR25HR	12.41	8.51	12	37.97	12.41	21.22		0.0			
NA0730	D_YR25HR	13.16	8.48	12	51.97	12.22	37.68		-0.1			
NA0740	D_YR25HR	12.32	9.2	12.27	153.89	12.32	153.13		0.0			
NA0750	D_YR25HR	13.46	12.01	12	85.01	13.3	10.37		0.0			
NA0760	D_YR25HR	15.05	8.26	12.81	90.54	13.14	36.89		-0.2			
NA0770	D_YR25HR	12.28	10.89	12.09	118.52	12.28	106.69		0.0			
NA0780	D_YR25HR	12.44	8.36	12.22	134.44	12.44	116.49		-0.1			
NA0790	D_YR25HR	15.04	8.26	12.38	316.21	12.41	312.53		-0.2			
NA0800	D_YR25HR	13.14	8.49	12.05	61.83	12	14.81		-0.1			
NA0810	D_YR25HR	13.16	8.48	12.23	42.39	13.43	23.72		-0.1			
NA0820	D_YR25HR	13.15	8.48	23.15	7.9	23.11	9.57		-0.1			
NA0830	D_YR25HR	13.15	8.47	12.63	1681.61	12.7	1610.12		-0.1			
NA0835	D_YR25HR	15.03	8.27	12.42	754.99	13.1	676.28		-0.2			
NA0840	D_YR25HR	12.38	8.32	12.34	87.77	12.39	87.2		-0.1			
NA0850	D_YR25HR	12.31	8.47	12.06	217.01	12.22	206.75		0.0			
NA0860	D_YR25HR	15.04	8.26	12.14	221.19	25.01	124.84		-0.2			
NA0870	D_YR25HR	13.13	8.53	12.11	1323.02	12.61	923.36		0.0			
NA0880	D_YR25HR	12.27	10.2	12	2.47	12.03	1.92		0.1			
NA0890	D_YR25HR	12.35	10.43	12	19.11	12.35	12.21		0.1			
NA0900	D_YR25HR	13.66	10.03	12	57.84	11.85	15.29	LOW RD=11 NO FLOOD	0.3	IMPACT		
NA0910	D_YR25HR	13.64	10.03	12	3.15	12.26	2.6		0.1			
NA0920	D_YR25HR	13.66	10.03	11.86	28.9	12.24	16.36	LOW RD=10.8 NO FLOOD	0.3	IMPACT		
NA0930	D_YR25HR	13.65	10.03	12.02	4.36	12.24	3.81	LOW RD=10.6 NO FLOOD	0.2	IMPACT		
NA0940	D_YR25HR	13.67	10.03	12.21	31.02	21.48	8.94	LOW RD=10.5 NO FLOOD	0.3	IMPACT		
NA0950	D_YR25HR	13.13	8.54	12	185.09	12.57	43.3		0.0			
NA0960	D_YR25HR	15.05	8.24	12	99.6	19.63	88.78		-0.2			
NA0970	D_YR25HR	15.05	8.26	13.11	588.17	13.13	458.39		-0.2			
NA0980	D_YR25HR	12.64	10.37	12	53.68	12.64	17.56		0.1			
NA0990	D_YR25HR	15.05	8.23	12	269.74	18.07	65.62		-0.2			
NA1000	D_YR25HR	15.04	8.25	18.46	1113.97	18.5	1188.22	rd=7.2 bank=7 low site=7.8	-0.2			
NA1010	D_YR25HR	14.99	8.21	15.65	1514.25	16.31	1545.01	rd=9 bank=7 low site=7.7	-0.2			
NA1020	D_YR25HR	14.87	7.99	15.77	1564.76	16.24	1578.47	bank=7n, 9.5 s;sites=9+	0.2	IMPACT		

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1030	D_YR25HR	12.45	17.35	12	71.36	12.45	36.11		0.0			
NA1040	D_YR25HR	12.57	14.03	12	18.31	12.57	8.53		0.0			
NA1050	D_YR25HR	12.66	13.52	12	20.36	12.04	8.51		0.0			
NA1060	D_YR25HR	12.08	13.8	12	27.75	12.08	25.73		0.0			
NA1070	D_YR25HR	12.52	13.23	12.04	33.05	12.52	18.67		0.0			
NA1110	D_YR25HR	13.11	16.36	12	15.33	13.17	7.65		0.0			
NA1120	D_YR25HR	12.88	15.88	12	32.3	12.93	12.48		0.0			
NA1130	D_YR25HR	12.68	15.46	12	55.36	12.65	25.33		0.0			
NA1140	D_YR25HR	12.82	15.14	12.45	12.42	12.91	11.18		0.0			
NA1150	D_YR25HR	12.18	13.72	12	146.93	12.18	138.15		0.0			
NA1160	D_YR25HR	12.22	15.92	12.17	27.06	12.22	26.77		0.0			
NA1170	D_YR25HR	12.84	15.65	12	194.95	12.84	72.72		0.0			
NA1180	D_YR25HR	14.82	7.93	16	1599.62	16.2	1602.85	in bank=9	0.1	IMPACT		
NA1185	D_YR25HR	14.8	7.89	12.9	2258.69	13.47	2180.09	in bank=8	0.1			
NA1190	D_YR25HR	14.88	7.69	13.47	2185.26	13.51	2168.08	in bank=7.5	0.1			
NA1195	D_YR25HR	15.15	6.78	12.97	2263.22	13.56	2132.05	in bank=7.5, low 7	-0.1			
NA1200	D_YR25HR	12.33	12.91	12	18.66	12.33	12.17		0.0			
NA1210	D_YR25HR	12.51	7.1	12	49.12	12.34	23.88	pond bank=6.6 low rd=9.5 low str=7.7	-0.7		BENEFIT	
NA1212N	D_YR25HR	15.51	6.81	12	153.63	12.01	79.51	pond bank=4.4 low rd=5 low str=6.5	#N/A	#N/A	#N/A	
NA1220	D_YR25HR	13.02	15.48	12	185.09	13.02	27.71		0.1			
NA1230	D_YR25HR	12.95	13.05	12	78.1	12.95	13.26		0.1			
NA1240	D_YR25HR	12.52	9.39	12	90.7	12.52	48.2		0.0			
NA1250	D_YR25HR	15.3	6.51	12	243.55	12.15	155.85		-0.2			
NA1255	D_YR25HR	15.61	6.11	13.65	2645.26	13.76	2597.01	in bank=6, low site 7.5	-0.3			
NA1260	D_YR25HR	14.93	12.21	12.37	56.87	15.28	8.78		0.0			
NA1270	D_YR25HR	17.99	6.49	12	71.1	25.56	7.28		-0.1			
NA1280	D_YR25HR	12.13	11.06	12	67.91	12.13	60.27		0.0			
NA1290	D_YR25HR	12.68	9.2	12.61	15.72	12.68	15.2		-0.1			
NA1300	D_YR25HR	15.22	6.66	13.46	2359.19	13.56	2309.88	in bank = 9+, 8 low	-0.1			
NA1305	D_YR25HR	15.26	6.6	13.52	2494.79	13.61	2441.3	in bank=7	-0.1			
NA1310	D_YR25HR	15.33	6.5	13.56	2720.88	13.76	2636.13	in bank=6 low site 7.2	-0.2			
NA1315	D_YR25HR	15.34	6.49	13.6	2617.38	13.64	2604.45	in bank=5, low site 7.5	-0.2			
NA1320	D_YR25HR	12.18	6.49	12	62.12	12.18	51.87		0.0			
NA1340	D_YR25HR	15.61	6.11	12	31.78	26.26	8.17		-0.3			
NA1350	D_YR25HR	15.89	9.27	12	111.03	24.56	7.99		0.1			
NA1360	D_YR25HR	15.63	6.07	12	245.01	24.42	52.1		-0.3		BENEFIT	
NA1365	D_YR25HR	15.63	6.07	13.87	2571.91	14.93	2545.54	in bank=4	-0.3		BENEFIT	

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1370	D_YR25HR	15.88	9.27	11.88	29.13	24.55	10.52		0.1			
NA1380	D_YR25HR	12.1	9.45	11.7	38.76	12.1	13.12		0.0			
NA1390	D_YR25HR	15.64	6.04	12	49.18	12.16	41.91		-0.3		BENEFIT	
NA1410	D_YR25HR	15.63	6.07	12	15.13	24.1	6.76		-0.3		BENEFIT	
NA1420	D_YR25HR	15.59	8.33	12	61.86	15.59	3.39		0.0			
NA1430	D_YR25HR	12.33	9.02	12	57.35	12.33	38.06		0.0			
NA1440	D_YR25HR	12.61	10.35	12	49.22	12.61	17.41		0.0			
NA1450	D_YR25HR	15.66	5.95	12.27	98.72	12.3	98.26		-0.3		BENEFIT	
NA1460	D_YR25HR	14.54	6.94	12.27	86.66	25.52	6.57		0.0			
NA1465	D_YR25HR	15.66	5.93	14.83	2991.43	14.98	2989.58	in bank=6	-0.3		BENEFIT	
NA1470	D_YR25HR	24.6	7.11	12	11.91	25.01	0.03		0.0			
NA1480	D_YR25HR	24.16	7.85	12	41.37	24.16	0.45		0.1			
NA1490	D_YR25HR	12.87	7.43	12	37.07	12.54	7.5		0.0			
NA1500	D_YR25HR	14.24	5.84	12.03	61.27	12.59	17.35		-0.2			
NA1520	D_YR25HR	14.24	5.84	12	10.9	24.73	3.72		-0.2			
NA1550	D_YR25HR	12.85	5.95	12	121.19	12.77	35.96		0.0			
NA1560	D_YR25HR	12.97	6.74	12	94.49	12.05	86.39		-0.1			
NA1570	D_YR25HR	12.99	6.77	11.99	40.02	12.01	21.31		-0.1			
NA1580	D_YR25HR	13	6.78	12	86.29	11.87	16.63		-0.1			
NA1590	D_YR25HR	13.14	6.91	12	59.88	24.42	21.1		-0.1			
NA1600	D_YR25HR	12.92	6.78	12.06	103.53	12.09	36.69		-0.1			
NA1610	D_YR25HR	12.8	6	12	64.89	12.75	14.72		0.0			
NA1620	D_YR25HR	12.98	6.72	12.06	252.15	12.01	150.45		-0.1			
NA1630	D_YR25HR	14.31	5.84	12	61.95	12.01	25.88		-0.1			
NA1640	D_YR25HR	14.24	5.84	12.14	186.2	12.21	138		-0.2			
NA1650	D_YR25HR	12.2	7.51	12.14	161.52	12.2	158.34		0.0			
NA1660	D_YR25HR	15.81	5.34	13.29	29.06	12.07	3.24		-0.3		BENEFIT	
NA1670	D_YR25HR	15.72	5.23	12.18	144.38	13.38	133.41		-0.4		BENEFIT	
NA1680	D_YR25HR	13.14	6.51	12.37	43.25	19.19	3.97		-0.1			
NA1690	D_YR25HR	12.44	6.79	12	110.01	12.48	48.77		0.0			
NA1700	D_YR25HR	12.64	11.94	12	36.77	12.64	11.9		0.0			
NA1720	D_YR25HR	24.59	7.11	11.94	5.78	24.59	0.06		0.0			
NA1730	D_YR25HR	12.44	6.79	11.97	87.18	12.44	84.34		0.0			
NA1740	D_YR25HR	12.44	6.65	12.43	79.48	12.46	79.58		0.0			
NA1750	D_YR25HR	24.1	8.51	12	18.36	24.1	0.25		0.0			
NA1760	D_YR25HR	12.13	6.36	12	146.1	12.13	144.27		0.0			
NA1770	D_YR25HR	12.17	7.96	12	68.53	12.15	57.57		0.0			
NA1780	D_YR25HR	12.19	7.64	12	3.22	12.19	2.63		0.0			
NA1790	D_YR25HR	12.22	7.82	12.1	79.58	12.22	76.26		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1800	D_YR25HR	15.66	5.95	12	15.69	12.31	11.05		-0.3		BENEFIT	
NA1810	D_YR25HR	12.58	7.25	12	24.8	12.52	9.55		0.0			
NA1820	D_YR25HR	15.66	5.95	12	6.77	12.24	4.18		-0.3		BENEFIT	
NA1830	D_YR25HR	15.66	5.95	12.08	52.71	12.18	45.97		-0.3		BENEFIT	
NA1840	D_YR25HR	17.62	6.36	12	16.42	25.02	3.29		-0.1			
NA1845	D_YR25HR	15.66	5.95	12.91	3107.24	14.9	2983.87	in bank=4.5	-0.3		BENEFIT	
NA1850	D_YR25HR	17.61	6.36	11.94	50.14	11.97	17.67		-0.1			
NA1860	D_YR25HR	17.61	6.35	11.97	20.2	23.07	12.61		-0.1			
NA1870	D_YR25HR	12.37	7.18	12.27	61.18	12.37	57.35		0.0			
NA1880	D_YR25HR	15.8	5.34	12	57.85	20.88	13.92		-0.3		BENEFIT	
NA1890	D_YR25HR	15.81	5.33	13.62	41.72	15.82	30.5		-0.3		BENEFIT	
NA1900	D_YR25HR	15.78	5.25	15.88	70.61	15.99	70.82		-0.4		BENEFIT	
NA1910	D_YR25HR	13.11	12.01	12	27.46	13.58	4.17		0.0			
NA1920	D_YR25HR	13.11	12.01	12	11.41	25.44	2.61		0.0			
NA1930	D_YR25HR	12.9	12.04	12	26.62	12.91	4.01		0.0			
NA1940	D_YR25HR	12.9	10.98	12	29.57	12.9	8.82		0.0			
NA1950	D_YR25HR	15.64	6.04	12.91	3069.88	14.57	2927.17	in bank=5	-0.3		BENEFIT	
NA1960	D_YR25HR	15.77	5.18	15.57	3148.59	15.77	3147.86	in bank=4	-0.4		BENEFIT	
NA1965	D_YR25HR	15.77	5.25	13.5	3073.53	16	2997.58	in bank=4	-0.4		BENEFIT	
NA1970	D_YR25HR	12.66	10.36	12.6	1135.84	12.67	1128.64	in bank=9	-0.7		BENEFIT	
NA1980	D_YR25HR	12.66	10.55	12.47	1190.65	12.6	1107.63	pond tob=9.0	-0.6		BENEFIT	
NA1990	D_YR25HR	12.44	7.34	12	46.41	12.67	40.16		0.0			
NA2000	D_YR25HR	12.32	6.44	12.17	171.19	12.31	150.01		0.0			
NA2005	D_YR25HR	15.76	5.38	14.08	2908.67	15.02	2893.06	in bank=6	-0.4		BENEFIT	
NA2070	D_YR25HR	12.02	37.54	12	71.25	12.02	70.31		0.0			
NA2080	D_YR25HR	13.18	37.26	12.17	290.63	13.18	59.41		0.1			
NA9000	D_YR25HR	0	1.5	15.67	3163.93	0	0		0.0			
NA9001	D_YR25HR	0	2	12.02	63.15	0	0		0.0			
NA9002	D_YR25HR	0	2	0	0	0	0		0.0			
NA9003	D_YR25HR	0	2	12.37	11.11	0	0		0.0			
NA9005	D_YR25HR	0	2	15.8	30.44	0	0		0.0			
NA9006	D_YR25HR	0	2	12.03	6.07	0	0		0.0			
NA9007	D_YR25HR	0	2	0	0	0	0		0.0			
NA9008	D_YR25HR	0	2	15.33	98.14	0	0		0.0			
NB0010	D_YR25HR	12.56	12.78	12	244.67	12.56	97.57		0.0			
NB0020	D_YR25HR	12.46	10.88	12	306.05	12.46	233.15		0.0			
NB0030	D_YR25HR	12.48	9	12	100.15	12.83	65		0.1			
NB0040	D_YR25HR	12.48	8.94	12.63	65.48	12.84	66.24		0.1			
NB0050	D_YR25HR	12.46	8.7	12.71	66.78	12.84	67.71		0.1			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NB0060	D_YR25HR	12.45	8.53	12	89.98	12.44	81.81		0.1			
NB0070	D_YR25HR	12.45	8.14	12.35	84.03	12.44	83.79		0.1			
NB0080	D_YR25HR	13.13	9.08	12	26.44	13.13	3.51		-0.1			
NB0090	D_YR25HR	12.14	6.26	12	74.97	12.14	67.73		0.0			
NB0100	D_YR25HR	12.75	5.87	12	48.59	12.92	17.57		-0.1			
NB0110	D_YR25HR	12.43	5.5	12.61	19.2	12.68	19.69		-0.2			
NB0120	D_YR25HR	15.74	5.27	12.06	308.23	12.11	302.17		-0.4		BENEFIT	
NB9000	D_YR25HR	0	2	12.46	115.73	0	0		0.0			
NC0010	D_YR25HR	12.88	12.78	12.17	352.08	12.24	147.42		0.0			
NC0020	D_YR25HR	12.92	12.74	12	284.08	11.87	71.49		0.0			
NC0030	D_YR25HR	12.92	12.72	11.88	91	11.86	81.36		0.0			
NC0040	D_YR25HR	12.54	12.69	12	7.62	12.4	3.25		0.0			
NC0050	D_YR25HR	12.59	12.54	12.06	8.9	12.15	7.71		0.0			
NC0060	D_YR25HR	12.94	12.22	12	210.08	13	163.91		0.0			
NC0070	D_YR25HR	12.87	12.02	12.02	211.47	12.9	178.08		0.0			
NC0080	D_YR25HR	12.63	10.45	12.6	137.23	12.72	137.4		0.0			
NC0090	D_YR25HR	12.47	8.37	12.41	153.82	12.47	153.5		0.1			
NC0100	D_YR25HR	12.4	6.86	12.04	215.57	12.37	197.14		0.0			
NC0110	D_YR25HR	15.49	6.43	12.32	166.3	12.3	166		-0.2			
NC9000	D_YR25HR	0	2	0	0	0	0		0.0			
ND0010	D_YR25HR	12.67	9.85	12	28.17	12.89	16.69		-0.1			
ND0020	D_YR25HR	12.28	10.58	12.25	485.05	12.28	464.16		0.0			
ND0030	D_YR25HR	12.44	7.35	12.19	468.79	12.53	427.06		0.0			
ND9000	D_YR25HR	0	2	0	0	12.25	490.58		0.0			
NE0050	D_YR25HR	12.04	16.72	12	25.36	12.04	24.48		0.0			
NE0060	D_YR25HR	17.61	17.41	12	76.34	16.9	2.84		0.1			
NE0070	D_YR25HR	14.53	17.36	12	14.75	12.01	6.02		0.0			
NE0080	D_YR25HR	12.4	17.49	12	72.84	12.16	48.11		0.0			
NE0090	D_YR25HR	14.54	17.35	12	170.67	14.54	14.05		0.0			
NE0200	D_YR25HR	18.78	17.67	12	115.45	19.35	6.72		0.0			
NE0210	D_YR25HR	14.24	17.85	12	115.56	12.54	13.51		0.0			
NE0220	D_YR25HR	12.99	17.94	12	3.43	12.46	2.69		0.0			
NE0230	D_YR25HR	12.64	16.97	12	24.87	12.73	8.24		0.0			
NE0240	D_YR25HR	12.69	16.9	12	21.16	12.92	6.31		0.0			
NE0250	D_YR25HR	12.44	16.43	12	17.63	12.33	9.78		0.0			
NE0260	D_YR25HR	12.93	18.02	12.13	3.49	12.75	2.16		0.1			
NE0270	D_YR25HR	13.5	18.17	12	31.54	13.57	2.27		0.1			
NE0280	D_YR25HR	13.33	18.15	12.35	0.37	30	0.17		0.0			
NE0290	D_YR25HR	13.16	18.13	11.76	1.19	30	0.15		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NE0300	D_YR25HR	12.94	18.11	12	2.59	11.7	0.71		0.0			
NE0310	D_YR25HR	12.43	16.61	12	8.28	0	0		0.0			
NE0320	D_YR25HR	12.47	16.36	12	36.25	0	0		0.0			
NE0330	D_YR25HR	17.3	15.87	12	270.59	17.76	13.58		0.0			
NE0340	D_YR25HR	12.2	13.64	12	31.8	12.2	25.69		0.0			
NE0350	D_YR25HR	12.06	14.88	12	14	12.06	13.26		0.0			
NE0360	D_YR25HR	20.88	12.89	12.17	824.22	22.02	94.94		0.1			
NE0370	D_YR25HR	12.4	15.02	12	94.86	12.4	54.44		0.0			
NE0375	D_YR25HR	20.07	11.73	20	99.1	20.12	99.09		0.1			
NE0380	D_YR25HR	14.28	16.68	12	32.23	14.28	2.29		0.1			
NE0390	D_YR25HR	13.41	14.93	12	56.25	13.92	6.82		0.0			
NE0400	D_YR25HR	13.26	11.63	13.1	100.75	13.26	100.65		0.1			
NE0410	D_YR25HR	12.65	12.4	12	20.88	12.65	6.56		-0.1			
NE0415	D_YR25HR	25.58	9.14	12.74	145.16	12.76	143.81		0.0			
NE0420	D_YR25HR	14.38	13.42	12	101.08	12.01	32.44		0.0			
NE0430	D_YR25HR	12.76	16.11	12	100.54	12.76	24.91		0.0			
NE0440	D_YR25HR	12.5	15.87	12	115.52	12.5	52.48		0.0			
NE0450	D_YR25HR	14.38	13.42	12.03	124.21	14.38	27.65		0.0			
NE0470	D_YR25HR	14.33	13.43	12	204.63	12.22	71.18		0.0			
NE0480	D_YR25HR	15.48	6.61	12	55.48	12.54	14.45		-0.1			
NE0490	D_YR25HR	12.61	7.38	12	38.83	12.61	14.02		-0.1			
NE0500	D_YR25HR	12.34	15.36	12	18.63	12.34	11.93		0.0			
NE0510	D_YR25HR	12.41	15.68	12.17	55.66	12.41	40.16		0.0			
NE0520	D_YR25HR	12.43	15.24	12.16	48.52	12.42	39.25		0.0			
NE0530	D_YR25HR	12.47	14.6	12.38	45.93	12.47	44.68		0.0			
NE0540	D_YR25HR	12.42	14.13	12.41	53.76	12.46	54.11		0.0			
NE0550	D_YR25HR	12.35	14.06	12.47	51.59	12.48	52.18		0.0			
NE0555	D_YR25HR	12.32	14.03	12.15	111.56	12.32	107.4		0.0			
NE0560	D_YR25HR	12.47	8.01	12.28	255.96	12.47	251.36		0.0			
NE0570	D_YR25HR	15.3	6.52	12.19	579.23	12.26	532.68		-0.2			
NE0575	D_YR25HR	14.61	6.72	12.38	271.18	12.43	269.22		-0.2			
NE0580	D_YR25HR	12.49	17.86	12	27.85	12.49	12.95		0.0			
NE0590	D_YR25HR	13.77	16.23	12	318.57	14.86	36.79		0.0			
NE0600	D_YR25HR	12.46	16.08	12	20.45	12.53	10.31		0.0			
NE0610	D_YR25HR	12.42	15.61	12	81.13	12.5	61.48		0.0			
NE0620	D_YR25HR	12.61	15.86	12	114.43	12.65	59.33		0.0			
NE0630	D_YR25HR	12.82	16.12	12	74.61	12.98	17.86		0.0			
NE0640	D_YR25HR	12.32	16.62	12	40.07	12.32	26.65		0.0			
NE0650	D_YR25HR	12.43	15.91	12	23.97	12.73	19.47		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NE0660	D_YR25HR	12.34	15.17	12	6.17	12.03	5.63		0.1			
NE0670	D_YR25HR	12.33	15.06	12	164.65	12.02	135.09		0.1			
NE0680	D_YR25HR	12.37	14	12.11	433.21	12.48	413		0.1			
NE0690	D_YR25HR	12.15	13.98	12	12.35	12.15	10.62		0.0			
NE0710	D_YR25HR	12.32	17.41	12	17.48	12.3	11.84		0.0			
NE0720	D_YR25HR	12.63	16.92	12.71	8.59	12.75	8.84		0.0			
NE0730	D_YR25HR	12.36	14.65	12.03	172.55	12.05	164.53		0.1			
NE9000	D_YR25HR	0	2	12.39	3.95	0	0		0.0			
NE9001	D_YR25HR	0	2	14.28	2.29	0	0		0.0			
NF0010	D_YR25HR	14.19	18.22	12	129.04	14.19	4.95		0.0			
NF0020	D_YR25HR	15.13	16.38	12	148.29	19.05	12.41		-0.1			
NF0030	D_YR25HR	12.96	16.29	12	37.7	12.05	35.62		0.0			
NF0040	D_YR25HR	13.11	16.45	12	12.17	15.17	2.35		0.0			
NF0050	D_YR25HR	12.97	16.29	12	11.36	12.04	10.41		0.0			
NF0055	D_YR25HR	12.09	16.37	12	9.57	12.09	8.78		0.0			
NF0060	D_YR25HR	12.96	16.29	12.05	109.72	13.5	20.45		0.0			
NF0070	D_YR25HR	13.26	16.32	12	16.64	15.15	4.21		0.0			
NF0080	D_YR25HR	12.96	16.29	12.01	18.21	12	16.79		0.0			
NF0090	D_YR25HR	12.92	16.3	12	27.91	12.2	19.2		0.0			
NF0100	D_YR25HR	12.96	16.29	12	26.3	14.41	10.31		0.0			
NF0110	D_YR25HR	12.95	16.29	14.78	67.2	14.88	73.79		0.0			
NF0120	D_YR25HR	12.63	16.19	12	15.14	12.59	5.09		0.1			
NF0130	D_YR25HR	12.47	16.57	12	81.93	11.95	52.59		0.0			
NF0140	D_YR25HR	12.61	16.37	11.96	70.58	11.96	67.67		0.0			
NF0150	D_YR25HR	12.76	16.24	12	90.79	14.79	83.58		0.0			
NF0160	D_YR25HR	12.7	15.91	12	223.43	12.11	151.45		0.0			
NF0165	D_YR25HR	12.71	15.89	12.1	174.08	12.12	142.83		0.0			
NF0180	D_YR25HR	12.79	16.76	12	24.01	13.34	6.25		0.0			
NF0190	D_YR25HR	12.47	16.49	12	12.24	12.54	9.28		0.0			
NF0200	D_YR25HR	12.27	16.11	12	34.62	12.2	29.6		0.0			
NF0210	D_YR25HR	12.67	17.23	12	17.36	12.67	5.22		0.0			
NF0220	D_YR25HR	12.73	15.8	12.13	189.76	12.15	173.52		0.0			
NF0230	D_YR25HR	13.02	15.2	12	229.8	13.97	45.23		0.0			
NF0240	D_YR25HR	12.53	17.31	12	42.29	12.54	17.95		0.0			
NF0250	D_YR25HR	12.42	16.91	12	13.29	12.42	11.35		0.0			
NF0260	D_YR25HR	13.5	15.64	12	26.01	12.87	2.77		0.0			
NF0270	D_YR25HR	12.74	15.61	12	21.93	12.12	20.8		0.0			
NF0280	D_YR25HR	12.81	15.31	12.13	240.08	13.62	178.58		0.0			
NF0290	D_YR25HR	12.17	15.34	12	43.4	12.14	38.44		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NF0300	D_YR25HR	13.15	14.94	12	31.35	15.31	9.4		0.0			
NF0310	D_YR25HR	12.74	14.95	12	15.52	12.5	5.52		0.0			
NF0320	D_YR25HR	13.97	16.3	12	5.62	12.08	1.69		0.0			
NF0325	D_YR25HR	12.42	11.43	12.42	320.98	12.42	593.63		0.0			
NF0330	D_YR25HR	12.98	11.29	12	6.46	13.14	2.44		0.0			
NF0340	D_YR25HR	13.94	16.3	12	7.33	12.01	2.11		0.0			
NF0350	D_YR25HR	12.21	13.39	12	30.7	12.21	24.26		0.0			
NF0360	D_YR25HR	12.71	14.93	12.36	310.45	12.92	296.06		0.0			
NF0370	D_YR25HR	12.41	10.6	12.27	649.16	12.44	367.34		0.0			
NF0380	D_YR25HR	12.2	10.23	12	160.69	12.2	147.45		0.0			
NF0390	D_YR25HR	12.37	16.53	12	12.76	12.29	7.99		0.0			
NF0395	D_YR25HR	12.97	16.29	12.09	38.07	12.58	1.36		0.0			
NF0400	D_YR25HR	12.96	16.29	12.07	59.79	12.1	22.31		0.0			
NF0405	D_YR25HR	12.38	10.07	12.26	421.38	12.38	416.18		0.0			
NF0410	D_YR25HR	13.78	16.29	12.13	10.38	13.78	0.19		0.0			
NF0415	D_YR25HR	12.38	7.85	12.36	436.41	12.39	436.04		0.0			
NF0420	D_YR25HR	12.31	7.12	12.24	639.61	12.31	633.55		0.0			
NG0010	D_YR25HR	12.02	47.27	12	420.86	12.02	413.54		0.0			
NG0015	D_YR25HR	12.68	42.64	12.01	406.64	12.76	217.59	site recreational-ok	0.6	IMPACT		
NG0030	D_YR25HR	12.81	43.13	12	284.6	14.44	106.04	banks=44; rd=46+	0.7	IMPACT		
NG0040	D_YR25HR	12.1	35.4	12	34.58	12.1	32.26		0.0			
NG0050	D_YR25HR	12.41	33.33	12.17	210.07	12.17	200.27		0.0			
NG0060	D_YR25HR	12.07	37.5	12	23.74	12.07	22.18		0.0			
NG0070	D_YR25HR	12.04	23.14	12.02	52.64	12.04	52.56		0.0			
NG0075	D_YR25HR	12.6	14.22	12	157.41	11.97	300.06		0.0			
NG0080	D_YR25HR	12.44	28.42	12.41	248.32	12.44	246.19		0.1			
NG0090	D_YR25HR	12.48	24.87	12.43	255.37	12.48	249.9		0.1			
NG0095	D_YR25HR	12.61	14.22	11.97	336.05	12.6	231.77		0.0			
NG0100	D_YR25HR	12.59	15.61	12	38.59	12.59	16.74		0.0			
NG0110	D_YR25HR	12.07	12.46	12	8.98	12.07	8.39		-0.5		BENEFIT	
NG0115	D_YR25HR	12.63	11.63	12.53	694.02	12.58	679.69	banks 12	-1.3		BENEFIT	
NG0120	D_YR25HR	12.56	12.01	12	106.34	12.36	63.68	low rd 11.9, pondbanks=11, low site12.6	-0.9		BENEFIT	
NG0130	D_YR25HR	12.56	12.01	11.98	448	12.05	423	driveway=11-11.5, banks=11	-0.9		BENEFIT	
NG0140	D_YR25HR	12.02	23.42	12	33.96	12.02	33.23		0.0			
NG0150	D_YR25HR	12.01	17.79	12	101.2	12.01	101.16		0.0			
NG0160	D_YR25HR	12.06	15.43	11.93	30.9	12.06	30.21		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NG0170	D_YR25HR	12.35	13.72	12.04	37.21	12.47	35.14		0.1			
NG0180	D_YR25HR	12.08	12.98	12	36.54	12.08	33.94		0.0			
NG0185	D_YR25HR	12.68	10.94	12.55	743.89	12.61	725.56	in banks=11	-0.4		BENEFIT	
NG0190	D_YR25HR	12.7	10.65	12.61	726.2	12.63	724.02	in banks=10.1	0.5	IMPACT		
NG0200	D_YR25HR	12.42	33.27	12.35	61.88	12.47	61.52		0.0			
NG0210	D_YR25HR	12.41	33.29	12.17	378.08	12.41	311.01		0.0			
NG0220	D_YR25HR	12.36	10.83	12	6.28	12.34	3.93		0.0			
NG0230	D_YR25HR	12.27	9.81	12	9.74	12.26	8.67		0.0			
NG0240	D_YR25HR	12.85	9.7	12.61	733.6	12.64	731.22	tob=10.5	0.3	IMPACT		
NG0250	D_YR25HR	12.86	9.59	12.57	1591.06	12.58	1584.49	tob=10.3	0.3	IMPACT		
NG0260	D_YR25HR	12.94	8.52	12.58	1587.69	12.6	1577.89	tob=11	0.2	IMPACT		
NH0010	D_YR25HR	17.56	65.85	12.17	6.28	17.56	0.61		0.0			
NH0030	D_YR25HR	12.12	38.37	12	108.59	12.12	96.45		0.0			
NH0040	D_YR25HR	12.03	34.73	12	60.25	12.03	58.97		0.0			
NH0050	D_YR25HR	12.22	34.91	12.19	166.32	12.22	165.7		0.0			
NH0060	D_YR25HR	25	33.02	12	3.27	0	0		-0.3			
NH0070	D_YR25HR	23.53	36.1	12	9.73	23.53	0.2		0.0			
NH0080	D_YR25HR	12.31	39.84	12	140.47	12.31	109.61		0.1			
NH0090	D_YR25HR	12.32	37.6	12.3	112.99	12.32	112.89		0.0			
NH0100	D_YR25HR	12.2	35.88	12.15	250.69	12.2	247.79		0.0			
NH0110	D_YR25HR	12.48	30.69	12.17	449.49	12.1	399.63		0.0			
NH0120	D_YR25HR	12.49	30.65	12.11	827.4	12.49	672.07		0.0			
NH0130	D_YR25HR	12.12	15.4	12	187.72	12.12	166.21		0.0			
NH0140	D_YR25HR	12.35	31.04	12.17	257.12	12.19	255.33		0.0			
NH0150	D_YR25HR	12.03	16.85	12	40.36	12.03	39.2		-0.1			
NH0160	D_YR25HR	12.49	19.17	12.48	716.96	12.49	716.22	low rd=19priv, tob=19, low site 20-20.4	-1.6		BENEFIT	
NH0170	D_YR25HR	12.54	13.27	12.48	754.38	12.54	744.49	lowfloor=18.14, site=13.5, rd=15.7 mhp	-1.1		BENEFIT	
NH0180	D_YR25HR	12.56	11.8	12.53	796.94	12.55	794.17	rd=13.7 5th st 12.6 oak, bank=12, low site 11.6	-0.8		BENEFIT	
NH0185	D_YR25HR	12.62	10.94	12.51	724.55	12.56	714.38	in bank=11.0, low rd 11.5	1.1	IMPACT		
NH0188N	D_YR25HR	12.65	10.51	12.56	714.38	12.58	710.96	low bank= 10.5	#N/A	#N/A	#N/A	
NH0195	D_YR25HR	12.68	9.93	12.52	883.3	12.54	857.95	low bank= 10.5, low rd=10, site=10.5	0.2	IMPACT		
NI0020	D_YR25HR	12.88	16.05	12	44.1	13.25	16.61		-0.1			
NI0025	D_YR25HR	12.85	16.05	12.17	222.2	12.93	148.8	low rd 15.3, bank=15	-0.1			
NI0030	D_YR25HR	12.39	17.39	12	6.77	12.39	3.95		0.0			
NI0040	D_YR25HR	12.58	16.92	12	113.48	12.58	43.16		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NI0045	D_YR25HR	12.77	15.25	12.62	225.12	12.89	225.66	bank=16	-0.4		BENEFIT	
NI0050	D_YR25HR	15.66	18.41	12	50.09	15.66	0.32		0.0			
NI0060	D_YR25HR	13.23	17.7	12.02	24.82	12.15	17.84		0.0			
NI0065	D_YR25HR	13.25	17.7	12	151.49	12.3	34.05		0.0			
NI0070	D_YR25HR	12.64	17.62	12	42.08	12.25	24.08		0.0			
NI0075	D_YR25HR	13.26	17.7	12	206.98	13.13	27.44		0.0			
NI0080	D_YR25HR	12.58	17.55	12.16	45.28	12.62	35.82		0.0			
NI0090	D_YR25HR	12.57	17.5	12.38	41.87	12.56	40.91		0.0			
NI0095	D_YR25HR	12.76	15.03	12.62	249.06	13	251.3	bank=15	-0.5		BENEFIT	
NI0100	D_YR25HR	12.57	17.46	12.29	54.18	12.55	49.95		0.0			
NI0110	D_YR25HR	12.61	17.28	12.51	51.7	12.54	51.5		0.0			
NI0120	D_YR25HR	12.64	17.19	12.23	79.17	12.56	66.15		0.0			
NI0130	D_YR25HR	12.71	17.04	12.4	77.89	12.69	71.45		0.0			
NI0140	D_YR25HR	12.72	16.9	12.67	72.34	12.73	72.22		0.0			
NI0150	D_YR25HR	14.82	17.66	12	19.15	14.82	1.14		0.0			
NI0170	D_YR25HR	12.71	17.47	12	19.42	12.77	5.45		0.0			
NI0180	D_YR25HR	14.66	17.24	12	21.7	14.82	3.11		0.0			
NI0190	D_YR25HR	14.43	17.32	12	47.77	30	3.85		0.0			
NI0200	D_YR25HR	13.6	15.1	12	151.52	13.72	20.55		0.0			
NI0205	D_YR25HR	12.6	12.4	12.46	540.63	12.86	567.68	in bank=12	0.2	IMPACT		
NI0210	D_YR25HR	13.08	15.32	12	31.72	12.15	5.36		0.0			
NI0220	D_YR25HR	12.3	14.28	12	21.95	12.3	15.32		0.0			
NI0230	D_YR25HR	12.97	15.55	12	36.29	15.26	7.49		0.0			
NI0240	D_YR25HR	12.75	14.56	12	51.2	13.6	19.21		-0.1			
NI0245	D_YR25HR	12.67	13.88	12.96	336.04	12.97	344.03	bank=15	-0.2			
NI0250	D_YR25HR	12.87	16.79	12	88.35	14.86	20		0.1			
NI0260	D_YR25HR	13.15	16.8	12	73.96	15.74	21.29		0.0			
NI0270	D_YR25HR	13.26	17.69	12.42	33.66	13.26	29.69		0.0			
NI0280	D_YR25HR	12.75	14.94	12.61	264.71	12.99	266.18	bank=17	-0.5		BENEFIT	
NI0285	D_YR25HR	12.7	14.2	12.76	288.12	12.97	291.24	bank=17	-0.1			
NI0290	D_YR25HR	12.66	13.74	12.96	383.35	12.95	388.98	bank=15, rd=17	-0.3		BENEFIT	
NI0295	D_YR25HR	12.79	16.13	12	72.42	15.78	43.15		0.0			
NI0300	D_YR25HR	17.56	8.08	12	42.37	22.87	9.57	tob=9+	-0.3		BENEFIT	
NI0310	D_YR25HR	12.38	12.75	12	88.11	12.38	1.04		0.0			
NI0320	D_YR25HR	12.64	14.05	12	22.78	12.64	7.42		0.0			
NI0325	D_YR25HR	12.62	13.32	12.59	506.24	12.88	509.42	bank=15, rd=17	0.2	IMPACT		
NI0330	D_YR25HR	12.86	16.13	12	70.83	12.87	18.71		0.0			
NI0340	D_YR25HR	12.4	12.61	12	39.1	12.47	23.93		0.0			
NI0350	D_YR25HR	12.47	15.42	12	33.15	12.48	16.17		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NI0355	D_YR25HR	12.53	11.25	12.86	572.91	12.81	641.11	in bank=11.0	0.1			
NI0360	D_YR25HR	12.52	11.21	12.89	690.38	12.79	859.49	in bank=10.5	0.1			
NI0370	D_YR25HR	12.31	16.84	12	24.28	12.29	16.49		0.0			
NI0380	D_YR25HR	12.43	16.51	12.12	122.52	12.24	113.43		0.1			
NI0390	D_YR25HR	12.52	16.67	12.01	4.57	12.83	4.3		0.0			
NI0400	D_YR25HR	12.31	16.86	11.96	31.79	12.2	3.79		0.0			
NI0410	D_YR25HR	12.17	15.91	12	35.48	12.17	30.02		0.0			
NI0415	D_YR25HR	13.11	16.36	12	39.16	15.17	5.54		0.0			
NI0420	D_YR25HR	12.26	15.19	12.06	83.4	12.25	73.68		0.0			
NI0430	D_YR25HR	12.28	14.98	12.13	153.52	12.28	144.47		0.0			
NI0440	D_YR25HR	12.44	17.33	12	75.08	12.44	8.35		0.0			
NI0450	D_YR25HR	12.94	16.73	12	119.79	11.62	35.57		0.0			
NI0455	D_YR25HR	12.44	17.32	11.98	99.09	11.9	73.04	site=18	0.0			
NI0460	D_YR25HR	13.72	15.17	12	21.36	13.86	2.28		0.0			
NI0470	D_YR25HR	12.64	17.36	12	59.65	12.63	18.65		0.0			
NI0480	D_YR25HR	12.35	17.28	12	24.28	12.05	19.62		0.0			
NI0490	D_YR25HR	13.52	17.44	12	82.88	13.3	8.26		0.0			
NI0500	D_YR25HR	12.8	17.59	12	35.59	13.2	12.7		0.0			
NI0510	D_YR25HR	12.61	17.79	12	62.24	12.11	13.97		0.0			
NI0520	D_YR25HR	12.69	17.58	12	45.27	13.09	14.56		0.0			
NI0530	D_YR25HR	18.77	17.44	12	49.32	29.99	1.68		0.0			
NI0540	D_YR25HR	18.77	17.44	12.17	47.23	18.96	3.37		0.0			
NI0550	D_YR25HR	18.69	17.65	25.49	7.35	25.47	7.41		0.0			
NI0560	D_YR25HR	12.47	18.14	12	13.41	12.37	6.52		0.0			
NI0570	D_YR25HR	12.3	18.53	12	8.11	12.3	5.63		0.0			
NI0580	D_YR25HR	12.81	17.74	12	19.56	15.3	21.12		0.0			
NI0590	D_YR25HR	12.92	15.02	12	18.39	0	4.26		0.0			
NI0600	D_YR25HR	12.89	17.87	12	24.39	13.91	12.78		0.0			
NI0610	D_YR25HR	12.83	18.04	12	33.12	12.02	8.37		0.0			
NI9000	D_YR25HR	0	2	12.87	5.12	0	0		0.0			
NJ0010	D_YR25HR	12.37	16.23	12	272.2	12.35	97.63		0.0			
NJ0020	D_YR25HR	13.53	15.81	12	37.95	13.53	3.8		0.1			
NJ0025	D_YR25HR	12.72	13.35	12.21	320.55	13.19	228.2	tob=16	-1.0		BENEFIT	
NJ0026N	D_YR25HR	12.71	13.37	12.14	81.33	12.19	70.23	tob=16	#N/A	#N/A	#N/A	
NJ0027N	D_YR25HR	12.62	13.43	12.12	85.5	12.14	81.33	tob=13.5	#N/A	#N/A	#N/A	
NJ0028N	D_YR25HR	12.58	13.45	12	111.26	12.12	74.45	low site=14	#N/A	#N/A	#N/A	
NJ0030	D_YR25HR	13.05	15.78	12	44.11	13.96	12.86		0.0			
NJ0040	D_YR25HR	12.75	15.59	12	4.24	14.22	1.57		0.0			
NJ0050	D_YR25HR	12.66	15.55	12	25.13	12.66	8.98		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NJ0060	D_YR25HR	12.85	14.63	12	38.04	13.57	20.26	bank= 14 ,site/str=14.5	0.0			
NJ0070	D_YR25HR	12.71	15.18	12.3	99.42	12.71	48.26		-0.3		BENEFIT	
NJ0080	D_YR25HR	12.72	14.04	12	152.51	12.72	47.86		0.0			
NJ0090	D_YR25HR	12.31	16.25	12	149.12	12.31	83.69		0.0			
NJ0100	D_YR25HR	15.01	16.06	12	249.54	15.55	14.67		0.0			
NJ0110	D_YR25HR	12.68	15.7	12.05	66.15	12.69	33.81		0.0			
NJ0120	D_YR25HR	14.57	15.95	12	72.09	18.99	7.33		0.0			
NJ0130	D_YR25HR	13.02	15.8	12	50.24	14.82	13.61		0.0			
NJ0135	D_YR25HR	12.62	13.42	12.28	89.42	12.32	82.94		-0.9		BENEFIT	
NJ0140	D_YR25HR	12.49	14.47	12	131.56	12.49	60.77		0.0			
NJ0150	D_YR25HR	12.59	13.07	12.72	272.8	13.16	287.17	low rd/bank=12.5 low site13.5	-1.2		BENEFIT	
NJ0155	D_YR25HR	12.42	12.46	12	603.16	12.34	475.53	bank=11.5, site 12.3	-0.4		BENEFIT	
NJ0160	D_YR25HR	12.48	11.64	12.03	770.66	12.56	720.65	bank=11.5, site 12.3	-0.9		BENEFIT	
NJ0170	D_YR25HR	12.22	13.89	12	130.65	12.22	103.13		0.0			
NJ0180	D_YR25HR	15.05	8.26	12	26.8	21.62	16.05		-0.2			
NJ0185	D_YR25HR	15.05	8.26	12.44	364.08	13.12	275.59		-0.2			
NJ0190	D_YR25HR	15.04	8.25	12	40.53	25.53	39.79		-0.2			
NJ0195	D_YR25HR	15.04	8.25	13.13	848.52	13.8	810.99		-0.2			
NJ0200	D_YR25HR	12.29	8.67	12	54.55	12.28	39.12		0.0			
NJ0210	D_YR25HR	15.05	8.26	11.96	39.12	21.45	31.14		-0.2			
NJ0215	D_YR25HR	15.04	8.26	13.13	563.6	13.13	532.14		-0.2			
NJ0220	D_YR25HR	12.72	13.08	12	72.63	12.72	19.63		0.0			
NJ0230	D_YR25HR	15.05	8.27	12.26	46.66	12.38	42.77		-0.2			
NJ0240	D_YR25HR	13.74	8.57	12	56.36	23.07	6.71	pond tob=9.8-10	-0.1			
NJ0250	D_YR25HR	12.54	11.31	12	33.98	12.54	14.1		0.0			
NJ0260	D_YR25HR	13.65	8.55	12	20.33	23.02	9.68	pond tob=9.6	-0.1			
NJ0265	D_YR25HR	12.39	10.07	12.23	819.94	12.37	816.38	in bank=12.3 negligable	0.8	IMPACT		
NJ0270	D_YR25HR	14.59	8.73	12.03	80.6	14.63	23.45		0.0			
NJ0280	D_YR25HR	13.5	8.52	23.01	9.97	22.98	11.99	pond tob=9.6	-0.1			
NJ0290	D_YR25HR	12.47	8.55	12.23	828.5	12.47	815.28	in bank= 8.5 low rd 7.7	-0.1			
NJ0300	D_YR25HR	15.04	8.27	12.56	906.04	12.38	673.53		-0.2			
NJ0310	D_YR25HR	15.04	8.26	11.82	155.47	28.82	73.59		-0.2			
NJ0320	D_YR25HR	15.04	8.26	12.37	490.63	12.39	318.52		-0.2			
NJ0330	D_YR25HR	15.05	8.25	13.11	868.7	20.63	5.88		-0.2			
NJ0340	D_YR25HR	12.35	16.51	12	212.54	12.35	133.77		0.0			
NJ0350	D_YR25HR	13.05	15.78	12	30.45	13.97	4.93		0.0			
NJ9000	D_YR25HR	0	12.5	12.35	15.01	0	0		0.0			
NK0010	D_YR25HR	15.64	6.95	12	14.55	15.84	0.75		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NK0020	D_YR25HR	14.53	7.41	12	16.42	15.78	1.17		0.0			
NK0030	D_YR25HR	12.97	4.41	12	28.32	12.87	5.1		0.0			
NK0040	D_YR25HR	17.58	7.64	12	24.74	18.96	0.93		0.0			
NK0050	D_YR25HR	12.86	8.47	12	79.96	13.02	16.56		0.0			
NK0060	D_YR25HR	12.68	5.28	12	124.77	12.49	41.46		0.0			
NK0070	D_YR25HR	12.98	4.42	12	87.17	13.13	14		0.0			
NK0080	D_YR25HR	12.62	7.47	12	67.8	12.62	32.47		0.0			
NK0090	D_YR25HR	12.97	4.41	12.81	22.4	13.02	22.25		0.0			
NK0100	D_YR25HR	12.75	8.01	12	88.06	12.73	36.74		0.0			
NK0110	D_YR25HR	12.76	4.14	12	52.1	12.76	34.11		0.0			
NK0120	D_YR25HR	12.49	6.24	12.46	42.32	12.49	42.2		0.0			
NK0130	D_YR25HR	12.68	5.45	12	91.73	12.68	39.28		0.0			
NK0140	D_YR25HR	13.33	5.25	12.17	401.61	13.27	158.9		0.0			
NK0150	D_YR25HR	13.36	5.18	13.23	167.88	13.36	166.54		0.0			
NK0160	D_YR25HR	12.12	7.54	12	14.98	12.12	13.28		0.0			
NK0170	D_YR25HR	13.06	7.86	12	89.05	13.38	13.31		0.0			
NK9000	D_YR25HR	0	2	13.26	195.31	0	0		0.0			
NK9001	D_YR25HR	0	2	13.06	0.42	0	0		0.0			
NA0010	F_YR100HF	12.08	67.06	12	34.99	12.08	32.9		0.0			
NA0020	F_YR100HF	12.18	36.39	12.17	363.58	12.18	358.56		0.0			
NA0030	F_YR100HF	12.73	63.79	12	75.43	14.44	22.13		0.6	IMPACT		
NA0040	F_YR100HF	12.32	31.77	11.76	5.47	16.75	3.54		0.1			
NA0050	F_YR100HF	12.34	31.49	12.17	331.41	12.29	282.94		0.0			
NA0060	F_YR100HF	12.17	33.83	12.17	319.18	12.17	318.06		0.0			
NA0070	F_YR100HF	12.23	35.82	12.17	597.32	12.23	584.63		0.0			
NA0075	F_YR100HF	12.32	31.82	12.08	273.21	12.28	165.86		0.1			
NA0080	F_YR100HF	12.35	31.45	12.28	1265.86	12.35	1241.95		0.0			
NA0090	F_YR100HF	12.66	22.84	12	31.26	12.66	11.15		-0.4		BENEFIT	
NA0100	F_YR100HF	12.04	17.04	12	46.92	12.04	45.06		0.0			
NA0110	F_YR100HF	12.38	64.87	12	259.94	12.38	177.18		0.0			
NA0120	F_YR100HF	12.37	16.53	12	52.95	12.37	31.9		0.0			
NA0130	F_YR100HF	12.7	18.01	12	60.94	12.7	17.22	LOW RD=18.8; TOB=17.5 ok	0.3	IMPACT		
NA0140	F_YR100HF	12.13	41.84	12	8.99	12.13	8.13		0.0			
NA0150	F_YR100HF	12.93	13.69	12	17.47	15.84	7.06		0.0			
NA0160	F_YR100HF	12.03	15.57	12	144.35	12.03	142.84		0.0			
NA0170	F_YR100HF	12.38	16.32	12.01	103.21	12.38	66.26		0.0			
NA0180	F_YR100HF	12.45	15.48	12	65.7	12.09	61.66		0.0			
NA0190	F_YR100HF	12.46	15.76	12.16	94.33	12.23	15.22	LOW RD=16.4 Ballfields	0.0			
NA0200	F_YR100HF	14.21	15.05	12.23	71.18	14.21	4.97		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0210	F_YR100HF	12.34	20.7	12.33	1356.31	12.34	1355.82	LowRd=20; TOB=21	0.1			
NA0220	F_YR100HF	12.02	67.47	12	58.75	12.02	57.85		0.0			
NA0230	F_YR100HF	12.33	56.88	12.29	617.54	12.33	613.73		0.0			
NA0240	F_YR100HF	12.1	57.19	12	101.8	12.1	99.48		0.0			
NA0250	F_YR100HF	12.07	49.48	12.03	220.06	12.07	218.2		0.0			
NA0255	F_YR100HF	15.39	9.67	12.06	599.76	12.2	170.64		-0.1			
NA0270	F_YR100HF	12.31	54.76	12.3	172.36	12.31	172.33		0.0			
NA0275	F_YR100HF	15.4	9.66	13.22	301.46	13.18	298.55		-0.1			
NA0290	F_YR100HF	12.33	16.63	12.32	1689.08	12.33	1687.72	LOW RD=15.5;TOB=15.5	0.1			
NA0300	F_YR100HF	12.22	13.21	12	50.37	12.22	39.47		0.0			
NA0310	F_YR100HF	13.18	12.49	12.4	55.2	12.5	9.68		0.0			
NA0320	F_YR100HF	13.19	12.49	11.72	134.64	11.77	34.97		0.0			
NA0330	F_YR100HF	13.19	12.49	12	97.19	26.73	35.13		0.0			
NA0340	F_YR100HF	12.45	11.73	12	25.04	12.42	12.82		0.0			
NA0350	F_YR100HF	12.76	11.36	12.08	105.34	12.18	101.1		-0.1			
NA0360	F_YR100HF	12.3	11.85	12	23.85	12.26	16.91		0.0			
NA0370	F_YR100HF	13.19	12.46	12.59	135.07	13.27	131.43		0.0			
NA0380	F_YR100HF	12.68	11.53	12.13	29.29	13.18	38		-0.2			
NA0390	F_YR100HF	12.74	11.55	12.13	61.95	12.11	45.65		-0.1			
NA0395	F_YR100HF	12.18	11.42	12	105.4	12.14	88.21		-0.1			
NA0400	F_YR100HF	12.73	11.3	12.01	30.03	13.17	32.95		-0.1			
NA0410	F_YR100HF	12.74	11.55	13.36	132.92	13.37	159.8		-0.1			
NA0420	F_YR100HF	12.68	11.53	13.57	123.79	13.55	129.54		-0.2			
NA0430	F_YR100HF	12.03	29.85	12	25.1	12.03	24.5		0.0			
NA0440	F_YR100HF	12.68	11.51	12	29.85	13.33	45.08		-0.2			
NA0450	F_YR100HF	12.34	14.57	12.33	1702.91	12.33	1702.14		0.1			
NA0470	F_YR100HF	12.37	12.82	12.33	1745.79	12.33	1741.32		0.0			
NA0480	F_YR100HF	12.5	11.87	12.33	1767.15	12.34	1738.6		-0.1			
NA0490	F_YR100HF	12.27	11.72	12.11	69.74	12.27	64.05		0.0			
NA0500	F_YR100HF	12.73	11.11	12.44	1990.26	12.44	1842.91	in banks=10	0.1			
NA0505	F_YR100HF	15.37	9.68	12.44	505.86	12.44	462.47	in banks=8.6	-0.1			
NA0510	F_YR100HF	12.77	11.68	12	42.59	12.81	10.17		0.0			
NA0515	F_YR100HF	12.56	15.36	12	53.45	12.55	21.36		0.0			
NA0520	F_YR100HF	12.3	13.67	11.97	303.14	12.28	158.79		0.0			
NA0525	F_YR100HF	12.42	16.1	12	229.22	12.43	125.61		0.0			
NA0530	F_YR100HF	12.4	13.13	11.95	111.55	12.22	108.89		0.0			
NA0540	F_YR100HF	12.65	12.74	12.26	335.28	12.62	258.14		0.0			
NA0550	F_YR100HF	12.48	14.81	12	159.14	12.48	75.11		0.0			
NA0570	F_YR100HF	12.81	29.84	12	43.05	13.37	14.59		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0580	F_YR100HF	12.21	30.75	12.03	101.47	12.21	95.51		0.0			
NA0590	F_YR100HF	12.01	13.16	12	98.13	12.01	96.88		0.0			
NA0600	F_YR100HF	12.39	11.2	12	250.61	12.39	162.73		0.0			
NA0610	F_YR100HF	12.17	37.87	12.17	107.91	12.17	107.33		0.0			
NA0620	F_YR100HF	12.03	14.66	12	8.78	12.03	8.55		0.0			
NA0630	F_YR100HF	12.57	13.69	12	150.48	12.57	60.11		0.0			
NA0640	F_YR100HF	12.06	10.53	12.03	616.28	12.06	614.06		0.0			
NA0650	F_YR100HF	15.31	7.58	12	36.62	12.06	21.43		0.0			
NA0660	F_YR100HF	15.31	7.58	12	34.33	11.8	15.53		0.0			
NA0670	F_YR100HF	15.31	7.58	12	29.58	12.02	20.55		0.0			
NA0680	F_YR100HF	15.3	7.58	11.8	31.98	11.83	25.76		0.0			
NA0690	F_YR100HF	13.91	9.99	12	29.68	12.35	4.31		0.0			
NA0700	F_YR100HF	12.98	10.63	12	20.23	14.2	11.23		0.0			
NA0710	F_YR100HF	15.39	9.67	12	73.97	11.99	41.61		-0.1			
NA0720	F_YR100HF	15.45	9.62	12	50.54	12.23	38.34		-0.1			
NA0730	F_YR100HF	15.42	9.66	12	72.73	12.06	53.09		-0.1			
NA0740	F_YR100HF	15.41	9.63	12.32	213.71	12.36	212.6		-0.1			
NA0750	F_YR100HF	12.75	12.23	12	115.54	12.76	38.47		0.0			
NA0760	F_YR100HF	15.44	9.62	12.7	205.68	12.62	86.41		-0.1			
NA0770	F_YR100HF	12.23	11.1	12.07	164.49	12.23	153.47		0.0			
NA0780	F_YR100HF	15.44	9.62	12.15	170.49	12.31	150.26		-0.1			
NA0790	F_YR100HF	15.44	9.62	12.3	433.61	12.29	427.55		-0.1			
NA0800	F_YR100HF	15.4	9.66	11.9	56.61	13.03	52.9		-0.1			
NA0810	F_YR100HF	15.41	9.66	12.07	67.65	19.17	27.48		-0.1			
NA0820	F_YR100HF	15.41	9.66	27.56	10.87	27.56	13.31		-0.1			
NA0830	F_YR100HF	15.41	9.66	12.44	2206.32	12.57	2096.05		-0.1			
NA0835	F_YR100HF	15.43	9.62	12.62	986.04	12.62	901.89		-0.1			
NA0840	F_YR100HF	15.44	9.62	12.21	141.57	12.24	139.67		-0.1			
NA0850	F_YR100HF	15.44	9.62	12.11	283.91	12.2	267.53		-0.1			
NA0860	F_YR100HF	15.43	9.62	12	247.87	28.39	129.38		-0.1			
NA0870	F_YR100HF	15.4	9.67	12.23	1775.37	12.62	1294.14		-0.1			
NA0880	F_YR100HF	12.53	10.44	12	3.3	12.08	2		0.1			
NA0890	F_YR100HF	12.22	10.48	12	25.51	12.22	20.09		0.0			
NA0900	F_YR100HF	12.87	10.31	12.18	66.26	11.49	8.48		0.1			
NA0910	F_YR100HF	12.81	10.34	12	3.63	12.06	2.81		0.1			
NA0920	F_YR100HF	12.87	10.31	12.11	30.55	12.1	23.08		0.1			
NA0930	F_YR100HF	12.86	10.32	12.01	5.29	12.03	3.78		0.1			
NA0940	F_YR100HF	12.88	10.31	12.07	43.02	12.94	15.82		0.1			
NA0950	F_YR100HF	15.4	9.67	12.04	214.7	12.32	65.11		-0.1			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA0960	F_YR100HF	15.44	9.6	12	125.31	25.14	105.26		-0.1			
NA0970	F_YR100HF	15.44	9.62	12.61	1172.11	12.61	814.57		-0.1			
NA0980	F_YR100HF	12.72	10.63	12	71.65	13.4	19.77		0.1			
NA0990	F_YR100HF	15.44	9.59	12	356.71	20.75	115.6		-0.1			
NA1000	F_YR100HF	15.43	9.61	13.01	1375.74	25.24	1268.54	rd=7.2 bank=7 low site=7.8	-0.1			
NA1010	F_YR100HF	15.42	9.59	17.3	1861.52	17.4	1913.27	rd=9 bank=7 low site=7.7	-0.1			
NA1020	F_YR100HF	14.97	9.25	17.38	1929.56	17.32	1960.52	bank=7n, 9.5 s;sites=9+	0.3	IMPACT		
NA1030	F_YR100HF	12.31	17.43	12	94.36	12.31	63.29		0.0			
NA1040	F_YR100HF	12.3	14.18	12.07	27.83	12.3	22.75		0.0			
NA1050	F_YR100HF	12.45	13.86	12	27.35	12.47	14.13		0.0			
NA1060	F_YR100HF	12.07	13.83	12	37.27	12.07	34.85		0.0			
NA1070	F_YR100HF	12.34	13.39	12.23	39.4	12.34	37.9		0.0			
NA1110	F_YR100HF	12.69	16.54	12.6	22.08	12.68	21.6		0.0			
NA1120	F_YR100HF	12.75	16.08	12	41.44	12.76	30.19		0.0			
NA1130	F_YR100HF	12.61	15.57	12	70.22	12.6	49.96		0.0			
NA1140	F_YR100HF	12.65	15.46	12.29	16.07	12.68	13.06		0.0			
NA1150	F_YR100HF	12.24	13.79	12.17	211.85	12.24	208.01		0.0			
NA1160	F_YR100HF	12.3	16.02	12.17	42.17	12.2	40.83		0.0			
NA1170	F_YR100HF	12.6	15.82	12.04	279.75	12.6	151.33		0.0			
NA1180	F_YR100HF	14.14	9.19	17.31	1982.4	17.3	1986.76	in bank=9	0.2	IMPACT		
NA1185	F_YR100HF	14.1	9.16	13.42	2738.58	13.8	2606.18	in bank=8	0.2	IMPACT		
NA1190	F_YR100HF	14.14	8.96	13.8	2611.8	13.89	2591.87	in bank=7.5	0.2	IMPACT		
NA1195	F_YR100HF	15.3	7.58	13.88	2640.79	15.72	2567.98	in bank=7.5, low 7	0.0			
NA1200	F_YR100HF	12.19	12.99	12	24.84	12.19	20.41		0.0			
NA1210	F_YR100HF	12.42	7.66	12	69.46	12.4	39.37	pond bank=6.6 low rd=9.5 low str=7.7	-0.1			
NA1212N	F_YR100HF	15.42	7.59	12	198.93	11.94	72.34	pond bank=4.4 low rd=5 low str=6.5	#N/A	#N/A	#N/A	
NA1220	F_YR100HF	12.72	15.83	12	247.81	12.72	67.04		0.1			
NA1230	F_YR100HF	12.79	13.68	12	104.25	12.81	23.74		0.0			
NA1240	F_YR100HF	12.49	10.04	12	120.33	12.49	64.72		0.0			
NA1250	F_YR100HF	15.25	7.2	12	323.44	12.43	235.05		-0.1			
NA1255	F_YR100HF	15.53	6.91	14	3075.53	14.19	3022.99	in bank=6, low site 7.5	-0.1			
NA1260	F_YR100HF	13.28	12.74	12.23	113.97	13.28	26.75		0.0			
NA1270	F_YR100HF	19.84	7.23	12	96.15	29.19	8.4		0.0			
NA1280	F_YR100HF	12.11	11.16	12.02	95.64	12.11	90.55		0.0			
NA1290	F_YR100HF	12.54	9.37	12.47	29.04	12.54	28.65		0.0			
NA1300	F_YR100HF	15.29	7.45	14.24	2575.87	14.49	2564.05	in bank = 9+, 8 low	0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1305	F_YR100HF	15.29	7.39	14.21	2962.29	14.34	2941.45	in bank=7	-0.1			
NA1310	F_YR100HF	15.33	7.26	12.61	3258.64	13.82	3072.88	in bank=6 low site 7.2	-0.1			
NA1315	F_YR100HF	15.33	7.25	12.78	2864.17	13.06	2826.97	in bank=5, low site 7.5	-0.1			
NA1320	F_YR100HF	15.54	6.92	12	83.71	12.13	73.48		-0.1			
NA1340	F_YR100HF	15.53	6.91	12	42.55	27.65	8.87		-0.1			
NA1350	F_YR100HF	17.69	9.88	12	149.62	25.46	9.18		0.1			
NA1360	F_YR100HF	15.55	6.87	12	331.6	12	89.91		-0.1			
NA1365	F_YR100HF	15.55	6.87	14.43	3015.71	14.51	2999.41	in bank=4	-0.1			
NA1370	F_YR100HF	17.69	9.88	11.73	33.2	25.46	12.23		0.1			
NA1380	F_YR100HF	17.64	9.87	11.62	33.59	25.44	13.56		0.1			
NA1390	F_YR100HF	15.55	6.84	12	62.56	12.05	47.45		-0.1			
NA1410	F_YR100HF	15.55	6.87	12	17.15	27.85	8.51		-0.1			
NA1420	F_YR100HF	12.74	8.52	12	85.36	12.74	22.61		-0.1			
NA1430	F_YR100HF	12.18	9.08	12	77.02	12.18	64.03		0.0			
NA1440	F_YR100HF	12.58	10.79	12	66.11	12.58	24.82		0.0			
NA1450	F_YR100HF	15.57	6.74	12.2	150.16	12.14	143.47		-0.1			
NA1460	F_YR100HF	12.92	7.1	12.14	141.39	29.17	6.6		0.0			
NA1465	F_YR100HF	15.56	6.72	15.41	3435.32	15.46	3435.06	in bank=6	-0.1			
NA1470	F_YR100HF	15.58	7.24	12	16.43	15.81	0.89		0.0			
NA1480	F_YR100HF	15.96	7.98	12	56.16	15.96	2.67		0.0			
NA1490	F_YR100HF	13.09	7.91	12	50.14	15.79	7.54		0.0			
NA1500	F_YR100HF	13.46	6.23	12.03	89.5	12.28	51.29		-0.1			
NA1520	F_YR100HF	13.46	6.23	12	14.55	13.24	6.46		-0.1			
NA1550	F_YR100HF	12.67	6.2	12	176.13	12.63	64.72		-0.1			
NA1560	F_YR100HF	13.07	7.31	12	128.83	12.04	114.46		0.0			
NA1570	F_YR100HF	13.1	7.33	11.89	37.46	11.84	20.07		0.0			
NA1580	F_YR100HF	13.1	7.33	11.94	89.59	11.66	16.54		0.0			
NA1590	F_YR100HF	13.01	7.37	12	71.17	27.22	18.11		0.0			
NA1600	F_YR100HF	13	7.34	12	120.89	11.93	36.07		0.0			
NA1610	F_YR100HF	12.55	6.15	12	86.63	12.56	35.31		0.0			
NA1620	F_YR100HF	13.07	7.3	12.03	361.48	11.86	149.01		0.0			
NA1630	F_YR100HF	12.96	6.01	12	78.74	11.96	24.49		-0.1			
NA1640	F_YR100HF	13.46	6.23	12.03	205.22	13.07	184.51		-0.1			
NA1650	F_YR100HF	12.27	7.59	12.2	254.07	12.27	252.74		0.0			
NA1660	F_YR100HF	15.6	5.9	12.59	45.16	11.85	3.28		-0.2			
NA1670	F_YR100HF	15.54	5.83	13.05	183.7	13.11	172.65		-0.2			
NA1680	F_YR100HF	12.64	7.1	12.22	88.23	12.82	15.75		0.0			
NA1690	F_YR100HF	12.64	7.11	12	150.7	12.23	55.25		0.0			
NA1700	F_YR100HF	12.41	12.1	12	49.08	12.41	27.44		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA1720	F_YR100HF	15.58	7.24	12.26	15.13	15.58	2.66		0.0			
NA1730	F_YR100HF	12.64	7.11	12.17	120.17	12.23	115.07		0.0			
NA1740	F_YR100HF	12.65	7.09	12.28	111.4	12.28	110.69		0.0			
NA1750	F_YR100HF	15.53	8.58	12	24.66	15.53	1.3		0.0			
NA1760	F_YR100HF	15.54	6.85	12	195.91	12.12	193.13		-0.1			
NA1770	F_YR100HF	12.15	8.07	12	92.04	12.14	79.62		0.0			
NA1780	F_YR100HF	12.22	7.84	12	4.3	12.22	3.38		0.0			
NA1790	F_YR100HF	12.16	7.91	12.1	109.26	12.16	107.92		0.0			
NA1800	F_YR100HF	15.57	6.74	12	20.85	12.19	17.77		-0.1			
NA1810	F_YR100HF	12.74	7.71	12	33.3	12.38	9.79		0.0			
NA1820	F_YR100HF	15.57	6.74	12.18	13.53	12.23	11.12		-0.1			
NA1830	F_YR100HF	15.57	6.74	12	64.07	12.02	45.28		-0.1			
NA1840	F_YR100HF	18.55	7.06	12	22.47	29.31	3.56		0.0			
NA1845	F_YR100HF	15.56	6.74	12.58	3654.07	15.41	3435.21	in bank=4.5	-0.1			
NA1850	F_YR100HF	18.55	7.06	12	75.33	11.81	16.93		0.0			
NA1860	F_YR100HF	18.55	7.06	11.81	19.21	27.2	15.19		0.0			
NA1870	F_YR100HF	12.21	7.26	12.13	103.32	12.2	100.01		0.0			
NA1880	F_YR100HF	15.6	5.9	12	79.15	25.66	17.07		-0.2			
NA1890	F_YR100HF	15.6	5.86	15.56	263.3	15.61	263.26		-0.1			
NA1900	F_YR100HF	15.58	5.87	19.14	117.1	19.16	118.74		-0.2			
NA1910	F_YR100HF	12.66	12.16	12	37.13	12.76	11.59		0.0			
NA1920	F_YR100HF	12.66	12.17	12.05	13.48	25.92	2.67		0.0			
NA1930	F_YR100HF	12.86	12.36	12	35.55	12.91	4.6		0.0			
NA1940	F_YR100HF	12.57	11.13	12	38.69	12.57	17.8		0.0			
NA1950	F_YR100HF	15.55	6.84	12.56	3646.72	14.98	3411.05	in bank=5	-0.1			
NA1960	F_YR100HF	15.57	5.8	15.32	3403.86	15.57	3403.37	in bank=4	-0.2			
NA1965	F_YR100HF	15.58	5.86	12.45	3481.56	15.94	3274.65	in bank=4	-0.2			
NA1970	F_YR100HF	12.69	11.43	12.45	1482.53	12.51	1407.17		-0.2			
NA1980	F_YR100HF	12.67	11.53	12.31	1651.62	12.44	1401.07	pond tob=9.0	-0.2			
NA1990	F_YR100HF	12.4	7.38	12	63.3	12.75	60.35		0.0			
NA2000	F_YR100HF	15.57	6.72	12.17	233.18	12.24	220.41		-0.1			
NA2005	F_YR100HF	15.59	6	15.5	3177.44	15.75	3177.82	in bank=6	-0.2			
NA2070	F_YR100HF	12.02	37.78	12	98.42	12.02	97.13		0.0			
NA2080	F_YR100HF	13.27	38.11	12	405.19	13.27	71.07		0.1			
NA9000	F_YR100HF	0	1.5	15.12	3429.17	0	0		0.0			
NA9001	F_YR100HF	0	2	12.02	87.15	0	0		0.0			
NA9002	F_YR100HF	0	2	0	0	0	0		0.0			
NA9003	F_YR100HF	0	2	12.21	26.06	0	0		0.0			
NA9005	F_YR100HF	0	2	15.59	388.32	0	0		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NA9006	F_YR100HF	0	2	12.03	8.15	0	0		0.0			
NA9007	F_YR100HF	0	2	0	0	0	0		0.0			
NA9008	F_YR100HF	0	2	15.33	334.8	0	0		0.0			
NB0010	F_YR100HF	12.38	12.96	12	329.72	12.34	198.33		0.0			
NB0020	F_YR100HF	12.41	11.1	12.22	474.06	12.41	421.16		0.0			
NB0030	F_YR100HF	12.52	9.45	12	118.22	12.57	68.35		0.1			
NB0040	F_YR100HF	12.51	9.39	12.54	69.34	12.57	69.45		0.1			
NB0050	F_YR100HF	12.5	9.13	12.58	70.02	12.7	70.5		0.1			
NB0060	F_YR100HF	12.49	9.01	12	99.63	12.48	89.57		0.0			
NB0070	F_YR100HF	12.49	8.68	12.42	89.31	12.54	89.21		0.1			
NB0080	F_YR100HF	12.66	9.28	12	35.89	12.66	11.19		0.0			
NB0090	F_YR100HF	12.12	6.48	12	100.74	12.12	92.2		0.0			
NB0100	F_YR100HF	12.54	6.15	12	65.26	12.85	17.3		0.0			
NB0110	F_YR100HF	15.53	5.88	12.31	23.08	12.28	21.56		-0.2			
NB0120	F_YR100HF	15.53	5.88	12.06	393.63	12.09	385.56		-0.2			
NB9000	F_YR100HF	0	2	12.41	224.97	0	0		0.0			
NC0010	F_YR100HF	12.83	13.18	12.17	474.54	12.34	183.57		0.0			
NC0020	F_YR100HF	12.87	13.16	12	410.16	11.71	78.03		0.0			
NC0030	F_YR100HF	12.86	13.14	11.72	95.21	11.7	85.66		0.0			
NC0040	F_YR100HF	12.64	12.99	12	10.17	12.51	3.34		0.0			
NC0050	F_YR100HF	12.66	12.82	12	11.97	11.99	7.72		0.0			
NC0060	F_YR100HF	12.75	12.41	12.02	252.4	12.85	207.86		0.0			
NC0070	F_YR100HF	12.63	12.13	12.43	241.82	12.64	237.7		0.0			
NC0080	F_YR100HF	12.49	10.73	12.4	170.01	12.49	168.72		0.0			
NC0090	F_YR100HF	12.48	9.21	12.34	200.1	12.48	195.2		0.1			
NC0100	F_YR100HF	12.52	7.05	12.14	266.82	12.28	251.65		0.0			
NC0110	F_YR100HF	15.46	6.89	12.12	170.52	12.11	168.17		-0.1			
NC9000	F_YR100HF	0	2	0	0	0	0		0.0			
ND0010	F_YR100HF	12.57	10.05	12	37.84	12.67	22.19		0.0			
ND0020	F_YR100HF	12.28	10.6	12.25	488.29	12.28	467.43		0.0			
ND0030	F_YR100HF	12.39	7.39	12.19	487.18	12.39	447.4		0.0			
ND9000	F_YR100HF	0	2	12.79	9.76	12.25	490.61		0.0			
NE0050	F_YR100HF	12.05	16.78	12	33.77	12.03	32.48		0.0			
NE0060	F_YR100HF	16.32	18.02	12	102.2	14.51	4.58	TOB/rd=18+ negligable	0.2	IMPACT		
NE0070	F_YR100HF	13.66	17.62	12	19.74	12	5.58		0.0			
NE0080	F_YR100HF	12.62	17.85	12	97.23	12.05	47.12		0.0			
NE0090	F_YR100HF	13.67	17.61	12	214.13	13.67	62.62		0.0			
NE0200	F_YR100HF	13.87	17.95	12	154.02	13.93	34.26		0.0			
NE0210	F_YR100HF	12.79	18.02	12	155.89	12.75	53.47		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NE0220	F_YR100HF	12.76	18.15	12	4.62	12.25	3.17		0.0			
NE0230	F_YR100HF	12.58	17.46	12	33.63	12.77	13.68		0.0			
NE0240	F_YR100HF	12.62	17.38	12	28.52	12.79	8.31		0.0			
NE0250	F_YR100HF	12.46	16.82	12	23.84	12.45	14.92		0.1			
NE0260	F_YR100HF	12.76	18.25	12	5.27	12.66	2.43		0.0			
NE0270	F_YR100HF	12.77	18.35	12	43.47	12.77	9.11		0.0			
NE0280	F_YR100HF	12.65	18.28	12.08	0.42	30	0.16		0.0			
NE0290	F_YR100HF	12.58	18.24	12	1.46	30	0.14		0.0			
NE0300	F_YR100HF	12.4	18.17	12	3.5	12.29	2.19		0.0			
NE0310	F_YR100HF	12.41	17.19	12	13.53	0	0		0.0			
NE0320	F_YR100HF	12.46	16.62	12	57.75	12.46	34.36		0.0			
NE0330	F_YR100HF	14.23	16.09	12	362.27	14.42	39.52		0.0			
NE0340	F_YR100HF	19.98	14.64	12	42.33	12.18	31.65		0.1			
NE0350	F_YR100HF	12.03	14.91	12	18.74	12.03	18.16		0.0			
NE0360	F_YR100HF	19.98	14.63	12.17	1054.28	20.24	128.94		0.1			
NE0370	F_YR100HF	12.36	15.27	12	126.28	12.36	78.89		0.0			
NE0375	F_YR100HF	13.6	12.78	18.5	134.84	18.81	134.82		0.1			
NE0380	F_YR100HF	12.9	16.81	12	42.91	12.9	7.84		0.1			
NE0390	F_YR100HF	12.6	15.09	12	74.88	12.72	16.24		0.0			
NE0400	F_YR100HF	13.58	12.73	13.07	158.73	13.09	157.71		0.1			
NE0410	F_YR100HF	12.91	13.35	12	27.79	12.23	8.61		-0.1			
NE0415	F_YR100HF	12.94	10.95	12.78	229.26	13.13	232.74		0.0			
NE0420	F_YR100HF	12.75	13.69	12	134.56	12.01	40.86		0.0			
NE0430	F_YR100HF	12.66	16.31	12	133.84	12.66	40.33		0.0			
NE0440	F_YR100HF	12.41	16.07	12	153.78	12.41	85.85		0.0			
NE0450	F_YR100HF	12.79	13.66	12.05	171.25	12.79	148.24		0.0			
NE0470	F_YR100HF	12.82	13.93	12	296.63	12.83	107.65		0.0			
NE0480	F_YR100HF	15.25	7.29	12	74.08	12.72	17.05		-0.1			
NE0490	F_YR100HF	12.56	7.9	12	52.51	12.42	21.63		-0.1			
NE0500	F_YR100HF	12.2	15.41	12	24.86	12.19	20.14		0.0			
NE0510	F_YR100HF	12.36	15.79	12	74.75	12.36	58.94		0.0			
NE0520	F_YR100HF	12.34	15.33	12	66.25	12.33	56.62		0.0			
NE0530	F_YR100HF	12.57	14.78	12.51	96.92	12.57	95.83		0.0			
NE0540	F_YR100HF	12.55	14.29	12.54	105.01	12.58	105.18		0.0			
NE0550	F_YR100HF	12.47	14.19	12.58	86.69	12.59	87.16		0.0			
NE0555	F_YR100HF	12.36	14.16	12.19	162.61	12.36	158.41		0.0			
NE0560	F_YR100HF	12.93	10.74	12.79	499.22	12.94	490.17		0.0			
NE0570	F_YR100HF	15.29	7.26	12.19	808.82	12.32	715.29		-0.1			
NE0575	F_YR100HF	13.01	7.97	12.92	498.71	12.97	495.88		-0.1			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NE0580	F_YR100HF	12.43	18.01	12	37.53	12.43	20.3		0.0			
NE0590	F_YR100HF	13.45	16.69	12	427.61	13.62	99.7		0.0			
NE0600	F_YR100HF	12.71	16.46	12	27.3	12.26	19.69		0.0			
NE0610	F_YR100HF	12.74	16.44	12	101.65	13.08	74.67		0.0			
NE0620	F_YR100HF	12.5	16.24	12.25	183.13	12.51	152.78		0.0			
NE0630	F_YR100HF	12.78	16.39	12	99.6	13.2	25.68		0.0			
NE0640	F_YR100HF	12.34	16.72	12	53.35	12.21	34.66		0.0			
NE0650	F_YR100HF	12.52	16.46	12.02	33.88	13.24	19.94		0.0			
NE0660	F_YR100HF	12.5	15.96	12	8.21	13.08	8.21		0.1			
NE0670	F_YR100HF	12.49	15.94	12	205.01	11.97	140.91		0.0			
NE0680	F_YR100HF	12.45	14.99	12.33	545.87	12.54	540.73		0.1			
NE0690	F_YR100HF	19.98	14.63	12	16.48	12.09	15.12		0.1			
NE0710	F_YR100HF	12.43	17.74	12	23.64	12.06	13.96		0.0			
NE0720	F_YR100HF	12.51	17.34	12.75	14.11	12.8	14.88		0.0			
NE0730	F_YR100HF	12.46	15.59	11.98	187.88	11.98	174.27		0.1			
NE9000	F_YR100HF	0	2	13.09	55.48	0	0		0.0			
NE9001	F_YR100HF	0	2	12.54	12.61	0	0		0.0			
NF0010	F_YR100HF	12.8	18.42	12	171.78	12.8	26.09		0.0			
NF0020	F_YR100HF	16.11	17.29	12	197.41	24.92	14.64		0.0			
NF0030	F_YR100HF	12.93	16.68	12.05	52.69	11.92	37.4		0.0			
NF0040	F_YR100HF	12.94	16.69	12	16.2	12.45	7.3		0.0			
NF0050	F_YR100HF	12.94	16.68	12	15.12	11.84	7.96		0.0			
NF0055	F_YR100HF	12.93	16.68	12	12.74	12.06	11.81		0.0			
NF0060	F_YR100HF	12.93	16.68	12	119.99	12.12	32.55		0.0			
NF0070	F_YR100HF	12.97	16.69	12	22.21	16.77	4.74		0.0			
NF0080	F_YR100HF	12.93	16.68	11.93	17.93	11.89	12.25		0.0			
NF0090	F_YR100HF	12.92	16.69	12	37.14	12.09	26.03		0.0			
NF0100	F_YR100HF	12.92	16.69	12	34.92	15.69	11.48		0.0			
NF0110	F_YR100HF	12.92	16.68	11.89	91.32	16.34	76.08		0.0			
NF0120	F_YR100HF	12.65	16.63	12	20.16	12.25	7.17		0.0			
NF0130	F_YR100HF	12.61	17.08	12	109.07	11.83	51.45		0.0			
NF0140	F_YR100HF	12.66	16.86	11.84	69.3	11.84	66.05		0.0			
NF0150	F_YR100HF	12.89	16.68	11.91	97.9	16.22	85.51		0.0			
NF0160	F_YR100HF	12.62	16.53	12	278.51	12.02	184.79		0.0			
NF0165	F_YR100HF	12.63	16.52	12.02	218.14	12.01	149.51		0.0			
NF0180	F_YR100HF	13	17.15	12	31.97	14.85	6.98		0.0			
NF0190	F_YR100HF	12.79	16.9	12	15.59	14.08	9.41		0.0			
NF0200	F_YR100HF	12.68	16.67	12	44.86	12.04	31.11		0.0			
NF0210	F_YR100HF	12.46	17.34	12	23.11	12.45	11.53		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NF0220	F_YR100HF	12.64	16.46	12.01	205.41	12.02	178.99		0.0			
NF0230	F_YR100HF	13.01	15.8	12	306.61	13.67	65.34		0.0			
NF0240	F_YR100HF	12.36	17.38	12	56.3	12.36	34.56		0.0			
NF0250	F_YR100HF	12.57	17.1	12	16.44	11.94	10.83		0.0			
NF0260	F_YR100HF	13.04	15.8	12	34.63	12.62	10.78		0.0			
NF0270	F_YR100HF	12.58	16.18	12	27.61	12.08	25.4		0.0			
NF0280	F_YR100HF	12.88	15.86	12.01	272.88	14.38	186.81		0.0			
NF0290	F_YR100HF	12.94	15.64	12	59.92	12.09	54.38		0.0			
NF0300	F_YR100HF	12.95	15.63	12.55	57.26	16.63	9.66		0.0			
NF0310	F_YR100HF	12.94	15.63	12	20.66	13.91	16.12		0.0			
NF0320	F_YR100HF	13.59	16.55	12	7.49	12.07	1.75		0.0			
NF0325	F_YR100HF	12.02	11.43	12.23	384.28	12.02	593.6		0.0			
NF0330	F_YR100HF	15.04	11.13	12	8.74	12.81	2.75		0.0			
NF0340	F_YR100HF	13.58	16.55	12	9.34	17.3	1.85		0.0			
NF0350	F_YR100HF	12.16	13.46	12	40.98	12.16	34.89		0.0			
NF0360	F_YR100HF	12.93	15.63	12.19	384.69	13.13	343.48		0.0			
NF0370	F_YR100HF	12.23	10.88	12.02	699.98	12.25	469.2		0.0			
NF0380	F_YR100HF	12.12	10.32	12	223.52	12.12	213.14		0.0			
NF0390	F_YR100HF	12.92	16.69	12	16.99	12.18	13.19		0.0			
NF0395	F_YR100HF	12.93	16.68	12.01	42.39	12.56	2.36		0.0			
NF0400	F_YR100HF	12.93	16.68	12.26	74.9	12.82	47.9		0.0			
NF0405	F_YR100HF	12.22	10.31	12.05	494.06	12.22	476.25		0.0			
NF0410	F_YR100HF	13.36	16.52	12	14.86	13.36	4.27		0.0			
NF0415	F_YR100HF	12.24	8.24	12.2	528.63	12.24	527.34		0.0			
NF0420	F_YR100HF	15.2	7.44	12.17	831.3	12.17	834.34		-0.1			
NG0010	F_YR100HF	12.02	47.42	12	591.88	12.02	583		0.0			
NG0015	F_YR100HF	12.81	44.47	12.11	612.3	12.92	237.14	site recreational-ok	0.4	IMPACT		
NG0030	F_YR100HF	12.91	45.04	12	411.17	16.1	110.48	banks=44; rd=46+ ok	0.5	IMPACT		
NG0040	F_YR100HF	12.03	35.53	12	51.53	12.03	50.21		0.0			
NG0050	F_YR100HF	12.28	33.5	12.17	297.56	12.24	279.13		0.0			
NG0060	F_YR100HF	12.06	37.57	12	31.79	12.06	29.97		0.0			
NG0070	F_YR100HF	12.03	23.21	12.02	71.4	12.03	71.29		0.0			
NG0075	F_YR100HF	12.4	14.95	12	220.46	11.86	305.03		-0.1			
NG0080	F_YR100HF	12.3	28.66	12.27	436.47	12.3	435.29		0.0			
NG0090	F_YR100HF	12.3	25.14	12.28	463.23	12.3	462.83		0.0			
NG0095	F_YR100HF	12.4	14.94	12.25	392.69	12.38	367.11		-0.1			
NG0100	F_YR100HF	12.33	16.15	12	54.07	12.32	38.54		0.0			
NG0110	F_YR100HF	12.7	12.93	12	11.95	12.06	11.32		-0.7		BENEFIT	
NG0115	F_YR100HF	12.71	12.9	12.32	950.11	12.36	885.11	banks 12	-0.7		BENEFIT	

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NG0120	F_YR100HF	12.71	12.93	12	141.97	13.2	103.77	low rd 11.9, pondbanks=11, low site12.6	-0.7		BENEFIT	
NG0130	F_YR100HF	12.7	12.95	12	473.37	12.02	445.25	driveway=11-11.5, banks=11	-0.7		BENEFIT	
NG0140	F_YR100HF	12.02	23.49	12	45.21	12.02	44.37		0.0			
NG0150	F_YR100HF	12	17.86	12	135.52	12	135.47		0.0			
NG0160	F_YR100HF	12.02	15.44	12	31.89	12.02	31.77		0.0			
NG0170	F_YR100HF	12.46	13.81	12	41.37	12.15	38.12		0.0			
NG0180	F_YR100HF	12.06	13.02	12	48.52	12.06	45.64		0.0			
NG0185	F_YR100HF	12.8	12.51	12.33	968.81	12.85	811.79	in banks=11	-0.2			
NG0190	F_YR100HF	12.79	12.39	12.85	812.27	12.9	813.9	in banks=10.1	0.1			
NG0200	F_YR100HF	12.29	33.43	12.24	116.81	12.32	115.97		0.0			
NG0210	F_YR100HF	12.28	33.47	12.02	424.2	12.28	343.41		0.0			
NG0220	F_YR100HF	12.8	12.51	12	8.38	13.35	11.41		-0.2			
NG0230	F_YR100HF	12.93	11.22	12	12.62	14.02	9.93		0.1			
NG0240	F_YR100HF	12.76	11.14	12.91	822.4	12.99	833.9	tob=10.5	0.1			
NG0250	F_YR100HF	12.75	11.03	12.67	1925.82	12.7	1920.17	tob=10.3	0.1			
NG0260	F_YR100HF	13	9.65	12.7	1923.37	12.72	1915.21	tob=11	0.0			
NH0010	F_YR100HF	14.67	66.62	12	13.4	14.67	1.58		0.0			
NH0030	F_YR100HF	12.07	38.5	12	144.95	12.07	134.76		0.0			
NH0040	F_YR100HF	12.02	34.79	12	83.91	12.02	82.45		0.0			
NH0050	F_YR100HF	12.22	34.97	12.2	222.39	12.22	221.49		0.0			
NH0060	F_YR100HF	25	34.08	12	4.44	0	0		-0.2			
NH0070	F_YR100HF	13.89	36.16	12	12.96	13.89	1.06		0.0			
NH0080	F_YR100HF	12.19	40.43	12	196.06	12.19	176.63		0.0			
NH0090	F_YR100HF	12.2	37.93	12.18	183.8	12.2	183.29		0.0			
NH0100	F_YR100HF	12.21	36	12.17	370.75	12.21	365.73		0.0			
NH0110	F_YR100HF	12.34	31.07	12.17	625.74	12.3	566.38		0.0			
NH0120	F_YR100HF	12.34	31.01	12.24	1142.38	12.34	1105.27		0.0			
NH0130	F_YR100HF	12.08	15.49	12	248.72	12.08	230.29		0.0			
NH0140	F_YR100HF	12.33	31.34	12.17	364.84	12.19	358.59		0.0			
NH0150	F_YR100HF	12.03	16.89	12	54.2	12.03	52.88		-0.3		BENEFIT	
NH0160	F_YR100HF	12.35	20.28	12.34	1171.35	12.35	1170.27	low rd=19priv, tob=19, low site 20-20.4	-1.0		BENEFIT	
NH0170	F_YR100HF	12.38	14.12	12.34	1236.9	12.37	1230.36	lowfloor=18.14, site=13.5, rd=15.7 mhp	-0.6		BENEFIT	
NH0180	F_YR100HF	12.42	12.5	12.36	1319.03	12.37	1310.44	rd=13.7 5th st 12.6 oak, bank=12, low site 11.6	-0.4		BENEFIT	

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NH0185	F_YR100HF	12.64	11.73	12.26	822.51	12.26	741.58	in bank=11.0, low rd 11.5 ok	0.4	IMPACT		
NH0188N	F_YR100HF	12.68	11.55	12.26	741.58	12.26	715.36	low bank= 10.5	#N/A	#N/A	#N/A	
NH0195	F_YR100HF	12.71	11.33	12.37	1447.75	12.59	1126.86	low bank= 10.5, low rd=10, site=10.5	0.1			
NI0020	F_YR100HF	12.93	16.51	12	58.32	13.92	29.19		-0.1			
NI0025	F_YR100HF	12.92	16.51	12.17	315.73	13.02	182.03	low rd 15.3, bank=15	-0.1			
NI0030	F_YR100HF	12.28	17.51	12	8.96	12.28	6.39		0.0			
NI0040	F_YR100HF	12.44	17.05	12	152.93	12.43	80.66		0.0			
NI0045	F_YR100HF	12.82	16.02	12.78	269.67	12.97	270.69	bank=16	-0.3		BENEFIT	
NI0050	F_YR100HF	13.15	18.59	12	66.52	13.15	4.1		0.0			
NI0060	F_YR100HF	12.92	17.9	12.01	37.31	12.08	27.59		0.0			
NI0065	F_YR100HF	12.93	17.9	12	204.45	12.2	46.6		0.0			
NI0070	F_YR100HF	12.75	17.84	12	56.01	12.13	24.63		0.0			
NI0075	F_YR100HF	12.94	17.9	12	284.25	12.76	45.09		0.0			
NI0080	F_YR100HF	12.67	17.78	12.15	67.18	12.77	55.43		0.0			
NI0090	F_YR100HF	12.65	17.72	12.55	64.28	12.73	63.97		0.0			
NI0095	F_YR100HF	12.81	15.84	12.59	297.73	13	299.16	bank=15	-0.4		BENEFIT	
NI0100	F_YR100HF	12.65	17.67	12.33	79.06	12.63	73.79		0.0			
NI0110	F_YR100HF	12.69	17.48	12.57	75.75	12.61	75.47		0.0			
NI0120	F_YR100HF	12.72	17.38	12.25	110.61	12.68	91.32		0.0			
NI0130	F_YR100HF	12.72	17.3	12.33	107.75	12.7	99.79		0.0			
NI0140	F_YR100HF	12.73	17.18	12.66	100.98	12.71	100.85		0.0			
NI0150	F_YR100HF	12.77	17.83	12	25.49	12.77	6.11		0.0			
NI0170	F_YR100HF	12.95	17.69	12	25.85	12.36	5.11		0.0			
NI0180	F_YR100HF	14.06	17.42	12	29.86	13.67	23.67		0.0			
NI0190	F_YR100HF	13.65	17.65	12.33	83.44	12.81	23.98		0.0			
NI0200	F_YR100HF	13.43	15.59	12	200.46	14.75	33.5		0.0			
NI0205	F_YR100HF	12.4	12.83	12.35	638.59	12.48	656.6	in bank=12	0.2	IMPACT		
NI0210	F_YR100HF	13.34	15.84	12	42.35	12.06	4.91		0.0			
NI0220	F_YR100HF	12.65	14.44	12	29.31	12.16	24.84		-0.2			
NI0230	F_YR100HF	12.98	15.83	12	48.44	17.08	7.73		0.0			
NI0240	F_YR100HF	12.93	15.11	12	65.93	14.4	20.01		-0.1			
NI0245	F_YR100HF	12.64	14.44	12.9	403.55	12.97	407.59	bank=15	-0.2			
NI0250	F_YR100HF	13.06	17.08	12	117.94	16.85	20.72		0.0			
NI0260	F_YR100HF	14.28	17.19	12	97.74	18.19	22.54		0.0			
NI0270	F_YR100HF	12.94	17.89	12.39	56.04	12.94	49.28		0.0			
NI0280	F_YR100HF	12.8	15.76	12.46	317.73	12.99	316.69	bank=17	-0.4		BENEFIT	
NI0285	F_YR100HF	12.66	14.72	12.88	339.71	12.91	341.19	bank=17	-0.1			
NI0290	F_YR100HF	12.62	14.3	12.92	448.62	12.97	452.91	bank=15, rd=17	-0.2			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NI0295	F_YR100HF	14.94	17.23	12	87.43	15.46	56.32		0.0			
NI0300	F_YR100HF	18.54	9.68	12	56.73	27.2	13.01	tob=9+	-0.2			
NI0310	F_YR100HF	12.29	12.92	11.9	72.96	12.29	9.38		0.0			
NI0320	F_YR100HF	12.45	14.51	12	30.5	12.46	15.5		0.0			
NI0325	F_YR100HF	12.46	13.73	12.7	582.53	12.71	585.35	bank=15, rd=17	0.3	IMPACT		
NI0330	F_YR100HF	12.6	16.28	12	94.91	12.61	42.12		0.0			
NI0340	F_YR100HF	12.28	12.69	12	52.05	12.23	37.66		0.0			
NI0350	F_YR100HF	12.27	15.51	12	44.13	12.27	27.27		0.0			
NI0355	F_YR100HF	12.38	11.62	12.47	673.77	12.39	716.03	in bank=11.0	0.0			
NI0360	F_YR100HF	12.38	11.6	12.48	796.36	12.38	914.85	in bank=10.5	0.0			
NI0370	F_YR100HF	12.4	16.97	12	32.33	12.09	22.05		0.0			
NI0380	F_YR100HF	12.41	16.95	12.01	134.7	12.06	115.22		0.0			
NI0390	F_YR100HF	12.4	16.97	12.02	5.16	13.41	4.2		0.0			
NI0400	F_YR100HF	12.4	16.98	11.79	27.61	12.39	11.78		0.0			
NI0410	F_YR100HF	12.14	15.98	12	47.83	12.14	42.73		0.0			
NI0415	F_YR100HF	12.69	16.55	12	52.13	12.78	15.23		0.0			
NI0420	F_YR100HF	12.26	15.32	12.03	115.97	12.23	99.25		0.0			
NI0430	F_YR100HF	12.34	15.07	12.25	218.34	12.34	214.06		0.0			
NI0440	F_YR100HF	13.66	17.65	12	95.88	13.66	44.43		0.0			
NI0450	F_YR100HF	16.07	17.26	12	159.07	11.64	32.18		0.0			
NI0455	F_YR100HF	12.47	17.77	12	107.05	13.6	72.23	site=18	0.0			
NI0460	F_YR100HF	13.27	16.02	12.47	31.32	13.02	5.71		0.0			
NI0470	F_YR100HF	13.64	17.65	12	82.65	12.36	58.71		0.0			
NI0480	F_YR100HF	12.5	17.6	12	32.33	11.91	19.8		0.0			
NI0490	F_YR100HF	12.83	17.73	12	109.81	13.04	23.71		0.0			
NI0500	F_YR100HF	12.99	17.96	12	47.37	14.36	14.82		0.0			
NI0510	F_YR100HF	12.56	17.99	12	83.57	12.5	26.16		0.0			
NI0520	F_YR100HF	12.77	17.89	12	57.61	13.87	15.74		0.0			
NI0530	F_YR100HF	13.64	17.68	12	65.66	14.17	6.93		0.0			
NI0540	F_YR100HF	13.64	17.68	12	77.05	13.86	18.27		0.0			
NI0550	F_YR100HF	13.88	17.95	26.04	7.53	25.95	7.59		0.0			
NI0560	F_YR100HF	13.13	18.57	12	17.86	12.14	6.91		0.0			
NI0570	F_YR100HF	12.16	18.58	12	10.77	12.16	9.18		0.0			
NI0580	F_YR100HF	13.02	18.24	11.92	19.93	17.34	21.19		0.0			
NI0590	F_YR100HF	13.11	15.31	12	24.48	0	4.26		0.0			
NI0600	F_YR100HF	13.03	18.24	12	29.58	15.82	12.88		0.0			
NI0610	F_YR100HF	13.13	18.31	12	44.21	15.92	8.97		0.0			
NI9000	F_YR100HF	0	2	12.93	41.54	0	0		0.0			
NJ0010	F_YR100HF	12.21	16.31	11.95	310.31	12.19	156.01		0.0			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NJ0020	F_YR100HF	12.92	16.13	12	50.66	12.93	8.9		0.0			
NJ0025	F_YR100HF	12.93	14	12.15	440.69	14.18	263.11		-0.7		BENEFIT	
NJ0026N	F_YR100HF	12.93	14.01	12.14	99.22	12.19	84.02		#N/A	#N/A	#N/A	
NJ0027N	F_YR100HF	12.92	14.03	12.12	105.43	12.14	99.22		#N/A	#N/A	#N/A	
NJ0028N	F_YR100HF	12.91	14.03	12	148.96	12.12	94.68	low site=14	#N/A	#N/A	#N/A	
NJ0030	F_YR100HF	13.34	16.08	12.03	65.78	15.42	13.47		0.0			
NJ0040	F_YR100HF	12.76	15.84	12	5.76	15.43	1.59		0.0			
NJ0050	F_YR100HF	12.75	15.83	12	33.87	12.75	10.18		0.0			
NJ0060	F_YR100HF	12.45	14.83	12	51.09	12.56	32.83	bank= 14 ,site/str=14.5	0.0			
NJ0070	F_YR100HF	12.69	16	12.15	162.36	12.51	51.34		-0.1			
NJ0080	F_YR100HF	12.43	14.16	12	203.66	12.42	118.87		0.0			
NJ0090	F_YR100HF	12.22	16.35	12	186.6	12.21	132.66		0.0			
NJ0100	F_YR100HF	13.33	16.35	12	335.15	13.97	36.93		0.0			
NJ0110	F_YR100HF	12.59	15.98	12	91.94	12.54	49.07		0.0			
NJ0120	F_YR100HF	14.86	16.33	12	96.23	21.24	8.52		0.0			
NJ0130	F_YR100HF	12.66	16.03	12	70.18	12.71	25.56		0.0			
NJ0135	F_YR100HF	12.86	14.06	12.19	136.33	12.23	126.52		-0.7		BENEFIT	
NJ0140	F_YR100HF	12.33	14.58	12	175.62	12.32	115.71		0.0			
NJ0150	F_YR100HF	12.81	13.85	14.08	300.99	13.96	321.04	low rd/bank=12.5 low site13.5	-0.6		BENEFIT	
NJ0155	F_YR100HF	12.62	13.2	12	738.99	12.55	591.31	bank=11.5, site 12.3	-0.6		BENEFIT	
NJ0160	F_YR100HF	12.75	12.55	12.33	1074.18	12.79	826.74	bank=11.5, site 12.3	-1.0		BENEFIT	
NJ0170	F_YR100HF	12.46	13.99	12	174.4	12.46	143.08		0.0			
NJ0180	F_YR100HF	15.44	9.62	12	36.82	26.23	23.11		-0.1			
NJ0185	F_YR100HF	15.44	9.62	12.61	569.72	12.61	441.56		-0.1			
NJ0190	F_YR100HF	15.44	9.61	12	55.45	28.81	45.13		-0.1			
NJ0195	F_YR100HF	15.43	9.61	12.94	1458.09	12.94	1350.24		-0.1			
NJ0200	F_YR100HF	15.39	9.63	12	75.62	12.13	66.67		-0.1			
NJ0210	F_YR100HF	15.43	9.62	12.62	107.24	26.22	47.26		-0.1			
NJ0215	F_YR100HF	15.43	9.61	12.61	849.01	12.61	761.21		-0.1			
NJ0220	F_YR100HF	12.81	13.38	12	96.69	12.81	21.29		0.0			
NJ0230	F_YR100HF	15.4	9.63	12.12	79.2	12.18	76.85		-0.1			
NJ0240	F_YR100HF	15.77	9.71	12	75.23	24.45	7.49	pond tob=9.8-10	-0.1			
NJ0250	F_YR100HF	12.53	11.9	12	45.36	12.53	19.35		0.0			
NJ0260	F_YR100HF	15.69	9.7	12	28.4	23.98	11.11	pond tob=9.6	-0.1			
NJ0265	F_YR100HF	12.61	10.47	12.47	934.94	12.54	931.75	in bank=12.3 ok	0.4	IMPACT		
NJ0270	F_YR100HF	15.28	9.66	12	112.34	26.56	21.15		-0.1			
NJ0280	F_YR100HF	15.55	9.68	12.71	12.52	24.32	13.94	pond tob=9.6	-0.1			
NJ0290	F_YR100HF	15.27	9.66	12.81	991.09	12.88	948.79	in bank= 8.5 low rd 7.7	-0.1			

		Max Time	Max	Max Time	Max	Max Time	Max		Eval	vs Base		
Name	Simulation	Stage	Stage	Inflow	Inflow	Outflow	Outflow					
		hrs	ft	hrs	cfs	hrs	cfs	comments	ft	IMPACT	BENEFIT	
									DIFF	>0.1 FT RISE	>0.25 RELIEF	
NJ0300	F_YR100HF	15.41	9.62	12.32	1270.69	12.14	779.96		-0.1			
NJ0310	F_YR100HF	15.42	9.62	11.9	104.99	26.24	74.8		-0.1			
NJ0320	F_YR100HF	15.42	9.62	12.12	605.53	12.61	408.68		-0.1			
NJ0330	F_YR100HF	15.43	9.61	12.6	1339.15	19.33	20.7		-0.1			
NJ0340	F_YR100HF	12.31	16.67	12	282.95	12.31	190.36		0.0			
NJ0350	F_YR100HF	13.34	16.08	12	40.77	15.43	5.16		0.0			
NJ9000	F_YR100HF	0	12.5	12.31	15.77	0	0		0.0			
NK0010	F_YR100HF	12.98	7.01	12	19.42	13.01	3.05		0.0			
NK0020	F_YR100HF	12.56	7.64	12	21.93	12.6	8.71		0.0			
NK0030	F_YR100HF	12.67	4.78	12	38.27	12.53	13.04		0.0			
NK0040	F_YR100HF	16.22	7.95	12	33.03	16.59	1.45		0.0			
NK0050	F_YR100HF	12.89	8.81	12	109.41	12.92	21.06		0.0			
NK0060	F_YR100HF	12.96	5.55	12	169.37	12.39	65.63		0.0			
NK0070	F_YR100HF	12.73	4.78	12	116.36	12.63	31.07		0.0			
NK0080	F_YR100HF	12.39	7.6	12	91.13	12.39	61.96		0.0			
NK0090	F_YR100HF	12.75	4.72	12.51	53.54	12.57	51.02		0.0			
NK0100	F_YR100HF	12.8	8.34	12	120.72	12.8	45.39		0.0			
NK0110	F_YR100HF	12.82	4.62	12.37	87.53	12.82	62.94		0.0			
NK0120	F_YR100HF	12.33	6.34	12.3	76.31	12.32	76.12		0.0			
NK0130	F_YR100HF	12.56	5.61	12	125.28	12.56	67.59		0.0			
NK0140	F_YR100HF	12.94	5.53	12.17	580.89	12.94	295.92		0.0			
NK0150	F_YR100HF	12.95	5.41	12.86	315.19	12.95	313.42		0.0			
NK0160	F_YR100HF	12.1	7.58	12	19.99	12.1	18.12		0.0			
NK0170	F_YR100HF	12.82	8.19	12	121.84	12.85	26.88		0.0			
NK9000	F_YR100HF	0	2	12.87	375.57	0	0		0.0			
NK9001	F_YR100HF	0	2	12.82	11.06	0	0		0.0			

Appendix C

Cost Estimates

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #1: Main Street (1st Avenue) Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$18,477	$18,477
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$6,159	$6,159
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	100	$20	$2,000
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	250	$142	$35,555
	STRUCTURES				
410-70	3-12'x6' CONC BOX CULVERT w/ WINGWALLS	LF	80	$3,140	$251,200
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	150	$75	$11,250
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$332,591**
DATE	***CONTINGENCY (20%)***				**$66,518**
3/21/2013	***TOTAL***				**$399,110**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #2: Starkey Road Culvert Addition at Channel 10

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$12,198	$12,198
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$4,066	$4,066
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	450	$142	$63,999
	STRUCTURES				
410-70	10'x5' CONC BOX CULVERT w/ WINGWALLS	LF	110	$1,160	$127,600
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	50	$75	$3,750
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$219,563**
DATE	***CONTINGENCY (20%)***				**$43,913**
3/21/2013	***TOTAL***				**$263,480**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #3: Lake Palms Drive Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$10,290	$10,290
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$3,430	$3,430
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	100	$20	$2,000
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	250	$142	$35,555
	STRUCTURES				
410-70	12'x5' CONC BOX CULVERT w/ WINGWALLS	LF	80	$1,500	$120,000
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	80	$75	$6,000
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$185,225**
DATE	***CONTINGENCY (20%)***				**$37,045**
3/21/2013	***TOTAL***				**$222,270**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #4: Channel 10 Improvements & Dahlia Place and Gardenia Place Outfall

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$4,566	$4,566
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$1,522	$1,522
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	1700	$2	$2,975
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	1	$5,000	$5,000
110	REMOVAL OF EXCESS FILL FROM SITE	CY	300	$25	$7,500
120-1	EXCAVATION, REGULAR, INCLUDING DEWATERING	CY	300	$20	$6,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	100	$142	$14,222
	STRUCTURES				
425-2, 425-3	INLETS OR MANHOLES	EA	2	$5,000	$10,000
	MISCELLANEOUS				
575-1-1	SODDING (BAHIA)	SY	9500	$3	$28,500
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$82,185**
DATE	***CONTINGENCY (20%)***				**$16,437**
3/21/2013	***TOTAL***				**$98,620**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #6A: New Haven Drive Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$14,385	$14,385
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$4,795	$4,795
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	100	$20	$2,000
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	250	$142	$35,555
	STRUCTURES				
410-70	3-10'x9' CONC BOX CULVERT w/ WINGWALLS	LF	50	$3,660	$183,000
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	150	$75	$11,250
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$258,935**
DATE	***CONTINGENCY (20%)***				**$51,787**
3/21/2013	***TOTAL***				**$310,720**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #6B: Donegan Road Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$21,180	$21,180
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$7,060	$7,060
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	100	$20	$2,000
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	250	$142	$35,555
	STRUCTURES				
410-70	4-12'x10' CONC BOX CULVERT w/ WINGWALLS	LF	50	$5,880	$294,000
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	180	$75	$13,500
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$381,245**
DATE	***CONTINGENCY (20%)***				**$76,249**
3/21/2013	***TOTAL***				**$457,490**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #7A: Starkey Road Culvert Addition at Channel 9

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$12,198	$12,198
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$4,066	$4,066
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	450	$142	$63,999
	STRUCTURES				
410-70	10'x5' CONC BOX CULVERT w/ WINGWALLS	LF	110	$1,160	$127,600
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	50	$75	$3,750
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$219,563**
DATE	***CONTINGENCY (20%)***				**$43,913**
3/21/2013	***TOTAL***				**$263,480**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #7B: Tall Pines Drive Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$8,595	$8,595
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$2,865	$2,865
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	160	$20	$3,200
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	250	$142	$35,555
	STRUCTURES				
410-70	10'x5' CONC BOX CULVERT w/ WINGWALLS	LF	80	$1,160	$92,800
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	50	$75	$3,750
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$154,715**
DATE	***CONTINGENCY (20%)***				**$30,943**
3/21/2013	***TOTAL***				**$185,660**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #8A: Remove Salinity Barrier Upstream of Park Boulevard

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$18,222	$18,222
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$6,074	$6,074
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	250	$15	$3,750
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110	REMOVAL OF EXCESS FILL FROM SITE	CY	500	$25	$12,500
110-3	REMOVAL OF EXISTING STRUCTURES	LF	182	$1,500	$273,000
120-5	EXCAVATION CHANNEL	CY	500	$20	$10,000
	MISCELLANEOUS				
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$327,996**
DATE	***CONTINGENCY (20%)***				**$65,599**
3/21/2013	***TOTAL***				**$393,600**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #8B: Park Boulevard Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$69,787	$69,787
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$23,262	$23,262
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	250	$15	$3,750
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	1	$5,000	$5,000
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	200	$20	$4,000
120-5	EXCAVATION CHANNEL	CY	500	$20	$10,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	550	$142	$78,221
	STRUCTURES				
	3-Span Bridge (30' Span Length)	SF	7200	$145	$1,044,000
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	200	$75	$15,000
575-1-1	SODDING (BAHIA)	SY	800	$3	$2,400
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$1,256,171**
DATE	***CONTINGENCY (20%)***				**$251,234**
3/21/2013	***TOTAL***				**$1,507,400**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #9A: Largo Maintenance Facility Driveway Culvert

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$4,900	$4,900
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$1,633	$1,633
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	32	$20	$640
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	150	$142	$21,333
	STRUCTURES				
410-70	12'x5' CONC BOX CULVERT w/ WINGWALLS	LF	32	$1,500	$48,000
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	50	$75	$3,750
575-1-1	SODDING (BAHIA)	SY	400	$3	$1,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$88,207**
DATE	***CONTINGENCY (20%)***				**$17,641**
3/21/2013	***TOTAL***				**$105,850**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #9B: Channel 7 Improvements

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$12,261	$12,261
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$4,087	$4,087
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	1800	$2	$3,150
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	2	$5,000	$10,000
110	REMOVAL OF EXCESS FILL FROM SITE	CY	3540	$25	$88,500
120-1	EXCAVATION, REGULAR, INCLUDING DEWATERING	CY	3540	$20	$70,800
	MISCELLANEOUS				
575-1-1	SODDING (BAHIA)	SY	10000	$3	$30,000
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$220,698**
DATE	***CONTINGENCY (20%)***				**$44,140**
3/21/2013	***TOTAL***				**$264,840**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #10A: Twin Oaks Drive Culvert Replacement (Oak Crest MHP)

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$11,057	$11,057
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$3,686	$3,686
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	1600	$2	$2,800
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110	REMOVAL OF EXCESS FILL FROM SITE	CY	900	$25	$22,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	35	$20	$700
120-5	EXCAVATION CHANNEL	CY	900	$20	$18,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	250	$142	$35,555
	STRUCTURES				
410-70	2-10'x6' CONC BOX CULVERT w/ WINGWALLS	LF	35	$2,500	$87,500
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	75	$75	$5,625
575-1-1	SODDING (BAHIA)	SY	2400	$3	$7,200
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$199,022**
DATE	***CONTINGENCY (20%)***				**$39,804**
3/21/2013	***TOTAL***				**$238,830**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #10B: Barrington Trace Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$6,912	$6,912
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$2,304	$2,304
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	200	$2	$350
104- 11-	TURBIDITY BARRIER FLOATING	LF	150	$15	$2,250
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	0.5	$5,000	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	15	$20	$300
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	0	$142	$0
	STRUCTURES				
410-70	3-10'x5' CONC BOX CULVERT w/ WINGWALLS	LF	30	$3,000	$90,000
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	200	$75	$15,000
575-1-1	SODDING (BAHIA)	SY	800	$3	$2,400
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$124,416**
DATE	***CONTINGENCY (20%)***				**$24,883**
3/21/2013	***TOTAL***				**$149,300**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #11: Green Meadows MHP Culvert Replacement

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$27,365	$27,365
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$9,122	$9,122
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	400	$2	$700
104- 11-	TURBIDITY BARRIER FLOATING	LF	100	$15	$1,500
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	1	$5,000	$5,000
110	REMOVAL OF EXCESS FILL FROM SITE	CY	100	$25	$2,500
110-3	STRUCTURES REMOVAL OF EXISTING STRUCTURES (CULVERT)	LF	220	$20	$4,400
120-5	EXCAVATION CHANNEL	CY	100	$20	$2,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	250	$142	$35,555
	STRUCTURES				
410-70	2-10'x5' CONC BOX CULVERT w/ WINGWALLS	LF	220	$1,800	$396,000
	MISCELLANEOUS				
530-3-4	RIPRAP (RUBBLE)(DITCH LINING)(12")	TN	75	$75	$5,625
575-1-1	SODDING (BAHIA)	SY	800	$3	$2,400
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$492,566**
DATE	***CONTINGENCY (20%)***				**$98,513**
3/21/2013	***TOTAL***				**$591,080**

PROJECT NAME: Starkey Road Basin BMP Alternatives Analysis

BMP #12: Blue Water Cove Pond 1 & 2 Outfall Improvements

FDOT PAY ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITIES	UNIT PRICE	TOTAL PER PAY ITEM
	MOBILIZATION & MAINTENANCE OF TRAFFIC				
101-1	MOBILIZATION $500,000 - $999,999 (6% OF PROJECT COST)	LS	1	$7,738	$7,738
102-1	MAINTENANCE OF TRAFFIC (2% OF PROJECT COST)	LS	1	$2,579	$2,579
	GENERAL CONSTRUCTION OPERATIONS				
104-10-1	HAY OR STRAW BALES (TYPE I)	EA	40	$10	$400
104-13	SILT FENCE, STAKED	LF	800	$2	$1,400
104- 11-	TURBIDITY BARRIER FLOATING	LF	80	$15	$1,200
	EARTHWORK AND RELATED OPERATIONS				
110-1-1	CLEARING & GRUBBING (INCLUDES TREES < 8")	AC	1	$5,000	$5,000
110	REMOVAL OF EXCESS FILL FROM SITE	CY	1650	$25	$41,250
120-1	EXCAVATION, REGULAR, INCLUDING DEWATERING	CY	1650	$20	$33,000
	ROADWAY CONSTRUCTION				
VARIOUS	REMOVE AND REPLACE PAVEMENT, INCLUDING BASE AND SUBBASE	SY	50	$142	$7,111
	STRUCTURES				
425-1	INLETS (TYPE D)	EA	1	$3,500	$3,500
425-1	INLETS (TYPE G)	EA	1	$6,000	$6,000
430-12	PIPE CONC CULV (CLASS III) (36" CD)	LF	150	$75	$11,250
430-12	PIPE CONC CULV (CLASS III) (48" CD)	LF	85	$110	$9,350
430-982	MITERED END SECTION (OPTIONAL ROUND) (36" CD)	EA	1	$2,000	$2,000
430-982	MITERED END SECTION (OPTIONAL ROUND) (48" CD)	EA	1	$3,000	$3,000
	MISCELLANEOUS				
530-3-4	SODDING (BAHIA)	SY	1500	$3	$4,500
	PRELIMINARY COST ESTIMATE			COST ESTIMATE SUBTOTAL =	**$139,278**
	CONTINGENCY (20%)				**$27,856**
DATE	***TOTAL***				**$167,130**