McKay Creek Watershed Management Plan

Pinellas County Board Of County Commissioners | June 2014

MCKAY CREEK WATERSHED MANAGEMENT PLAN

Prepared for:

PINELLAS COUNTY BOARD OF COUNTY COMMISSIONERS
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1 INTRODUCTION

1.1 AUTHORIZATION

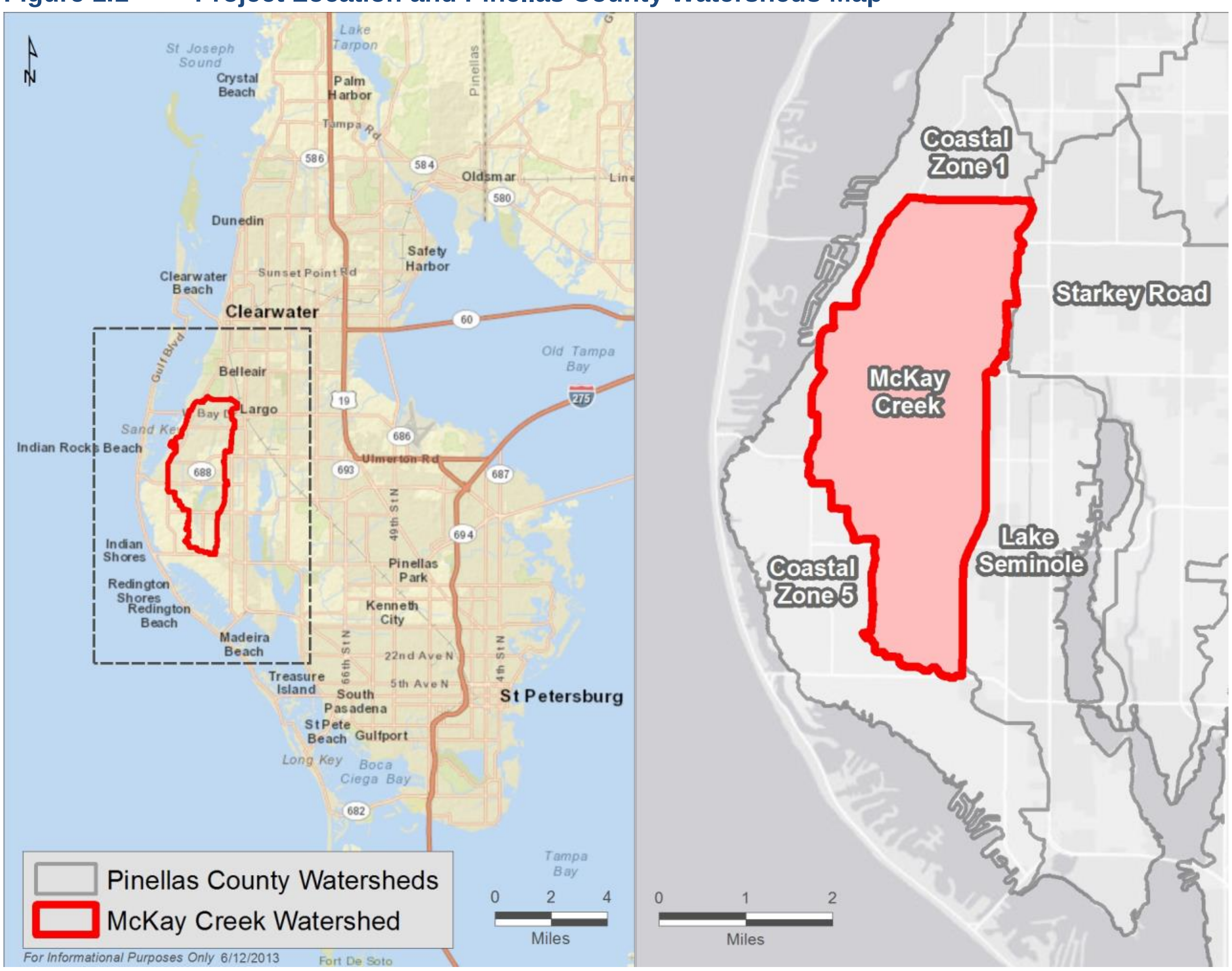
The McKay Creek Watershed Management Plan was initiated by Pinellas County and the Southwest Florida Water Management District (SWFWMD). This Plan incorporates Digital Topographic Information, Watershed Evaluation, and Watershed Management Plan elements from the SWFWMD Guidelines and Specifications (G&S) (SWFWMD, 2011). This report documents the Digital Topographic Information and Watershed Evaluation phases of the Plan.

Jones Edmunds & Associates, Inc. is developing this Watershed Management Plan under Pinellas County PO 405405 (Contract No. 090-0348-CN).

1.2 PROJECT LOCATION AND GENERAL DESCRIPTION

The McKay Creek watershed comprises approximately 9 square miles in the west coastal portion of Pinellas County. A location map is shown in Figure 1.1. The watershed is bordered on the north by Coastal Zone 1, on the east by Starkey Road and Lake Seminole, and on the southwest by Coastal Zone 5 watersheds. Figure 1.1 also shows these neighboring watersheds.

Figure 1.1 Project Location and Pinellas County Watersheds Map



The McKay Creek watershed is highly developed with 60% of the watershed comprised of high-density residential – commercial and recreational areas account for 7% and 8% respectively. The watershed contains many open-channel and closed-conduit drainage features. Walsingham Reservoir and Taylor Lake are the two largest bodies of water within the watershed, excluding the major channels McKay Creek and Church Creek. Elevations within the watershed range from approximately 73 feet (NAVD 88) along the northeast boundary of the watershed to below sea-level along McKay Creek.

1.3 Purpose and Objectives

This project develops elements of a Watershed Management Program for the McKay Creek watershed. Elements of the program were created in accordance with the SWFWMD G&S (SWFWMD, 2011).

The primary project tasks included the following:

- **Digital Terrain Model:** Develop a Digital Terrain Model (DTM) of the study area using Light Detection and Ranging (LiDAR) data. This DTM provided the foundation for developing watershed and subbasin boundaries, storage, and conveyance. Update topographic voids in the DTM using permitted or as-built drawings.

- **Watershed Evaluation:** Develop a watershed evaluation focusing on feature inventory, field evaluation, and assessment of the watershed. Create a Geographic Information Systems (GIS) geodatabase to store information collected in the field and to identify features in accordance with SWFWMD's Geographic Watershed Information System (GWIS) Version 1.6 geodatabase standards and other SWFWMD guidance documents. Inventory of hydraulic features such as culverts, drop structures, weirs, and channels. Perform survey of selected hydraulic features and evaluate hydraulic structure maintenance requirements for those structures that were inventoried.

- **Watershed Management Plan:** Develop a Watershed Management Plan building upon the data collected during Watershed Evaluation. This plan includes watershed parameterization, hydrology and hydraulic modeling, model calibration and verification, and floodplain delineation.

- **Level-of-Service:** Assign flood protection level-of-service (LOS) to subbasins throughout the watershed consistent with County guidelines.

- **Surface Water Resource Assessment:** Develop a surface water resource assessment. This assessment includes updating the pollutant loading model developed for the Tampa Bay Estuary Program and evaluating watershed impacts due to land use. This assessment will be conducted by Janiki Environmental

- **Biological Assessment:** Perform a Habitat and Biological Assessment in the freshwater portions of the McKay Creek and the estuarine portions of the watershed. This assessment will be conducted by Janiki Environmental.

- **Best Managaement Practices (BMP) Alternative Analysis:** Conduct a BMP alternative analysis for both structural and non-structural BMPs. Model BMPs using ICPR and estimate pollutant load reductions.

This report provides supporting documentation for the DTM, Watershed Evaluation, and Watershed Management Plan tasks described above. Additional information is documented in the Technical Support Data Notebook (TSDN).

2 WATERSHED INVENTORY

The primary watershed inventory tasks included in this study were developing a DTM and inventorying hydrologic and hydraulic features. These inventories are detailed in the following section.

2.1 CHARACTERIZATION OF THE WATERSHEDS AND TRIBUTARIES

The McKay Creek watershed covers approximately 5,500 acres (9 square miles) in Pinellas County. The entire watershed ultimately drains to Clearwater Harbor by way of McKay Creek. The majority (81%) of the watershed area drains directly to McKay Creek, whereas the remaining area drains to Church Creek – which empties into the mouth of McKay Creek.

At the south and most upstream end of McKay Creek is the Walsingham drainage region. Small channel/ditch systems and storm-sewer networks discharge into Walsingham Reservoir (shown as Walsingham Park in Figure 2.1). Walsingham Reservoir then outfalls under Walsingham Road into a channelized portion of upper McKay Creek. This segment of McKay Creek empties into Taylor Lake (shown as John Taylor Park in Figure 2.1). From Taylor Lake, water is channelized again to form lower McKay Creek. Lower McKay Creek has been altered significantly from its natural state by the addition of many seawalls and gabions along its banks.

The Church Creek drainage region – west of Walsingham and Taylor Lake — is also channelized and discharges into the mouth of lower McKay Creek. Figure 2.1 shows the locations of these water features within the watershed.

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Figure 2.1 McKay Creek Watershed

Soils are poorly drained and are mainly categorized in B/D and D hydrologic soil groups (74% watershed area). McKay Creek watershed is highly developed with 60% of the watershed area comprised of high-density residential land-use, followed by 8% recreational and 7% commercial land-use areas. Table 2.1 summarizes land use within the watershed.

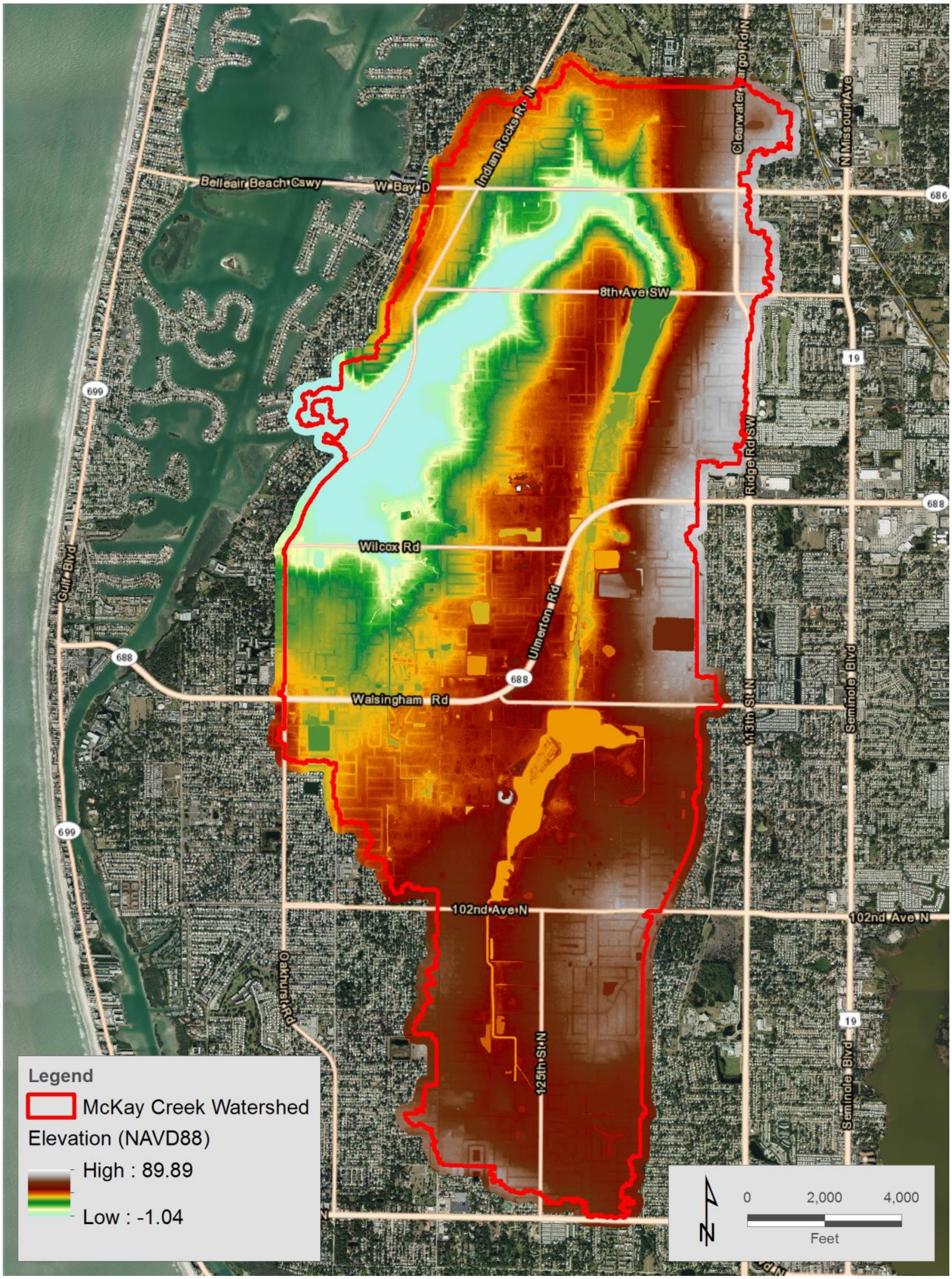
Table 2.1 McKay Creek Watershed Land-Use Summary

FLUCCS Code	Description	Acres	% Area
1100	RESIDENTIAL LOW DENSITY	85.77	1.5%
1200	RESIDENTIAL MED DENSITY	219.30	4.0%
1300	**RESIDENTIAL HIGH DENSITY**	**3312.06**	**59.7%**
1400	COMMERCIAL AND SERVICES	390.64	7.0%
1500	INDUSTRIAL	23.16	0.4%
1700	INSTITUTIONAL	299.27	5.4%
1800	RECREATIONAL	450.75	8.1%
1820	GOLF COURSES	74.27	1.3%
1900	OPEN LAND	165.54	3.0%
2500	SPECIALTY FARMS	26.73	0.5%
4000s	WOODS	54.29	1.0%
5000s	STREAMS, LAKES, RESERVOIRS, BAYS AND ESTUARIES	247.00	4.5%
6000s	WETLANDS AND MARSHES	98.08	1.8%
8100	TRANSPORTATION	57.47	1.0%
8300	UTILITIES	40.14	0.7%

2.2 DIGITAL TERRAIN MODEL DEVELOPMENT

Topographic information for the McKay Creek watershed was collected using LiDAR technology. A DTM was derived from LiDAR data points and supplemental three-dimensional breaklines. The DTM provided a three-dimensional representation of the watersheds and was the basis for interpolating a raster-based digital elevation model (DEM) and Esri terrain feature dataset. Figure 2.2 shows the DEM for the McKay Creek watershed.

Figure 2.2 McKay Creek Digital Elevation Model



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2.2.1 Existing Aerial Topographic Mapping

The LiDAR and vector data used to create the terrain dataset were collected as part of the Florida Division of Emergency Management (FDEM) coastal LiDAR project for Pinellas County that was flown in July and August 2007. These data were then hydro-enhanced by Earth Eye LLC for SWFWMD and provided to Jones Edmunds in March 2011. Our review of the hydro-enhanced LiDAR data is described in Technical Memorandum No. 2 submitted to Pinellas County in July 2012.

The vertical reference for all data is North American Vertical Datum (NAVD) of 1988. Elevation data in National Geodetic Vertical Datum (NGVD) 29 were converted to NAVD 88 using a conversion value of -0.87 foot. This value was determined using the average USGS VERTCON conversion value across the watershed. The minimum and maximum VERTCON conversion values for the watershed were -0.86 and -0.88 foot. The GCS North American 1983 HARN geographic coordinate system was used.

2.2.2 Remapped Areas

No areas were remapped as a part of this project.

2.2.3 Topographic Voids and Areas of New Development

Topographic voids are the areas of the DTM where accurate bare earth LiDAR returns were not captured to adequately define the ground surface in the DTM – for example, an area where LiDAR was unable to penetrate the dense tree canopy. No data are missing because LiDAR coverage is complete for the McKay Creek watershed.

Areas of new development are those areas where the topography has been altered since the data used to create the DTM were collected. For example, the grading associated with a new commercial building or a road-widening project can result in the ground surface being very different than what was captured by the LiDAR. Jones Edmunds identified 24 areas of new development in the McKay Creek watershed. The cut-off date for areas of new development was set as July 5, 2012, which was the date the ERP polygons were downloaded from SWFWMD. The latest aerial imagery, 2011 SWFWMD 6-inch pixel, natural color, was used. More details on topographic voids and identified areas of new development for the watershed are provided in Technical Memorandum No. 1, submitted to Pinellas County in July 2012.

2.2.4 QA/QC Process Description

Jones Edmunds reviewed the hydro-enhanced LiDAR dataset for any anomalies by studying the areas where the minimum and maximum elevations occur within each watershed. We also created and reviewed a hillshade raster for any striping that could indicate errors in the DTM. We reviewed breaklines to confirm that they followed features visible in the aerial imagery and compared breakline elevations to a DTM constructed without breaklines to confirm that all breaklined elevations appeared reasonable. We also reviewed the density of LiDAR ground returns for the watershed to confirm that a sufficient number of LiDAR returns were available to adequately define the ground surface. More details on the Jones Edmunds review of the DTM were provided in Technical Memorandum No. 2.

2.3 Hydrologic Inventory

The hydrologic inventory comprises datasets that define and characterize the watershed and components of the hydrologic model. The hydrologic model, developed within the Interconnected Channel and Pond Routing (ICPR) v3 framework, simulates infiltration and runoff resulting from a single rainfall event. The hydrologic inventory includes subbasin polygons and model datasets derived from soils and land use data.

The level of detail in the subbasin delineation within the McKay Creek watershed was driven primarily by the level of detail in the hydraulic model described in Section 2.4. In general, a subbasin was delineated for each node in the model network. Exceptions to this rule include manhole nodes that receive piped inflows but no surface runoff.

2.3.1 Subbasin Delineation Process

Jones Edmunds developed subbasin (catchment) delineations for the McKay Creek Watershed in general accordance with the SWFWMD *Watershed Management Program Guidelines and Specifications* (SWFWMD, 2011). Subbasins were typically delineated around all major drainage conveyances and significant detention systems.

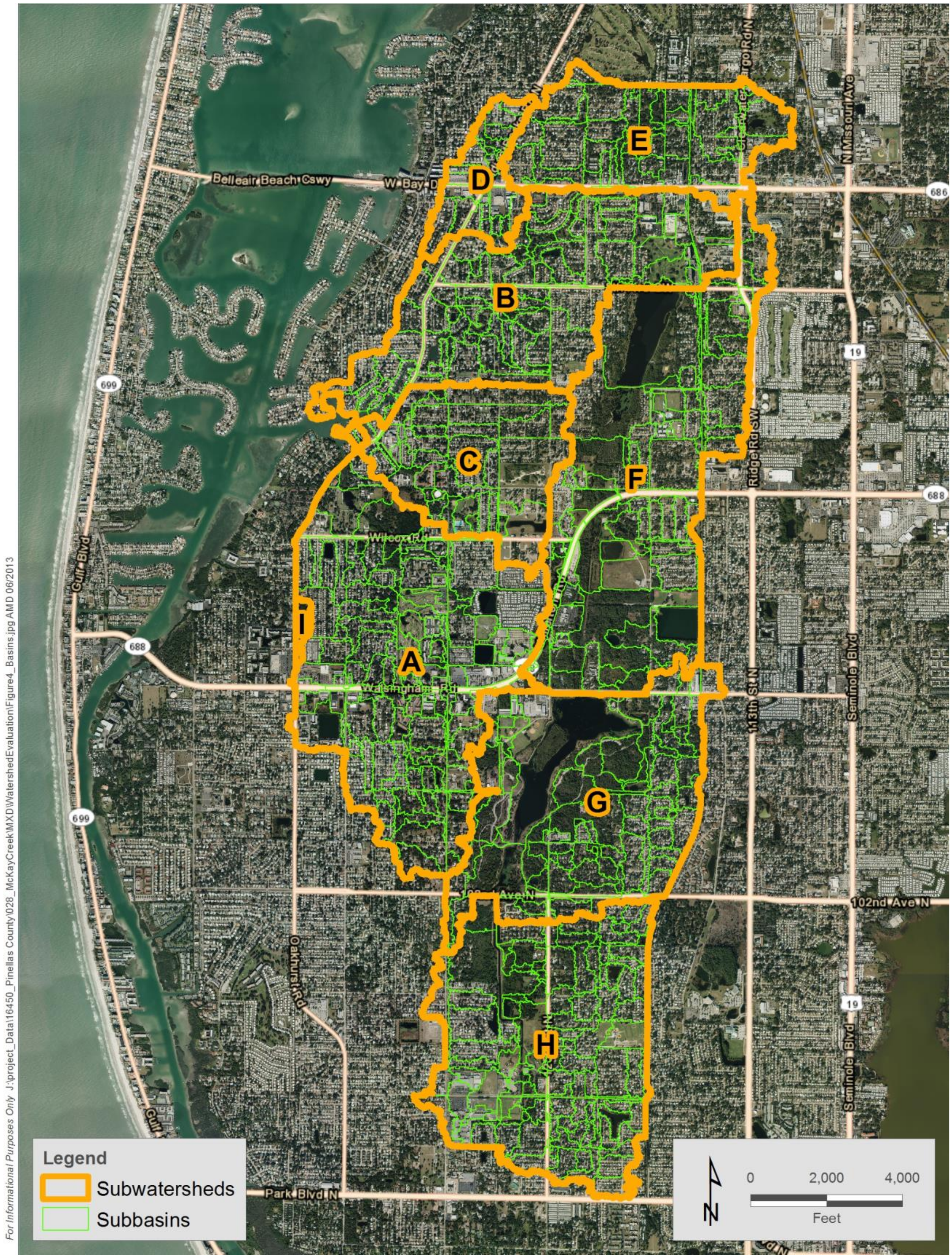
2.3.2 Subbasin Characterization

The McKay Creek watershed was subdivided into 589 subbasins ranging in size from 0.3 to 155.7 acres with an average size of 9.3 acres. For modeling and reporting, subbasins were aggregated into nine subwatersheds based on the main hydrologic feature to which they ultimately drain. Table 2.2 summarizes subbasin statistics by subwatershed. Figure 2.3 shows the delineation of subbasins and subwatersheds.

Table 2.2 Summary Statistics of Subbasin Sizes by Subwatershed

Subwatershed	Count	Total Acreage	Minimum	Maximum	Average	St. Deviation
A	131	1051.9	0.7	42.4	8.0	7.6
B	88	775.2	1.1	47.8	8.8	7.7
C	39	415.2	1.2	55.2	10.6	12.1
D	23	146.2	1.1	18.6	6.4	4.3
E	41	432.7	1.2	32.4	10.6	8.1
F	88	1060.5	0.3	141.4	12.1	19.7
G	78	809.3	0.5	155.7	10.4	18.3
H	108	833	0.6	67.7	7.7	8.0
I	1	11.4	11.4	11.4	11.4	0.0

Figure 2.3 Subbasins and Subwatersheds



2.3.3 LAND USE CHARACTERIZATION

Land use characterization was generated using the 2011 SWFWMD land use (based on the Florida Land Use, Land Cover Classification System). Table 2.3 provides tabulated land use information for each subwatershed. Figure 2.4 presents the SWFWMD land use distribution within the watersheds. The following describes the spatial distribution of the major land uses within the watershed:

- Church Creek (Subwatershed A) – 69% of the area that drains to Church Creek is high- and medium-density residential areas. Commercial (13%) and institutional (5%) use areas are the second and third most prevalent uses. The Largo Municipal Golf Course and Memorial Park are in this region.

- McKay Creek (Subwatersheds B, C, D, and E) – 77% of the area that drains to lower channelized portion of McKay Creek is high- and medium-density residential areas. Commercial use accounts for 10% of the area. Institutional uses, such as the Largo Medical Centers, make up 4% of the drainage area. The Pinecrest Golf Course is also in this region.

- Taylor Lake (Subwatershed F) – This region is dominated by high-density residential (44%) and recreational open-land areas. Areas like Taylor Park, Ridgecrest Park, and Florida Botanical Gardens are comprised of recreational, open-land, reservoir, wood, wetland, and marsh land-uses and account for 36% of the subwatershed area. Other minor uses include institutional (8%), commercial (5%), utilities (3%) and transportation (2%).

- Walsingham Reservoir (Subwatersheds G and H) – Much like the Taylor Lake drainage area, the Walsingham Reservoir area is dominated by high-density residential (57%) and Walsingham Park. Walsingham Park and the recreational/open-land area surrounding upper McKay Creek south of 102nd Avenue account for 31% area of this region.

- Coastal Zone 5 Subbasin (Subwatershed I) – This single subbasin subwatershed contains Anona Elementary School with 48% of the area classified as institutional and 49% classified as commercial and services.

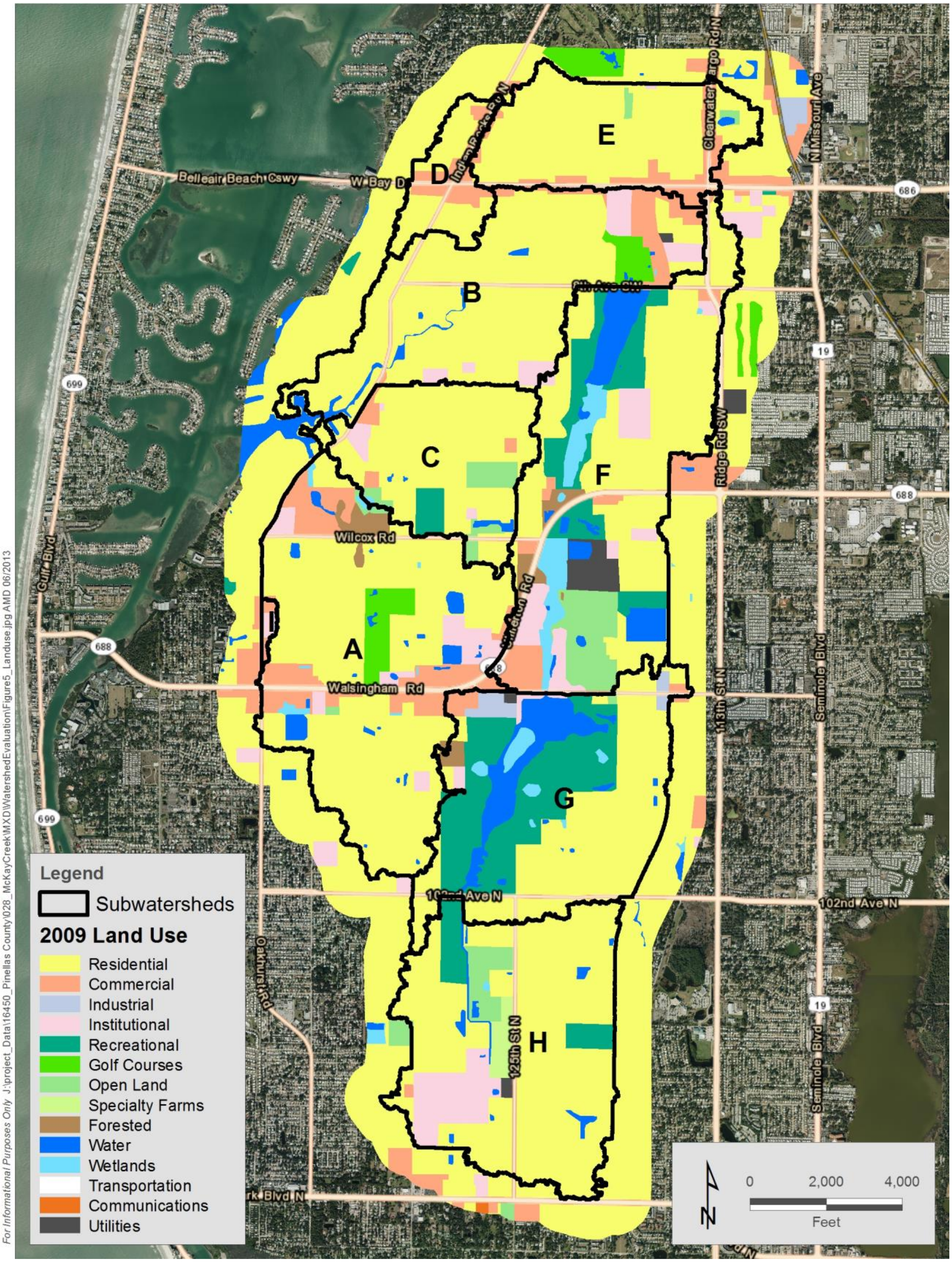
Table 2.3 Summary of Land Use by Subwatershed

Subwatershed	FLUCCS Code	Description	Acres	% Subwatershed
A	1200	RESIDENTIAL MED DENSITY	126.6	12%
	1300	RESIDENTIAL HIGH DENSITY	596.3	57%
	1400	COMMERCIAL AND SERVICES	140.8	13%
	1500	INDUSTRIAL	0.0	0%
	1700	INSTITUTIONAL	55.9	5%
	1800	RECREATIONAL	2.8	0%
	1820	GOLF COURSES	45.4	4%
	1900	OPEN LAND	6.1	1%
	4340	HARDWOOD CONIFER MIXED	24.2	2%
	5200	LAKES	3.0	0%
	5300	RESERVOIRS	29.5	3%
	6410	FRESHWATER MARSHES	4.2	0%
	6420	SALTWATER MARSHES	2.2	0%
	6440	EMERGENT AQUATIC VEGETATION	0.4	0%
	6530	INTERMITTENT PONDS	2.4	0%
	8100	TRANSPORTATION	12.1	1%
B	1200	RESIDENTIAL MED DENSITY	18.0	2%

Subwatershed	FLUCCS Code	Description	Acres	% Subwatershed
	1300	RESIDENTIAL HIGH DENSITY	605.0	78%
	1400	COMMERCIAL AND SERVICES	56.8	7%
	1700	INSTITUTIONAL	50.2	6%
	1800	RECREATIONAL	0.1	0%
	1820	GOLF COURSES	27.8	4%
	5100	STREAMS AND WATERWAYS	2.9	0%
	5300	RESERVOIRS	3.4	0%
	5400	BAYS AND ESTUARIES	8.9	1%
	6410	FRESHWATER MARSHES	0.2	0%
	8100	TRANSPORTATION	0.2	0%
	8300	UTILITIES	1.8	0%
C	1100	RESIDENTIAL LOW DENSITY	24.1	6%
	1200	RESIDENTIAL MED DENSITY	28.9	7%
	1300	RESIDENTIAL HIGH DENSITY	278.8	66%
	1400	COMMERCIAL AND SERVICES	15.1	4%
	1700	INSTITUTIONAL	13.0	3%
	1800	RECREATIONAL	20.7	5%
	1900	OPEN LAND	35.8	8%
	4340	HARDWOOD CONIFER MIXED	0.0	0%
	5300	RESERVOIRS	4.9	1%
	5400	BAYS AND ESTUARIES	1.1	0%
	6530	INTERMITTENT PONDS	1.1	0%
D	1300	RESIDENTIAL HIGH DENSITY	99.3	68%
	1400	COMMERCIAL AND SERVICES	43.0	29%
	8100	TRANSPORTATION	3.8	3%
E	1200	RESIDENTIAL MED DENSITY	20.1	5%
	1300	RESIDENTIAL HIGH DENSITY	327.2	76%
	1400	COMMERCIAL AND SERVICES	60.1	14%
	1700	INSTITUTIONAL	1.2	0%
	1900	OPEN LAND	6.5	2%
	5200	LAKES	1.8	0%
	8100	TRANSPORTATION	15.8	4%
F	1100	RESIDENTIAL LOW DENSITY	23.4	2%
	1200	RESIDENTIAL MED DENSITY	2.6	0%
	1300	RESIDENTIAL HIGH DENSITY	459.9	44%
	1400	COMMERCIAL AND SERVICES	52.2	5%
	1500	INDUSTRIAL	0.2	0%
	1700	INSTITUTIONAL	81.8	8%
	1800	RECREATIONAL	125.1	12%
	1820	GOLF COURSES	1.1	0%
	1900	OPEN LAND	78.5	7%
	4110	PINE FLATWOODS	8.7	1%
	4340	HARDWOOD CONIFER MIXED	12.9	1%
	5300	RESERVOIRS	81.1	8%
	6300	WETLAND FORESTED MIXED	20.9	2%
	6410	FRESHWATER MARSHES	32.9	3%
	6430	WET PRAIRIES	5.2	0%
	6440	EMERGENT AQUATIC VEGETATION	8.6	1%

Subwatershed	FLUCCS Code	Description	Acres	% Subwatershed
	8100	TRANSPORTATION	25.6	2%
	8300	UTILITIES	31.8	3%
G	1100	RESIDENTIAL LOW DENSITY	32.5	4%
	1200	RESIDENTIAL MED DENSITY	12.7	2%
	1300	RESIDENTIAL HIGH DENSITY	340.8	42%
	1400	COMMERCIAL AND SERVICES	15.1	2%
	1500	INDUSTRIAL	23.0	3%
	1700	INSTITUTIONAL	9.9	1%
	1800	RECREATIONAL	251.7	31%
	1900	OPEN LAND	1.9	0%
	4340	HARDWOOD CONIFER MIXED	8.5	1%
	5100	STREAMS AND WATERWAYS	0.7	0%
	5300	RESERVOIRS	91.0	11%
	6410	FRESHWATER MARSHES	18.1	2%
	6440	EMERGENT AQUATIC VEGETATION	1.1	0%
	8100	TRANSPORTATION	0.0	0%
	8300	UTILITIES	2.3	0%
H	1100	RESIDENTIAL LOW DENSITY	5.7	1%
	1200	RESIDENTIAL MED DENSITY	10.4	1%
	1300	RESIDENTIAL HIGH DENSITY	604.4	72%
	1400	COMMERCIAL AND SERVICES	1.9	0%
	1700	INSTITUTIONAL	81.9	10%
	1800	RECREATIONAL	50.2	6%
	1900	OPEN LAND	36.8	4%
	2500	SPECIALTY FARMS	26.7	3%
	5100	STREAMS AND WATERWAYS	5.6	1%
	5300	RESERVOIRS	13.1	2%
	6410	FRESHWATER MARSHES	0.9	0%
	8300	UTILITIES	4.2	1%
I	1300	RESIDENTIAL HIGH DENSITY	0.3	3%
	1400	COMMERCIAL AND SERVICES	5.6	49%
	1700	INSTITUTIONAL	5.5	48%

Figure 2.4 Land Use Classifications



2.3.4 Soil Characterization

Soil information was obtained from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) dataset. Data were clipped to the McKay Creek project area.

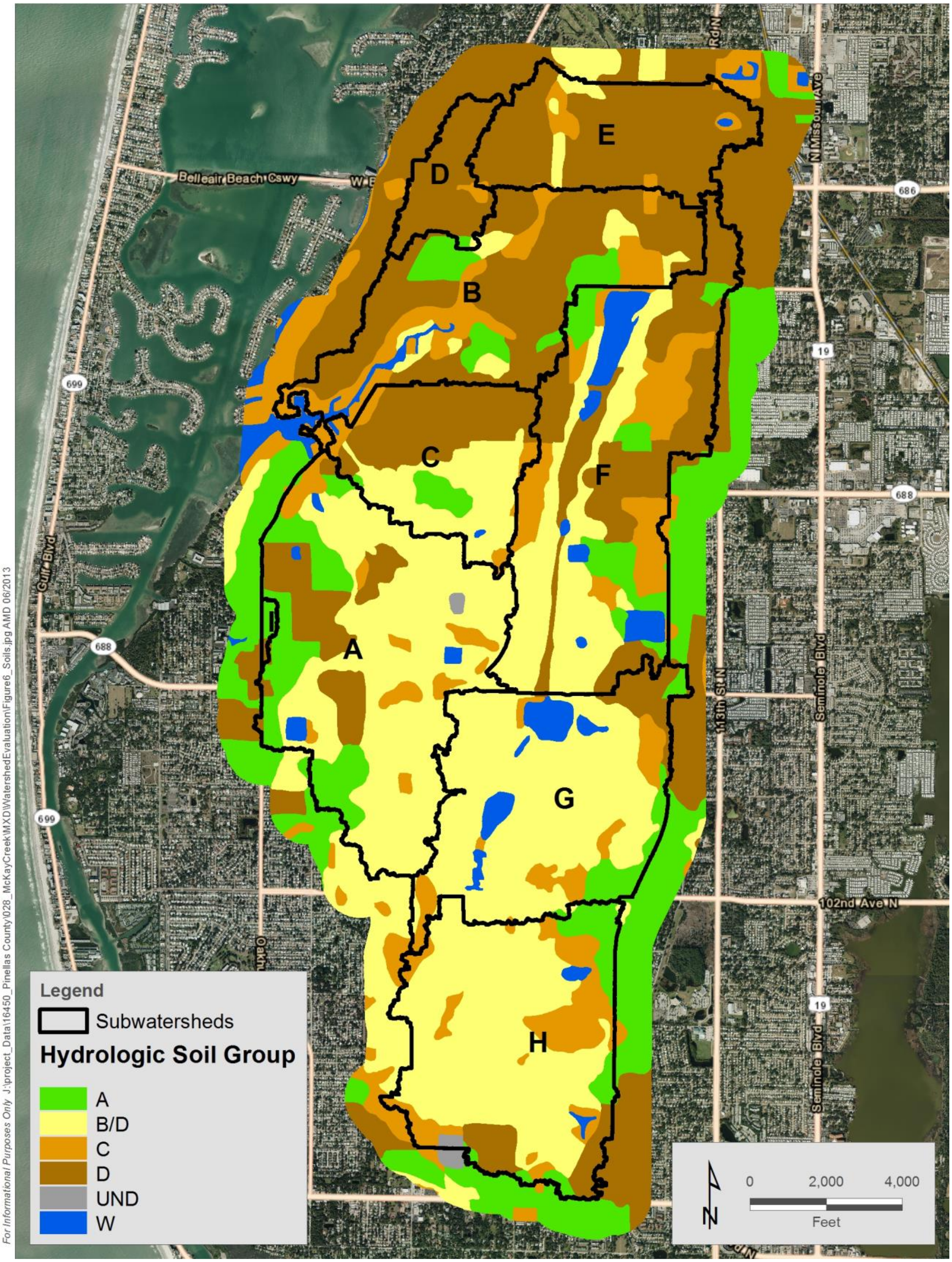
Church Creek (Subwatershed A) and Walsingham (Subwatersheds G and H) drainage regions are characterized by more than 60% B/D soils. The McKay Creek drainage region (Subwatersheds B, C, D, and E) has predominately D (66%) soils. Taylor Lake (Subwatershed F) has roughly equal parts B/D (31%) and D (34%) soils. Coastal Zone 5 Subbasin (Subwatershed I) has 77% A soils and 23% D soils.

Table 2.4 shows the area of each hydrologic soil group within each subwatershed. Figure 2.5 shows the soil classifications for the entire watershed.

Table 2.4 Soil Acreage by Subwatershed

Subwatershed	Hydrologic Soil Group Acreage					
	A	B/D	C	D	UND	W
A	164.6	638.4	69.5	158.8	4.6	16.1
B	87.8	55.6	161.7	455.1	–	15.1
C	28.8	169.5	30.6	192.4	–	2.3
D	2.7	1.4	5.7	136.3	–	–
E		22.2	28.0	381.0	–	1.6
F	99.3	324.6	189.2	361.3	–	77.8
G	54.6	569.6	78.8	50.3	–	56.0
H	72.6	543.2	146.9	64.9	5.5	8.8
I	8.8	–	–	2.6	–	–
Grand Total	519.1	2324.4	710.3	1802.8	10.1	177.7

Figure 2.5 Soil Classifications



2.3.5 QC/QA Process Description

Once our team defined the McKay Creek watershed and subbasins based on the LiDAR data, the project manager reviewed every subbasin for compliance with SWFWMD's G&S (2011) and the specific modeling tasks for this watershed. Hydrologic parameters were also reviewed to ensure that they were reasonable.

2.4 Hydraulic Feature Inventory

2.4.1 Development Process

Jones Edmunds identified potential hydraulic features using features provided by Pinellas County's stormwater asset-management database. Additional stormwater asset data were provided by the Cities of Largo and Seminole. We reviewed plans from a number of sources including SWFWMD environmental resource permits and the Florida Department of Transportation for additional hydraulic feature information. Some of the road drainage plans we reviewed included:

- Walsingham Road/Ulmerton Road (SR-688).
- Indian Rocks Road.
- West Bay Drive (CR-416).
- Clearwater Largo Road/Ridge Road South (CR-321).

When available, we used previous hydrologic and hydraulic models corroborate pipe sizes, material types, etc. Some of previous models that we reviewed include:

- Pinellas County Master Drainage Plan – CH2MHill (1981).
- Clearwater-Largo Drainage District Study – Cardno TBE (2012).
- City of Seminole GWIS Asset Inventory – City of Seminole (2010).

We found the locations of other potential hydraulic features by analyzing the DTM, Google Street View and aerial imagery. Once all potential hydraulic features were identified, the project engineer completed a prescreening process in the field. This preliminary field reconnaissance was performed for the Upper McKay watershed area in September 2012 and for the Lower McKay watershed area in October 2012. Jones Edmunds identified more than 800 hydraulic structure points and 44 cross-sections to be inventoried. The features were then verified by the project manager. This process allowed the project engineer to identify the locations of assumed hydraulic features and to verify other subsurface drainage before starting field reconnaissance and survey.

Once the prescreening process was completed, field crews took photographs and captured the hydraulic characteristics of all accessible hydraulic features that were previously identified by Jones Edmunds. This field effort followed the survey plan described in Jones Edmunds Technical Memorandum No. 4 and was conducted in two parts – data collection by Jones Edmunds staff (December 2012 to January 2013) and survey by Degrove Surveyors (January 2013 to February 2013). The field data collection effort contained around two-thousand (2,000) points (x, y, and z) and included 553 structures and 41 cross-sections. Each feature inventoried was assigned a unique identification number known as the *HydroID.*

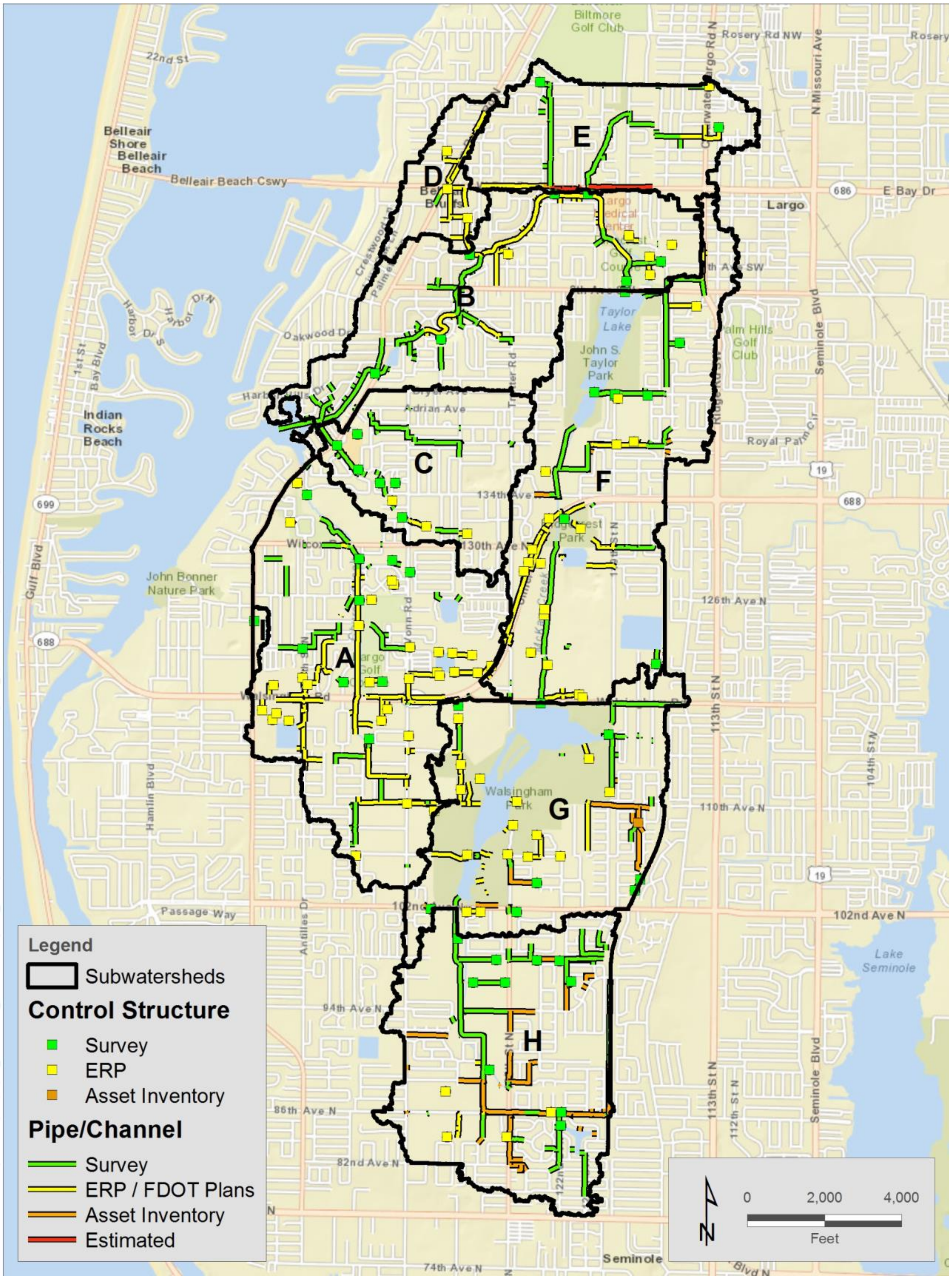
A sample hydraulic feature form is provided as Appendix A – hydraulic feature forms are provided under separate cover. Hydraulic feature forms were generated using a custom Microsoft Access application. Forms are provided for all features inventoried during the field reconnaissance task. Table 2.5 summarizes hydraulic features inventoried for this project and the subwatershed in which they fall. Figure 2.6 shows all these features spatially.

Table 2.5 Hydraulic Features Inventoried by Subwatershed and Data Source

Subwatershed	Data Source				Total # Structures
	Survey	ERP / FDOT Plans	Asset Inventory	Estimated	
A	59	165	–	–	224
B	83	54	–	–	137
C	50	9	–	–	59
D	3	33	–	–	36
E	36	10	1	8	55
F	55	85	6	–	146
G	36	62	19	–	117
H	74	14	63	–	151
I	2	–	–	–	2
Total	398	430	89	8	927

Note: A "drop structure" feature is comprised of a control structure and pipe and is counted as two structures.

Figure 2.6 Hydraulic Feature Inventory by Data Source



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2.4.2 SUMMARY OF WATER BODY FEATURES BY SUBWATERSHED AND TYPE

The US Geological Survey (USGS) National Hydrologic Dataset and hard breaklines identified during terrain mapping show many water bodies in the McKay Creek watershed. The primary named water bodies in the watershed are McKay Creek, Church Creek, Walsingham Reservoir, and Taylor Lake. The majority of the water bodies are small unnamed ponds of less than 1 acre. Table 2.6 summarizes the acreages for each of the waterbodies by subwatershed.

Table 2.6 Summary Statistics of Water Body Features Inventoried by Subwatershed

Subwatershed	Count	Water Body Acreage				
		Total	Minimum	Maximum	Average	Std. Dev.
A	23	31.8	0.1	7.7	1.4	2.0
B	5	11.7	0.4	9.0	2.3	3.8
C	3	5.9	0.4	4.2	2.0	2.0
E	2	2.0	0.2	1.9	1.0	1.2
F	12	86.2	0.6	43.9	7.2	12.7
G	12	90.0	0.2	83.9	7.5	24.1
H	11	17.6	0.1	4.9	1.6	1.5
I	0	–	–	–	–	–
Total	68	245.3	0.1	83.9	3.6	11.5

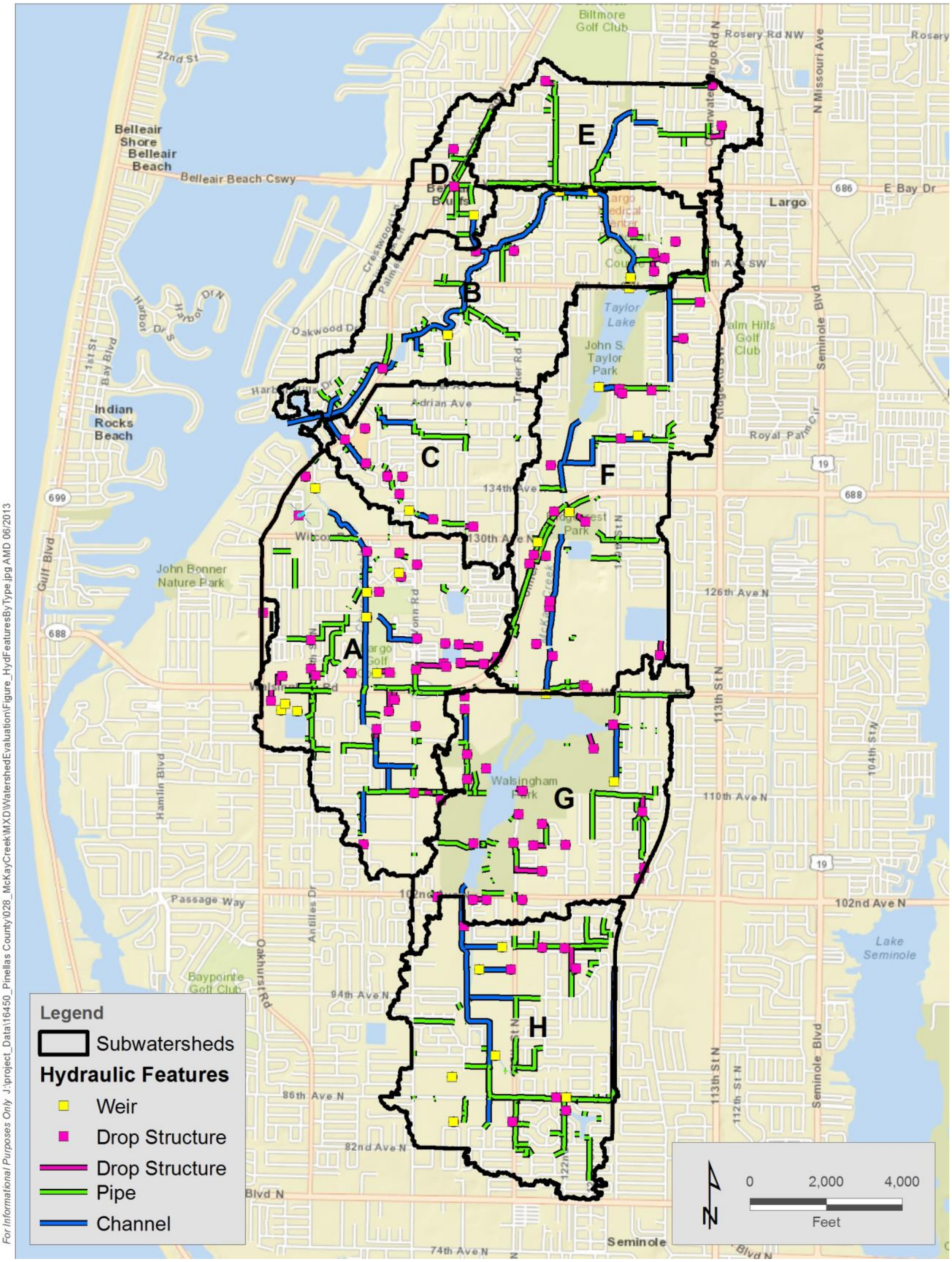
2.4.3 SUMMARY OF CONVEYANCE FEATURES BY SUBWATERSHED AND TYPE

Significant hydraulic conveyance features in the watershed include channels, culverts, drop-structures, overland weirs, and structural weirs. Table 2.7 summarizes hydraulic inventory counts by structure type for each subwatershed – this table excludes overland weirs. Figure 2.7 shows the locations of the hydraulic features in the watershed.

Table 2.7 Hydraulic Features Inventoried by Subwatershed and Type

Subwatershed	Pipe	Channel	Weir	Drop Structure	Bridge	Total
A	125	16	11	34	1	187
B	82	22	1	8	–	113
C	35	4	1	8	–	48
D	29	3	3	2	–	37
E	46	3	6	3	–	58
F	89	9	10	20	1	129
G	65	3	3	22	–	93
H	121	8	7	8	1	145
I	–	–	–	1	–	1
Grand Total	592	68	42	106	3	811

Figure 2.7 Hydraulic Feature Inventory by Type



2.4.4 SUBWATERSHED HYDRAULIC CONNECTIVITY

Most subwatersheds are hydraulically connected to the McKay Creek canal via a channelized drainage system, storm-sewer network, or direct runoff. Figures B1 and B2 in Appendix B have a junction-reach layout over subbasin boundaries and hill shading backdrops, respectively. We drew an overland weir reach through each of the locations where overland flow may occur.

2.4.5 QC/QA PROCESS DESCRIPTION

Jones Edmunds checked to confirm that connectivity had been developed through all possible overland weirs. Hydraulic features were also reviewed by a QC engineer to verify the connectivity.

3 WATERSHED SURVEY

A total of 584 hydraulic structures, cross-sections, and bridges were included in the field data collection effort. Jones Edmunds collected data for 502 structures and 26 cross-section using Real-Time Kinematic Geographic Positioning System (RTK/GPS). Jones Edmunds contracted with Degrove surveyors to survey 34 structures, 18 cross-sections, and 4 bridges using a combination of RTK/GPS and conventional ground surveying practices. Field data collection was conducted by Jones Edmunds from December 19, 2012 to January 26, 2013 and by Degrove Surveyors from January 21 to February 15, 2013.

3.1 ESTABLISHMENT OF ELEVATION CONTROL FOR WATERSHED

Traditional survey methods (differential leveling) use a vertical-control-loop technique to ensure the accuracy of the orthometric heights collected. To collect field data for the McKay Creek watershed Management Plan, we used RTK GPS methods. Although the control-loop process is not applicable using these methods, QA/QC was achieved by regularly collecting data points at National Geodetic Survey (NGS) control monuments BAUDER D AZ MK 1, WALSING C AZ MK 1, NARROW R, HALL O, BAUDER B, AND HALL K.

Jones Edmunds RTK/GPS observations used NGS monuments AG0608, AG1033 and AG0721 for elevation control.

3.2 SURVEY ACCURACY

Degrove Surveyors certified the survey to have a vertical accuracy of ±0.25 foot for all hard surfaces and a horizontal accuracy of ±0.1 feet.

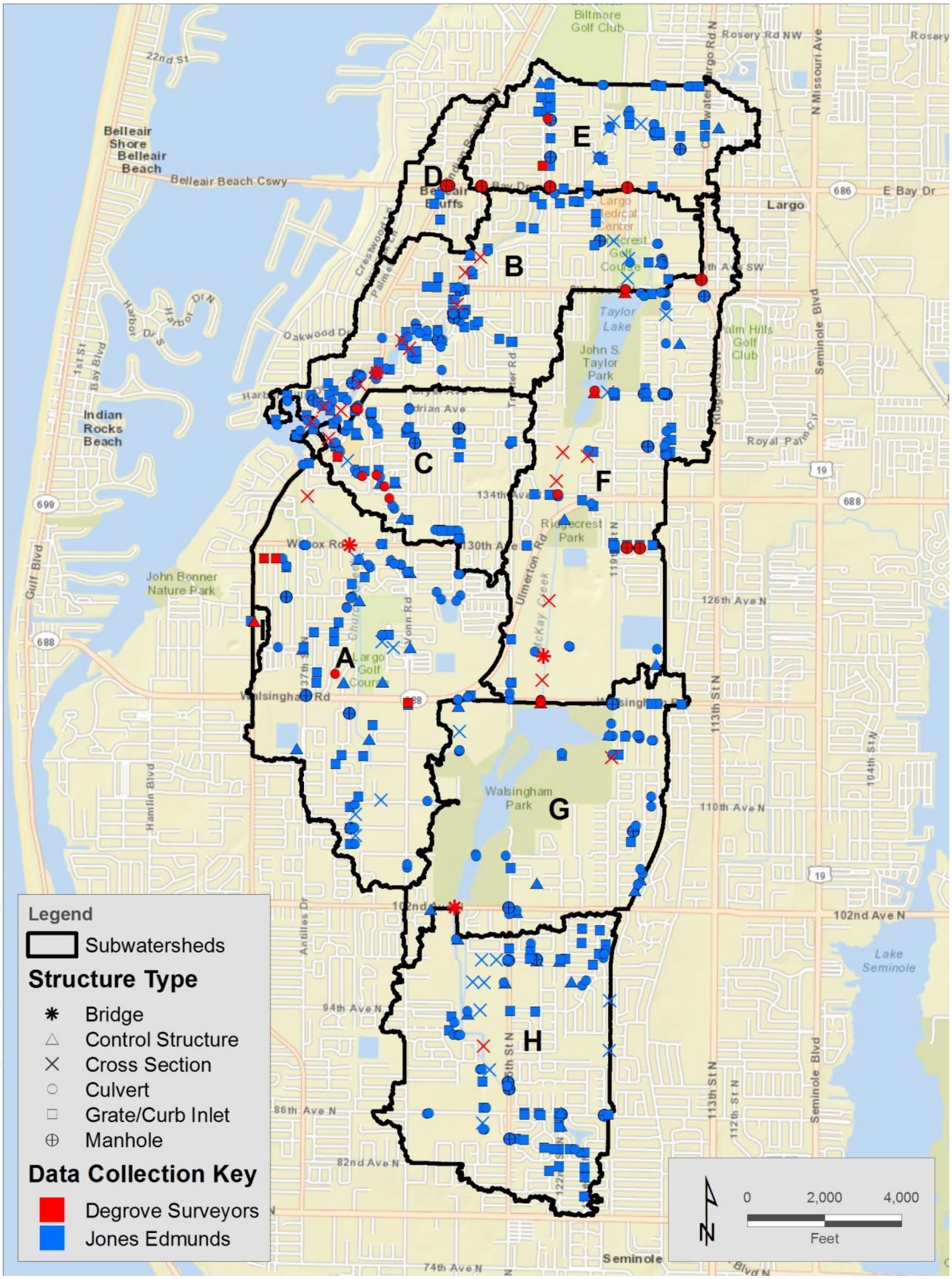
3.3 SURVEY INFORMATION COLLECTED

Cross-section data collected included vertical and horizontal coordinates, elevations, surface descriptions and photos. Hydraulic structure data collected included vertical and horizontal coordinates, invert elevations, structure geometry, material, dimensions and photos. Figure 3.1 shows the features that were collected within the watershed, and Table 3.1 summarizes these features.

Table 3.1 Hydraulic Features - Field Data Collection

Feature Type	Field Crew		Total
	Degrove Surveyors	Jones Edmunds	
Control Structure	4	41	45
Grate/Curb Inlet	5	197	202
Manhole	8	32	40
Pipe Inlet/Outlet	17	232	249
Cross Section	18	26	44
Bridge	4		4
Total	56	528	584

Figure 3.1 Field Data Collection



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4 WATERSHED MODEL DEVELOPMENT

This section describes modeling methodology, implementation, calibration and verification for the McKay Creek hydrologic and hydraulic model.

4.1 HYDROLOGIC AND HYDRAULIC MODEL METHODOLOGY

Jones Edmunds created a watershed-wide hydrologic and hydraulic model using ICPR (Version 3.10). The hydrologic component of the model simulates runoff flows, and the hydraulic component routes these flows through constructed stormwater management facilities and natural topographic features to determine flood stages. Three 24-hour-duration design storms were simulated, including return frequencies of 10, 25 and 100 years. Jones Edmunds selected ICPR for hydrologic and hydraulic modeling based on a variety of factors such as applicability to the watershed and the local engineering community's familiarity with the software. This model is FEMA-approved for flood insurance studies.

We developed the model schematic from the hydro-network schematic developed during the Watershed Evaluation phase of the project (see Section 2.4). The generic schematic was developed using Esri's ArcGISv.10.0 and Esri's ArcHydro Tools. The model-specific schematic was then created from the generic schematic using a number of GIS-based methods and tools developed by Jones Edmunds. In some instances, we revised the model-specific schematic to better represent a specific feature within the watershed. In these instances, the model-specific schematic may no longer match the generic schematic developed during the watershed evaluation. Throughout the model development, we reviewed the model for missing interconnections and added connections that may have been excluded initially.

The model-specific schematic is stored in the *Model* feature dataset within GWIS 1.6. Figure B1 in Appendix B shows the revised model-specific schematic. The schematic is also shown Figure B2 with the DEM.

4.2 HYDROLOGY

ICPR was used to analyze the hydrology of the watershed. Subbasin areas, times of concentration, and composite curve numbers were developed as model inputs. Runoff volume was calculated by applying the NRCS Curve Number (CN) method. The runoff volume is distributed over the duration of the simulation at rates calculated according to the NRCS Unit Hydrograph Method. Runoff rates and timing are controlled by the hydrograph shape factor and the time of concentration. The subsections below describe the methodologies Jones Edmunds used to develop these parameters. These parameters were confirmed and adjusted as necessary during the model calibration and verification tasks.

4.2.1 CURVE NUMBER

Jones Edmunds used the landuse and hydrologic soils group information described in Section 2.3 to developed composite curve numbers. Composite CNs were calculated for each subbasin by area-weighting standard TR-55 CN values based on landuse and soil classifications. Jones Edmunds thoroughly reviewed each landuse polygon with aerials and parcel polygons to determine appropriateness. Some high-density residential areas were re-classified as medium-density based on parcel acreage (parcels greater than 0.2-acre) according to the Florida Land Use, Cover and Forms Classification System (FDOT, 1999). This landuse re-classification was used only for parameterization—no changes were made to the primary GWIS landuse feature class. The re-classified landuse is provided in a feature class named *CompositeCN_LUSoilsUnion* in the *Parameterization* dataset. The minimum composite CN value was calculated to be 57 and the maximum was calculated to be 99. The average CN value was 87.

4.2.2 UNCONNECTED AND DIRECTLY CONNECTED IMPERVIOUS AREA

Jones Edmunds looked at available impervious GIS feature data such as roadway breaklines and waterbody polygons from the FDEM Coastal LiDAR project (2007). We determine the impervious feature layers did not contain enough coverage to account for all impervious areas—e.g. driveways and building footprints. Next, we considered assigning DCIA based on land use; however, too much variability in DCIA with land use hindered calibration efforts. Ultimately, the composite CN method was chosen.

The urban CN values reported in TR-55 include impervious area assumptions based on typical landuse conditions. Directly connected impervious areas are accounted for in these CN values; therefore, DCIA percentages were set to zero.

4.2.3 TIME-OF-CONCENTRATION

Jones Edmunds calculated the time-of-concentration (Tc) using the methods outlined in the TR-55. We determined the longest flow path in each subbasin using a combination of GIS techniques and manual review. We excluded from this analysis any storage or conveyance areas that would be considered in the hydraulics model to avoid routing flow in both the hydrologic and hydraulic components of the model. The first 100 feet of the flow path was assumed to be sheet flow, and the rest of the flow path was segmented based on applicable flow regime (shallow concentrated, open channel, or piped flow). Roughness values were assigned for sheet flow and open channel flow based on average surface characteristics visible from aerials. Pervious/impervious classifications were assigned to shallow concentrated portions of the flow path. For piped flow segments, a velocity of 2 ft/s was assumed. Travel times were then calculated using the methods described in TR-55: kinematic solution for sheet flow, regression equation relating velocity to slope and type of channel for shallow concentrated flow, and Manning's equation for open channel flow. A minimum slope of 0.001 and a minimum velocity of 0.1 ft/sec were applied. A minimum travel time of 6 minutes was used. The maximum travel time was 62 minutes with an average travel time of 20 minutes.

4.2.4 UNIT HYDROGRAPH

The NRCS Unit Hydrograph Method was used to distribute runoff volume over the duration of the storm. Runoff rates and timing are controlled by the hydrograph shape factor and the time of concentration, with lower peak factors. The standard peak factor of 256 recommended by SWFWMD was used for all subbasins. This peak factor is reasonable because the watershed's high development intensity—which would tend toward higher peak factors—is offset by the watershed's low relief.

4.2.5 RAINFALL SIMULATIONS

Jones Edmunds modeled the 10 year, 25 year and 100 year frequency 24 hour duration storm events in ICPR using the SCS Type-II Florida-Modified Rainfall Distribution. Rainfall volumes for these storms were derived from rainfall isohyet maps provided in SWFWMD's ERP Information Manual (SWFWMD, 1996) and are listed in Table 4.1.

Table 4.1 Design Storm Rainfall Volumes

Simulation	Return Frequency	Duration	Distribution	Rainfall Volume
10YR24HR	10 Year	24-Hour	Type II FL Modified	7.5
25YR24HR	25 Year	24-Hour	Type II FL Modified	9.0
100YR24HR	100 Year	24-Hour	Type II FL Modified	12.0

4.3 HYDRAULICS

4.3.1 CONVEYANCE STRUCTURES

Conveyance features within the McKay Creek watershed include culverts, inlets, overland weirs, bridges, and open channels. All modeled pipes include an overflow to accurately simulate flooding during larger storms.

Jones Edmunds used ICPR to model 593 pipes and 106 drop structures in the McKay Creek watershed. Pipe and inlet invert elevations and dimensions were entered into the model based on field reconnaissance, as-built drawings, design plan sets and survey data. Pipe lengths for the model were calculated within GIS based on the distance between surveyed inverts or as shown on as-built documents.

The McKay Creek watershed contains four bridges. One bridge is a bottomless box culvert that was modeled as an equivalent box culvert pipe link. The other three bridges have pile foundations. The three bridges were evaluated to determine the applicability of ICPR's bridge routines. The results of the evaluation showed the predicted 100-year water surface elevation is below bridge's lowest horizontal member (girder) in all three cases; therefore, hydraulic performance at the three bridge locations does not require application of ICPR's bridge routines. A complete description of this evaluation is provided in *Technical Memorandum: Bridge Assessment* included in the TSDN.

4.3.2 OVERLAND WEIRS

Overland flows occur at saddles along basin boundaries, over man-made berms, or over roads. Flow over these landscape features were estimated with the weir equation. Jones Edmunds modeled these overland flows as vertical weirs using the standard weir equation with submergence correction according to the Mavis equation. While the Mavis submergence correction is derived for sharp-crested weirs, our analysis of the various weir equations available in ICPR indicated that model results are more stable when Mavis is used to correct for submergence at all weirs. Additionally, our analysis of peak stages indicated that the choice of weir equation does not affect maximum node stage.

Weirs in ICPR representing subbasin saddles are linked to irregular cross sections developed using the LiDAR-based DTM. A Jones Edmunds GIS-based tool was used to extract the cross sections that represent the geometry of the saddle captured in the LiDAR. We developed the cross-section lines from the subbasin boundaries, which were typically delineated along the ridge between subbasins and would provide inter-basin connections during extreme storm events. The cross-section lines were horizontally smoothed in GIS to avoid overestimating the true weir length. We then extracted elevations along the lines from the 5-foot-by-5-foot DEM. Next, we exported the station-elevation relationship for each cross section. We thinned (generalized) the station-elevation data using the Douglas-Peucker technique with a tolerance of 0.1 foot. This reduced the number of points needed to characterize each cross section. As a QC measure, we compared the cross-sectional area before and after thinning to confirm that there were no significant changes in the cross-sectional area. We also reviewed a plot comparing the original cross section and the thinned cross section to confirm that no errors occurred during the thinning process and that cross-sectional geometry was essentially the same.

4.3.3 STORAGE REPRESENTATION

4.3.3.1 Dynamic Channel

Jones Edmunds modeled 67 channel reaches in the McKay Creek watershed. We removed channel storage from depression storage using exclusion polygons delineated in ArcGIS. Most of the channel reaches were used to represent well-defined channel features including the McKay Creek and Church Creek.

4.3.3.2 Lake and Pond Storage

Depression storage is represented in ICPR by stage-area relationships at model nodes. Jones Edmunds calculated stage-area relationships for each subbasin using a GIS-based tool that we developed. The stage-area tool extracts volume and area from the DTM at user-specified intervals (0.1- to 1-foot intervals for these watersheds). The extraction interval varies based on an error tolerance that the user specifies.

Most of the storage in the McKay Creek watershed is in the form of detention ponds and lakes. Nearly all of these storage areas have a control structure such as a drop structure, pipe, or structural weir. Jones Edmunds evaluated the control-structure invert elevations, the breaklined water-surface elevations, and imagery when setting initial conditions for the wet-storage area.

Jones Edmunds set starting water elevations for nodes using a combination of control structure information, aerial imagery, LiDAR data, seasonal high water (SHW) indicators visible on aerials or other datasets (water, vegetation, ground cover), and tidal (boundary) information. The following summarizes the approach used to set the starting water level at various types of features in the watershed:

1) Nodes representing stormwater features with control structures, such as wet detention ponds, were set to start at the elevation of the lowest modeled control elevation.

2) Nodes representing storage features such as lakes or wetlands were set to start at the highest water level observed in aerial imagery or SHW where indicators were available.

3) Nodes representing the McKay Creek Canal were set to start at the boundary elevation representing Clearwater Harbor (0.5 foot NAVD 88). This elevation is based on the mean high water (MHW) levels provided in the SWFWMD G&S (SWFWMD, 2011). This tailwater was translated upstream until superseded by initial conditions set by one of the other methods presented in this list.

4) Node representing other channels and stormwater conveyance features were set with the initial condition based on the assumption that the stormwater system was drained to the lowest invert directly downstream of each node– or in other words, based on the assumption that the stormwater system was drained dry.

4.3.3.3 Overbank Storage

Channel storage was removed from node storage using exclusion polygons delineated in ArcGIS. These polygons defined the channel area occupied by flow conveyance and thus not available for storage. The storage outside of this exclusion polygon – the overbank storage – was calculated using the stage-area tool described in Section 4.3.3.2.

4.3.4 BOUNDARY CONDITIONS

Jones Edmunds reviewed the watershed boundaries for Coastal Zone 1, Starkey Road, Lake Seminole, and Coastal Zone 5. There are no significant contributing areas to the McKay Creek watershed based on the hydraulic inventory and topography. We evaluated preliminary floodplains to determine any missing interconnections between watersheds. Boundary nodes connected by overland weirs were placed in areas where minor overland flow exists. Boundary node time-series were set to allow free outfall. Table 4.2 summaries the outflow volumes from McKay Creek to adjacent watersheds. A boundary node location map is provided in Figure 4.1 in the following section.

Table 4.2 McKay Creek Outfall Flows to Adjacent Watersheds

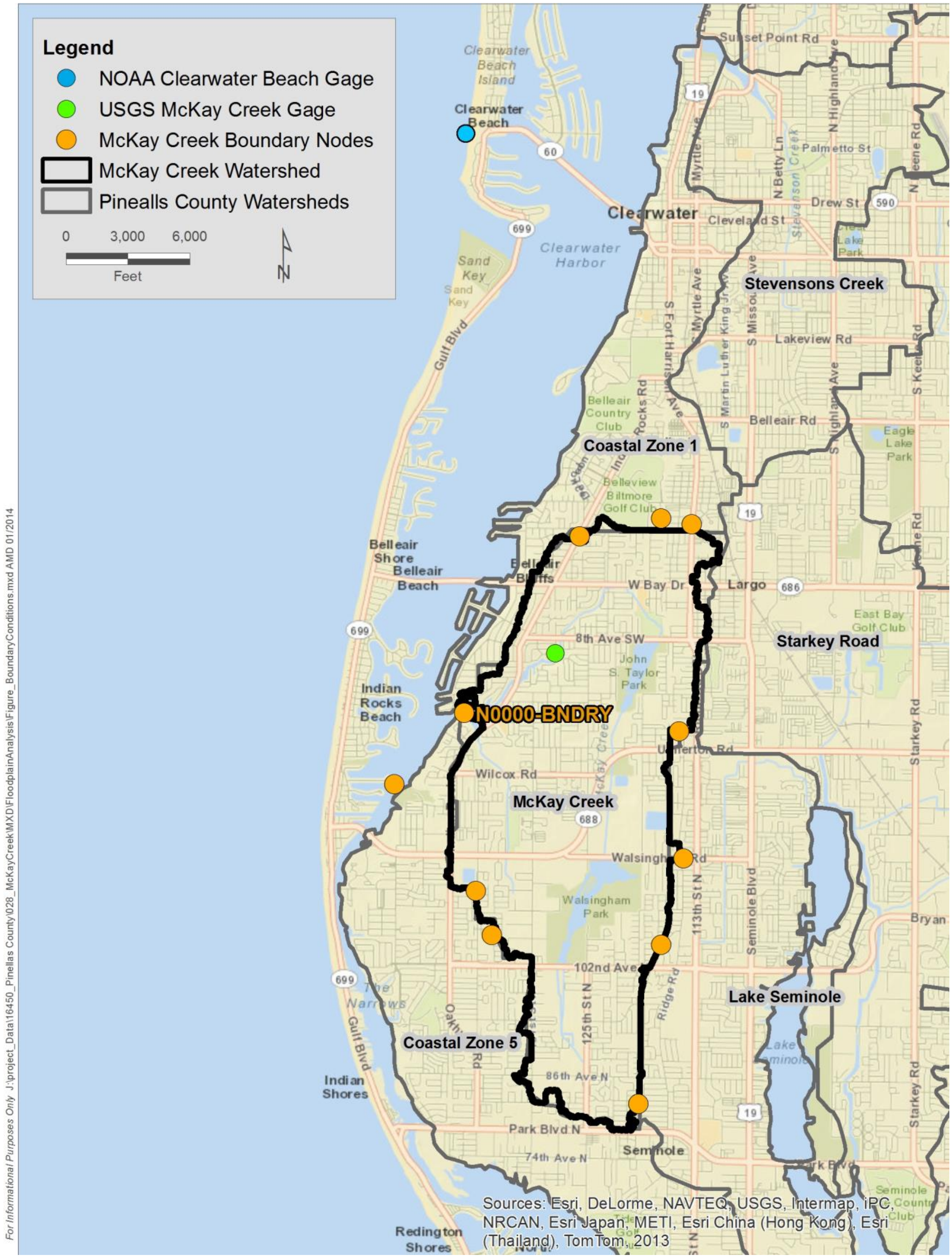
Watershed	Boundary Node Name	Maximum Outflow (cfs)
COASTAL ZONE 1	N8000-BNDRY	8.39
	N2000-BNDRY	13.35
	N9100-BNDRY	25.29
COASTAL ZONE 5	N1000-BNDRY	14.59
	N6000-BNDRY	52.44
	N9000-BNDRY	29.62
LAKE SEMINOLE	N3000-BNDRY	47.29
	N4000-BNDRY	78.83
	N5000-BNDRY	52.33
	N7000-BNDRY	69.2

McKay Creek and Church Creek discharge into Clearwater Harbor. See the next section for a description of the tidal/riverine interactions at boundary node N0000-BNDRY.

4.3.5 JOINT CONDITIONS – TIDAL AND RIVERINE

The McKay Creek and Church Creek channel systems discharge to Clearwater Harbor at boundary node N0000-BNDRY. Jones Edmunds reviewed observed tide and stage data for two gages located near or within McKay Creek: *National Oceanic and Atmospheric Administration (NOAA) Clearwater Beach Station 8726724* and *USGS 02309110 McKay Creek Near Largo*. Figure 4.1 shows the locations of these gages in relation to the watershed. The purpose of our review was to determine if we could use the NOAA tide gauge to develop boundary conditions for our calibration and verification events. For the design storms our boundary condition is set to mean high water (MHW) level as specified in SWFWMD G&S (SWFWMD, 2011). MHW is 0.5 feet (NAVD 88) at Clearwater Harbor.

Figure 4.1 Tidal and Stream Gages

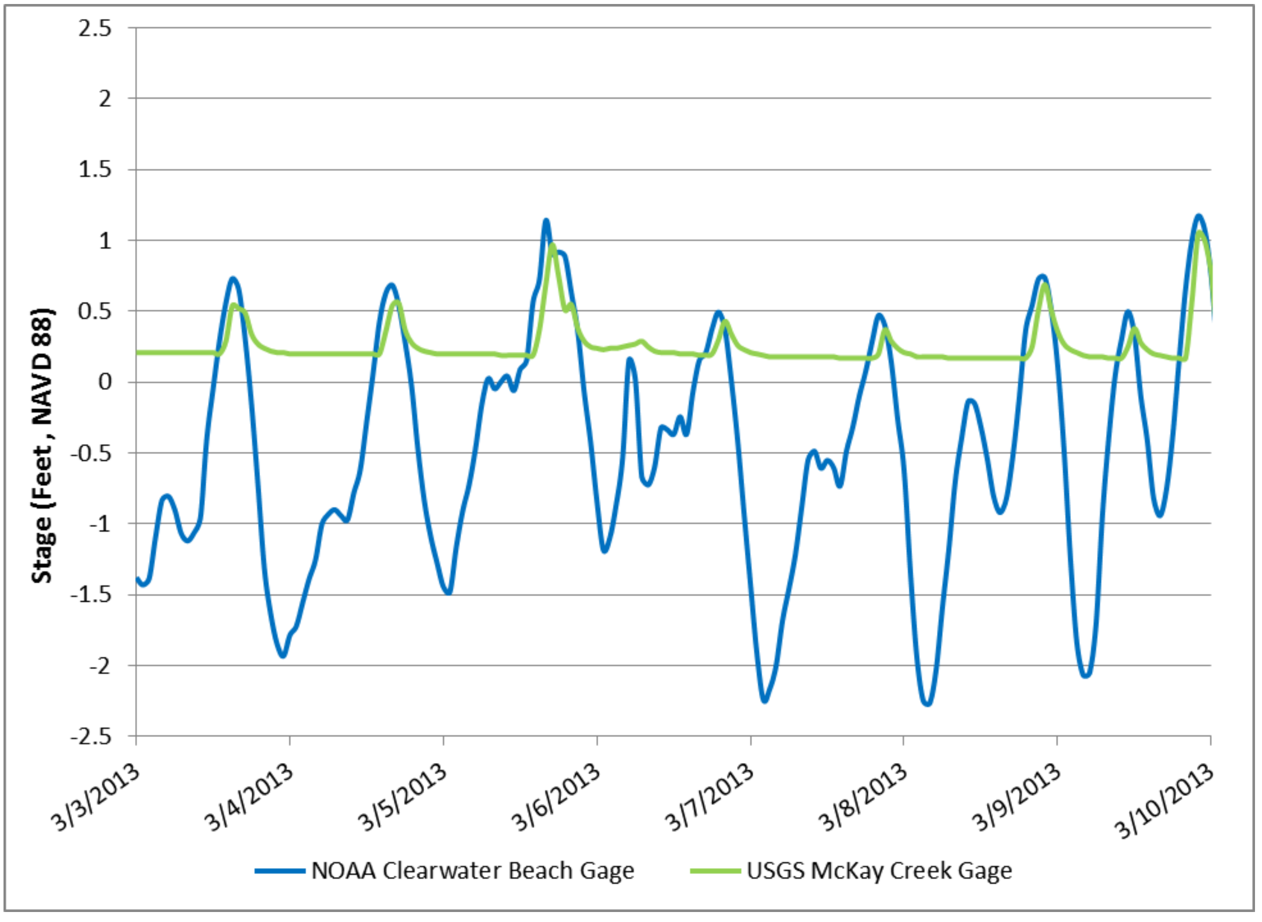


The NOAA Clearwater Beach gage is located approximately 1.6-miles northwest of the McKay Creek outfall. This gage is mounted on Big Pier 60 at Clearwater Beach and records water and atmospheric data for the Gulf of Mexico. Water level elevations are available in 6-min and 1-hour intervals, as well as various vertical datums.

The USGS McKay Creek gage is located approximately 1.2-miles upstream of the McKay Creek outfall. The gage is mounted on the bridge located at Hickory Drive and records gage-height and precipitation data. Data is available in 15-minute intervals.

In order to determine tidal influences within the McKay Creek channel system we compared time-stage data from the NOAA Clearwater Beach gage with the time-stage data obtained from USGS McKay Creek gage. We analyzed a period of record from March 3, 2013 to March 10, 2013 where no rainfall occurred. Figure 4.2 shows the water levels (converted to NAVD 88) at both Clearwater Beach and upstream McKay Creek for this period. Stages at the McKay Creek gage closely follow the NOAA tide gage; therefore, it is reasonable to use the NOAA tide gauge as a boundary for our calibration and verification events.

Figure 4.2 Water Levels for No Rainfall Event



Ultimately the calibration and verification events were evaluated using both the observed tidal elevations at the NOAA Clearwater Beach gage and the static 0.5 foot Clearwater Harbor MHW elevation. A more complete description of our calibration and verification boundaries is provided in the next sections.

4.4 MODEL CALIBRATION

Jones Edmunds calibrated the model using a rainfall event that occurred between July 7, 2011 and July 8, 2011. For the model hydrology, we assigned NEXRAD rainfall distributions to each basin based on the basin's centroid. We ran the routing simulation for 96 hours, which was approximately the time required for water levels to recover at the USGS gage. We compared the model results to gauge data and then adjusted the model parameters to obtain a better fit.

4.4.1 CALIBRATION RAINFALL EVENT

Jones Edmunds reviewed recent rainfall data for the watershed to identify a suitable calibration event. We chose the rainfall event that began shortly after noon (EST) on July 7, 2011 and ended around 7PM (EST) July 8, 2011 for the following reasons:

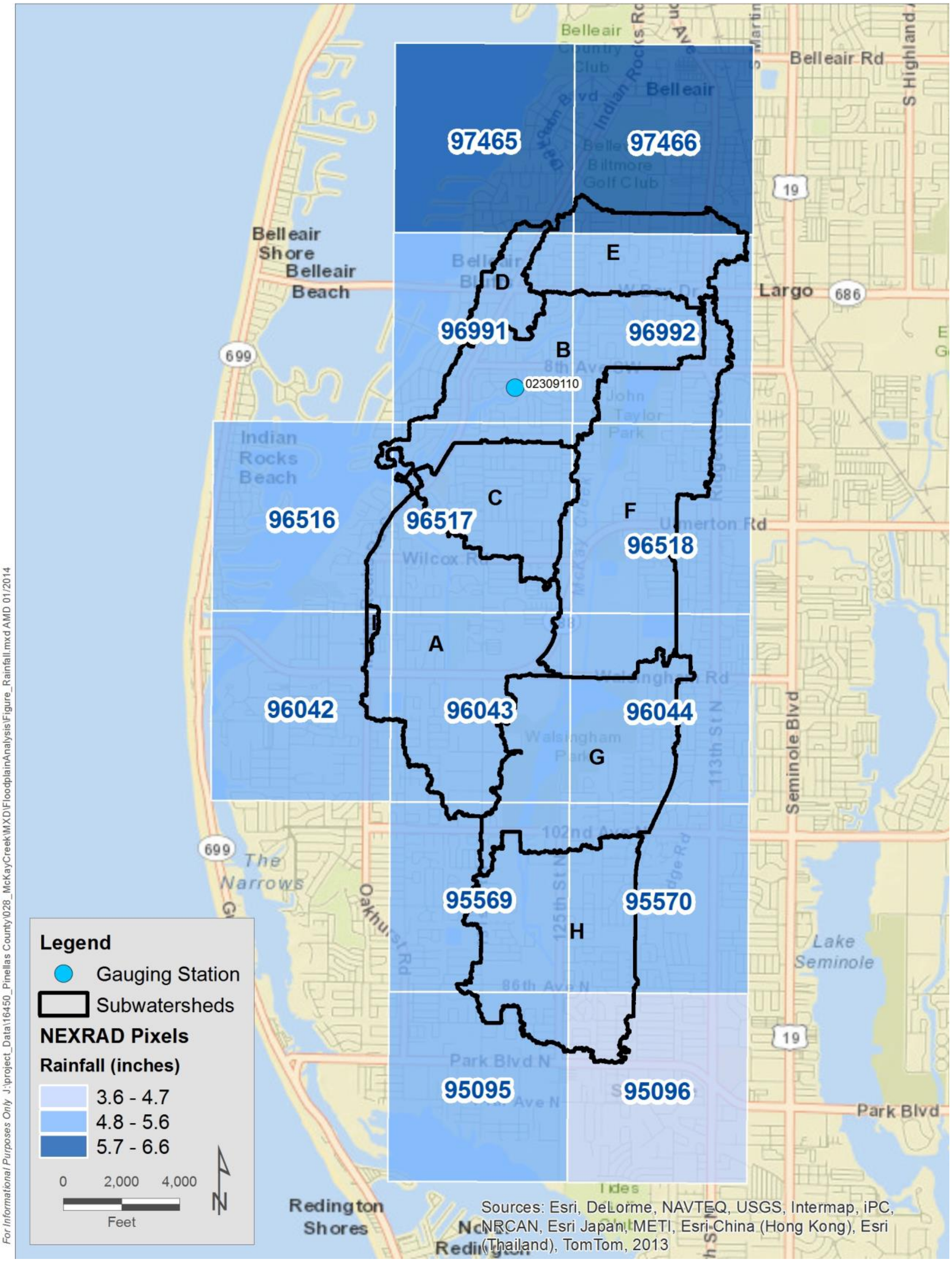
- As in the design condition, detention ponds were typically full due to over 7 inches of rainfall in the previous two weeks.
- Rainfall depth was reasonably uniform across the watershed.
- The event produced a well-defined response in the USGS gauge located in McKay Creek.
- The event did not produce significant tidal storm surge.

NEXRAD rainfall volumes varied from 3.6- to 6.6-inches; however, most rainfall pixels showed 4.8- and 5.8-inches of rainfall (a standard deviation of 0.6-inches). NEXRAD rainfall volumes per pixel are summarized in Table 4.3 and a pixel rainfall volume distribution is shown in Figure 4.3.

Table 4.3 NEXRAD Rainfall Volumes By Pixel For July 7, 2011 to July 8, 2011

PIXEL	Rainfall (inches)
95095	4.8
95096	3.6
95569	5.6
95570	4.9
96042	5.3
96043	5.4
96044	5.2
96516	5.0
96517	5.4
96518	5.2
96991	5.2
96992	5.3
97465	5.9
97466	6.6

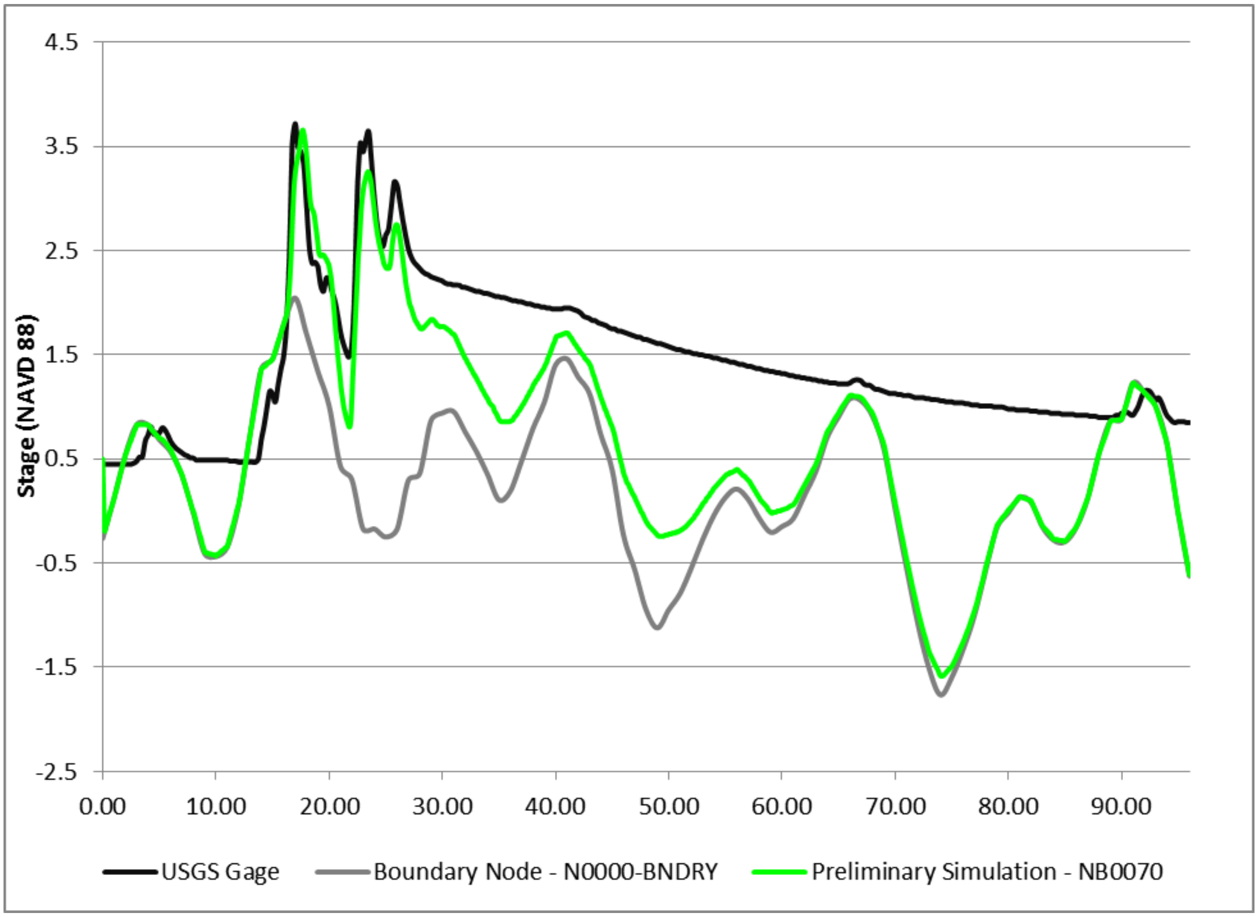
Figure 4.3 NEXRAD Rainfall Volume Distribution For July 7, 2012 to July 8, 2012



4.4.2 INITIAL COMPARISON

We compared the simulation results to the data obtained for the USGS McKay Creek gage and found that the simulated peak stage at the gage location, which corresponds to Node NB0070, was only 0.1 foot below the observed gauge data; however, the second and third hydrograph peaks were both approximately 0.4 below the recorded stage. The USGS gage is tidally influenced and flow is not reported – only stage. Figure 4.4 shows the results of the simulation.

Figure 4.4 Comparison of Gage and Preliminary Model Stages for the Calibration Storm Event



Simulated peak stages are close to observed stages; however, the modeled hydrograph shows numerous “valleys” that are not present in the recorded data. These pronounced valleys are due to the tidal boundary condition used in the simulated model. True water levels observed at the mouth of McKay Creek are unknown, but are likely a dampened version of the recorded water levels at the NOAA gage. For calibration and verification, simulations were tested using both a static water elevation (i.e. no tide) and the NOAA observed levels. Peak stages at the calibration point (USGS gage) do not appear to be very sensitive to the tide level at the outfall to Clearwater Harbour.

4.4.3 PARAMETER ADJUSTMENT

Based on the results of the calibration model, Jones Edmunds tested the following adjustments to obatin a better calibration:

- **Initial Stage** – The initial stage at Taylor Lake (node NF0190) is set to the outfall weir control elevation. The Taylor Lake control structure contains a 24-inch adjustable value that is operated by the County. According to County maintenance and operation procedures, the value at Taylor Lake is manually controlled between the end of April and the beginning of November. During the wet season, the value is opened to reduce the lake water levels and allow for more storage. The procedure states*:*

  "During the rainy season, the goal is to keep Taylor Lake maintained at a level approximately two or three feet lower than the weir outfall for the lake."

  Procedure logs were not available for the calibration event period, so we assumed the water level at Taylor Lake was two (2) feet below the control weir per the County's drawn-down procedure. We lowered the initial stage for Taylor Lake nodes NF0190 and NF0195 from 38 feet to 36 feet (NAVD 88) for the calibration event simulation.

- **CN/DCIA** – Preliminary hydrology parameters included DCIA. We reviewed the CN/DCIA parameters and concluded the composite CN approach is more applicable to the McKay Creek watershed given the lack of impervious coverage data. We also reviewed the high-density residential landuse polygons and change some areas from high-density to med-density based on parcel sizes (see Section 4.2.1). This change in landuse lowered CN values and reduced simulated runoff volumes.

- **Manning's Roughness** – During the initial parameterization of channels, Jones Edmunds set Manning's channel roughness values to be between 0.025 and 0.06. When the calibration event was simulated with these initial roughness values, water-level recovery rate predicted by the model was significantly faster than the observed recovery rate. We reevaluated the channel systems and determined that higher roughness values should be used at some locations due to thick vegetation in the channels. Also, overbank roughness factors needed to be accounted for. Revised roughness values varied from 0.035 to 0.08 for the channel portions of the cross-sections. We ran the model with these adjusted values and found that the ascending and descending limbs of the simulated hydrograph were a closer match to the observed data at the USGS gauge.

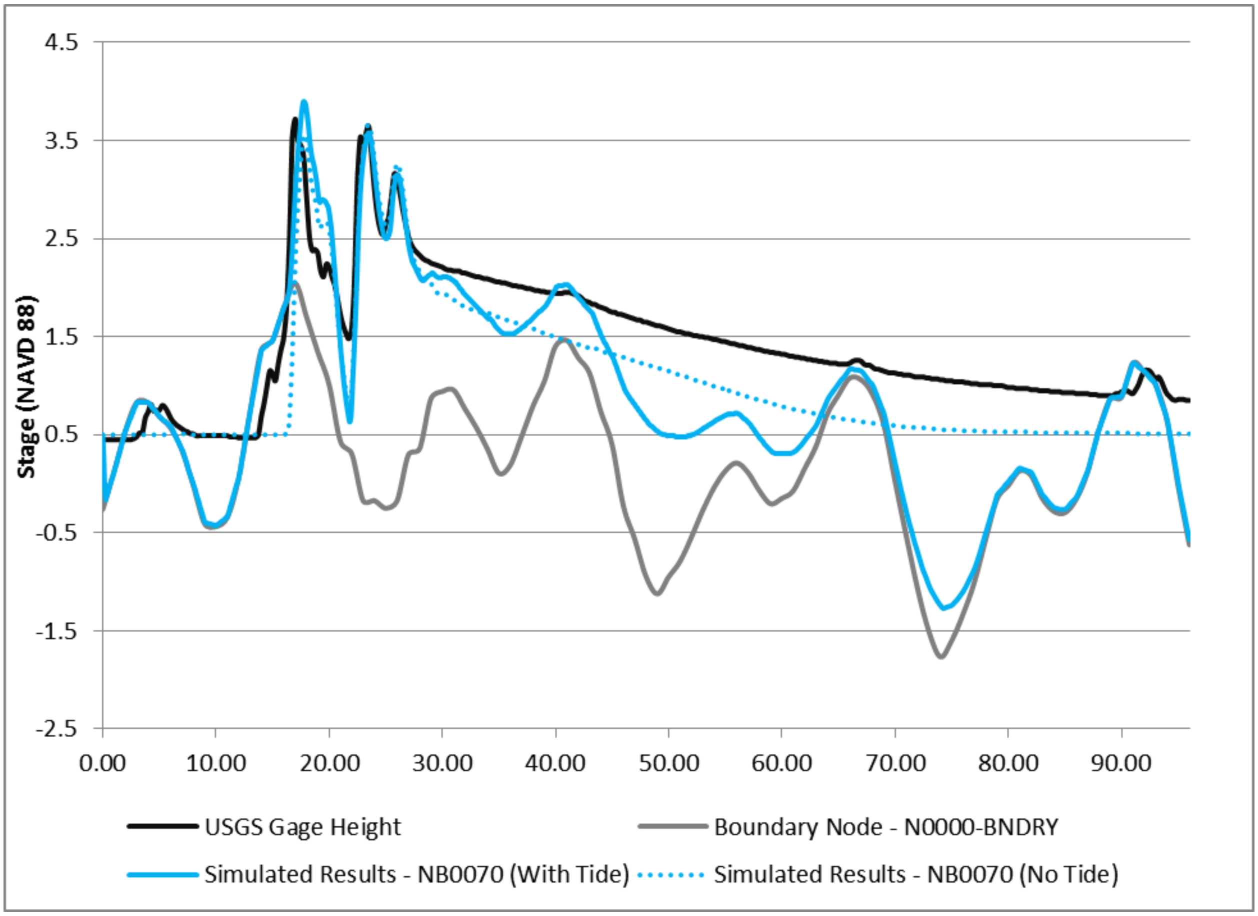
- **Time of Concentration** – We reviewed the preliminary Tc parameters and determined values to be reasonable. No adjustments were made.

We ran the calibration event with the lowered Taylor Lake initial stages, revised Manning's n and revised curve number values. Simulated final stages were very close to the observed peak stage data and the simulated results using a static boundary condition also produced a hydrograph closely resembles the recovery rate at the gage. Peak stages are shown in Table 4.4. We believe these results provide a good calibration. Figures 4.5 shows the simulated and observed results at the USGS gage for the calibration event with adjusted parameters.

Table 4.4 Comparison of Gage and Model Peak Stages (NAVD 88) for Calibration Storm Event After Parameter Adjustment

	USGS Gage Height	Node NB0070 (With Tide)	Node NB0070 (No Tide)
1st Peak	**3.7**	3.9	3.7
2nd Peak	**3.6**	3.6	3.7
3rd Peak	**3.2**	3.2	3.3

Figure 4.5 Comparison of Gage and Model Stages for the Calibration Storm Event after Parameter Adjustment



4.5 MODEL VERIFICATION

Jones Edmunds used Tropical Storm Debby as the verification event. The storm produced heavy, intense rainfall and runoff in the Pinellas County area as it made landfall approximately 130 miles north of the watershed. Jones Edmunds documented flooding in the watershed after the storm. Model hydrology was based on NEXRAD rainfall distributions for each basin. We ran the routing simulation for 96 hours, which was approximately the time required for water levels to recover at the USGS gage. We compared the model results to gauge data to verify model calibration.

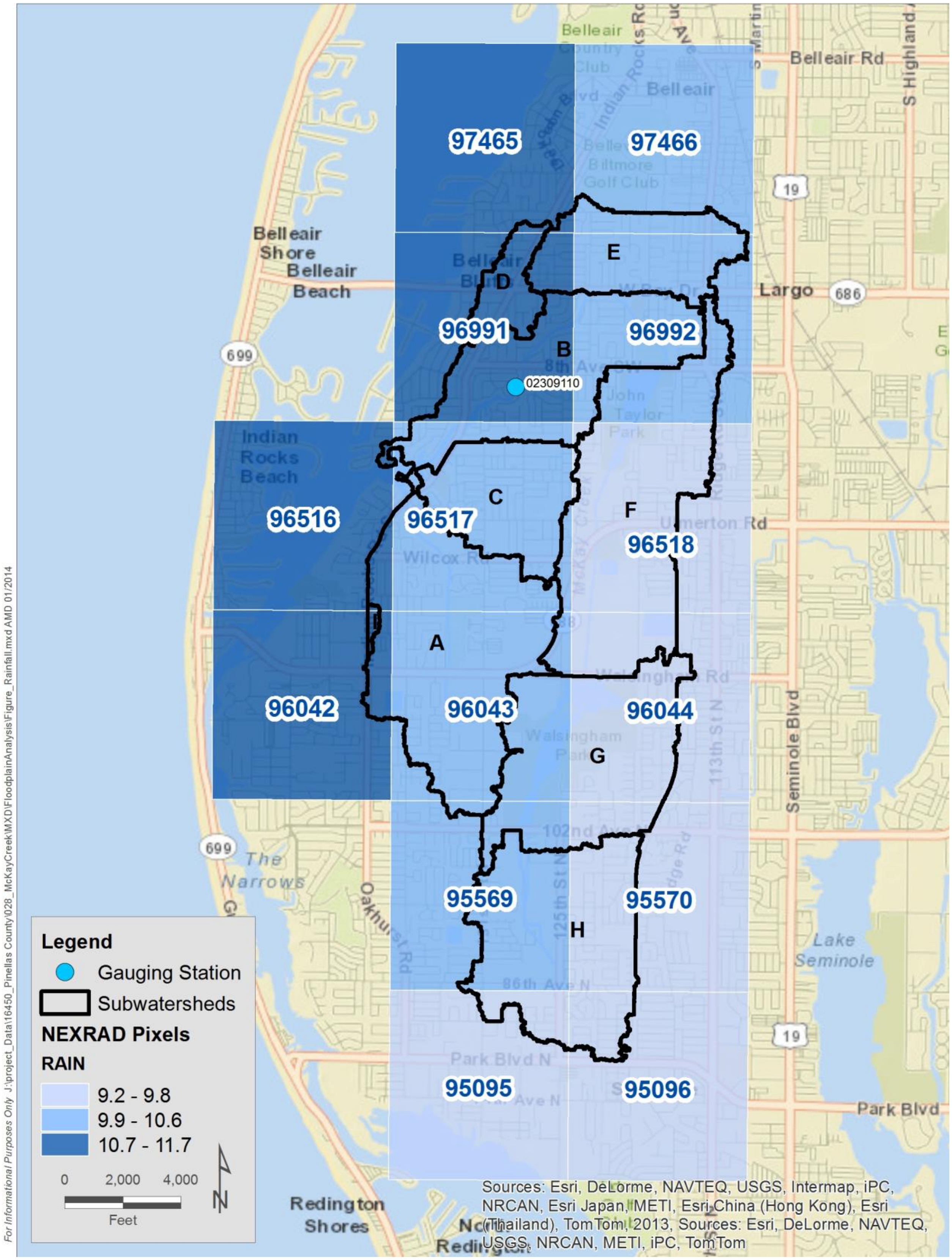
4.5.1 VERIFICATION RAINFALL EVENT

Between June 23 and June 25, 2012, Tropical Storm Debby produced approximately 10.4 inches of total rainfall within the McKay Creek watershed according to NEXRAD data. During this 36-hour storm event, the maximum recorded rainfall intensity for all NEXRAD pixels within the watershed was 2.6 inches per hour. The NEXRAD rainfall volumes per pixel are summarized in Table 4.5 and shown in Figure 4.6.

Table 4.5 NEXRAD Rainfall Volumes By Pixel For June 23, 2012 to June 15, 2010

PIXEL	Rainfall (inches)
95095	9.8
95096	9.2
95569	10.1
95570	9.5
96042	11.5
96043	10.4
96044	9.6
96516	11.7
96517	10.6
96518	9.8
96991	11.0
96992	10.1
97465	11.3
97466	10.6

Figure 4.6 NEXRAD Rainfall Volume Distribution For Tropical Storm Debby



4.5.2 COMPARISONS BETWEEN SIMULATED AND OBSERVED

For model verification we used Tropical Storm Debby which began on June 23, 2012 at 1 PM and ended on June 25, 2012 at 2 AM. Tropical Storm Debby produced significant wave height along the Gulf of Mexico coast which would not have been as pronounced within Clearwater Harbor and at the mouth of McKay Creek; therefore, we used the static 0.5-foot MHW elevation for boundary conditions instead of the NOAA gage data. The validity of using a static tailwater condition is supported by our earlier observation during calibration where we noted simulated stages at the USGS gauge are not very sensitive to boundary conditions at the McKay Creek outfall.

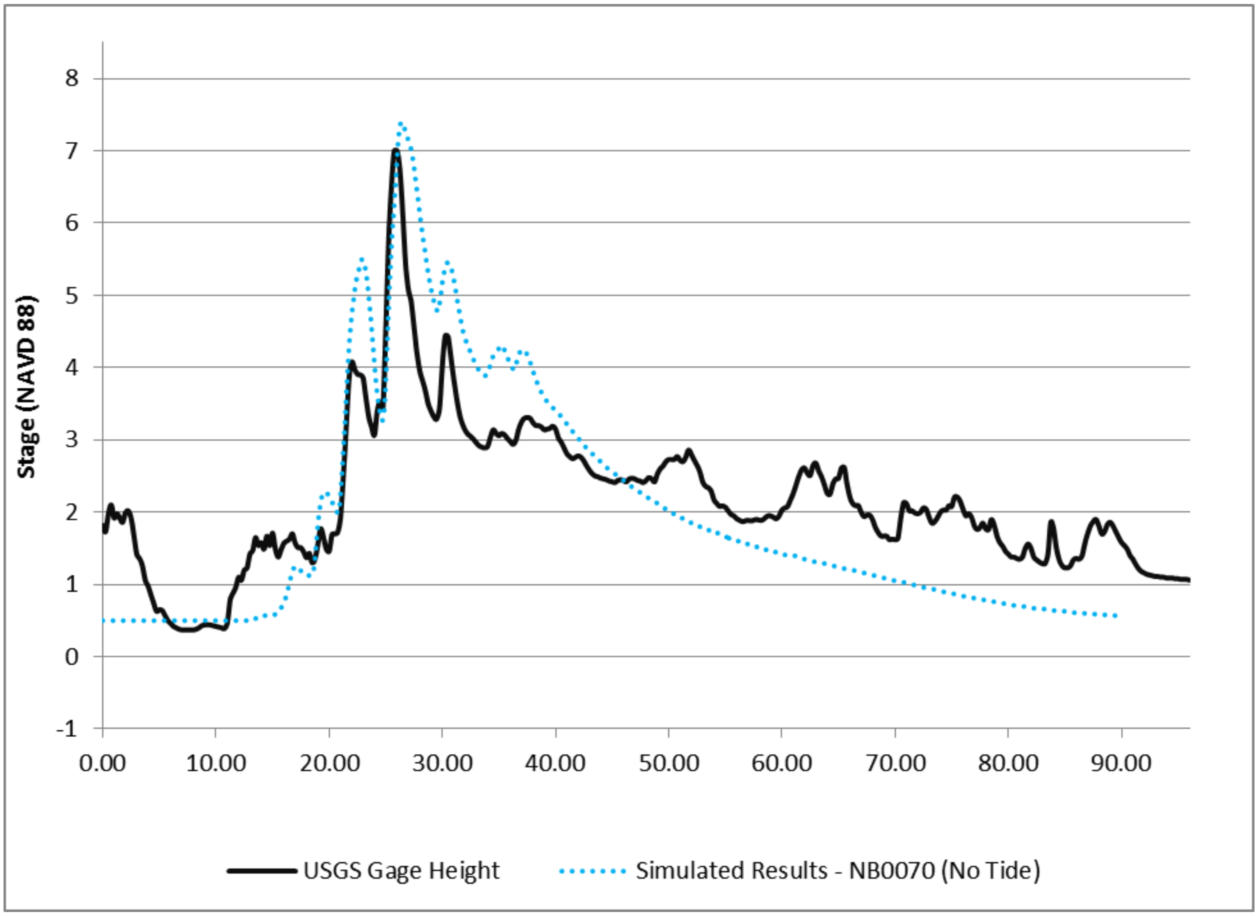
The verification event occurred in June which is during the County's Taylor Lake Drawdown Period—see Section 4.4.3 for a description of this procedure. We lowered initial stages for nodes NF0190 and NF0195—located at Taylor Lake—from 38feet (the weir crest) to 35.5-foot (NAVD88). The 2.5-foot water elevation reduction is within the 2-to-3-foot recommended drawdown operating procedure range.

The following is a comparison of the modeled-versus-simulated stages at the McKay Creek gage (Node NB0070):

- The peak stage recorded at the gage was 7.0 feet (NAVD88) at hour 26 and the simulated peak stage at Node NB0070 was 7.4 feet at hour 26.5.
- The simulated data compared very well to the gage data with three distinct peaks being present. The slope of the hydrograph during the recovery phase after each subsequent peak is very close to the recovery rate captured by the gage data.
- There is significant "noise" in the observed stage data—this is due to tidal influences within McKay Creek. The modeled hydrograph is smoother, because a static tailwater boundary condition was used during the verification simulation.

Figure 4.7 shows the stage results for the simulated and observed data at the McKay Creek gage.

Figure 4.7 Comparison of Gage and Modeled Stage Data at McKay Creek (USGS 02309110) for the Verification Storm Event



5 FLOODPLAIN ANALYSIS

Jones Edmunds mapped floodplains using the results from the model described in this report.

5.1 FLOODPLAIN DELINEATION METHODOLOGY

Jones Edmunds mapped level-water-surface floodplains within GIS using a grid (raster) calculation technique. The Raster Calculator within the Spatial Analyst extension of Esri's ArcGIS v10.0 was used to subtract the terrain raster from the peak-water-surface raster (created from the model results for each subbasin) resulting in a new raster dataset of the expected floodplain depth. We converted the areas of the floodplain raster with depths greater than 0 to polygon features using Spatial Analyst.

We mapped preliminary floodplains using a raster with a 5-foot resolution. Small polygons (i.e., less than 2,500 feet squared) were removed and small gaps (i.e., less than 2,500 feet squared) were filled. We selected a threshold of 2,500 feet squared because this is a typical threshold used in Digital Flood Insurance Rate Map (DFIRM) production. We applied a smoothing algorithm to floodplain edges. We used the PAEK smoothing algorithm available within ArcGIS 10.0 with a tolerance of 5 feet to smooth the floodplains.

5.2 QA/QC

5.2.1 NUMERIC STABILITY

The node time-stage hydrographs from which peak stages were determined for each node are stable in all simulations. Some link hydrographs show minor instability toward the ends of the simulations, but this occurs during times when the adjacent nodes are at level pool conditions and does not affect peak stages. The ICPR node computational performance summary and mass-balance reports also indicate that the ICPR model was numerically stable.

5.2.2 MODEL-STORAGE VERIFICATION

Jones Edmunds checked nodes for extrapolation for the largest storm events during preliminary modeling. Extrapolating nodes signify that the stage area was not defined to a large-enough volume to contain the simulated flooding. To prevent node extrapolation, we recalculated stage-area relationships for these nodes to a higher stage using the LiDAR-derived DTM.

5.2.3 STORAGE

Jones Edmunds checked the mapped floodplains for consistency with storage. We also checked all ponds and wetlands to ensure that they were included in the floodplains.

5.2.4 CONVEYANCE

No conveyance or floodway mapping was included in this project.

5.2.5 MODEL-INTERCONNECTIVITY ADJUSTMENTS

Jones Edmunds ran an automated GIS routine that used the 100-year floodplain to identify missing interconnects between storage areas within the model. No missing interconnects were found based on a review of the 100-year floodplain.

5.2.6 HYDRAULIC INTERCONNECTIVITY

Preliminary floodplain mapping pointed out missing interconnections between subbasins. We incorporated additional subbasin saddles into the final model to ensure proper hydraulic connectivity.

5.2.7 ROADWAY OVERTOPPING

In cases where culverts or storm-sewer pipes were simulated, Jones Edmunds incorporated overflow weirs into the model.

5.2.8 PRELIMINARY FLOODPLAIN MAPPING

Jones Edmunds mapped preliminary floodplains for the 100-year events as part of the internal model-review process. These floodplains were used to check for missing interconnections and node extrapolations. Figure B3 in Appendix B shows the preliminary floodplain delineations for the McKay Creek watershed.

5.3 SIMULATION RESULTS

Refer to Table C1 and Table C2 in Appendix C for complete simulation results, including maximum flood elevations and maximum flows for the 100-year/1-day storm event. Jones Edmunds used the results from the 100-year/1-day storm events to plot the 100-year floodplain.

5.3.1 100-YEAR-EVENT RESULTS

Jones Edmunds mapped the 100-year floodplain using GIS software (see Figure B3 in Appendix B). The 24-hour storm simulated 12.0 inches of rain, distributed by the Florida Type II Modified Distribution. The results from the 100-year/24-hour event were used for plotting floodplains.

5.3.2 25-YEAR-EVENT RESULTS

Jones Edmunds did not map the 25-year floodplains. The 24-hour storm simulated 9.0 inches of rain, distributed by the Florida Type II Modified Distribution. The results from the 25-year/24-hour event were reviewed against the 100-year results for comparison purposes only.

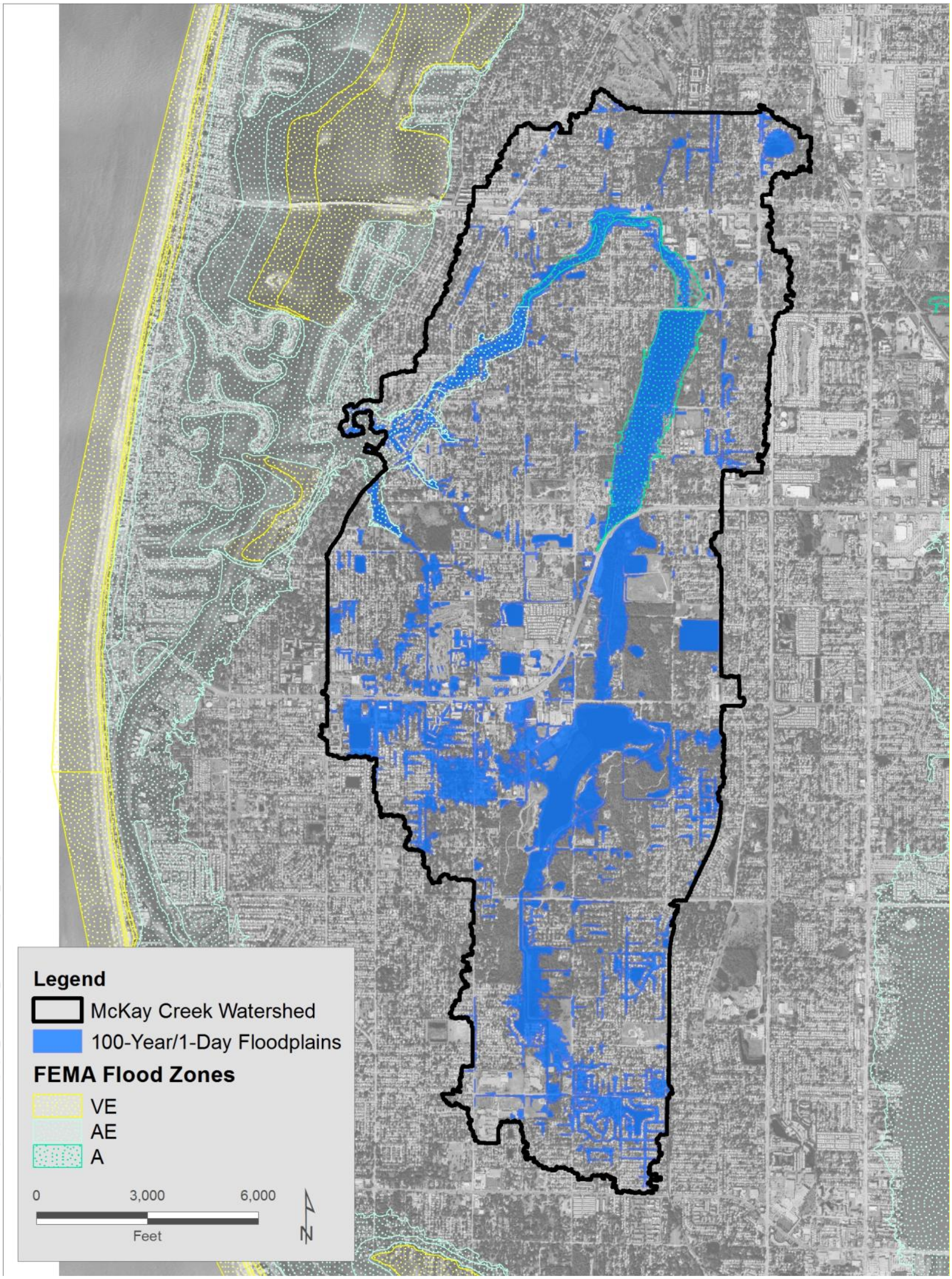
5.4 COMPARISON TO FEMA BFE

The current Flood Insurance Study (FIS, effective 8/18/2009) does not include a detailed study of the inland portions of McKay Creek. Coastal portions of McKay Creek are mapped and the base flood elevation (BFE) ranges from elevation 11 feet at the outlet to Clearwater Harbor to elevation 9 (NAVD88) at 8th Avenue Southwest, where the coastal special flood hazard area ends. Figure 5.1 shows both the simulated 100-Year/1-Day level-pool floodplains and the FEMA FIRM flood zones reported in May 2012.

5.5 ADJUSTMENTS IN BOUNDARY CONDITIONS FOR EVENTS

Jones Edmunds did not adjust any boundary conditions for the different design events.

Figure 5.1 FEMA and Simulated 100-Year/1-Day Floodplains



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6 JUSTIFICATION FOR UPDATES TO THE FEMA FLOODPLAIN

6.1 MODEL VERIFICATION AND VALIDATION

Jones Edmunds calibrated and verified the McKay Creek model (see Section). The floodplain compares well with the flood prone locations provided by Tom Farrand (9/7/2012).

6.2 MODELED STORM EVENT JUSTIFICATION

As prescribed by SWFWMD, we determined the 100-year floodplain for the McKay Creek model using the results from the 100-year/1-day storm event. Multi-day storms were not simulated for the McKay Creek Watershed and were therefore not considered during floodplain delineation.

6.3 MCKAY CREEK FLOODPLAIN JUSTIFICATION

Jones Edmunds compared the 100-year floodplain to the existing FEMA floodplains, shown in Figure 5.1. McKay Creek Watershed's effective floodplains in inland areas are based on approximate methods, and the modeled floodplain from this study is very detailed and is based on a detailed model. Furthermore, the topographic data on which this study and mapping are based is superior to the earlier topographic data source used to map the effective floodplains in McKay Creek.

7 LEVEL-OF-SERVICE

Jones Edmunds performed a flooding Level-of-Service (LOS) Analysis for the McKay Creek Watershed. The results of the LOS evaluation help to identify the locations and severity of flooding problems within the McKay Creek Watershed. The methodology and LOS results are described in the following sections.

7.1 METHODOLOGY

A LOS grade was developed for each subbasin by comparing modeled flood stages with topography, road classifications, and building locations. The LOS standard that was used is described in the following subsection followed by a description of how the standard was applied to the McKay Creek Watershed.

7.1.1 LOS STANDARD

The flooding LOS standard described in *Stormwater Level of Service Methodology* (SWFWMD, 1993) was used for determining the LOS for each subbasin. The following summarizes the LOS categories defined in the *Stormwater Level of Service Methodology*:

- LOS A – This refers to areas with excellent flood protection. All buildings, including emergency service centers, are protected from flood damage up to the 100-year event. All streets remain passable during and after the 100-year event.

- LOS B – This refers to areas with above-standard flood protection. All buildings, including emergency service centers, are protected from flood damage up to the 100-year event. Evacuation routes and emergency service roads remain passable during and after the 100-year event. Arterial roads remain passable during and after such events. Collector and local roads have a 4% chance of flooding in a given year.

- LOS C – This refers to areas with standard flood protection. All buildings, including emergency service centers, are protected from flood damage up to the 100-year event. Evacuation routes and emergency service roads remain passable during and after such events. Arterial roads remain passable during and after the 100-year event. Collector roads have a 4% chance of flooding in a given year. Local roads in urban areas have a 20% chance of flooding in a given year.

- LOS D – This refers to areas subject to inconvenience flooding. All buildings, including emergency service centers, are protected from flood damage up to the 100-year event. Evacuation and emergency service roads remain passable during and following the 100-year event. Arterial roads become impassable on average once every 10 years, and collector roads become impassable on average once every 5 years. Local roads in urban areas are subject to flooding on average every 3 years.

- LOS E – This refers to areas with severe road flooding problems. All buildings, including emergency service centers, are protected from flood damage up to the 100-year event. Evacuation and emergency service roads become impassable during or following the 100-year event. Arterial roads have greater than a 10% chance of flooding in a given year. On average, collector roads become impassable more frequently than once every 5 years, and local roads flood more often than once every 3 years.

- LOS F – This refers to areas subject to hazardous flooding conditions. Buildings, including emergency service centers, are subject to flood damage from a 100-year event. Evacuation and emergency service roads become impassable during or following such events. Arterial roads have greater than a 10% chance of flooding in a given year. Collector roads have greater than a 20% chance of flooding in a given year. Local roads are subject to flooding on average, more than once every three years.

7.1.2 Level-of-Service Assignments

Separate LOS grades were assigned for road flooding and building flooding. The overall LOS grade for a particular subbasin is the lowest of the two grades. For example, a subbasin rated “F” for building flooding and “C” for roadway flooding would receive a final LOS grade of “F”. The lowest possible grade due to roadway flooding alone is “E”.

Jones Edmunds assigned LOS codes (grades) to the *ICPR_BASIN* feature class for road flooding, building flooding, and the overall LOS. Jones Edmunds also estimated the number of buildings flooded in each basin during the 100-year/24-hour storm. The supporting data for these determinations are the basins, floodplains, flood-depth grids, roads, and 2011 aerial imagery. Flood-depth grids were created for 24-hour duration storms with return periods of the 2.33 years (mean annual), 5 years, 10 year, 25 years, and 100 years.

Within each basin, the Jones Edmunds project engineer looked for areas where the delineated floodplains overlap roads, buildings, and essential services and then used digital aerial imagery and the flood-depth grids to determine the LOS assignments. In cases where multiple flooded areas occur within a single basin, the most severe LOS grade was assigned to the basin.

Road flooding was assumed to occur when the maximum depth of water at any point on the road was 8 inches or greater. Building flooding was assumed to occur when the 100-year/24-hour storm results were higher than the lowest adjacent grade estimated from the LiDAR-based DEM. The locations of flooded buildings are shown on Figure 7.1.

Roadway designations are shown on Figure 7.2. All roads not labeled as *Evacuation*, *Arterial*, or *Collector* are *Local* roads. The Mckay Creek Watershed includes two fire stations – one on 88th Avenue in Seminole and one on 134th Avenue in Largo. Neither of these fires stations are located inside the 100 year floodplain or have access issues related to road flooding. The locations of critical facilities as well as evacuation routes were determined using Pinellas County’s latest vulnerability assessment (Pinellas County, 2012). Streets classified by Pinellas County as principal arterial or minor arterial were considered *arterials*. Streets classified by Pinellas County as collector or minor collector were considered *collectors*. All remaining roads, including roads classified by Pinellas County as local streets or local major streets, were considered *local* roads.

7.1.3 Quality Control/Quality Assurance Process

Another Jones Edmunds engineer used the same datasets to check all of the LOS assessments for mistakes and omissions. The LOS evaluations are considered complete.

7.2 Level-of-Service Results

The results of the LOS analysis are provided separately for roads and overall including building flooding. Table 7.1 and Figure7.3 show the results for road flooding only, and Table 7.2 and Figure7.4 show the overall LOS results. Table 7.2 also included a count of the number of flooded structures per tributary.

Figure 7.1 Flooded Structures (100-yr/24-hour Storm)

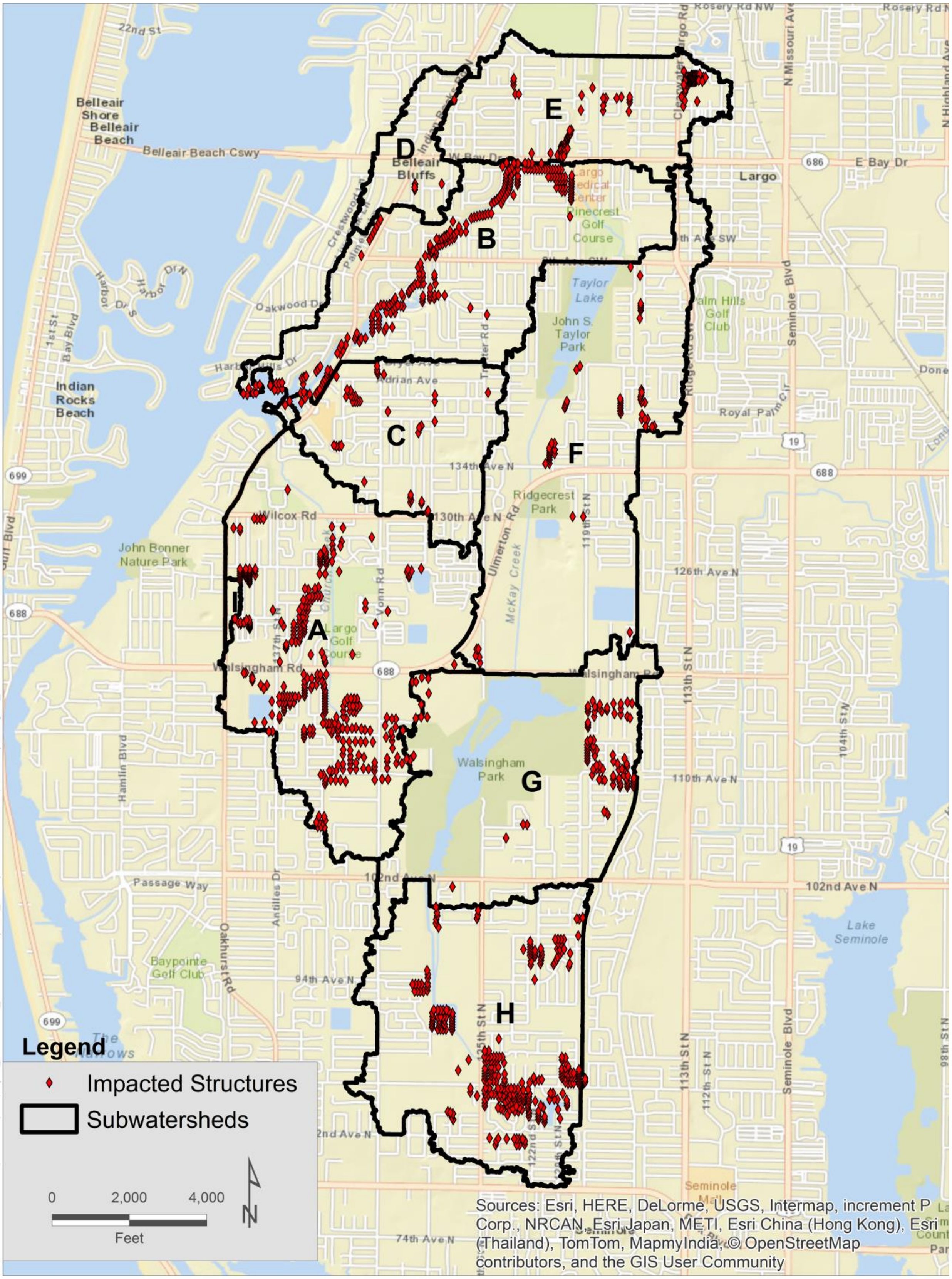

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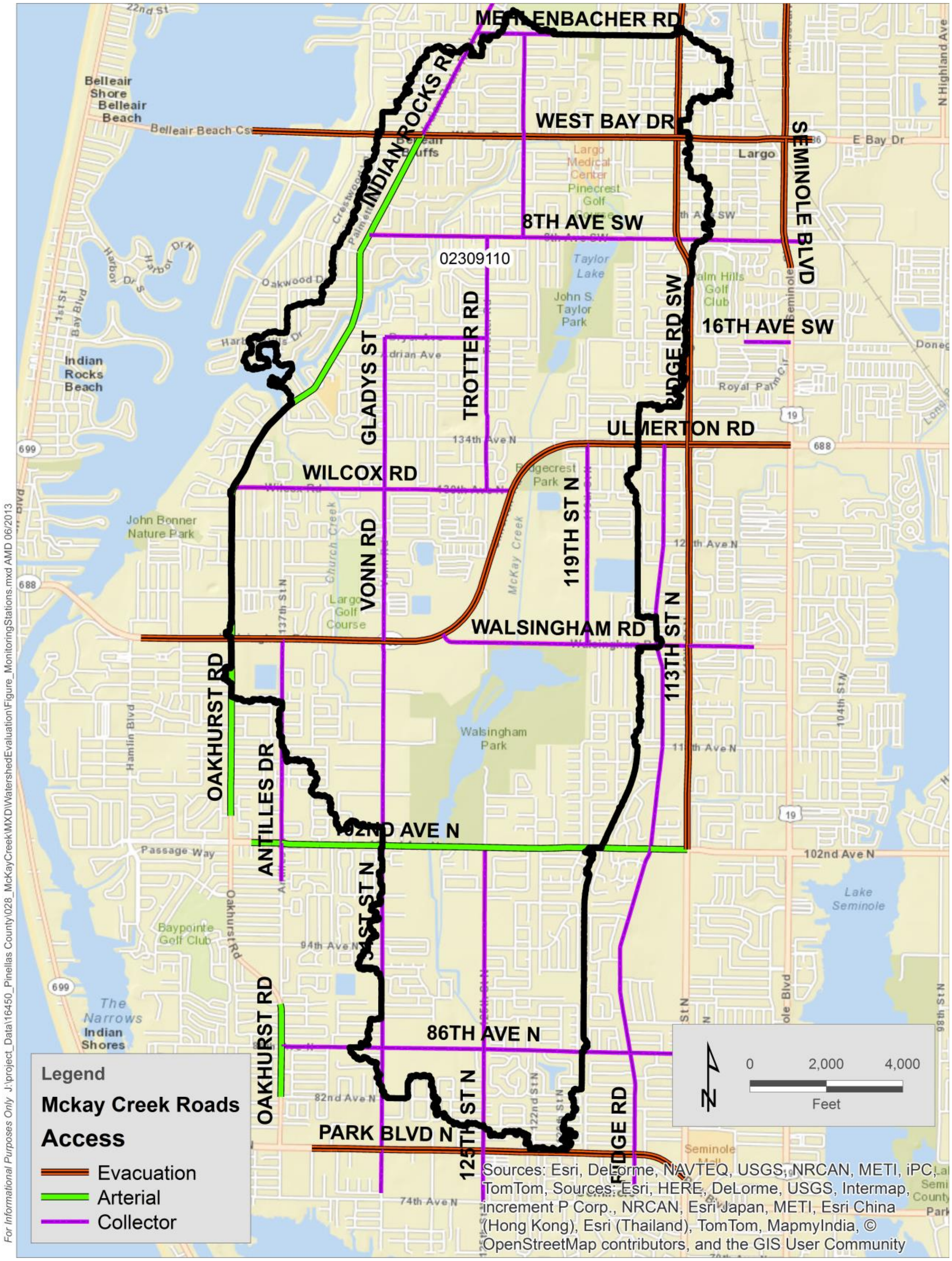
Figure 7.2 Road Classifications



1.

Table 7.1 Roadway LOS Summary

Tributary	Basin Count	Road Level of Service				
		A	B	C	D	E
A	131	89	6	12	14	10
B	88	47	10	11	9	11
C	39	25	3	3	4	4
D	23	19	2	1	1	0
E	41	19	9	4	1	8
F	88	70	12	1	2	3
G	78	57	8	4	6	3
H	108	58	15	23	9	3
Total	**596**	**384**	**65**	**59**	**46**	**42**

Table 7.2 Overall LOS Summary

Tributary	Basin Count	Number of Flooded Structures	Final Level of Service					
			A	B	C	D	E	F
A	131	312	61	0	2	1	3	64
B	88	243	31	8	3	3	2	41
C	39	40	17	0	1	3	2	16
D	23	7	16	2	1	1	0	3
E	41	110	14	4	3	0	5	15
F	88	54	61	8	1	1	2	15
G	78	92	45	8	2	0	0	23
H	108	276	47	5	6	1	0	49
Total	596	1,134	292	35	19	10	14	226

Figure 7.3 Road LOS Grade per Subbasin

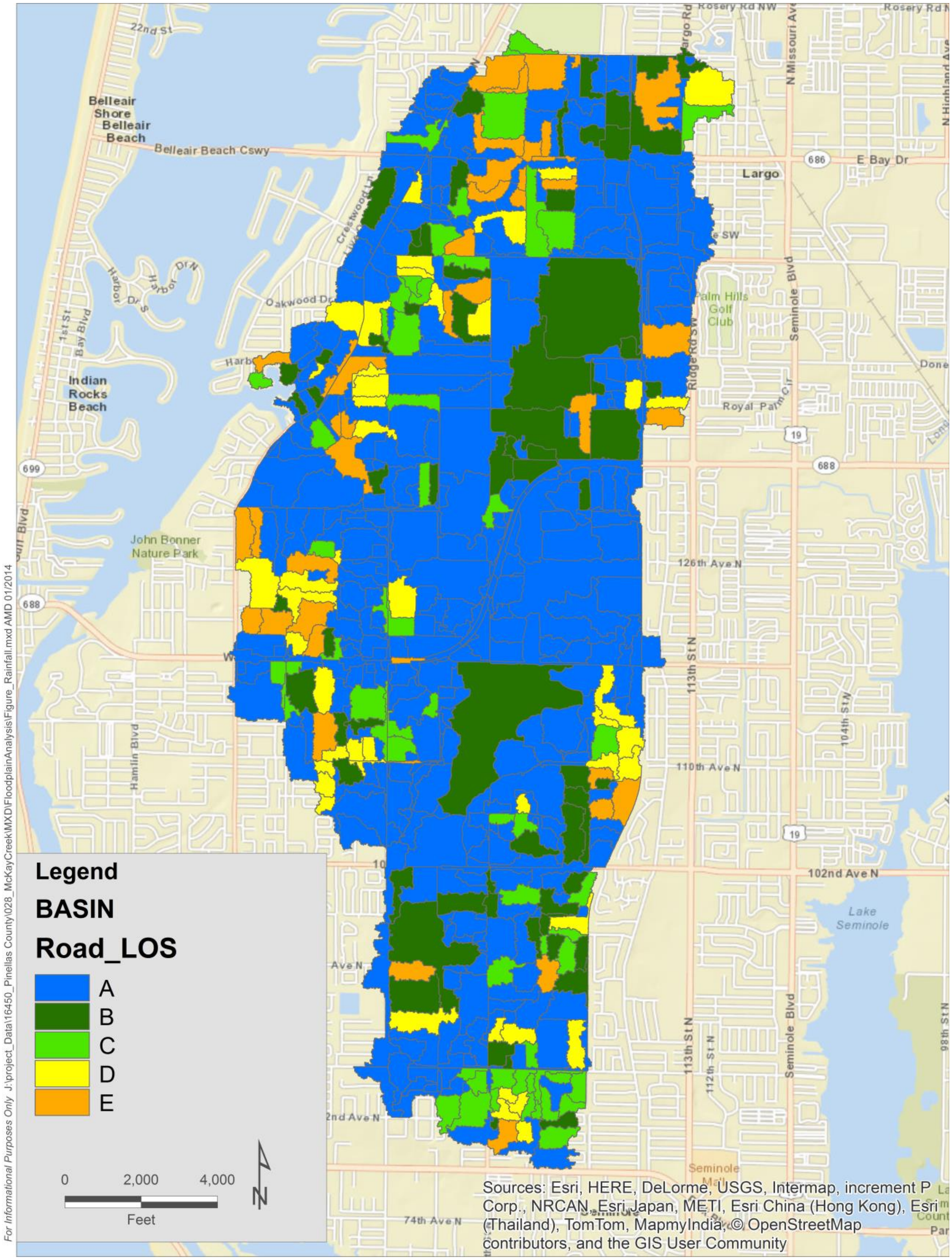
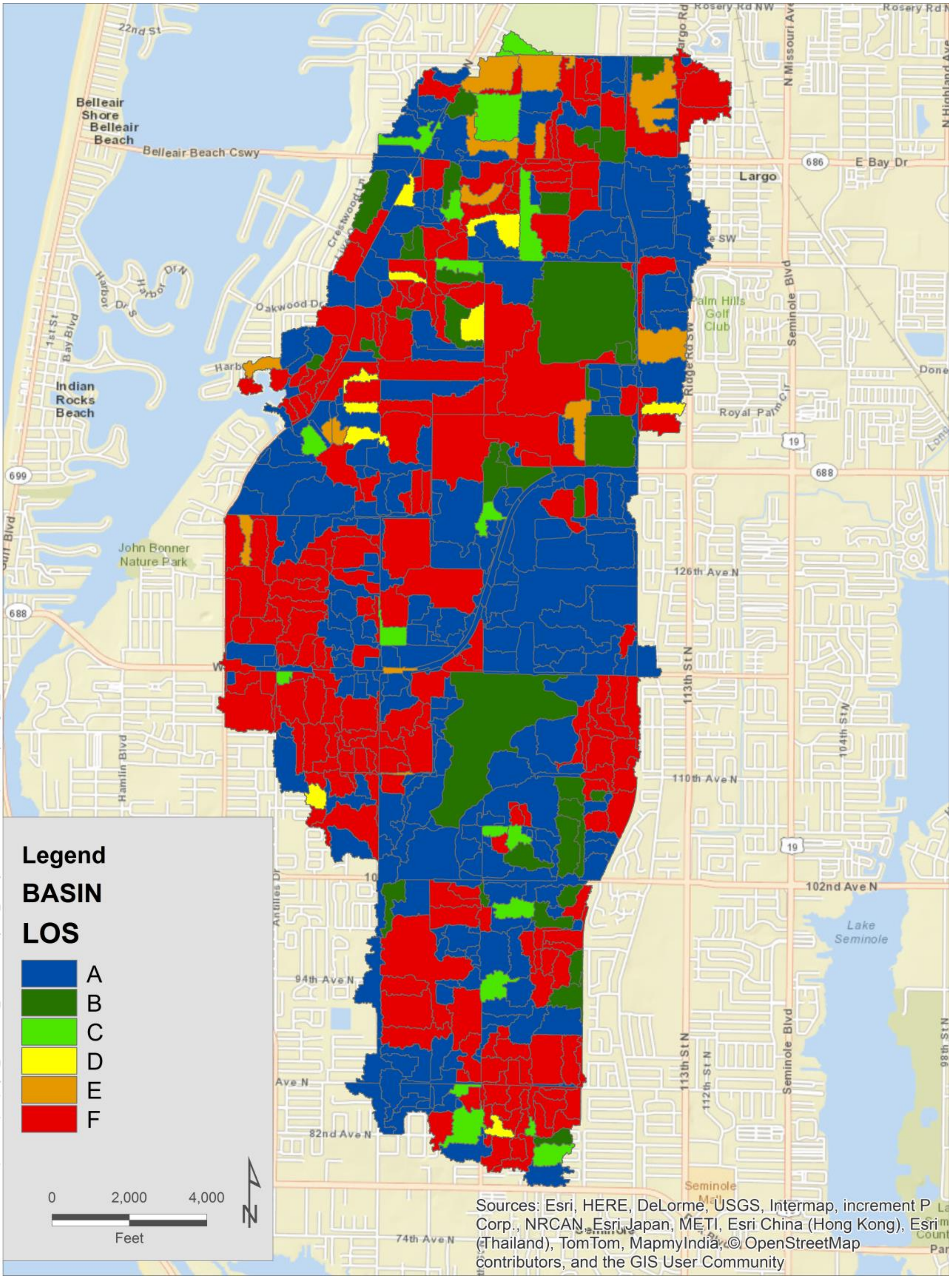


Figure 7.4 Overall LOS Grade per Subbasin



8 BMP ANALYSIS

Jones Edmunds conducted a BMP analysis to find projects that provide flood control and water quality benefits within the McKay Creek Watershed. Given the widespread flooding within the watershed, most alternatives were identified to address flooding. Where possible we looked at including components within these BMPs to improve water quality.

Significant flooding occurs along Church Creek, McKay Creek, and elsewhere within the watershed. Low relief, high runoff potential, and under-sized storm sewer facilities contribute to the flooding problems. The Level-of-Service Determination (Section 7) identified that nearly 40% of the basins have a Level-of-Service F classifications involving over a thousand flooded structures; likewise, roadway flooding is a concern with 42 instances of Level-of-Service E classification for roadway flooding.

Over ninety (90) different models were prepared to test the various BMPs and alternatives. The twelve projects presented below are all effective at providing reduced flood stages. Some of the projects provide large regional benefits, and some provide flood relief for individual neighborhoods; therefore, in any given year improvements can be made based on the amount of funding available. Figure 8.1 shows an overview of the BMP locations, and Table 8.1 provides a listing of the BMPs along with jurisdiction information.

Table 8.1 BMP Summary

Map ID (*)	BMP Name	Report Section	Location	Jurisdiction Benefitting
1	Taylor Lake Drawdown	8.1.1	Largo	Pinellas & Largo
2	Walsingham Reservoir Drawdown	8.1.2	Pinellas	Pinellas, Seminole, & Largo
3	125th Street North Culvert Replacement	8.2.1	Pinellas	Pinellas & Largo
4	20th Ave. SW Neighborhood Flood Improvement Project	8.2.2	Pinellas	Pinellas & Largo
5	10th St. SW Neighborhood Flood Improvement Project	8.2.3	Pinellas	Pinellas & Largo
6	Indian Rocks Road Drainage Improvements	8.2.4	Pinellas & Largo	Pinellas & Largo
7	Pond at West Bay Drive Near Velma Drive	8.2.5	Largo	Largo
8	126th Ave. N Neighborhood Drainage Improvements	8.2.6	Largo	Largo
9	Channel Widening Upstream of Walsingham Reservoir	8.2.7	Pinellas & Seminole	Pinellas & Seminole
10	121st St. N Neighborhood Drainage Improvements	8.2.8	Pinellas	Pinellas & Seminole
11	Brookside Blvd. Neighborhood Drainage Improvements	8.2.9	Pinellas	Pinellas
12	Harbor Cir. Neighborhood Drainage Improvements	8.2.10	Pinellas	Pinellas

* See Figure 8.1

The twelve (12) BMPs are described in the following two sections. Each project is independent of the other projects, except for the *10th St. SW Neighborhood Flood Improvement Project* (Section 8.2.3), which relies on implementation of *20th Ave. SW Neighborhood Flood Improvement Project* (Section 8.2.2) first. All elevations below are referenced to the North American Vertical Datum of 1988 (NAVD 88). A *Drainage Project Rating Sheet* is provided in Appendix E for each structural BMP. Figures in this section are located at the end, beginning on page 8-11.

8.1 LAKE DRAWDOWN BMPS

This section provides descriptions of the flood control benefits associated with lowered water levels in Taylor Lake and Walsinghan Reservoir. The flood control features of these BMPs is the only aspect analyzed by Jones Edmunds. Prior to implementing either of these BMPs the effects of lowered water levels should be evaluated from a biological and geotechnical perspective.

8.1.1 TAYLOR LAKE DRAWDOWN

Significant flood reductions can be achieved by operating Taylor Lake at lower levels. Lower initial lake stages reduce flood stage by providing additional storage as well lowered tailwater for the contributing systems.

The Taylor Lake control structure is equipped with an operable structure that allows for lowering the lake to a minimum elevation of 29.5 feet, or 8.5 feet below the weir crest of Elevation 38.00. This Taylor Lake drawdown BMP analysis estimates 1) the level of flood reductions that can be expected, and 2) the time required to drawdown the lake to the desired operating level.

To estimate the flood reduction benefits of lowering the lake levels, Jones Edmunds prepared simulations with lower lake levels at 2.5-foot increments beginning 2.5 feet below the primary weir crest (38 feet NAVD 88) and extending to the minimum possible elevation (29.5). This minimum elevation corresponds to the invert of the 24-inch orifice and is the lowest possible lake stage using the existing control structure.

The initial stage of Taylor Lake's sedimentation area was not lowered for this analysis. Lowering the initial stage in the sedimentation area would require construction to lower the connection between the sedimentation area and Taylor Lake. Additionally, the effects lowering the water surface would have on its sedimentation functions would have to be analyzed. As evaluated, this BMP could be implemented using the existing infrastructure and no construction would be required.

Figure 8.2 shows flood stage decreases with the lake drawn down 2.5 feet. Other scenarios (drawdown levels) showed reductions as well, and, as expected, the lower the initial stage, the greater the flood reductions; however, the magnitude of flood reductions does not increase dramatically with decreasing initial stage. Figure 8.3 shows, the flood stage reductions for the 100-year storm are only slightly improved. Downstream of the 20th Street Southwest Bridge they are essentially identical.

When opened to full capacity the drawdown-orifice discharges around 50 CFS initially and will draw down the lake about two feet in 24 hours. The orifice is no longer surcharged (at Elevation 31.5) after about 100 hours, and the rate of drawdown slows substantially as the orifice loses pressure. Figure 8.4 provides the drawdown curve at full opening.

8.1.2 Walsingham Reservoir Drawdown

Lowering the level of Walsingham Reservoir will improve flood conditions for a large portion of the watershed, especially the tributaries west of the reservoir. Lower initial lake stages reduce flood stage by providing additional storage as well lowered tailwater for the contributing systems.

Unlike Taylor Lake, Walsingham Reservoir is not equipped with an operable structure to allow for lowering the water level. Jones Edmunds assumed that a new control structure will be constucted, but the culvert crossing under Walsingham Road would remain in place, thus limiting drawdown to Elevation 40.8, or 2.9 feet below the Walsingham Reservoir weir, which is the culvert's invert.

The initial stage of Walsingham's Reservoir's sedimentation area was lowered for this analysis since at elevations above 35.4, which is the lowest invert of the culverts connecting the pools, the main reservoir and the sedimentation area are one continuous pool.

Figure 8.5 shows flood stage decreases with the lake drawn down 2.9 feet.

8.2 Structural BMPs

8.2.1 125th Street North Culvert Replacement

Structure and roadway flooding occur in the neighborhoods adjacent to 125th Street North along Mar Vista Lane and Forest Avenue. The existing 14 X 23-inch (18-inch equivalent) reinforced concrete pipe (RCP) is too small to handle the locally-generated flows. To determine the most cost-effective solution, Jones Edmunds ran multiple scenarios with increasingly larger pipe sizes, and ultimately determined that a pipe replacement with twin 19" X 30" RCP is most suitable. Pipe cover is tight; road and invert elevation should be checked during preliminary design.

8.2.1.1 BMP Effectiveness

The estimated flood stage reduction for this BMP is 0.62 feet at the upstream end of the culvert (See Figure 8.6) replacement. Small decreases are also present along Walsingham Road owing to reduced overland flows from the problem flooding area.

8.2.1.2 Right-of-Way and/or Easement Requirements

This project appears to be contained within the existing right-of-way.

8.2.1.3 Special Permit Considerations

An ERP will be required for this project; however, this project is straightforward with no known special permit considerations.

8.2.1.4 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required.

8.2.1.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.2 20TH AVENUE SOUTHWEST NEIGHBORHOOD FLOOD IMPROVEMENT PROJECT

Structure and roadway flooding occur in this neighborhood due to its undersized outlet – an 18-inch pipe. Replacing this pipe with a 48-inch RCP together with downstream pipe improvements reduces flooding. The downstream improvements consist of upgrading 75 LF of 30-inch RCP to a 60-inch pipe. The downstream improvements are necessary to support proper drainage for this and future BMPs (See Section 8.2.3). Currently large flows are discharged overland causing flooding from this neighborhood. Forcing these flows into the upgraded storm sewer will further tax the already over-burdened system running east-west behind the neighborhood.

Additionally, improvements upstream of the neighborhood are required to achieve the full flood reduction benefit. These upstream improvements, upsizing the 18" RCP to 48-inch RCP, are needed since despite the upgrades described in the previous paragraph, overflows from this neighborhood still travel offsite to the Pinellas Trail drainage system then southward where flows are picked up by the east-west system running behind the neighborhood. Jones Edmunds tried a scenario that did not include the 18"-to-48" pipe upgrade, and the flood reductions were reduced by almost 50%.

8.2.2.1 BMP Effectiveness

This project reduces flood stage for the 100-year storm by about 1.4 feet in this 20th Avenue South neighborhood (See Figure 8.7). Smaller flood reductions are also seen in the basins formerly receiving the overland flows from this neighborhood.

8.2.2.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required. Special considerations for this particular project should include geotechnical recommendations for excavation and compaction between the homes in the yards through which the 48-inch upgrade must pass.

8.2.2.3 Right-of-Way and/or Easement Requirements

These improvements are to be constructed within the same space generally occupied by the existing drainage facilities; however, new or expanded permanent easements may be required. A construction easement will be required.

8.2.2.4 Special Permit Considerations

This project produces some stage increases and involves construction in close proximity to structures. The greater stage increases (at the US and DS end of the 60-inch pipe) are contained within the banks of the outfall channel, and the remaining much smaller increases do not appear to worsen flooding enough to cause additional flooding impacts; however, further demonstration regarding worsened flooding conditions may be necessary during preliminary design.

8.2.2.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.3 10TH STREET SOUTHWEST NEIGHBORHOOD FLOOD IMPROVEMENT PROJECT

Structure and roadway flooding occur in this neighborhood due to its undersized outlet – an 18-inch pipe. Replacing this pipe with a 30-inch RCP together with downstream pipe improvements reduces flooding. The downstream improvements are the same as those proposed in the previous BMP, *20th Avenue Southwest Neighborhood Flood Improvement Project* (Section 8.2.2); thus, concerning sequencing, the

20th Avenue Southwest project should be completed before this project.. This BMP takes advantage of the lower tail-water created by the 20th Street project and combines the 20th Street project with a new outfall.

8.2.3.1 BMP Effectiveness

This project reduces flood stage for the 100-year storm by about 0.6 feet in this 10th Street Southwest neighborhood (See Figure 8.8). The effectiveness of the 20th Avenue project, which uses some of the same drainage facilities, is largely unaffected.

8.2.3.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required. Special considerations for this particular project should include geotechnical recommendations for excavation and compaction between the homes in the yards through which the 30-inch upgrade must pass.

8.2.3.3 Right-of-Way and/or Easement Requirements

These improvements are to be constructed within the same space generally occupied by the existing drainage facilities; however, new or expanded permanent easements may be required. A construction easement will be required.

8.2.3.4 Special Permit Considerations

The stage increases caused by the 20th Street project (Section 8.3) are slightly larger, yet still either contained within the banks of the outfall channel, or otherwise do not appear to worsen flooding enough to cause additional flooding impacts.

8.2.3.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.4 Indian Rocks Road Drainage Improvements

This project provides a piped drainage system to relieve roadway and structure flooding along Indian Rocks Road near Palm Drive. The new 36-inch system would begin with a new ditch-bottom inlet and connect to the exiting 8th Avenue Southwest drainage system, which will need to be upsized to handle the additional flow (See Figure 8.9).

8.2.4.1 BMP Effectiveness

This project reduces flood stage for the 100-year storm by about 1.6 feet at Palm Drive.

8.2.4.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as subgrade stability, bearing capacity, groundwater conditions, contamination, and others, and obtain recommendations from a geotechnical engineer as needed.

8.2.4.3 Right-of-Way and/or Easement Requirements

This project appears to be contained within the existing right-of-way.

8.2.4.4 Special Permit Considerations

A small stage increase (0.14') occurs where the new system connects to the existing system at Grovewood Lane; however, the peak water surface elevation is still below grade and is not expected to present any special permitting challenges.

8.2.4.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.5 Pond at West Bay Drive Near Velma Drive

Substantial structure and roadway flooding occur along West Bay Drive and in the neighborhoods abutting McKay Creek in this vicinity. This project, which consists of a 5-acre pond, will attenuate flows for a 217-acre area that enters McKay Creek just east of Velma Drive. The pond site is sloped from north to south, and, the proposed pond, as conceptualized, has a top-of-bank of 31, a weir crest of 22, and a bottom at 21. Final design parameters should be based on geotechnical testing and recommendations, See Section 8.2.5.4, below. The peak 100 stage in the pond is 30.33 leaving 0.67 feet of freeboard. Freeboard is advisable for this project since the southern end of the pond is an embankment (maximum height 5 feet) along East Bay Road.

Quite a number of alternatives were tested to bring the water surface profile down in this area, but most of the alternatives worsened the severity of flooding downstream, which already experiences considerable flooding.

8.2.5.1 BMP Effectiveness

This project reduces the 100-year flood stage by nearly a foot in some locations along East Bay Drive, and about a half-foot in McKay Creek (See Figure 8.10). The only increase is at the pond itself.

Table 8.2 Annual Average Pollutant Mass Removals

Pollutant	Annual Average Load (#)	Removed Load (#)	Net Load(#)
TN	3,436	1,340	2,096
TP	580	226	354
TSS	107,125	41,779	68,346
BOD_5	19,531	7,617	11,914

The pond is expected to remove about 1.5 tons of nitrogen, 600 pounds of phosphorous, and around 50 tons of suspended solids per year on an annual average basis. Table 8.2 shows the load received and removed at the pond. The removal efficiencies were calculated using information provided in the Draft State Stormwater Rule (FDEP, 2010) where removal efficiency for retention is the expected percent retained (percent that does not discharge); thus, the removal efficiency is the same for all pollutants. For a retention pond meeting the *Basis of Review* criteria (0.5-inch of treatment) the removal efficiency is 90%. Since this is a retrofit and we are treating 0.22 inches of runoff, the expected removal efficiency is 39%.

8.2.5.2 Right-of-Way, Property, or Easement Requirements

The pond site is on private property under singular ownership – West Bay Oaks, LLC. Currently the site is occupied by the West Bay Mobile Home and RV Park. The 2013 assessed value of the site is $1,475,000.

8.2.5.3 Special Permit Considerations

The currently estimated site-wide seasonal highwater is at elevation 20 feet NAVD 88; although, it is possible that the pond may need to be separated into multiple pools at staged elevations to make maximum use of the site while avoiding creating an outlet below seasonal high water. This project will, however, raise the elevation of the ultimate outlet and in general be supportive of water conservation.

8.2.5.4 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as subgrade stability, bearing capacity, groundwater conditions, contamination, and others, and obtain recommendations from a geotechnical engineer as needed. Key geotechnical data needs for this site are seasonal high water levels and percolation rates taken at several locations, and construction recommendations for the embankment.

8.2.5.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.6 126TH AVENUE NORTH NEIGHBORHOOD DRAINAGE IMPROVEMENTS

Structure and roadway flooding occurs in the neighborhoods just south of 126th Avenue North along Eldon and Mallory Drives. Drainage from this area flows north into a piped-system along 138th Street North and drains into a pond. The pond also provides drainage for a neighborhood, having its own local flooding problems, just south of Wilcox Road. This BMP would provide a new 48-inch outfall directly to Church Creek along 126th Avenue North.

8.2.6.1 BMP Effectiveness

This project reduces flood stage for the 100-year storm by about 0.35 feet at Mallory Drive. In addition to the local benefits, this BMP relieves flows to the neighborhood pond causing about a half-foot drop in the 100-year flood stage.

8.2.6.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required.

8.2.6.3 Right-of-Way and/or Easement Requirements

These improvements are to be constructed within the existing right-of-way.

8.2.6.4 Special Permit Considerations

An ERP will be required for this project. Small stage increases are shown near Whispering Palms Place Southwest and 134th Street North. Survey may be needed at these locations to investigate the impact of these increases.

8.2.6.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.7 MCKAY CREEK CANAL CHANNEL WIDENING UPSTREAM OF WALSINGHAM RESERVOIR

Structure and roadway flooding occurs along McKay Creek Canal upstream of Walsingham Reservoir. The gradient in this area between 86th Avenue North and 102nd Avenue North is very slight. This project is to widen the channel to provide greater conveyance capacity.

8.2.7.1 BMP Effectiveness

This project reduces flood stage for the 100-year storm in the McKay Creek Canal by almost a foot. Lowered flood stages in Mckay Creek Canal also provide improvement for the numerous tributaries entering McKay Creek along its length from 86th Avenue North and 102nd Avenue North. Walshingham Reservoir, at the downstream end of this channel widening project, does an excellent job attenuating the increased flows and there are no stage increases associated with this project.

8.2.7.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required. Geotechnical recommendations to ensure bank stability are important for this project.

8.2.7.3 Right-of-Way and/or Easement Requirements

Pinellas County owns the land along the canal.

8.2.7.4 Special Permit Considerations

This project will require an ERP permit. Design elements can be included to convert the dredging project a wetland enhancement, if required.

8.2.7.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.8 121ST STREET NORTH NEIGHBORHOOD DRAINAGE IMPROVEMENTS

Structure and roadway flooding occurs in the neighborhoods just south and east of 121st Street North and 98th Avenue North. Inadequately sized storm drainage facilities and low relief are the main suspected causes of this flooding. This BMP provides for larger drainage pipes and reduces flooding.

8.2.8.1 BMP Effectiveness

This project reduces flood stages throughout the subject neighborhoods. Flood stage reductions are over 1.5 feet for the 100-year storm in some locations. Increases are seen downstream of the project west of 125th Street North. Flood waters are still contained within the channels banks during the 100-year storm.

8.2.8.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required.

8.2.8.3 Right-of-Way and/or Easement Requirements

These improvements are to be constructed within the same space generally occupied by the existing drainage facilities; however, new or expanded permanent easements may be required. A construction easement will be required.

8.2.8.4 Special Permit Considerations

An ERP will be required for this project.

8.2.8.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.9 BROOKSIDE BOULEVARD NEIGHBORHOOD DRAINAGE IMPROVEMENTS

Structure and roadway flooding occurs in the neighborhood served by Brookside Boulevard. Drainage from this area flows north into an 18-inch RCP system at the end of the cul-de-sac and discharges to Mckay Creek. This BMP would provide a new 42-inch outfall to replace the existing one.

8.2.9.1 BMP Effectiveness

This project reduces flood stage for the 100-year storm by about 0.5 feet at Brookside Drive.

8.2.9.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required.

8.2.9.3 Right-of-Way and/or Easement Requirements

These improvements are to be constructed within the same space generally occupied by the existing drainage facilities; however, new or expanded permanent easements may be required. A construction easement will be required.

8.2.9.4 Special Permit Considerations

An ERP will be required for this project.

8.2.9.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

8.2.10 HARBOR CIRCLE NEIGHBORHOOD DRAINAGE IMPROVEMENTS

Structure and roadway flooding occurs in the neighborhood served by Harbor Circle. Drainage from this area flows south and into a 15-inch RCP system and discharges to Mckay Creek. This BMP would provide a new 36-inch outfall to replace the existing one.

8.2.10.1 BMP Effectiveness

This project reduces flood stage for the 100-year storm by 0.83 feet.

8.2.10.2 Special Geotechnical Considerations

During preliminary design, the design engineer should review all appropriate soil considerations such as stable subgrade, bearing capacity, groundwater conditions, contamination, and others seeking recommendations from a geotechnical engineer as required.

8.2.10.3 Right-of-Way and/or Easement Requirements

These improvements are to be constructed within the same space generally occupied by the existing drainage facilities; however, new or expanded permanent easements may be required. A construction easement will be required.

8.2.10.4 Special Permit Considerations

An ERP will be required for this project.

8.2.10.5 Estimate of Probable Construction Cost

An estimate of probable construction cost is provided in Appendix D.

Figure 8.1 BMP Locations

Figure 8.2 100-Year Flood Reductions for Taylor Lake Drawdown - 2.5 feet

Figure 8.3 100-Year Flood Reductions for Taylor Lake Drawdown - 8.5 feet

Figure 8.4 Taylor Lake Drawdown Curve

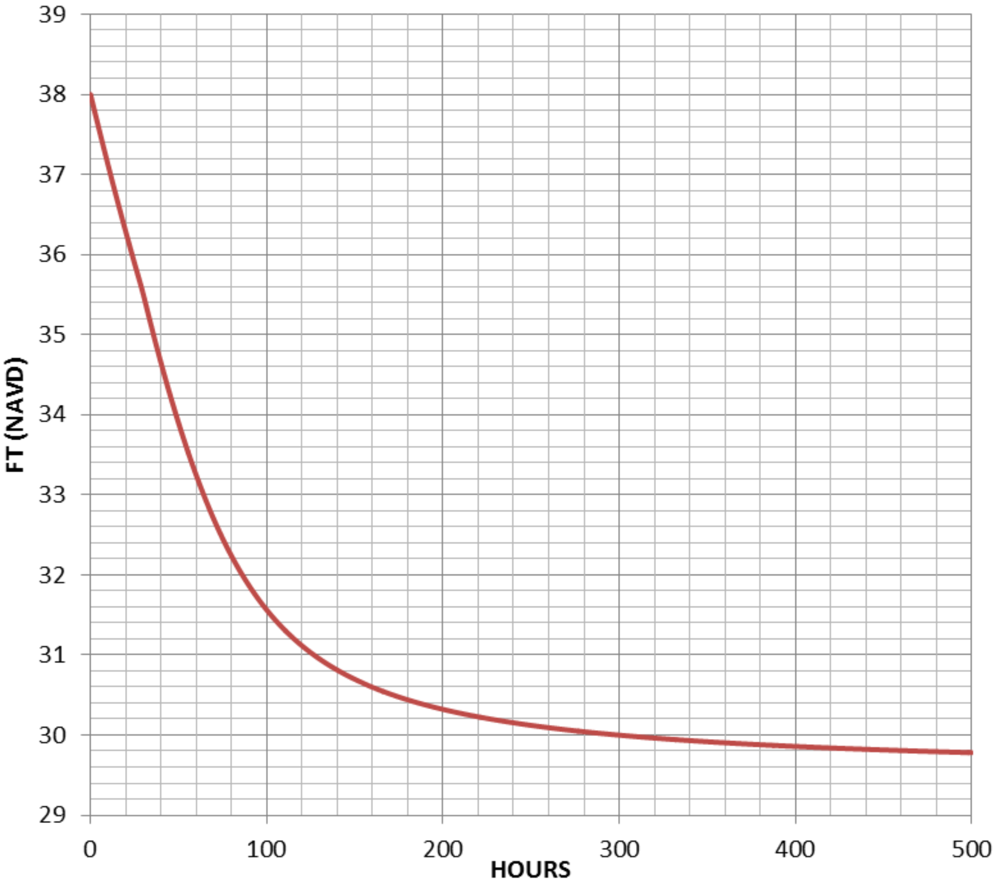


Figure 8.5 100-Year Flood Reductions for Walsingham Reservoir Drawdown – 2.9 feet

Figure 8.6 125th Street North Culvert Replacement (7)

Figure 8.7 20th Avenue Southwest Neighborhood Flood Improvement Project (8)

Figure 8.8 10th Street Southwest Neighborhood Flood Improvement Project (8b)

Figure 8.9 Indian Rocks Road Drainage Improvements (13)

Figure 8.10 Pond at West Bay Drive Near Velma Drive(11)

Figure 8.11 126th Avenue North Neighborhood Drainage Improvements (17)

Figure 8.12 McKay Creek Canal Channel Widening Upstream of Walsingham Reservoir(2)

Figure 8.13 121st Street North Neighborhood Drainage Improvements (3)

Figure 8.14 Brookside Boulevard Neighborhood Drainage Improvements

Figure 8.15 Harbor Circle Neighborhood Drainage Improvements

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Appendix A

Sample Hydraulic Feature Form and Photograph

Appendix B

Model Schematics and Floodplains

Appendix C

ICPR Model Simulation Results

Table C1 – 100-year/24-hour Peak Node Results

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
N0000-BNDRY	BNDRY	24HR100YR	0.500	0.000
N1000-BNDRY	BNDRY	24HR100YR	0.500	0.000
N2000-BNDRY	BNDRY	24HR100YR	52.800	0.000
N3000-BNDRY	BNDRY	24HR100YR	54.400	0.000
N4000-BNDRY	BNDRY	24HR100YR	57.500	0.000
N5000-BNDRY	BNDRY	24HR100YR	64.000	0.000
N6000-BNDRY	BNDRY	24HR100YR	40.700	0.000
N7000-BNDRY	BNDRY	24HR100YR	52.600	0.000
N8000-BNDRY	BNDRY	24HR100YR	43.600	0.000
N9000-BNDRY	BNDRY	24HR100YR	46.200	0.000
N9100-BNDRY	BNDRY	24HR100YR	63.700	0.000
NA1000	A	24HR100YR	4.026	12.694
NA1010	A	24HR100YR	5.479	12.141
NA1020	A	24HR100YR	6.631	12.023
NA1030	A	24HR100YR	7.896	12.638
NA1040	A	24HR100YR	18.343	12.628
NA1050	A	24HR100YR	9.629	12.597
NA1055	A	24HR100YR	13.801	12.553
NA1060	A	24HR100YR	16.074	12.493
NA1065	A	24HR100YR	16.578	12.493
NA1070	A	24HR100YR	17.719	12.438
NA1080	A	24HR100YR	20.952	12.503
NA1090	A	24HR100YR	21.613	12.653
NA1100	A	24HR100YR	28.560	12.167
NA1110	A	24HR100YR	23.272	12.496
NA1120	A	24HR100YR	23.270	12.493
NA1140	A	24HR100YR	27.813	12.106
NA1150	A	24HR100YR	30.163	12.266
NA1160	A	24HR100YR	34.387	12.261
NA1170	A	24HR100YR	35.434	12.265
NA1180	A	24HR100YR	44.589	13.446
NA1190	A	24HR100YR	45.627	12.370
NA1200	A	24HR100YR	25.869	12.425
NA1210	A	24HR100YR	24.830	12.437
NA1215	A	24HR100YR	34.033	12.250
NA1220	A	24HR100YR	36.917	12.247
NA1225	A	24HR100YR	25.033	12.479
NA1230	A	24HR100YR	28.391	12.426
NA1240	A	24HR100YR	28.471	12.432

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NA1250	A	24HR100YR	32.164	12.084
NA2000	A	24HR100YR	28.712	12.412
NA2010	A	24HR100YR	31.374	12.400
NA2020	A	24HR100YR	31.989	12.398
NA2030	A	24HR100YR	33.584	15.789
NA2035	A	24HR100YR	38.663	13.473
NA2040	A	24HR100YR	38.509	13.474
NA2050	A	24HR100YR	39.185	12.109
NA2060	A	24HR100YR	38.515	13.473
NA2065	A	24HR100YR	39.182	12.326
NA2070	A	24HR100YR	40.394	12.096
NA2100	A	24HR100YR	35.035	15.781
NA2105	A	24HR100YR	37.031	15.858
NA2110	A	24HR100YR	37.609	15.893
NA2113	A	24HR100YR	38.612	15.957
NA2115	A	24HR100YR	39.375	16.049
NA2120	A	24HR100YR	41.119	12.265
NA2130	A	24HR100YR	39.484	16.074
NA2131	A	24HR100YR	40.098	16.076
NA2132	A	24HR100YR	40.606	16.073
NA2133	A	24HR100YR	41.340	16.069
NA2135	A	24HR100YR	40.434	16.073
NA2140	A	24HR100YR	41.565	16.064
NA2150	A	24HR100YR	41.843	15.579
NA2160	A	24HR100YR	41.580	16.047
NA2170	A	24HR100YR	41.569	16.066
NA2180	A	24HR100YR	41.570	16.068
NA2185	A	24HR100YR	41.574	16.058
NA2187	A	24HR100YR	41.607	15.989
NA2190	A	24HR100YR	41.714	15.776
NA2200	A	24HR100YR	42.834	15.343
NA2210	A	24HR100YR	41.685	12.448
NA2220	A	24HR100YR	41.559	16.099
NA2230	A	24HR100YR	41.558	16.100
NA2240	A	24HR100YR	39.480	16.076
NA2300	A	24HR100YR	41.558	16.087
NA2305	A	24HR100YR	41.503	16.081
NA2307	A	24HR100YR	41.435	16.071
NA2310	A	24HR100YR	41.432	16.081
NA2320	A	24HR100YR	41.551	16.102
NA2330	A	24HR100YR	45.509	12.158

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NA2340	A	24HR100YR	40.691	15.708
NA2400	A	24HR100YR	38.114	15.654
NA2410	A	24HR100YR	38.793	12.387
NA3000	A	24HR100YR	30.253	12.467
NA3010	A	24HR100YR	34.108	12.416
NA3020	A	24HR100YR	38.968	12.398
NA3030	A	24HR100YR	39.936	12.379
NA3040	A	24HR100YR	40.727	12.363
NA3050	A	24HR100YR	41.899	12.338
NA3060	A	24HR100YR	40.692	12.361
NA3070	A	24HR100YR	41.896	12.324
NA3080	A	24HR100YR	43.080	12.212
NA3083	A	24HR100YR	43.761	12.308
NA3085	A	24HR100YR	45.293	12.230
NA3090	A	24HR100YR	45.962	12.212
NA3100	A	24HR100YR	47.548	12.153
NA3110	A	24HR100YR	45.788	12.281
NA3120	A	24HR100YR	44.465	12.336
NA3130	A	24HR100YR	44.550	12.350
NA3140	A	24HR100YR	44.583	12.312
NA3200	A	24HR100YR	41.356	15.428
NA3210	A	24HR100YR	42.153	15.377
NA3220	A	24HR100YR	43.955	15.341
NA3225	A	24HR100YR	43.943	15.365
NA3230	A	24HR100YR	43.900	15.499
NA3240	A	24HR100YR	44.492	15.321
NA3250	A	24HR100YR	44.481	15.318
NA3260	A	24HR100YR	45.885	15.294
NA3265	A	24HR100YR	45.712	15.308
NA3270	A	24HR100YR	45.320	15.336
NA3280	A	24HR100YR	46.064	15.278
NA3290	A	24HR100YR	46.072	15.279
NA3295	A	24HR100YR	46.312	15.255
NA3300	A	24HR100YR	46.338	15.241
NA3305	A	24HR100YR	46.360	15.232
NA3307	A	24HR100YR	46.396	15.227
NA3310	A	24HR100YR	46.411	15.223
NA3320	A	24HR100YR	46.584	15.150
NA3325	A	24HR100YR	46.365	15.121
NA3330	A	24HR100YR	46.744	15.090
NA3400	A	24HR100YR	46.329	15.256

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NA3405	A	24HR100YR	46.288	15.259
NA3410	A	24HR100YR	46.337	15.253
NA3420	A	24HR100YR	46.337	15.253
NA3425	A	24HR100YR	46.392	15.231
NA3430	A	24HR100YR	46.415	15.222
NA3440	A	24HR100YR	55.092	12.506
NA3450	A	24HR100YR	46.414	15.224
NA3460	A	24HR100YR	46.411	15.226
NA3470	A	24HR100YR	46.945	15.128
NA3475	A	24HR100YR	46.685	15.158
NA3480	A	24HR100YR	46.413	15.224
NA3490	A	24HR100YR	46.336	15.252
NA3500	A	24HR100YR	46.331	15.254
NA3510	A	24HR100YR	46.334	15.249
NA3600	A	24HR100YR	46.596	12.704
NA3610	A	24HR100YR	47.090	12.502
NA3620	A	24HR100YR	47.527	12.460
NA3630	A	24HR100YR	47.763	12.427
NA3640	A	24HR100YR	46.575	12.689
NA3650	A	24HR100YR	46.898	12.498
NA3660	A	24HR100YR	46.910	12.491
NA3670	A	24HR100YR	46.910	12.488
NA4000	A	24HR100YR	34.793	12.747
NA4010	A	24HR100YR	41.635	12.984
NA4020	A	24HR100YR	41.151	12.758
NA4030	A	24HR100YR	41.805	12.791
NA4040	A	24HR100YR	41.806	12.793
NA4050	A	24HR100YR	41.845	12.783
NA4055	A	24HR100YR	43.552	12.486
NA4060	A	24HR100YR	47.041	12.610
NA4070	A	24HR100YR	47.321	12.349
NA4080	A	24HR100YR	47.637	12.301
NA4090	A	24HR100YR	48.277	12.220
NA4100	A	24HR100YR	49.438	12.236
NA4110	A	24HR100YR	49.343	12.075
NA4120	A	24HR100YR	47.511	12.078
NA4130	A	24HR100YR	47.277	12.084
NA4140	A	24HR100YR	41.850	12.783
NA4145	A	24HR100YR	44.367	12.312
NA4150	A	24HR100YR	44.805	12.233
NA4155	A	24HR100YR	45.240	12.226

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NA4157	A	24HR100YR	45.982	12.196
NA4159	A	24HR100YR	45.616	12.272
NA4160	A	24HR100YR	46.103	12.348
NA4170	A	24HR100YR	46.195	12.352
NA4180	A	24HR100YR	46.027	12.199
NA4190	A	24HR100YR	47.866	12.112
NA4200	A	24HR100YR	49.165	13.180
NA4210	A	24HR100YR	50.414	12.752
NA4220	A	24HR100YR	45.491	12.255
NA5000	A	24HR100YR	24.228	12.670
NA5005	A	24HR100YR	24.608	12.672
NA5010	A	24HR100YR	36.012	12.458
NA5020	A	24HR100YR	22.758	12.199
NA5030	A	24HR100YR	24.804	12.189
NB0010	B	24HR100YR	2.646	12.840
NB0020	B	24HR100YR	3.715	12.850
NB0030	B	24HR100YR	4.301	12.868
NB0035	B	24HR100YR	4.680	12.873
NB0036	B	24HR100YR	6.660	12.919
NB0040	B	24HR100YR	6.948	12.926
NB0045	B	24HR100YR	7.966	12.909
NB0050	B	24HR100YR	8.689	12.900
NB0051	B	24HR100YR	8.716	12.899
NB0060	B	24HR100YR	8.999	12.892
NB0065	B	24HR100YR	10.929	12.823
NB0070	B	24HR100YR	11.167	12.818
NB0080	B	24HR100YR	11.740	12.810
NB0090	B	24HR100YR	14.388	12.743
NB0100	B	24HR100YR	16.381	12.823
NB0110	B	24HR100YR	20.181	12.795
NB0120	B	24HR100YR	20.584	12.774
NB0130	B	24HR100YR	20.774	12.761
NB0135	B	24HR100YR	21.950	12.766
NB0140	B	24HR100YR	25.303	12.641
NB0150	B	24HR100YR	26.231	12.770
NB0157	B	24HR100YR	29.680	12.271
NB0160	B	24HR100YR	27.000	12.831
NB0170	B	24HR100YR	27.763	12.837
NB0175	B	24HR100YR	28.041	12.896
NB0180	B	24HR100YR	28.378	12.955
NB1000	B	24HR100YR	5.344	12.552

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NB1010	B	24HR100YR	5.547	12.109
NB1020	B	24HR100YR	4.984	12.093
NB1030	B	24HR100YR	4.253	12.258
NB1040	B	24HR100YR	4.380	12.151
NB1050	B	24HR100YR	2.646	12.840
NB1060	B	24HR100YR	9.010	12.003
NB1065	B	24HR100YR	8.320	0.000
NB1070	B	24HR100YR	11.389	12.259
NB1080	B	24HR100YR	5.002	12.070
NB1090	B	24HR100YR	5.951	12.012
NB1100	B	24HR100YR	5.322	12.379
NB1110	B	24HR100YR	5.459	12.367
NB1120	B	24HR100YR	7.486	12.003
NB1130	B	24HR100YR	6.513	12.907
NB1140	B	24HR100YR	23.459	12.253
NB1150	B	24HR100YR	40.645	12.267
NB1160	B	24HR100YR	42.773	12.298
NB1170	B	24HR100YR	6.860	12.006
NB1180	B	24HR100YR	6.662	12.919
NB1190	B	24HR100YR	7.086	12.926
NB1200	B	24HR100YR	7.701	12.911
NB1210	B	24HR100YR	8.938	12.099
NB1220	B	24HR100YR	8.699	12.896
NB1230	B	24HR100YR	10.600	12.611
NB1240	B	24HR100YR	22.620	12.214
NB1250	B	24HR100YR	8.769	12.898
NB1255	B	24HR100YR	11.692	12.853
NB1260	B	24HR100YR	15.364	12.668
NB1270	B	24HR100YR	26.450	12.334
NB1280	B	24HR100YR	8.996	12.892
NB1290	B	24HR100YR	11.070	12.821
NB1300	B	24HR100YR	10.972	12.823
NB1305	B	24HR100YR	11.909	12.821
NB1310	B	24HR100YR	18.313	12.107
NB1320	B	24HR100YR	12.616	12.116
NB1330	B	24HR100YR	21.031	12.101
NB1335	B	24HR100YR	24.482	12.134
NB1337	B	24HR100YR	28.998	12.117
NB1340	B	24HR100YR	30.430	12.113
NB1350	B	24HR100YR	36.758	12.093
NB1360	B	24HR100YR	21.926	12.110

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NB1370	B	24HR100YR	13.309	12.013
NB1380	B	24HR100YR	11.664	12.795
NB1390	B	24HR100YR	35.328	12.341
NB1400	B	24HR100YR	11.152	12.819
NB1410	B	24HR100YR	11.616	12.804
NB1415	B	24HR100YR	24.884	12.242
NB1420	B	24HR100YR	26.868	12.210
NB1430	B	24HR100YR	31.080	12.300
NB1440	B	24HR100YR	11.875	12.806
NB1450	B	24HR100YR	15.953	12.089
NB1460	B	24HR100YR	15.956	12.819
NB1470	B	24HR100YR	16.407	12.822
NB1473	B	24HR100YR	16.502	12.844
NB1475	B	24HR100YR	17.542	13.040
NB1480	B	24HR100YR	17.867	13.111
NB1490	B	24HR100YR	18.980	12.336
NB1500	B	24HR100YR	28.606	12.337
NB1510	B	24HR100YR	20.198	12.795
NB1520	B	24HR100YR	20.606	12.773
NB1530	B	24HR100YR	31.122	12.012
NB1540	B	24HR100YR	20.218	12.795
NB1550	B	24HR100YR	20.541	12.777
NB1560	B	24HR100YR	20.659	12.771
NB1570	B	24HR100YR	21.910	12.762
NB1580	B	24HR100YR	21.960	12.767
NB1590	B	24HR100YR	23.161	12.716
NB1600	B	24HR100YR	24.281	12.713
NB1610	B	24HR100YR	36.529	12.265
NB1615	B	24HR100YR	30.822	12.176
NB1620	B	24HR100YR	32.979	12.169
NB1630	B	24HR100YR	36.161	12.018
NB1640	B	24HR100YR	38.091	12.243
NB1645	B	24HR100YR	35.991	12.325
NB1650	B	24HR100YR	41.396	12.346
NB1660	B	24HR100YR	39.914	12.315
NB1670	B	24HR100YR	47.150	12.355
NB1680	B	24HR100YR	48.012	12.354
NB1690	B	24HR100YR	58.848	12.721
NC2000	C	24HR100YR	2.648	12.839
NC2010	C	24HR100YR	4.828	12.261
NC2020	C	24HR100YR	6.299	12.198

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NC2030	C	24HR100YR	6.904	12.197
NC2040	C	24HR100YR	15.298	12.184
NC2050	C	24HR100YR	8.072	12.206
NC2055	C	24HR100YR	10.258	12.236
NC2060	C	24HR100YR	11.291	12.035
NC2070	C	24HR100YR	12.375	12.217
NC2080	C	24HR100YR	12.496	12.222
NC2090	C	24HR100YR	12.469	12.220
NC2100	C	24HR100YR	12.906	12.187
NC2110	C	24HR100YR	16.156	12.242
NC2120	C	24HR100YR	23.193	12.441
NC2130	C	24HR100YR	22.355	12.231
NC2140	C	24HR100YR	25.613	12.320
NC2150	C	24HR100YR	25.901	12.220
NC2160	C	24HR100YR	26.656	12.218
NC2165	C	24HR100YR	28.240	12.261
NC2170	C	24HR100YR	31.611	12.245
NC2175	C	24HR100YR	34.204	12.242
NC2180	C	24HR100YR	35.737	12.223
NC2190	C	24HR100YR	39.827	12.137
NC2200	C	24HR100YR	42.732	13.255
NC2210	C	24HR100YR	43.935	13.370
NC2220	C	24HR100YR	43.946	13.206
NC2230	C	24HR100YR	44.744	13.575
NC2240	C	24HR100YR	44.593	12.990
NC2500	C	24HR100YR	5.654	12.368
NC2510	C	24HR100YR	9.869	12.261
NC2520	C	24HR100YR	13.751	12.092
NC2530	C	24HR100YR	9.234	12.361
NC2540	C	24HR100YR	11.472	12.364
NC2545	C	24HR100YR	13.120	12.382
NC2550	C	24HR100YR	13.283	12.269
NC2560	C	24HR100YR	15.680	12.335
NC2565	C	24HR100YR	16.059	12.375
NC2570	C	24HR100YR	19.534	12.338
NC2575	C	24HR100YR	35.559	12.350
NC2580	C	24HR100YR	36.048	12.335
NC2590	C	24HR100YR	39.213	12.420
NC2600	C	24HR100YR	47.178	12.418
NC2610	C	24HR100YR	16.518	12.421
NC2620	C	24HR100YR	37.610	12.397

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NC2630	C	24HR100YR	20.665	12.435
ND3000	D	24HR100YR	14.703	12.537
ND3010	D	24HR100YR	17.387	12.279
ND3020	D	24HR100YR	22.527	12.240
ND3025	D	24HR100YR	23.806	12.241
ND3027	D	24HR100YR	28.091	12.252
ND3030	D	24HR100YR	28.318	12.231
ND3040	D	24HR100YR	25.597	12.206
ND3050	D	24HR100YR	32.535	12.280
ND3060	D	24HR100YR	25.572	12.422
ND3070	D	24HR100YR	33.814	12.255
ND3075	D	24HR100YR	33.976	12.262
ND3080	D	24HR100YR	38.316	12.292
ND3090	D	24HR100YR	34.709	12.267
ND3093	D	24HR100YR	35.365	12.263
ND3095	D	24HR100YR	37.171	12.264
ND3100	D	24HR100YR	37.935	12.229
ND3105	D	24HR100YR	38.439	12.257
ND3110	D	24HR100YR	39.476	12.282
ND3120	D	24HR100YR	42.178	12.279
ND3130	D	24HR100YR	36.665	12.220
ND3135	D	24HR100YR	38.020	12.274
ND3140	D	24HR100YR	38.175	12.268
ND3150	D	24HR100YR	38.642	12.315
ND3155	D	24HR100YR	39.107	12.323
ND3157	D	24HR100YR	40.750	12.338
ND3160	D	24HR100YR	40.766	12.339
ND3170	D	24HR100YR	42.570	12.331
ND3175	D	24HR100YR	42.840	12.339
ND3180	D	24HR100YR	43.382	12.345
ND3190	D	24HR100YR	41.984	12.296
ND3195	D	24HR100YR	42.918	12.307
ND3200	D	24HR100YR	43.039	12.288
ND3210	D	24HR100YR	43.593	12.342
ND3220	D	24HR100YR	44.094	12.363
NE4000	E	24HR100YR	20.785	12.757
NE4010	E	24HR100YR	20.772	12.750
NE4015	E	24HR100YR	20.933	12.732
NE4017	E	24HR100YR	21.688	12.615
NE4020	E	24HR100YR	20.810	12.737
NE4030	E	24HR100YR	22.077	12.345

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NE4040	E	24HR100YR	24.843	12.361
NE4045	E	24HR100YR	20.754	12.752
NE4050	E	24HR100YR	20.733	12.754
NE4060	E	24HR100YR	20.769	12.741
NE4070	E	24HR100YR	20.750	12.743
NE4080	E	24HR100YR	33.837	12.425
NE4090	E	24HR100YR	24.447	12.163
NE4095	E	24HR100YR	25.029	12.177
NE4100	E	24HR100YR	29.518	12.252
NE4105	E	24HR100YR	32.211	12.377
NE4110	E	24HR100YR	35.453	12.360
NE4115	E	24HR100YR	37.528	12.368
NE4117	E	24HR100YR	44.016	12.258
NE4120	E	24HR100YR	44.383	12.221
NE4130	E	24HR100YR	44.260	12.209
NE4140	E	24HR100YR	46.768	12.310
NE4150	E	24HR100YR	25.261	12.383
NE4160	E	24HR100YR	35.443	12.354
NE4170	E	24HR100YR	36.088	12.218
NE4180	E	24HR100YR	39.737	12.299
NE5000	E	24HR100YR	23.593	12.635
NE5010	E	24HR100YR	27.063	12.364
NE5020	E	24HR100YR	44.062	12.177
NE5030	E	24HR100YR	55.510	12.168
NE5040	E	24HR100YR	34.344	12.397
NE5050	E	24HR100YR	34.648	12.043
NE5060	E	24HR100YR	37.404	12.414
NE5070	E	24HR100YR	40.754	12.435
NE5080	E	24HR100YR	44.797	12.471
NE5085	E	24HR100YR	45.403	12.389
NE5090	E	24HR100YR	46.870	12.333
NE5100	E	24HR100YR	47.486	12.253
NE5110	E	24HR100YR	47.748	12.356
NE5120	E	24HR100YR	53.752	12.413
NE5130	E	24HR100YR	55.385	12.349
NE5140	E	24HR100YR	56.010	12.339
NE5150	E	24HR100YR	60.191	12.329
NE5155	E	24HR100YR	63.738	12.347
NE5160	E	24HR100YR	65.185	12.384
NE5170	E	24HR100YR	64.648	15.871
NE5180	E	24HR100YR	64.421	12.325

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NE5190	E	24HR100YR	61.638	12.084
NE5500	E	24HR100YR	54.707	12.334
NE5510	E	24HR100YR	56.589	12.295
NE5520	E	24HR100YR	64.359	12.382
NE5530	E	24HR100YR	64.362	12.378
NF0185	F	24HR100YR	41.779	20.456
NF0190	F	24HR100YR	42.443	20.456
NF0195	F	24HR100YR	42.419	20.439
NF0200	F	24HR100YR	42.514	20.384
NF0210	F	24HR100YR	43.256	18.664
NF0220	F	24HR100YR	44.308	16.747
NF0230	F	24HR100YR	44.347	16.731
NF0233	F	24HR100YR	44.433	13.327
NF0240	F	24HR100YR	45.178	16.612
NF0245	F	24HR100YR	45.136	16.611
NF0250	F	24HR100YR	45.210	16.610
NF0260	F	24HR100YR	45.553	16.194
NF0270	F	24HR100YR	45.578	16.172
NF0280	F	24HR100YR	46.126	15.522
NF6000	F	24HR100YR	44.927	12.229
NF6010	F	24HR100YR	47.569	12.232
NF6020	F	24HR100YR	50.090	12.242
NF6030	F	24HR100YR	50.581	12.288
NF6040	F	24HR100YR	48.724	12.339
NF6045	F	24HR100YR	58.303	12.114
NF6050	F	24HR100YR	62.872	12.350
NF6060	F	24HR100YR	64.205	12.170
NF6070	F	24HR100YR	64.243	12.508
NF6080	F	24HR100YR	62.022	12.089
NF6090	F	24HR100YR	55.230	12.254
NF6100	F	24HR100YR	55.513	12.253
NF6105	F	24HR100YR	62.052	12.304
NF6110	F	24HR100YR	66.564	12.252
NF6120	F	24HR100YR	59.927	12.712
NF6130	F	24HR100YR	66.085	12.546
NF6140	F	24HR100YR	64.952	12.250
NF6200	F	24HR100YR	43.418	12.527
NF6205	F	24HR100YR	45.003	12.489
NF6207	F	24HR100YR	58.209	12.586
NF6210	F	24HR100YR	58.694	12.330
NF6220	F	24HR100YR	59.969	12.587

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NF6225	F	24HR100YR	62.449	12.561
NF6230	F	24HR100YR	65.167	12.553
NF6240	F	24HR100YR	66.116	12.570
NF6250	F	24HR100YR	62.410	12.513
NF6260	F	24HR100YR	45.361	12.423
NF6270	F	24HR100YR	45.215	12.363
NF6280	F	24HR100YR	50.245	12.369
NF6300	F	24HR100YR	43.231	18.616
NF6310	F	24HR100YR	44.031	12.404
NF6320	F	24HR100YR	43.258	12.515
NF6330	F	24HR100YR	52.767	12.504
NF6335	F	24HR100YR	58.550	12.469
NF6337	F	24HR100YR	61.526	12.398
NF6340	F	24HR100YR	66.007	12.410
NF6350	F	24HR100YR	52.898	12.006
NF6365	F	24HR100YR	56.420	12.431
NF6370	F	24HR100YR	58.527	14.669
NF6380	F	24HR100YR	59.768	12.387
NF6390	F	24HR100YR	64.844	12.402
NF6400	F	24HR100YR	67.253	12.342
NF6410	F	24HR100YR	65.996	12.386
NF6420	F	24HR100YR	66.542	12.417
NF6430	F	24HR100YR	65.959	12.139
NF6440	F	24HR100YR	46.663	12.028
NF6450	F	24HR100YR	45.580	12.123
NF6460	F	24HR100YR	48.624	12.168
NF6505	F	24HR100YR	45.639	12.547
NF6507	F	24HR100YR	46.333	12.583
NF6509	F	24HR100YR	46.953	12.613
NF6510	F	24HR100YR	47.222	12.627
NF6513	F	24HR100YR	47.232	12.628
NF6515	F	24HR100YR	47.242	12.626
NF6520	F	24HR100YR	47.613	12.094
NF6530	F	24HR100YR	46.445	12.145
NF6540	F	24HR100YR	47.402	12.665
NF6550	F	24HR100YR	47.406	12.105
NF6560	F	24HR100YR	48.522	12.724
NF6570	F	24HR100YR	48.185	13.606
NF6600	F	24HR100YR	45.600	12.387
NF6610	F	24HR100YR	45.985	12.253
NF6620	F	24HR100YR	48.297	12.060

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NF6625	F	24HR100YR	48.521	12.071
NF6630	F	24HR100YR	50.071	12.181
NF6640	F	24HR100YR	49.809	12.181
NF6650	F	24HR100YR	44.218	15.946
NF6670	F	24HR100YR	52.207	12.003
NF6700	F	24HR100YR	45.211	16.610
NF6710	F	24HR100YR	53.163	12.344
NF6715	F	24HR100YR	58.698	12.292
NF6720	F	24HR100YR	60.211	12.278
NF6725	F	24HR100YR	63.989	12.296
NF6727	F	24HR100YR	67.073	12.227
NF6730	F	24HR100YR	69.491	12.133
NF6740	F	24HR100YR	53.178	12.346
NF6750	F	24HR100YR	59.669	12.252
NF6760	F	24HR100YR	59.586	12.254
NF6780	F	24HR100YR	65.330	12.344
NF6790	F	24HR100YR	67.822	12.117
NF6800	F	24HR100YR	45.315	13.043
NF6805	F	24HR100YR	60.394	12.511
NF6810	F	24HR100YR	62.117	12.507
NF6820	F	24HR100YR	47.405	12.425
NF6830	F	24HR100YR	46.768	13.547
NF6840	F	24HR100YR	45.537	16.205
NF6850	F	24HR100YR	45.556	16.203
NF6860	F	24HR100YR	47.245	12.189
NF6870	F	24HR100YR	48.455	12.442
NF6890	F	24HR100YR	45.958	15.572
NF6900	F	24HR100YR	50.008	12.339
NF6905	F	24HR100YR	47.440	12.366
NF6907	F	24HR100YR	49.550	12.278
NF6910	F	24HR100YR	51.836	12.270
NF6920	F	24HR100YR	47.952	12.349
NF6930	F	24HR100YR	47.617	12.342
NF6940	F	24HR100YR	57.757	90.000
NF6950	F	24HR100YR	65.217	12.161
NG0285	G	24HR100YR	48.692	14.942
NG0290	G	24HR100YR	49.579	14.942
NG0300	G	24HR100YR	49.659	14.815
NG0301	G	24HR100YR	49.698	14.766
NG7000	G	24HR100YR	49.889	12.557
NG7010	G	24HR100YR	49.653	12.532

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NG7020	G	24HR100YR	49.581	14.967
NG7030	G	24HR100YR	50.015	12.462
NG7040	G	24HR100YR	57.231	12.392
NG7050	G	24HR100YR	52.599	12.177
NG7060	G	24HR100YR	52.793	12.150
NG7070	G	24HR100YR	53.895	12.399
NG7080	G	24HR100YR	53.736	12.393
NG7090	G	24HR100YR	49.586	14.935
NG7100	G	24HR100YR	50.228	12.366
NG7110	G	24HR100YR	50.924	12.193
NG7120	G	24HR100YR	54.732	12.273
NG7130	G	24HR100YR	55.820	12.451
NG7140	G	24HR100YR	59.244	12.514
NG7150	G	24HR100YR	55.051	12.088
NG7160	G	24HR100YR	54.585	24.667
NG7170	G	24HR100YR	58.387	12.400
NG7180	G	24HR100YR	49.525	14.946
NG7190	G	24HR100YR	50.001	12.419
NG7200	G	24HR100YR	49.408	14.815
NG7205	G	24HR100YR	49.308	14.900
NG7210	G	24HR100YR	49.406	12.041
NG7220	G	24HR100YR	49.210	14.958
NG7223	G	24HR100YR	49.217	14.991
NG7225	G	24HR100YR	49.160	15.002
NG7230	G	24HR100YR	48.219	15.024
NG7240	G	24HR100YR	49.336	14.970
NG7250	G	24HR100YR	49.189	15.003
NG7260	G	24HR100YR	49.079	15.020
NG7270	G	24HR100YR	49.141	15.019
NG7280	G	24HR100YR	49.134	15.050
NG7290	G	24HR100YR	49.166	13.181
NG7300	G	24HR100YR	49.729	12.059
NG7310	G	24HR100YR	49.131	12.356
NG7400	G	24HR100YR	50.977	12.446
NG7410	G	24HR100YR	53.582	12.149
NG7420	G	24HR100YR	56.415	12.379
NG7430	G	24HR100YR	56.999	12.762
NG7440	G	24HR100YR	50.373	12.487
NG7450	G	24HR100YR	50.288	12.522
NG7460	G	24HR100YR	51.534	12.624
NG7470	G	24HR100YR	51.273	12.401

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NG7475	G	24HR100YR	55.871	12.433
NG7477	G	24HR100YR	56.645	12.418
NG7480	G	24HR100YR	57.049	12.283
NG7490	G	24HR100YR	57.069	12.443
NG7500	G	24HR100YR	57.145	12.433
NG7510	G	24HR100YR	56.825	12.446
NG7520	G	24HR100YR	52.376	22.648
NG7600	G	24HR100YR	49.612	14.836
NG7610	G	24HR100YR	49.598	14.861
NG7615	G	24HR100YR	53.810	12.252
NG7620	G	24HR100YR	56.011	12.251
NG7630	G	24HR100YR	60.734	12.137
NG7640	G	24HR100YR	61.107	12.138
NG7650	G	24HR100YR	57.335	12.252
NG7660	G	24HR100YR	52.484	12.337
NG7670	G	24HR100YR	52.661	12.294
NG7680	G	24HR100YR	54.760	12.295
NG7690	G	24HR100YR	54.761	12.299
NG7700	G	24HR100YR	55.178	12.295
NG7710	G	24HR100YR	52.461	12.343
NG7720	G	24HR100YR	52.373	12.859
NG7730	G	24HR100YR	52.666	12.702
NG7740	G	24HR100YR	52.523	12.889
NG7750	G	24HR100YR	53.437	12.774
NG7760	G	24HR100YR	54.358	12.595
NG7770	G	24HR100YR	57.593	12.608
NG7780	G	24HR100YR	58.951	12.450
NG7790	G	24HR100YR	53.473	12.627
NG7795	G	24HR100YR	54.448	12.569
NG7800	G	24HR100YR	54.909	12.593
NG7810	G	24HR100YR	54.870	12.608
NG7820	G	24HR100YR	54.840	12.545
NG7830	G	24HR100YR	54.789	12.543
NG7840	G	24HR100YR	54.710	12.543
NG7850	G	24HR100YR	56.636	12.267
NG7860	G	24HR100YR	58.318	12.268
NG7870	G	24HR100YR	54.918	12.581
NG7890	G	24HR100YR	58.575	12.286
NG7900	G	24HR100YR	59.621	12.253
NG7910	G	24HR100YR	60.986	12.287
NH0310	H	24HR100YR	49.833	14.529

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NH0320	H	24HR100YR	50.985	13.279
NH0340	H	24HR100YR	51.833	12.957
NH8000	H	24HR100YR	50.925	13.277
NH8010	H	24HR100YR	50.991	13.276
NH8020	H	24HR100YR	50.989	13.279
NH8030	H	24HR100YR	57.916	12.319
NH8040	H	24HR100YR	51.347	12.777
NH8050	H	24HR100YR	51.798	12.956
NH8100	H	24HR100YR	50.987	13.280
NH8110	H	24HR100YR	51.318	13.280
NH8120	H	24HR100YR	52.059	13.221
NH8125	H	24HR100YR	56.161	12.445
NH8127	H	24HR100YR	57.574	12.452
NH8129	H	24HR100YR	58.338	12.474
NH8130	H	24HR100YR	57.313	12.106
NH8140	H	24HR100YR	57.672	12.090
NH8150	H	24HR100YR	59.056	12.495
NH8160	H	24HR100YR	59.636	12.374
NH8170	H	24HR100YR	59.584	12.686
NH8180	H	24HR100YR	61.233	13.143
NH8190	H	24HR100YR	61.422	12.778
NH8200	H	24HR100YR	61.912	12.644
NH8210	H	24HR100YR	61.592	12.417
NH8220	H	24HR100YR	62.352	12.212
NH8230	H	24HR100YR	62.491	12.134
NH8240	H	24HR100YR	62.452	12.161
NH8250	H	24HR100YR	62.722	12.110
NH8260	H	24HR100YR	61.456	12.875
NH8270	H	24HR100YR	61.443	12.879
NH8280	H	24HR100YR	61.451	12.878
NH8290	H	24HR100YR	61.452	12.877
NH8300	H	24HR100YR	61.418	12.836
NH8310	H	24HR100YR	61.339	12.822
NH8400	H	24HR100YR	50.987	13.280
NH8410	H	24HR100YR	50.997	13.273
NH8420	H	24HR100YR	51.493	12.667
NH8430	H	24HR100YR	53.041	12.418
NH8440	H	24HR100YR	53.883	13.154
NH8500	H	24HR100YR	50.990	13.278
NH8510	H	24HR100YR	50.986	13.281
NH8520	H	24HR100YR	52.350	12.537

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NH8530	H	24HR100YR	55.797	12.172
NH8540	H	24HR100YR	55.201	12.171
NH8550	H	24HR100YR	58.876	12.157
NH8600	H	24HR100YR	51.932	12.930
NH8610	H	24HR100YR	52.123	12.886
NH8620	H	24HR100YR	52.444	12.407
NH8625	H	24HR100YR	52.898	12.360
NH8630	H	24HR100YR	53.606	12.171
NH8640	H	24HR100YR	52.767	12.327
NH8650	H	24HR100YR	52.839	12.314
NH8660	H	24HR100YR	54.542	12.332
NH8670	H	24HR100YR	55.771	12.351
NH8680	H	24HR100YR	52.779	12.867
NH9000	H	24HR100YR	51.956	12.932
NH9010	H	24HR100YR	52.792	12.173
NH9020	H	24HR100YR	52.447	12.818
NH9025	H	24HR100YR	52.793	12.816
NH9030	H	24HR100YR	52.445	12.820
NH9040	H	24HR100YR	52.538	12.775
NH9050	H	24HR100YR	53.308	12.304
NH9060	H	24HR100YR	52.815	13.563
NH9070	H	24HR100YR	56.874	12.226
NH9080	H	24HR100YR	52.956	12.178
NH9090	H	24HR100YR	54.672	12.101
NH9100	H	24HR100YR	58.322	12.180
NH9110	H	24HR100YR	57.021	12.049
NH9120	H	24HR100YR	58.796	12.285
NH9130	H	24HR100YR	58.788	12.239
NH9140	H	24HR100YR	54.389	12.129
NH9150	H	24HR100YR	56.005	12.174
NH9160	H	24HR100YR	56.754	12.113
NH9170	H	24HR100YR	57.718	12.053
NH9200	H	24HR100YR	52.871	12.808
NH9210	H	24HR100YR	52.991	12.793
NH9220	H	24HR100YR	53.283	12.739
NH9223	H	24HR100YR	53.399	12.748
NH9225	H	24HR100YR	53.501	12.758
NH9227	H	24HR100YR	53.554	12.740
NH9229	H	24HR100YR	53.565	12.863
NH9230	H	24HR100YR	53.918	12.608
NH9231	H	24HR100YR	53.838	12.625

NAME	GROUP	SIM	MXSTAGE	MXSTAGETM
NH9240	H	24HR100YR	54.585	12.546
NH9245	H	24HR100YR	54.778	12.521
NH9250	H	24HR100YR	54.863	12.489
NH9260	H	24HR100YR	56.953	12.409
NH9270	H	24HR100YR	60.338	12.391
NH9280	H	24HR100YR	60.934	12.871
NH9300	H	24HR100YR	53.659	13.023
NH9310	H	24HR100YR	53.677	13.027
NH9320	H	24HR100YR	53.315	12.730
NH9330	H	24HR100YR	53.922	12.605
NH9340	H	24HR100YR	54.791	12.522
NH9400	H	24HR100YR	53.687	13.018
NH9410	H	24HR100YR	53.683	13.023
NH9420	H	24HR100YR	53.702	13.004
NH9430	H	24HR100YR	53.693	13.014
NH9440	H	24HR100YR	53.696	13.048
NH9450	H	24HR100YR	54.046	12.311
NH9460	H	24HR100YR	55.102	12.324
NH9500	H	24HR100YR	53.695	13.021
NH9510	H	24HR100YR	53.700	13.015
NH9520	H	24HR100YR	53.690	13.017
NH9530	H	24HR100YR	53.682	13.001
NH9540	H	24HR100YR	53.700	12.982
NH9550	H	24HR100YR	53.713	12.907
NH9560	H	24HR100YR	53.782	12.331
NH9570	H	24HR100YR	53.995	12.152
NH9600	H	24HR100YR	53.623	12.992
NH9610	H	24HR100YR	53.668	12.939
NH9615	H	24HR100YR	53.653	12.965
NH9620	H	24HR100YR	53.635	12.986
NH9630	H	24HR100YR	53.674	13.017
NH9640	H	24HR100YR	53.691	13.049
NH9650	H	24HR100YR	54.413	12.347
NH9660	H	24HR100YR	53.704	13.003
NH9670	H	24HR100YR	55.647	12.349
NH9675	H	24HR100YR	55.463	12.346
NH9680	H	24HR100YR	55.231	12.332
NH9690	H	24HR100YR	55.516	12.288
NI1000	I	24HR100YR	36.414	12.388

Table C2 – 100-year/24-hour Peak Link Results

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA1000O	A	24HR100YR	0.000	0.000
RA1000P	A	24HR100YR	838.601	12.694
RA1000P2	A	24HR100YR	718.716	12.694
RA1000P3	A	24HR100YR	849.025	12.694
RA1010D	A	24HR100YR	10.817	12.141
RA1010O	A	24HR100YR	0.000	0.000
RA1020O	A	24HR100YR	35.341	12.023
RA1020P	A	24HR100YR	15.649	11.963
RA1030W	A	24HR100YR	2400.278	12.624
RA1040D	A	24HR100YR	42.371	12.628
RA1040O	A	24HR100YR	220.472	12.628
RA1050O	A	24HR100YR	88.180	12.597
RA1050P	A	24HR100YR	1949.518	12.546
RA1055C	A	24HR100YR	1940.821	12.538
RA1060C	A	24HR100YR	1919.977	12.498
RA1065P	A	24HR100YR	45.338	12.087
RA1070O	A	24HR100YR	0.036	12.438
RA1070O2	A	24HR100YR	16.410	12.438
RA1070P	A	24HR100YR	45.590	12.089
RA1080O	A	24HR100YR	4.521	12.503
RA1080O2	A	24HR100YR	21.490	12.503
RA1080P	A	24HR100YR	19.457	11.997
RA1090O	A	24HR100YR	0.000	0.000
RA1090O2	A	24HR100YR	174.965	12.653
RA1090O3	A	24HR100YR	0.000	0.000
RA1090P	A	24HR100YR	12.138	19.280
RA1100O	A	24HR100YR	13.575	12.167
RA1100P	A	24HR100YR	20.743	12.167
RA1110D	A	24HR100YR	11.779	13.914
RA1110O	A	24HR100YR	21.089	12.669
RA1120C	A	24HR100YR	1842.115	12.493
RA1140D	A	24HR100YR	13.032	12.106
RA1140O	A	24HR100YR	18.179	12.106
RA1150O	A	24HR100YR	115.603	12.266
RA1150P	A	24HR100YR	66.336	12.266
RA1150P2	A	24HR100YR	45.915	12.266
RA1160O	A	24HR100YR	142.003	12.261
RA1160P	A	24HR100YR	77.885	12.261
RA1170D	A	24HR100YR	50.268	15.497
RA1170O	A	24HR100YR	134.603	12.265

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA1180O	A	24HR100YR	81.607	13.446
RA1180P	A	24HR100YR	9.642	13.446
RA1190O	A	24HR100YR	23.539	12.370
RA1190O2	A	24HR100YR	0.000	0.000
RA1190P	A	24HR100YR	12.620	12.189
RA1190P2	A	24HR100YR	35.891	12.395
RA1200O	A	24HR100YR	424.263	12.425
RA1200O2	A	24HR100YR	0.000	0.000
RA1200P	A	24HR100YR	7.270	12.132
RA1210O	A	24HR100YR	402.079	12.433
RA1210O2	A	24HR100YR	0.000	0.000
RA1210P	A	24HR100YR	4.831	12.177
RA1210P2	A	24HR100YR	23.938	11.600
RA1215W	A	24HR100YR	2.437	12.250
RA1215W2	A	24HR100YR	10.282	12.250
RA1220D	A	24HR100YR	12.719	12.247
RA1220O	A	24HR100YR	0.000	0.000
RA1225C	A	24HR100YR	736.864	12.385
RA1230C	A	24HR100YR	742.336	12.399
RA1240O	A	24HR100YR	44.201	12.459
RA1240O2	A	24HR100YR	2.827	12.432
RA1240O3	A	24HR100YR	0.000	0.000
RA1240W	A	24HR100YR	11.019	12.499
RA1250D	A	24HR100YR	0.259	12.084
RA1250O	A	24HR100YR	3.737	12.084
RA1250O2	A	24HR100YR	24.317	12.084
RA2000O	A	24HR100YR	828.923	12.405
RA2000O2	A	24HR100YR	94.294	12.412
RA2000O3	A	24HR100YR	0.000	0.000
RA2000P	A	24HR100YR	75.270	26.397
RA2010O	A	24HR100YR	441.087	12.400
RA2010P	A	24HR100YR	39.832	26.400
RA2010P2	A	24HR100YR	39.653	26.400
RA2020O	A	24HR100YR	417.376	15.788
RA2020O2	A	24HR100YR	388.254	12.398
RA2020O3	A	24HR100YR	0.000	0.000
RA2020O4	A	24HR100YR	50.397	12.398
RA2020P	A	24HR100YR	78.409	15.786
RA2030O	A	24HR100YR	691.096	15.789
RA2030P	A	24HR100YR	71.638	15.788
RA2035P	A	24HR100YR	36.418	13.853
RA2040O	A	24HR100YR	29.106	12.075
RA2040P	A	24HR100YR	16.247	23.233

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA2050O	A	24HR100YR	18.729	12.109
RA2050O2	A	24HR100YR	21.692	12.109
RA2050O3	A	24HR100YR	0.718	12.109
RA2050P	A	24HR100YR	3.894	11.452
RA2060D	A	24HR100YR	12.238	25.209
RA2060O	A	24HR100YR	28.277	12.078
RA2060O2	A	24HR100YR	16.715	12.273
RA2065P	A	24HR100YR	115.193	11.376
RA2070D	A	24HR100YR	11.661	12.005
RA2070D2	A	24HR100YR	1.002	11.579
RA2070O	A	24HR100YR	61.851	12.096
RA2100O	A	24HR100YR	687.207	15.781
RA2100O2	A	24HR100YR	0.000	0.000
RA2100P	A	24HR100YR	41.250	25.604
RA2105P	A	24HR100YR	37.014	27.705
RA2110O	A	24HR100YR	203.143	15.893
RA2110P	A	24HR100YR	32.276	28.166
RA2113P	A	24HR100YR	33.504	20.410
RA2115P	A	24HR100YR	34.936	28.116
RA2120D	A	24HR100YR	3.311	12.265
RA2120O	A	24HR100YR	0.000	0.000
RA2130O	A	24HR100YR	2.346	16.074
RA2130P	A	24HR100YR	33.461	27.609
RA2131P	A	24HR100YR	39.932	16.086
RA2132P	A	24HR100YR	25.829	16.059
RA2133P	A	24HR100YR	9.509	27.548
RA2133P2	A	24HR100YR	25.829	16.040
RA2135P	A	24HR100YR	14.190	11.807
RA2140O	A	24HR100YR	54.585	15.181
RA2140O2	A	24HR100YR	72.574	16.064
RA2140P	A	24HR100YR	14.103	16.022
RA2150O	A	24HR100YR	45.243	15.090
RA2150O2	A	24HR100YR	48.324	15.579
RA2150P	A	24HR100YR	8.039	13.285
RA2160O	A	24HR100YR	114.626	15.195
RA2160O2	A	24HR100YR	80.515	15.846
RA2160O3	A	24HR100YR	0.072	21.261
RA2160P	A	24HR100YR	11.402	11.682
RA2170O	A	24HR100YR	93.378	15.086
RA2170P	A	24HR100YR	34.124	28.363
RA2180O	A	24HR100YR	10.928	15.009
RA2180O2	A	24HR100YR	0.650	14.905
RA2180O3	A	24HR100YR	12.019	16.068

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA2180P	A	24HR100YR	27.881	12.383
RA2185P	A	24HR100YR	41.057	11.908
RA2187P	A	24HR100YR	44.340	11.914
RA2190O	A	24HR100YR	20.923	12.380
RA2190P	A	24HR100YR	23.418	11.897
RA2200O	A	24HR100YR	22.519	15.343
RA2200P	A	24HR100YR	18.268	14.753
RA2210O	A	24HR100YR	4.012	12.946
RA2210O2	A	24HR100YR	34.580	12.448
RA2210O3	A	24HR100YR	43.910	12.448
RA2210P	A	24HR100YR	22.009	11.922
RA2220O	A	24HR100YR	0.000	0.000
RA2220O2	A	24HR100YR	23.358	16.099
RA2220O3	A	24HR100YR	0.000	0.000
RA2220P	A	24HR100YR	25.355	30.011
RA2220P2	A	24HR100YR	9.161	28.370
RA2230O	A	24HR100YR	7.988	12.797
RA2230O2	A	24HR100YR	1.867	20.293
RA2230O3	A	24HR100YR	0.000	0.000
RA2230W	A	24HR100YR	18.672	12.122
RA2230W2	A	24HR100YR	10.185	12.168
RA2230W3	A	24HR100YR	0.239	12.748
RA2230W4	A	24HR100YR	0.239	12.748
RA2240O	A	24HR100YR	88.256	16.076
RA2240O2	A	24HR100YR	0.000	0.000
RA2240O3	A	24HR100YR	0.922	12.081
RA2240P	A	24HR100YR	3.455	12.047
RA2240P2	A	24HR100YR	9.712	17.906
RA2300O	A	24HR100YR	66.864	14.985
RA2300W	A	24HR100YR	30.437	12.252
RA2305P	A	24HR100YR	54.908	12.222
RA2307P	A	24HR100YR	54.922	12.221
RA2310O	A	24HR100YR	0.000	0.000
RA2310O2	A	24HR100YR	88.618	16.081
RA2310P	A	24HR100YR	42.534	12.002
RA2320O	A	24HR100YR	11.697	12.098
RA2320P	A	24HR100YR	31.886	12.086
RA2330D	A	24HR100YR	7.394	12.361
RA2330O	A	24HR100YR	1.672	12.158
RA2340O	A	24HR100YR	0.000	0.000
RA2340O2	A	24HR100YR	254.688	15.708
RA2340O3	A	24HR100YR	103.826	15.708
RA2340P	A	24HR100YR	18.329	12.368

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA2400O	A	24HR100YR	491.132	15.654
RA2400P	A	24HR100YR	7.345	27.610
RA2410D	A	24HR100YR	11.654	11.999
RA2410O	A	24HR100YR	305.045	12.387
RA2410O2	A	24HR100YR	0.000	0.000
RA3000C	A	24HR100YR	437.401	12.491
RA3010C	A	24HR100YR	172.746	12.405
RA3020C	A	24HR100YR	330.180	12.398
RA3030C	A	24HR100YR	294.530	15.460
RA3040O	A	24HR100YR	73.889	12.362
RA3040O2	A	24HR100YR	1.888	12.363
RA3040P	A	24HR100YR	6.036	10.558
RA3050D	A	24HR100YR	1.541	25.613
RA3050O	A	24HR100YR	95.130	12.338
RA3050O2	A	24HR100YR	1.112	12.338
RA3060O	A	24HR100YR	151.968	12.360
RA3060O2	A	24HR100YR	21.196	11.953
RA3060W	A	24HR100YR	0.937	12.051
RA3070O	A	24HR100YR	0.000	0.000
RA3070O2	A	24HR100YR	48.339	12.324
RA3070O3	A	24HR100YR	0.000	0.000
RA3070P	A	24HR100YR	65.253	12.254
RA3080O	A	24HR100YR	27.214	12.212
RA3080O2	A	24HR100YR	4.421	12.212
RA3080P	A	24HR100YR	46.199	13.256
RA3083P	A	24HR100YR	20.448	12.379
RA3085P	A	24HR100YR	35.651	12.239
RA3090O	A	24HR100YR	15.121	12.212
RA3090P	A	24HR100YR	36.247	12.012
RA3100O	A	24HR100YR	0.000	0.000
RA3100P	A	24HR100YR	17.172	12.135
RA3110O	A	24HR100YR	42.757	12.281
RA3110O2	A	24HR100YR	0.257	12.822
RA3110P	A	24HR100YR	13.689	15.140
RA3120O	A	24HR100YR	49.424	12.336
RA3120P	A	24HR100YR	13.226	13.664
RA3130D	A	24HR100YR	6.487	11.867
RA3130O	A	24HR100YR	2.362	12.354
RA3140D	A	24HR100YR	8.081	12.063
RA3140O	A	24HR100YR	7.005	12.312
RA3140O2	A	24HR100YR	0.303	12.275
RA3200O	A	24HR100YR	0.000	0.000
RA3200O2	A	24HR100YR	229.573	15.379

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA3200P	A	24HR100YR	237.463	15.416
RA3200P2	A	24HR100YR	237.463	15.416
RA3210O	A	24HR100YR	440.495	15.367
RA3210O2	A	24HR100YR	192.347	15.323
RA3210O3	A	24HR100YR	113.079	15.377
RA3210P	A	24HR100YR	10.085	11.648
RA3220C	A	24HR100YR	256.306	15.323
RA3220O	A	24HR100YR	609.778	15.341
RA3225P	A	24HR100YR	12.926	12.476
RA3230O	A	24HR100YR	0.000	0.000
RA3230O2	A	24HR100YR	7.178	15.499
RA3230P	A	24HR100YR	12.931	12.476
RA3240O	A	24HR100YR	232.911	15.315
RA3240O2	A	24HR100YR	18.373	16.161
RA3240P	A	24HR100YR	127.799	15.244
RA3240P2	A	24HR100YR	127.799	15.244
RA3250D	A	24HR100YR	15.274	11.798
RA3250O	A	24HR100YR	352.747	15.316
RA3250O2	A	24HR100YR	0.000	0.000
RA3260O	A	24HR100YR	15.734	12.367
RA3260O2	A	24HR100YR	0.000	0.000
RA3260O3	A	24HR100YR	28.009	15.294
RA3260O4	A	24HR100YR	88.293	15.294
RA3260P	A	24HR100YR	29.778	14.356
RA3265P	A	24HR100YR	10.015	11.580
RA3270O	A	24HR100YR	137.225	15.336
RA3270O2	A	24HR100YR	2.501	12.261
RA3270O3	A	24HR100YR	37.448	15.336
RA3270O4	A	24HR100YR	6.321	15.336
RA3270P	A	24HR100YR	10.878	11.545
RA3280C	A	24HR100YR	385.061	15.196
RA3280O	A	24HR100YR	129.335	15.278
RA3290O	A	24HR100YR	133.625	15.386
RA3290P	A	24HR100YR	66.061	24.365
RA3290P2	A	24HR100YR	66.061	24.365
RA3295C	A	24HR100YR	160.401	12.715
RA3300C	A	24HR100YR	76.825	12.573
RA3300O	A	24HR100YR	667.824	15.218
RA3305P	A	24HR100YR	20.323	11.942
RA3307P	A	24HR100YR	12.036	27.779
RA3310O	A	24HR100YR	24.435	25.209
RA3310O2	A	24HR100YR	0.000	0.000
RA3310O3	A	24HR100YR	679.439	15.123

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA3310P	A	24HR100YR	12.884	27.744
RA3320O	A	24HR100YR	288.519	15.097
RA3320P	A	24HR100YR	12.374	12.091
RA3325P	A	24HR100YR	12.025	11.987
RA3330O	A	24HR100YR	325.636	15.033
RA3330P	A	24HR100YR	16.131	2.631
RA3400C	A	24HR100YR	115.335	11.994
RA3405P	A	24HR100YR	107.696	12.355
RA3410O	A	24HR100YR	24.635	12.626
RA3410P	A	24HR100YR	31.580	25.889
RA3420O	A	24HR100YR	64.439	12.177
RA3420P	A	24HR100YR	31.443	25.893
RA3425P	A	24HR100YR	26.957	12.344
RA3430D	A	24HR100YR	23.260	11.763
RA3430O	A	24HR100YR	27.052	12.483
RA3430O2	A	24HR100YR	0.118	15.222
RA3440O	A	24HR100YR	30.612	12.506
RA3440P	A	24HR100YR	8.946	12.506
RA3450O	A	24HR100YR	6.222	25.079
RA3450O2	A	24HR100YR	98.311	12.463
RA3450P	A	24HR100YR	24.042	26.336
RA3460O	A	24HR100YR	5.968	12.045
RA3460P	A	24HR100YR	5.099	12.001
RA3470D	A	24HR100YR	23.178	12.538
RA3470O	A	24HR100YR	0.000	0.000
RA3475P	A	24HR100YR	4.395	26.842
RA3480O	A	24HR100YR	0.000	0.000
RA3480O2	A	24HR100YR	0.161	15.109
RA3480P	A	24HR100YR	4.192	26.831
RA3490O	A	24HR100YR	98.891	12.331
RA3490O2	A	24HR100YR	39.979	12.443
RA3490O3	A	24HR100YR	21.758	13.098
RA3490O4	A	24HR100YR	13.148	14.986
RA3490P	A	24HR100YR	2.387	26.563
RA3500O	A	24HR100YR	60.958	21.257
RA3500O2	A	24HR100YR	55.259	15.216
RA3510O	A	24HR100YR	50.568	13.243
RA3510O2	A	24HR100YR	114.230	12.313
RA3600O	A	24HR100YR	75.654	12.673
RA3600P	A	24HR100YR	110.951	12.365
RA3610C	A	24HR100YR	137.547	12.327
RA3620C	A	24HR100YR	133.954	12.429
RA3630D	A	24HR100YR	22.978	12.034

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA3630O	A	24HR100YR	36.858	12.408
RA3640O	A	24HR100YR	1.713	12.373
RA3640O2	A	24HR100YR	17.883	12.689
RA3640P	A	24HR100YR	6.233	11.698
RA3650O	A	24HR100YR	17.768	12.498
RA3650O2	A	24HR100YR	37.543	12.498
RA3650O3	A	24HR100YR	0.608	12.498
RA3650O4	A	24HR100YR	0.404	13.545
RA3650P	A	24HR100YR	6.021	11.967
RA3660O	A	24HR100YR	30.893	11.975
RA3660O2	A	24HR100YR	0.000	0.000
RA3660P	A	24HR100YR	7.062	11.647
RA3670O	A	24HR100YR	12.344	11.981
RA3670O2	A	24HR100YR	29.625	12.488
RA3670O3	A	24HR100YR	0.000	0.000
RA3670P	A	24HR100YR	11.303	0.000
RA4000D	A	24HR100YR	16.729	8.891
RA4000O	A	24HR100YR	26.274	12.747
RA4000O2	A	24HR100YR	226.548	12.747
RA4000W	A	24HR100YR	14.482	12.747
RA4010O	A	24HR100YR	18.099	12.984
RA4010O2	A	24HR100YR	0.527	12.328
RA4010P	A	24HR100YR	1.770	12.984
RA4010P2	A	24HR100YR	1.792	12.984
RA4020C	A	24HR100YR	237.418	12.758
RA4030C	A	24HR100YR	192.159	12.824
RA4040O	A	24HR100YR	13.242	13.169
RA4050O	A	24HR100YR	199.651	12.655
RA4050P	A	24HR100YR	19.920	17.225
RA4050P2	A	24HR100YR	19.920	17.225
RA4055P	A	24HR100YR	26.843	12.428
RA4060D	A	24HR100YR	13.994	12.689
RA4060O	A	24HR100YR	89.450	12.610
RA4060O2	A	24HR100YR	1.186	12.610
RA4070D	A	24HR100YR	24.982	11.968
RA4070O	A	24HR100YR	0.000	0.000
RA4070O2	A	24HR100YR	32.350	12.349
RA4070O3	A	24HR100YR	19.100	12.349
RA4080D	A	24HR100YR	22.001	12.108
RA4080D2	A	24HR100YR	20.332	11.928
RA4080O	A	24HR100YR	0.052	12.301
RA4090D	A	24HR100YR	15.203	12.143
RA4090D2	A	24HR100YR	7.230	12.037

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA4090O	A	24HR100YR	4.718	12.220
RA4100D	A	24HR100YR	8.562	12.607
RA4100O	A	24HR100YR	3.989	12.236
RA4110D	A	24HR100YR	16.956	12.030
RA4110O	A	24HR100YR	62.494	12.075
RA4120D	A	24HR100YR	27.875	12.078
RA4120O	A	24HR100YR	75.273	12.078
RA4130D	A	24HR100YR	26.851	12.084
RA4130O	A	24HR100YR	0.000	0.000
RA4130O2	A	24HR100YR	8.954	12.084
RA4130O3	A	24HR100YR	15.796	12.084
RA4140D	A	24HR100YR	4.561	21.050
RA4140O	A	24HR100YR	51.065	12.185
RA4145P	A	24HR100YR	13.430	11.998
RA4150O	A	24HR100YR	0.422	12.233
RA4150O2	A	24HR100YR	48.126	12.233
RA4150O3	A	24HR100YR	45.419	12.233
RA4150O4	A	24HR100YR	0.000	0.000
RA4150P	A	24HR100YR	9.778	10.520
RA4155P	A	24HR100YR	39.266	12.203
RA4157P	A	24HR100YR	28.454	12.161
RA4159P	A	24HR100YR	12.550	15.140
RA4160O	A	24HR100YR	25.433	12.348
RA4160O2	A	24HR100YR	0.000	0.000
RA4160O3	A	24HR100YR	0.000	0.000
RA4160P	A	24HR100YR	12.548	15.128
RA4160P2	A	24HR100YR	8.000	12.000
RA4170D	A	24HR100YR	0.321	12.504
RA4170O	A	24HR100YR	31.618	12.357
RA4170O2	A	24HR100YR	0.000	0.000
RA4170O3	A	24HR100YR	0.000	0.000
RA4180O	A	24HR100YR	0.000	0.000
RA4180O2	A	24HR100YR	36.368	12.166
RA4180P	A	24HR100YR	7.599	11.775
RA4190O	A	24HR100YR	0.000	0.000
RA4190O2	A	24HR100YR	2.410	12.112
RA4190P	A	24HR100YR	24.968	12.066
RA4200O	A	24HR100YR	0.000	0.000
RA4200P	A	24HR100YR	20.343	15.845
RA4210O	A	24HR100YR	0.000	0.000
RA4210P	A	24HR100YR	7.289	12.891
RA4210P2	A	24HR100YR	7.356	12.890
RA4210P3	A	24HR100YR	2.976	12.906

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RA4220D	A	24HR100YR	6.607	12.207
RA4220O	A	24HR100YR	40.628	12.255
RA5000O	A	24HR100YR	126.059	12.670
RA5000P	A	24HR100YR	10.950	12.729
RA5005P	A	24HR100YR	27.145	12.035
RA5010O	A	24HR100YR	97.878	12.458
RA5010P	A	24HR100YR	27.490	12.052
RA5020O	A	24HR100YR	0.000	0.000
RA5020O2	A	24HR100YR	17.847	12.199
RA5020O3	A	24HR100YR	89.715	12.199
RA5020P	A	24HR100YR	8.118	10.812
RA5030O	A	24HR100YR	57.102	12.189
RA5030O2	A	24HR100YR	0.017	12.189
RA5030P	A	24HR100YR	9.509	13.232
RB0010C	B	24HR100YR	4797.933	12.840
RB0020C	B	24HR100YR	4410.376	12.859
RB0030C	B	24HR100YR	3869.939	12.914
RB0035C	B	24HR100YR	3852.962	12.894
RB0036P	B	24HR100YR	916.155	13.456
RB0036P2	B	24HR100YR	915.733	13.456
RB0036P3	B	24HR100YR	915.733	13.456
RB0040C	B	24HR100YR	2730.639	13.436
RB0040O	B	24HR100YR	89.682	12.926
RB0040O2	B	24HR100YR	717.393	12.942
RB0040O3	B	24HR100YR	118.549	12.926
RB0045C	B	24HR100YR	2410.218	12.333
RB0050C	B	24HR100YR	3537.254	12.884
RB0051P	B	24HR100YR	7.426	12.367
RB0060C	B	24HR100YR	3093.172	12.838
RB0065C	B	24HR100YR	3404.918	12.767
RB0070O	B	24HR100YR	315.963	12.733
RB0070O2	B	24HR100YR	597.898	12.790
RB0070P	B	24HR100YR	1761.442	12.058
RB0080O	B	24HR100YR	1044.484	12.799
RB0080P	B	24HR100YR	2070.709	12.228
RB0090C	B	24HR100YR	1495.227	12.580
RB0100C	B	24HR100YR	1677.609	12.851
RB0110C	B	24HR100YR	2255.026	12.791
RB0120C	B	24HR100YR	882.810	11.998
RB0130O	B	24HR100YR	178.830	12.523
RB0130P	B	24HR100YR	1032.442	12.007
RB0135C	B	24HR100YR	1233.205	12.891
RB0140C	B	24HR100YR	661.266	12.609

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RB0150C	B	24HR100YR	659.407	12.902
RB0157P	B	24HR100YR	29.422	12.272
RB0160C	B	24HR100YR	1017.770	12.845
RB0170C	B	24HR100YR	904.322	12.841
RB0175C	B	24HR100YR	644.669	20.327
RB0180W	B	24HR100YR	644.642	20.096
RB1000O	B	24HR100YR	11.825	12.552
RB1000P	B	24HR100YR	8.611	12.552
RB1010O	B	24HR100YR	38.178	12.109
RB1010O2	B	24HR100YR	0.959	12.109
RB1010O3	B	24HR100YR	13.805	12.109
RB1010P	B	24HR100YR	4.440	12.109
RB1020O	B	24HR100YR	10.017	12.093
RB1020O2	B	24HR100YR	26.735	12.093
RB1020P	B	24HR100YR	16.543	12.093
RB1030O	B	24HR100YR	8.893	12.258
RB1030P	B	24HR100YR	8.608	12.258
RB1040O	B	24HR100YR	6.328	12.151
RB1040O2	B	24HR100YR	0.963	12.151
RB1040P	B	24HR100YR	12.084	12.010
RB1050C	B	24HR100YR	87.098	0.721
RB1060O	B	24HR100YR	0.000	0.000
RB1060O2	B	24HR100YR	23.644	12.003
RB1060P	B	24HR100YR	38.403	12.003
RB1065P	B	24HR100YR	0.000	0.000
RB1070O	B	24HR100YR	0.000	0.000
RB1070O2	B	24HR100YR	20.113	12.259
RB1070P	B	24HR100YR	31.306	12.503
RB1070P2	B	24HR100YR	0.000	0.000
RB1080O	B	24HR100YR	17.975	12.070
RB1080O2	B	24HR100YR	10.114	12.070
RB1080P	B	24HR100YR	13.908	12.049
RB1090O	B	24HR100YR	34.509	12.012
RB1090O2	B	24HR100YR	32.577	12.012
RB1090O3	B	24HR100YR	0.712	12.012
RB1090P	B	24HR100YR	9.531	12.101
RB1100O	B	24HR100YR	214.593	12.379
RB1100O2	B	24HR100YR	0.000	0.000
RB1100P	B	24HR100YR	10.700	12.075
RB1110D	B	24HR100YR	13.628	11.886
RB1110O	B	24HR100YR	278.244	12.367
RB1110O2	B	24HR100YR	132.945	12.367
RB1110P	B	24HR100YR	9.788	12.108

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RB1120O	B	24HR100YR	12.412	12.003
RB1120O2	B	24HR100YR	55.344	12.003
RB1120P	B	24HR100YR	7.230	11.815
RB1120P2	B	24HR100YR	0.000	0.000
RB1130O	B	24HR100YR	803.856	12.910
RB1130P	B	24HR100YR	20.381	12.014
RB1140O	B	24HR100YR	67.932	12.253
RB1140O2	B	24HR100YR	3.825	12.253
RB1140P	B	24HR100YR	32.966	12.253
RB1150O	B	24HR100YR	50.842	12.267
RB1150O2	B	24HR100YR	3.324	12.267
RB1160O	B	24HR100YR	16.848	12.298
RB1160O2	B	24HR100YR	18.014	12.298
RB1160O3	B	24HR100YR	7.909	12.298
RB1170O	B	24HR100YR	6.842	12.006
RB1170O2	B	24HR100YR	16.943	12.006
RB1170P	B	24HR100YR	10.509	12.006
RB1180O	B	24HR100YR	17.120	12.325
RB1180P	B	24HR100YR	8.269	11.820
RB1190O	B	24HR100YR	1207.362	12.924
RB1190O2	B	24HR100YR	0.000	0.000
RB1190P	B	24HR100YR	6.274	11.720
RB1200C	B	24HR100YR	95.783	12.025
RB1210O	B	24HR100YR	49.203	12.099
RB1210O2	B	24HR100YR	34.075	12.099
RB1210P	B	24HR100YR	73.094	11.999
RB1210P2	B	24HR100YR	10.013	11.946
RB1220O	B	24HR100YR	41.249	12.294
RB1220O2	B	24HR100YR	2.687	12.896
RB1220P	B	24HR100YR	22.186	12.037
RB1230O	B	24HR100YR	0.106	12.611
RB1230P	B	24HR100YR	7.938	12.364
RB1240O	BASE	24HR100YR	54.673	12.214
RB1240O2	B	24HR100YR	2.744	12.214
RB1250O	B	24HR100YR	295.737	12.872
RB1250O2	B	24HR100YR	3.950	12.075
RB1250P	B	24HR100YR	12.697	11.706
RB1255P	B	24HR100YR	13.428	12.757
RB1260O	B	24HR100YR	34.325	12.668
RB1260P	B	24HR100YR	13.475	12.668
RB1270O	B	24HR100YR	43.064	12.334
RB1270P	B	24HR100YR	7.440	12.287
RB1280O	B	24HR100YR	13.084	14.447

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RB1280O2	B	24HR100YR	92.359	12.883
RB1280P	B	24HR100YR	8.008	11.774
RB1290O	B	24HR100YR	6.921	11.772
RB1290O2	B	24HR100YR	1130.112	12.749
RB1290O3	B	24HR100YR	35.779	12.821
RB1290P	B	24HR100YR	6.794	11.677
RB1300O	B	24HR100YR	613.002	12.823
RB1300P	B	24HR100YR	8.516	11.847
RB1305P	B	24HR100YR	12.399	11.752
RB1310O	B	24HR100YR	53.587	12.107
RB1310O2	B	24HR100YR	95.874	12.107
RB1310P	B	24HR100YR	12.406	12.107
RB1320O	B	24HR100YR	258.521	12.116
RB1320P	B	24HR100YR	93.611	11.929
RB1330O	B	24HR100YR	222.701	12.101
RB1330P	B	24HR100YR	77.743	11.618
RB1335P	B	24HR100YR	60.424	12.136
RB1337P	B	24HR100YR	60.437	12.117
RB1340O	B	24HR100YR	11.356	12.113
RB1340O2	B	24HR100YR	208.202	12.113
RB1340P	B	24HR100YR	60.439	12.110
RB1350O	B	24HR100YR	199.499	12.093
RB1350P	B	24HR100YR	39.439	12.093
RB1360O	B	24HR100YR	143.568	12.113
RB1360O2	B	24HR100YR	125.442	12.110
RB1360P	B	24HR100YR	17.363	11.575
RB1370O	B	24HR100YR	16.361	12.013
RB1370O2	B	24HR100YR	34.115	12.013
RB1370O3	B	24HR100YR	1.149	12.013
RB1370P	B	24HR100YR	10.155	11.597
RB1380O	B	24HR100YR	116.726	12.782
RB1380O2	B	24HR100YR	33.915	12.267
RB1380P	B	24HR100YR	13.155	12.052
RB1390O	B	24HR100YR	52.853	12.341
RB1390O2	B	24HR100YR	54.139	12.341
RB1400O	B	24HR100YR	13.150	11.769
RB1400O2	B	24HR100YR	559.180	12.784
RB1400P	B	24HR100YR	11.843	11.667
RB1410O	B	24HR100YR	53.706	12.170
RB1410O2	B	24HR100YR	270.952	12.788
RB1410P	B	24HR100YR	55.214	11.960
RB1415P	B	24HR100YR	17.183	12.242
RB1420O	B	24HR100YR	0.189	12.210

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RB1420P	B	24HR100YR	8.143	12.199
RB1430O	B	24HR100YR	42.077	12.300
RB1430P	B	24HR100YR	9.964	12.746
RB1440O	B	24HR100YR	1570.232	12.758
RB1440O2	B	24HR100YR	0.000	0.000
RB1440O3	B	24HR100YR	0.000	0.000
RB1440P	B	24HR100YR	9.378	11.648
RB1450D	B	24HR100YR	18.352	11.737
RB1450O	B	24HR100YR	55.964	12.089
RB1460O	B	24HR100YR	851.566	12.827
RB1460O2	B	24HR100YR	8.915	11.928
RB1460P	B	24HR100YR	14.340	11.638
RB1470O	B	24HR100YR	326.964	12.805
RB1470O2	B	24HR100YR	0.000	0.000
RB1470P	B	24HR100YR	44.711	11.778
RB1473P	B	24HR100YR	8.978	16.088
RB1475P	B	24HR100YR	8.948	16.179
RB1480D	B	24HR100YR	8.919	16.176
RB1480O	B	24HR100YR	14.717	13.111
RB1490O	B	24HR100YR	33.273	12.336
RB1490O2	B	24HR100YR	8.616	12.336
RB1490P	B	24HR100YR	55.926	11.992
RB1500O	B	24HR100YR	36.317	12.337
RB1500O2	B	24HR100YR	1.520	12.337
RB1500P	B	24HR100YR	29.509	11.907
RB1510O	B	24HR100YR	242.686	12.813
RB1510P	B	24HR100YR	5.708	11.593
RB1520O	B	24HR100YR	462.585	12.487
RB1520O2	B	24HR100YR	222.250	12.745
RB1520P	B	24HR100YR	9.885	10.934
RB1530O	B	24HR100YR	39.892	12.012
RB1540O	B	24HR100YR	564.078	12.755
RB1540P	B	24HR100YR	12.261	11.729
RB1550O	B	24HR100YR	2.950	24.738
RB1550O2	B	24HR100YR	0.000	0.000
RB1550O3	B	24HR100YR	569.372	12.648
RB1550O4	B	24HR100YR	978.889	12.638
RB1550P	B	24HR100YR	1.257	34.527
RB1560O	B	24HR100YR	98.595	12.579
RB1560O2	B	24HR100YR	0.000	0.000
RB1560P	B	24HR100YR	40.629	11.908
RB1570O	B	24HR100YR	15.659	12.003
RB1570O2	B	24HR100YR	22.719	12.762

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RB1570P	B	24HR100YR	9.881	11.750
RB1580O	B	24HR100YR	271.852	13.668
RB1580O2	B	24HR100YR	198.028	12.766
RB1580O3	B	24HR100YR	0.000	0.000
RB1580P	B	24HR100YR	7.418	39.824
RB1580P2	B	24HR100YR	28.693	33.673
RB1590O	B	24HR100YR	487.711	12.716
RB1590O2	B	24HR100YR	0.000	0.000
RB1590O3	B	24HR100YR	0.000	0.000
RB1590P	B	24HR100YR	3.865	11.438
RB1600O	B	24HR100YR	291.494	12.713
RB1600O2	B	24HR100YR	0.000	0.000
RB1600P	B	24HR100YR	5.330	10.873
RB1610O	B	24HR100YR	41.279	12.265
RB1610P	B	24HR100YR	29.422	12.260
RB1615P	B	24HR100YR	49.666	12.176
RB1620O	B	24HR100YR	22.005	12.169
RB1620P	B	24HR100YR	35.450	12.168
RB1630D	B	24HR100YR	12.729	12.014
RB1630O	B	24HR100YR	17.727	12.018
RB1640O	B	24HR100YR	53.190	12.243
RB1640P	B	24HR100YR	14.943	13.846
RB1645P	B	24HR100YR	281.038	12.325
RB1650D	B	24HR100YR	14.975	12.954
RB1650O	B	24HR100YR	120.911	12.346
RB1660D	B	24HR100YR	26.469	12.315
RB1660O	B	24HR100YR	37.094	12.315
RB1670D	B	24HR100YR	240.072	12.413
RB1670O	B	24HR100YR	119.726	12.355
RB1670O2	B	24HR100YR	48.797	12.355
RB1680O	B	24HR100YR	238.141	12.354
RB1680P	B	24HR100YR	31.779	12.347
RB1680P2	B	24HR100YR	76.156	12.165
RB1680P3	B	24HR100YR	71.685	12.171
RB1680P4	B	24HR100YR	74.192	12.177
RB1690D	B	24HR100YR	12.564	12.721
RB1690O	B	24HR100YR	0.000	0.000
RC2000C	C	24HR100YR	535.562	12.228
RC2010O	C	24HR100YR	32.435	12.261
RC2010O2	C	24HR100YR	24.083	12.261
RC2010O3	C	24HR100YR	0.000	0.000
RC2010P	C	24HR100YR	11.274	12.044
RC2010P2	C	24HR100YR	17.790	12.261

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RC2020O	C	24HR100YR	169.566	12.198
RC2020O2	C	24HR100YR	71.794	12.198
RC2020P	C	24HR100YR	314.921	12.198
RC2030D	C	24HR100YR	33.166	13.389
RC2030O	C	24HR100YR	407.978	12.197
RC2040D	C	24HR100YR	2.865	12.184
RC2040O	C	24HR100YR	5.773	12.184
RC2050O	C	24HR100YR	311.212	12.207
RC2050P	C	24HR100YR	165.336	13.633
RC2055C	C	24HR100YR	375.958	12.241
RC2060O	C	24HR100YR	40.989	12.035
RC2060P	C	24HR100YR	22.674	11.779
RC2070D	C	24HR100YR	26.373	11.941
RC2070O	C	24HR100YR	23.809	12.217
RC2070O2	C	24HR100YR	75.166	12.217
RC2080O	C	24HR100YR	180.183	12.222
RC2080P	C	24HR100YR	76.695	11.831
RC2090O	C	24HR100YR	2.879	16.502
RC2090O2	C	24HR100YR	105.506	12.227
RC2090O3	C	24HR100YR	98.342	12.220
RC2090P	C	24HR100YR	3.658	17.346
RC2100O	C	24HR100YR	0.000	0.000
RC2100O2	C	24HR100YR	31.058	12.185
RC2100P	C	24HR100YR	12.589	11.697
RC2110D	C	24HR100YR	18.017	11.604
RC2110O	C	24HR100YR	268.610	12.242
RC2120D	C	24HR100YR	9.225	12.441
RC2120O	C	24HR100YR	33.190	12.441
RC2130O	C	24HR100YR	117.540	12.231
RC2130P	C	24HR100YR	86.458	12.231
RC2140D	C	24HR100YR	7.378	12.320
RC2140O	C	24HR100YR	0.000	0.000
RC2150O	C	24HR100YR	144.789	12.220
RC2150P	C	24HR100YR	43.349	12.220
RC2160O	C	24HR100YR	124.237	12.217
RC2160W	C	24HR100YR	39.221	15.056
RC2165P	C	24HR100YR	34.376	12.261
RC2170O	C	24HR100YR	91.489	12.245
RC2170P	C	24HR100YR	34.381	12.245
RC2175C	C	24HR100YR	83.746	12.242
RC2180D	C	24HR100YR	12.478	11.635
RC2180O	C	24HR100YR	73.188	12.223
RC2190O	C	24HR100YR	26.493	12.137

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RC2190P	C	24HR100YR	44.189	12.137
RC2200O	C	24HR100YR	18.709	13.255
RC2200P	C	24HR100YR	35.440	16.042
RC2210O	C	24HR100YR	19.864	13.370
RC2210O2	C	24HR100YR	24.551	13.370
RC2210P	C	24HR100YR	30.139	17.392
RC2220O	C	24HR100YR	0.000	0.000
RC2220P	C	24HR100YR	11.624	12.169
RC2230D	C	24HR100YR	52.489	13.602
RC2230O	C	24HR100YR	0.027	13.575
RC2230O2	C	24HR100YR	11.593	13.575
RC2240O	C	24HR100YR	0.000	0.000
RC2240P	C	24HR100YR	12.608	12.247
RC2500O	C	24HR100YR	216.484	12.364
RC2500O2	C	24HR100YR	412.178	12.368
RC2500O3	C	24HR100YR	0.000	0.000
RC2500P	C	24HR100YR	251.102	12.406
RC2500P2	C	24HR100YR	3.851	13.062
RC2510O	C	24HR100YR	8.293	12.261
RC2510P	C	24HR100YR	7.690	12.261
RC2520O	C	24HR100YR	43.211	12.091
RC2520O2	C	24HR100YR	22.241	12.092
RC2530O	C	24HR100YR	462.353	12.361
RC2530O2	C	24HR100YR	0.000	0.000
RC2530P	C	24HR100YR	147.230	12.354
RC2530P2	C	24HR100YR	145.951	12.354
RC2540O	C	24HR100YR	454.625	12.364
RC2540O2	C	24HR100YR	16.334	12.364
RC2540P	C	24HR100YR	102.616	14.244
RC2540P2	C	24HR100YR	101.895	14.244
RC2545C	C	24HR100YR	326.597	12.385
RC2550O	C	24HR100YR	262.611	12.269
RC2550O2	C	24HR100YR	13.216	12.269
RC2550P	C	24HR100YR	29.916	11.697
RC2560O	C	24HR100YR	102.253	12.335
RC2560O2	C	24HR100YR	232.121	12.335
RC2560O3	C	24HR100YR	0.000	0.000
RC2560P	C	24HR100YR	26.904	12.089
RC2565P	C	24HR100YR	71.524	11.914
RC2570O	C	24HR100YR	218.870	12.338
RC2570P	C	24HR100YR	71.875	11.937
RC2575P	C	24HR100YR	19.393	12.329
RC2580O	C	24HR100YR	163.516	12.335

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RC2580P	C	24HR100YR	7.103	12.269
RC2590O	C	24HR100YR	18.714	12.420
RC2590O2	C	24HR100YR	42.268	12.420
RC2590O3	C	24HR100YR	133.454	12.420
RC2590P	C	24HR100YR	12.307	12.503
RC2600O	C	24HR100YR	15.432	12.418
RC2600P	C	24HR100YR	22.040	12.418
RC2610O	C	24HR100YR	107.919	12.421
RC2610P	C	24HR100YR	25.766	12.421
RC2620O	C	24HR100YR	85.373	12.397
RC2620O2	C	24HR100YR	0.002	12.397
RC2620P	C	24HR100YR	13.019	12.397
RC2630O	C	24HR100YR	0.000	0.000
RC2630O2	C	24HR100YR	0.000	0.000
RC2630O3	C	24HR100YR	65.701	12.435
RC2630O4	C	24HR100YR	49.211	12.435
RC2630P	C	24HR100YR	7.768	12.435
RD3000O	D	24HR100YR	0.000	0.000
RD3000P	D	24HR100YR	591.888	12.245
RD3010O	D	24HR100YR	0.000	0.000
RD3010W	D	24HR100YR	544.184	12.243
RD3020O	D	24HR100YR	0.000	0.000
RD3020W	D	24HR100YR	534.252	12.240
RD3025W	D	24HR100YR	214.631	12.244
RD3027P	D	24HR100YR	214.639	12.244
RD3030O	D	24HR100YR	239.615	12.231
RD3030P	D	24HR100YR	79.172	12.993
RD3040O	D	24HR100YR	4.848	12.206
RD3040P	D	24HR100YR	41.971	12.082
RD3050O	D	24HR100YR	32.738	12.280
RD3050O2	D	24HR100YR	1.299	12.280
RD3050P	D	24HR100YR	32.505	12.834
RD3060O	D	24HR100YR	8.618	12.422
RD3060P	D	24HR100YR	29.744	12.797
RD3070O	D	24HR100YR	0.000	0.000
RD3070P	D	24HR100YR	165.666	12.254
RD3075P	D	24HR100YR	8.291	12.390
RD3080O	D	24HR100YR	11.946	12.292
RD3080O2	D	24HR100YR	52.748	12.292
RD3080O3	D	24HR100YR	4.396	12.292
RD3080P	D	24HR100YR	7.473	12.292
RD3090O	D	24HR100YR	10.746	12.267
RD3090P	D	24HR100YR	234.506	12.267

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RD3093P	D	24HR100YR	94.025	12.643
RD3093P2	D	24HR100YR	75.001	11.920
RD3095P	D	24HR100YR	163.002	12.014
RD3100O	D	24HR100YR	11.675	12.229
RD3100P	D	24HR100YR	81.581	12.014
RD3105P	D	24HR100YR	54.108	13.150
RD3110O	D	24HR100YR	52.212	12.282
RD3110O2	D	24HR100YR	17.923	12.282
RD3110P	D	24HR100YR	53.944	13.146
RD3120O	D	24HR100YR	77.467	12.279
RD3130D	D	24HR100YR	4.706	11.705
RD3130O	D	24HR100YR	0.000	0.000
RD3130O2	D	24HR100YR	48.383	12.220
RD3135P	D	24HR100YR	88.460	13.137
RD3140O	D	24HR100YR	55.333	12.268
RD3140P	D	24HR100YR	17.960	11.860
RD3150O	D	24HR100YR	112.755	12.315
RD3150O2	D	24HR100YR	31.689	12.317
RD3150P	D	24HR100YR	76.230	13.657
RD3155P	D	24HR100YR	46.162	12.760
RD3157P	D	24HR100YR	46.140	12.760
RD3160O	D	24HR100YR	29.575	12.339
RD3160P	D	24HR100YR	20.245	13.061
RD3170O	D	24HR100YR	8.809	12.331
RD3170P	D	24HR100YR	38.034	12.317
RD3175P	D	24HR100YR	11.327	12.361
RD3180D	D	24HR100YR	11.323	12.355
RD3180O	D	24HR100YR	0.000	0.000
RD3180O2	D	24HR100YR	0.000	0.000
RD3190O	D	24HR100YR	3.425	12.296
RD3190O2	D	24HR100YR	1.796	12.296
RD3190P	D	24HR100YR	69.589	12.236
RD3195P	D	24HR100YR	64.920	12.859
RD3200O	D	24HR100YR	8.099	12.288
RD3200O2	D	24HR100YR	7.128	12.288
RD3200P	D	24HR100YR	20.982	12.047
RD3210O	D	24HR100YR	3.568	12.342
RD3210O2	D	24HR100YR	0.489	12.342
RD3210O3	D	24HR100YR	12.517	12.342
RD3210P	D	24HR100YR	50.853	12.948
RD3220O	D	24HR100YR	0.000	0.000
RD3220O2	D	24HR100YR	8.390	12.363
RD3220O3	D	24HR100YR	0.000	0.000

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RD3220P	D	24HR100YR	19.316	12.406
RE4000W	E	24HR100YR	43.361	10.853
RE4000W2	E	24HR100YR	40.614	10.853
RE4000W3	E	24HR100YR	83.885	11.791
RE4010O	E	24HR100YR	309.970	12.113
RE4010P	E	24HR100YR	161.754	11.750
RE4015P	E	24HR100YR	41.483	11.937
RE4017P	E	24HR100YR	33.073	12.030
RE4020O	E	24HR100YR	60.172	12.164
RE4020O2	E	24HR100YR	84.619	12.385
RE4020P	E	24HR100YR	13.485	11.792
RE4030O	E	24HR100YR	111.839	12.345
RE4030O2	E	24HR100YR	55.306	12.345
RE4030P	E	24HR100YR	17.076	11.775
RE4040O	E	24HR100YR	162.690	12.361
RE4040O2	E	24HR100YR	65.994	12.361
RE4040P	E	24HR100YR	20.837	12.173
RE4045P	E	24HR100YR	112.791	11.616
RE4050O	E	24HR100YR	69.733	12.103
RE4050O2	E	24HR100YR	358.179	12.490
RE4050O3	E	24HR100YR	397.174	12.464
RE4050O4	E	24HR100YR	122.995	11.913
RE4050P	E	24HR100YR	113.540	11.617
RE4060O	E	24HR100YR	249.578	12.258
RE4060O2	E	24HR100YR	177.681	12.587
RE4060P	E	24HR100YR	58.502	11.772
RE4070O	E	24HR100YR	18.861	12.208
RE4070O2	E	24HR100YR	83.609	12.655
RE4070P	E	24HR100YR	31.380	11.727
RE4080O	E	24HR100YR	0.000	0.000
RE4080O2	E	24HR100YR	1.959	12.425
RE4080P	E	24HR100YR	60.336	12.384
RE4090O	E	24HR100YR	15.296	12.163
RE4090P	E	24HR100YR	144.989	12.058
RE4095P	E	24HR100YR	50.771	13.033
RE4100O	E	24HR100YR	49.582	12.252
RE4100O2	E	24HR100YR	0.000	0.000
RE4100P	E	24HR100YR	23.748	13.221
RE4100P2	E	24HR100YR	23.727	13.221
RE4105P	E	24HR100YR	30.169	12.346
RE4110O	E	24HR100YR	1.115	12.360
RE4110O2	E	24HR100YR	2.857	12.360
RE4110P	E	24HR100YR	20.051	12.357

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RE4115P	E	24HR100YR	16.556	12.395
RE4117P	E	24HR100YR	12.806	12.057
RE4120O	E	24HR100YR	28.230	12.223
RE4120O2	E	24HR100YR	0.000	0.000
RE4120P	E	24HR100YR	12.005	11.799
RE4130D	E	24HR100YR	2.866	11.788
RE4130O	E	24HR100YR	1.054	12.209
RE4130O2	E	24HR100YR	32.251	12.209
RE4140O	E	24HR100YR	0.000	0.000
RE4140O2	E	24HR100YR	2.768	12.310
RE4140P	E	24HR100YR	4.020	12.310
RE4150O	E	24HR100YR	0.000	0.000
RE4150O2	E	24HR100YR	285.333	12.383
RE4150P	E	24HR100YR	22.983	13.296
RE4160O	E	24HR100YR	6.893	18.419
RE4160O2	E	24HR100YR	189.616	12.354
RE4160P	E	24HR100YR	10.120	12.352
RE4170O	E	24HR100YR	121.516	12.218
RE4170P	E	24HR100YR	11.047	11.683
RE4170P2	E	24HR100YR	6.152	11.993
RE4180O	E	24HR100YR	54.484	12.299
RE4180O2	E	24HR100YR	2.060	12.299
RE5000W	E	24HR100YR	129.195	11.856
RE5000W2	E	24HR100YR	121.012	11.856
RE5000W3	E	24HR100YR	133.928	12.565
RE5010O	E	24HR100YR	226.831	12.364
RE5010O2	E	24HR100YR	286.036	12.364
RE5010P	E	24HR100YR	327.790	12.180
RE5020O	E	24HR100YR	98.393	12.177
RE5020P	E	24HR100YR	53.182	11.791
RE5030O	E	24HR100YR	61.440	12.168
RE5030P	E	24HR100YR	31.230	11.738
RE5040O	E	24HR100YR	424.929	12.397
RE5040P	E	24HR100YR	196.937	13.430
RE5050O	E	24HR100YR	0.000	0.000
RE5050O2	E	24HR100YR	39.280	12.043
RE5050P	E	24HR100YR	9.440	11.846
RE5060C	E	24HR100YR	495.852	12.416
RE5070O	E	24HR100YR	62.060	12.435
RE5070P	E	24HR100YR	280.998	12.775
RE5080C	E	24HR100YR	204.082	12.480
RE5085P	E	24HR100YR	103.599	12.155
RE5090O	E	24HR100YR	0.000	0.000

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RE5090P	E	24HR100YR	60.432	12.089
RE5100O	E	24HR100YR	25.908	12.253
RE5100O2	E	24HR100YR	3.123	12.253
RE5100P	E	24HR100YR	11.446	12.253
RE5110O	E	24HR100YR	9.918	12.356
RE5110O2	E	24HR100YR	87.037	12.356
RE5110O3	E	24HR100YR	94.923	12.356
RE5110O4	E	24HR100YR	106.000	12.356
RE5110O5	E	24HR100YR	70.631	12.356
RE5110O6	E	24HR100YR	0.000	0.000
RE5110P	E	24HR100YR	42.743	13.404
RE5120C	E	24HR100YR	244.725	12.415
RE5130O	E	24HR100YR	53.876	12.349
RE5130O2	E	24HR100YR	101.508	12.349
RE5130P	E	24HR100YR	25.477	11.909
RE5130P2	E	24HR100YR	48.019	12.338
RE5130P3	E	24HR100YR	26.132	12.098
RE5140O	E	24HR100YR	171.375	12.339
RE5140O2	E	24HR100YR	10.554	12.339
RE5140P	E	24HR100YR	6.751	10.851
RE5140P2	E	24HR100YR	5.522	12.335
RE5150O	E	24HR100YR	30.556	12.329
RE5150P	E	24HR100YR	32.902	11.806
RE5155P	E	24HR100YR	27.996	13.248
RE5160O	E	24HR100YR	12.770	12.384
RE5160O2	E	24HR100YR	13.754	12.384
RE5160P	E	24HR100YR	22.998	13.952
RE5170D	E	24HR100YR	3.843	26.258
RE5170O	E	24HR100YR	6.260	15.871
RE5170O2	E	24HR100YR	0.000	0.000
RE5170O3	E	24HR100YR	0.116	15.871
RE5180O	E	24HR100YR	0.003	12.325
RE5180O2	E	24HR100YR	8.051	12.325
RE5180P	E	24HR100YR	9.929	11.973
RE5190O	E	24HR100YR	15.162	12.084
RE5190P	E	24HR100YR	7.779	11.762
RE5500O	E	24HR100YR	0.000	0.000
RE5500O2	E	24HR100YR	0.000	0.000
RE5500O3	E	24HR100YR	93.218	12.334
RE5500P	E	24HR100YR	13.354	12.315
RE5510O	E	24HR100YR	9.134	12.295
RE5510O2	E	24HR100YR	23.576	12.295
RE5510P	E	24HR100YR	20.970	13.389

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RE5520O	E	24HR100YR	2.408	12.382
RE5520O2	E	24HR100YR	0.119	13.373
RE5520O3	E	24HR100YR	25.289	12.382
RE5520P	E	24HR100YR	8.703	12.382
RE5530D	E	24HR100YR	1.788	15.277
RE5530O	E	24HR100YR	4.954	12.043
RF0185P	F	24HR100YR	323.227	20.456
RF0185P2	F	24HR100YR	320.202	20.456
RF0190W	F	24HR100YR	643.437	20.452
RF0195P	F	24HR100YR	153.434	12.593
RF0195P2	F	24HR100YR	155.795	12.591
RF0200O	F	24HR100YR	585.566	13.398
RF0200W	F	24HR100YR	309.593	12.591
RF0210C	F	24HR100YR	576.024	14.993
RF0220C	F	24HR100YR	537.528	16.026
RF0230O	F	24HR100YR	446.256	16.257
RF0230P	F	24HR100YR	84.697	12.468
RF0230P2	F	24HR100YR	84.775	12.468
RF0233P	F	24HR100YR	120.378	12.302
RF0240O	F	24HR100YR	0.000	0.000
RF0240P	F	24HR100YR	259.718	16.495
RF0240P2	F	24HR100YR	259.718	16.495
RF0245P	F	24HR100YR	63.157	40.941
RF0245P2	F	24HR100YR	63.424	40.941
RF0245P3	F	24HR100YR	62.960	40.941
RF0250O	F	24HR100YR	525.401	16.415
RF0250W	F	24HR100YR	51.502	42.863
RF0250W2	F	24HR100YR	49.273	42.194
RF0250W3	F	24HR100YR	45.769	43.195
RF0250W4	F	24HR100YR	47.239	42.126
RF0250W5	F	24HR100YR	85.825	27.475
RF0260C	F	24HR100YR	502.005	13.732
RF0270C	F	24HR100YR	410.361	14.190
RF0280C	F	24HR100YR	323.523	12.537
RF6000O	F	24HR100YR	9.639	12.229
RF6000O2	F	24HR100YR	0.714	12.229
RF6000P	F	24HR100YR	54.122	12.229
RF6010O	F	24HR100YR	24.202	12.232
RF6010P	F	24HR100YR	36.521	13.012
RF6020O	F	24HR100YR	24.503	12.242
RF6020P	F	24HR100YR	29.928	12.953
RF6030O	F	24HR100YR	0.000	0.000
RF6030O2	F	24HR100YR	252.025	12.288

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RF6030O3	F	24HR100YR	0.000	0.000
RF6030P	F	24HR100YR	37.245	12.313
RF6040O	F	24HR100YR	0.000	0.000
RF6040P	F	24HR100YR	169.059	12.339
RF6045P	F	24HR100YR	102.723	12.108
RF6050O	F	24HR100YR	0.000	0.000
RF6050O2	F	24HR100YR	8.244	12.350
RF6050P	F	24HR100YR	73.614	12.737
RF6060O	F	24HR100YR	4.074	12.170
RF6060O2	F	24HR100YR	0.000	0.000
RF6060O3	F	24HR100YR	25.848	12.170
RF6060P	F	24HR100YR	42.379	11.881
RF6070O	F	24HR100YR	16.826	12.508
RF6070O2	F	24HR100YR	17.364	12.508
RF6070P	F	24HR100YR	45.377	13.432
RF6080O	F	24HR100YR	0.000	0.000
RF6080P	F	24HR100YR	33.569	12.088
RF6090O	F	24HR100YR	14.844	12.254
RF6090P	F	24HR100YR	35.779	12.254
RF6100O	F	24HR100YR	33.011	12.252
RF6100O2	F	24HR100YR	114.039	12.253
RF6100P	F	24HR100YR	19.171	14.295
RF6105P	F	24HR100YR	9.951	12.310
RF6110D	F	24HR100YR	10.102	12.239
RF6110O	F	24HR100YR	12.357	12.252
RF6120C	F	24HR100YR	96.278	12.720
RF6130C	F	24HR100YR	85.146	12.568
RF6130O	F	24HR100YR	9.488	12.546
RF6140D	F	24HR100YR	6.538	12.250
RF6140O	F	24HR100YR	34.021	12.250
RF6200C	F	24HR100YR	128.892	12.454
RF6205P	F	24HR100YR	98.473	12.489
RF6207P	F	24HR100YR	65.135	12.585
RF6210O	F	24HR100YR	0.000	0.000
RF6210O2	F	24HR100YR	12.358	12.330
RF6210P	F	24HR100YR	16.546	12.139
RF6220O	F	24HR100YR	0.000	0.000
RF6220P	F	24HR100YR	55.447	12.589
RF6225P	F	24HR100YR	29.267	12.559
RF6230O	F	24HR100YR	12.065	12.553
RF6230O2	F	24HR100YR	34.493	12.553
RF6230P	F	24HR100YR	29.269	12.553
RF6240O	F	24HR100YR	14.248	12.087

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RF6240O2	F	24HR100YR	41.865	12.570
RF6240P	F	24HR100YR	18.306	13.899
RF6250D	F	24HR100YR	15.830	12.099
RF6250O	F	24HR100YR	38.440	12.513
RF6250O2	F	24HR100YR	0.897	12.513
RF6260D	F	24HR100YR	38.460	12.016
RF6270D	F	24HR100YR	14.204	13.795
RF6270O	F	24HR100YR	17.361	12.363
RF6270O2	F	24HR100YR	0.184	13.051
RF6270O3	F	24HR100YR	127.146	12.363
RF6280D	F	24HR100YR	29.678	13.238
RF6280O	F	24HR100YR	66.191	12.369
RF6300C	F	24HR100YR	96.869	12.174
RF6310O	F	24HR100YR	0.000	0.000
RF6310P	F	24HR100YR	16.262	12.277
RF6320O	F	24HR100YR	13.725	12.515
RF6320O2	F	24HR100YR	133.890	12.515
RF6320P	F	24HR100YR	37.146	11.911
RF6320P2	F	24HR100YR	36.999	11.911
RF6330O	F	24HR100YR	63.687	12.504
RF6330P	F	24HR100YR	45.576	12.500
RF6330P2	F	24HR100YR	45.881	12.500
RF6335C	F	24HR100YR	29.213	12.469
RF6337P	F	24HR100YR	22.656	12.398
RF6340O	F	24HR100YR	5.328	12.410
RF6340P	F	24HR100YR	10.427	16.113
RF6350D	F	24HR100YR	7.212	11.808
RF6350O	F	24HR100YR	19.237	12.004
RF6365P	F	24HR100YR	11.703	12.431
RF6370O	F	24HR100YR	0.000	0.000
RF6370W	F	24HR100YR	0.152	14.669
RF6370W2	F	24HR100YR	0.175	14.669
RF6380O	F	24HR100YR	51.796	12.387
RF6380P	F	24HR100YR	11.711	12.387
RF6390O	F	24HR100YR	50.837	12.402
RF6390O2	F	24HR100YR	1.445	12.402
RF6390O3	F	24HR100YR	0.000	0.000
RF6390O4	F	24HR100YR	13.101	12.402
RF6390O5	F	24HR100YR	3.934	12.402
RF6390P	F	24HR100YR	12.774	12.406
RF6400O	F	24HR100YR	10.335	12.342
RF6400O2	F	24HR100YR	2.258	12.342
RF6400P	F	24HR100YR	4.844	13.366

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RF6410O	F	24HR100YR	0.000	0.000
RF6410O2	F	24HR100YR	50.698	12.386
RF6410P	F	24HR100YR	2.210	19.356
RF6410P2	F	24HR100YR	6.002	11.834
RF6420O	F	24HR100YR	19.988	12.417
RF6420P	F	24HR100YR	7.078	13.654
RF6430O	F	24HR100YR	0.000	0.000
RF6430O2	F	24HR100YR	55.183	12.139
RF6430P	F	24HR100YR	4.316	19.037
RF6440D	F	24HR100YR	10.048	12.028
RF6440O	F	24HR100YR	8.839	12.028
RF6450O	F	24HR100YR	6.149	12.123
RF6450P	F	24HR100YR	62.620	11.990
RF6460O	F	24HR100YR	0.000	0.000
RF6460O2	F	24HR100YR	31.052	12.168
RF6460P	F	24HR100YR	48.003	12.180
RF6505P	F	24HR100YR	75.003	12.354
RF6507P	F	24HR100YR	54.095	12.809
RF6509P	F	24HR100YR	32.744	12.775
RF6510P	F	24HR100YR	25.637	12.765
RF6513P	F	24HR100YR	3.484	13.435
RF6515P	F	24HR100YR	4.199	12.128
RF6520O	F	24HR100YR	0.000	0.000
RF6520P	F	24HR100YR	4.261	12.092
RF6530O	F	24HR100YR	30.379	12.145
RF6530P	F	24HR100YR	10.708	12.145
RF6530P2	F	24HR100YR	18.257	12.145
RF6540O	F	24HR100YR	1.228	12.665
RF6540P	F	24HR100YR	25.486	12.072
RF6550O	F	24HR100YR	0.000	0.000
RF6550O2	F	24HR100YR	5.769	12.105
RF6550W	F	24HR100YR	0.000	0.000
RF6560D	F	24HR100YR	7.055	12.903
RF6560O	F	24HR100YR	0.000	0.000
RF6560O2	F	24HR100YR	0.000	0.000
RF6570D	F	24HR100YR	14.384	14.153
RF6570O	F	24HR100YR	0.000	0.000
RF6600D	F	24HR100YR	46.149	12.245
RF6600O	F	24HR100YR	19.952	12.387
RF6610O	F	24HR100YR	12.788	12.253
RF6610P	F	24HR100YR	74.460	11.975
RF6620O	F	24HR100YR	0.000	0.000
RF6620P	F	24HR100YR	28.768	12.048

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RF6625P	F	24HR100YR	18.110	12.684
RF6630O	F	24HR100YR	0.286	12.181
RF6630P	F	24HR100YR	17.921	12.668
RF6640O	F	24HR100YR	13.394	12.181
RF6640P	F	24HR100YR	6.889	12.751
RF6650O	F	24HR100YR	13.345	13.137
RF6650O2	F	24HR100YR	43.384	15.946
RF6650P	F	24HR100YR	29.511	11.913
RF6670O	F	24HR100YR	19.376	12.003
RF6670O2	F	24HR100YR	1.950	12.003
RF6670P	F	24HR100YR	10.138	12.003
RF6700D	F	24HR100YR	49.907	11.914
RF6700O	F	24HR100YR	222.176	12.250
RF6710O	F	24HR100YR	3.523	12.344
RF6710P	F	24HR100YR	204.725	12.344
RF6715P	F	24HR100YR	149.471	12.047
RF6720O	F	24HR100YR	7.150	12.278
RF6720P	F	24HR100YR	105.135	11.980
RF6725P	F	24HR100YR	87.159	11.980
RF6727P	F	24HR100YR	61.693	11.967
RF6730O	F	24HR100YR	5.245	12.133
RF6730O2	F	24HR100YR	3.294	12.133
RF6730P	F	24HR100YR	29.912	11.980
RF6740O	F	24HR100YR	28.627	12.549
RF6740P	F	24HR100YR	21.933	11.970
RF6750O	F	24HR100YR	26.599	12.252
RF6750O2	F	24HR100YR	5.819	12.252
RF6750P	F	24HR100YR	15.132	11.960
RF6750P2	F	24HR100YR	21.186	12.047
RF6760O	F	24HR100YR	0.000	0.000
RF6760P	F	24HR100YR	36.834	12.253
RF6780O	F	24HR100YR	8.676	12.344
RF6780P	F	24HR100YR	47.099	12.705
RF6790O	F	24HR100YR	17.237	12.117
RF6790O2	F	24HR100YR	12.168	12.117
RF6790P	F	24HR100YR	36.575	11.885
RF6800O	F	24HR100YR	63.448	13.043
RF6800P	F	24HR100YR	1.888	13.019
RF6800P2	F	24HR100YR	1.888	13.019
RF6805P	F	24HR100YR	52.063	12.512
RF6810O	F	24HR100YR	17.894	12.507
RF6810P	F	24HR100YR	52.065	12.502
RF6820O	F	24HR100YR	0.000	0.000

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RF6820O2	F	24HR100YR	118.191	12.425
RF6830D	F	24HR100YR	6.780	13.527
RF6830O	F	24HR100YR	0.000	0.000
RF6840D	F	24HR100YR	22.240	12.333
RF6840O	F	24HR100YR	0.000	0.000
RF6840O2	F	24HR100YR	66.196	16.042
RF6850D	F	24HR100YR	23.223	12.445
RF6850O	F	24HR100YR	13.194	12.797
RF6860D	F	24HR100YR	18.783	12.189
RF6860O	F	24HR100YR	0.000	0.000
RF6870O	F	24HR100YR	86.954	12.442
RF6870P	F	24HR100YR	6.304	12.442
RF6890D	F	24HR100YR	50.118	12.190
RF6890O	F	24HR100YR	129.971	15.572
RF6890O2	F	24HR100YR	11.216	12.363
RF6890O3	F	24HR100YR	17.703	15.088
RF6900O	F	24HR100YR	30.835	12.339
RF6900O2	F	24HR100YR	0.009	12.339
RF6900P	F	24HR100YR	18.831	12.339
RF6905P	F	24HR100YR	70.632	12.283
RF6907P	F	24HR100YR	38.866	12.277
RF6910D	F	24HR100YR	38.876	12.270
RF6910D2	F	24HR100YR	0.000	0.000
RF6910O	F	24HR100YR	0.000	0.000
RF6920O	F	24HR100YR	3.758	12.349
RF6920P	F	24HR100YR	24.291	12.268
RF6930O	F	24HR100YR	0.000	0.000
RF6930P	F	24HR100YR	8.793	12.098
RF6940O	F	24HR100YR	0.000	0.000
RF6950D	F	24HR100YR	19.906	12.161
RF6950O	F	24HR100YR	9.706	12.161
RG0285P	G	24HR100YR	195.801	14.945
RG0285P2	G	24HR100YR	200.063	14.944
RG0290W	G	24HR100YR	395.864	14.942
RG0300O	G	24HR100YR	0.000	0.000
RG0300O2	G	24HR100YR	8.990	14.787
RG0300P	G	24HR100YR	727.661	12.899
RG0300P2	G	24HR100YR	727.332	12.899
RG0301P	G	24HR100YR	11.158	12.222
RG7000D	G	24HR100YR	23.447	12.557
RG7000O	G	24HR100YR	35.993	12.557
RG7000O2	G	24HR100YR	23.404	12.561
RG7000O3	G	24HR100YR	0.000	0.000

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RG7010O	G	24HR100YR	54.983	12.532
RG7010P	G	24HR100YR	23.538	12.532
RG7020D	G	24HR100YR	26.246	12.229
RG7020O	G	24HR100YR	16.255	15.776
RG7030D	G	24HR100YR	40.334	12.198
RG7030O	G	24HR100YR	170.318	12.462
RG7030O2	G	24HR100YR	19.281	12.462
RG7030O3	G	24HR100YR	15.288	12.462
RG7040D	G	24HR100YR	16.414	12.392
RG7040O	G	24HR100YR	39.021	12.392
RG7050D	G	24HR100YR	34.775	12.147
RG7050O	G	24HR100YR	30.329	12.177
RG7060O	G	24HR100YR	38.299	12.143
RG7060P	G	24HR100YR	27.616	11.835
RG7070O	G	24HR100YR	6.212	12.399
RG7070P	G	24HR100YR	28.231	12.416
RG7080D	G	24HR100YR	3.444	11.663
RG7080O	G	24HR100YR	10.986	11.735
RG7080O2	G	24HR100YR	36.596	12.393
RG7080O3	G	24HR100YR	21.833	12.393
RG7080O4	G	24HR100YR	35.379	12.393
RG7090O	G	24HR100YR	113.758	12.408
RG7090P	G	24HR100YR	58.721	12.224
RG7090P2	G	24HR100YR	14.913	12.223
RG7090P3	G	24HR100YR	10.831	12.223
RG7090P4	G	24HR100YR	0.652	12.407
RG7090P5	G	24HR100YR	14.149	12.224
RG7100O	G	24HR100YR	79.369	12.366
RG7100P	G	24HR100YR	51.089	12.029
RG7110D	G	24HR100YR	13.346	12.148
RG7110O	G	24HR100YR	30.463	12.193
RG7120O	G	24HR100YR	3.304	12.273
RG7120O2	G	24HR100YR	4.339	12.273
RG7120P	G	24HR100YR	21.279	11.961
RG7130O	G	24HR100YR	18.413	12.451
RG7130O2	G	24HR100YR	20.700	12.451
RG7130P	G	24HR100YR	10.869	15.988
RG7140D	G	24HR100YR	4.602	17.399
RG7140O	G	24HR100YR	0.000	0.000
RG7140O2	G	24HR100YR	31.710	12.514
RG7140O3	G	24HR100YR	0.000	0.000
RG7150O	G	24HR100YR	24.795	12.088
RG7160O	G	24HR100YR	0.000	0.000

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RG7170O	G	24HR100YR	27.519	12.400
RG7170O2	G	24HR100YR	0.000	0.000
RG7180D	G	24HR100YR	12.949	12.135
RG7180O	G	24HR100YR	36.211	12.353
RG7190O	G	24HR100YR	0.000	0.000
RG7190O2	G	24HR100YR	23.438	12.419
RG7190P	G	24HR100YR	14.804	12.346
RG7200O	G	24HR100YR	0.000	0.000
RG7200O2	G	24HR100YR	0.000	0.000
RG7200O3	G	24HR100YR	14.276	14.815
RG7200P	G	24HR100YR	63.958	12.186
RG7205P	G	24HR100YR	33.204	11.995
RG7210D	G	24HR100YR	0.000	0.000
RG7210O	G	24HR100YR	0.000	0.000
RG7210O2	G	24HR100YR	0.000	0.000
RG7220O	G	24HR100YR	0.000	0.000
RG7220O2	G	24HR100YR	0.074	13.127
RG7220P	G	24HR100YR	33.722	11.981
RG7223P	G	24HR100YR	32.094	12.070
RG7225P	G	24HR100YR	28.644	12.438
RG7230O	G	24HR100YR	0.000	0.000
RG7230O2	G	24HR100YR	0.000	0.000
RG7230O3	G	24HR100YR	0.000	0.000
RG7230O4	G	24HR100YR	400.953	15.024
RG7230O5	G	24HR100YR	87.813	15.024
RG7230O6	G	24HR100YR	237.457	15.024
RG7230O7	G	24HR100YR	0.000	0.000
RG7230O8	G	24HR100YR	0.000	0.000
RG7230P	G	24HR100YR	8.768	11.560
RG7240D	G	24HR100YR	4.611	12.016
RG7240O	G	24HR100YR	107.034	14.996
RG7240O2	G	24HR100YR	0.000	0.000
RG7250O	G	24HR100YR	0.000	0.000
RG7250O2	G	24HR100YR	0.000	0.000
RG7250P	G	24HR100YR	28.710	12.433
RG7260O	G	24HR100YR	4.806	12.473
RG7260O2	G	24HR100YR	0.582	25.395
RG7260O3	G	24HR100YR	247.811	15.020
RG7260P	G	24HR100YR	3.543	11.676
RG7270O	G	24HR100YR	9.859	12.672
RG7270O2	G	24HR100YR	0.000	0.000
RG7270P	G	24HR100YR	22.442	12.107
RG7280C	G	24HR100YR	22.456	12.941

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RG7290D	G	24HR100YR	13.269	13.357
RG7290D2	G	24HR100YR	3.402	20.154
RG7290O	G	24HR100YR	1.018	13.181
RG7290O2	G	24HR100YR	5.194	13.181
RG7290O3	G	24HR100YR	2.445	13.181
RG7290O4	G	24HR100YR	1.682	13.181
RG7290O5	G	24HR100YR	0.000	0.000
RG7290P	G	24HR100YR	2.258	13.358
RG7300O	G	24HR100YR	0.000	0.000
RG7300O2	G	24HR100YR	18.091	12.059
RG7300O3	G	24HR100YR	2.279	12.059
RG7300O4	G	24HR100YR	0.000	0.000
RG7310O	G	24HR100YR	0.000	0.000
RG7310P	G	24HR100YR	10.390	11.904
RG7400D	G	24HR100YR	5.185	12.446
RG7400O	G	24HR100YR	25.211	12.446
RG7410O	G	24HR100YR	0.000	0.000
RG7410P	G	24HR100YR	7.535	12.147
RG7420O	G	24HR100YR	0.000	0.000
RG7420O2	G	24HR100YR	29.531	12.379
RG7420P	G	24HR100YR	29.247	12.379
RG7430D	G	24HR100YR	14.187	12.762
RG7430O	G	24HR100YR	13.983	12.762
RG7440O	G	24HR100YR	0.000	0.000
RG7440P	G	24HR100YR	44.037	12.524
RG7450D	G	24HR100YR	9.617	15.523
RG7450O	G	24HR100YR	2.662	14.156
RG7450O2	G	24HR100YR	98.986	12.522
RG7450O3	G	24HR100YR	0.000	0.000
RG7460D	G	24HR100YR	16.743	12.655
RG7460O	G	24HR100YR	0.000	0.000
RG7460O2	G	24HR100YR	0.000	0.000
RG7470O	G	24HR100YR	0.000	0.000
RG7470P	G	24HR100YR	57.493	12.516
RG7475P	G	24HR100YR	35.377	12.435
RG7477P	G	24HR100YR	23.001	14.639
RG7480O	G	24HR100YR	11.533	12.283
RG7480O2	G	24HR100YR	11.598	12.283
RG7480P	G	24HR100YR	15.525	11.980
RG7490O	G	24HR100YR	53.482	12.441
RG7490O2	G	24HR100YR	0.000	0.000
RG7490P	G	24HR100YR	17.054	15.007
RG7500D	G	24HR100YR	6.851	16.165

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RG7500O	G	24HR100YR	25.293	12.422
RG7500O2	G	24HR100YR	26.819	12.433
RG7510O	G	24HR100YR	75.692	12.446
RG7510O2	G	24HR100YR	0.007	12.446
RG7510P	G	24HR100YR	12.863	12.460
RG7520O	G	24HR100YR	0.840	22.648
RG7520O2	G	24HR100YR	0.000	0.000
RG7600O	G	24HR100YR	0.000	0.000
RG7600P	G	24HR100YR	287.629	12.538
RG7600P2	G	24HR100YR	287.629	12.538
RG7610D	G	24HR100YR	15.573	11.968
RG7610O	G	24HR100YR	77.752	12.238
RG7610O2	G	24HR100YR	80.159	12.238
RG7615P	G	24HR100YR	85.600	12.252
RG7620O	G	24HR100YR	0.000	0.000
RG7620P	G	24HR100YR	85.606	12.250
RG7630O	G	24HR100YR	0.000	0.000
RG7630O2	G	24HR100YR	0.000	0.000
RG7630P	G	24HR100YR	44.411	12.096
RG7640O	G	24HR100YR	0.000	0.000
RG7640O2	G	24HR100YR	0.002	12.138
RG7640P	G	24HR100YR	21.145	13.022
RG7650O	G	24HR100YR	0.000	0.000
RG7650O2	G	24HR100YR	47.289	12.252
RG7650P	G	24HR100YR	13.331	13.606
RG7660O	G	24HR100YR	124.161	12.337
RG7660P	G	24HR100YR	25.509	12.094
RG7670O	G	24HR100YR	43.154	12.285
RG7670P	G	24HR100YR	16.633	11.853
RG7680O2	G	24HR100YR	29.569	12.295
RG7680P	G	24HR100YR	13.601	15.817
RG7690O	G	24HR100YR	8.807	15.820
RG7690O2	G	24HR100YR	69.684	12.299
RG7690P	G	24HR100YR	6.565	17.984
RG7700O	G	24HR100YR	47.349	12.295
RG7700O2	G	24HR100YR	0.000	0.000
RG7700P	G	24HR100YR	12.110	13.348
RG7710O	G	24HR100YR	0.000	0.000
RG7710O2	G	24HR100YR	21.270	12.343
RG7710P	G	24HR100YR	26.198	12.343
RG7720C	G	24HR100YR	333.289	12.862
RG7730O	G	24HR100YR	216.969	12.633
RG7730P	G	24HR100YR	29.533	12.150

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RG7740O	G	24HR100YR	0.000	0.000
RG7740W	G	24HR100YR	141.044	13.383
RG7740W2	G	24HR100YR	0.000	0.000
RG7750C	C	24HR100YR	0.000	0.000
RG7750O	G	24HR100YR	0.000	0.000
RG7750P	G	24HR100YR	135.395	12.271
RG7760O	G	24HR100YR	12.668	12.595
RG7760P	G	24HR100YR	99.640	12.115
RG7770O	G	24HR100YR	0.000	0.000
RG7770P	G	24HR100YR	88.999	12.610
RG7780O	G	24HR100YR	11.238	12.450
RG7780O2	G	24HR100YR	10.708	12.450
RG7780P	G	24HR100YR	48.946	12.063
RG7790O	G	24HR100YR	0.000	0.000
RG7790O2	G	24HR100YR	0.000	0.000
RG7790O3	G	24HR100YR	143.494	12.627
RG7790O4	G	24HR100YR	0.000	0.000
RG7790P	G	24HR100YR	47.855	14.668
RG7795P	G	24HR100YR	35.875	15.956
RG7800O	G	24HR100YR	18.642	12.593
RG7800P	G	24HR100YR	13.346	18.053
RG7810O	G	24HR100YR	5.726	14.893
RG7810O2	G	24HR100YR	53.346	12.608
RG7810O3	G	24HR100YR	1.889	12.608
RG7810P	G	24HR100YR	6.121	19.240
RG7820D	G	24HR100YR	30.183	11.833
RG7820O	G	24HR100YR	0.000	0.000
RG7830O	G	24HR100YR	0.055	11.981
RG7830O2	G	24HR100YR	0.085	12.160
RG7830P	G	24HR100YR	6.467	11.816
RG7840O	G	24HR100YR	0.000	0.000
RG7840O2	G	24HR100YR	64.656	12.543
RG7840P	G	24HR100YR	3.250	17.733
RG7850O	G	24HR100YR	15.267	12.267
RG7850O2	G	24HR100YR	0.000	0.000
RG7850O3	G	24HR100YR	0.031	12.267
RG7850P	G	24HR100YR	13.878	11.932
RG7860O	G	24HR100YR	6.578	12.268
RG7860O2	G	24HR100YR	19.696	12.268
RG7860P	G	24HR100YR	5.354	14.303
RG7870O	G	24HR100YR	91.608	12.057
RG7870P	G	24HR100YR	16.792	11.746
RG7890O	G	24HR100YR	0.000	0.000

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RG7890O2	G	24HR100YR	37.440	12.286
RG7890P	G	24HR100YR	3.719	11.261
RG7900D	G	24HR100YR	2.972	21.324
RG7900O	G	24HR100YR	17.411	12.253
RG7900O2	G	24HR100YR	41.053	12.253
RG7910D	G	24HR100YR	2.792	12.449
RG7910O	G	24HR100YR	28.369	12.287
RG7910O2	G	24HR100YR	0.436	12.287
RH0310C	H	24HR100YR	1481.831	12.936
RH0320C	H	24HR100YR	1291.910	12.880
RH0340C	H	24HR100YR	812.618	12.445
RH8000D	H	24HR100YR	60.396	12.554
RH8000O	H	24HR100YR	96.660	13.277
RH8000O2	H	24HR100YR	44.348	12.377
RH8010O	H	24HR100YR	226.587	12.143
RH8010P	H	24HR100YR	24.466	12.027
RH8010P2	H	24HR100YR	26.408	12.009
RH8020O	H	24HR100YR	39.141	12.133
RH8020O2	H	24HR100YR	19.819	13.148
RH8020P	H	24HR100YR	12.326	11.784
RH8030O	H	24HR100YR	75.959	12.319
RH8030O2	H	24HR100YR	0.000	0.000
RH8030P	H	24HR100YR	18.752	11.948
RH8030P2	H	24HR100YR	0.000	0.000
RH8040O	H	24HR100YR	19.938	12.777
RH8040O2	H	24HR100YR	202.553	12.767
RH8040O3	H	24HR100YR	0.000	0.000
RH8040P	H	24HR100YR	26.248	11.848
RH8050O	H	24HR100YR	61.397	12.099
RH8050P	H	24HR100YR	1.752	12.144
RH8100O	H	24HR100YR	75.378	12.419
RH8100O2	H	24HR100YR	31.522	12.416
RH8100P	H	24HR100YR	28.438	11.885
RH8100P2	H	24HR100YR	28.516	11.885
RH8110C	H	24HR100YR	135.087	13.278
RH8120W	H	24HR100YR	120.666	12.088
RH8125P	H	24HR100YR	116.935	12.426
RH8127P	H	24HR100YR	105.109	12.453
RH8129P	H	24HR100YR	102.673	12.908
RH8130O	H	24HR100YR	0.001	12.106
RH8130O2	H	24HR100YR	0.000	0.000
RH8130O3	H	24HR100YR	61.941	12.106
RH8130P	H	24HR100YR	13.782	11.826

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RH8140O	H	24HR100YR	45.557	12.090
RH8140P	H	24HR100YR	16.204	11.726
RH8150O	H	24HR100YR	13.920	12.495
RH8150O2	H	24HR100YR	4.457	12.495
RH8150O3	H	24HR100YR	7.722	12.495
RH8150P	H	24HR100YR	8.920	15.810
RH8160D	H	24HR100YR	12.671	12.360
RH8160O	H	24HR100YR	34.372	12.374
RH8170O	H	24HR100YR	0.000	0.000
RH8170P	H	24HR100YR	91.843	12.943
RH8180D	H	24HR100YR	21.830	14.563
RH8180O	H	24HR100YR	0.000	0.000
RH8180O2	H	24HR100YR	7.296	13.143
RH8180O3	H	24HR100YR	0.000	0.000
RH8190O	H	24HR100YR	22.352	12.708
RH8190P	H	24HR100YR	20.725	12.077
RH8190P2	H	24HR100YR	51.537	12.077
RH8200O	H	24HR100YR	0.000	0.000
RH8200P	H	24HR100YR	12.034	11.659
RH8210O	H	24HR100YR	106.854	12.343
RH8210O2	H	24HR100YR	0.000	0.000
RH8210P	H	24HR100YR	16.173	11.670
RH8220O	H	24HR100YR	0.000	0.000
RH8220O2	H	24HR100YR	0.000	0.000
RH8220P	H	24HR100YR	22.326	11.947
RH8230O	H	24HR100YR	26.582	12.134
RH8230P	H	24HR100YR	15.258	11.818
RH8240O	H	24HR100YR	0.000	0.000
RH8240O2	H	24HR100YR	32.175	12.161
RH8240O3	H	24HR100YR	14.496	12.161
RH8240P	H	24HR100YR	27.027	11.964
RH8250O	H	24HR100YR	29.461	12.097
RH8250P	H	24HR100YR	9.780	11.659
RH8260O	H	24HR100YR	8.160	13.147
RH8260P	H	24HR100YR	13.886	16.050
RH8270D	H	24HR100YR	14.596	16.053
RH8270O	H	24HR100YR	16.108	13.052
RH8280O	H	24HR100YR	14.821	11.917
RH8280O2	H	24HR100YR	24.718	12.399
RH8280O3	H	24HR100YR	20.461	12.878
RH8280O4	H	24HR100YR	0.722	12.941
RH8280P	H	24HR100YR	8.908	12.108
RH8290O	H	24HR100YR	39.855	12.387

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RH8290O2	H	24HR100YR	7.033	12.903
RH8290O3	H	24HR100YR	0.000	0.000
RH8290P	H	24HR100YR	14.080	11.837
RH8300O	H	24HR100YR	8.237	13.539
RH8300P	H	24HR100YR	18.428	12.186
RH8310O	H	24HR100YR	15.899	12.149
RH8310O2	H	24HR100YR	50.550	12.822
RH8310P	H	24HR100YR	8.282	11.802
RH8400O	H	24HR100YR	45.183	14.921
RH8400P	H	24HR100YR	16.554	11.799
RH8410O	H	24HR100YR	18.306	12.932
RH8410W	H	24HR100YR	65.610	12.223
RH8420C	H	24HR100YR	69.939	12.400
RH8430D	H	24HR100YR	65.656	12.418
RH8430O	H	24HR100YR	0.000	0.000
RH8440O	H	24HR100YR	1.448	13.154
RH8440O2	H	24HR100YR	0.475	13.154
RH8500O	H	24HR100YR	81.707	12.198
RH8500P	H	24HR100YR	41.011	11.891
RH8510O	H	24HR100YR	22.557	13.942
RH8510O2	H	24HR100YR	0.000	0.000
RH8510P	H	24HR100YR	2.785	32.095
RH8520C	H	24HR100YR	101.450	12.216
RH8530O	H	24HR100YR	23.433	12.172
RH8530O2	H	24HR100YR	57.333	12.172
RH8530O3	H	24HR100YR	0.228	12.172
RH8530P	H	24HR100YR	61.006	11.940
RH8540O	H	24HR100YR	0.000	0.000
RH8540O2	H	24HR100YR	13.901	12.171
RH8540O3	H	24HR100YR	71.544	12.171
RH8540P	H	24HR100YR	10.764	11.686
RH8550O	H	24HR100YR	82.914	12.157
RH8550P	H	24HR100YR	5.321	14.376
RH8600O	H	24HR100YR	256.915	12.850
RH8600W	H	24HR100YR	123.076	12.590
RH8610O	H	24HR100YR	54.098	12.758
RH8610P	H	24HR100YR	51.822	12.110
RH8610P2	H	24HR100YR	51.822	12.110
RH8620O	H	24HR100YR	0.000	0.000
RH8620O2	H	24HR100YR	77.456	12.407
RH8620P	H	24HR100YR	87.089	12.116
RH8625P	H	24HR100YR	13.037	11.986
RH8630O	H	24HR100YR	6.896	12.171

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RH8630O2	H	24HR100YR	24.887	12.171
RH8630P	H	24HR100YR	14.311	12.071
RH8640O	H	24HR100YR	97.679	12.318
RH8640P	H	24HR100YR	36.985	11.755
RH8650O	H	24HR100YR	89.360	12.276
RH8650O2	H	24HR100YR	0.222	12.314
RH8650P	H	24HR100YR	27.233	11.652
RH8660O	H	24HR100YR	29.614	12.332
RH8660O2	H	24HR100YR	5.221	12.332
RH8660P	H	24HR100YR	28.747	11.968
RH8670O	H	24HR100YR	35.713	12.351
RH8670P	H	24HR100YR	16.402	14.047
RH8680O	H	24HR100YR	0.000	0.000
RH8680O2	H	24HR100YR	3.636	12.896
RH8680O3	H	24HR100YR	0.000	0.000
RH8680O4	H	24HR100YR	82.433	12.867
RH8680P	H	24HR100YR	78.131	14.033
RH9000O	H	24HR100YR	125.578	12.802
RH9000O2	H	24HR100YR	74.967	12.499
RH9000P	H	24HR100YR	251.177	12.027
RH9000P2	H	24HR100YR	253.105	12.027
RH9010O	H	24HR100YR	86.432	12.173
RH9010O2	H	24HR100YR	0.000	0.000
RH9010P	H	24HR100YR	26.215	11.727
RH9020O	H	24HR100YR	56.979	12.792
RH9020P	H	24HR100YR	232.007	12.051
RH9020P2	H	24HR100YR	232.181	12.051
RH9025P	H	24HR100YR	126.496	14.528
RH9025P2	H	24HR100YR	125.211	14.528
RH9030O	H	24HR100YR	11.408	13.735
RH9030O2	H	24HR100YR	19.027	12.820
RH9030P	H	24HR100YR	4.049	17.288
RH9040O	H	24HR100YR	189.702	12.397
RH9040P	H	24HR100YR	116.289	11.961
RH9050C	H	24HR100YR	44.833	12.258
RH9060O	H	24HR100YR	0.000	0.000
RH9060P	H	24HR100YR	2.024	16.020
RH9070O	H	24HR100YR	0.936	12.226
RH9070O2	H	24HR100YR	26.866	12.226
RH9070P	H	24HR100YR	24.572	12.114
RH9080O	H	24HR100YR	127.228	12.163
RH9080O2	H	24HR100YR	16.247	12.178
RH9080P	H	24HR100YR	68.769	11.891

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RH9090O	H	24HR100YR	14.652	12.101
RH9090O2	H	24HR100YR	12.052	12.101
RH9090O3	H	24HR100YR	34.103	12.101
RH9090P	H	24HR100YR	61.043	12.109
RH9100O	H	24HR100YR	6.400	12.180
RH9100W	H	24HR100YR	15.535	12.180
RH9100W2	H	24HR100YR	13.580	12.180
RH9110O	H	24HR100YR	54.564	12.049
RH9110O2	H	24HR100YR	37.534	12.049
RH9110P	H	24HR100YR	32.791	12.049
RH9120O	H	24HR100YR	12.362	12.285
RH9120P	H	24HR100YR	31.146	12.285
RH9130O	H	24HR100YR	0.000	0.000
RH9130O2	H	24HR100YR	39.115	12.239
RH9130O3	H	24HR100YR	0.000	0.000
RH9130P	H	24HR100YR	6.492	11.931
RH9140O	H	24HR100YR	12.954	12.129
RH9140P	H	24HR100YR	62.806	12.134
RH9150O	H	24HR100YR	10.709	12.174
RH9150O2	H	24HR100YR	8.822	12.174
RH9150P	H	24HR100YR	0.462	12.170
RH9160O	H	24HR100YR	3.535	12.113
RH9160P	H	24HR100YR	43.772	12.084
RH9170O	H	24HR100YR	0.000	0.000
RH9170W	H	24HR100YR	10.712	12.053
RH9200O	H	24HR100YR	0.000	0.000
RH9200P	H	24HR100YR	138.403	24.264
RH9200P2	H	24HR100YR	139.142	24.264
RH9210O	H	24HR100YR	41.525	12.761
RH9210P	H	24HR100YR	100.625	15.608
RH9210P2	H	24HR100YR	100.815	15.608
RH9220O	H	24HR100YR	81.734	12.730
RH9220P	H	24HR100YR	97.496	12.549
RH9220P2	H	24HR100YR	97.786	12.549
RH9223P	H	24HR100YR	68.995	16.091
RH9223P2	H	24HR100YR	68.865	16.091
RH9225P	H	24HR100YR	82.104	25.127
RH9225P2	H	24HR100YR	81.697	25.127
RH9227P	H	24HR100YR	65.888	11.628
RH9227P2	H	24HR100YR	65.406	11.628
RH9229P	H	24HR100YR	40.462	16.447
RH9229P2	H	24HR100YR	40.462	16.447
RH9230O	H	24HR100YR	25.066	12.604

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RH9230O2	H	24HR100YR	14.151	12.608
RH9230P	H	24HR100YR	31.507	12.360
RH9230P2	H	24HR100YR	31.343	12.360
RH9231P	H	24HR100YR	29.287	12.114
RH9231P2	H	24HR100YR	29.350	12.114
RH9240O	H	24HR100YR	26.000	12.546
RH9240O2	H	24HR100YR	5.537	12.546
RH9240P	H	24HR100YR	24.921	15.011
RH9240P2	H	24HR100YR	24.840	15.011
RH9245P	H	24HR100YR	19.309	15.275
RH9245P2	H	24HR100YR	19.183	15.275
RH9250O	H	24HR100YR	47.243	12.379
RH9250O3	H	24HR100YR	22.254	12.489
RH9250P	H	24HR100YR	26.308	12.071
RH9250P2	H	24HR100YR	25.988	12.071
RH9260O	H	24HR100YR	52.559	12.409
RH9260O2	H	24HR100YR	45.333	12.409
RH9260P	H	24HR100YR	16.611	11.992
RH9260P2	H	24HR100YR	16.583	11.992
RH9270C	H	24HR100YR	72.597	12.391
RH9280C	H	24HR100YR	34.819	12.961
RH9300O	H	24HR100YR	63.393	13.142
RH9300O2	H	24HR100YR	0.000	0.000
RH9300O3	H	24HR100YR	0.061	13.023
RH9300P	H	24HR100YR	42.793	15.362
RH9310O	H	24HR100YR	61.147	13.092
RH9310O2	H	24HR100YR	0.000	0.000
RH9310P	H	24HR100YR	26.108	16.111
RH9320D	H	24HR100YR	6.845	16.299
RH9320O	H	24HR100YR	96.811	12.653
RH9330O	H	24HR100YR	34.442	12.167
RH9330O2	H	24HR100YR	83.296	12.598
RH9330W	H	24HR100YR	59.146	12.112
RH9340O	H	24HR100YR	38.109	12.517
RH9340O2	H	24HR100YR	81.348	12.522
RH9340P	H	24HR100YR	13.479	15.874
RH9340P2	H	24HR100YR	10.273	15.518
RH9400O	H	24HR100YR	0.000	0.000
RH9400O2	H	24HR100YR	16.361	12.741
RH9400P	H	24HR100YR	41.216	16.458
RH9400P2	H	24HR100YR	41.334	16.458
RH9410O	H	24HR100YR	10.027	16.438
RH9410O2	H	24HR100YR	51.032	12.716

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RH9410P	H	24HR100YR	7.308	11.706
RH9420O	H	24HR100YR	29.695	12.448
RH9420P	H	24HR100YR	31.582	11.910
RH9420P2	H	24HR100YR	31.469	11.910
RH9430O	H	24HR100YR	18.281	12.359
RH9430O2	H	24HR100YR	13.309	12.051
RH9430O3	H	24HR100YR	0.000	0.000
RH9430O4	H	24HR100YR	13.654	12.526
RH9430P	H	24HR100YR	16.765	11.718
RH9440O	H	24HR100YR	17.174	12.323
RH9440O2	H	24HR100YR	0.872	13.143
RH9440P	H	24HR100YR	5.840	17.095
RH9450O	H	24HR100YR	52.604	12.311
RH9450P	H	24HR100YR	39.788	11.865
RH9460O	H	24HR100YR	0.000	0.000
RH9460O2	H	24HR100YR	43.782	12.324
RH9460O3	H	24HR100YR	10.440	12.324
RH9460P	H	24HR100YR	20.300	12.464
RH9500D	H	24HR100YR	51.544	17.537
RH9500O	H	24HR100YR	26.944	14.941
RH9510O	H	24HR100YR	23.706	12.381
RH9510O2	H	24HR100YR	1.170	13.240
RH9510O3	H	24HR100YR	11.962	16.312
RH9510O4	H	24HR100YR	4.874	12.598
RH9510P	H	24HR100YR	19.997	12.026
RH9520O	H	24HR100YR	5.788	13.107
RH9520O2	H	24HR100YR	9.760	14.490
RH9520O3	H	24HR100YR	0.003	12.657
RH9520P	H	24HR100YR	14.000	11.955
RH9530O	H	24HR100YR	0.819	15.689
RH9530O2	H	24HR100YR	2.769	12.590
RH9530O3	H	24HR100YR	51.235	13.001
RH9530P	H	24HR100YR	32.467	11.975
RH9540O	H	24HR100YR	0.000	0.000
RH9540P	H	24HR100YR	105.503	11.993
RH9550O	H	24HR100YR	55.291	12.326
RH9550O2	H	24HR100YR	0.000	0.000
RH9550O3	H	24HR100YR	15.518	12.907
RH9550P	H	24HR100YR	88.478	12.020
RH9560O	H	24HR100YR	69.893	12.157
RH9560O2	H	24HR100YR	0.000	0.000
RH9560O3	H	24HR100YR	24.981	12.331
RH9560P	H	24HR100YR	60.417	11.804

NAME	GROUP	SIM	MXFLOW	MXFLOWTM
RH9570O	H	24HR100YR	50.383	12.090
RH9570O2	H	24HR100YR	8.905	12.152
RH9570P	H	24HR100YR	28.756	11.715
RH9600O	H	24HR100YR	68.869	12.992
RH9600O2	H	24HR100YR	0.114	12.992
RH9600P	H	24HR100YR	74.602	12.159
RH9610O	H	24HR100YR	64.900	12.295
RH9610P	H	24HR100YR	62.541	11.701
RH9615P	H	24HR100YR	1.492	11.861
RH9620D	H	24HR100YR	1.647	11.861
RH9620O	H	24HR100YR	0.780	11.947
RH9620O2	H	24HR100YR	56.880	12.352
RH9620O3	H	24HR100YR	9.185	12.986
RH9630O	H	24HR100YR	53.277	12.138
RH9630O2	H	24HR100YR	0.000	0.000
RH9630O3	H	24HR100YR	1.724	13.032
RH9630P	H	24HR100YR	12.035	15.732
RH9640O	H	24HR100YR	26.027	12.279
RH9640P	H	24HR100YR	6.842	16.280
RH9650O	H	24HR100YR	0.561	12.347
RH9650P	H	24HR100YR	31.155	12.345
RH9660O	H	24HR100YR	34.290	12.199
RH9660O2	H	24HR100YR	0.346	12.825
RH9660P	H	24HR100YR	6.824	11.666
RH9670O	H	24HR100YR	0.000	0.000
RH9670P	H	24HR100YR	39.124	12.352
RH9675P	H	24HR100YR	10.965	11.649
RH9680O	H	24HR100YR	0.000	0.000
RH9680O2	H	24HR100YR	0.000	0.000
RH9680P	H	24HR100YR	10.458	11.591
RH9690O	H	24HR100YR	0.000	0.000
RH9690O2	H	24HR100YR	0.046	12.288
RH9690P	H	24HR100YR	3.812	11.988
RI1000D	I	24HR100YR	12.484	12.388
RI1000O	I	24HR100YR	2.121	12.388
RI1000O2	I	24HR100YR	45.294	12.388

Appendix D

Engineer’s Opinion of Probable Costs

Appendix E

BMP Rankings