Master Stormwater Management Plan for the Lake Dora Basin

Project 95K260

Volume I

Reconnaissance of Existing Data
for the Dora Basin of Lake County, Florida

Prepared for

The St. Johns River Water Management District
and
Lake County

by

Ghioto & Associates

April 1997

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EXECUTIVE SUMMARY

The Lake Dora Basin is located in Central Florida, within the Ocklawaha River Basin, and covers an area of approximately 42 square miles. A location map is provided in Figure ES-1. It is situated among the cities of Eustis, Mt. Dora, and Tavares. The basin exhibits hydrologic characteristics of both ridge and valley landforms, as land elevations range from 200 to 60 feet above sea level. Deep sands, characterized by high infiltration rates, are found throughout the north and east portions of the basin, while low permeability, hydric soils are present in the flat and depressional areas to the south and west.

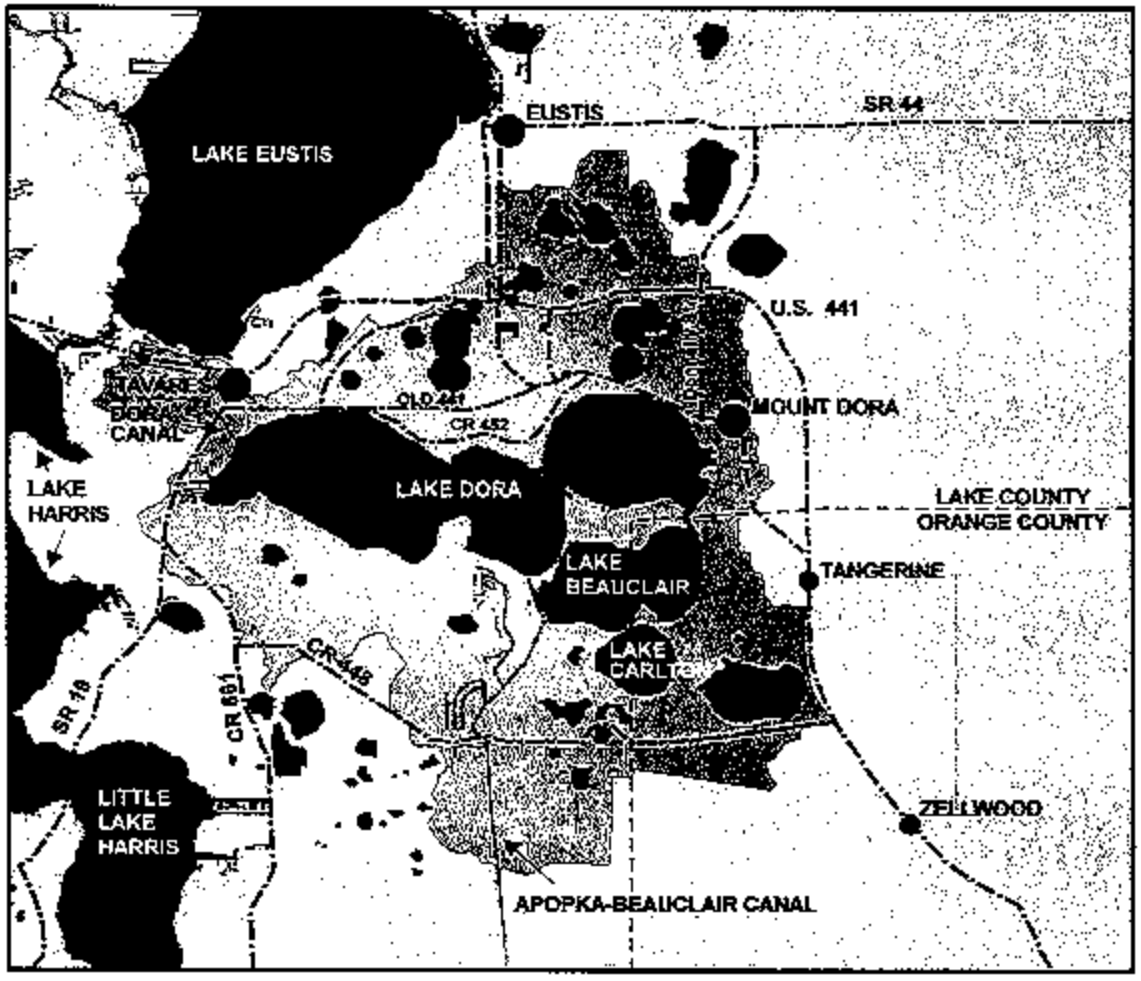
The Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District contracted with Ghioto & Associates to provide consultant and professional engineering services relating to the preparation of a Master Stormwater Management Plan (MSMP) for the Lake Dora Basin. The MSMP evaluates existing water quantity and quality conditions, locates problem areas, recommends measures for improvement and restoration, and provides design for improvement and restoration. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by Lake County in the planning and regulation of future development in the Lake Dora Basin.

This document describes activities undertaken for reconnaissance of existing data of the Lake Dora Basin. It is the first in a series of three volumes, which together provide results of the problem definition phase of the Master Stormwater Management Plan.

An extensive data collection program was undertaken to locate, acquire and assimilate available information. That program concentrated on obtaining existing data to the extent that it was available from the County, the District, and from various state, regional and federal agencies. Data sought included aerial photography, topography, drainage maps, construction plans, reports, and geographic information. Existing land use maps were updated to account for recent changes throughout the basin.

Collected data was used to develop a preliminary model network, for use with the EPA Stormwater Management Model (SWMM). Based upon the preliminary model network, a field survey program was established to supply information on selected hydraulic features associated with the primary conveyance system within the basin. Supplemental data was derived from available aerial photography and photogrammetry.

Master Stormwater Management Plan for the Lake Dora Basin



Location Map

Figure ES-1

Field investigations were undertaken to become familiar with basin characteristics, to verify preliminary model parameter selection, and to evaluate known drainage problem areas. Subcatchment areas were then delineated and hydrologic and hydraulic parameters selected for use in the preliminary model data set.

Existing, constructed land uses were identified using aerial photographs and available records obtained from County and District sources (including available GIS coverages). Approved, unconstructed land use plans were also identified (based on approved local comprehensive plans and DRIs). A comparison was made of the existing and approved (future) land uses, and apparent differences were noted.

CHAPTER I. INTRODUCTION

This document describes data collection and reconnaissance activities undertaken for the hydrologic and hydraulic investigation of the Lake Dora Basin. It is the first in a series of three volumes, which together provide results of the problem definition phase of the Master Stormwater Management Plan. This project was jointly funded by the Governing Board of the St. Johns River Water Management District and the Lake County Board of County Commissioners, and was administered by the District.

The organization of this volume is briefly described in the following :

Chapter II contains a description of the study area.

Chapter III contains a discussion of data collection.

Chapter IV contains a discussion of reconnaissance.

Chapter V contains a discussion of field investigations.

Chapter VI contains a discussion of available water quality data.

Chapter VII contains a description of land use identification.

Chapter VIII contains a summary of project activities.

Volume II in the series presents results of water quantity modeling. Included in that document is a discussion of model development, testing, and predictive simulations. Results of simulation of the response of the system to the 10-, 25-, and 100-Year 24-Hour storm events are presented in detail, and problem areas are identified.

Volume III in the series presents results of water quality modeling. Included in that document is a discussion of model development, testing, and definition of water quality parameters. Results of simulation of the response of the system to a "typical year" of rainfall data are presented in detail and opportunities for water quality improvement are identified.

A. LOCATION AND EXTENT OF THE STUDY AREA

The Lake Dora Basin is located in Central Florida, amid the cities of Eustis, Mount Dora and Tavares. From the Apopka-Beauclair Canal lock and dam to the Lake Dora Canal at US 441, the Lake Dora Basin covers an area of approximately 42 square miles. The study area is generally bounded on the north by Lake Eustis, on the south by Lake Apopka, on the east by the Wolf Branch Basin, and on the west by Lake Harris. A general location map is provided in Figure I-1.

B. PROJECT OBJECTIVES

The primary objective of this study is the development of a Master Stormwater Management Plan (MSMP). The MSMP evaluates existing water quantity and quality conditions, locates problem areas, and recommends and designs measures for improvement and restoration. Feasible structural and non-structural approaches to storm water management will be significant parts of the plan. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by the County in the planning and regulation of future development in the Lake Dora Basin

C. SCOPE OF WORK

On September 26, 1995, the Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District approved an agreement whereby Ghioto & Associates would provide consultant and professional engineering services relating to preparation of a Master Stormwater Management Plan for the Lake Dora Basin. Under that agreement, the watershed to be studied in detail includes a 42 square mile contributing area, and excludes the Wolf Branch Basin.

Overall, the Master Stormwater Management Plan consists of three (3) phases:

Phase I	The Problem Definition Phase
Phase II	The Conceptual Design and Permitting Phase
Phase III	The Implementation and Construction Phase

Phase I tasks consist of the collection of existing data (including coordination of any previous studies, documents and data and collection of additional information through field survey), the development of water quantity and quality

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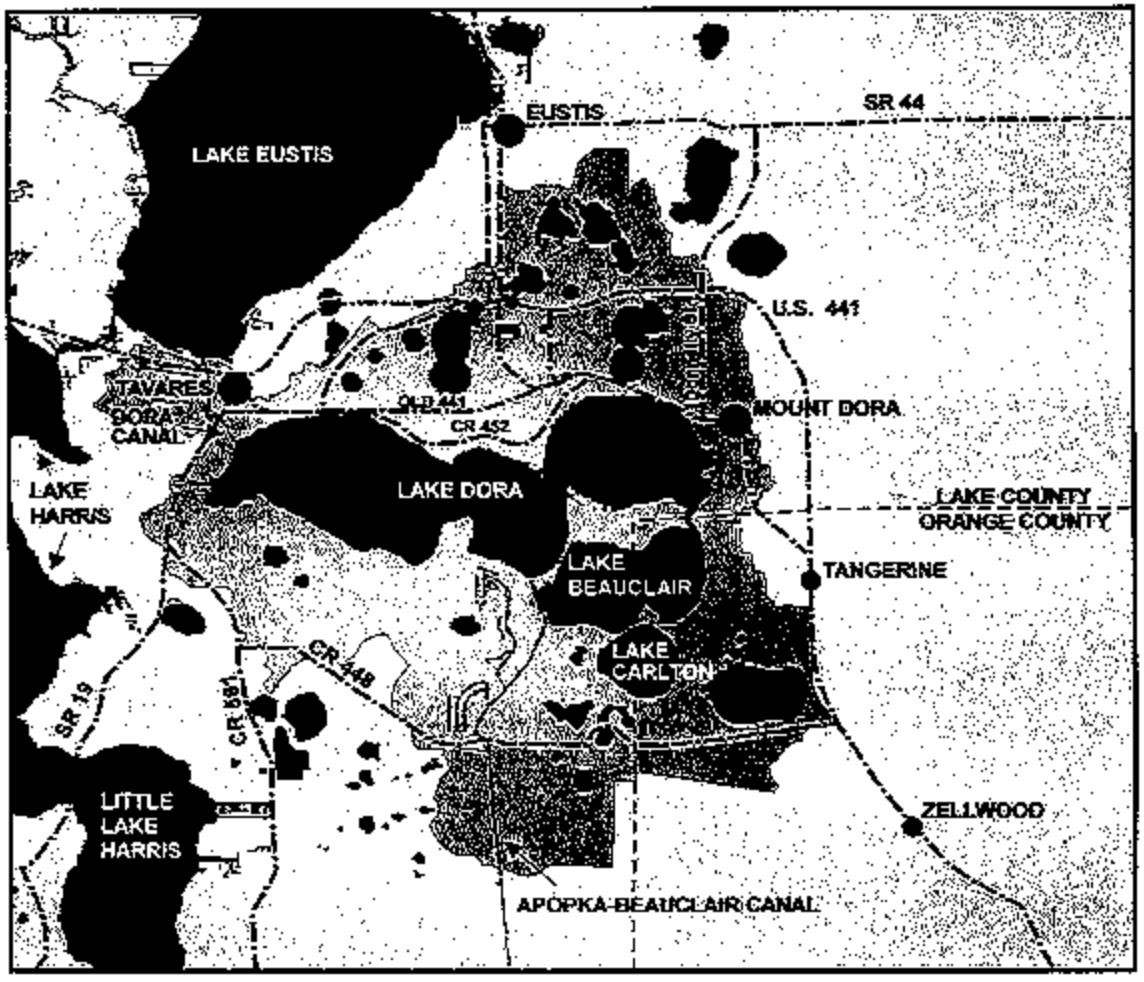

Location Map

Figure I-1

simulation models for the Lake Dora watershed, and the identification of problem areas in the watershed. Phases II and III will be separate studies and/or contracts.

The model to be employed is the Environmental Protection Agency's Stormwater Management Model (SWMM). SWMM is to be implemented as a surface water model for storm events, utilizing the Extended Transport block for water quantity simulations. The model is then implemented as a surface water model for a typical year's rainfall, utilizing the Transport block for continuous water quality simulations.

D. STUDY PARTICIPANTS

This report is the result of a great deal of effort, not only by Ghioto & Associates staff, but also by the staffs of the St. Johns River Water Management District, and Lake County. Both the District and the County provided extensive assistance by providing GIS coverages, data and other information that made this work product possible.

Mr. John Richmond of the SJRWMD is commended for his support and for his attention to detail in the execution and project management of District activities. Ms. Lora Bailey is gratefully acknowledged for her project management activities on behalf of Lake County. Mr. Elliot Moore, also of Lake County, is commended for his coordination of data collection activities with all other agencies. The members of the SJRWMD review team, Mr Martien Bergman, Mr. Marc Adkins, Mr. Lou Donnangelo, and Mr. Rolland Fulton, are also gratefully acknowledged.

CHAPTER II. STUDY AREA DESCRIPTION

The Lake Dora Basin is located in the Ocklawaha River Basin and has a total area of approximately 42 square miles. It lies within the jurisdiction of the St. Johns River Water Management District and Lake County. The basin is located within the "Golden Triangle", encompassing portions of the cities of Eustis, Mount Dora, and Tavares. The primary transportation routes into and out of the area include US 441, SR 19 and the Seaboard Coast Line railroad. Figure II-1 presents a view of the study area in its entirety.

A. GENERAL BASIN CHARACTERISTICS

The Lake Dora Basin lies within the Central Highlands topographic division and extends across portions of the Mount Dora Ridge and the Central Valley landforms. In addition to their height, some general characteristics of ridge landforms are deep lakes, closed lake basins, low water tables and subsurface drainage. General characteristics of valley landforms include large lakes, flat terrain, high water tables and relatively high surface runoff. Figure II-2 presents the Lake Dora Basin in relation to the extents of these two distinct landforms.

Lakes are the predominant hydrologic feature within the basin. In the Mount Dora Ridge area, to the north and east of Lake Dora, numerous lakes are enclosed by sand hills. These lakes exhibit a fair hydraulic connection to the underlying Floridan aquifer. To the south and west of Lake Dora, in the Central Valley area, lakes are less well connected to the aquifer and are characteristically surrounded by flat, wetland areas. Generally, natural stream channels exist only as high water connections between lakes and swamps. However, a number of waterbodies throughout the study area have been connected at the surface by manmade conveyance systems.

B. LAND USE

Figure II-3 depicts generalized land use for the Lake Dora Basin. Based upon District-supplied data, the land use shown is representative of conditions in 1994. In the figure, similar categories (such as commercial, industrial and institutional land use) have been combined. No distinction is made between low, medium and high density residential areas. These simplifications are for presentation purposes only.

Generally, residential communities are more prevalent, and of a higher density, along the northern perimeter of Lake Dora. The most intensive residential

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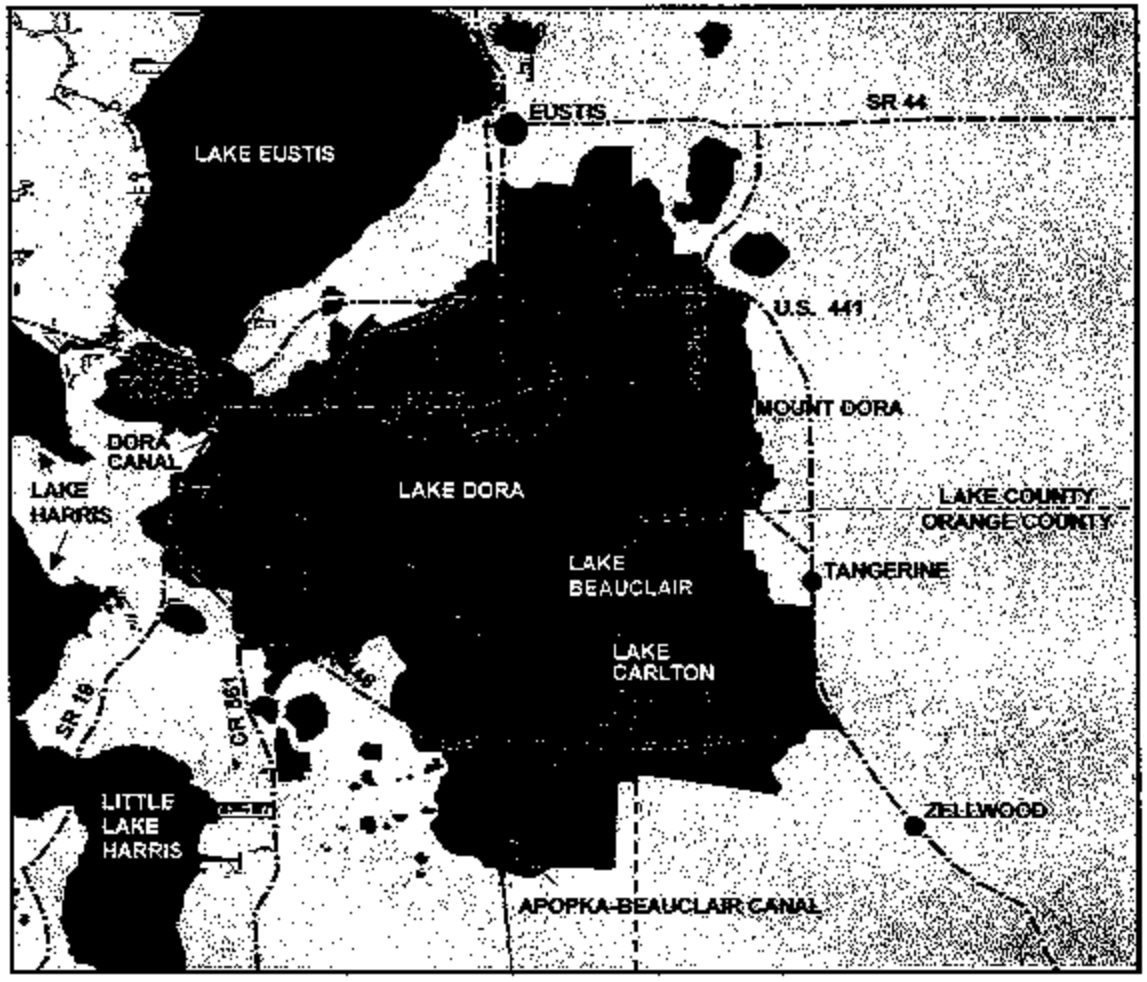
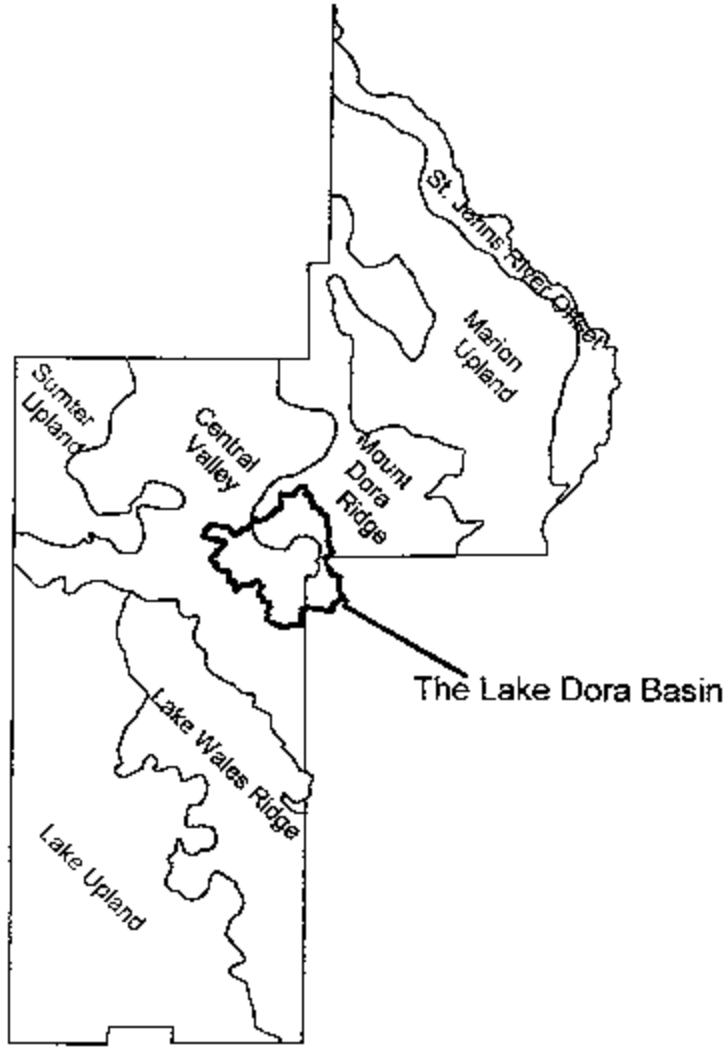


Figure II-1

Master Stormwater Management Plan for the Lake Dora Basin

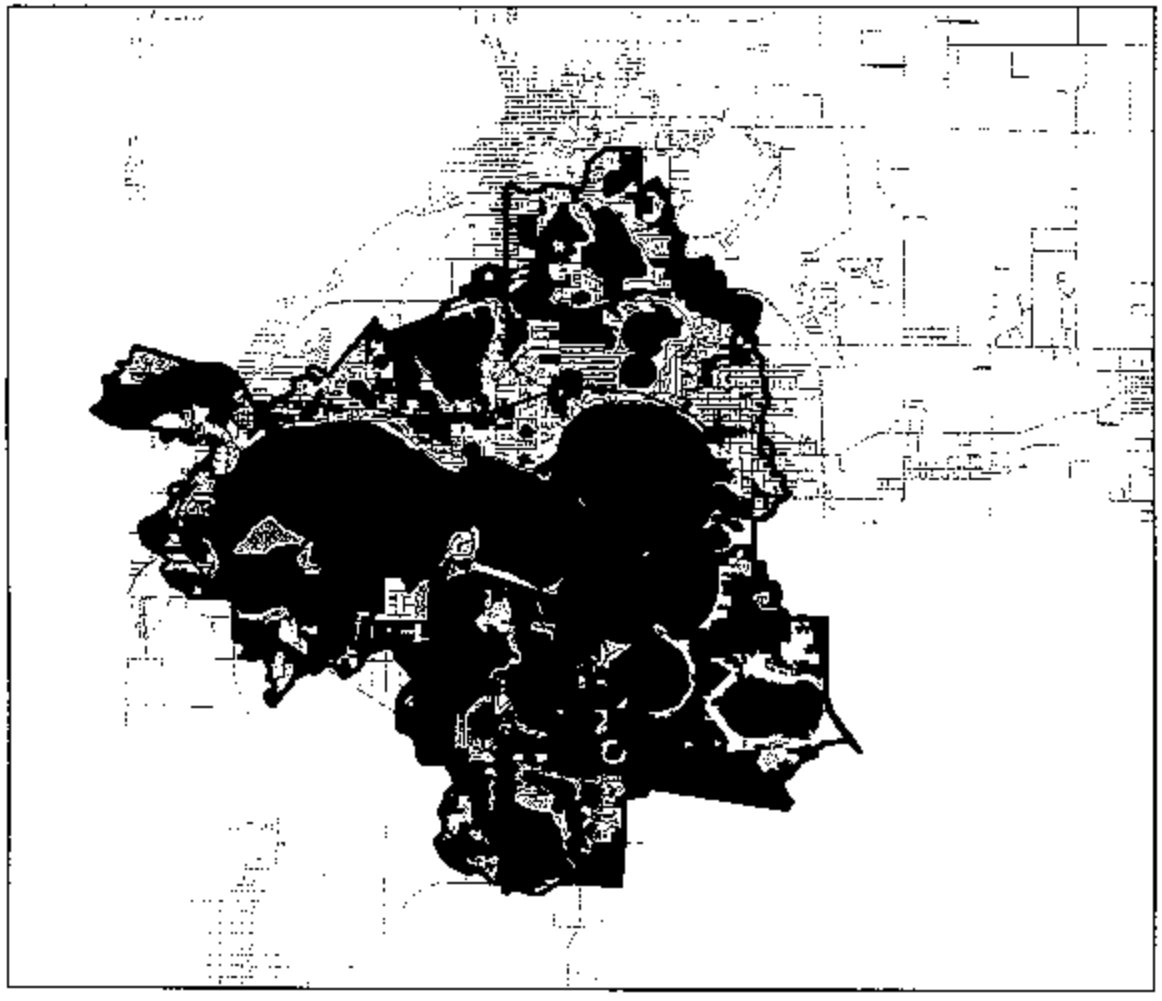


Landforms

N
Not To Scale

Figure II-2

Master Stormwater Management Plan for the Lake Dora Basin



Generalized Land Use

- Residential
- Comm/Indust/Intstit
- Rec/Open Space
- Agriculture
- Rangeland
- Upland Forests
- Water
- Wetlands
- Barren Land
- Trans/Comm/Utils

N

Not To Scale

Figure II-3

development has taken place in and around the cities of Eustis, Mount Dora, and Tavares. Throughout the more rural areas, south and west of Lake Dora, residential development is sparse and of a much lower density. Most of the commercial development within the basin has occurred along the primary transportation routes of State Road 441, Old State Road 441, State Road 19 and the Seaboard Coastline Railroad. A significant portion of the basin is in agricultural use, particularly in areas south of Lake Dora. Further discussion of land use is presented in Chapter VII of this report.

C. SOILS

Deep sands which exhibit high infiltration and high available storage capabilities are found at locations throughout the north and east portions of the watershed. However, low permeability, hydric soils that are associated with depressional areas are also present, particularly south and west of Lake Dora. These soils are characterized by much lower infiltration rates and low available storage capacity.

Figure II-4 shows the distribution of hydrologic soil groups across the area. Hydrologic soil group classifications are one means of classifying the infiltration and storage capabilities of a soil. The classification is used here, for presentation purposes, to depict the distribution of soil properties across the basin. A brief discussion of each hydrologic soil group's characteristics is provided in the following.

Hydrologic Soil Group A : Soils having a high infiltration rate (i.e. low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively well drained sands or gravely sands. These soils have a high rate of water transmission.

Hydrologic Soil Group B : Soils having a moderate infiltration when thoroughly wet. These consist mainly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Hydrologic Soil Group C : Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Hydrologic Soil Group D : Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that

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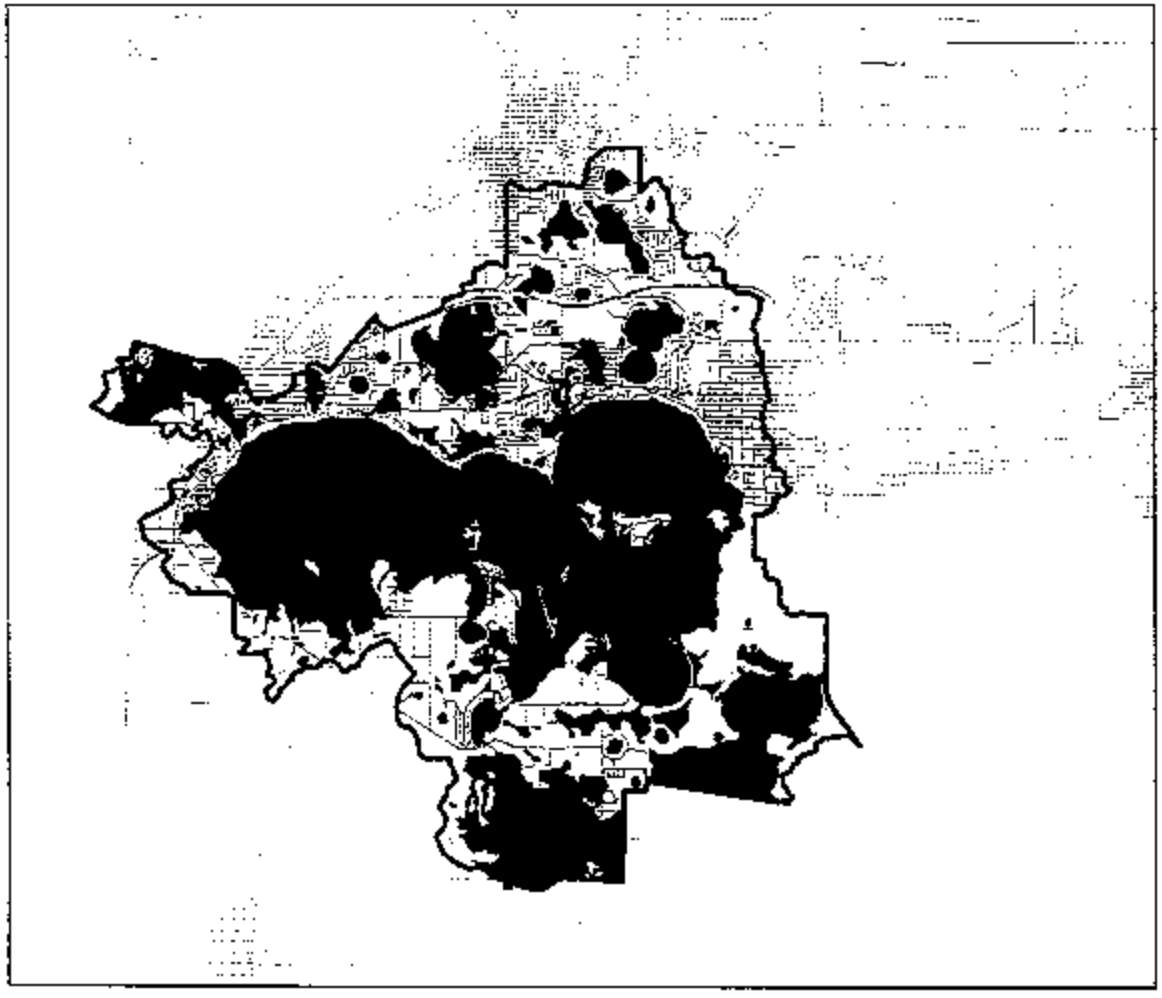

Hydrologic Soil Groups

HSG A
HSG B/D
HSG C
HSG D
W (Water)
Z (Other)

N
Not To Scale

Figure II-4

have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material.

Some soils are classified as belonging to dual hydrologic groups, such as A/D, B/D, or C/D. These ratings mean that, under natural conditions, the soil is classified as belonging to hydrologic soil group D, but by artificial methods the water table could be lowered sufficiently so that the soil would fit into a lower runoff potential category.

Areas indicated in Figure II-4 by a "Z" are classified as "made" soils, for which no hydrologic soils designation is given by the SCS. These soils are typically found in filled areas or in pits, and their hydrologic characteristics depend upon local conditions. Areas indicated in Figure II-4 by a "W" are classified as water.

D. TOPOGRAPHY

Figure II-5 presents topography, at five foot contour intervals, throughout the Lake Dora Basin. Land elevations in the study area range from approximately 200 to 60 feet NGVD. The transition across landforms, from ridge to valley, is reflected clearly in the figure. Deep lakes among sand hills are evident to the north and east of Lake Dora. Large lakes surrounded by low lying, flat terrain are evident to the south and west. Lake Dora itself, is characteristically associated with the valley landform and is bordered on it's southwest shore by a large wetland area.

E. WETLANDS AND HABITAT

Figure II-6 presents a composite image of water bodies, wetland vegetation, and wetland habitat zones. The water bodies and wetland vegetation shown are adapted from land use coverage data provided by the SJRWMD, previously discussed. The wetland habitat zones, also supplied as a GIS coverage by the SJRWMD, represent freshwater forested and herbaceous habitat areas. The habitat zones were originally defined by the U.S. Fish and Wildlife Service, based on National Wetland Inventory mapping.

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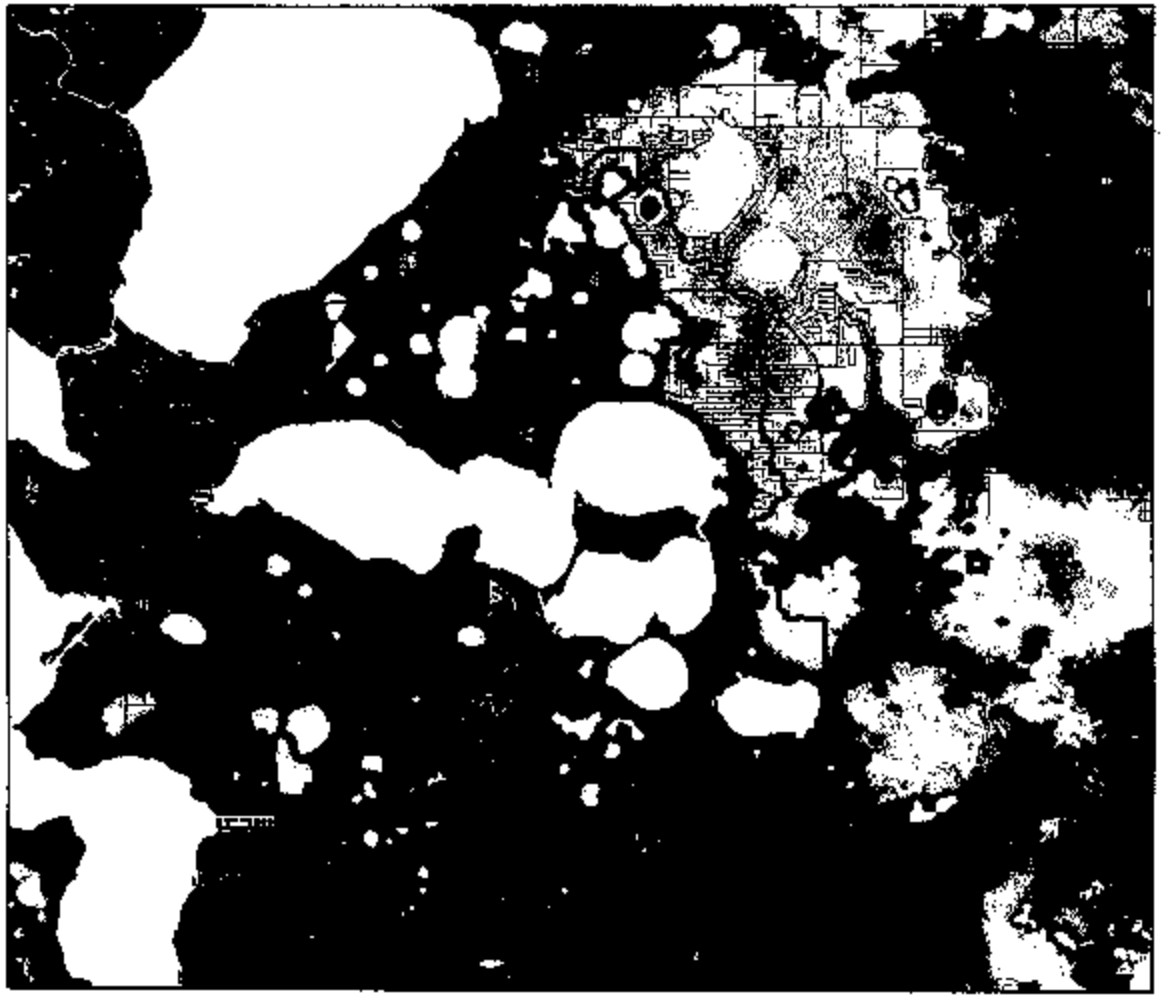

Topography

- 51-55
- 56-60
- 61-65
- 66-70
- 71-75
- 76-80
- 81-85
- 86-90
- 91-95
- 96-100
- 101-105
- 106-110
- 111-115
- 116-120
- 121-125
- 126-130
- 131-135
- 136-140
- 141-145
- 146-150
- 151-155
- 156-160
- 161-165
- 166-170
- 171-175
- 176-180
- 181-185
- 186-190
- 191-195
- 196-200

N

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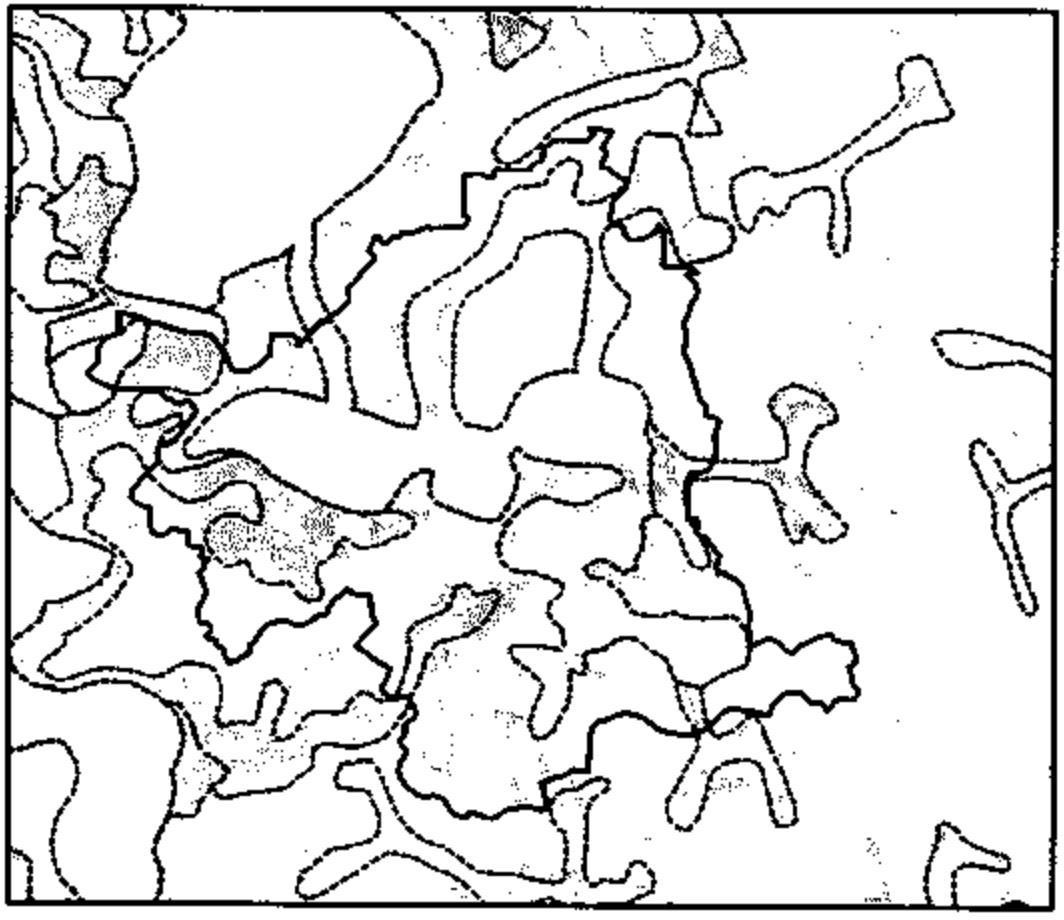
Figure II-5

Master Stormwater Management Plan for the Lake Dora Basin



Wetlands and Habitat

Water

Wetland

Habitat Zone

N

Not To Scale

Figure II-6

CHAPTER III. DATA COLLECTION

An extensive data collection program was undertaken to locate, acquire and assimilate available information for use in the study. Historical information was sought that would familiarize the hydrologists with characteristics of the area, while physical data was sought to quantitatively describe surface water systems for modeling purposes. The program concentrated on obtaining existing information to the extent that it was available from the County, the District, various state, regional, and federal agencies, as well as from consultants that had worked in the area.

A. AGENCY COORDINATION

A number of data needs were anticipated at the outset of the investigation. These generally fell into three categories: aerial mapping, geographic information, and historical data. Contact was made with various agencies and a general description was given of the project purpose and scope. Each agency was also provided a description of the general "area of interest", similar to those shown in Tables III-1 and III-2, with which they could clip out available geographic data or query existing database systems.

Table III-1 — **The General Area of Interest Clipping Boxes**

	Latitude-Longitude Box		
From Latitude	28° 42' 00"	To Latitude	28° 52' 00"
From Longitude	81° 34' 00"	To Longitude	81° 47' 00"
	State Plane Feet Box		
From Northing	1,590,000	To Northing	1,650,000
From Easting	250,000	To Easting	320,000

Table III-2		The General Area of Interest Land Sections
Township	Range	Sections
19	25	25 , 36
19	26	11 - 15 , 20 - 36
19	27	07 , 18 - 20 , 29 - 32
20	26	01 - 16 , 21 - 27
20	27	02 - 11 , 14 - 22

A comprehensive data request was developed by Ghioto & Associates staff, based on the types of data typically available from various governmental agencies, and forwarded to the SJRWMD and Lake County. County staff served to coordinate with all of the various agencies in an attempt to acquire the requested data. The following summarizes, by agency, the specific types of data that were requested.

The St. Johns River Water Management District.

- Historical rainfall, stage, flow, well, evaporation and water quality data for all stations within the general area of interest as well as data for those stations that were specified on page 5 of the Phase I Scope of Services.
- As-built plans of construction for drainage facilities, both public works and private development.
- Plans for proposed (permitted) future drainage systems, both public works and private development.
- Drainage reports and data supporting the analysis, planning and design of constructed and proposed drainage systems, both public works and private development.
- Existing survey of drainage facilities, natural features and historical flood elevations (structures, channel sections, high water marks, etc.)
- District rules and regulations regarding stormwater management.
- Drawing files which depict roads, drainage works, political boundaries, mitigation areas, permit locations, right-of-way and other features. In addition to providing spatial information, such CAD files may prove useful when we compose base mapping for report graphics.
- Summary list of Surface Water, Agricultural Discharge, and Consumptive Use Permit Applications with Site Locations.

- Complaint logs and photography which record occurrences of flooding or poor water quality within the area.
- Other available mapping (drainage maps, inventories, etc.).
- All GIS Coverages, clipped with the general area of interest boundary.
- Satellite Imagery.
- Digital Topography.

Lake County & Local Government.

- A copy of the County's Comprehensive Plan.
- Master plans for the Cities of Eustis, Mount Dora and Tavares.
- Three sets of 1 inch = 200 feet 1994 aerial photography.
- Three sets of 1 inch = 400 feet 1994 aerial photography.
- Three sets of 1 inch = 200 feet aerial photogrammetry (various dates).
- CAD files which depict roads, parcels, right-of-way, and drainage works.
- Complaint logs and photography which record occurrences of flooding or poor water quality within the area.
- As-built plans of construction for drainage facilities, both public works and private development.
- Plans for proposed (permitted) future drainage systems, both public works and private development.
- Drainage reports and data supporting the planning and design of constructed and proposed drainage systems, both public works and private development.
- Existing survey of drainage facilities (structures, channel sections, etc.).
- Rules, regulations and ordinances regarding stormwater management.

Orange County.

- A copy of the County's Comprehensive Plan.
- One sets of 1 inch = 200 feet 1994 aerial photography.
- One sets of 1 inch = 200 feet aerial photogrammetry (various dates).
- CAD files which depict roads, parcels, right-of-way, and drainage works.
- Complaint logs and photography which record occurrences of flooding or poor water quality within the area.
- As-built plans of construction for drainage facilities, both public works and private development.
- Plans for proposed (permitted) future drainage systems, both public works and private development.
- Drainage reports and data supporting the planning and design of constructed and proposed drainage systems, both public works and private development.
- Existing survey of drainage facilities (structures, channel sections, etc.).

- Rules, regulations and ordinances regarding stormwater management.

The Lake County Water Authority.

- CAD files which depict roads, parcels, right-of-way, and drainage works.
- GIS coverages, clipped with the general area of interest boundary.
- Historical rainfall, stage and water quality data.
- Complaint logs and photography which record occurrences of flooding or poor water quality within the area.
- As-built plans of construction for drainage facilities.
- Plans for proposed (permitted) future drainage systems.
- Drainage reports and data supporting the analysis, planning and design of constructed and proposed drainage.
- Existing survey of drainage facilities (structures, channel sections, etc.).
- Rules, regulations and ordinances regarding stormwater management.

The East Central Florida Regional Planning Council.

- Lake County Statistical Data.
- Orange, Seminole, Osceola Counties Statistical Data.
- Endangered Species Database.
- Orange County Land Use Data.
- Floodplain Boundaries.
- USGS Digital Line Graph Data - Lake & Orange Counties.
- FGFWFC Habitat Inventory Data (ARC/INFO Conversion).
- DRI Map Digital Data - Lake & Orange Counties.

The Florida Department of Environmental Protection.

- Summary List of Permit Applications and Site Locations.
- CAD Drawings.
- GIS Coverages.
- Mapping.
- Historical Data.
- Photography.
- Reports.
- Rules and Regulations.

The Florida Department of Transportation

- Drainage Maps.
- Location and Bridge Hydraulic Reports.
- Photography.
- Straight Line Diagrams.
- Rules and Regulations.

The Florida Game & Freshwater Fish Commission, The Florida Natural Areas Inventory, and The United States Dept of the Interior Fish & Wildlife Service.

- GIS Coverages.
- Mapping.
- Historical Data.
- Inventories.
- Photography.
- Reports.
- Rules and Regulations.

The United States Army Corps of Engineers.

- CAD Drawings.
- As-built plans of construction for drainage facilities.
- Drainage reports and data supporting the analysis, planning and design of constructed and proposed drainage systems.
- Historical rainfall and stage data.
- Existing survey of drainage facilities (structures, channel sections, etc.).
- Rules, regulations and ordinances regarding stormwater management.

The United States Dept of Agriculture - Natural Resources Conservation Service

- CAD Drawings.
- GIS Coverages.
- Photography.
- Reports.

The United States Geological Survey.

- CAD Drawings.

- GIS Coverages.
- Historical Data.
- Photography.
- Reports.
- Survey Data.
- Topographic Maps.

The United States Weather Bureau

- Historical Data.
- Photography.
- Reports.

Much of the requested data was not available for the study area. However, all agencies did respond in some manner to the request, and a large amount of valuable information was made available for use. A complete log of the data that was provided by the agencies is presented in Appendix "A".

Additional requests were made for various types of data throughout the course of the project. For example, as drainage structures were identified during field investigations, requests would first be made to the County or District for construction plans, in order to minimize the use of survey budget in areas where sufficient detailed information might already be available.

B. HISTORICAL DATA

Historical data, including records of rainfall, streamflow, lake stage, and water quality were acquired as previously described. Much of the historical data was imported into a general database maintained by Ghioto & Associates, so that it could easily be retrieved for display and analysis.

Initially, the primary function of historical data was to allow the hydrologists to review how the system had functioned in the past. Data at selected sites would later be worked up, as available, for use in the calibration and verification of the model.

Rainfall. Table III-3 presents maximum rainfall depths for return periods of 10, 25 and 100 years. These rainfall depths are the result of frequency analyses performed by the SJRWMD, published in Technical Publication SJ 88-3. The time distribution of 24-Hour rainfall, also the result of analyses by the SJRWMD,

will be used along with these rainfall volumes, to drive storm event simulations with the SWMM model.

Table III-3 **24-Hour Maximum Rainfall**

Return Period (in Years)	Rainfall Volume (in Inches)
10	6.5
25	8.4
100	11.4

Table III-4 summarizes historical rainfall data that was acquired from the National Climatic Data Center of the National Oceanic and Atmospheric Administration. Three hourly and five daily record data sets were identified by NCDC staff in the vicinity of the general area of interest for this project. These data sets were analyzed to develop daily rainfall for a "typical year", as discussed in Volume III of this report. That daily rainfall was used to drive continuous simulation with the SWMM model.

Table III-4 **Historical Rainfall Data Acquired**

Station	Description	Record	From	To
081641	Clermont	Daily	1/1/1948	8/30/1995
085076	Lisbon	Daily	1/1/1959	8/30/1995
086628	Orlando IAP	Daily	2/1/1974	8/30/1995
086638	Orlando Herndon AP	Daily	5/1/1956	1/31/1974
087982	Sanford Exp. Sta.	Daily	6/1/1956	8/31/1995
085076	Lisbon	Hourly	1/1/1959	4/30/1995
086628	Orlando IAP	Hourly	5/1/1974	4/30/1995
086638	Orlando Herndon AP	Hourly	1/1/1942	12/31/1974

Evaporation. Table III-5 presents mean monthly evaporation values, for the period from 1960 through 1995, at Lisbon. These evaporation values were used, along with the "typical year" rainfall during continuous simulation with the SWMM model.

Table III-5 **Mean Monthly Pan Evaporation At Lisbon (1960-1995)**

Month	Evaporation (in Inches)
January	2.45
February	3.03
March	5.00
April	6.56
May	7.44
June	6.90
July	6.84
August	6.31
September	5.30
October	4.22
November	2.76
December	2.27
Annual Total	59.08

Stage, Discharge, and Water Quality. Historical data was acquired describing stage, discharge and water quality at various locations throughout the study area. Unfortunately, the majority of available data describes historical conditions in receiving bodies of water, which were not modeled during this effort. The MSMP is focused upon the primary conveyance system which delivers stormwater runoff to those receiving water bodies.

C. GEOGRAPHIC INFORMATION

A large amount of geographic information was acquired from the various agencies, including the St. Johns River Water Management District, the Lake County Water Authority, the East Central Florida Regional Planning Council, and the U.S. Fish and Wildlife Service. In addition, some digital mapping provided by other agencies in the form of drawing files was converted to geographic coverages. Land use and soil coverages were assembled from panels provided by the SJRWMD, and used directly for the development of hydrologic parameters. Other coverage data served to be useful in defining the extent of wetland habitat, describing the future land use condition and providing base mapping for report graphics.

D. TOPOGRAPHY

Aerial photogrammetry with a 1 foot topographic contour interval was available for the entire study area on a scale of 1 inch = 200 feet. As shown in Table III-6, the topographic mapping for the study area draws upon several contracts which were flown between 1974 and 1994. Additional topographic information was provided in digital form by the SJRWMD at both one foot and five foot contour intervals. Topography was used over the course of this project for the delineation of basin boundaries, for the determination of overflow geometry and elevations in unsurveyed areas, and for the development of surface storage area data.

Table III-6 **Photogrammetry Coverage**

Title	Contractor	Date
Ocklawaha River Basin - Lake Harris	Abrams	1974
Ocklawaha River Basin - Little Lake Harris	Rader & Assoc.	1975
St. Johns River Water Management District	Hamrick	1984
Lake Dora, Beauclair, and Apopka Canal	Kucera	1986
Golden Triangle Aerial Contour Mapping Project	Continental	1987
Lake Griffin Aerial Mapping Project	-	1989
Orange County	Continental	1994

E. AERIAL PHOTOGRAPHY

Additional aerial photography of the study area (without elevation contours) was made available for use by Lake County. These aerials were flown in 1994 and provided at 1 inch = 200 feet scale in Lake County and at 1 inch = 300 feet scale in Orange County. These more recent aerial photographs were used by Ghioto & Associates to update basin delineations for those areas which had undergone recent development and to update existing land use in the study area. In addition, the aerials were used as a guide for determining where field survey was to be conducted for structure and channel geometry.

F. REPORTS OF PREVIOUS INVESTIGATIONS

The hydrology of the Lake Dora Basin and surrounding areas has been the subject of numerous investigations spanning a period of more than twenty years. Each of those previous studies presents valuable information regarding the hydrology, hydrogeology, and surface drainage characteristics of the region.

General Hydrology and Hydrogeology. The United States Geological Survey's *Hydrology of Lake County, Florida* (1976) was prepared in cooperation with the Oklawaha Basin Recreation and Water Conservation and Control Authority (also called the Lake County Water Authority), the Lake County Planning and Zoning Commission, the Lake County Board of County Commissioners, and the Florida Bureau of Geology. The stated purpose of that investigation was to inventory and appraise the water resources of all of Lake County and to provide part of the hydrologic information necessary for coordinated development of the resources of the County. In scope, the investigation was to determine or describe: (1) the hydrologic cycle as it pertains to rainfall, evaporation, surface water and groundwater in Lake County; (2) runoff characteristics of various drainage basins; (3) physical characteristics of lakes; (4) aquifer properties including recharge characteristics; (5) the availability and quality of surface water and groundwater resources; and (6) the effects of manmade stresses on the local hydrologic system.

Surface Water Management. The *Stormwater Management Needs Assessment for Lake County* (1991) was published by Camp, Dresser, & McKee. That report presents the results of the Data Collection and Preliminary Needs Assessment tasks of a phased Stormwater Management Program for Lake County. During the investigation, stormwater-related data were collected, evaluated for adequacy and quality, and utilized to establish levels of detail and priorities for subsequent program tasks. In addition, conceptual Capital Improvement Program probable cost estimates were made for facilities to mitigate known stormwater quantity problems, and to provide for the treatment of stormwater in areas where such facilities did not exist. The report also presents the recommended levels of service and detail to meet the requirements of Chapter 9J-5, FAC, and the additional future tasks which would be required for Lake County to complete the overall Stormwater Management Program objectives.

The *Mount Dora Master Drainage Plan* was published by Boyer-Singleton & Associates. The scope of the project included the inventory and evaluation of existing primary drainage and stormwater management systems within the City of Mount Dora and adjacent areas of Lake County. Thirteen drainage basins were identified and delineated from topographic maps. Field reviews were performed to locate and inventory approximately 700 stormwater structures, with field inspection data for each structure placed into a computer database. A preliminary analysis of existing systems was performed to identify critical flooding areas. Structure and pipe capacities were estimated based on data obtained in the field and from discussions with City of Mount Dora staff and long-time residents of the community. Existing and anticipated future system deficiencies were identified in order to develop possible alternatives for alleviating the drainage problems which occur within the City of Mount Dora. Recommendations were then made to the City so that an effective Capital

Improvement Program could be developed to provide adequate drainage service to the residents.

The *City of Eustis Stormwater Facilities Study* (undated) was published by Conklin, Porter and Holmes. The purpose of the study was to assemble, in a comprehensive report, information that can be used by local public officials and management personnel for developing and operating effective stormwater management programs and facilities. The report presents the results of the Preliminary Master Stormwater Management Study of physical facilities on City-wide and adjacent county areas. The Master Plan divides the study area into 62 major drainage basins. Elements of discussion associated with each basin in the report are: (1) description of the basin; (2) soil condition; (3) existing development; (4) existing drainage system; (5) flooding and existing problems; (6) projected growth; and (7) recommended facilities. The TR-55 hydraulic analysis method was used for preliminary determination of the runoff for areas within the basins where it was appropriate. General design criteria and policies are suggested for existing and proposed facilities, and nonstructural considerations are discussed. An opinion of probable cost for the recommended programs and a phased implementation of the master plan was recommended.

The *City of Tavares Stormwater Management Study* (1988) was published by Howard, Needles, Tammen & Bergendoff. The report describes the work efforts including (1) the hydrologic investigation of the study area; (2) a stormwater facility inventory; (3) a review of existing and proposed stormwater regulations; and (4) the development of proposed stormwater treatment methods. In addition, recommendations were provided in relation to existing flood problems within the City, stormwater facility maintenance procedures and the development of a water quality sampling program.

Other reports of particular interest, which address the quality of receiving water bodies and the wildlife habitat of the region, include :

Lake County Surface Water Quality Report by the Lake County Environmental Management Division
Closing the Gaps in Florida's Wildlife Habitat Conservation System by the Florida Game and Freshwater Fish Commission

A complete bibliography is included at the conclusion of this report.

Recommendations for system modifications are made in a number of reports. The status of actions on those recommendations varies, as numerous agencies are involved in improvements within their respective jurisdictions. In addition, other minor changes to drainage systems, not specifically identified in the master drainage reports listed above, occur throughout the study area, as a result of ongoing operations and maintenance activities. Coordination with each

of those affected agencies will be essential in considering plans for improvements to the primary drainage system, during Phase II of this project.

G. MAPS, PLANS AND OTHER DATA

Numerous other sources of information were gathered, with the assistance of Lake County and the SJRWMD, to describe surface drainage facilities throughout the Lake Dora Basin. As-built construction plans, drainage system inventories, roadways plans and other types of data all were compiled for assimilation and incorporation into the study effort.

CHAPTER IV. RECONNAISSANCE

The reconnaissance task involved investigation and inventory of existing primary drainage systems within the MSMP area. This included establishment of the location, type, number and invert or control elevations of major structures along the primary systems, lakes and connecting channels. This information was used as a basis for subsequent computer modeling activities.

A. PRELIMINARY MODEL NETWORK

SWMM operates with a network of manholes or inlets connected by conduits, to represent the physical layout of storage and conveyance systems to be analyzed in a watershed. The Lake Dora Basin network was initially constructed from a review of aerial photogrammetry. Based upon the layout of manhole and conduit elements that comprised the preliminary network, locations for field survey were selected and delineations of individual basin boundaries were performed. Refinements were subsequently made to the network to include information from more recent aerial photography, from available subdivision plans and from extensive field investigations undertaken by Ghioto & Associates staff. The network continuously evolved through testing and modifications over the lifetime of the project.

B. SUBCATCHMENT DELINEATION

Subcatchments were developed for the entire Lake Dora Basin using aerial photogrammetry, aerial photography, drainage maps and subdivision plans. In general, there is at least one subcatchment delineated for each inlet in the model network. However, there is an occasional manhole which was inserted for hydraulic modeling purposes where a subcatchment is not defined. In some cases, two or more subcatchments will contribute to a single inlet.

C. HYDROLOGIC PARAMETERS

The Green-Ampt method was selected for use in this investigation for the computation of infiltration. One advantage gained from the use of this method is the fact that the parameters used are physically based. The Green-Ampt infiltration equation, as employed by the SWMM model, has three parameters to be specified. Average capillary suction, hydraulic conductivity, and initial moisture deficit are fairly well defined for each of the soils encountered in the study area. Data sources used in the selection of parameters include Soil

Science Research Reports (compiled by the University of Florida in cooperation with the U.S. Department of Agriculture), the SWMM users manual and other journal publications.

Rainfall excess is the volume of water, from rainfall on a basin, that is available to be discharged as runoff. The discharge of rainfall excess from a basin to an inlet is defined as a function of time by the computation of a runoff hydrograph for the basin. The Kinematic Overland Flow Method is utilized by SWMM to perform that computation. Parameters used with this method include the catchment area, imperviousness, roughness and depression storage

D. HYDRAULIC PARAMETERS

Previously published drainage system inventories for the Cities of Eustis, Mount Dora, and Tavares were used extensively in the definition of the primary conveyance system. Field investigations were undertaken to become familiar with those components of the drainage system which would be modeled, especially in those portions of the basin not covered in the previous inventories. Drainage plans and field survey notes were employed to define the geometry of culvert and weir structures. Other hydraulic parameters, such as roughness coefficients, were selected based upon local conditions.

E. FIELD SURVEY

A survey program was designed, based on a review of aerial photography, photogrammetry, reports, initial field investigations, and the preliminary model network layout. The first set of survey sites was chosen to thoroughly describe the conveyance system throughout the Lake Dora Basin. After incorporation into the network data set and testing of the model, additional sites were selected to increase detail and, to the extent possible, expand the area of hydraulic detail into upstream areas. All data were reduced and prepared for use in the SWMM network file by professional hydrologists on Ghioto & Associates staff.

Through field survey, the geometric features of channels and structures were defined with a high degree of accuracy along primary conveyance systems. However, it was not considered economically feasible to survey every overflow and hydraulic connection in areas farther upland. In those areas for which field survey could not be cost-effectively acquired, a high degree of reliance was placed on photogrammetry (contours and spot elevations) for the definition of hydraulic connections. Field estimates of culvert inverts and road crowns in upstream areas were obtained through on-site observation and estimation based on photogrammetry. In areas where access was either not possible or where sites were deemed to be too remote for on-site inspection, estimates were made

solely from the photogrammetry. In most cases, these features consisted of connections between wetland systems, sloughs and natural topographic saddles.

F. STORAGE

Elevation-area relationships were obtained by digitizing appropriate contours using aerial photogrammetry and electronically extracting surface areas. These relationships were adjusted, where appropriate, to account for changes in land use since the photogrammetry was flown. In making these adjustments, it was assumed that storage within developed areas along the primary conveyance systems was removed from the system. In some cases, constructed ponds were incorporated into the network. Adjustments were made to the lower range of the area relationships where hydraulic control elevations (e.g. culvert inverts) were lower than available minimum topographic contours.

CHAPTER V. FIELD INVESTIGATIONS

Field investigations were conducted in order to become familiar with the watershed and primary drainage systems. These investigations also provided opportunities for the verification of model assumptions and parameters, and for the review of problem areas.

A. INITIAL FIELD VISITS

Initial field visits were performed to become acquainted with the study area and to obtain preliminary information needed in developing a model network. The first such visit focused upon the southwest portion of the study area from the intersection of SR 561 and SR 19 to the Apopka-Beauclair Canal Lock and Dam (including Sections 1 through 11, 14 through 16 and 21 through 23 of Township 20S Range 26E). The second field visit focused on familiarization with the northwest portion of the study area from the intersection of SR 561 and SR 19 to Lake Nettie (including Sections 10 through 16, and 20 through 35 of Township 19S Range 26E, Section 25 of Township 19S Range 25E, and Section 31 of Township 20S Range 26E). The third, and final, visit was undertaken to view the remainder of the study area, including lands east and south of Lake Dora.

The purpose of the three initial field investigations was to become familiar with the hydrologic characteristics of the study area and to identify drainage patterns and elements of the primary drainage system. Structure locations (culverts, bridges, etc.) and estimates of geometry were recorded for preliminary inclusion in the model database and for identification in a subsequent survey data request.

As a result of the field investigations, it was determined that the southwest portion of the study area can be defined generally by topographic means. That is, drainage patterns are related more to natural topography than to manmade conveyances (ditches, structures, etc.). Lands west of the Seaboard Coastline Railroad and SR 561, south of the intersection with SR 19 are locked out of the study area, by the elevation of the road and/or rail line. No significant structural connection exists that provides conveyance beneath SR 561 toward the study area from SR 19 to the Apopka-Beauclair Canal.

Wetlands in the vicinity of Lakes Newark and Virginia are connected through natural sloughs and/or across low points in dirt trails and roadways to Lake Dora. It is appropriate to define these areas hydrologically (i.e., model them as basins contributory to Lake Dora but not modeling their connection

hydraulically). In fact, given the undeveloped nature of the area it is appropriate to consider the areas as a part of Lake Dora itself (i.e., not model them at all).

Lands within and around developments bordering Lake Dora (including Squirrel Point, and developments along Shirley Shores and Deer Island Roads) drain according to the natural topography of the area. Use of swales and other manmade conveyances is limited and not considered the primary mode of drainage. These areas will be limited to hydrologic modeling.

A 40± acre lake east of the Givens Ranch must stage above the elevation of a dirt road (along its east shoreline) in order to overflow to an adjacent wetland area. That large wetland can then stage up above a low point in a dirt trail, and flow toward the western limits of the Venetian Village development. The Venetian Village system consists of graded lots with a limited swale system directing runoff to a primary canal system. The canal connects directly to the Apopka-Beauclair canal approximately one-half mile north of the Lock and Dam. It is possible that the canal water surface has some slope during a storm event, and it may be beneficial to model the Venetian Village and Apopka-Beauclair canals hydrodynamically to define such slope. Limited survey of canal cross sections would be required to provide sufficient data on the cross sectional geometry and the flowline of those canals for modeling purposes.

Access to the farm in Planning Unit 13 and to the lands west of the Apopka-Beauclair Canal (around Dague Lake) was restricted by gates. Reliance was placed upon aerial photogrammetry in analyzing this portion of the watershed.

It was also determined that the northwest portion of the study area can be defined both by topographic means and by physical layout of manmade conveyance systems. Drainage patterns are generally related to natural topography. However, manmade conveyances (ditches, structures, etc.) are in place throughout portions of the area which have altered natural drainage patterns. Lands west of SR 19 and south of Dead River Road are out of the study area, as they are a part of the Lake Harris basin.

No swale system or other surface conveyance system is evident in the Baytree Country Club community. Portions of the citrus grove to the west of Baytree slope toward the community and represent an upland basin (of different land use than Baytree). The citrus grove is bedded at grade and appears to be on well drained soils.

Lands within the Imperial Terrace development drain primarily via roadside swales and inlets to retention ponds and ultimately to canals which connect directly to the Dora Canal. The development was modeled hydrologically. The finger canals which connect to the Dora Canal were not modeled (they were considered along with Lake Dora and the Dora Canal as a boundary condition).

A median strip west of the intersection of US 441 and Lake Shore Boulevard receives no inflows and is drained via a single 18" RCP. A roadside swale to the south of US 441 and west of Lake Shore Boulevard collects runoff from the adjacent roadways and from a small commercial area. The commercial area is southeast of the intersection and drains to an inlet and across Lake Shore Drive via an 18" RCP to the roadside swale. The roadside swale is then drained northward beneath US 441 directly to Lake Eustis via a single 36" RCP.

The remainder of the area north of the intersection of SR 19 and Lake Shore Drive south of US 441 (one potential site for future use in flood or quality mitigation) is drained via a storm sewer and swales into a small ditch. That ditch is connected via a single 24" RCP beneath SR19 to a ditch which runs eastward to a large wetland area. Additionally, a median strip southwest of the intersection of SR19 and US 441 drains via a single 18" RCP to the same wetland.

A single 18" RCP is located beneath SR 19 southwest of its intersection with Lake Shore Drive. It apparently connects roadside swales along Lake Shore Drive, on the east side of an abandoned railroad bed. To the west of the abandoned railroad bed is a large wetland that abuts the Dora Canal. A mobile home sales business, adjacent to the wetland, was observed to be a potential flood problem area. Another culvert is located beneath SR 19, approximately 500 feet southwest of Lake Shore Drive. This (unsized) culvert connects a small wetland south of the intersection to the larger wetland which abuts the Dora Canal.

Preliminary basin delineations in the vicinities of Lakes Dicie, Dora, Elsie, Frances (outside study area), Louise, Saunders, Tavares, Woodward, and East and West Crooked Lakes were confirmed through observations of topographic relief. It was noted that the locations of retention facilities would be important in determining effective loading rates to waterbodies. It was also determined that detailed information was needed regarding the layout and geometry of storm sewer systems throughout the City of Tavares.

The southeast portion of the study area can also be defined both by topographic means and by the layout of manmade conveyance systems. Drainage patterns are generally related to natural topography. However, manmade conveyances (ditches, structures, etc.). are in place throughout portions of the area of investigation which have altered natural drainage patterns. Lands east of SR 441 are out of the study area, as they are a part of the Wolf Branch basin.

Preliminary basin delineations in the vicinities of Lakes Beauclair, Carlton, Jem, Victoria, and Horseshoe Lakes were confirmed through field observation.

Interconnections of these waterbodies through small ditch systems and culverts beneath roads were identified for subsequent field survey.

B. HYDROLOGIC AND HYDRAULIC EVALUATIONS

Additional field time was spent evaluating upland contributing areas and secondary systems which would be lumped hydrologically during the modeling effort. Relative imperviousness of various types of land uses was noted. Land cover and soil conditions were also reviewed to give hydrologists a feel for characteristics of the area. Drainage divides were verified on the ground for areas in which topographic data proved insufficient.

Locations of known problem areas were visited to evaluate condition of the drainage system. These field investigations provided familiarity with local conditions and identified needs for additional field survey data to describe conveyance systems.

CHAPTER VI. WATER QUALITY ANALYSIS

Each of the major waterbodies throughout the Ocklawaha River Basin has been subjected to water quality analysis. The most recent report on water quality was published in 1995 by the Lake County Environmental Management Division. As described in that report, a surface water quality surveillance network was established to enable staff to determine whether the level of water pollution is increasing or decreasing throughout Lake County. A rigid sampling routine was established in 1982 in order to more closely establish water quality trends and to ensure adequate protocols to document water quality changes.

Other agencies have historically sampled and analyzed the water quality of selected major waterbodies in Lake County. However, water quality sampling has primarily occurred within receiving water bodies, downstream of primary conveyance systems to be modeled in the Lake Dora Basin MSMP.

A. EXISTING DATA

Existing water quality data was acquired, as available, from each of the various agencies. Among the lakes sampled by Lake County are Lakes Dora and Beauclair. According the Lake County Environmental Management Division report, both Lakes Dora and Beauclair are hypereutrophic and have experienced nuisance algal blooms and fish kills. Stormwater discharges from Tangerine, Mount Dora, and Tavares, including runoff from commercial, residential, agricultural and rural developments contribute to overall mass loadings of pollutants to the lakes. In addition, both lakes are downstream from Lake Apopka via the Apopka-Beauclair Canal.

Table VI-1 presents the locations for which water quality sampling data was made available by the SJRWMD. While a significant amount of data has been collected by the District throughout the study area, it generally describes receiving water bodies. That is, none of the collected samples provides information regarding in-stream pollutant levels within the primary systems upstream of the major lakes. Available historical data does not provide information useful for calibration of the loading model. For this reason, no formal analysis of the available historical water quality data was undertaken as part of this MSMP.

Table VI-1 **Water Quality Sample Sites (from SJRWMD)**

Sampling Site Name	No. of Samples
Apopka-Beauclair La SR 448 Nr Astatula	2
L Carlton Leydens Ldg Nr Lake Jem Fla	2
L Dora At Dora Ca At SR 19 Nr Tavares	2
L Dora SR 452 Bell Ayre Est Nr Tavares	2
L Dora, Shirley Sh Rd At Ca Nr Tangerine	2
L Eustis (Dora Ca Otfl) Nr Tavares Fla	2
L Eustis (Trout C Otfl SR 44) N Eustis	1
Lake Beauclair Nr Astatula Fla	1
Lake Beauclair Trimble Pk Nr Tangerine	2
Lake Carlton Nr Astatula Fla	1
Lake Dora At Mt Dora Fla	1
Lake Dora Nr Mount Dora	1
Lake Fanny Nr Zellwood Fla	1
Lake Melton Nr Astatula, Fla.	1
Lake Ola At Tangerine Fla	2
Lk Dora Evans Rd At Donnelly D Mt Dora	2
Jewel Foulage	1
City Well No 1 Mt Dora	1
Apopka Beauclair Canal	9
Apopka Beauclair Lock & Dam Rain Sta 04/X3 Abir	1
Apopka Beauclair Lock And Dam 04/X3 Bal	1
Apopka-Beauclair Ca Outlet At Lk Beau, Nr Mt Dora	3
Apopka-Beauclair Canal At SR 448 Nr Astatula, Fl	4
Apopka-Beauclair Canal Bl Dam Nr Astatula, Fla.	77
Apopka-Beauclair Canal Nr Astatula, Fla.	169
Beauclair (Lake) Center	54
Beauclair Canal At 48 Bridge 04/X3 Abb	1
Beauclair Canal At SR #448 Midsl	9
Carlton (Lake) Center	5
Center Of Lake Ola	11
Dora (Lake) East Lobe Center	57
Dora (Lake) Middle Lobe Center	8
Dora (Lake) West Lobe Center	55
Dora Canal	6
Dora Canal At Tavares Fl	132
Dora Canal Center Of Run 04/X3 Dcc	1
Dora Cl 500yds Frm Hw 19 Bridge	10
Eustis (Lake) South	56
Gertrude Lake @ Center	2
Horseshoe Lake Nr Tangerine Fla	1
Idamere Lake @ Center	6
L Beauclair Middle	35
L Carlton Middle 1/2 Mile N Shore	31
L Dora E End Mid E Bay	9
L Dora Middle	10
L Dora W End	34

Table VI-1 (cont'd)	Water Quality Sample Sites (from SJRWMD)
Sampling Site Name	No. of Samples
L Eustis S End	10
L Ola At Us 441	1
L. Beauclair-Lake Co (See Paragraph)	53
L. Carlton-Orange Co (See Paragraph)	4
L. Dora-Lake Co (See Paragraph)	56
L. Ola-Orange Co (See Paragraph)	6
Lake Beauclair Mid-Lake	1
Lake Beauclair At Center Nr Mt Dora	3
Lake Beauclair Center 03/B3 Lbc	1
Lake Beauclair East (Tsm Project)	53
Lake Beauclair Mid-Lake	42
Lake Beauclair North (Tsm Project)	41
Lake Beauclair South (Tsm Project)	30
Lake Beauclair West (Tsm Project)	53
Lake Carlton Center 03/B3 Lcc	1
Lake Carlton Mid Section	1
Lake Carlton Middle	1
Lake Carlton North End	1
Lake Carlton South End	1
Lake Carlton Horseshoe Creek - Inflow	3
Lake Carlton Mid Lake	41
Lake Carlton Mid Section	28
Lake Carlton Nearshore - East Side	3
Lake Carlton North End	15
Lake Carlton Outflow	3
Lake Carlton South End	14
Lake Dicie At Eustis, Fla.	14
Lake Dora	20
Lake Dora Center Middle Lobe 03/B3 Ldc	1
Lake Dora Center West Lobe 03/Be Ldw	1
Lake Dora Mid-Lake	1
Lake Dora At Mount Dora, Fla.	251
Lake Dora Center East Lobe 03/B3 Lde	1
Lake Dora Center Lobe	54
Lake Dora Mid Lake	13
Lake Dora, Center Of East Lobe	24
Lake Eustis South 03/B3 Les	1
Lake Ola Outlet Nr Tangerine Fla	1
Lake Woodward	1
Okla. R. Lake Beauclair Inlet	6
Okla. R. Lake Dora Inlet	6
Okla. R. Lake Dora Outlet Canal	6
Saunders Lake @ Center	2
Unnamed Creek	8
West Crooked Lake Nr Eustis, Fla.	80
Total No. Samples	1781

CHAPTER VII. LAND USE IDENTIFICATION

Existing, constructed land uses were identified using aerial photographs and available records obtained from County and District sources (including available GIS coverages). Approved, unconstructed land use plans were also identified (based on approved local comprehensive plans and DRIs). A comparison was made of the existing and approved land uses, with apparent differences noted.

A. EXISTING LAND USE

Existing land use information was provided in digital form by the SJRWMD for use in this investigation. Provided in a set of six panels, the coverage was assembled and processed to remove sliver polygons. Land use information contained in the coverage is representative of conditions in the Lake Dora Basin in 1994.

B. LAND USE CHANGES

Recent aerial photography was used to update the existing land use coverage for the study area within Lake and Orange counties. Land use changes were then mapped on existing aerial photographs using the Florida Land Use, Cover and Forms Classification System. The resulting land use coverage was used along with the soils coverage to define hydrologic parameters for the watershed. Table VII-1 presents a Land Use - Hydrologic Soil Group matrix for the Lake Dora Basin, based upon those GIS coverages.

Table VII-1 **Land Use - Hydrologic Soil Group Matrix (Areas in Acres)**

Land Use	Hydrologic Soil Group						
	A	B/D	C	D	W	Z	Total
Agricultural	3525	874	376	181	11	94	5062
Commercial/Industrial	748	33	53	9	3	115	964
Open Space	2475	1246	486	2200	179	281	6870
Residential	3265	218	419	131	66	613	4713
Water/Wetlands	37	22	5	40	7610	35	7752
Total	10051	2395	1340	2564	7871	1140	25363

C. FUTURE LAND USE

The Future Land Use Element of the Lake County Comprehensive Plan allows for urban, suburban and rural land use throughout the majority of the Lake Dora Basin. Residential development within urban areas will range in density from one to seven dwelling units per acre, while development within urban expansion areas will range from one to four dwelling units per acre. Future urban and urban expansion areas are allowed to the north, west and east of Lake Dora. South of Lake Dora, suburban land use is allowed, with maximum densities of three dwelling units per acre, as a transition from urban and rural land uses. Further south, rural land use with a maximum density of one dwelling unit per five acres will be allowed for the continuation of existing agricultural uses, to maintain open space, and to protect native habitat.

CHAPTER VIII. SUMMARY

The Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District contracted with Ghioto & Associates to provide consultant and professional engineering services relating to the preparation of a Master Stormwater Management Plan (MSMP) for the Lake Dora Basin. The MSMP evaluates existing water quantity and quality conditions, locates problem areas, recommends measures for improvement and restoration, and provides design for improvement and restoration. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by Lake County in the planning and regulation of future development in the Lake Dora Basin.

This document describes activities undertaken for the reconnaissance of existing data for the Lake Dora Basin. It is the first in a series of three volumes, which together provide results of the problem definition phase of the Master Stormwater Management Plan.

A. RECONNAISSANCE OF EXISTING DATA

The Lake Dora Basin lies within the Central Highlands topographic division and extends across portions of the Mount Dora Ridge and the Central Valley landforms. In addition to their height, some general characteristics of ridge landforms are deep lakes, closed lake basins, low water tables and subsurface drainage. General characteristics of valley landforms include large lakes, flat terrain, high water tables and relatively high surface runoff. Figure II-2 presents the Lake Dora Basin in relation to the extents of these two distinct landforms.

Lakes are the dominant hydrologic feature within the basin. In the Mount Dora Ridge area, to the north and east of Lake Dora, numerous lakes are enclosed by sand hills. These lakes exhibit a fair hydraulic connection to the underlying Floridan aquifer. To the south and west of Lake Dora, in the Central Valley area, lakes are less well connected to the aquifer and are characteristically surrounded by flat, wetland areas. Generally, natural stream channels exist only as high water connections between lakes and swamps. However, a number of waterbodies throughout the study area have been connected at the surface by manmade conveyance systems.

Residential communities are usually more prevalent, and of a higher density, along the northern perimeter of Lake Dora. The most intensive residential development has taken place in and around the cities of Eustis, Mount Dora, and

Tavares. Throughout the more rural areas, south and west of Lake Dora, residential development is sparse and of a much lower density. Most of the commercial development within the basin has occurred along the primary transportation routes of State Road 441, Old State Road 441, State Road 19 and the Seaboard Coastline Railroad. A significant portion of the basin is in agricultural use, particularly south of Lake Dora.

An extensive data collection program was undertaken to locate, acquire and assimilate available information. That program concentrated on obtaining existing data to the extent that it was available from the County, the District, and from various state, regional and federal agencies. Data sought included aerial photography, topography, drainage maps, constructions plans, reports, and geographic information. Existing land use maps were updated to account for recent changes throughout the basin.

Collected data was used to develop a preliminary model network, for use with the EPA Stormwater Management Model (SWMM). Based upon the preliminary model network, a field survey program was established to supply information on selected hydraulic features associated with the primary conveyance system within the basin. Supplemental data was derived from available aerial photography and photogrammetry.

Field investigations were undertaken to become familiar with basin characteristics, to verify preliminary model parameter selection, and to evaluate known drainage problem areas. Subcatchment areas were then delineated and hydrologic and hydraulic parameters selected for use in the preliminary model data set.

Existing, constructed land uses were identified using aerial photographs and available records obtained from County and District sources (including available GIS coverages). Approved, unconstructed land use plans were also identified (based on approved local comprehensive plans and DRIs). A comparison was made of the existing and approved (future) land uses, and apparent differences were noted.

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APPENDIX A

Log of Acquired Data

Item Description	Type	Source
Ocklawaha River Drainage Basins July 1993	Map	District
SJRWMD Planning Units September 1993	Map	District
Technical Memorandum No.8 Surface Water Drainage Basin Boundaries: Reference Guide February 1995	Report	District
LK_DORA.XLS Historic WQ Data Spreadsheet	Disk	County
Special Publication SJ94-SP11 Index of Hydrologic Stations October 1993	Report	District
SJRWMD GIS Data Documentation September 1993	Report	District
Mapping and Geographic Information Standards Report October 1993	Report	District
Technical Memorandum No. 1 Development of a Nonpoint Source Pollution Load Screening Model 1993/1994	Report	District
Soil Survey Report Maps and Interpretations Lake County Area, Florida	Report	SCS
Technical Publication SJ91-3 24-Hour Rainfall Distributions for Surface Water Basins Within the SJRWMD, Northeast Florida	Report	District

Log of Acquired Data (Continued)

Item Description	Type	Source
SWMM Version 4.3 (interim version)	Program	OSU
Dora Basin (within Lake County) 200 Scale Aerial Photography March 1994	Aerial Photos	County
Dora Basin (within Lake County) 400 Scale Aerial Photography March 1994	Aerial Photos	County
Dora Basin (within Lake County) 200 Scale Aerial Topography Dated 1973 through 1987	Aerial Topography	County
City of Tavares Stormwater Management Study (by HNTB) September 1988	Report & Plans	County/ Tavares
Stormwater Management Needs Assessment For Lake County (by CDM) May 1991	Report	County
City of Mount Dora Mt. Dora Master Drainage Plan (by Bowyer-Singleton & Assoc.) (undated)	Report	County/ Mt. Dora
Comprehensive Drainage Plan Lake County, Florida Phase II Hydrologic Evaluation of Basin Segments and Sub-Segments October 1978	Report & Map	County
City of Eustis Stormwater Facilities Study (by CPH) (undated)	Report & Plans	County/ Eustis
Lake County Township Book (1"=2000' and 1"=3000') 1995 Edition	Bound Maps	County

Log of Acquired Data (Continued)

Item Description	Type	Source
Lake County GIS System Data Coverage Index (LCWA) County-Wide Coverages Most Commonly Used Final draft 5/18/95	Report	County/ LCWA
Water Resources Data, Florida, Water Year 1994 Volume 1A Northeast Florida Surface Water USGS – 1995	Report	USGS
Hydrology of Lake County, Florida Water-Resources Investigation 76-72 USGS -- August 1976	Report	County/ USGS
Gage Height, Discharge, and/or Elevation Data, and Water Quality Data 8 diskettes USGS (some stations taken over by SJRWMD post 1993)	Diskettes	USGS
Lake County Surface Water Quality Report 1995 Lake County Environmental Management Division June 6, 1995	Report	County
Water Quality Data Lake County Environmental Management	Disk	County
Biodiversity Hot Spots; Priority Wetlands; Wetland-Depend. List. Species Dist.; Land Cover; Strategic Habitat Cons. Areas; Species From "Closing The Gap" (Accompaniment Technical Information Instructions)	8mm Tape	County/ FGFWFC
Mapping Wetland Habitats of High Priority To Endangered and Threatened Species In Florida -- Final Project Report FL Game And Fresh Water Fish Comm. -- Sept. 1994	Report	County/ FGFWFC
Closing The Gaps In Florida's Wildlife Habitat Conservation System FL Game and Fresh Water Fish Comm. 1994	Report	County/ FGFWFC

Log of Acquired Data (Continued)

Item Description	Type	Source
Orange County, FL Subdivision Regulations Ord. # 94-4 Orange County Planning Department Feb. 22, 1994	Report	County/ Orange County
Lake County Geographic Information System Data Dictionary Lake County Water Authority Dec. 1, 1995	Report	County/ LCWA
Daily Rainfall (Inches) For Calendar Years 1987-1995 Tavares Rainfall Station	Report	County/ OBRWCC A
Daily Rainfall (Inches) For Calendar Years 1988-1995 Round Lake Road	Report	County/ OBRWCC A
USDA Soil Conservation Svc. & Other GIS Coverages Lake Dora Basin Area LCWA - 2 CD Roms	2 CD's	County/ LCWA
Drainage Map N.R.M. 53-E Alfred Street, Tavares, FL Scale 1" = 100' State of Florida - Dept. of Roads	Map	County/ FDOT
Drainage Map -- Mt. Dora F.D.O.T. -- State Project No. # 11682-3603 Sheets No. 2,5,6,7	Map	County/ FDOT
Drainage Map -- Mt. Dora F.D.O.T. -- State Project No. # 11240-3510 Sheets No. 4,5,6	Map	County/ FDOT
Drainage Map -- Mt. Dora F.D.O.T. -- State Project No. # 11682-3602 Sheet No. 2,3,9,10,11,12,13,14,15,16	Map	County/ FDOT
Drainage Map -- Mt. Dora F.D.O.T. -- State Project No. # 11050-3504 Sheet No. (unknown)	Map	County/ FDOT

Log of Acquired Data (Continued)

Item Description	Type	Source
Drainage Map -- Mt. Dora F.D.O.T. -- State Project No. # 11050-3503 F.D.O.T. -- State Project No. # 11050-3504 Sheets No. 16,17,18	Map	County/ FDOT
Drainage Map -- Mt. Dora F.D.O.T. -- State Project No. # 11010-3111 F.D.O.T. -- State Project No. # 75020-3108 Sheets No. 4,23,24,25,26,27,28,29	Map	County/ FDOT
Storet Retrieval Summaries (miscellaneous water quality)	Text	County
Restoring the Ocklawaha River Basin and Floodplain SJRWMD Publication	Pamphlet	SJRWMD
Proposed LCWA/SJRWMD DOQQ Project	Map	County
Technical Publication SJ 95-6 External Nutrient Budget and Trophic State Modeling for Lakes in the Upper Ocklawaha River Basin 1995	Report	G&A
Project 90G149 Bathymetric and Sediment Thickness Analysis of Seven Lakes in the Upper Ocklawaha River Basin ECT - September, 1992	Report	G&A
SJRWMD GIS Coverage Data	8mm	SJRWMD
SJRWMD Topography Coverage Data	8mm	SJRWMD
Application for Conceptual Permit Application Gilbert Park Drainage Basin, Mount Dora, Florida by DRMP May 1995	Report	County
Codding Property Feasibility Study for the City of Mount Dora by DRMP June 1995	Report	County

Log of Acquired Data (Continued)

Item Description	Type	Source
FNAI - DORABASN.DBF Species and Natural Community Occurrences	Disk	County
Eudora Road Pump Station Lake County Public Services 1993	Plans	County
US Fish and Wildlife Service Florida Scrub Jay point and polygon GIS data January, 1996	Disk	County
ECFRPC Census, Endangered Species, DLG and DRI data January 1996	Disks	County
NOAA NCDC Precipitation Data	Disks	County
Drainage Map -- State Road S-48 F.D.O.T. -- State Project No. # 11514-3601 Sheets No. 1,2,4-13	Map	County/ FDOT
City of Tavares Future Land Use Map 2001	Map	County/ Tavares
GPS Control Points and Descriptions (includes map indicating locations)	Reports/ Maps	County
Lake Gertrude Outlet Pipe Survey Data	Notes	County

Master Stormwater Management Plan for the Lake Dora Basin

Project 95K260

Volume II

Water Quantity Analysis
of the Dora Basin of Lake County, Florida

Prepared for

The St. Johns River Water Management District
and
Lake County

by

Ghioto & Associates

April 1997

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EXECUTIVE SUMMARY

The Lake Dora Basin is located in Central Florida, within the Ocklawaha River Basin, and covers an area of approximately 42 square miles. A location map is provided in Figure ES-1. It is situated among the cities of Eustis, Mt. Dora, and Tavares. The basin exhibits hydrologic characteristics of both ridge and valley landforms, as land elevations range from 200 to 60 feet above sea level. Deep sands, characterized by high infiltration rates, are found throughout the north and east portions of the basin, while low permeability, hydric soils are present in the flat and depressional areas to the south and west.

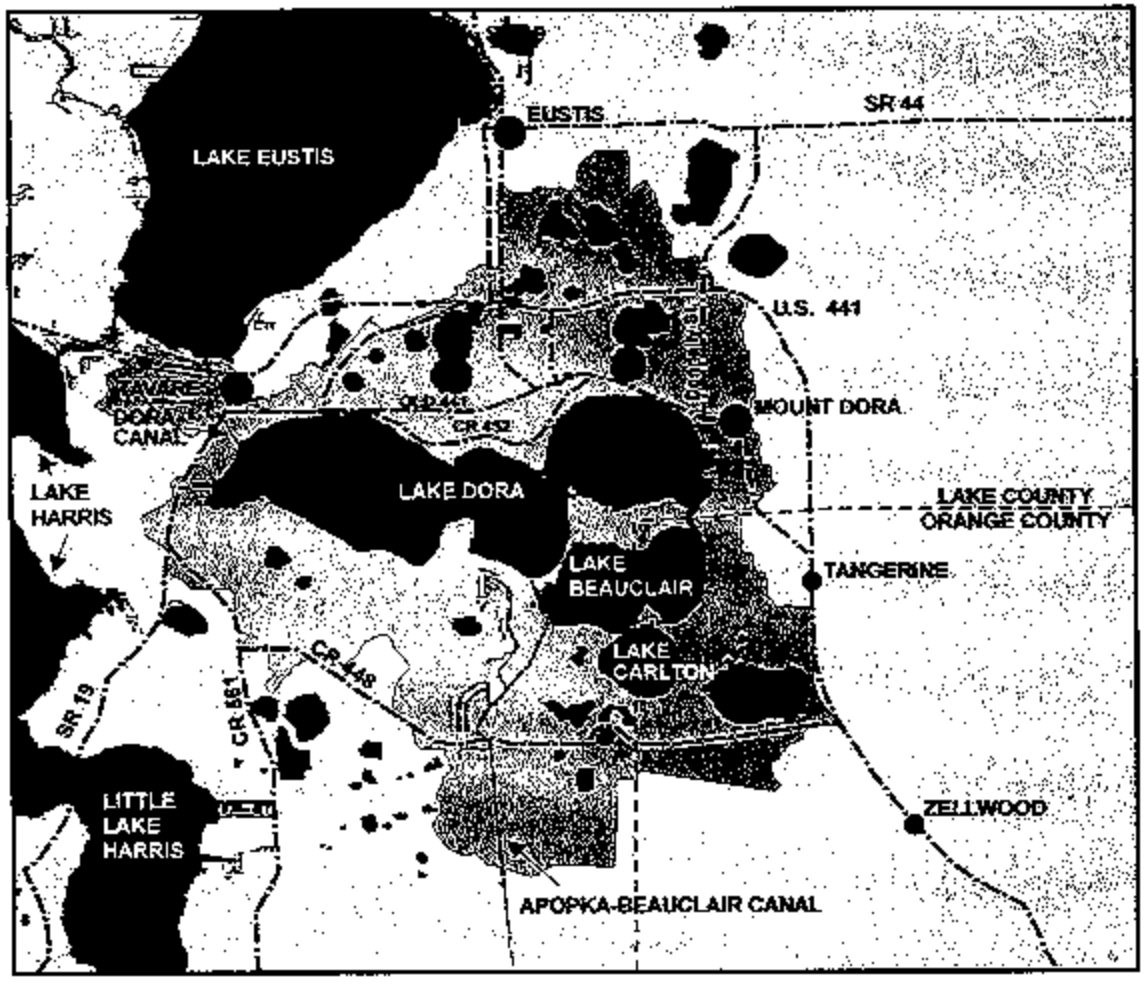
The Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District contracted with Ghioto & Associates to provide consultant and professional engineering services relating to the preparation of a Master Stormwater Management Plan (MSMP) for the Lake Dora Basin. The MSMP evaluates existing water quantity and quality conditions, locates problem areas, recommends measures for improvement and restoration, and provides design for improvement and restoration. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by Lake County in the planning and regulation of future development in the Lake Dora Basin.

This document describes activities undertaken for the water quantity analysis of the Lake Dora Basin. It is the second in a series of three volumes, which together provide results of the problem definition phase of the Master Stormwater Management Plan.

The Environmental Protection Agency's Stormwater Management Model (SWMM Versions 4.2 and 4.31) was used to simulate the response of the study area to rainfall. SWMM is constructed in the form of "blocks". The RUNOFF block of SWMM computes surface runoff from a basin, based upon a rainfall hyetograph, antecedent conditions, land cover and topography. The Extended Transport block of SWMM, or EXTRAN, is used to perform routings of that runoff through the primary conveyance system. The principal advantage of using the EXTRAN block lies in its ability to solve the St. Venant Equations, thereby allowing for hydrodynamic simulation of flow reversals and backwater effects.

A customized version of Aquarian Software's CHAN for Windows was employed as a pre-processor to the SWMM program, for construction of the model network database. CHAN export and translation functions were then employed to generate SWMM input data files for execution of storm event simulations.

Master Stormwater Management Plan for the Lake Dora Basin



Location Map

Figure ES-1

Nine distinct model networks were developed to describe the surface water conveyance systems within the Lake Dora Watershed. These networks depict individual drainage systems that could be analyzed separately, thus providing for smaller model input and output data sets, faster simulations, and more focused analysis of results. Another advantage of separation into individually modeled subareas will be experienced during future modifications to the model, for analysis of proposed system modifications.

In order to calibrate (and verify) a model, historical rainfall, streamflow and stage data is required. Such historical data was not available for use in this study. An alternative methodology was therefore developed to test each subarea model, and its sensitivity to parameter selection. Since model network and rainfall data were stored in CHAN format databases, CHAN simulations were run for comparison to SWMM Runoff block results. Based upon the comparisons of numerous simulations, and upon the experience of staff, it was concluded that the SWMM storm event simulations provide reasonable results for each of the subareas of the Lake Dora Watershed.

Summaries of simulation results for each subarea model are provided, along with figures depicting subcatchment layout and the link-node representation of the model network (primary conveyance system). Hydrologic summary tables, and tables of peak stage, discharge and velocity are presented and discussed for each storm event simulated. Time series graphs of discharge at selected locations in the watershed are displayed and discussed to illustrate representative time-varying flow conditions.

Problem areas were identified based upon simulation results for the 10-, 25-, and 100-Year 24-Hour storm event simulations. The depth and duration of flooding at manholes and inlets was reviewed, along with peak stage, discharge and velocity, as indicators of the severity of simulated flood conditions. Reports of previous investigations and discussions with County staff corroborated the simulation results and served to identify other known problem areas.

A simple ranking methodology was selected to prioritize problem areas. Each identified problem area was classified as being either a high, medium, or low priority, as described in the following.

<u>High Priority Problem Areas</u>. High priority problems include those identified as posing a potential threat to public health, welfare and safety. For example, roadways which overtop pose a potential threat to motorists and must be considered a high priority for investigation. Streets which convey flood flows from surcharged inlets are considered a high priority for the same reason. Locations at which high velocities are expected should be investigated. Among the high priority areas are the following:

Along John's Avenue, from Clayton Street to Grandview Street, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities.

Along East 4th Avenue, from Baker Street to McDonald Street, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities.

Just north of Liberty Avenue, from Tremain Street upstream to Grandview Street, then to 1st Avenue and Tremain Street, insufficient drainage capacity of the primary conveyance system may result in surcharge conditions, roadway overtopping and high velocities at culvert crossings.

In the vicinity of Helen Street, 6th Avenue and 8th Avenue, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities.

Medium Priority Problem Areas. Medium priority areas include those which have the potential to result in property damage and those which inconvenience the public on a frequent basis. The existing drainage system associated with these areas is generally considered to be inadequate and in need of improvement. Among the medium priority areas are the following:

Upstream (East) of Clayton Street, insufficient capacity of the primary conveyance system from South Highland Street to the railroad crossing results in surcharge conditions and overland flows.

In the vicinity of Charles Avenue, Donnelly Street and Tremain Street, insufficient drainage capacity of the primary conveyance system results in surcharge conditions and limited roadway overtopping.

In the vicinity of Old Eustis Road, Dogwood Drive and Hillside Drive, frequent inundation associated insufficient drainage capacity (possibly exacerbated by high tailwater conditions in Lake Gertrude) has historically occurred. Also, insufficient drainage capacity of the primary conveyance system may result in surcharge conditions and some roadway overtopping during extreme storm events.

Low Priority Problem Areas. Low priority is assigned to infrequent, minor flood conditions without property damage, sometimes referred to as "nuisance flooding" conditions. These include conditions for which the level of service provided by the existing drainage system is considered adequate, but which may be considered for improvement along with other maintenance-related activities (culvert replacements, roadway re-surfacing, etc) or in conjunction with

addressing a higher priority problem in the same general vicinity. Among the low priority areas are the following:

In the vicinity of 10th Avenue, from Alexander Street to Baker Street, surcharge of the storm sewer system results in localized street flooding.

Near the intersection of Alfred Street and Dora Avenue, surcharge of the storm sewer system results in localized street flooding.

Near the intersection of Greenway Avenue and Virginia Avenue, surcharge of the storm sewer system results in localized street flooding.

Various locations throughout the secondary drainage systems in and around the Cities of Tavares and Mount Dora, identified in the reports of previous investigations, have historically experienced limited flooding of short duration.

Other Identified Problem Areas. Portions of the Lake Gertrude and Lake Saunders Watersheds have been the subject of numerous complaints regarding water levels and drainage capacity in adjacent areas. These particular problems are associated with long term, historical fluctuations in the lakes and the underlying aquifer. Each watershed should be analyzed further to quantify the extent and severity of flooding conditions. These analyses will require collection of additional site-specific hydrologic data and continuous simulation modeling.

To summarize, this report describes the development of a primary drainage system model for the Lake Dora Basin. System performance is described and problem areas are identified, as defined by the model, for the 10-, 25- and 100-Year 24-Hour storm events. As a result of this analysis, it has been determined that limited flooding of the primary conveyance system occurs throughout portions of the basin, north and east of Lake Dora. No significant problem areas were identified in the primary drainage system south and west of Lake Dora. In developing solutions to the above problems, it is recommended that opportunities for improvement of water quality, documented in Volume III of this report, also be considered.

CHAPTER I. INTRODUCTION

This document describes activities undertaken for the water quantity analysis of the Lake Dora Basin. It is the second in a series of three volumes, which together provide results of the problem definition phase of the Master Stormwater Management Plan. This project was jointly funded by the Governing Board of the St. Johns River Water Management District and the Lake County Board of County Commissioners, and was administered by the District.

The organization of this volume is briefly described in the following :

Chapter II contains general modeling requirements, including a discussion of the modeling and support programs employed in the analysis, and the meteorological and boundary conditions employed.

Chapter III contains a discussion of model input data assembly, including methods to define parameters which describe characteristics of the hydrologic system and the manner in which physical attributes of conveyance systems were collected and translated into a model database.

Chapter IV contains a discussion of model testing, addressing availability of historical data for use in calibration and verification of the model. This chapter describes comparisons made between SWMM Runoff block simulation results and the results of comparative CHAN simulations, as well as sensitivity of the model to parameter selections.

Chapter V contains an overview of results of predictive simulations for the Lake Dora Watershed. Both hydrologic and hydraulic results are discussed and tabulated, with graphical plots of time-series discharges at selected (representative) points within the system.

Chapter VI contains a discussion on problem area identification and classification. Flood duration tables are provided as an aid to the analysis of frequency and magnitude of computed flood conditions. Problem areas are prioritized and discussed.

Chapter VII contains a summary of this report.

Volume I in the series presents a reconnaissance of existing data. Included in that document is a discussion of data collection, agency coordination, field survey, and preliminary site investigations.

Volume III in the series presents results of water quality modeling. Included in that document is a discussion of model development, testing, and definition of water quality parameters. Response of the system to a "typical year" of rainfall data are presented in detail and opportunities for water quality improvement are identified.

A. LOCATION AND EXTENT OF THE STUDY AREA

The Lake Dora Basin is located in Central Florida, amid the cities of Eustis, Mount Dora and Tavares. From the Apopka-Beauclair Canal lock and dam to the Lake Dora Canal at US 441, the Lake Dora Basin covers an area of approximately 42 square miles. The study area is generally bounded on the north by Lake Eustis, on the south by Lake Apopka, on the east by the Wolf Branch Basin, and on the west by Lake Harris. A general location map is provided in Figure I-1.

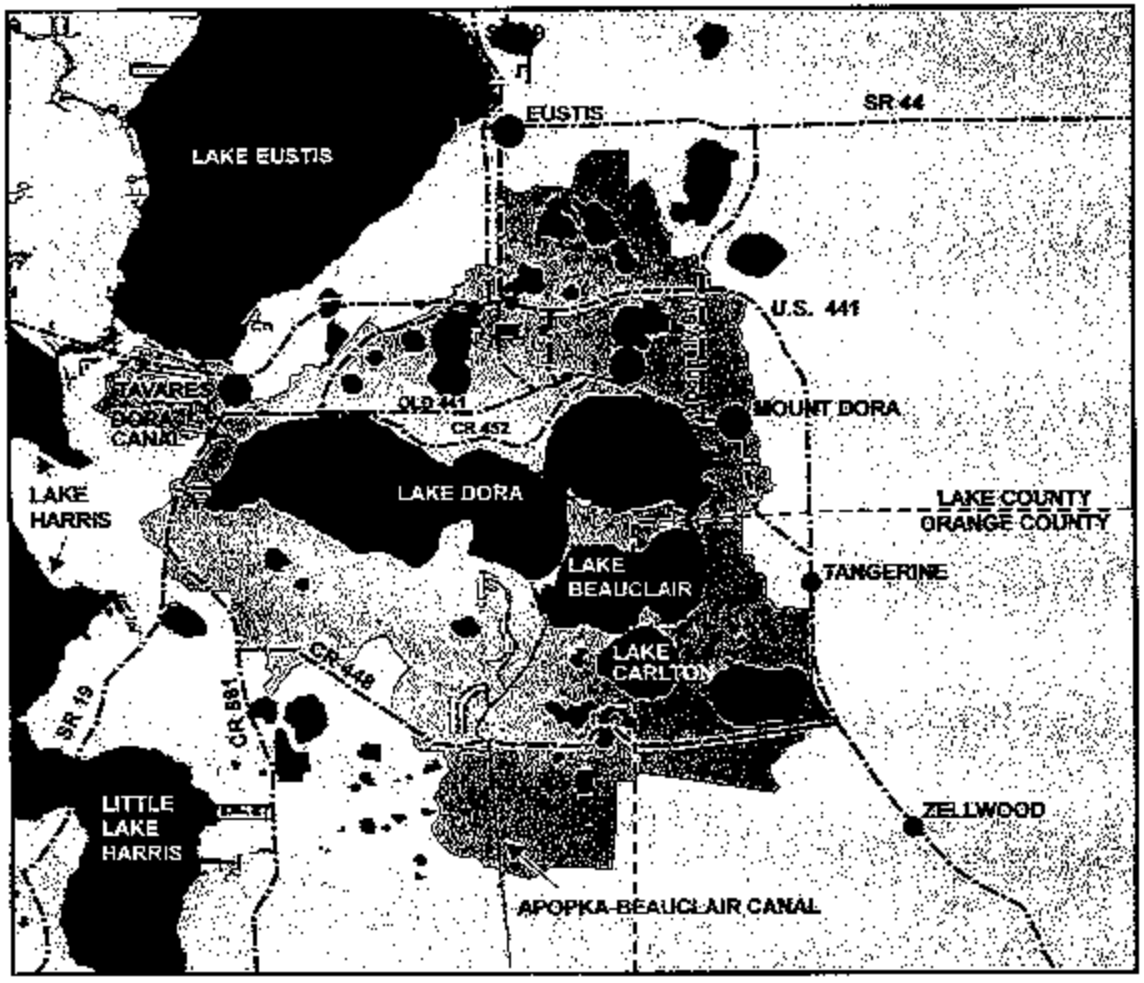
B. PROJECT OBJECTIVES

The primary objective of this study is the development of a Master Stormwater Management Plan (MSMP). The MSMP evaluates existing water quantity and quality conditions, locates problems areas, and recommends and designs measures for improvement and restoration. Feasible structural and non-structural approaches to stormwater management will be significant parts of the plan. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by the County in the planning and regulation of future development in the Lake Dora Basin.

C. SCOPE OF WORK

On September 26, 1995, the Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District approved an agreement whereby Ghioto & Associates would provide consultant and professional engineering services relating to preparation of a Master Stormwater Management Plan for the Lake Dora Basin. Under that agreement, the watershed to be studied in detail includes a 42 square mile contributing area, and excludes the Wolf Branch Basin.

Master Stormwater Management Plan for the Lake Dora Basin



Location Map

Figure I-1

Overall, the Master Stormwater Management Plan consists of three (3) phases:

Phase I	The Problem Definition Phase
Phase II	The Conceptual Design and Permitting Phase
Phase III	The Implementation and Construction Phase

Phase I tasks consist of the collection of existing data (including coordination of any previous studies, documents and data and collection of additional information through field survey), the development of water quantity and quality simulation models for the Lake Dora watershed, and the identification of problem areas in the watershed.

The model to be employed is the Environmental Protection Agency's Stormwater Management Model (SWMM). SWMM is to be implemented as a surface water model for storm events, utilizing the Runoff and Extended Transport blocks for water quantity simulations. The model is also to be implemented as a surface water model for a typical year's rainfall, utilizing the Runoff and Transport blocks for continuous water quality simulations.

D. STUDY PARTICIPANTS

This report is the result of a great deal of effort, not only by Ghioto & Associates staff, but also by the staffs of the St. Johns River Water Management District, and Lake County. Both the District and the County provided extensive assistance by providing GIS coverages, data and other information that made this work product possible.

Mr. John Richmond of the SJRWMD is commended for his support and for his attention to detail in the execution and project management of District activities. Ms. Lora Bailey is gratefully acknowledged for her project management activities on behalf of Lake County. Mr. Elliot Moore, also of Lake County, is commended for his coordination of data collection activities with all other agencies. The members of the SJRWMD review team, Mr. Martien Bergman, Mr. Marc Adkins, Mr. Lou Donnangelo, and Mr. Rolland Fulton, are also gratefully acknowledged.

CHAPTER II. GENERAL MODELING REQUIREMENTS

A computer model was developed to predict responses of the study area to rainfall and to evaluate performance of conveyance systems. A model, in this context, is a mathematical representation of the physical and behavioral characteristics of a system. With this mathematical representation, the response to meteorological conditions are simulated (using synthetic rainfall distributions) and results are analyzed to evaluate hydraulic performance.

A. MODEL SELECTION

Models available for use in the analysis of surface water hydrology and hydraulics can generally be placed into either single event or continuous categories. Single event surface water models are used to evaluate the response of systems to discrete rainfall events, while continuous surface water models evaluate the response of systems to long-term meteorological conditions including rainfall and evapotranspiration. A small number of available models can be used in both of these computational modes.

Objectives of the Lake Dora Basin modeling, discussed in this document, include the evaluation of drainage system responses to a set of discrete storm events. In addition, long-term water quality simulations of a "typical year" rainfall were performed, as discussed in Volume III of this report. The Environmental Protection Agency's Storm Water Management Model (SWMM) was selected for use. SWMM can be operated in either event or continuous mode, and has the ability to account for both the quantity and the quality of surface water runoff.

B. THE STORMWATER MANAGEMENT MODEL

The Environmental Protection Agency's Stormwater Management Model (SWMM Versions 4.2 and 4.31) was used to simulate the response of the study area to rainfall, given a set of parameters that describe the characteristics of the surface water drainage system. Throughout the remainder of this and subsequent chapters, the descriptions of the model formulation will be brief, and will focus only on those capabilities of SWMM that were employed for this particular investigation. A more detailed description of the model, its time, space and mathematical properties, the physical, chemical and biological process that can be simulated, and input data requirements for various levels of investigation, are documented in the SWMM User's Manuals.

SWMM is constructed in the form of "blocks". The RUNOFF block of SWMM is used to simulate the quantity of rainfall excess for a drainage basin. This block generates surface runoff based upon a rainfall hyetograph, antecedent conditions, land cover and topography. The basin itself is represented by a set of idealized subcatchments, each described by its own set of input parameters. Subcatchment elements represent idealized areas of uniform slope, with parameters such as surface roughness, depression storage and infiltration representative of average conditions across the area. Subcatchments receive rainfall and account for losses due to ponding, evaporation and infiltration. Flow routing of rainfall excess is accomplished by approximating each subcatchment as a non-linear reservoir.

The Runoff block can also be used to route lows to some receiving body through a series of gutters or pipes. However, in this investigation, the Extended Transport block, or EXTRAN, was selected as an alternative for performing flow routings. Each component of a conveyance system is classified as a certain type of element in the EXTRAN block of SWMM, providing an idealized link and node representation. The principal advantage of using the EXTRAN block lies in its ability to solve the St. Venant Equations, thereby allowing for hydrodynamic simulation of flow reversals and backwater effects.

C. SWMM EXTENSIONS OF THE CHAN PROGRAM

A customized version of Aquarian Software's CHAN for Windows was employed as a pre- and post processor to the SWMM program. CHAN is a hydrologic and hydrodynamic model, similar in many respect to SWMM, and requires hydrologic and hydraulic input data similar to that required by the Runoff, Transport and Extended Transport blocks of SWMM. However, in some cases CHAN allows model elements to be described in a more intuitive manner. For example, invert elevations of structures are stored directly in the CHAN database, whereas the Extended Transport block of SWMM stores depths above a manhole invert. In addition, CHAN allows the actual (surveyed) manhole bottom elevation to be specified, whereas the Extended Transport block requires that the manhole bottom be defined at the same elevation as the invert of the lowest connected pipe.

These and other differences in the definition and storage of physical data describing the drainage system led to the choice of using CHAN for construction of the model network database. CHAN export and translation functions were then employed to generate SWMM input data files for execution of storm event simulations.

Since model network and rainfall data were stored in CHAN format databases, CHAN simulations were run for comparison to SWMM results during the model

testing phase. This added capability provided one means of verifying the predictive capability of the SWMM model, as will be discussed later in this report. Finally, the CHAN retrieval system was used to view model results, for both the SWMM and the CHAN simulations. The retrieval system allows for time series and profile plots, comparisons of multiple simulations and summary report printouts.

It is important to reiterate that all final storm event modeling was performed using the EPA SWMM model, while the CHAN program was used for comparative simulations and to provide pre- and post-processing for SWMM. Throughout the remainder of this report, the specific manner in which CHAN was employed, in support of the modeling effort, will be detailed so that the reader can fully understand the data manipulation and processing techniques employed during construction of the model database.

D. GEOGRAPHIC INFORMATION SYSTEMS

Many of the spatially lumped parameters required to describe subcatchments in the SWMM model are most efficiently defined through analysis with a Geographic Information System. The ArcCad and AutoCad programs (by ESRI and AutoDesk, respectively) were employed to digitize, store and process geographic data. Resulting spatial data were imported to the CHAN model database, and subsequently translated into subcatchment parameter values as required by the SWMM model.

E. SYNTHETIC STORM EVENTS

Hydrologic models typically employ synthetic rainfall data to evaluate the response of a surface water system to a storm event. As discussed by Rao (1991), two components of the synthetic storm are the total rainfall amount during the storm event and the time distribution of that rainfall. Table II-1 presents maximum rainfall depths for return periods of 10, 25 and 100 years. These rainfall depths are the result of frequency analyses performed by the SJRWMD, published in Technical Publication SJ 88-3.

Generalized relationships have been extensively used to describe the temporal distribution of rainfall. For example, the USDA Soil Conservation Service developed generalized distributions that have been used by agencies and consulting engineers throughout the United States for calculating design or peak discharges. However, when applied to a specific area, use of those generalized

Table II-1	24-Hour Maximum Rainfall
Return Period (in Years)	Rainfall Volume (in Inches)
10	6.5
25	8.4
100	11.4

distributions may lead to the under- or over-prediction of peak runoff. Therefore, site-specific distributions are more desirable. A site-specific time distribution of rainfall for the 24-hour storm event (SJRWMD, Technical Publication SJ 91-3) was used along with the tabulated rainfall volumes to drive storm event simulations with the SWMM model.

CHAPTER III. MODEL INPUT DATA ASSEMBLY

A model input database stores physical attributes of a drainage system in terms of conceptual model elements. This chapter describes methods used to develop hydrologic parameters. It discusses the manner in which physical attributes of conveyance systems were collected and translated into the model database. Finally, an overview of the input and output database files is presented.

A. THE MODEL NETWORK

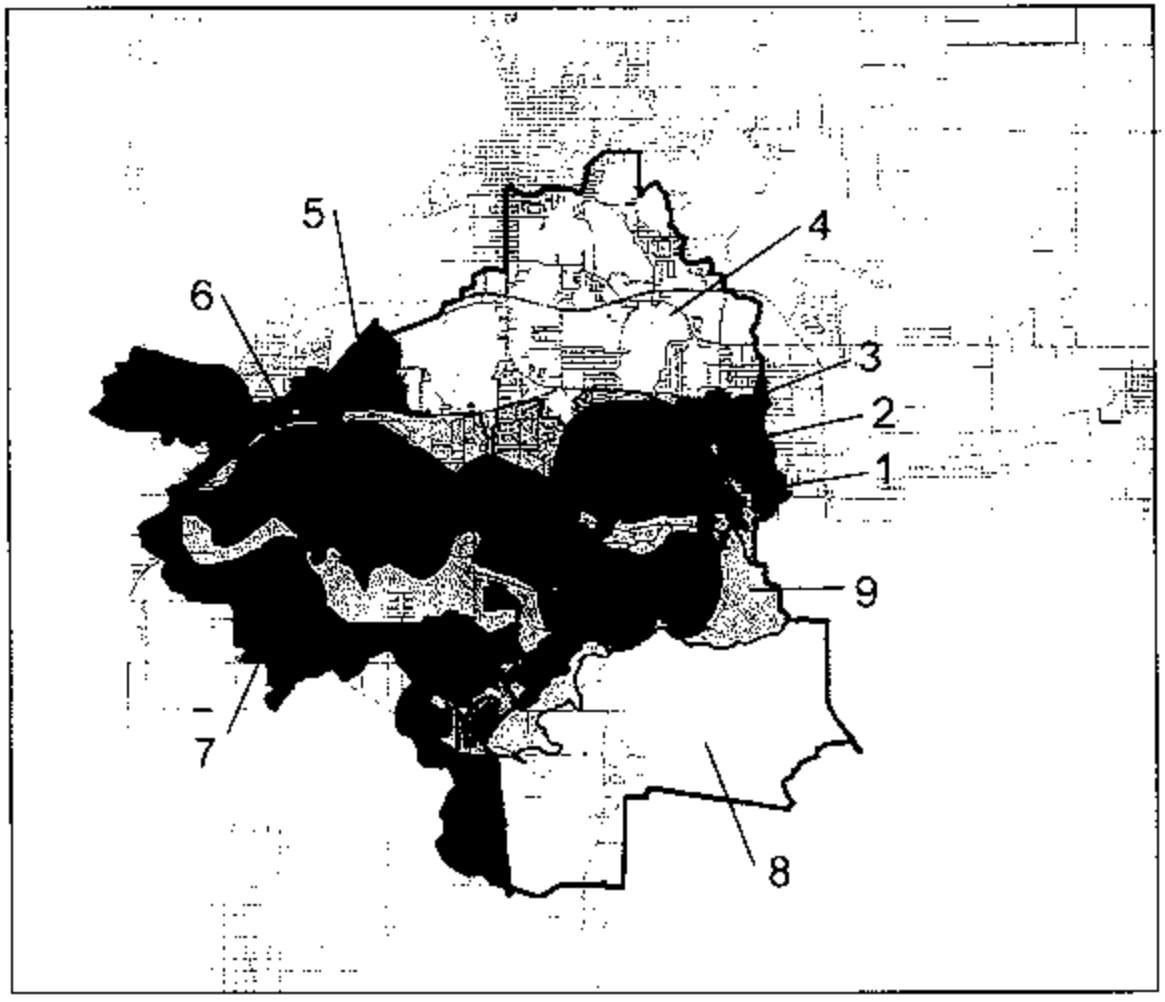
SWMM operates within a network of elements which describe the physical layout of a drainage system. These elements are comprised of subcatchments, inlets, manholes and conduits. In the SWMM Runoff block, subcatchment elements receive rainfall and account for losses due to ponding, evaporation and infiltration. Rainfall excess is routed across subcatchments to inlet elements. In the SWMM Extended Transport block, conduit elements link the inlets (and manholes) and provide conveyance for surface water runoff to receiving bodies.

The level of detail used to hydraulically describe the drainage system is an important factor in the cost of developing a model, due in part to the fact that supporting data must be supplied from field survey. The focus of this analysis is the "primary" drainage system conveying stormwater runoff to Lake Dora. A primary drainage system can be variously differentiated from a "secondary" system. Often, the distinction is made simply based upon size of drainage elements (diameter of pipes, cross section area of ditches, contributing area to a pond or detention facility, etc.). However, it is also important to consider location and function of elements within the drainage system. For example a relatively small diameter pipe may be included in the model, if it is determined that upstream conditions warrant it.

Nine distinct model networks were developed to describe surface water conveyance systems within the Lake Dora Basin. These networks define individual drainage systems that can be analyzed separately, thus providing for smaller model input and output data sets, faster simulations, and more focused analysis of results. Another advantage of separation into modeled subareas will be experienced during future modifications to the model, for analysis of proposed system modifications. Figure III-1 presents an overview of segmentation of the overall study area into those nine subareas, and a brief description of each is provided in the following.

The first subarea model consists of 8 subcatchments, covering 145 acres. It generally comprises the southern extents of the City of Mount Dora. The second

Master Stormwater Management Plan for the Lake Dora Basin



Modeled Subareas

- Lakes Dora & Beauclair
- Subarea 1
- Subarea 2
- Subarea 3
- Subarea 4
- Subarea 5
- Subarea 6
- Subarea 7
- Subarea 8
- Subarea 9

N

Not To Scale

Figure III-1

subarea model includes the central portion of the City of Mount Dora, consisting of 24 subcatchments, covering 229 acres. The third subarea model includes the northern extents of the City of Mount Dora and contains 28 subcatchments, covering 163 acres. All of these three subareas are characterized primarily by closed storm sewer systems, with few open channel reaches and little surface storage (ponds, depressional wetlands, etc.). All three subareas discharge directly to Lake Dora.

In contrast, the fourth subarea model, comprised of 50 subcatchments covering 5145 acres, contains large surface storage areas, including Lakes Gertrude, John, Tem, and Saunders and numerous wetland depressions, which serve to attenuate flows to Lake Dora. Also contained in this subarea are a number of catchments which surround "closed" lake systems, including East and West Crooked Lakes, Lakes Dicie, Louise and Woodward. These catchments do not directly contribute flows to Lake Dora under most circumstances, but were modeled to evaluate the potential contribution of flood flows under extreme conditions of the 100-year storm event.

The fifth and sixth subarea models describe portions of the extensive closed storm sewer systems in and around the City of Tavares which discharge directly to Lake Dora. These models are comprised of 30 and 18 subcatchments, covering 561 and 50 acres, respectively. Like the three Mount Dora subareas, the Tavares subareas are characterized primarily by closed storm sewer systems, with few open channel reaches and little surface storage.

The seventh and eighth subarea models depict lands generally to the southwest and south of Lake Dora, respectively. These models consist of 16 and 32 subcatchments, covering 1746 and 4683 acres, respectively. Drainage within these portions of the study area can be defined generally by topographic means. That is, drainage patterns are related more to natural topography than to manmade conveyances (ditches, structures, etc.). Portions of the seventh subarea, adjacent to the Dora Canal, were modeled hydrologically only.

The ninth subarea includes land immediately adjacent to Lake Dora, Lake Beauclair and the Apopka-Beauclair Canal. The response of this area to storm event rainfall was not analyzed, as no defined primary conveyance system is present. However, the ninth subarea was modeled to analyze pollutant loadings during a typical year, as will be discussed in Volume III of this report.

B. THE MODEL DATABASE

In order to store collected data describing the study area, and to manipulate that data for use with the SWMM model, a CHAN-format model network database was constructed for each of the nine subareas. Each model database contains a

schematic representation of its modeled system, as well as all of the physical data describing hydrologic and hydraulic characteristics of elements in each system. In addition, each model database contains detailed comments regarding the source of data (field survey identifier, field book and page number) and assumptions made in describing model elements. Additional detail regarding contents of the network database files (including subcatchment and conveyance system data) is provided in the discussion below.

Each CHAN-format network database is translated to a SWMM input data file for simulation. Translation options include selection of the hydraulic routing method to be performed (Extended Transport block for storm event simulations), use of alphanumerics in identification of SWMM model elements, adjustment for equivalent pipe lengths, lumping minor losses into conduit Manning's roughness, and more.

Rainfall data files are selected at the time of translation to define meteorological conditions to be used by SWMM. For example, a CHAN-format rainfall table, describing synthetic 24-Hour rainfall events with recurrence intervals of 10, 25, or 100 years, is selected for use in the SWMM simulation. The use of external support files removes the storm event rainfall data from the network database itself, so that a single CHAN network database can be used with any selected rainfall file.

C. SUBCATCHMENT DATA

Subcatchment elements define the land area that contributes runoff to a segment of the surface water drainage system. A rainfall hyetograph is assigned to each subcatchment for simulation. Infiltration computations for a subcatchment can be performed using either the Horton or the Green-Ampt methods in the SWMM Runoff block. In this analysis, the Green-Ampt method was selected, due to its physically-based formulation and the experience of staff employing the method. Rainfall excess (runoff) is routed across the subcatchment, to a receiving node, or inlet.

Delineation of Spatial Data. Development of subcatchment element data included the identification of subcatchment, land cover and soil type boundaries. This effort consisted of the delineation and digitization of subcatchment boundaries, using 1 inch = 200 feet aerial photogrammetry. Figure III-2 presents delineations for the entire Lake Dora Basin. It should be noted that major water bodies (Lakes Gertrude, Saunders, Carlton, etc.) were included as individually delineated subcatchments.

Land use boundaries were provided, in digital form, by the SJRWMD. In that database, each land use area was identified using the Florida Land Use, Cover

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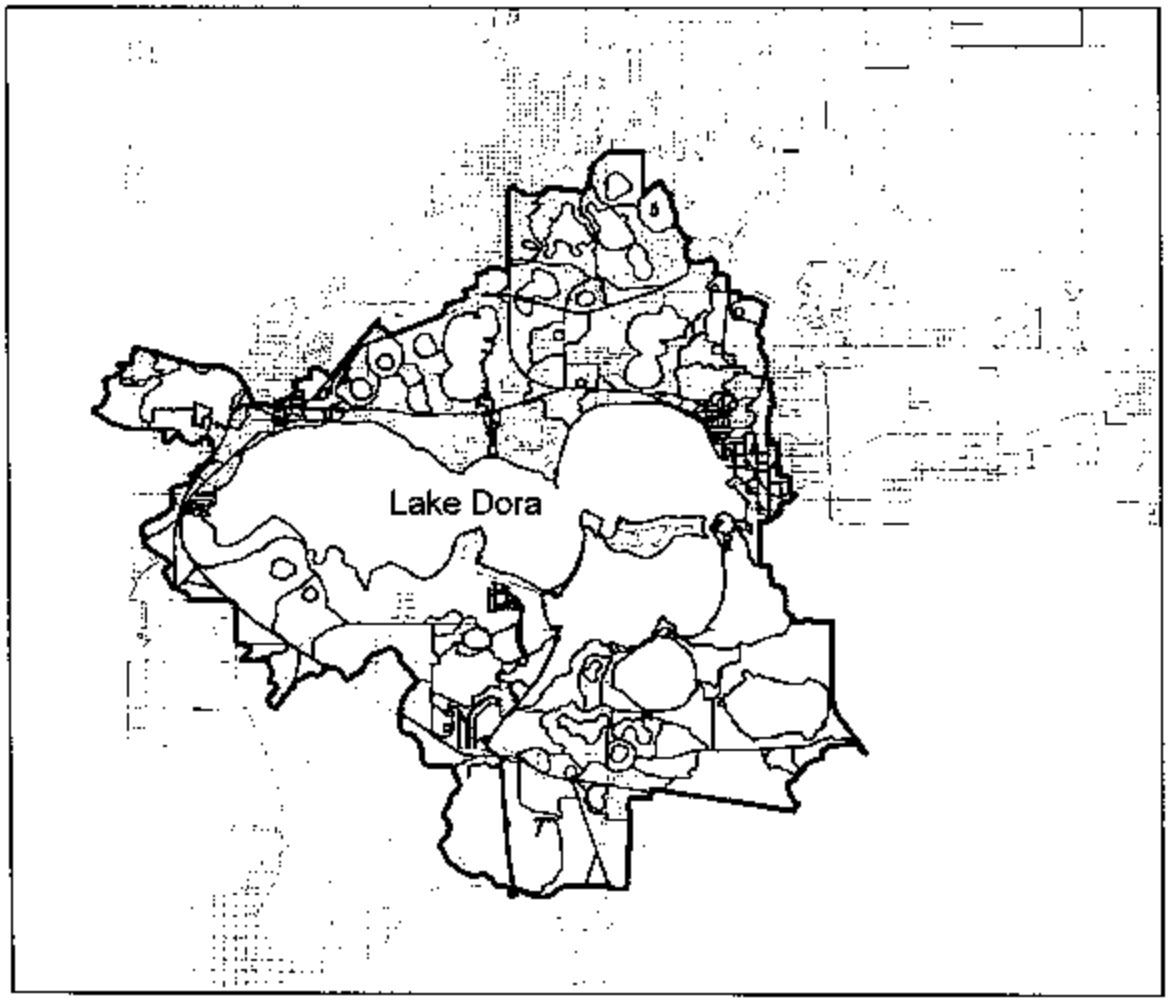

Subcatchment Delineations

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Figure III-2

and Forms Classification System (FLUCCS). For use with the SWMM model, these land cover categories were cross-referenced into a set of five general land use groups; Residential, Commercial, Agricultural, Open Space and Water.

Soil type boundaries were also provided by the SJRWMD. In that database, individual soil types were identified using codes from the NRCS Soil Survey. Soil types were used in defining hydrologic parameters for modeling with SWMM, while their associated hydrologic soil groups were used to define hydrologic parameters for comparative hydrologic simulation with CHAN.

Processing of Spatial Data. A Geographic Information System was employed to process the spatial database of subcatchment, land use and soil type delineations. Figure III-3 depicts the process employed, which results in the segmentation of the entire watershed into hydrologic units, each containing a description of land use, soil type and the basin (subcatchment) in which the hydrologic unit belongs. These hydrologic units are imported directly into the CHAN model network database for automated subcatchment parameter development.

The CHAN model network database contains numerous parameter lookup tables. These lookup tables provide a means of automatically translating the intrinsic spatial data of the GIS into related parameters describing subcatchment characteristics, so that for a given land use and soil combination a parameter value (such as hydraulic conductivity) is defined. The processing of parameters for all land use and soil type combinations allows the assignment of weighted parameter values for all subcatchments. This weighting was employed for assignment of initial moisture deficit, hydraulic conductivity, average capillary suction, impervious Manning's n, pervious Manning's n, and percentages of imperviousness for each subcatchment in the Lake Dora watershed. Lookup table values of these parameters, upon which the spatially weighted assignments are based, are presented in Appendix A.

Other Subcatchment Characteristics. A number of subcatchment parameters were not processed spatially. Subcatchment width and slope are examples of parameters for which manual takeoffs were required. In order to develop these two parameter values, a travel path for each subcatchment was defined. The slope along this travel path was assigned as the subcatchment slope. Subcatchment width was defined as the total area of the subcatchment divided by its travel path length. One advantage to using this methodology is that the travel path can also be used to define time of concentration for comparative analyses.

Layered Approach To Hydrologic Units

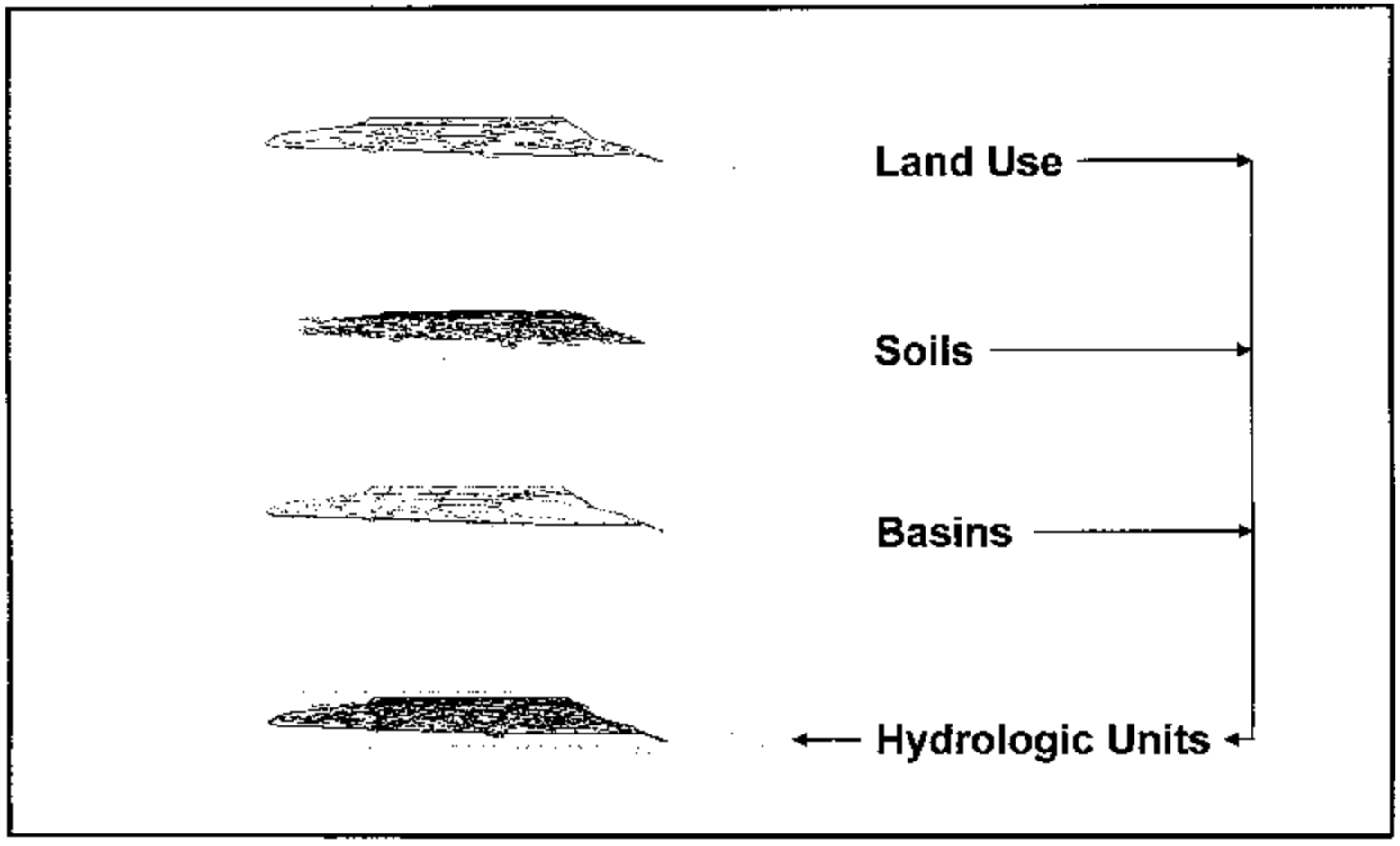


Figure III-3

D. CONVEYANCE SYSTEM DATA

As previously discussed, hydraulic modeling was performed for the primary conveyance system, utilizing the Extended Transport block of SWMM. Data to support this detailed modeling analysis was provided through field survey of drainage structures, and augmented by field estimates of structure geometry and estimates of overflows from photogrammetry.

Figure III-4 presents generalized locations of field survey. As indicated in the figure, field survey was acquired to define the primary drainage system (extensive closed conduit systems, culverts, overflows, and a few open channels) in and around the Cities of Mount Dora and Tavares, to the east and north of Lake Dora. Additional field work was performed to define characteristics of the primary conveyance system south of Lake Dora, accounting for culvert connections between various waterbodies. Exact locations and field survey data gathered for this investigation is available from the County.

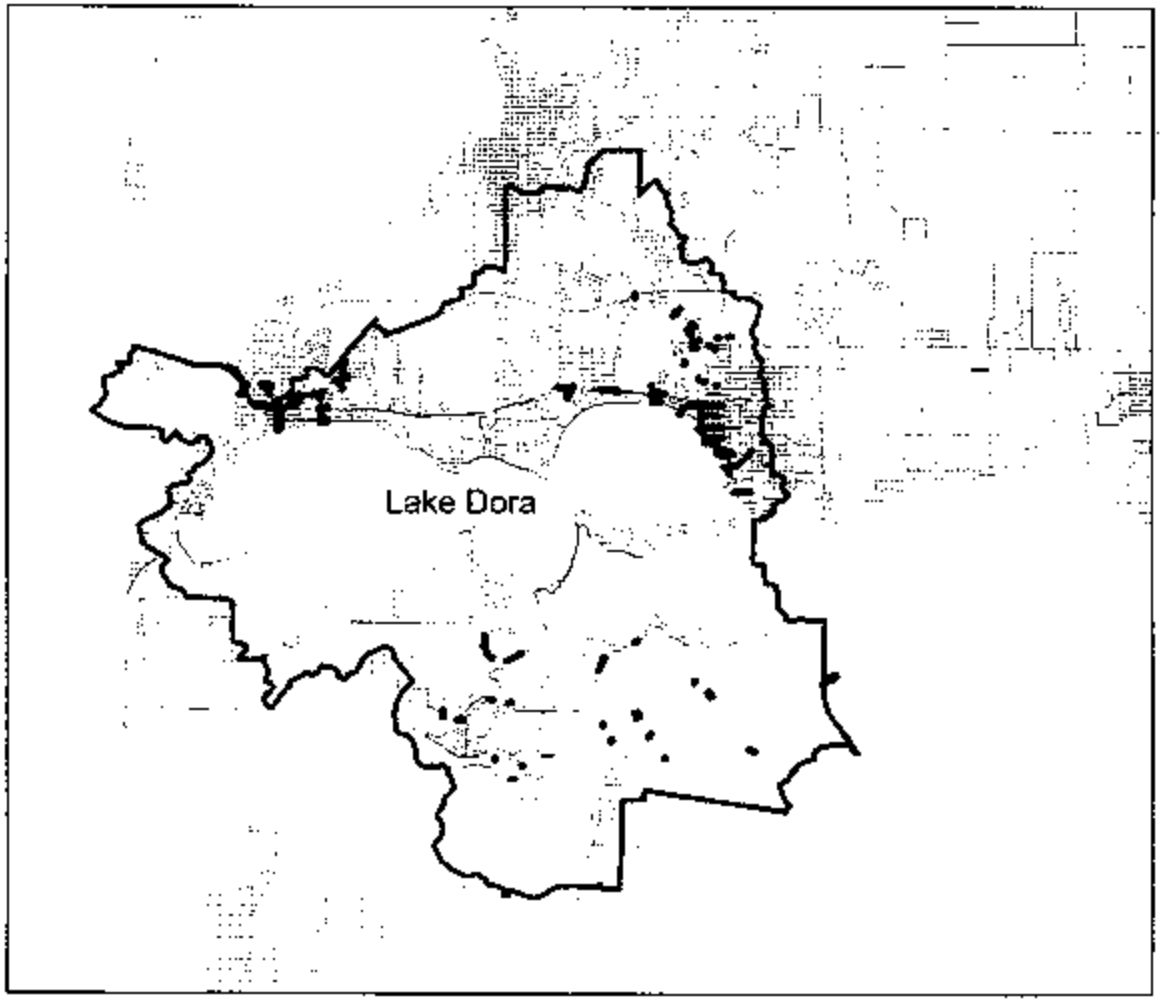
As hydraulic data was entered into the CHAN model network database, notes on the source of data (field book number and page) and other assumptions regarding the modeled features were entered as comments, for later reference. These comments serve to indicate where field data was available and where reliance was placed on estimates and assumptions for modeling.

In addition to structures which comprise the primary drainage system, numerous supplemental model elements were coded to provide for overflows during surcharge conditions. Within developed areas, in and around Mount Dora and Tavares, these overflows often define flow paths down streets. In some cases, these overflows can account for a significant part of the total conveyance of a system. In determining whether or not a street would be allowed to carry flow, it was decided that any inlet and any manhole cover that was not bolted down would be allowed to surcharge. Inlets were allowed to receive overflows from the surface (flooded streets) but manholes were not.

Similarly, reach elements were coded to define roadway overtopping for extreme storm event conditions. Diversions of flood flows were also defined, where necessary, utilizing data from photogrammetry to model flow across topographic saddles between depressional areas.

Photogrammetry was used extensively to define storage (as an elevation versus area relation) for the many lakes, wetlands, and depressional areas across the Lake Dora Basin. Initial conditions in all of these storage areas were defined based upon a review of the aerial photogrammetry. No historical data was available to otherwise define initial stages in the lakes and depressions.

Master Stormwater Management Plan for the Lake Dora Basin



Field Survey Locations

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Figure III-4

Tailwater boundary conditions in Lake Dora, Lake Beauclair, the Dora Canal and the Apopka Beauclair Canal were provided by the SJRWMD. Table III-1 presents historical conditions at Lake Dora for the period from 1975 to 1995. From these data, and as directed by staff of the SJRWMD, a static tailwater condition for all hydraulic modeling was selected to be at elevation 63 feet, NGVD.

Table III-1 **Historical Conditions at Lake Dora Provided by SJRWMD**

Month (1975 - 1995)	Stage (in Feet NGVD) Minimum	Mean	Maximum
January	61.61	62.77	63.83
February	61.99	62.91	63.62
March	62.06	62.99	63.95
April	61.81	62.89	64.19
May	61.49	62.53	63.17
June	61.58	62.45	63.06
July	61.71	62.53	63.22
August	61.74	62.59	63.38
September	61.85	62.73	63.61
October	61.76	62.69	63.79
November	61.63	62.57	63.39
December	61.50	62.64	63.89

E. MODEL INPUT DATA FILES

All physical data supplied to the SWMM model for simulation was stored in CHAN network data files. Each subarea model was contained in a separate file. For simulation, each of those network files was translated by the CHAN Editor, and supplemented with a selected rainfall hyetograph. During execution, the SWMM program saved simulation results in an output database, for later retrieval. These retrievals were performed using a SWMM Module of the CHAN retrieval system.

Detailed model network data listings have been provided separately to the District and the County, in a CHAN format, for each subarea model. The CHAN report format is used so that all of the comments regarding field survey and model assumptions are displayed and actual invert elevations are indicated (instead of depths above inverts). Following each CHAN listing are listings for

the three SWMM input data files (for the 10-, 25- and 100-Year 24-Hour storm event simulations), as translated by the CHAN Editor. In the SWMM input data conversion, manhole bottom elevations have been adjusted so that the lowest connecting pipe is at the manhole bottom, pipe inverts have been converted to depths above the manhole bottom, Manning's roughness values have been adjusted to include entrance and minor losses throughout the system, and rainfall hyetographs have been inserted.

CHAPTER IV. MODEL TESTING

Mathematical models are traditionally subjected to a calibration process in order to improve their ability to hindcast system response to historical rainfall conditions. Verification of the calibrated model is then performed, to determine the ability of the model to simulate the system response under other historical meteorological conditions. A verified model is usually assumed to be a good predictor of system response to design storm events. In order to calibrate (and verify) a model, however, historical rainfall, streamflow and lake stage data are required. Such historical data was not available for use in this study. An alternative methodology was therefore developed to test the model, and its sensitivity to parameter selection. The following discussion presents the approach to testing and adjusting each of the model networks.

A. PRELIMINARY TESTING AND NETWORK MODIFICATIONS

Preliminary simulations were performed for each of the subarea models, testing each system's response to the 100-Year 24-Hour storm event. The primary goal of these initial simulations was the identification of data deficiencies in the model network. For example, preliminary simulations can point out locations for which greater hydraulic detail is necessary to adequately define overflows and interconnections within the system. In addition, locations can be identified for which additional storage data are needed, as peak stages exceed the highest elevation in the model's elevation-area relation. The initial model testing effort was repeated several times for each subarea (as modifications to the model database would result in the identification of new areas for which additional overflows and storage were required) until all hydraulic connections and storage relations were defined.

B. COMPARISON OF METHODS AND MODELS

Lacking historical data with which to calibrate the models, reliance was placed on the experience of the hydrologists in parameter selection and model construction. Literature values for parameters were used as a starting point. However, without some comparative tool, the ultimate reliability of the models remained in doubt. Since a CHAN model database was available, it was determined that comparative simulations would be made with that model, utilizing an alternative methodology for computation of runoff hydrographs.

The CHAN model was used to simulate the response of the Lake Dora subcatchments to rainfall, utilizing the SCS Runoff Curve Number method for

calculation of rainfall excess and the SCS Unit Hydrograph Method for computation of runoff hydrographs. These two hydrologic methods are commonly used, and the simulation results would provide a sound basis for comparison with the computational results of the SWMM Runoff block.

C. PARAMETER ADJUSTMENTS AND FINAL MODEL SETUP

In the Runoff Block of SWMM, the Mein-Larson formulation of the Green-Ampt equation is a two-stage model of infiltration, with surface saturation the key to development of rainfall excess. The first step predicts the volume of water which will infiltrate before the surface becomes saturated. From this point onward, infiltration capacity is predicted by the Green-Ampt equation, directly. For rainfall intensities less than the saturated hydraulic conductivity of a soil, all rainfall infiltrates, but the infiltrated volume is used only to update the initial moisture deficit. The cumulative infiltration, which determines surface saturation, is not altered by infiltration of "low intensity" rainfall. Thus, only for rainfall intensities greater than the saturated conductivity of the soil will infiltration accumulate and saturation of the soil layer occur. This causes the volume of runoff generated by SWMM to be somewhat dependent on rainfall intensity over pervious areas of the watershed.

By contrast, the SCS Runoff Curve Number method (employed by the CHAN model) is dependent upon antecedent moisture conditions and available soil moisture storage at the start of the rainfall event. The Curve Number method is dependent upon the volume of rainfall, but not intensity, in computing runoff volume for an event.

Using both the SWMM and the CHAN models, dozens of simulations were performed. CHAN simulations were performed using both dry and average antecedent moisture conditions (AMC I and II), and employing literature values for imperviousness and runoff curve numbers. SWMM simulations were performed for dry and average moisture conditions (by varying the initial moisture deficit appropriately), and employing literature values for hydraulic conductivity.

Based upon a qualitative review of numerous comparative simulations, the SWMM model proved insensitive to the specification of initial moisture deficit for the types of soils encountered in the study area. However, the model was very sensitive to selection of hydraulic conductivity. By adjusting the value of hydraulic conductivity in SWMM, a number of other important physical parameters are indirectly adjusted, due to the formulation of the SWMM program. For example, decreasing hydraulic conductivity actually decreases soil depth, and thus decreases available soil moisture storage.

Using hydraulic conductivity values from the SWMM manual and from local soil survey reports provided a preliminary basis for parameter selection. Successive simulations and comparisons to CHAN simulations resulted in the refinement of final parameter values. In the absence of historical data, further verification of the accuracy of the model is not possible. However, based upon the comparisons made between the SWMM Runoff block results and the CHAN simulation results, and upon the experience of staff, the final parameter values selected for use in storm event simulations provide reasonable results.

CHAPTER V. PREDICTIVE SIMULATIONS

Storm event simulations were performed for each subarea within the Lake Dora Basin. After each simulation, the results of Runoff and Extended Transport block computations were reviewed to verify that continuity errors in each computational block were minimal. The following discussion briefly summarizes predictive simulations for each subarea model.

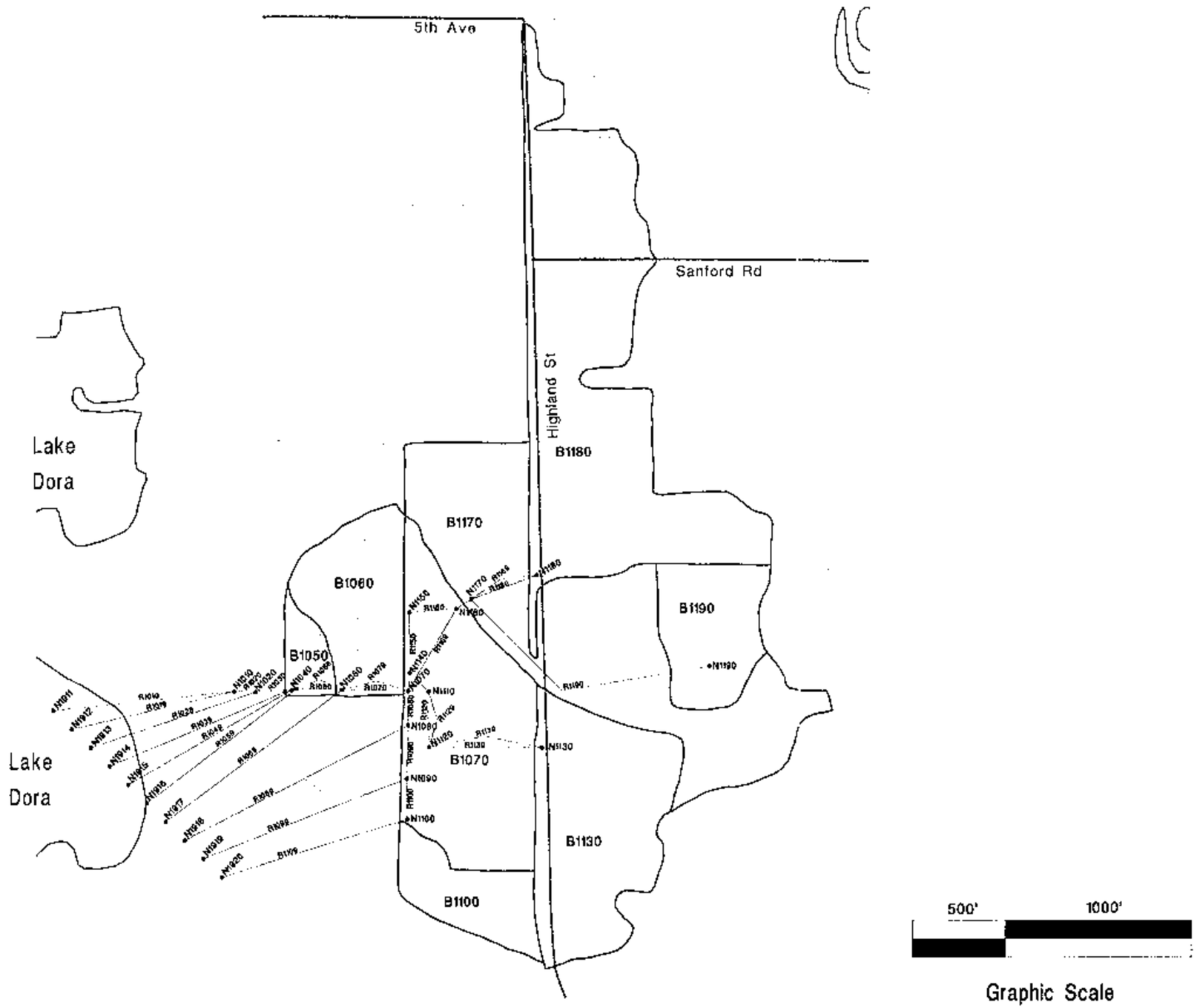
Subarea 1. Figure V-1 presents the subcatchment layout for Subarea 1, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All model elements in this subarea are given an identifier in the range from 1000 to 1999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R1029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

This portion of the Lake Dora Basin is comprised of 52.13 impervious acres and 92.73 pervious acres. The 36 percent imperviousness of the subarea results in a high volume of runoff from all events modeled, in spite of the fact that soils in the area are predominantly well drained. Table V-1 presents a hydrologic summary for Subarea 1 simulations, including the 10-, 25- and 100-Year 24-Hour results.

Table V-1 — **Hydrologic Summary for Subarea 1 SWMM Runoff Block Results**

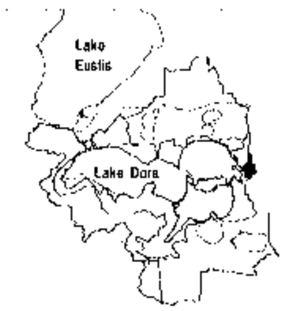
		Volume (in Inches)		
No. Subcatchments	8			
Tributary Area (ac)	144.86	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		3.66	4.47	5.62
Total Evaporation		0.10	0.10	0.10
Surface Runoff		2.68	3.76	5.60
Surface Storage		0.04	0.04	0.05
Pervious Infiltration		5.72	6.98	8.78

Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary



NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 1



Location Map

LEGEND

- Node and ID
- Reach and ID
- B1070 Basin ID
- Basin Line
- Water
- Road

Figure V-1

of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole) and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.

Figure V-2 presents a time series graph of computed discharge at the outlet of the primary drainage system to Lake Dora, at Reach R1010, for the 10-, 25- and 100-Year 24-Hour storms. This figure graphically depicts data contained in the simulation output database, and illustrates time varying flow conditions in the lower reaches of Subarea 1. As indicated in the graph, response of the drainage system is rapid, due to the imperviousness and steepness of the contributing land area, with peak discharge occurring near the time of peak rainfall intensity. The primary drainage system lacks substantial surface storage to attenuate the rate of runoff. Thus, the peak discharge for all three events reflects discharge capacity of the conveyance system, and all peak discharge rates are within 40 cfs, from approximately 195 cfs for the 10 year storm to just under 230 cfs for the 100 year storm. This type of response is fairly typical for each of the urban drainage systems in Subareas 1, 2 and 3.

Subarea 2. Figure V-3 presents the subcatchment layout for Subarea 2, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 2000 to 2999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R2029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

This portion of the Lake Dora Basin is comprised of 92.18 impervious acres and 136.84 pervious acres. The 40 percent imperviousness of the subarea results in a high volume of runoff from all events modeled, again, in spite of the fact that soils in the area are predominantly well drained. Table V-2 presents a hydrologic summary for Subarea 2 simulations, including the 10-, 25- and 100-Year 24-Hour storm results.

Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole)

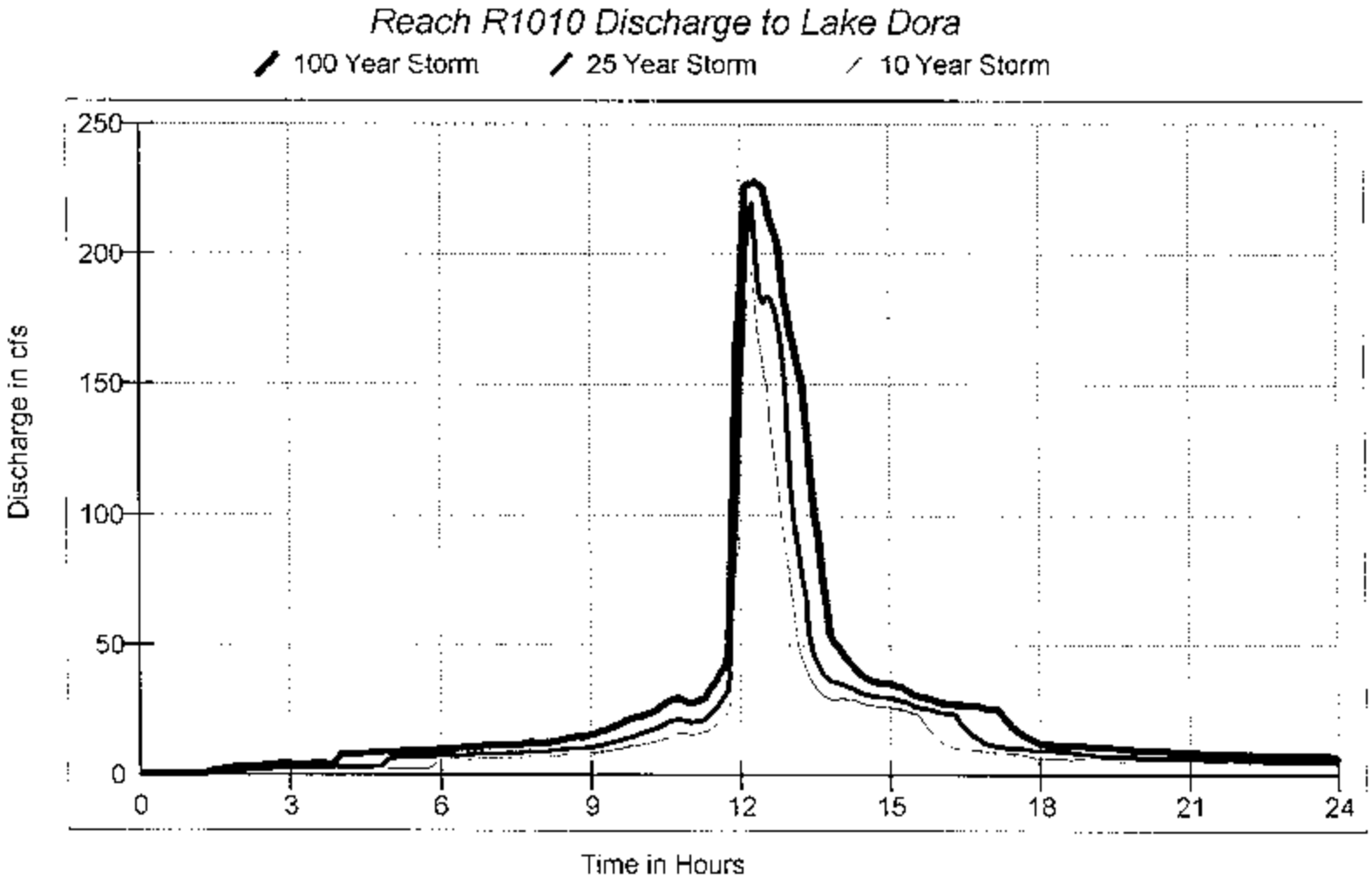
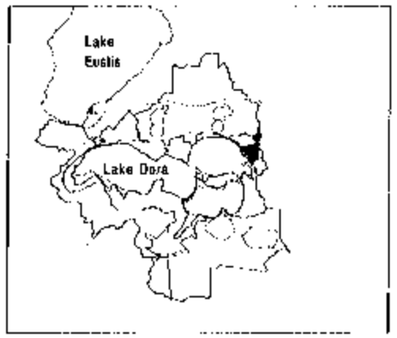

Reach R1010 Discharge to Lake Dora
100 Year Storm
25 Year Storm
10 Year Storm
Discharge in cfs
250
200
150
100
50
0
0
3
6
9
12
15
18
21
24
Time in Hours

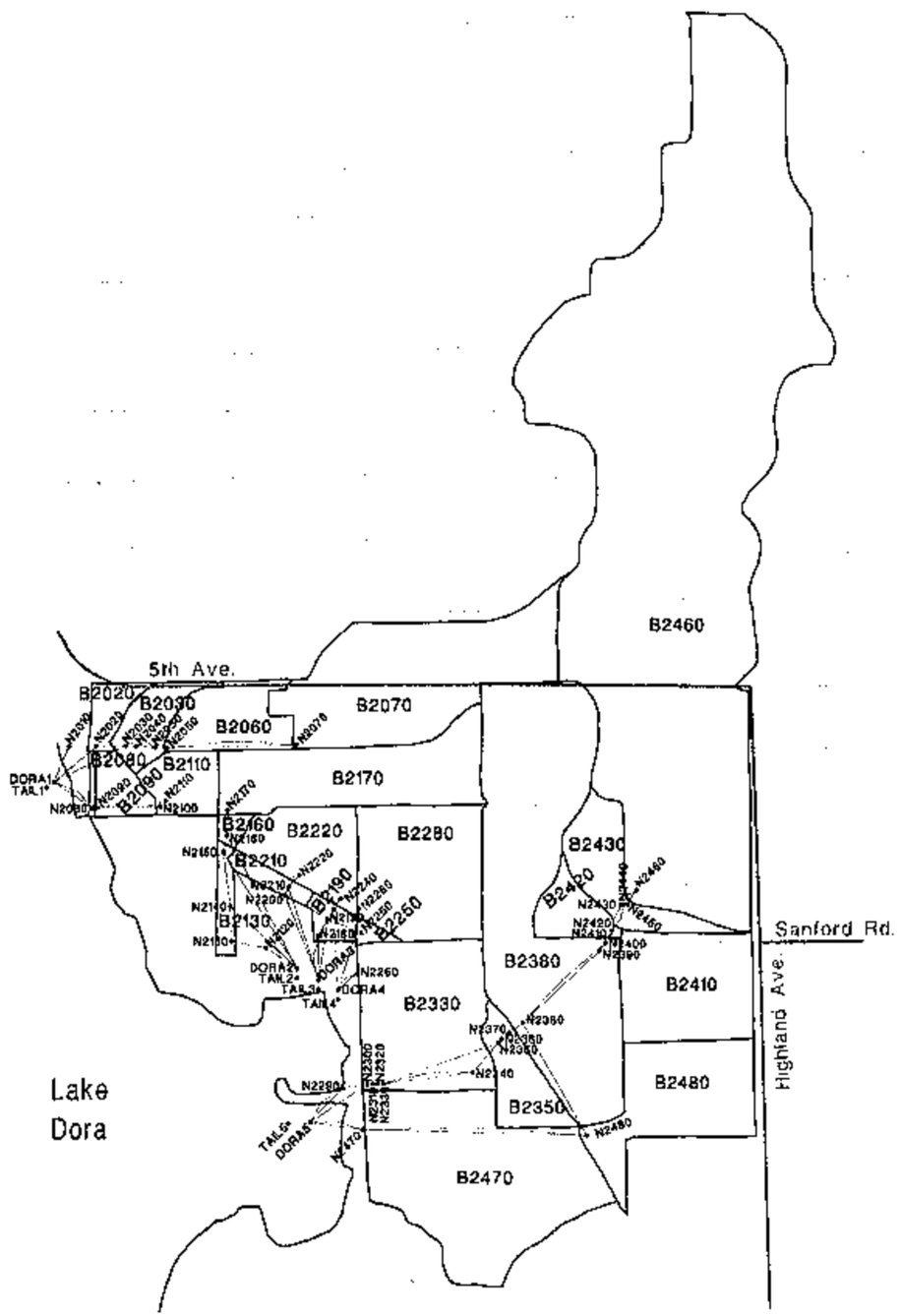
Figure V-2

NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 2



Location Map



500' 1000'

Graphic Scale

N

LEGEND

N1100	Manhole/Inlet
	Conduit
B1070	Basin ID
	Basin Line
	Water
	Road

Figure V-3

Table V-2		Hydrologic Summary for Subarea 2 SWMM Runoff Block Results		
No. Subcatchments	24		Volume (in Inches)	
Tributary Area (ac)	229.02	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		3.39	4.14	5.22
Total Evaporation		0.10	0.10	0.10
Surface Runoff		2.95	4.09	5.99
Surface Storage		0.05	0.05	0.05
Pervious Infiltration		5.67	6.93	8.74

and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.

Figure V-4 presents a time series graph of discharge at one outlet of the primary drainage system to Lake Dora, at Reach R2120, for the 10-, 25- and 100-Year 24-Hour storms. This figure graphically depicts data contained in the simulation output database, and illustrates time varying flow conditions in this portion of Subarea 2. Discharge hydrographs from other portions of Subarea 2 to Lake Dora are similar in character. As indicated in the graph, response of the primary drainage system is rapid, with peak discharge occurring near the time of peak rainfall intensity. This rapid response is due to the fact that, as in Subarea 1, the contributing area is highly impervious, land slopes are steep, and there is little attenuating storage in the area.

Subarea 3. Figure V-5 presents the subcatchment layout for Subarea 3, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 3000 to 3999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R3029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

This portion of the Lake Dora Basin is comprised of 54.24 impervious acres and 108.98 pervious acres. The 33 percent imperviousness of the subarea results in

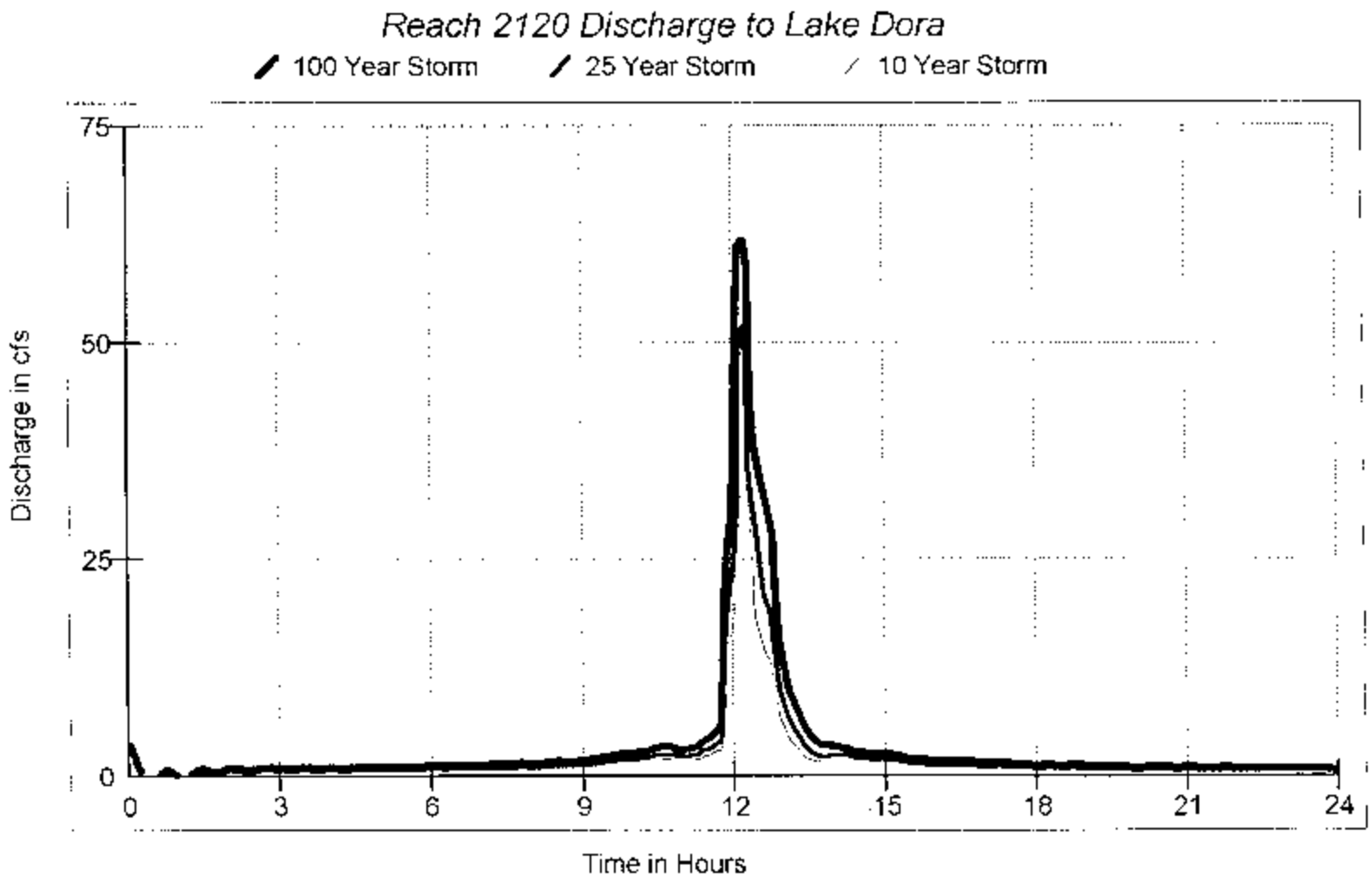
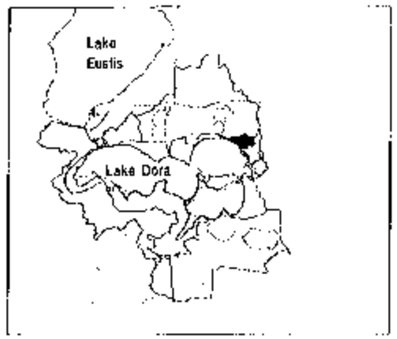

Reach 2120 Discharge to Lake Dora
100 Year Storm
25 Year Storm
10 Year Storm
Discharge in cfs
75
50
25
0
0
3
6
9
12
15
18
21
24
Time in Hours

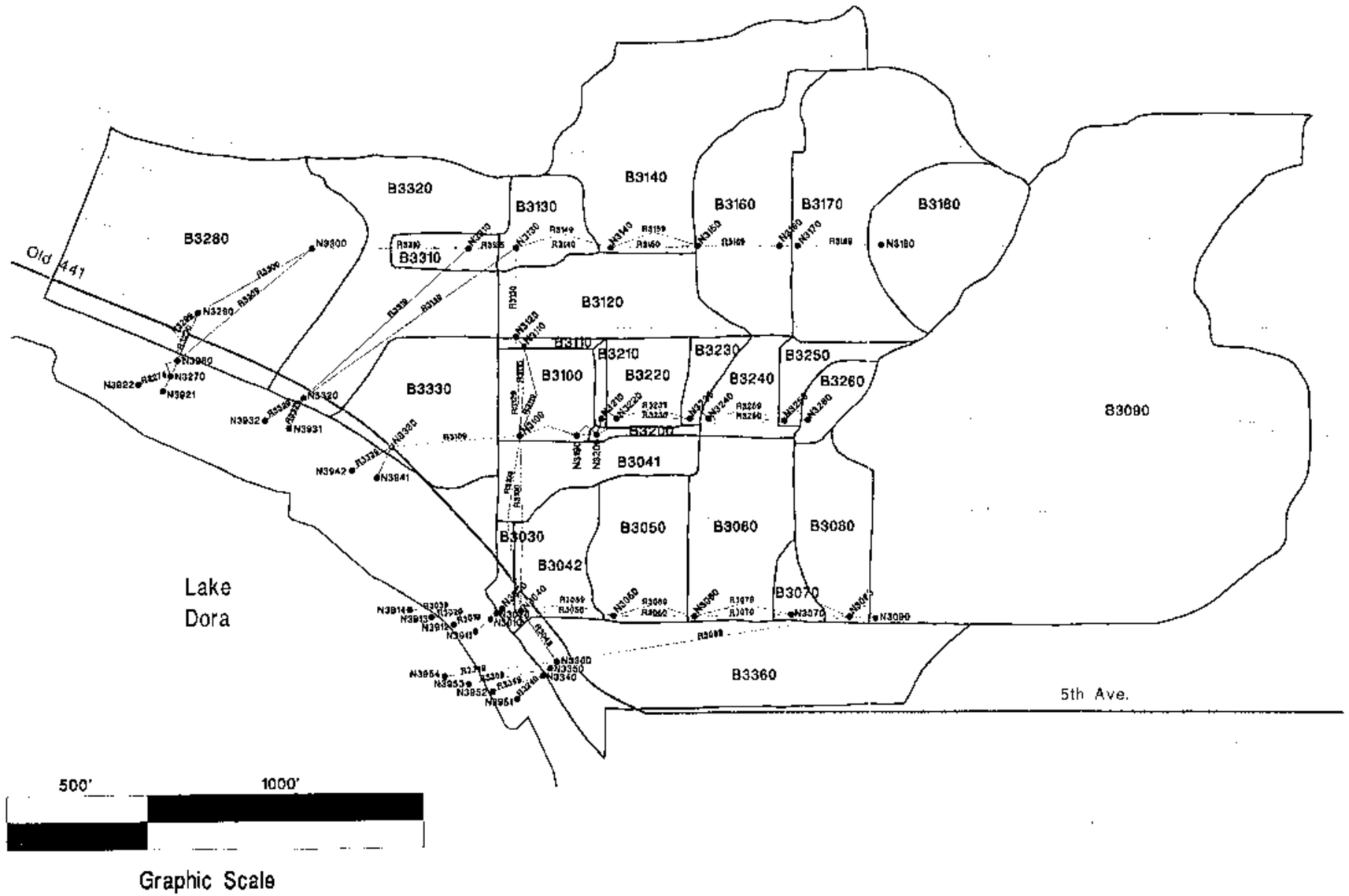
Figure V-4

NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 3



Location Map



LEGEND

• N1190	Manhole/Inlet
R1190	Conduit
B1070	Basin ID
	Basin Line
	Water
	Road

Figure V-5

a high volume of runoff from all events modeled. Table V-3 presents a hydrologic summary for Subarea 3 simulations, including the 10-, 25- and 100-Year 24-Hour storm results.

Table V-3 — **Hydrologic Summary for Subarea 3 SWMM Runoff Block Results**

		Volume (in Inches)		
No. Subcatchments	28			
Tributary Area (ac)	163.21	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		3.76	4.59	5.78
Total Evaporation		0.10	0.10	0.10
Surface Runoff		2.59	3.65	5.45
Surface Storage		0.04	0.04	0.04
Pervious Infiltration		5.63	6.88	8.66

Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole) and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.

Figure V-6 presents a time series graph of discharge at one outlet of the primary drainage system to Lake Dora, at Reach R3010, for the 10-, 25- and 100-Year 24-Hour storms. Figure V-7 presents a time series graph of the discharge at Reach R3019. These figures graphically depict data contained in the simulation output database, and illustrate time varying flow conditions in this portion of Subarea 3. Reach 3019 is an overflow reach, which conveys stormwater to Lake Dora when the capacity of Reach 3010 is exceeded and surcharge at Node 3010 occurs. The combined discharge of these two reaches is roughly equal to that of the upstream Reach 3020. Because the capacity of the outlet pipe (R3010) is insufficient to carry the flow being delivered to it (R3020) under the given head conditions, the node (N3010) surcharges, and the surcharged flow is conveyed at the surface (R3019) downstream to Lake Dora.

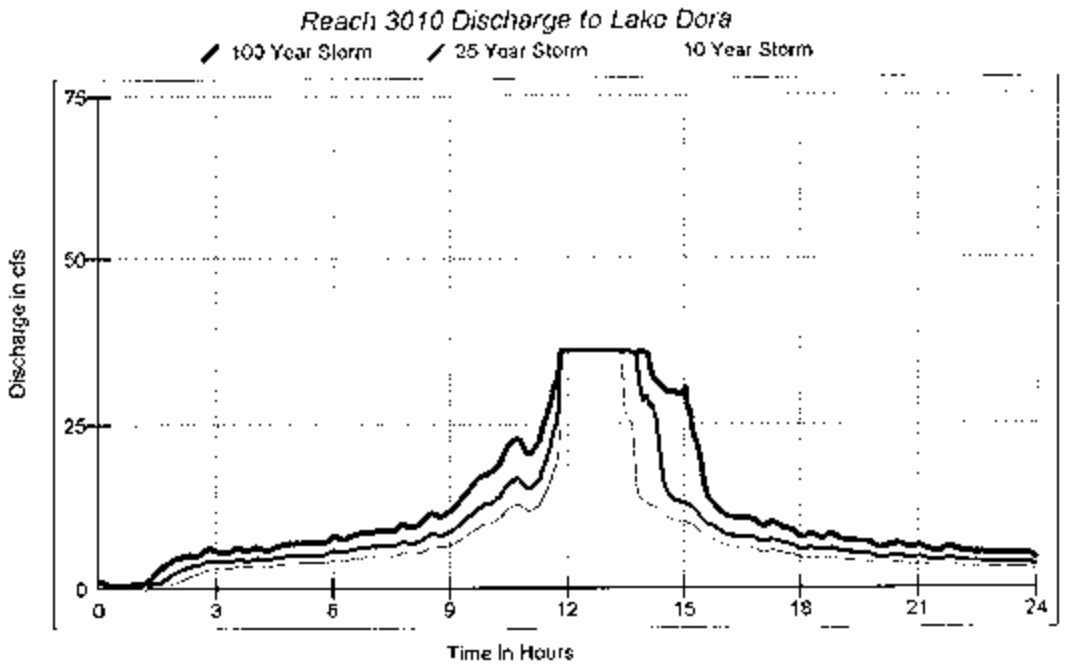


Figure V-6

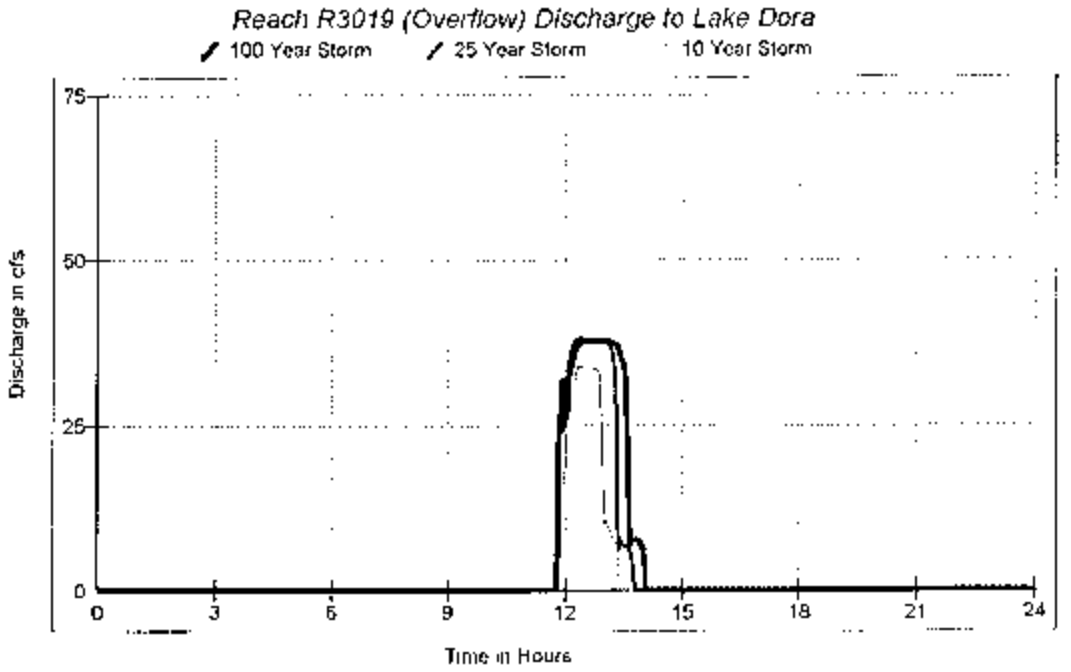


Figure V-7

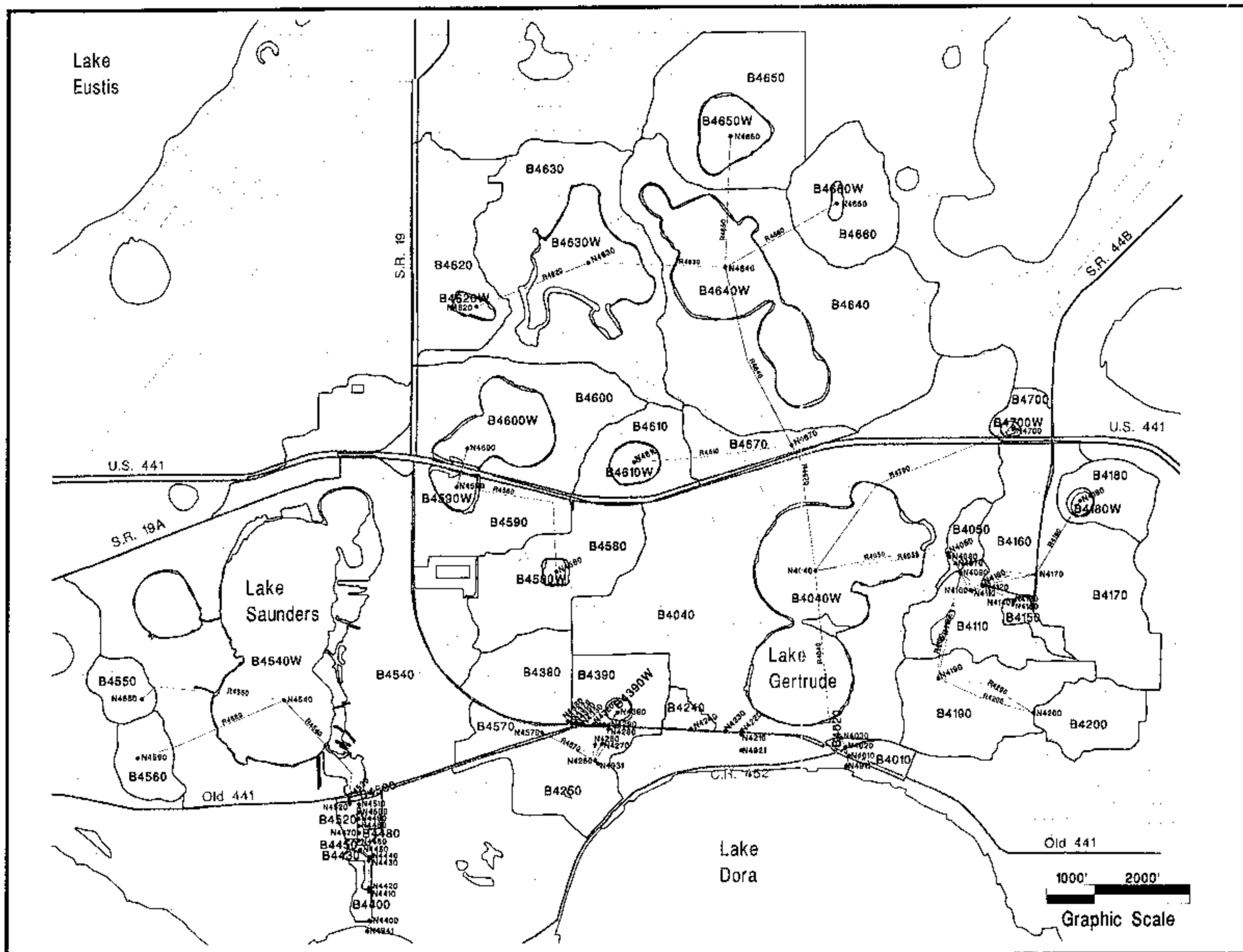
Subarea 4. Figure V-8 presents the subcatchment layout for Subarea 4, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 4000 to 4999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R4029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

This portion of the Lake Dora Basin is comprised of 1888.66 impervious acres and 3256.41 pervious acres. The 37 percent imperviousness of the subarea results in a high volume of runoff from all events modeled. Table V-4 presents a hydrologic summary for Subarea 4 simulations, including the 10-, 25- and 100-Year 24-Hour storm results.

Table V-4 — **Hydrologic Summary for Subarea 4 SWMM Runoff Block Results**

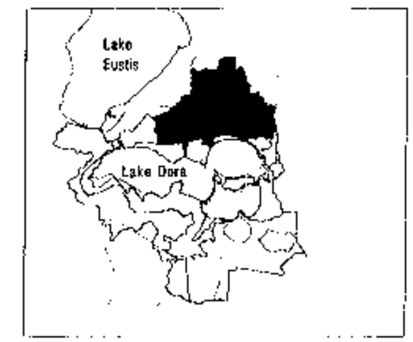
		Volume (in Inches)		
No. Subcatchments	50			
Tributary Area (ac)	5145.07	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		3.73	4.62	5.87
Total Evaporation		0.10	0.10	0.10
Surface Runoff		2.62	3.62	5.36
Surface Storage		0.04	0.04	0.04
Pervious Infiltration		5.89	7.29	9.27

Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole) and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.



NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 4



Location Map

N

LEGEND

• N1160	Manhole/Inlet
R150	Conduit
B1070	Basin ID
	Basin Line
	Water
	Road

Figure V-8

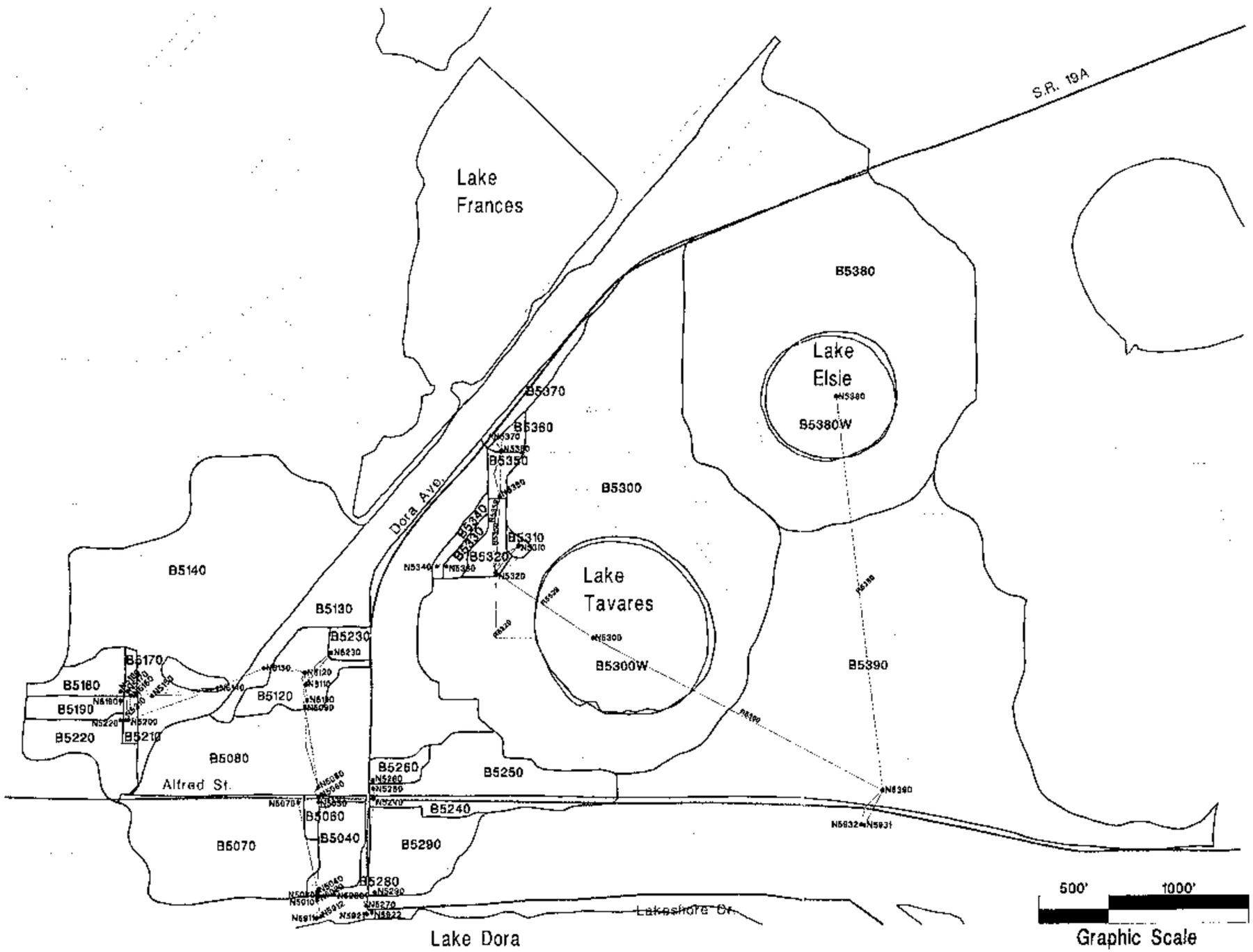
The initial water surface elevations that were assigned to lakes, wetlands, and depressions throughout the watershed were estimated based upon control structure elevations and, for closed lakes, water surface elevations recorded on photogrammetry. The reports of peak stages provided in this report do not reflect the extreme stages that might occur when initial conditions in those storage areas are higher than were assigned. Results of these simulations are indicative only of short-term response to storm event rainfall, given these assumed initial water surface elevations, and may actually underestimate flood conditions that would occur due to an extreme wet season or a rainfall event of longer duration (e.g., a five-day rainfall event). The "100-year flood elevation" of West Crooked Lake, Lake Gertrude and other similarly defined lake and wetland systems, may be significantly higher than that computed for the 24-hour simulations defined in this report.

Subarea 5. Figure V-9 presents the subcatchment layout for Subarea 5, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 5000 to 5999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R5029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

This portion of the Lake Dora Basin is comprised of 154.61 impervious acres and 406.87 pervious acres. The 28 percent imperviousness of the subarea results in a high volume of runoff from all events modeled. Table V-5 presents a hydrologic summary for Subarea 5 simulations, including the 10-, 25- and 100-Year 24-Hour results.

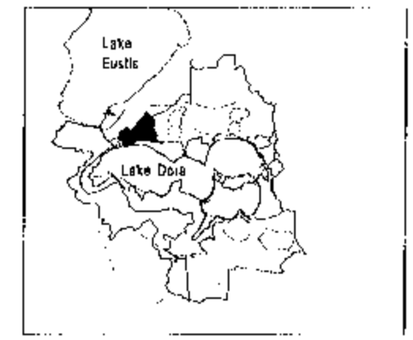
Table V-5 — **Hydrologic Summary for Subarea 5 SWMM Runoff Block Results**

		Volume (in Inches)		
No. Subcatchments	30			
Tributary Area (ac)	561 48	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		4.21	5.17	6.51
Total Evaporation		0.10	0.10	0.10
Surface Runoff		2.15	3.08	4.72
Surface Storage		0.03	0.03	0.03
Pervious Infiltration		5.81	7.13	8.99



NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 5



Location Map

N

LEGEND

- Manhole/Inlet
- Conduit
- B1070 Basin ID
- Basin Line
- Water
- Road

Figure V-9

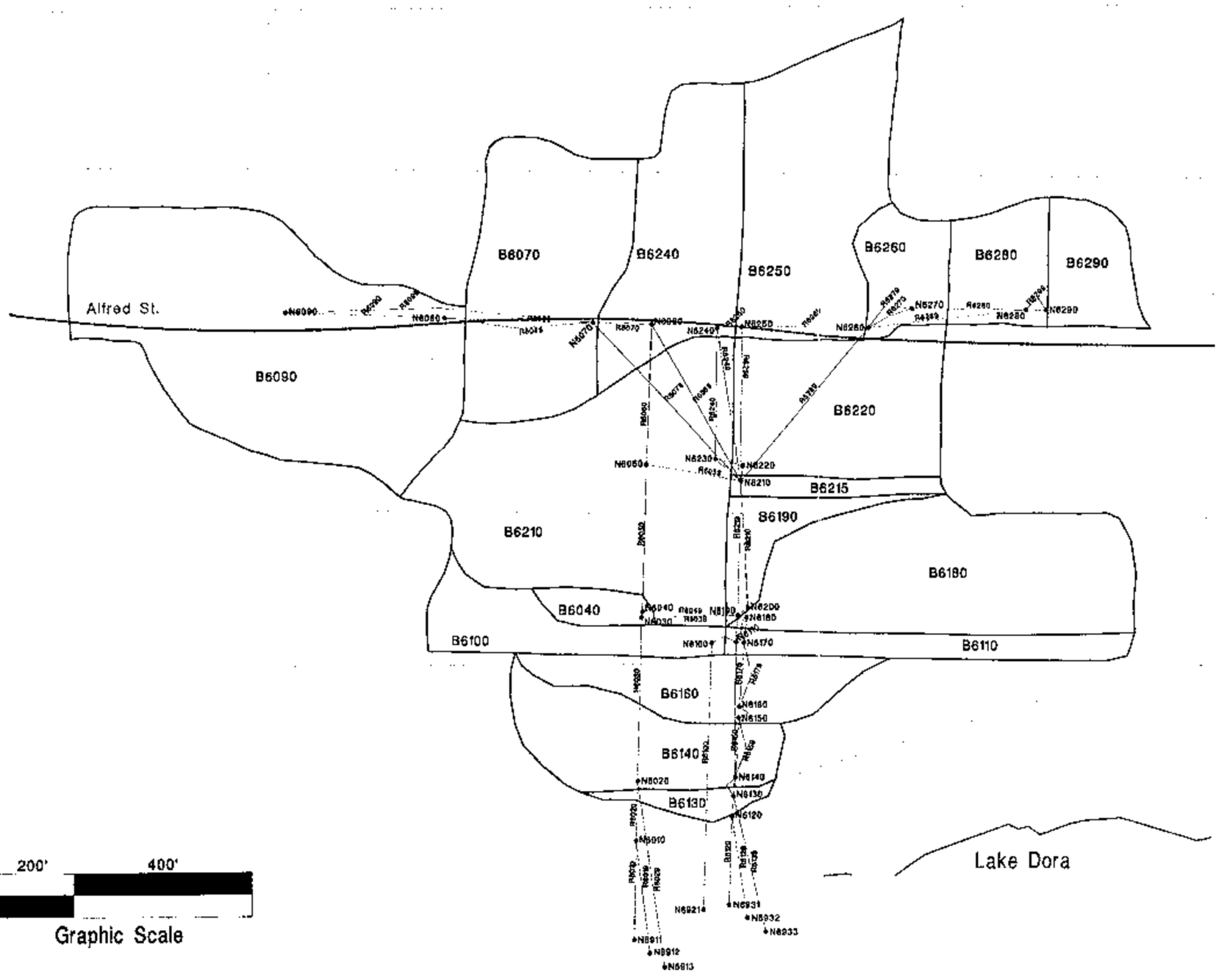
Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole) and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.

Subarea 6. Figure V-10 presents the subcatchment layout for Subarea 6, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 6000 to 6999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R6029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

This portion of the Lake Dora Basin is comprised of 29.33 impervious acres and 20.76 pervious acres. The 59 percent imperviousness of the subarea results in a very high volume of runoff from all events modeled. Table V-6 presents a hydrologic summary for Subarea 6 simulations, including the 10-, 25- and 100-Year 24-Hour results.

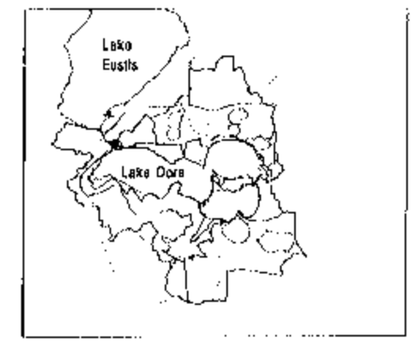
Table V-6 — **Hydrologic Summary for Subarea 6 SWMM Runoff Block Results**

		Volume (in Inches)		
No. Subcatchments	18			
Tributary Area (ac)	50.09	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		2.24	2.71	3.41
Total Evaporation		0.10	0.10	0.10
Surface Runoff		4.08	5.49	7.79
Surface Storage		0.07	0.07	0.08
Pervious Infiltration		5.40	6.55	8.22



NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 6



Location Map

LEGEND

N1190	Manhole/Inlet
R100	Conduit
B1070	Basin ID
	Basin Line
	Water
	Road

Figure V-10

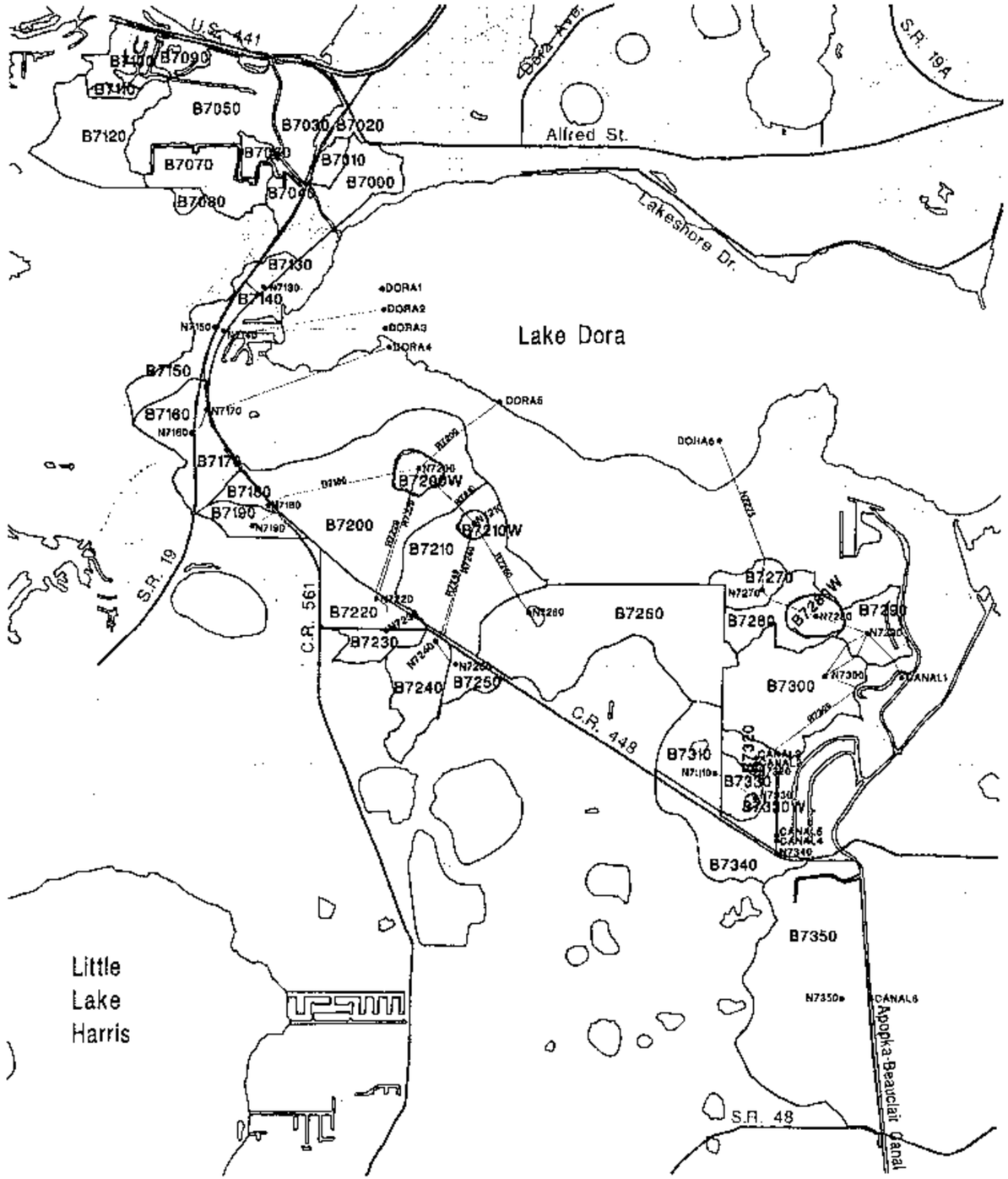
Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole) and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.

Subarea 7. Figure V-11 presents the subcatchment layout for Subarea 7, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 7000 to 7999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R7029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

This portion of the Lake Dora Basin is comprised of 272.81 impervious acres and 2774.68 pervious acres. The 5 percent imperviousness of the subarea results in a low volume of runoff from all events modeled. Due to limitations in the compilation of the SWMM program, Subarea 7 simulations were split into two parts. Tables V-7A and V-7B present a hydrologic summary for the two parts of the Subarea 7 simulations, including the 10-, 25- and 100-Year 24-Hour results.

Table V-7A — **Hydrologic Summary for Subarea 7 (Part A) SWMM Runoff Block Results**

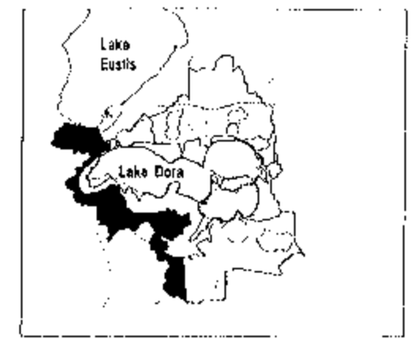
		Volume (in Inches)		
No. Subcatchments	16			
Tributary Area (ac)	1746.82	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		5.47	6.93	9.07
Total Evaporation		0.10	0.10	0.10
Surface Runoff		0.90	1.33	2.17
Surface Storage		0.01	0.02	0.02
Pervious Infiltration		6.21	7.87	10.31



2000' 4000'
Graphic Scale

NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 7



Location Map

LEGEND

- Manhole/Inlet
- Conduit
- B1070 Basin ID
- Basin Line
- Water
- Road

Figure V-11

Table V-7B		Hydrologic Summary for Subarea 7 (Part B) SWMM Runoff Block Results		
No. Subcatchments	11		Volume (in Inches)	
Tributary Area (ac)	1300.67	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		5.71	7.09	9.01
Total Evaporation		0.10	0.10	0.10
Surface Runoff		0.67	1.18	2.25
Surface Storage		0.004	0.004	0.004
Pervious Infiltration		6.00	7.45	9.48

Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole) and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.

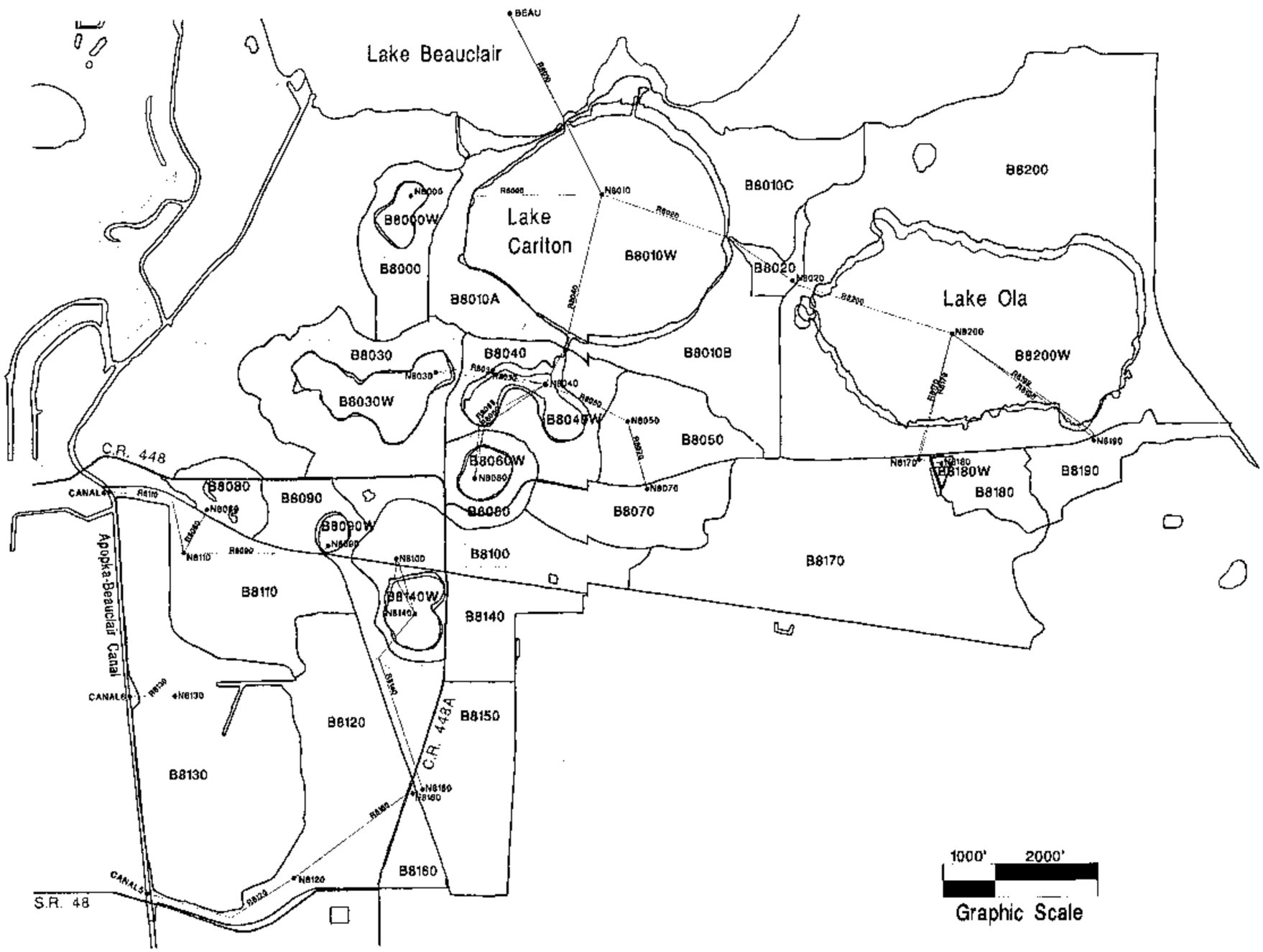
Subarea 8. Figure V-12 presents the subcatchment layout for Subarea 8, with the link-node representation of the model network (primary conveyance system) overlaid. Identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 8000 to 8999, with prefixes as follows: Subcatchment = B, Inlet or Manhole = N, and Conduit = R. Any conduit whose last digit is non-zero (e.g. R8029) is a surface flow conduit, used to define a road overtop, flow down a street, or an overflow across a topographic saddle.

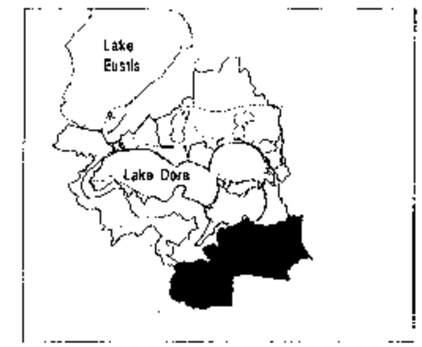
This portion of the Lake Dora Basin is comprised of 1215.74 impervious acres and 3467.27 pervious acres. The 26 percent imperviousness of the subarea results in a moderately high volume of runoff from all events modeled. Table V-8 presents a hydrologic summary for Subarea 8 simulations, including the 10-, 25- and 100-Year 24-Hour results.

Magnitude and timing of peak stages and discharges throughout the system are tabulated in Appendix B and C, respectively. These tables present a summary

NETWORK SCHEMATIC

MSMP for the Lake Dora Basin
Model Subarea 8





Location Map

LEGEND

• N1190	Manhole/Inlet
R1150	Conduit
B1070	Basin ID
	Basin Line
	Water
	Road

Figure V-12

Table V-8			Hydrologic Summary for Subarea 8 SWMM Runoff Block Results	
No. Subcatchments	32		Volume (in Inches)	
Tributary Area (ac)	4683.01	10 Year	25 Year	100 Year
Total Precipitation		6.48	8.38	11.37
Total Infiltration		4.47	5.59	7.17
Total Evaporation		0.10	0.10	0.10
Surface Runoff		1.89	2.66	4.07
Surface Storage		0.02	0.03	0.03
Pervious Infiltration		6.04	7.55	9.69

of maximum stage and discharge values at all points in the modeled system, as computed by the Extended Transport Block of SWMM, for each of the storm events simulated. In addition, depth of flooding at each node (inlet or manhole) and velocity in each reach (conduit) are reported. A negative value for flood depth (the depth of water above an assigned flood elevation for the node) indicates that no flooding occurs at a location. Maximum stages are listed at time zero for tailwater nodes (static water surface elevations), and maximum discharges are listed at time zero for conduits that never discharge during the simulation.

Subarea 9. No detailed storm event analysis was performed for this subarea, which is comprised of land immediately adjacent to Lakes Dora and Beauclair and the Apopka-Beauclair Canal, due to the absence of a defined primary conveyance system.

CHAPTER VI. PROBLEM AREA DETERMINATIONS

The following discussion examines the simulation results, in order to identify problem areas in the Lake Dora Basin. Locations at which flood conditions are reported by the model are listed. Computed flood depths and durations are summarized in tables, and discussed. In addition, other known problems areas are identified, based upon the reports of previous investigations and discussions with County staff. All known problem areas are then ranked (prioritized).

A. IDENTIFICATION OF PROBLEM AREAS

Problem areas were identified based upon simulation results for the 10-, 25-, and 100-Year 24-Hour storm event simulations. Results of those simulations were reviewed to quantify peak stages, discharges and velocities that occurred throughout the primary drainage system. In addition, depth and duration of flooding at manholes and inlets was reviewed as an indicator of the severity of simulated flood conditions. Reports of previous investigations and discussions with County staff corroborated simulation results and served to identify other known problem areas.

Definition of Flood Elevations. The assignment of an elevation at which flooding begins at any given location is subjective. For example, the flood elevation for storm sewer systems was usually set to the elevation of the inlet or manhole cover elevations in that system, so that surcharging into the roadway would be interpreted as a "flood" condition. The flood elevation of a lake was usually set at either the elevation of overflow to an adjoining area or at an elevation identified from photogrammetry at which some structure (first flood slab, etc.) or adjacent roadway might be submerged. The accuracy with which some flood elevations were selected, without benefit of detailed field survey, is less than the accuracy with which the physical model has been constructed and far less than the numerical precision at which simulation results are reported.

Peak Stages and Discharges. Maximum stage and discharge reports, provided in Appendix B and C, respectively, for the 10- 25- and 100-Year 24-Hour simulations can be used by relating a node (an inlet or manhole) in the model to a particular area of interest in the watershed.

Table VI-1 presents a summary list of the inlets and manholes for which flooding is reported in the maximum stage reports for the 100-Year 24-Hour simulation. The fact that an area is not listed in a flood report does not necessarily mean that flooding does not occur in that area. For example, in the vicinity of Johns

Table VI-1	List of Flooded Inlets and Manholes (from Maximum Stage Reports, Appendix A)
Model Subarea	Flooded Inlet/Manhole Model ID (100 Year 24-Hour Storm Event)
1	N1050, N1060, N1070, N1080, N1110, N1160, N1180
2	N2020, N2030, N2040, N2050, N2060, N2070, N2080, N2090, N2140, N2170, N2210, N2220, N2260, N2270, N2280, N2290, N2300, N2310, N2320, N2330, N2350, N2360, N2370, N2400, N2410, N2420, N2430, N2440, N2450, N2460, N2470
3	N3010, N3030, N3050, N3060, N3080, N3090, N3100, N3120, N3130, N3160, N3170, N3180, N3190, N3200, N3210, N3220, N3230, N3240, N3250, N3260, N3310, N3340, N3350, N3360
4	N4060, N4160, N4931
5	N5250, N5360
6	none
7	none
8	N8190

Lake (Model element N4110, in Subarea 4 just east of Lake Gertrude) no flooding conditions are reported. This is due to the fact that the assigned flood elevations for the inlets and manholes in this area were placed at road overtop elevations. John's Lake itself has a computed peak stage of 80.0', while the road overtop, and thus the assigned flood elevation, is at approximately elevation 80.3'. However, a review of photogrammetry in the area reveals that some localized flooding will, in fact, occur in the vicinity of John's Lake if it rises to elevation 80.0'.

Table VI-2 presents a summary list of conduits for which overflow conditions are reported in the maximum discharge reports for the 100-Year 24-Hour simulation. Flow in overflow conduits (for the simulation of roadway overtopping, flow down streets, popoffs across topographic saddles, etc.) provide a good indicator of conditions which may, or may not, be classified as "flooding", depending upon the particular situation. Two examples will serve to illustrate this concept.

Within the Mount Dora area (generally, Subareas 1, 2, and 3), street flooding may occur for extreme rainfall events. The model has been constructed so that

Table VI-2 **List of Overflow Conduits (from Maximum Discharge Reports, Appendix A)**

Model Subarea	Overflow Conduit Model ID (100 Year 24-Hour Storm Event)
1	R1059, R1068, R1069, R1079, R1089, R1119, R1189, R1169, WEIR#1
2	R2029, R2039, R2049, R2059, R2069, R2079, R2089, R2099, R2149, R2179, R2219, R2229, R2269, R2279, R2289, R2299, R2309, R2319, R2329, R2339, R2359, R2369, R2379, R2409, R2419, R2429, R2449, R2459, R2469, WEIR#1, WEIR#2, WEIR#3
3	R3019, R3039, R3049, R3059, R3069, R3089, R3099, R3108, R3129, R3139, R3179, R3189, R3199, R3209, R3219, R3229, R3239, R3249, R3259, R3269, R3319, R3349, R3359, R3369
4	WEIR#2, WEIR#6, WEIR#8, WEIR#9, WEIR#12
5	none
6	none
7	none
8	none

when the capacity of the pipe system is exceeded, inlets and manholes may surcharge (flow to the surface). The streets themselves are modeled as conveyance structures, and allowed to carry the excess flow downstream to a receiving inlet. If the downstream inlet is also at its capacity, the excess flow will continue down the street. In such a case, "flooding" of the roadway may actually be a design function of the system, since storm sewer systems are seldom designed to carry runoff from a 100 Year storm event. Thus, the flow in model overflow conduits may, or may not, be defined as a "problem", depending on point of view.

Overflows of crossing streets are more frequently considered as potential safety concerns. For example, overtopping of Old Eustis/ Mount Dora Road, near the intersection with Suzanne Drive was modeled by providing an additional model conduit to simulate the overflow, in parallel with a culvert conduit. In the model network, this overtop reach is identified as R4169 (however, the SWMM EXTRAN model renames the reach WEIR#9). Consulting the peak discharge

reports reveals that a peak discharge across the road of 71 cfs occurs in the 100 Year storm event.

Flood Depths and Durations. To aid in the assessment of the severity of flooding problems under storm event conditions, flood duration analysis results are presented in Appendix D. These reports indicate the depth and the duration of flooding at model inlets and manholes throughout the primary drainage system. Table VI-3 presents a summary list of inlets and manholes for which the duration of flood conditions exceeded one hour for the 100-Year 24-Hour simulation.

Table VI-3 **Locations with Flood Duration of 1 Hour or Greater (from Flood Duration Reports, Appendix B)**

Model Subarea	Flooded Inlet/Manhole Model ID (100 Year 24-Hour Storm Event)
1	N1060, N1070, N1080, N1110, N1160, N1180
2	N2030, N2040, N2050, N2060, N2070, N2090, N2290, N2300, N2310, N2320, N2330, N2350, N2360, N2370, N2410, N2420, N2430, N2440, N2450
3	N3010, N3030, N3080, N3090, N3100, N3130, N3160, N3170, N3180, N3190, N3200, N3220, N3230, N3240
4	none
5	N5250, N5360
6	none
7	none
8	none

Velocities. The assessment of the severity of flooding problems under storm event conditions should also include a review of velocities during peak conditions throughout the primary conveyance system. Velocities are reported, along with the peak discharge conditions, in Appendix C. Of particular importance are velocities associated with roadway overtopping and flows down streets. The reported velocities are qualitatively factored into the prioritization of problem areas, as they reflect potential health and safety risks.

Other Known Problem Areas. The results of storm event simulations were generally corroborated by "Drainage Deficiency Sites" identified as part of the

Mount Dora Master Drainage Plan (Bowyer-Singleton & Associates, Inc.). However, a small number of known problem areas were not identified by the model. Some of those known problem areas, previously identified in the Mount Dora Master Drainage Plan as well as in the City of Tavares Stormwater Management Study (Howard, Needles, Tammen & Bergendoff, 1988), include portions of the drainage system that lie outside the extents of hydraulic modeling performed during this investigation. It is assumed that those problems still exist, though it is probable that corrective action has been taken in some cases since the completion of those previous studies. Coordination of the results of this investigation with the findings of those previous studies (and the associated plans of the Cities to implement improvements) is recommended.

County staff also indicated that Lake Gertrude and Lake Saunders (both located in Subarea 4) experience flooding, and are the source of frequent complaints from residents. Flooding problems were not reported at those lakes as a result of the storm event modeling performed in this investigation. The reason that the simulations did not reflect the known flooding problems is related to the fact that the problems experienced in those two areas are related more to long term fluctuations in lake levels than to the effects of a single rainfall event, as modeled here. It is recommended that detailed analyses of those water bodies be performed, including an evaluation of long term lake level fluctuations and groundwater influences.

B. PRIORITIZATION OF IDENTIFIED PROBLEM AREAS

A simple ranking methodology was selected to prioritize problem areas. Each identified problem area is classified as being either a high, medium, or low priority, as described in the following.

High Priority Problem Areas. High priority problems include those identified as posing a potential threat to public health, welfare and safety. For example, roadways which overtop pose a potential threat to motorists and must be considered a high priority for investigation and mitigation. Streets which convey flood flows from surcharged inlets are considered a high priority for the same reason. Locations at which high velocities are expected should also be investigated. Among the high priority areas are the following:

> Along John's Avenue from Clayton Street to Grandview Street, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities. (Subarea 1 Model Elements N1050, N1060, N1070, N1080, N1110, R1059, R1068, R1069, R1079, R1089, R1119)

Along East 4th Avenue from Baker Street to McDonald Street, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities. (Subarea 2 Model elements N2020, N2030, N2040, N2050, N2060, N2070, N2080, N2090, R2029, R2039, R2049, R2059, R2069, R2079, R2089, R2099)

Just north of Liberty Avenue, from Tremain Street upstream to Grandview Street, then to 1st Avenue and Tremain Street, insufficient drainage capacity of the primary conveyance system may result in surcharge conditions, roadway overtopping and high velocities at culvert crossings. (Subarea 2 Model elements N2300, N2310, N2320, N2330, N2350, N2360, N2370, N2400, N2410, N2420, N2430, N2440, N2450, N2460, N2470, R2309, R2319, R2329, R2339, R2359, R2369, R2379, R2409, R2419, R2429, R2449, R2459, R2469, WEIR#1, WEIR#2, WEIR#3)

In the vicinity of Helen Street, 6th Avenue and 8th Avenue, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities. (Subarea 3 Model elements N3010, N3030, N3050, N3060, N3080, N3090, N3100, N3120, N3130, N3190, N3200, N3210, N3220, N3230, N3240, N3250, N3260, N3340, N3350, N3360, R3019, R3039, R3049, R3059, R3069, R3089, R3099, R3108, R3129, R3139, R3199, R3209, R3219, R3229, R3239, R3249, R3259, R3269, R3319, R3349, R3359, R3369)

Medium Priority Problem Areas. Medium priority areas include those which have the potential to result in property damage and those which inconvenience the public on a frequent basis. The existing drainage system associated with these areas is generally considered to be inadequate and in need of improvement. Among the medium priority areas are the following:

Upstream (East) of Clayton Street, insufficient capacity of the primary conveyance system from South Highland Street to the railroad crossing results in surcharge conditions and overland flows. (Subarea 1 Model elements N1160, N1180, R1189, R1169, WEIR#1)

In the vicinity of Charles Avenue, Donnelly Street and Tremain Street, insufficient drainage capacity of the primary conveyance system results in surcharge conditions and limited roadway overtopping. (Subarea 2 Model elements N2140, N2170, N2210, N2220, N2260, N2270, N2280, R2149, R2179, R2219, R2229, R2269, R2279, R2289)

In the vicinity of Old Eustis Road, Dogwood Drive and Hillside Drive, frequent inundation associated insufficient drainage capacity (possibly exacerbated by high tailwater conditions in Lake Gertrude) has

historically occurred. Also, insufficient drainage capacity of the primary conveyance system may result in surcharge conditions and some roadway overtopping during extreme storm events. (Subarea 4 Model elements N4060, N4160, WEIR#2, WEIR#6, WEIR#8, WEIR#9, WEIR#12)

Low Priority Problem Areas. Low priority is assigned to infrequent, minor flood conditions without property damage, sometimes referred to as "nuisance flooding" conditions. These include conditions for which the level of service provided by the existing drainage system is considered adequate, but which may be considered for improvement along with other maintenance-related activities (culvert replacements, roadway re-surfacing, etc) or in conjunction with addressing a higher priority problem in the same general vicinity. Among the low priority areas are the following:

In the vicinity of 10th Avenue, from Alexander Street to Baker Street, surcharge of the storm sewer system results in localized street flooding. (Subarea 3 Model elements N3160, N3170, N3180, R3179, R3189)

Near the intersection of Alfred Street and Dora Avenue, surcharge of the storm sewer system results in localized street flooding. (Subarea 5 Model elements N5250)

Near the intersection of Greenway Avenue and Virginia Avenue, surcharge of the storm sewer system results in localized street flooding. (Subarea 5 Model elements N5360)

Various locations throughout the secondary drainage systems in and around the Cities of Tavares and Mount Dora, identified in the reports of previous investigations, have historically experienced limited flooding of short duration.

Other Identified Problem Areas. Portions of the Lake Gertrude and Lake Saunders Watersheds have been the subject of numerous complaints regarding water levels and drainage capacity in adjacent areas. These particular problems are associated with long term, historical fluctuations in the lakes as well as with groundwater conditions. Each watershed should be analyzed further to quantify the extent and severity of flooding conditions. These analyses will require collection of additional site-specific hydrologic data and continuous simulation modeling.

CHAPTER VII. SUMMARY

The Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District contracted with Ghioto & Associates to provide consultant and professional engineering services relating to the preparation of a Master Stormwater Management Plan (MSMP) for the Lake Dora Basin. The MSMP evaluates existing water quantity and quality conditions, locates problem areas, recommends measures for improvement and restoration, and provides design for improvement and restoration. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by Lake County in the planning and regulation of future development in the Lake Dora Basin.

This document describes activities undertaken for the water quantity analysis of the Lake Dora Basin. It is the second in a series of three volumes, which together provide results of the problem definition phase of the Master Stormwater Management Plan.

A. WATER QUANTITY MODELING

Water quantity modeling and problem area analysis includes the hydrologic and hydrodynamic evaluation of the primary drainage system under storm event conditions. In order to predict the response of the study area to rainfall and evaluate performance of the conveyance system, a computer model was developed. The model employed was the Environmental Protection Agency's Stormwater Management Model (SWMM). SWMM was implemented as a surface water model for storm events, utilizing the Runoff and Extended Transport blocks for water quantity simulations.

A model input database was constructed, utilizing a customized version of Aquarian Software's CHAN model as a pre-processor to store the physical attributes of the drainage system in terms of conceptual model elements. Parameters were developed to describe characteristics of the hydrologic system, while physical attributes of the conveyance system were collected and input to describe the physical geometry of hydraulic model elements. CHAN export and translation functions were then employed to generate SWMM input data files for execution of storm event simulations.

Nine distinct model networks were developed to describe the surface water conveyance systems within the Lake Dora Basin. These networks depict individual drainage systems that could be analyzed separately, thus providing

for smaller model input and output data sets, faster simulations, and more focused analysis of results. Another advantage of separation into individually modeled subareas will be experienced during future modifications to the model, for analysis of proposed system modifications.

Lacking historical data with which to calibrate the model, reliance was placed on the experience of the hydrologists in parameter selection and model construction. Literature values for parameters were used as a starting point. However, without some comparative tool, the ultimate reliability of the models remained in doubt. Therefore, comparative simulations were made, using the CHAN model and an alternative methodology for computation of runoff hydrographs. Based upon those comparative simulations and testing of model sensitivity, a final set of model parameters was selected for use.

Meteorological conditions across the watershed were defined, using synthetic rainfall distributions to describe the 10, 25 and 100 Year 24-Hour storm events. Storm event simulations were performed for areas within the Lake Dora Watershed. After each simulation, the results of Runoff and Extended Transport block computations were reviewed to verify that continuity errors in each computational block were minimal.

Summaries of simulation results for each subarea model are provided, along with figures depicting subcatchment layout and the link-node representation of the model network (primary conveyance system). Hydrologic summary tables, and tables of peak stage, discharge and velocity are presented and discussed for each storm event simulated. Time series graphs of discharge at selected locations in the watershed are displayed and discussed to illustrate representative time-varying flow conditions.

Problem areas are identified based upon simulation results for the 10-, 25-, and 100-Year 24-Hour storm event simulations. The depth and duration of flooding at manholes and inlets was reviewed, along with peak stage, discharge and velocity, as indicators of the severity of simulated flood conditions. Reports of previous investigations and discussions with County staff corroborated the simulation results and served to identify other known problem areas.

A simple ranking methodology was selected to prioritize problem areas. Each identified problem area is classified as being either a high, medium, or low priority, as described in the following.

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Locations at which high velocities are expected should be investigated. Among the high priority areas are the following:

Along John's Avenue from Clayton Street to Grandview Street, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities.

Along East 4th Avenue from Baker Street to McDonald Street, surcharge of the storm sewer system may result in significant surface flows accompanied by high velocities.

Just north of Liberty Avenue, from Tremain Street upstream to Grandview Street, then to 1st Avenue and Tremain Street, insufficient drainage capacity of the primary conveyance system may result in surcharge conditions, roadway overtopping and high velocities at culvert crossings.

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provided by the existing drainage system is considered adequate, but which may be considered for improvement along with other maintenance-related activities (culvert replacements, roadway re-surfacing, etc) or in conjunction with addressing a higher priority problem in the same general vicinity. Among the low priority areas are the following:

In the vicinity of 10th Avenue, from Alexander Street to Baker Street, surcharge of the storm sewer system results in localized street flooding.

Near the intersection of Alfred Street and Dora Avenue, surcharge of the storm sewer system results in localized street flooding.

Near the intersection of Greenway Avenue and Virginia Avenue, surcharge of the storm sewer system results in localized street flooding.

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To summarize, this report describes the development of a primary drainage system model for the Lake Dora Basin. System performance is described and problem areas are identified, as defined by the model, for the 10-, 25- and 100-Year 24-Hour storm events. As a result of this analysis, it has been determined that limited flooding of the primary conveyance system occurs throughout portions of the basin, north and east of Lake Dora. No significant problem areas were identified in the primary drainage system south and west of Lake Dora. In developing solutions to the above problems, it is recommended that opportunities for improvement of water quality, documented in Volume III of this report, also be considered.

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APPENDIX A - HYDROLOGIC LOOKUP TABLES

HYDRAULIC CONDUCTIVITY LOOKUP TABLE

Soil Code	Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
690002	0.4	0.4	0.4	0.4	0.4
690003	0.4	0.4	0.4	0.4	0.4
690005	1.2	1.2	1.2	1.2	1.2
690006	1.2	1.2	1.2	1.2	1.2
690007	1.2	1.2	1.2	1.2	1.2
690009	1.2	1.2	1.2	1.2	1.2
690010	4	4	4	4	4
690011	1.2	1.2	1.2	1.2	1.2
690012	0.04	0.04	0.04	0.04	0.04
690013	1.2	1.2	1.2	1.2	1.2
690014	1.2	1.2	1.2	1.2	1.2
690015	1.2	1.2	1.2	1.2	1.2
690016	1.2	1.2	1.2	1.2	1.2
690017	1.2	1.2	1.2	1.2	1.2
690018	1.2	1.2	1.2	1.2	1.2
690019	0.4	0.4	0.4	0.4	0.4
690020	0.04	0.04	0.04	0.04	0.04
690021	0.04	0.04	0.04	0.04	0.04
690022	1.2	1.2	1.2	1.2	1.2
690023	1.2	1.2	1.2	1.2	1.2
690024	0.12	0.12	0.12	0.12	0.12
690025	1.2	1.2	1.2	1.2	1.2
690028	1.2	1.2	1.2	1.2	1.2
690029	1.2	1.2	1.2	1.2	1.2
690030	1.2	1.2	1.2	1.2	1.2
690031	1.2	1.2	1.2	1.2	1.2
690032	0.4	0.4	0.4	0.4	0.4
690033	0.4	0.4	0.4	0.4	0.4
690035	1.2	1.2	1.2	1.2	1.2
690036	1.2	1.2	1.2	1.2	1.2
690037	1.2	1.2	1.2	1.2	1.2
690038	0.4	0.4	0.4	0.4	0.4
690039	1.2	1.2	1.2	1.2	1.2
690040	1.2	1.2	1.2	1.2	1.2
690041	4	4	4	4	4
690042	4	4	4	4	4
690043	4	4	4	4	4
690044	4	4	4	4	4
690045	0.4	0.4	0.4	0.4	0.4
690046	1.2	1.2	1.2	1.2	1.2
690047	1.2	1.2	1.2	1.2	1.2
690048	4	4	4	4	4
690049	4	4	4	4	4
690050	1.2	1.2	1.2	1.2	1.2
690051	1.2	1.2	1.2	1.2	1.2
690052	4	4	4	4	4
690053	4	4	4	4	4
690054	1.2	1.2	1.2	1.2	1.2
690055	1.2	1.2	1.2	1.2	1.2
690056	1.2	1.2	1.2	1.2	1.2

HYDRAULIC CONDUCTIVITY LOOKUP TABLE

Soil Code	Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
690057	1.2	1.2	1.2	1.2	1.2
690058	1.2	1.2	1.2	1.2	1.2
690060	1.2	1.2	1.2	1.2	1.2
690099	0.4	0.4	0.4	0.4	0.4
950001	0.4	0.4	0.4	0.4	0.4
950002	4	4	4	4	4
950003	1.2	1.2	1.2	1.2	1.2
950004	1.2	1.2	1.2	1.2	1.2
950005	1.2	1.2	1.2	1.2	1.2
950006	1.2	1.2	1.2	1.2	1.2
950007	1.2	1.2	1.2	1.2	1.2
950008	1.2	1.2	1.2	1.2	1.2
950009	1.2	1.2	1.2	1.2	1.2
950013	1.2	1.2	1.2	1.2	1.2
950017	1.2	1.2	1.2	1.2	1.2
950018	1.2	1.2	1.2	1.2	1.2
950020	1.2	1.2	1.2	1.2	1.2
950022	0.4	0.4	0.4	0.4	0.4
950023	1.2	1.2	1.2	1.2	1.2
950025	1.2	1.2	1.2	1.2	1.2
950026	1.2	1.2	1.2	1.2	1.2
950028	1.2	1.2	1.2	1.2	1.2
950030	1.2	1.2	1.2	1.2	1.2
950032	1.2	1.2	1.2	1.2	1.2
950033	0.4	0.4	0.4	0.4	0.4
950034	4	4	4	4	4
950037	1.2	1.2	1.2	1.2	1.2
950038	4	4	4	4	4
950040	1.2	1.2	1.2	1.2	1.2
950041	1.2	1.2	1.2	1.2	1.2
950042	1.2	1.2	1.2	1.2	1.2
950043	1.2	1.2	1.2	1.2	1.2
950044	1.2	1.2	1.2	1.2	1.2
950045	1.2	1.2	1.2	1.2	1.2
950046	1.2	1.2	1.2	1.2	1.2
950047	1.2	1.2	1.2	1.2	1.2
950048	1.2	1.2	1.2	1.2	1.2
950049	1.2	1.2	1.2	1.2	1.2
950050	0.4	0.4	0.4	0.4	0.4
950051	1.2	1.2	1.2	1.2	1.2
950054	1.2	1.2	1.2	1.2	1.2
950099	0.4	0.4	0.4	0.4	0.4

AVERAGE CAPILLARY SUCTION LOOKUP TABLE

Soil Code	Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
690002	8	8	8	8	8
690003	8	8	8	8	8
690005	4	4	4	4	4
690006	4	4	4	4	4
690007	4	4	4	4	4
690009	4	4	4	4	4
690010	4	4	4	4	4
690011	12	12	12	12	12
690012	10	10	10	10	10
690013	4	4	4	4	4
690014	4	4	4	4	4
690015	4	4	4	4	4
690016	4	4	4	4	4
690017	4	4	4	4	4
690018	4	4	4	4	4
690019	4	4	4	4	4
690020	4	4	4	4	4
690021	8	8	8	8	8
690022	12	12	12	12	12
690023	4	4	4	4	4
690024	8	8	8	8	8
690025	4	4	4	4	4
690028	4	4	4	4	4
690029	4	4	4	4	4
690030	4	4	4	4	4
690031	4	4	4	4	4
690032	4	4	4	4	4
690033	4	4	4	4	4
690035	4	4	4	4	4
690036	4	4	4	4	4
690037	12	12	12	12	12
690038	12	12	12	12	12
690039	4	4	4	4	4
690040	4	4	4	4	4
690041	4	4	4	4	4
690042	4	4	4	4	4
690043	4	4	4	4	4
690044	4	4	4	4	4
690045	8	8	8	8	8
690046	4	4	4	4	4
690047	4	4	4	4	4
690048	4	4	4	4	4
690049	4	4	4	4	4
690050	4	4	4	4	4
690051	4	4	4	4	4
690052	4	4	4	4	4
690053	4	4	4	4	4
690054	4	4	4	4	4
690055	4	4	4	4	4
690056	4	4	4	4	4

AVERAGE CAPILLARY SUCTION LOOKUP TABLE

Soil Code	Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
690057	4	4	4	4	4
690058	4	4	4	4	4
690060	4	4	4	4	4
690099	8	8	8	8	8
950001	8	8	8	8	8
950002	4	4	4	4	4
950003	4	4	4	4	4
950004	4	4	4	4	4
950005	4	4	4	4	4
950006	4	4	4	4	4
950007	4	4	4	4	4
950008	4	4	4	4	4
950009	12	12	12	12	12
950013	4	4	4	4	4
950017	12	12	12	12	12
950018	12	12	12	12	12
950020	4	4	4	4	4
950022	4	4	4	4	4
950023	4	4	4	4	4
950025	12	12	12	12	12
950026	4	4	4	4	4
950028	4	4	4	4	4
950030	4	4	4	4	4
950032	4	4	4	4	4
950033	8	8	8	8	8
950034	4	4	4	4	4
950037	4	4	4	4	4
950038	4	4	4	4	4
950040	12	12	12	12	12
950041	12	12	12	12	12
950042	12	12	12	12	12
950043	4	4	4	4	4
950044	4	4	4	4	4
950045	4	4	4	4	4
950046	4	4	4	4	4
950047	4	4	4	4	4
950048	4	4	4	4	4
950049	12	12	12	12	12
950050	8	8	8	8	8
950051	4	4	4	4	4
950054	4	4	4	4	4
950099	8	8	8	8	8

INITIAL MOISTURE DEFICIT LOOKUP TABLE

Soil Code	Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
690002	0.210	0.210	0.210	0.210	0.210
690003	0.210	0.210	0.210	0.210	0.210
690005	0.238	0.238	0.238	0.238	0.238
690006	0.238	0.238	0.238	0.238	0.238
690007	0.238	0.238	0.238	0.238	0.238
690009	0.238	0.238	0.238	0.238	0.238
690010	0.238	0.238	0.238	0.238	0.238
690011	0.175	0.175	0.175	0.175	0.175
690012	0.182	0.182	0.182	0.182	0.182
690013	0.238	0.238	0.238	0.238	0.238
690014	0.238	0.238	0.238	0.238	0.238
690015	0.238	0.238	0.238	0.238	0.238
690016	0.238	0.238	0.238	0.238	0.238
690017	0.238	0.238	0.238	0.238	0.238
690018	0.238	0.238	0.238	0.238	0.238
690019	0.238	0.238	0.238	0.238	0.238
690020	0.238	0.238	0.238	0.238	0.238
690021	0.231	0.231	0.231	0.231	0.231
690022	0.175	0.175	0.175	0.175	0.175
690023	0.238	0.238	0.238	0.238	0.238
690024	0.231	0.231	0.231	0.231	0.231
690025	0.238	0.238	0.238	0.238	0.238
690028	0.238	0.238	0.238	0.238	0.238
690029	0.238	0.238	0.238	0.238	0.238
690030	0.238	0.238	0.238	0.238	0.238
690031	0.238	0.238	0.238	0.238	0.238
690032	0.238	0.238	0.238	0.238	0.238
690033	0.238	0.238	0.238	0.238	0.238
690035	0.238	0.238	0.238	0.238	0.238
690036	0.238	0.238	0.238	0.238	0.238
690037	0.175	0.175	0.175	0.175	0.175
690038	0.175	0.175	0.175	0.175	0.175
690039	0.238	0.238	0.238	0.238	0.238
690040	0.238	0.238	0.238	0.238	0.238
690041	0.238	0.238	0.238	0.238	0.238
690042	0.238	0.238	0.238	0.238	0.238
690043	0.238	0.238	0.238	0.238	0.238
690044	0.238	0.238	0.238	0.238	0.238
690045	0.210	0.210	0.210	0.210	0.210
690046	0.238	0.238	0.238	0.238	0.238
690047	0.238	0.238	0.238	0.238	0.238
690048	0.238	0.238	0.238	0.238	0.238
690049	0.238	0.238	0.238	0.238	0.238
690050	0.238	0.238	0.238	0.238	0.238
690051	0.238	0.238	0.238	0.238	0.238
690052	0.238	0.238	0.238	0.238	0.238
690053	0.238	0.238	0.238	0.238	0.238
690054	0.238	0.238	0.238	0.238	0.238
690055	0.238	0.238	0.238	0.238	0.238
690056	0.238	0.238	0.238	0.238	0.238

INITIAL MOISTURE DEFICIT LOOKUP TABLE

Soil Code	Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
690057	0.238	0.238	0.238	0.238	0.238
690058	0.238	0.238	0.238	0.238	0.238
690060	0.238	0.238	0.238	0.238	0.238
690099	0.210	0.210	0.210	0.210	0.210
950001	0.210	0.210	0.210	0.210	0.210
950002	0.238	0.238	0.238	0.238	0.238
950003	0.238	0.238	0.238	0.238	0.238
950004	0.238	0.238	0.238	0.238	0.238
950005	0.238	0.238	0.238	0.238	0.238
950006	0.238	0.238	0.238	0.238	0.238
950007	0.238	0.238	0.238	0.238	0.238
950008	0.238	0.238	0.238	0.238	0.238
950009	0.175	0.175	0.175	0.175	0.175
950013	0.238	0.238	0.238	0.238	0.238
950017	0.175	0.175	0.175	0.175	0.175
950018	0.175	0.175	0.175	0.175	0.175
950020	0.238	0.238	0.238	0.238	0.238
950022	0.238	0.238	0.238	0.238	0.238
950023	0.238	0.238	0.238	0.238	0.238
950025	0.175	0.175	0.175	0.175	0.175
950026	0.238	0.238	0.238	0.238	0.238
950028	0.238	0.238	0.238	0.238	0.238
950030	0.238	0.238	0.238	0.238	0.238
950032	0.238	0.238	0.238	0.238	0.238
950033	0.210	0.210	0.210	0.210	0.210
950034	0.238	0.238	0.238	0.238	0.238
950037	0.238	0.238	0.238	0.238	0.238
950038	0.238	0.238	0.238	0.238	0.238
950040	0.175	0.175	0.175	0.175	0.175
950041	0.175	0.175	0.175	0.175	0.175
950042	0.175	0.175	0.175	0.175	0.175
950043	0.238	0.238	0.238	0.238	0.238
950044	0.238	0.238	0.238	0.238	0.238
950045	0.238	0.238	0.238	0.238	0.238
950046	0.238	0.238	0.238	0.238	0.238
950047	0.238	0.238	0.238	0.238	0.238
950048	0.238	0.238	0.238	0.238	0.238
950049	0.175	0.175	0.175	0.175	0.175
950050	0.210	0.210	0.210	0.210	0.210
950051	0.238	0.238	0.238	0.238	0.238
950054	0.238	0.238	0.238	0.238	0.238
950099	0.210	0.210	0.210	0.210	0.210

PERCENT IMPERVIOUSNESS LOOKUP TABLE

Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
27	86	0	1.5	100

IMPERVIOUS MANNING'S ROUGHNESS LOOKUP TABLE

Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
0.015	0.015	0.025	0.025	0.025

PERVIOUS MANNING'S ROUGHNESS LOOKUP TABLE

Residential	Commercial and Industrial	Agricultural	Open Space	Water and Wetlands
0.3	0.3	0.3	0.3	0.3

APPENDIX B - PEAK STAGE REPORTS

Area 1 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N1010	12.25	70.87	77.68	-6.81
N1911	0.00	63.00	65.00	-2.00
N1020	12.25	73.84	85.54	-11.70
N1030	12.25	85.23	91.69	-6.46
N1040	12.25	89.99	94.18	-4.19
N1050	12.25	92.13	93.26	-1.13
N1060	12.25	95.07	94.15	0.92
N1070	12.25	100.55	99.97	0.58
N1080	12.32	102.06	102.00	0.06
N1090	12.25	108.59	114.50	-5.91
N1100	12.25	113.65	119.50	-5.85
N1110	12.25	100.59	100.00	0.59
N1120	12.35	104.65	108.50	-3.85
N1130	12.25	134.28	140.50	-6.22
N1190	23.00	139.59	147.50	-7.91
N1170	12.25	125.49	126.00	-0.51
N1140	12.25	100.73	101.00	-0.27
N1150	10.48	103.50	103.50	0.00
N1160	12.15	109.62	109.00	0.62
N1180	12.97	144.57	145.00	-0.43
N1912	0.00	63.00	65.00	-2.00
N1913	0.00	63.00	65.00	-2.00
N1914	0.00	63.00	65.00	-2.00
N1915	0.00	63.00	65.00	-2.00
N1916	0.00	63.00	65.00	-2.00
N1917	0.00	63.00	65.00	-2.00
N1918	0.00	63.00	65.00	-2.00
N1919	0.00	63.00	65.00	-2.00
N1920	0.00	63.00	65.00	-2.00

Area 1 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N1010	12.27	72.25	77.68	-5.43
N1911	0.00	63.00	65.00	-2.00
N1020	12.25	74.06	85.54	-11.48
N1030	12.25	86.70	91.69	-4.99
N1040	12.25	90.81	94.18	-3.37
N1050	12.25	93.55	93.26	0.29
N1060	12.25	95.24	94.15	1.09
N1070	12.25	100.72	99.97	0.75
N1080	12.33	102.11	102.00	0.11
N1090	12.27	109.05	114.50	-5.45
N1100	12.25	113.89	119.50	-5.61
N1110	12.25	100.75	100.00	0.75
N1120	12.58	106.53	108.50	-1.97
N1130	12.30	135.16	140.50	-5.34
N1190	23.00	140.28	147.50	-7.22
N1170	12.25	125.60	126.00	-0.40
N1140	12.25	100.89	101.00	-0.11
N1150	4.82	103.50	103.50	0.00
N1160	12.25	109.67	109.00	0.67
N1180	12.55	145.41	145.00	0.41
N1912	0.00	63.00	65.00	-2.00
N1913	0.00	63.00	65.00	-2.00
N1914	0.00	63.00	65.00	-2.00
N1915	0.00	63.00	65.00	-2.00
N1916	0.00	63.00	65.00	-2.00
N1917	0.00	63.00	65.00	-2.00
N1918	0.00	63.00	65.00	-2.00
N1919	0.00	63.00	65.00	-2.00
N1920	0.00	63.00	65.00	-2.00

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Area 1 - 100 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N1010	12.28	72.63	77.68	-5.05
N1911	0.00	63.00	65.00	-2.00
N1020	12.28	77.67	85.54	-7.87
N1030	12.25	87.12	91.69	-4.57
N1040	12.25	91.02	94.18	-3.16
N1050	12.25	93.96	93.26	0.70
N1060	12.25	95.45	94.15	1.30
N1070	12.27	100.97	99.97	1.00
N1080	12.37	102.12	102.00	0.12
N1090	12.57	110.72	114.50	-3.78
N1100	12.25	118.09	119.50	-1.41
N1110	12.25	100.99	100.00	0.99
N1120	12.77	107.23	108.50	-1.27
N1130	12.52	138.04	140.50	-2.46
N1190	23.00	141.29	147.50	-6.21
N1170	12.28	125.92	126.00	-0.08
N1140	12.13	101.00	101.00	0.00
N1150	3.87	103.50	103.50	0.00
N1160	12.32	110.04	109.00	1.04
N1180	12.30	145.76	145.00	0.76
N1912	0.00	63.00	65.00	-2.00
N1913	0.00	63.00	65.00	-2.00
N1914	0.00	63.00	65.00	-2.00
N1915	0.00	63.00	65.00	-2.00
N1916	0.00	63.00	65.00	-2.00
N1917	0.00	63.00	65.00	-2.00
N1918	0.00	63.00	65.00	-2.00
N1919	0.00	63.00	65.00	-2.00
N1920	0.00	63.00	65.00	-2.00

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Area 2 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N2010	11.00	67.96	100.00	-32.04
N2020	12.27	81.76	81.57	0.19
N2030	12.27	88.03	87.75	0.28
N2050	12.27	94.15	93.88	0.27
N2060	12.27	95.84	95.54	0.30
N2040	12.27	89.52	89.25	0.27
N2070	12.25	119.82	119.63	0.19
N2080	12.25	67.33	67.21	0.12
N2090	12.25	68.14	67.32	0.82
N2100	12.25	83.17	89.21	-6.04
N2110	12.25	84.79	89.88	-5.09
N2120	12.25	66.63	100.00	-33.37
N2130	12 25	74.80	100.00	-25.20
N2140	12.25	68.11	71.76	-3.65
N2150	12.25	83.24	90.56	-7.32
N2160	12.25	88.64	94.11	-5.47
N2170	12.25	99.55	99.48	0.07
N2180	12.25	67.42	75.40	-7.98
N2190	12.25	76.04	84.22	-8.18
N2200	12.27	86.46	87.76	-1.30
N2210	12.25	88.25	87.11	1.14
N2220	12.25	93.67	96.65	-2.98
N2230	0.00	78.55	83.24	-4.69
N2240	0.00	80.00	83.10	-3.10
N2250	12.25	81.25	84.01	-2.76
N2260	12.28	73.00	73.29	-0.29
N2270	12.27	82.32	83.91	-1.59
N2280	12.25	87.67	89.99	-2.32
N2290	12.33	66.67	66.33	0.34
N2300	12.32	70.02	67.59	2.43
N2310	12.30	69.42	67.73	1.69
N2320	12.32	69.58	69.19	0.39
N2330	12.30	70.43	69.25	1.18
N2340	12.32	85.46	88.58	-3.12
N2350	12.32	92.08	90.14	1.94
N2360	12.30	93.06	90.58	2.48
N2370	12.30	93.78	92.30	1.48
N2380	12.30	97.05	110.00	-12.95
N2390	12.25	104.72	125.00	-20.28
N2400	12.25	112.07	114.79	-2.72
N2410	12.25	115.96	114.40	1.56
N2420	12.25	116.60	115.14	1.46
N2430	12.08	116.46	116.46	0.00
N2440	12.25	118.37	116.31	2.06
N2450	12.25	117.59	115.93	1.66
N2460	12.25	118.36	115.00	3.36
N2470	12.25	67.48	67.00	0.48

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Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N2480	12.27	116.81	117.50	-0.69
DORA1	0.00	63.00	65.00	-2.00
DORA2	0.00	63.00	65.00	-2.00
DORA5	0.00	63.00	65.00	-2.00
TAIL1	0.00	63.00	65.00	-2.00
TAIL2	0.00	63.00	65.00	-2.00
TAIL5	0.00	63.00	65.00	-2.00
DORA3	0.00	63.00	65.00	-2.00
DORA4	0.00	63.00	65.00	-2.00
TAIL3	0.00	63.00	65.00	-2.00
TAIL4	0.00	63.00	65.00	-2.00

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Area 2 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N2010	11.93	72.48	100.00	-27.52
N2020	12.25	81.89	81.57	0.32
N2030	12.25	88.16	87.75	0.41
N2050	12.25	94.29	93.88	0.41
N2060	12.25	96.24	95.54	0.70
N2040	12.25	89.65	89.25	0.40
N2070	12.25	119.94	119.63	0.31
N2080	12.25	67.39	67.21	0.18
N2090	12.25	68.18	67.32	0.86
N2100	12.25	83.33	89.21	-5.88
N2110	12.25	85.84	89.88	-4.04
N2120	12.30	66.52	100.00	-33.48
N2130	12.28	79.40	100.00	-20.60
N2140	12.25	69.54	71.76	-2.22
N2150	12.25	83.48	90.56	-7.08
N2160	12.25	88.88	94.11	-5.23
N2170	12.25	99.62	99.48	0.14
N2180	12.25	67.50	75.40	-7.90
N2190	12.25	76.11	84.22	-8.11
N2200	12.27	86.51	87.76	-1.25
N2210	12.25	88.29	87.11	1.18
N2220	12.25	97.21	96.65	0.56
N2230	0.00	78.55	83.24	-4.69
N2240	0.00	80.00	83.10	-3.10
N2250	12.25	81.32	84.01	-2.69
N2260	12.42	73.35	73.29	0.06
N2270	12.25	84.03	83.91	0.12
N2280	12.25	90.10	89.99	0.11
N2290	12.18	66.68	66.33	0.35
N2300	12.25	70.15	67.59	2.56
N2310	12.25	69.48	67.73	1.75
N2320	12.25	69.62	69.19	0.43
N2330	12.25	70.60	69.25	1.35
N2340	12.20	85.47	88.58	-3.11
N2350	12.18	92.14	90.14	2.00
N2360	12.42	93.12	90.58	2.54
N2370	12.42	93.80	92.30	1.50
N2380	12.42	98.92	110.00	-11.08
N2390	12.25	109.13	125.00	-15.87
N2400	12.25	115.89	114.79	1.10
N2410	12.25	116.37	114.40	1.97
N2420	12.25	116.84	115.14	1.70
N2430	12.02	116.46	116.46	0.00
N2440	12.25	118.64	116.31	2.33
N2450	12.25	117.72	115.93	1.79
N2460	12.25	118.62	115.00	3.62
N2470	12.25	67.62	67.00	0.62

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Area 2 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N2480	12.25	116.95	117.50	-0.55
DORA1	0.00	63.00	65.00	-2.00
DORA2	0.00	63.00	65.00	-2.00
DORA5	0.00	63.00	65.00	-2.00
TAIL1	0.00	63.00	65.00	-2.00
TAIL2	0.00	63.00	65.00	-2.00
TAIL5	0.00	63.00	65.00	-2.00
DORA3	0.00	63.00	65.00	-2.00
DORA4	0.00	63.00	65.00	-2.00
TAIL3	0.00	63.00	65.00	-2.00
TAIL4	0.00	63.00	65.00	-2.00

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Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N2010	11.88	73.86	100.00	-26.14
N2020	12.25	82.00	81.57	0.43
N2030	12.25	88.28	87.75	0.53
N2050	12.25	94.42	93.88	0.54
N2060	12.25	96.67	95.54	1.13
N2040	12.25	89.77	89.25	0.52
N2070	12.25	120.05	119.63	0.42
N2080	12.25	67.46	67.21	0.25
N2090	12.25	68.24	67.32	0.92
N2100	12.25	83.76	89.21	-5.45
N2110	12.25	87.46	89.88	-2.42
N2120	12.03	65.78	100.00	-34.22
N2130	12.03	71.81	100.00	-28.19
N2140	12.25	71.90	71.76	0.14
N2150	12.25	83.88	90.56	-6.68
N2160	12.25	89.28	94.11	-4.83
N2170	12.25	99.70	99.48	0.22
N2180	12.25	67.63	75.40	-7.77
N2190	12.25	76.22	84.22	-8.00
N2200	12.25	86.70	87.76	-1.06
N2210	12.25	88.51	87.11	1.40
N2220	12.25	97.43	96.65	0.78
N2230	0.00	78.55	83.24	-4.69
N2240	0.00	80.00	83.10	-3.10
N2250	12.25	81.41	84.01	-2.60
N2260	12.32	73.35	73.29	0.06
N2270	12.25	84.12	83.91	0.21
N2280	12.25	90.19	89.99	0.20
N2290	12.27	66.69	66.33	0.36
N2300	12.25	70.35	67.59	2.76
N2310	12.25	69.59	67.73	1.86
N2320	12.25	69.68	69.19	0.49
N2330	12.25	70.87	69.25	1.62
N2340	12.50	85.50	88.58	-3.08
N2350	12.50	92.33	90.14	2.19
N2360	12.53	93.47	90.58	2.89
N2370	12.53	93.96	92.30	1.66
N2380	12.53	101.79	110.00	-8.21
N2390	12.40	109.91	125.00	-15.09
N2400	12.25	116.18	114.79	1.39
N2410	12.25	116.61	114.40	2.21
N2420	12.25	117.09	115.14	1.95
N2430	11.92	116.46	116.46	0.00
N2440	12.23	118.92	116.31	2.61
N2450	12.22	117.88	115.93	1.95
N2460	12.22	119.00	115.00	4.00
N2470	12.25	67.84	67.00	0.84

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Area 2 - 100 Year Storm Event Simulation
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Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N2480	12.25	117.12	117.50	-0.38
DORA1	0.00	63.00	65.00	-2.00
DORA2	0.00	63.00	65.00	-2.00
DORA5	0.00	63.00	65.00	-2.00
TAIL1	0.00	63.00	65.00	-2.00
TAIL2	0.00	63.00	65.00	-2.00
TAIL5	0.00	63.00	65.00	-2.00
DORA3	0.00	63.00	65.00	-2.00
DORA4	0.00	63.00	65.00	-2.00
TAIL3	0.00	63.00	65.00	-2.00
TAIL4	0.00	63.00	65.00	-2.00

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Area 3 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N3010	12.12	71.83	71.58	0.25
N3030	11.95	83.76	84.85	-1.09
N3040	12.32	92.15	97.82	-5.67
N3050	12.25	115.39	115.27	0.12
N3060	12.25	125.40	125.26	0.14
N3070	12.27	128.55	132.41	-3.86
N3080	12.25	129.51	128.12	1.39
N3090	12.25	136.44	136.19	0.25
N3100	12.48	132.66	132.56	0.10
N3110	12.30	142.60	143.91	-1.31
N3120	12.27	144.16	144.65	-0.49
N3130	12.25	150.62	150.74	-0.12
N3140	12.25	151.18	152.86	-1.68
N3150	12.50	151.28	153.76	-2.48
N3160	12.60	151.62	151.04	0.58
N3170	12.60	151.64	150.75	0.89
N3180	12.25	152.59	152.39	0.20
N3190	12.35	138.68	138.57	0.11
N3200	12.32	139.73	139.58	0.15
N3210	12.27	141.38	141.27	0.11
N3220	12.27	141.78	141.59	0.19
N3230	12.25	146.15	146.05	0.10
N3240	12.25	146.41	146.28	0.13
N3250	12.28	149.56	151.75	-2.19
N3260	12.25	149.84	152.30	-2.46
N3270	12.73	91.75	95.73	-3.98
N3280	12.73	94.54	100.00	-5.46
N3290	12.68	99.18	103.11	-3.93
N3300	12.65	124.36	130.77	-6.41
N3310	12.28	145.68	147.69	-2.01
N3020	12.35	77.96	84.56	-6.60
N3911	0.00	63.00	65.00	-2.00
N3921	0.00	63.00	65.00	-2.00
N3912	0.00	63.00	65.00	-2.00
N3913	0.00	63.00	65.00	-2.00
N3914	0.00	63.00	65.00	-2.00
N3922	0.00	63.00	65.00	-2.00
N3320	12.25	90.73	100.00	-9.27
N3931	0.00	63.00	65.00	-2.00
N3330	12.25	95.69	100.00	-4.31
N3941	0.00	63.00	65.00	-2.00
N3932	0.00	63.00	65.00	-2.00
N3942	0.00	63.00	65.00	-2.00
N3340	12.23	79.94	79.77	0.17
N3951	0.00	63.00	65.00	-2.00
N3350	12.25	84.22	84.03	0.19
N3360	12.25	95.00	92.66	2.34

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Area 3 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N3952	0.00	63.00	65.00	-2.00
N3953	0.00	63.00	65.00	-2.00
N3954	0.00	63.00	65.00	-2.00

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Area 3 - 25 Year Storm Event Simulation
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Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N3010	12.63	71.84	71.58	0.26
N3030	12.62	85.10	84.85	0.25
N3040	12.55	95.75	97.82	-2.07
N3050	12.25	115.45	115.27	0.18
N3060	12.25	125.45	125.26	0.19
N3070	12.25	128.84	132.41	-3.57
N3080	12.25	129.62	128.12	1.50
N3090	12.25	136.51	136.19	0.32
N3100	12.27	132.77	132.56	0.21
N3110	12.25	143.31	143.91	-0.60
N3120	12.23	144.76	144.65	0.11
N3130	12.27	150.86	150.74	0.12
N3140	12.75	151.71	152.86	-1.15
N3150	12.77	152.03	153.76	-1.73
N3160	12.82	152.40	151.04	1.36
N3170	12.80	152.40	150.75	1.65
N3180	12.25	152.68	152.39	0.29
N3190	12.25	138.75	138.57	0.18
N3200	12.25	139.81	139.58	0.23
N3210	12.25	141.41	141.27	0.14
N3220	12.25	141.85	141.59	0.26
N3230	12.25	146.19	146.05	0.14
N3240	12.25	146.46	146.28	0.18
N3250	12.30	150.58	151.75	-1.17
N3260	12.25	150 97	152.30	-1.33
N3270	12.77	91.91	95.73	-3.82
N3280	12.75	95.55	100.00	-4.45
N3290	13.13	99 70	103.11	-3.41
N3300	12.27	124.36	130.77	-6.41
N3310	12.25	146.84	147.69	-0.85
N3020	12.65	78.68	84.56	-5.88
N3911	0.00	63.00	65.00	-2.00
N3921	0.00	63.00	65.00	-2.00
N3912	0.00	63.00	65.00	-2.00
N3913	0.00	63.00	65.00	-2.00
N3914	0.00	63.00	65.00	-2.00
N3922	0.00	63.00	65.00	-2.00
N3320	12.25	91.00	100.00	-9.00
N3931	0.00	63.00	65.00	-2.00
N3330	12.25	95.84	100.00	-4.16
N3941	0.00	63.00	65.00	-2.00
N3932	0.00	63.00	65.00	-2.00
N3942	0.00	63.00	65.00	-2.00
N3340	12 22	79.94	79.77	0.17
N3951	0.00	63.00	65.00	-2.00
N3350	12.25	84.22	84.03	0.19
N3360	12.25	95.13	92.66	2.47

Area 3 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N3952	0.00	63.00	65.00	-2.00
N3953	0.00	63.00	65.00	-2.00
N3954	0.00	63.00	65.00	-2.00

Area 3 - 100 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N3010	12.37	71.84	71.58	0.26
N3030	12.32	85.18	84.85	0.33
N3040	12.28	96.65	97.82	-1.17
N3050	12.25	115.52	115.27	0.25
N3060	12.25	125.50	125.26	0.24
N3070	12.25	129.24	132.41	-3.17
N3080	12.25	129.79	128.12	1.67
N3090	12.25	136.61	136.19	0.42
N3100	12.25	132.86	132.56	0.30
N3110	12.25	143.48	143.91	-0.43
N3120	12.25	144.80	144.65	0.15
N3130	12.25	150.96	150.74	0.22
N3140	12.25	152.38	152.86	-0.48
N3150	12.77	152.62	153.76	-1.14
N3160	12.92	153.04	151.04	2.00
N3170	12.92	153.04	150.75	2.29
N3180	12.95	153.07	152.39	0.68
N3190	12.27	138.81	138.57	0.24
N3200	12.27	139.90	139.58	0.32
N3210	12.27	141.50	141.27	0.23
N3220	12.27	142.03	141.59	0.44
N3230	12.27	146.27	146.05	0.22
N3240	12.27	146.55	146.28	0.27
N3250	12.25	151.86	151.75	0.11
N3260	12.25	152.41	152.30	0.11
N3270	12.77	92.28	95.73	-3.45
N3280	12.78	97.19	100.00	-2.81
N3290	13.32	100.96	103.11	-2.15
N3300	12.28	124.39	130.77	-6.38
N3310	12.25	147.71	147.69	0.02
N3020	12.37	78.73	84.56	-5.83
N3911	0.00	63.00	65.00	-2.00
N3921	0.00	63.00	65.00	-2.00
N3912	0.00	63.00	65.00	-2.00
N3913	0.00	63.00	65.00	-2.00
N3914	0.00	63.00	65.00	-2.00
N3922	0.00	63.00	65.00	-2.00
N3320	12.25	91.56	100.00	-8.44
N3931	0.00	63.00	65.00	-2.00
N3330	12.25	96.04	100.00	-3.96
N3941	0.00	63.00	65.00	-2.00
N3932	0.00	63.00	65.00	-2.00
N3942	0.00	63.00	65.00	-2.00
N3340	12.25	79.94	79.77	0.17
N3951	0.00	63.00	65.00	-2.00
N3350	12.27	84.22	84.03	0.19
N3360	12.25	95.39	92.66	2.73

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Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N3952	0.00	63.00	65.00	-2.00
N3953	0.00	63.00	65.00	-2.00
N3954	0.00	63.00	65.00	-2.00

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Area 4 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N4010	12.12	79.87	79.87	0.00
N4911	0.00	63.00	65.00	-2.00
N4020	12.17	84.70	84.70	0.00
N4030	12.17	84.25	84.25	0.00
N4040	23.00	68.67	75.00	-6.33
N4050	23.00	71.76	75.00	-3.24
N4070	17.03	78.52	79.90	-1.38
N4090	17.03	78.73	80.00	-1.27
N4060	28.77	72.08	75.00	-2.92
N4110	28.77	78.70	95.00	-16.30
N4100	17.03	78.71	80.54	-1.83
N4120	13.05	82.82	85.00	-2.18
N4130	13.03	102.95	125.00	-22.05
N4140	13.03	107.20	125.00	-17.80
N4160	13.52	82.34	85.00	-2.66
N4170	12.40	105.21	116.00	-10.79
N4180	23.00	155.36	164.50	-9.14
N4190	16.78	84.55	95.00	-10.45
N4200	12.25	145.83	152.00	-6.17
N4150	13.00	115.07	120.00	-4.93
N4210	11.72	74.01	77.44	-3.43
N4921	0.00	63.00	65.00	-2.00
N4220	11.72	78.74	80.60	-1.86
N4230	11.73	78.86	87.80	-8.94
N4240	10.50	80.81	80.81	0.00
N4250	18.22	68.51	70.00	-1.49
N4931	4.42	66.00	65.00	1.00
N4260	13.23	70.63	79.17	-8.54
N4270	13.22	71.12	80.00	-8.88
N4280	13.15	74.12	79.25	-5.13
N4290	13.15	78.27	78.39	-0.12
N4300	12.72	79.09	79.09	0.00
N4310	12.72	79.78	79.78	0.00
N4320	12.72	79.53	79.53	0.00
N4330	15.50	78.98	79.52	-0.54
N4340	14.12	79.18	80.72	-1.54
N4350	20.25	79.20	79.20	0.00
N4360	11.85	79.97	80.64	-0.67
N4370	11.85	80.73	81.43	-0.70
N4380	14.35	81.50	81.50	0.00
N4390	13.22	78.13	85.00	-6.87
N4400	12.25	65.19	71.18	-5.99
N4941	25.12	65.00	65.00	0.00
N4410	12.38	71.29	78.70	-7.41
N4420	12.33	72.80	78.80	-6.00
N4430	12.08	79.18	84.00	-4.82
N4440	12.25	79.75	83.50	-3.75

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Area 4 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N4450	12.25	79.75	84.00	-4.25
N4460	9.77	82.00	82.00	0.00
N4470	9.77	82.00	82.00	0.00
N4480	9.77	82.00	82.00	0.00
N4490	11.77	81.28	82.00	-0.72
N4500	11.77	80.50	80.50	0.00
N4510	11.77	80.50	80.50	0.00
N4520	12.23	80.50	82.00	-1.50
N4530	12.23	79.62	85.30	-5.68
N4540	23.00	74.83	85.00	-10.17
N4550	15.77	78.40	83.00	-4.60
N4560	23.00	77.98	82.00	-4.02
N4570	12.72	80.79	82.00	-1.21
N4580	23.00	93.90	99.00	-5.10
N4590	23.97	71.72	77.00	-5.28
N4600	24.00	71.72	77.00	-5.28
N4610	23.00	71.16	90.00	-18.84
N4670	12.85	85.76	87.50	-1.74
N4640	23.00	69.31	85.00	-15.69
N4630	23.00	64.98	85.00	-20.02
N4620	23.00	67.94	85.00	-17.06
N4650	23.00	61.04	85.00	-23.96
N4660	23.80	76.50	90.00	-13.50
N4700	23.00	162.62	170.00	-7.38

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Area 4 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N4010	12.03	79.87	79.87	0.00
N4911	0.00	63.00	65.00	-2.00
N4020	12.05	84.70	84.70	0.00
N4030	12.07	84.25	84.25	0.00
N4040	23.00	68.97	75.00	-6.03
N4050	28.77	75.00	75.00	0.00
N4070	18.28	79.11	79.90	-0.79
N4090	12.88	80.00	80.00	0.00
N4060	28.77	75.01	75.00	0.01
N4110	23.83	80.27	95.00	-14.73
N4100	24.27	80.18	80.54	-0.36
N4120	13.07	83.00	85.00	-2.00
N4130	13.07	103.24	125.00	-21.76
N4140	12.68	112.39	125.00	-12.61
N4160	13.87	83.81	85.00	-1.19
N4170	12.77	107.63	116.00	-8.37
N4180	23.00	155.92	164.50	-8.58
N4190	14.50	86.35	95.00	-8.65
N4200	12.27	148.29	152.00	-3.71
N4150	13.05	115.58	120.00	-4.42
N4210	10.55	74.01	77.44	-3.43
N4921	0.00	63.00	65.00	-2.00
N4220	10.53	78.74	80.60	-1.86
N4230	10.53	78.86	87.80	-8.94
N4240	9.70	80.81	80.81	0.00
N4250	19.97	69.07	70.00	-0.93
N4931	3.63	66.00	65.00	1.00
N4260	12.85	70.84	79.17	-8.33
N4270	12.83	71.33	80.00	-8.67
N4280	12.80	74.25	79.25	-5.00
N4290	14.15	78.39	78.39	0.00
N4300	12.42	79.09	79.09	0.00
N4310	12.42	79.24	79.78	-0.54
N4320	12.40	79.21	79.53	-0.32
N4330	12.78	79.02	79.52	-0.50
N4340	12.78	79.09	80.72	-1.63
N4350	7.67	79.20	79.20	0.00
N4360	11.35	79.97	80.64	-0.67
N4370	11.35	80.73	81.43	-0.70
N4380	15.30	81.50	81.50	0.00
N4390	13.18	78.73	85.00	-6.27
N4400	12.25	65.32	71.18	-5.86
N4941	26.33	65.00	65.00	0.00
N4410	12.45	71.40	78.70	-7.30
N4420	12.40	73.55	78.80	-5.25
N4430	12.25	79.33	84.00	-4.67
N4440	12.25	80.34	83.50	-3.16

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Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N4450	12.25	80.35	84.00	-3.65
N4460	9.18	82.00	82.00	0.00
N4470	5.65	82.00	82.00	0.00
N4480	12.23	81.22	82.00	-0.78
N4490	12.23	80.86	82.00	-1.14
N4500	12.03	80.50	80.50	0.00
N4510	12.03	80.50	80.50	0.00
N4520	12.23	81.48	82.00	-0.52
N4530	12.23	80.25	85.30	-5.05
N4540	23.00	75.07	85.00	-9.93
N4550	14.27	79.48	83.00	-3.52
N4560	23.00	78.36	82.00	-3.64
N4570	12.77	81.26	82.00	-0.74
N4580	23.00	94.73	99.00	-4.27
N4590	23.00	72.20	77.00	-4.80
N4600	24.02	72.20	77.00	-4.80
N4610	23.00	71.66	90.00	-18.34
N4670	13.02	87.28	87.50	-0.22
N4640	23.00	69.63	85.00	-15.37
N4630	23.00	65.29	85.00	-19.71
N4620	23.00	69.10	85.00	-15.90
N4650	23.00	61.51	85.00	-23.49
N4660	23.87	77.75	90.00	-12.25
N4700	23.00	163.36	170.00	-6.64

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Area 4 - 100 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N4010	12.00	79.87	79.87	0.00
N4911	0.00	63.00	65.00	-2.00
N4020	12.00	84.70	84.70	0.00
N4030	12.02	84.25	84.25	0.00
N4040	23.00	69.53	75.00	-5.47
N4050	25.42	75.00	75.00	0.00
N4070	14.28	79.11	79.90	-0.79
N4090	13.55	80.00	80.00	0.00
N4060	25.45	75.01	75.00	0.01
N4110	18.20	81.63	95.00	-13.37
N4100	13.85	80.54	80.54	0.00
N4120	13.07	83.29	85.00	-1.71
N4130	13.07	103.93	125.00	-21.07
N4140	13.05	112.56	125.00	-12.44
N4160	13.40	85.67	85.00	0.67
N4170	12.78	111.09	116.00	-4.91
N4180	23.00	156.91	164.50	-7.59
N4190	14.87	89.08	95.00	-5.92
N4200	12.30	150.58	152.00	-1.42
N4150	13.05	116.39	120.00	-3.61
N4210	15.38	74.01	77.44	-3.43
N4921	0.00	63.00	65.00	-2.00
N4220	9.53	78.75	80.60	-1.85
N4230	9.45	78.74	87.80	-9.06
N4240	9.13	80.81	80.81	0.00
N4250	20.53	69.68	70.00	-0.32
N4931	2.90	66.00	65.00	1.00
N4260	12.40	70.84	79.17	-8.33
N4270	12.38	71.33	80.00	-8.67
N4280	12.33	74.25	79.25	-5.00
N4290	12.15	78.39	78.39	0.00
N4300	12.15	79.09	79.09	0.00
N4310	24.62	79.78	79.78	0.00
N4320	12.15	79.53	79.53	0.00
N4330	19.22	78.99	79.52	-0.53
N4340	17.90	79.89	80.72	-0.83
N4350	4.93	79.20	79.20	0.00
N4360	10.18	79.97	80.64	-0.67
N4370	10.18	80.73	81.43	-0.70
N4380	15.98	81.50	81.50	0.00
N4390	13.00	79.52	85.00	-5.48
N4400	12.25	65.79	71.18	-5.39
N4941	3.17	65.00	65.00	0.00
N4410	12.40	71.80	78.70	-6.90
N4420	12.22	78.80	78.80	0.00
N4430	12.25	79.62	84.00	-4.38
N4440	12.25	81.36	83.50	-2.14

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Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N4450	12.25	81.38	84.00	-2.62
N4460	8.03	82.00	82.00	0.00
N4470	8.40	82.00	82.00	0.00
N4480	12.12	82.00	82.00	0.00
N4490	12.12	81.25	82.00	-0.75
N4500	12.00	80.50	80.50	0.00
N4510	11.80	80.50	80.50	0.00
N4520	12.05	82.00	82.00	0.00
N4530	12.23	80.69	85.30	-4.61
N4540	23.00	75.48	85.00	-9.52
N4550	14.72	80.42	83.00	-2.58
N4560	23.00	78.93	82.00	-3.07
N4570	12.82	82.00	82.00	0.00
N4580	23.00	96.18	99.00	-2.82
N4590	23.00	72.99	77.00	-4.01
N4600	24.03	72.99	77.00	-4.01
N4610	23.00	72.46	90.00	-17.54
N4670	13.52	87.50	87.50	0.00
N4640	23.00	70.18	85.00	-14.82
N4630	23.00	65.80	85.00	-19.20
N4620	23.00	70.98	85.00	-14.02
N4650	23.00	62.28	85.00	-22.72
N4660	21.75	79.48	90.00	-10.52
N4700	23.00	164.57	170.00	-5.43

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Area 5 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N5010	12.25	64.22	66.65	-2.43
N5911	0.00	63.00	65.00	-2.00
N5020	12.25	65.17	66.95	-1.78
N5030	12.25	65.06	66.99	-1.93
N5040	12.25	65.74	66.87	-1.13
N5050	12.80	68.37	69.79	-1.42
N5070	13.62	65.66	67.00	-1.34
N5060	12.80	67.21	67.21	0.00
N5080	18.37	65.52	68.00	-2.48
N5240	11.90	72.76	72.76	0.00
N5250	11.97	72.71	72.64	0.07
N5260	11.95	72.74	72.74	0.00
N5270	12.25	65.18	65.90	-0.72
N5921	2.22	65.00	65.00	0.00
N5280	11.77	67.08	67.08	0.00
N5290	11.77	66.74	66.74	0.00
N5090	18.37	65.52	67.68	-2.16
N5100	15.03	65.91	66.76	-0.85
N5110	12.27	67.30	67.53	-0.23
N5120	9.68	67.45	67.45	0.00
N5130	9.68	69.00	69.00	0.00
N5230	11.80	68.50	68.50	0.00
N5140	24.00	68.35	70.00	-1.65
N5150	12.25	70.80	72.84	-2.04
N5160	12.02	71.93	73.53	-1.60
N5170	12.02	72.18	73.16	-0.98
N5180	12.02	72.37	73.29	-0.92
N5190	11.88	72.38	72.38	0.00
N5200	11.80	73.02	73.02	0.00
N5210	11.80	71.94	71.94	0.00
N5220	11.80	71.86	71.86	0.00
N5912	0.00	63.00	65.00	-2.00
N5922	0.00	63.00	65.00	-2.00
N5320	12.25	81.79	86.04	-4.25
N5300	23.00	70.06	82.70	-12.64
N5310	0.00	82.72	85.52	-2.80
N5330	12.23	86.99	87.09	-0.10
N5340	11.82	86.78	86.78	0.00
N5350	12.25	93.90	94.39	-0.49
N5360	12.07	95.08	95.00	0.08
N5370	12.25	95.37	96.58	-1.21
N5390	12.10	69.00	69.00	0.00
N5931	0.00	63.00	65.00	-2.00
N5932	0.00	63.00	65.00	-2.00
N5380	23.00	70.62	98.50	-27.88

Area 5 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N5010	12.25	64.40	66.65	-2.25
N5911	0.00	63.00	65.00	-2.00
N5020	12.25	65.47	66.95	-1.48
N5030	12.25	65.66	66.99	-1.33
N5040	12.23	66.06	66.87	-0.81
N5050	12.43	69.79	69.79	0.00
N5070	15.95	66.14	67.00	-0.86
N5060	12.15	67.21	67.21	0.00
N5080	17.53	66.08	68.00	-1.92
N5240	11.85	72.76	72.76	0.00
N5250	11.88	72.71	72.64	0.07
N5260	11.88	72.74	72.74	0.00
N5270	12.25	65.22	65.90	-0.68
N5921	1.82	65.00	65.00	0.00
N5280	11.75	67.08	67.08	0.00
N5290	11.40	66.74	66.74	0.00
N5090	17.27	66.09	67.68	-1.59
N5100	17.25	66.62	66.76	-0.14
N5110	17.23	67.53	67.53	0.00
N5120	9.12	67.45	67.45	0.00
N5130	9.10	69.00	69.00	0.00
N5230	11.78	68.50	68.50	0.00
N5140	24.88	68.71	70.00	-1.29
N5150	12.03	70.76	72.84	-2.08
N5160	12.03	72.14	73.53	-1.39
N5170	12.07	73.16	73.16	0.00
N5180	11.82	73.26	73.29	-0.03
N5190	11.83	72.38	72.38	0.00
N5200	11.82	73.02	73.02	0.00
N5210	11.75	71.94	71.94	0.00
N5220	11.73	71.86	71.86	0.00
N5912	0.00	63.00	65.00	-2.00
N5922	0.00	63.00	65.00	-2.00
N5320	12.25	82.77	86.04	-3.27
N5300	23.00	70.45	82.70	-12.25
N5310	12.27	82.75	85.52	-2.77
N5330	11.83	87.09	87.09	0.00
N5340	11.80	86.78	86.78	0.00
N5350	12.12	94.39	94.39	0.00
N5360	12.02	95.08	95.00	0.08
N5370	12.25	95.77	96.58	-0.81
N5390	12.03	69.00	69.00	0.00
N5931	0.00	63.00	65.00	-2.00
N5932	0.00	63.00	65.00	-2.00
N5380	23.00	71.15	98.50	-27.35

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Area 5 - 100 Year Storm Event Simulation
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Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N5010	12.23	64.62	66.65	-2.03
N5911	0.00	63.00	65.00	-2.00
N5020	12.18	65.80	66.95	-1.15
N5030	12.18	66.29	66.99	-0.70
N5040	12.18	66.87	66.87	0.00
N5050	12.25	67.19	69.79	-2.60
N5070	17.75	66.87	67.00	-0.13
N5060	12.25	67.21	67.21	0.00
N5080	15.02	66.94	68.00	-1.06
N5240	11.82	72.76	72.76	0.00
N5250	11.83	72.71	72.64	0.07
N5260	11.83	72.74	72.74	0.00
N5270	12.25	65.74	65.90	-0.16
N5921	1.47	65.00	65.00	0.00
N5280	11.75	67.08	67.08	0.00
N5290	10.30	66.74	66.74	0.00
N5090	15.02	66.93	67.68	-0.75
N5100	12.00	66.76	66.76	0.00
N5110	24.00	67.53	67.53	0.00
N5120	7.57	67.45	67.45	0.00
N5130	7.57	69.00	69.00	0.00
N5230	11.77	68.50	68.50	0.00
N5140	24.45	69.25	70.00	-0.75
N5150	12.17	70.66	72.84	-2.18
N5160	11.82	71.65	73.53	-1.88
N5170	11.82	73.16	73.16	0.00
N5180	11.78	73.29	73.29	0.00
N5190	11.80	72.38	72.38	0.00
N5200	11.78	73.02	73.02	0.00
N5210	11.73	71.94	71.94	0.00
N5220	11.37	71.86	71.86	0.00
N5912	0.00	63.00	65.00	-2.00
N5922	0.00	63.00	65.00	-2.00
N5320	12.13	86.04	86.04	0.00
N5300	23.00	71.11	82.70	-11.59
N5310	12.18	83.63	85.52	-1.89
N5330	11.80	87.09	87.09	0.00
N5340	11.77	86.78	86.78	0.00
N5350	12.03	94.39	94.39	0.00
N5360	11.92	95.08	95.00	0.08
N5370	12.03	96.58	96.58	0.00
N5390	11.95	69.00	69.00	0.00
N5931	0.00	63.00	65.00	-2.00
N5932	0.00	63.00	65.00	-2.00
N5380	23.00	72.01	98.50	-26.49

Area 6 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N6010	11.87	67.81	68.11	-0.30
N6911	0.00	63.00	65.00	-2.00
N6020	11.87	69.34	70.18	-0.84
N6030	11.87	68.87	71.89	-3.02
N6040	11.87	69.05	71.30	-2.25
N6050	11.85	69.40	69.40	0.00
N6060	12.78	70.93	71.57	-0.64
N6070	11.83	70.20	70.20	0.00
N6080	11.87	75.89	79.36	-3.47
N6090	11.85	76.58	76.58	0.00
N6100	12.25	67.36	68.31	-0.95
N6921	0.00	63.00	65.00	-2.00
N6110	12.25	67.92	68.13	-0.21
N6120	12.25	65.77	67.92	-2.15
N6931	0.00	63.00	65.00	-2.00
N6130	12.25	66.92	66.97	-0.05
N6140	12.25	67.53	67.93	-0.40
N6150	12.23	67.83	68.17	-0.34
N6160	12.23	67.95	68.14	-0.19
N6170	12.25	67.95	68.79	-0.84
N6180	12.00	67.95	67.95	0.00
N6190	12.25	67.98	68.06	-0.08
N6200	12.25	67.97	68.96	-0.99
N6210	11.78	68.03	68.03	0.00
N6220	12.25	68.50	69.42	-0.92
N6230	12.25	68.90	69.08	-0.18
N6240	11.83	72.25	72.25	0.00
N6250	11.83	73.49	73.49	0.00
N6260	11.90	75.85	75.85	0.00
N6270	11.90	76.30	76.30	0.00
N6280	12.15	73.91	73.91	0.00
N6290	12.15	74.15	74.15	0.00
N6912	0.00	63.00	65.00	-2.00
N6913	0.00	63.00	65.00	-2.00
N6932	0.00	63.00	65.00	-2.00
N6933	0.00	63.00	65.00	-2.00

Area 6 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N6010	11.83	68.11	68.11	0.00
N6911	0.00	63.00	65.00	-2.00
N6020	11.83	70.18	70.18	0.00
N6030	11.83	69.71	71.89	-2.18
N6040	11.83	69.84	71.30	-1.46
N6050	11.82	69.40	69.40	0.00
N6060	12.82	70.81	71.57	-0.76
N6070	11.80	70.20	70.20	0.00
N6080	11.83	76.30	79.36	-3.06
N6090	11.80	76.58	76.58	0.00
N6100	12.25	67.65	68.31	-0.66
N6921	0.00	63.00	65.00	-2.00
N6110	12.25	68.00	68.13	-0.13
N6120	12.12	65.96	67.92	-1.96
N6931	0.00	63.00	65.00	-2.00
N6130	12.07	66.97	66.97	0.00
N6140	12.25	67.76	67.93	-0.17
N6150	12.25	68.00	68.17	-0.17
N6160	12.25	68.10	68.14	-0.04
N6170	12.25	68.00	68.79	-0.79
N6180	11.88	67.95	67.95	0.00
N6190	12.25	68.03	68.06	-0.03
N6200	12.25	67.99	68.96	-0.97
N6210	11.77	68.03	68.03	0.00
N6220	12.25	68.69	69.42	-0.73
N6230	12.25	69.06	69.08	-0.02
N6240	11.80	72.25	72.25	0.00
N6250	11.80	73.49	73.49	0.00
N6260	11.85	75.85	75.85	0.00
N6270	11.83	76.30	76.30	0.00
N6280	12.03	73.91	73.91	0.00
N6290	12.05	74.15	74.15	0.00
N6912	0.00	63.00	65.00	-2.00
N6913	0.00	63.00	65.00	-2.00
N6932	0.00	63.00	65.00	-2.00
N6933	0.00	63.00	65.00	-2.00

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Area 6 - 100 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N6010	11.80	68.11	68.11	0.00
N6911	0.00	63.00	65.00	-2.00
N6020	11.80	70.18	70.18	0.00
N6030	11.80	70.24	71.89	-1.65
N6040	11.80	70.26	71.30	-1.04
N6050	11.78	69.40	69.40	0.00
N6060	12.97	71.47	71.57	-0.10
N6070	11.78	70.20	70.20	0.00
N6080	11.80	76.12	79.36	-3.24
N6090	11.77	76.58	76.58	0.00
N6100	12.25	67.98	68.31	-0.33
N6921	0.00	63.00	65.00	-2.00
N6110	12.25	68.09	68.13	-0.04
N6120	12.05	65.96	67.92	-1.96
N6931	0.00	63.00	65.00	-2.00
N6130	12.00	66.97	66.97	0.00
N6140	12.12	67.93	67.93	0.00
N6150	11.78	68.14	68.17	-0.03
N6160	11.78	68.14	68.14	0.00
N6170	12.25	68.06	68.79	-0.73
N6180	11.82	67.95	67.95	0.00
N6190	12.05	68.06	68.06	0.00
N6200	12.05	68.00	68.96	-0.96
N6210	11.75	68.03	68.03	0.00
N6220	12.25	68.88	69.42	-0.54
N6230	12.07	69.08	69.08	0.00
N6240	11.78	72.25	72.25	0.00
N6250	11.78	73.49	73.49	0.00
N6260	11.80	75.85	75.85	0.00
N6270	11.80	76.30	76.30	0.00
N6280	11.80	73.91	73.91	0.00
N6290	11.82	74.15	74.15	0.00
N6912	0.00	63.00	65.00	-2.00
N6913	0.00	63.00	65.00	-2.00
N6932	0.00	63.00	65.00	-2.00
N6933	0.00	63.00	65.00	-2.00

Area 7 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N7200	13.57	64.91	67.00	-2.09
DORA1	0.00	63.00	65.00	-2.00
N7210	13.70	67.06	68.00	-0.94
N7190	26.27	76.07	78.00	-1.93
N7180	12.40	77.74	78.00	-0.26
N7160	10.58	82.50	82.50	0.00
N7170	11.87	73.50	73.50	0.00
N7150	12.72	71.50	71.50	0.00
N7140	12.28	67.50	67.50	0.00
N7130	23.00	76.42	77.50	-1.08
N7220	13.32	72.23	74.50	-2.27
N7230	12.30	79.50	79.50	0.00
N7250	23.00	68.40	78.50	-10.10
N7240	13.50	74.76	76.00	-1.24
N7260	12.80	72.43	75.00	-2.57
DORA2	0.00	63.00	65.00	-2.00
DORA3	0.00	63.00	65.00	-2.00
DORA4	0.00	63.00	65.00	-2.00
DORA5	0.00	63.00	65.00	-2.00

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Area 7 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N7200	14.18	65.07	67.00	-1.93
DORA1	0.00	63.00	65.00	-2.00
N7210	13.75	67.21	68.00	-0.79
N7190	25.95	76.87	78.00	-1.13
N7180	12.35	77.84	78.00	-0.16
N7160	9.50	82.50	82.50	0.00
N7170	10.93	73.50	73.50	0.00
N7150	12.33	71.50	71.50	0.00
N7140	12.17	67.50	67.50	0.00
N7130	23.00	76.78	77.50	-0.72
N7220	13.73	72.90	74.50	-1.60
N7230	12.15	79.50	79.50	0.00
N7250	23.00	68.97	78.50	-9.53
N7240	14.18	75.18	76.00	-0.82
N7260	12.88	72.55	75.00	-2.45
DORA2	0.00	63.00	65.00	-2.00
DORA3	0.00	63.00	65.00	-2.00
DORA4	0.00	63.00	65.00	-2.00
DORA5	0.00	63.00	65.00	-2.00

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Area 7 - 100 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N7200	14.68	65.35	67.00	-1.65
DORA1	0.00	63.00	65.00	-2.00
N7210	14.17	67.46	68.00	-0.54
N7190	21.77	77.60	78.00	-0.40
N7180	12.33	77.97	78.00	-0.03
N7160	7.95	82.50	82.50	0.00
N7170	9.62	73.50	73.50	0.00
N7150	12.18	71.50	71.50	0.00
N7140	12.02	67.50	67.50	0.00
N7130	23.00	77.35	77.50	-0.15
N7220	14.28	73.85	74.50	-0.65
N7230	12.02	79.50	79.50	0.00
N7250	23.00	69.90	78.50	-8.60
N7240	14.18	75.74	76.00	-0.26
N7260	13.10	72.74	75.00	-2.26
DORA2	0.00	63.00	65.00	-2.00
DORA3	0.00	63.00	65.00	-2.00
DORA4	0.00	63.00	65.00	-2.00
DORA5	0.00	63.00	65.00	-2.00

Area 7 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N7270	17.25	78.52	81.50	-2.98
N7280	23.00	64.69	70.00	-5.31
N7290	28.77	63.68	65.50	-1.82
N7300	13.37	64.90	66.50	-1.60
N7320	23.93	65.55	72.25	-6.70
CANAL2	0.00	63.00	65.00	-2.00
N7330	13.68	67.67	73.00	-5.33
N7310	13.18	79.50	79.50	0.00
N7340	12.42	70.50	70.50	0.00
CANAL4	0.00	63.00	65.00	-2.00
N7350	23.00	66.56	70.00	-3.44
CANAL6	0.00	63.00	65.00	-2.00
DORA6	0.00	63.00	65.00	-2.00
CANAL1	0.00	63.00	65.00	-2.00
CANAL5	0.00	63.00	65.00	-2.00
CANAL3	0.00	63.00	65.00	-2.00

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Area 7 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N7270	13.83	79.07	81.50	-2.43
N7280	23.00	64.92	70.00	-5.08
N7290	23.00	64.47	65.50	-1.03
N7300	13.37	65.37	66.50	-1.13
N7320	23.00	66.30	72.25	-5.95
CANAL2	0.00	63.00	65.00	-2.00
N7330	14.08	68.29	73.00	-4.71
N7310	12.57	79.50	79.50	0.00
N7340	12.27	70.50	70.50	0.00
CANAL4	0.00	63.00	65.00	-2.00
N7350	23.90	67.15	70.00	-2.85
CANAL6	0.00	63.00	65.00	-2.00
DORA6	0.00	63.00	65.00	-2.00
CANAL1	0.00	63.00	65.00	-2.00
CANAL5	0.00	63.00	65.00	-2.00
CANAL3	0.00	63.00	65.00	-2.00

Area 7 - 100 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N7270	14.45	79.85	81.50	-1.65
N7280	23.00	65.32	70.00	-4.68
N7290	23.00	65.04	65.50	-0.46
N7300	13.20	65.81	66.50	-0.69
N7320	14.45	67.26	72.25	-4.99
CANAL2	0.00	63.00	65.00	-2.00
N7330	14.67	69.17	73.00	-3.83
N7310	12.30	79.50	79.50	0.00
N7340	12.17	70.50	70.50	0.00
CANAL4	0.00	63.00	65.00	-2.00
N7350	23.78	68.02	70.00	-1.98
CANAL6	0.00	63.00	65.00	-2.00
DORA6	0.00	63.00	65.00	-2.00
CANAL1	0.00	63.00	65.00	-2.00
CANAL5	0.00	63.00	65.00	-2.00
CANAL3	0.00	63.00	65.00	-2.00

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Area 8 - 10 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N8000	23.00	65.16	67.40	-2.24
N8010	12.80	63.23	67.00	-3.77
N8030	23.00	64.29	69.00	-4.71
N8040	12.87	63.33	66.00	-2.67
BEAU	0.00	63.00	65.00	-2.00
N8060	18.77	65.35	75.00	-9.65
N8200	18.92	74.12	76.00	-1.88
N8020	12.75	73.67	78.00	-4.33
N8170	12.27	80.04	86.18	-6.14
N8180	23.00	83.32	87.12	-3.80
N8190	12.12	84.00	83.50	0.50
N8050	12.78	66.45	68.00	-1.55
N8070	13.08	92.49	94.50	-2.01
N8100	12.75	75.34	76.00	-0.66
N8140	23.00	73.42	75.00	-1.58
N8110	12.27	63.06	68.00	-4.94
CANAL4	0.00	63.00	65.00	-2.00
N8080	23.00	68.01	75.00	-6.99
N8090	23.00	72.62	75.00	-2.38
N8120	12.75	63.28	68.00	-4.72
CANAL5	0.00	63.00	65.00	-2.00
N8160	12.30	77.00	77.00	0.00
N8150	23.00	74.47	77.00	-2.53
CANAL6	0.00	63.00	65.00	-2.00
N8130	23.00	60.97	70.00	-9.03

Area 8 - 25 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N8000	23.00	65.47	67.40	-1.93
N8010	12.83	63.32	67.00	-3.68
N8030	23.78	64.58	69.00	-4.42
N8040	12.95	63.51	66.00	-2.49
BEAU	0.00	63.00	65.00	-2.00
N8060	15.78	65.63	75.00	-9.37
N8200	21.80	74.36	76.00	-1.64
N8020	12.75	73.85	78.00	-4.15
N8170	12.27	80.65	86.18	-5.53
N8180	23.00	83.86	87.12	-3.26
N8190	12.03	84.00	83.50	0.50
N8050	12.82	66.78	68.00	-1.22
N8070	13.55	93.72	94.50	-0.78
N8100	12.73	75.68	76.00	-0.32
N8140	23.00	73.80	75.00	-1.20
N8110	12.32	63.11	68.00	-4.89
CANAL4	0.00	63.00	65.00	-2.00
N8080	23.00	68.86	75.00	-6.14
N8090	23.00	72.90	75.00	-2.10
N8120	12.82	63.58	68.00	-4.42
CANAL5	0.00	63.00	65.00	-2.00
N8160	12.18	77.00	77.00	0.00
N8150	23.00	74.74	77.00	-2.26
CANAL6	0.00	63.00	65.00	-2.00
N8130	21.75	61.62	70.00	-8.38

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Area 8 - 100 Year Storm Event Simulation
Maximum Stages Report

Node ID	Time of Max Stage hours	Maximum Stage feet	Flood Elevation feet	Flood Depth feet
N8000	23.00	66.06	67.40	-1.34
N8010	13.00	63.48	67.00	-3.52
N8030	21.77	65.03	69.00	-3.97
N8040	13.03	63.80	66.00	-2.20
BEAU	0.00	63.00	65.00	-2.00
N8060	15.03	66.08	75.00	-8.92
N8200	23.78	74.79	76.00	-1.21
N8020	12.75	74.16	78.00	-3.84
N8170	12.27	81.62	86.18	-4.56
N8180	15.62	84.58	87.12	-2.54
N8190	11.00	84.00	83.50	0.50
N8050	12.87	67.27	68.00	-0.73
N8070	12.95	94.50	94.50	0.00
N8100	12.40	76.00	76.00	0.00
N8140	23.00	74.45	75.00	-0.55
N8110	12.82	63.32	68.00	-4.68
CANAL4	0.00	63.00	65.00	-2.00
N8080	23.00	69.72	75.00	-5.28
N8090	23.00	73.38	75.00	-1.62
N8120	12.93	64.23	68.00	-3.77
CANAL5	0.00	63.00	65.00	-2.00
N8160	12.08	77.00	77.00	0.00
N8150	17.83	75.26	77.00	-1.74
CANAL6	0.00	63.00	65.00	-2.00
N8130	17.73	62.41	70.00	-7.59

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APPENDIX C - PEAK DISCHARGE REPORTS

Area 1 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R1010	12.27	195.00	12.27	15.55
R1019	0.00	0.00	0.00	0.00
R1020	12.25	195.00	12.25	18.97
R1029	0.00	0.00	0.00	0.00
R1030	12.25	195.00	12.25	15.55
R1039	0.00	0.00	0.00	0.00
R1040	12.25	195.00	12.25	15.56
R1049	0.00	0.00	0.00	0.00
R1050	12.25	195.00	12.25	15.50
R1059	0.00	0.00	0.00	0.00
R1060	12.02	95.30	12.02	13.48
R1068	12.25	121.00	12.25	6.59
R1069	12.25	52.60	12.25	3.33
R1070	12.00	87.50	12.00	12.38
R1079	12.25	135.00	12.25	11.59
R1080	12.57	9.01	12.57	5.10
R1089	12.32	1.87	12.32	0.89
R1090	12.25	12.50	12.25	8.87
R1099	0.00	0.00	0.00	0.00
R1100	12.25	13.20	12.25	12.45
R1109	0.00	0.00	0.00	0.00
R1110	12.85	26.80	11.88	4.53
R1119	12.27	27.00	12.35	2.61
R1120	12.35	44.10	12.35	8.98
R1129	0.00	0.00	0.00	0.00
R1130	12.25	53.00	12.25	18.50
R1139	0.00	0.00	0.00	0.00
R1140	13.50	6.14	10.80	6.52
R1150	11.80	6.06	11.78	7.89
R1160	12.15	6.31	12.15	8.03
R1180	13.47	17.90	13.50	14.68
R1189	0.00	0.00	0.00	0.00
N1169	12.15	84.00	12.15	2.99
WEIR#1	12.25	89.90	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
FREE#1	12.27	195.00	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	12.25	52.60	0.00	0.00
FREE#8	12.32	1.87	0.00	0.00
FREE#9	0.00	0.00	0.00	0.00
FREE#10	0.00	0.00	0.00	0.00

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Area 1 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R1010	12.27	220.00	12.27	17.54
R1019	0.00	0.00	0.00	0.00
R1020	12.25	220.00	12.25	20.65
R1029	0.00	0.00	0.00	0.00
R1030	12.25	220.00	12.25	17.54
R1039	0.00	0.00	0.00	0.00
R1040	12.25	221.00	12.25	17.56
R1049	0.00	0.00	0.00	0.00
R1050	12.25	221.00	12.25	17.56
R1059	0.00	0.00	0.00	0.00
R1060	11.93	95.30	11.93	13.49
R1068	12.25	159.00	12.25	7.31
R1069	12.25	109.00	12.25	4.45
R1070	11.92	87.20	11.92	12.33
R1079	12.25	204.00	12.25	11.07
R1080	12.95	9.07	12.95	5.13
R1089	12.33	6.84	12.33	1.50
R1090	12.27	15.70	12.10	9.66
R1099	0.00	0.00	0.00	0.00
R1100	12.25	19.60	12.25	12.88
R1109	0.00	0.00	0.00	0.00
R1110	13.10	22.40	13.32	4.42
R1119	12.27	35.80	12.60	2.90
R1120	12.58	52.70	12.58	10.73
R1129	0.00	0.00	0.00	0.00
R1130	12.17	57.70	12.15	19.32
R1139	0.00	0.00	0.00	0.00
R1140	11.80	6.15	10.02	6.53
R1150	11.77	6.07	11.77	7.89
R1160	12.25	6.34	12.25	8.07
R1180	13.75	18.10	13.77	14.82
R1189	12.55	33.40	12.55	2.06
N1169	12.25	113.00	12.25	3.19
WEIR#1	12.25	120.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
FREE#1	12.27	220.00	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	12.25	109.00	0.00	0.00
FREE#8	12.33	6.84	0.00	0.00
FREE#9	0.00	0.00	0.00	0.00
FREE#10	0.00	0.00	0.00	0.00

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Area 1 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R1010	12.28	228.00	12.28	18.16
R1019	0.00	0.00	0.00	0.00
R1020	12.28	228.00	12.18	21.07
R1029	0.00	0.00	0.00	0.00
R1030	12.27	228.00	12.27	18.17
R1039	0.00	0.00	0.00	0.00
R1040	12.25	228.00	12.25	18.17
R1049	0.00	0.00	0.00	0.00
R1050	12.25	228.00	12.25	18.17
R1059	12.25	45.50	12.25	12.25
R1060	11.87	95.20	11.87	13.47
R1068	12.25	211.00	12.25	8.12
R1069	12.25	197.00	12.25	5.61
R1070	13.57	87.20	13.57	12.34
R1079	12.25	324.00	12.25	16.18
R1080	13.38	9.07	13.67	5.16
R1089	12.37	8.75	12.03	1.79
R1090	12.57	16.70	12.03	9.53
R1099	0.00	0.00	0.00	0.00
R1100	12.25	27.20	12.25	15.39
R1109	0.00	0.00	0.00	0.00
R1110	13.57	34.50	13.57	4.88
R1119	12.37	42.80	12.95	3.03
R1120	12.85	55.40	12.85	11.28
R1129	0.00	0.00	0.00	0.00
R1130	12.08	58.20	12.05	19.36
R1139	0.00	0.00	0.00	0.00
R1140	11.77	6.15	9.13	6.53
R1150	11.55	6.04	11.48	7.89
R1160	12.32	6.52	12.32	8.31
R1180	14.48	18.10	14.53	14.88
R1189	12.30	101.00	12.30	3.22
N1169	12.28	220.00	12.28	4.38
WEIR#1	12.28	230.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
FREE#1	12.28	228.00	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00
FREE#6	12.25	45.50	0.00	0.00
FREE#7	12.25	197.00	0.00	0.00
FREE#8	12.37	8.75	0.00	0.00
FREE#9	0.00	0.00	0.00	0.00
FREE#10	0.00	0.00	0.00	0.00

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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R2010	12.27	31.20	12.27	9.99
R2020	12.27	31.20	12.27	17.64
R2029	12.27	39.90	12.27	10.89
R2030	12.27	19.80	12.27	16.11
R2039	12.27	66.40	12.27	11.78
R2040	12.32	23.40	11.83	11.59
R2049	12.27	53.40	12.27	9.61
R2050	11.85	27.20	11.85	11.40
R2059	12.27	49.90	12.27	9.24
R2060	11.90	31.20	11.90	12.97
R2069	12.27	53.40	12.25	9.30
R2070	12.25	32.50	11.85	13.57
R2079	12.25	29.70	12.25	6.18
R2080	12.28	18.60	12.03	10.79
R2089	12.25	6.52	12.25	1.31
R2090	12.05	6.13	12.05	7.84
R2099	12.23	18.90	12.23	5.22
R2100	12.25	14.10	12.25	10.17
R2109	0.00	0.00	0.00	0.00
R2110	12.25	14.10	12.08	8.71
R2119	0.00	0.00	0.00	0.00
R2120	12.25	42.80	12.25	8.72
R2130	12.25	42.60	12.25	8.68
R2140	12.25	39.00	12.25	10.20
R2149	0.00	0.00	0.00	0.00
R2150	12.25	36.70	12.25	16.84
R2159	0.00	0.00	0.00	0.00
R2160	12.25	36.90	12.25	16.22
R2169	0.00	0.00	0.00	0.00
R2170	12.25	30.00	12.25	17.00
R2179	12.25	4.27	12.25	3.74
R2180	12.25	16.00	12.25	11.29
R2189	0.00	0.00	0.00	0.00
R2190	12.25	16.10	12.25	16.68
R2199	0.00	0.00	0.00	0.00
R2200	12.27	11.70	12.27	9.57
R2209	0.00	0.00	0.00	0.00
R2210	12.10	14.70	12.10	12.01
R2219	12.25	12.30	12.25	1.03
R2220	12.23	21.10	12.23	19.24
R2229	0.00	0.00	0.00	0.00
R2230	0.00	0.00	0.00	0.00
R2239	0.00	0.00	0.00	0.00
R2240	0.00	0.00	0.00	0.00
R2249	0.00	0.00	0.00	0.00
R2250	12.25	1.25	12.25	3.47
R2259	0.00	0.00	0.00	0.00

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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R2260	12.28	25.30	12.15	8.33
R2269	0.00	0.00	0.00	0.00
R2270	12.22	27.20	12.20	9.81
R2279	0.00	0.00	0.00	0.00
R2280	12.20	28.30	12.20	9.42
R2289	0.00	0.00	0.00	0.00
R2290	12.33	71.50	12.33	8.21
R2299	12.33	13.00	12.33	1.12
R2300	12.32	84.50	12.32	8.79
R2309	12.32	130.00	12.32	3.22
R2310	12.05	67.30	12.05	6.99
R2319	12.30	267.00	12.30	9.47
R2320	12.03	84.60	11.95	6.76
R2329	12.32	41.50	12.32	1.49
R2330	12.32	74.80	12.32	7.77
R2339	12.27	142.00	12.27	6.63
R2340	12.32	60.90	12.30	10.62
R2349	0.00	0.00	0.00	0.00
R2350	12.32	60.90	12.32	8.85
R2359	12.32	137.00	12.32	3.11
R2360	13.25	51.20	11.98	7.74
R2369	12.30	140.00	12.30	7.20
R2370	11.97	58.80	11.97	8.31
R2379	12.30	151.00	12.28	3.29
R2380	12.30	191.00	12.30	17.12
R2389	0.00	0.00	0.00	0.00
R2390	12.25	156.00	12.22	12.87
R2400	12.25	156.00	12.22	15.88
R2409	0.00	0.00	0.00	0.00
R2410	12.25	106.00	12.25	17.83
R2419	12.25	49.70	12.25	2.81
R2420	12.65	-70.10	12.65	-11.80
R2429	12.25	87.70	12.13	2.83
R2430	12.08	47.10	12.08	6.66
R2440	13.03	44.60	13.03	14.21
R2449	12.25	141.00	12.25	3.22
R2450	13.27	-30.10	13.27	-9.58
R2459	12.25	204.00	12.07	8.00
R2460	13.70	22.30	13.70	7.10
R2469	12.25	172.00	12.25	3.31
R2470	12.25	4.13	12.25	3.74
R2480	12.27	6.26	12.25	7.46
WEIR#1	12.25	43.50	0.00	0.00
WEIR#2	12.27	11.20	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00

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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Area 2 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R2010	12.25	31.30	12.25	10.03
R2020	12.25	31.30	12.25	17.71
R2029	12.25	102.00	12.25	15.76
R2030	12.25	19.90	12.25	16.20
R2039	12.25	123.00	12.25	15.04
R2040	12.27	23.40	11.80	11.43
R2049	12.25	103.00	12.25	12.65
R2050	11.83	28.10	11.83	11.76
R2059	12.25	99.10	12.25	12.11
R2060	11.85	32.50	11.85	13.50
R2069	12.25	101.00	12.13	11.24
R2070	12.13	32.50	11.82	13.77
R2079	12.25	66.70	12.15	8.29
R2080	12.32	18.60	11.98	10.79
R2089	12.25	13.80	12.25	1.77
R2090	12.00	6.20	12.00	7.89
R2099	12.23	26.10	12.23	5.86
R2100	12.25	18.40	12.25	12.23
R2109	0.00	0.00	0.00	0.00
R2110	12.25	18.40	12.25	10.42
R2119	0.00	0.00	0.00	0.00
R2120	12.25	52.20	12.25	10.64
R2130	12.25	52.20	12.25	10.64
R2140	12.25	48.10	12.17	11.62
R2149	0.00	0.00	0.00	0.00
R2150	12.25	50.80	12.25	18.24
R2159	0.00	0.00	0.00	0.00
R2160	12.25	50.90	12.25	17.74
R2169	0.00	0.00	0.00	0.00
R2170	12.25	30.10	12.25	17.05
R2179	12.25	17.40	12.25	8.56
R2180	12.25	18.10	12.25	12.31
R2189	0.00	0.00	0.00	0.00
R2190	12.25	18.20	12.25	17.18
R2199	0.00	0.00	0.00	0.00
R2200	12.28	11.80	12.28	9.60
R2209	0.00	0.00	0.00	0.00
R2210	12.03	15.10	12.03	12.27
R2219	12.25	15.70	12.25	1.15
R2220	12.25	23.10	12.05	19.41
R2229	0.00	0.00	0.00	0.00
R2230	0.00	0.00	0.00	0.00
R2239	0.00	0.00	0.00	0.00
R2240	0.00	0.00	0.00	0.00
R2249	0.00	0.00	0.00	0.00
R2250	12.25	1.86	12.25	4.26
R2259	0.00	0.00	0.00	0.00

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Area 2 - 25 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R2260	12.40	25.80	12.40	8.34
R2269	12.42	1.26	12.42	0.67
R2270	12.17	27.30	12.07	9.82
R2279	12.25	16.20	12.25	6.82
R2280	12.15	30.40	12.13	9.69
R2289	12.25	14.90	12.25	6.85
R2290	12.18	85.60	12.18	9.17
R2299	12.18	13.40	12.18	1.13
R2300	12.25	86.20	12.25	8.96
R2309	12.25	161.00	12.25	3.51
R2310	11.98	67.10	11.88	7.01
R2319	12.25	302.00	12.25	10.48
R2320	11.97	64.10	11.88	6.83
R2329	12.25	49.70	12.25	1.64
R2330	12.25	80.20	12.25	8.33
R2339	12.18	172.00	12.18	7.12
R2340	12.18	61.20	12.20	10.62
R2349	0.00	0.00	0.00	0.00
R2350	12.18	61.20	12.18	8.88
R2359	12.18	149.00	12.18	3.21
R2360	11.93	52.50	11.90	7.75
R2369	12.42	148.00	12.42	7.28
R2370	11.88	59.40	11.88	8.40
R2379	12.42	160.00	12.17	3.35
R2380	12.42	199.00	12.17	17.48
R2389	0.00	0.00	0.00	0.00
R2390	12.25	208.00	12.25	16.53
R2400	12.25	208.00	12.18	18.52
R2409	12.25	19.30	12.25	2.77
R2410	12.18	109.00	12.18	18.31
R2419	12.25	187.00	12.22	4.53
R2420	12.90	-71.00	12.90	-11.95
R2429	12.25	156.00	12.20	3.29
R2430	12.00	48.00	12.00	6.79
R2440	12.25	47.30	12.25	15.07
R2449	12.25	208.00	12.25	3.78
R2450	11.00	-30.70	11.00	-9.77
R2459	12.25	276.00	12.25	9.80
R2460	14.28	22.30	14.28	7.11
R2469	12.25	242.00	12.25	3.83
R2470	12.25	4.54	12.25	3.98
R2480	12.25	7.71	12.25	7.71
WEIR#1	12.25	63.30	0.00	0.00
WEIR#2	12.25	19.50	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00

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Area 2 - 25 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Area 2 - 100 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R2010	12.25	31.40	12.25	10.06
R2020	12.25	31.40	12.25	17.76
R2029	12.25	164.00	12.25	18.96
R2030	12.25	20.00	12.25	16.28
R2039	12.25	181.00	12.25	17.32
R2040	12.35	24.50	11.77	10.54
R2049	12.25	155.00	12.25	14.77
R2050	11.80	27.90	11.80	11.68
R2059	12.25	151.00	12.25	14.22
R2060	11.82	33.80	11.83	14.06
R2069	12.25	151.00	12.05	12.37
R2070	12.02	32.50	11.78	13.87
R2079	12.25	107.00	12.05	9.23
R2080	11.86	18.90	11.87	10.80
R2089	12.25	24.50	12.25	2.22
R2090	11.87	6.14	12.42	7.86
R2099	12.23	36.30	12.13	6.52
R2100	12.23	24.20	12.13	14.32
R2109	0.00	0.00	0.00	0.00
R2110	12.25	25.20	12.25	14.24
R2119	0.00	0.00	0.00	0.00
R2120	12.25	62.00	12.25	12.63
R2130	12.25	62.00	12.25	12.63
R2140	12.28	55.60	12.05	11.52
R2149	12.25	18.70	12.25	6.63
R2150	12.25	73.50	12.07	18.70
R2159	0.00	0.00	0.00	0.00
R2160	12.25	74.20	12.25	19.47
R2169	0.00	0.00	0.00	0.00
R2170	12.25	30.30	12.25	17.12
R2179	12.25	39.40	12.25	9.08
R2180	12.25	21.70	12.25	13.85
R2189	0.00	0.00	0.00	0.00
R2190	12.25	21.80	12.25	17.86
R2199	0.00	0.00	0.00	0.00
R2200	12.25	11.90	12.25	9.69
R2209	0.00	0.00	0.00	0.00
R2210	11.93	13.90	11.93	11.35
R2219	12.25	38.60	12.25	1.74
R2220	12.12	23.30	12.00	19.30
R2229	12.25	20.30	12.25	1.02
R2230	0.00	0.00	0.00	0.00
R2239	0.00	0.00	0.00	0.00
R2240	0.00	0.00	0.00	0.00
R2249	0.00	0.00	0.00	0.00
R2250	12.25	2.86	12.25	5.12
R2259	0.00	0.00	0.00	0.00

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Area 2 - 100 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R2260	12.32	25.80	12.32	8.34
R2269	12.32	1.38	12.10	1.23
R2270	12.03	28.70	12.02	9.82
R2279	12.25	39.80	12.25	9.74
R2280	12.05	32.50	12.05	10.41
R2289	12.25	38.60	12.25	9.99
R2290	12.10	85.60	12.10	9.17
R2299	12.27	14.60	12.27	1.17
R2300	12.25	88.40	12.25	9.19
R2309	12.25	214.00	12.25	3.93
R2310	11.90	68.50	11.90	7.11
R2319	12.25	363.00	12.25	12.14
R2320	11.88	65.50	11.83	6.91
R2329	12.25	63.60	12.25	1.84
R2330	12.25	88.60	12.25	9.21
R2339	12.25	217.00	12.13	7.32
R2340	12.50	62.10	12.50	10.64
R2349	0.00	0.00	0.00	0.00
R2350	12.50	62.10	12.50	9.01
R2359	12.50	194.00	12.50	3.57
R2360	11.85	64.00	11.85	9.05
R2369	12.53	192.00	12.53	7.72
R2370	11.87	57.60	11.87	8.14
R2379	12.53	213.00	12.00	3.85
R2380	12.53	246.00	12.53	19.61
R2389	0.00	0.00	0.00	0.00
R2390	12.22	209.00	12.22	16.67
R2400	12.22	209.00	12.07	18.52
R2409	12.25	124.00	12.25	5.81
R2410	12.07	109.00	12.07	18.34
R2419	12.25	292.00	12.10	4.90
R2420	13.17	-71.70	13.17	-12.06
R2429	12.25	239.00	12.22	4.01
R2430	11.92	47.00	11.92	6.66
R2440	12.23	50.30	12.23	16.00
R2449	12.23	291.00	12.23	4.34
R2450	14.45	-30.20	14.45	-9.61
R2459	12.22	362.00	12.22	12.23
R2460	15.17	22.30	15.17	7.11
R2469	12.22	326.00	12.22	4.21
R2470	12.25	5.10	12.25	4.40
R2480	12.27	9.09	12.27	7.76
WEIR#1	12.25	99.50	0.00	0.00
WEIR#2	12.25	32.10	0.00	0.00
WEIR#3	12.25	5.70	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00

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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Area 3 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R3010	12.12	36.10	12.12	11.49
R3019	12.12	34.30	12.12	1.72
R3020	11.82	75.60	11.82	25.35
R3029	0.00	0.00	0.00	0.00
R3030	12.12	81.20	12.12	25.83
R3039	0.00	0.00	0.00	0.00
R3040	11.95	80.40	11.95	25.58
R3048	0.00	0.00	0.00	0.00
R3049	0.00	0.00	0.00	0.00
R3050	12.15	29.30	12.02	16.93
R3059	12.25	16.20	12.25	6.93
R3060	12.05	22.00	12.05	12.43
R3069	12.25	15.20	12.25	5.60
R3070	12.80	13.90	12.80	7.96
R3079	0.00	0.00	0.00	0.00
R3080	11.83	13.10	11.82	7.49
R3088	0.00	0.00	0.00	0.00
R3089	12.25	99.90	12.25	3.95
R3090	11.00	24.50	11.00	13.88
R3099	12.25	64.20	12.25	3.91
R3100	12.03	28.40	11.98	16.34
R3108	12.48	9.93	12.48	5.67
R3109	0.00	0.00	0.00	0.00
R3110	12.28	18.60	12.02	12.24
R3119	0.00	0.00	0.00	0.00
R3120	12.08	20.80	12.08	11.95
R3129	0.00	0.00	0.00	0.00
R3130	13.23	11.50	13.23	9.34
R3139	0.00	0.00	0.00	0.00
R3140	12.72	30.70	12.72	4.34
R3149	0.00	0.00	0.00	0.00
R3150	13.00	-25.70	13.00	-3.64
R3159	0.00	0.00	0.00	0.00
R3160	12.00	25.40	12.03	4.57
R3169	0.00	0.00	0.00	0.00
R3170	13.22	22.50	13.22	7.16
R3179	12.87	-14.80	12.00	-1.50
R3180	12.08	6.91	12.08	5.63
R3189	12.25	12.30	12.20	2.82
R3190	12.33	10.40	12.02	10.45
R3199	12.35	7.19	12.35	4.07
R3200	12.23	12.70	12.23	10.35
R3209	12.32	11.90	12.32	4.14
R3210	12.23	13.40	12.23	10.95
R3219	12.32	10.90	12.27	4.88
R3220	12.13	12.00	12.13	9.76
R3229	12.27	13.80	12.25	3.86

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Area 3 - 10 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R3230	12.20	8.49	12.20	6.92
R3239	12.25	6.34	12.23	2.22
R3240	12.10	8.58	12.10	6.99
R3249	12.25	7.24	12.25	2.75
R3250	12.07	7.58	12.07	6.88
R3259	0.00	0.00	0.00	0.00
R3260	12.10	4.86	12.07	5.02
R3269	0.00	0.00	0.00	0.00
R3270	12.75	37.80	12.75	13.67
R3279	0.00	0.00	0.00	0.00
R3280	12.73	37.80	12.73	12.03
R3289	0.00	0.00	0.00	0.00
R3290	12.68	24.30	12.68	7.73
R3299	0.00	0.00	0.00	0.00
R3300	12.65	24.40	12.65	9.99
R3309	0.00	0.00	0.00	0.00
R3310	12.20	24.60	12.77	8.36
R3319	0.00	0.00	0.00	0.00
R3135	12.70	24.50	12.70	7.93
R3320	12.25	21.70	12.25	21.07
R3329	0.00	0.00	0.00	0.00
R3330	12.25	21.70	12.25	22.47
R3339	0.00	0.00	0.00	0.00
R3340	12.23	21.80	12.23	12.32
R3349	12.23	28.80	11.00	3.68
R3350	12.25	50.60	11.97	17.38
R3359	12.25	29.80	12.25	3.34
R3360	12.25	80.40	12.25	25.58
R3369	12.25	68.60	12.25	4.88
FREE#1	12.12	36.10	0.00	0.00
FREE#2	12.75	37.80	0.00	0.00
FREE#3	12.12	34.30	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	12.25	21.70	0.00	0.00
FREE#8	12.25	21.70	0.00	0.00
FREE#9	0.00	0.00	0.00	0.00
FREE#10	0.00	0.00	0.00	0.00
FREE#11	12.23	21.80	0.00	0.00
FREE#12	12.23	28.80	0.00	0.00
FREE#13	12.25	29.80	0.00	0.00
FREE#14	12.25	68.60	0.00	0.00

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Area 3 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R3010	12.63	36.10	12.63	11.50
R3019	12.63	37.80	11.82	2.05
R3020	11.80	75.60	11.80	25.36
R3029	0.00	0.00	0.00	0.00
R3030	12.03	81.10	12.03	25.81
R3039	12.62	4.38	12.62	0.32
R3040	12.55	77.50	12.55	24.66
R3048	0.00	0.00	0.00	0.00
R3049	12.55	5.38	12.55	0.70
R3050	12.07	29.30	11.92	16.93
R3059	12.25	31.00	12.25	8.95
R3060	12.02	22.00	12.02	12.45
R3069	12.25	24.10	12.25	6.70
R3070	12.97	13.40	11.78	7.83
R3079	0.00	0.00	0.00	0.00
R3080	11.80	13.00	11.80	7.42
R3088	0.00	0.00	0.00	0.00
R3089	12.25	140.00	12.25	4.51
R3090	11.92	24.50	11.92	13.89
R3099	12.25	97.70	12.25	5.37
R3100	13.42	28.20	11.88	16.34
R3108	12.27	40.30	12.27	9.90
R3109	0.00	0.00	0.00	0.00
R3110	12.18	18.90	11.93	12.27
R3119	0.00	0.00	0.00	0.00
R3120	12.03	21.50	12.03	12.28
R3129	12.23	10.90	12.23	4.56
R3130	13.53	12.30	13.53	10.06
R3139	12.27	10.00	12.27	4.15
R3140	12.75	33.10	11.82	5.57
R3149	0.00	0.00	0.00	0.00
R3150	13.55	-29.60	13.55	-4.19
R3159	0.00	0.00	0.00	0.00
R3160	13.55	29.40	11.93	4.56
R3169	0.00	0.00	0.00	0.00
R3170	13.92	23.70	13.92	7.55
R3179	13.47	-22.40	13.73	-1.66
R3180	12.03	6.78	12.03	5.52
R3189	12.25	21.50	12.12	3.14
R3190	12.20	10.20	11.93	10.50
R3199	12.25	22.10	12.25	6.39
R3200	12.15	12.80	12.15	10.41
R3209	12.25	24.90	12.25	5.49
R3210	12.13	13.40	12.13	10.94
R3219	12.25	19.20	12.25	7.24
R3220	12.07	12.10	12.07	9.88
R3229	12.25	23.60	12.25	4.78

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Area 3 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R3230	12.13	8.47	11.90	7.04
R3239	12.25	11.60	12.25	2.91
R3240	12.03	8.61	12.03	7.01
R3249	12.25	10.90	12.25	3.18
R3250	12.32	8.09	12.32	6.59
R3259	0.00	0.00	0.00	0.00
R3260	12.25	5.96	12.02	5.08
R3269	0.00	0.00	0.00	0.00
R3270	12.77	43.20	12.77	14.79
R3279	0.00	0.00	0.00	0.00
R3280	12.75	43.20	12.75	13.74
R3289	0.00	0.00	0.00	0.00
R3290	13.57	24.90	13.57	7.94
R3299	0.00	0.00	0.00	0.00
R3300	12.25	24.50	12.25	9.99
R3309	0.00	0.00	0.00	0.00
R3310	12.10	24.60	13.15	8.35
R3319	0.00	0.00	0.00	0.00
R3135	13.12	25.10	13.12	8.11
R3320	12.25	38.30	12.25	24.45
R3329	0.00	0.00	0.00	0.00
R3330	12.25	30.70	12.25	24.71
R3339	0.00	0.00	0.00	0.00
R3340	12.22	21.80	12.22	12.32
R3349	12.22	28.80	12.28	3.45
R3350	12.25	50.60	11.92	17.87
R3359	12.25	30.30	12.25	3.36
R3360	12.25	80.80	12.25	25.73
R3369	12.25	128.00	12.25	6.25
FREE#1	12.63	36.10	0.00	0.00
FREE#2	12.77	43.20	0.00	0.00
FREE#3	12.63	37.80	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	12.62	4.38	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	12.25	38.30	0.00	0.00
FREE#8	12.25	30.70	0.00	0.00
FREE#9	0.00	0.00	0.00	0.00
FREE#10	0.00	0.00	0.00	0.00
FREE#11	12.22	21.80	0.00	0.00
FREE#12	12.22	28.80	0.00	0.00
FREE#13	12.25	30.30	0.00	0.00
FREE#14	12.25	128.00	0.00	0.00

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Area 3 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R3010	12.35	36.10	12.35	11.50
R3019	12.37	36.00	12.40	1.79
R3020	12.37	74.20	11.83	24.62
R3029	0.00	0.00	0.00	0.00
R3030	11.83	81.60	11.83	25.99
R3039	12.32	8.28	12.32	0.43
R3040	12.28	80.40	12.28	25.59
R3048	0.00	0.00	0.00	0.00
R3049	12.28	106.00	12.28	2.55
R3050	11.00	29.30	11.83	16.92
R3059	12.25	56.60	12.25	11.38
R3060	11.88	22.00	11.88	12.43
R3069	12.25	38.30	12.25	8.07
R3070	13.12	14.00	13.12	7.98
R3079	0.00	0.00	0.00	0.00
R3080	11.65	12.80	11.63	7.32
R3088	0.00	0.00	0.00	0.00
R3089	12.25	208.00	12.25	5.27
R3090	11.88	24.60	11.88	13.90
R3099	12.25	155.00	12.25	7.41
R3100	11.87	28.60	11.83	16.34
R3108	12.25	75.00	12.25	12.65
R3109	0.00	0.00	0.00	0.00
R3110	12.10	18.90	11.87	12.43
R3119	0.00	0.00	0.00	0.00
R3120	12.07	21.60	12.07	12.23
R3129	12.25	18.30	12.15	5.64
R3130	13.82	12.80	13.82	10.41
R3139	12.25	27.10	12.25	6.14
R3140	12.27	42.00	12.27	5.94
R3149	0.00	0.00	0.00	0.00
R3150	14.40	-30.60	14.40	-4.32
R3159	0.00	0.00	0.00	0.00
R3160	14.38	30.40	11.88	4.80
R3169	0.00	0.00	0.00	0.00
R3170	15.02	24.10	15.02	7.68
R3179	12.25	27.70	14.82	-1.69
R3180	11.93	6.77	11.93	5.51
R3189	12.25	36.20	12.03	3.41
R3190	12.12	10.20	11.85	10.35
R3199	12.27	37.50	12.27	7.90
R3200	12.05	12.90	12.05	10.53
R3209	12.27	39.90	12.25	6.54
R3210	12.05	13.70	12.05	11.16
R3219	12.27	33.90	12.25	8.25
R3220	11.00	11.90	11.00	9.69
R3229	12.27	37.50	12.25	5.04

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Area 3 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R3230	12.03	8.50	11.83	7.17
R3239	12.27	24.50	12.27	3.72
R3240	11.85	8.88	11.85	7.29
R3249	12.25	22.60	12.25	4.28
R3250	12.25	9.17	12.25	7.47
R3259	12.25	8.86	12.25	2.32
R3260	12.20	7.67	12.20	6.25
R3269	12.25	5.37	12.25	2.54
R3270	12.78	50.10	12.78	16.42
R3279	0.00	0.00	0.00	0.00
R3280	12.78	50.10	12.78	15.96
R3289	0.00	0.00	0.00	0.00
R3290	14.05	26.30	14.05	8.38
R3299	0.00	0.00	0.00	0.00
R3300	12.28	24.90	12.18	10.02
R3309	0.00	0.00	0.00	0.00
R3310	12.25	25.00	13.65	8.36
R3319	12.25	0.16	12.25	0.32
R3135	13.53	24.10	13.58	7.86
R3320	12.25	73.50	12.25	27.90
R3329	0.00	0.00	0.00	0.00
R3330	12.25	45.40	12.25	27.33
R3339	0.00	0.00	0.00	0.00
R3340	12.25	21.80	12.25	12.32
R3349	12.25	28.80	11.88	3.46
R3350	12.27	50.60	11.88	18.04
R3359	12.27	31.20	12.27	3.40
R3360	12.25	81.60	12.25	26.03
R3369	12.25	290.00	12.25	8.64
FREE#1	12.35	36.10	0.00	0.00
FREE#2	12.78	50.10	0.00	0.00
FREE#3	12.37	38.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	12.32	8.28	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	12.25	73.50	0.00	0.00
FREE#8	12.25	45.40	0.00	0.00
FREE#9	0.00	0.00	0.00	0.00
FREE#10	0.00	0.00	0.00	0.00
FREE#11	12.25	21.80	0.00	0.00
FREE#12	12.25	28.80	0.00	0.00
FREE#13	12.27	31.20	0.00	0.00
FREE#14	12.25	290.00	0.00	0.00

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Area 4 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R4010	12.20	47.70	12.20	15.17
R4020	12.17	-6.28	12.17	-2.01
R4030	12.23	-14.90	12.23	-4.76
R4040	12.23	-15.20	12.22	-5.36
R4050	0.00	0.00	0.00	0.00
R4060	28.77	0.02	28.77	0.03
R4070	17.03	6.26	15.52	10.23
R4090	16.80	6.26	14.20	3.61
R4100	28.77	1.37	0.00	1.76
R4110	28.77	1.36	28.77	2.24
R4120	13.05	5.32	13.05	6.00
R4130	13.03	5.32	13.03	4.93
R4140	13.03	5.32	13.03	4.07
R4160	13.52	31.30	13.52	5.51
R4170	0.00	0.00	0.00	0.00
R4171	12.40	61.40	12.40	12.53
R4190	16.78	7.62	14.40	9.00
R4200	12.25	117.00	12.25	16.57
R4210	11.72	2.07	11.72	5.24
R4220	11.72	-2.07	13.40	-2.58
R4230	11.65	2.07	11.32	1.94
R4240	11.30	2.08	11.30	2.65
R4250	18.22	24.40	18.22	7.76
R4260	13.25	24.70	13.23	5.33
R4270	13.22	24.70	13.22	5.18
R4280	13.15	24.70	13.15	7.36
R4290	13.15	25.30	13.15	8.18
R4300	11.53	6.26	11.53	4.99
R4310	12.72	5.14	9.58	3.93
R4320	12.23	5.00	12.23	3.48
R4330	9.43	4.97	9.37	3.42
R4340	9.35	-4.98	9.35	-3.20
R4350	9.33	-4.98	9.33	-2.82
R4360	12.77	10.30	12.77	5.82
R4370	12.23	10.30	12.23	5.82
R4380	12.77	10.30	12.77	5.82
R4390	13.15	-25.50	13.15	-3.62
R4400	12.25	27.90	0.00	-4.26
R4410	12.38	15.20	12.38	1.78
R4420	12.32	15.50	12.32	4.93
R4430	12.08	27.20	12.08	2.80
R4440	12.25	-14.80	12.25	-4.73
R4450	12.25	14.80	12.25	0.26
R4460	12.22	4.85	3.12	2.06
R4470	12.22	4.85	12.22	1.54
R4480	12.22	4.85	12.22	1.54
R4490	12.58	-3.28	3.63	1.07

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Area 4 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R4500	12.58	-3.28	3.63	1.11
R4510	12.58	-3.28	4.05	1.13
R4520	12.83	-3.38	4.63	1.16
R4530	12.23	48.00	12.25	6.79
R4540	12.25	60.20	12.25	15.05
R4570	12.72	18.20	12.72	10.31
R4590	12.25	287.00	12.25	3.94
R4670	12.85	25.00	12.85	8.09
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	13.00	5.32	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	12.72	0.00	0.00	0.00
WEIR#21	0.00	0.00	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	0.00	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	0.00	0.00	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
WEIR#30	0.00	0.00	0.00	0.00
WEIR#31	0.00	0.00	0.00	0.00
WEIR#32	0.00	0.00	0.00	0.00
WEIR#33	0.00	0.00	0.00	0.00
WEIR#34	0.00	0.00	0.00	0.00
WEIR#35	0.00	0.00	0.00	0.00
WEIR#36	0.00	0.00	0.00	0.00
WEIR#37	0.00	0.00	0.00	0.00
FREE#1	12.20	47.70	0.00	0.00
FREE#2	11.72	2.07	0.00	0.00

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Area 4 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R4010	12.23	55.40	12.23	17.63
R4020	12.25	-11.10	12.25	-3.52
R4030	12.23	-24.70	12.25	-7.85
R4040	12.25	-24.70	12.25	-7.99
R4050	28.77	9.78	28.77	5.73
R4060	22.37	6.61	22.37	3.74
R4070	18.28	12.80	12.93	12.00
R4080	12.77	16.60	12.77	9.41
R4100	23.85	8.13	14.58	-2.63
R4110	24.27	8.15	15.38	-3.92
R4120	13.07	9.50	13.07	7.14
R4130	13.07	9.50	13.07	5.74
R4140	13.05	9.50	13.05	5.58
R4160	13.87	57.70	13.87	8.42
R4170	0.00	0.00	0.00	0.00
R4171	12.77	82.60	12.77	16.83
R4190	12.77	19.60	12.73	12.48
R4200	12.27	149.00	12.27	21.11
R4210	10.55	2.07	10.48	5.24
R4220	10.53	-2.07	14.50	-2.58
R4230	10.47	2.07	10.22	1.94
R4240	10.18	2.07	10.18	2.63
R4250	19.97	27.00	19.97	8.59
R4260	12.85	28.80	12.85	5.64
R4270	12.83	28.80	14.15	5.51
R4280	12.80	28.80	12.77	7.74
R4290	12.77	28.80	12.77	9.25
R4300	10.43	6.26	10.43	4.99
R4310	20.82	4.98	7.90	3.93
R4320	12.10	5.00	12.10	3.48
R4330	7.75	4.97	7.68	3.42
R4340	7.67	-4.97	7.67	-3.20
R4350	7.67	-4.98	7.67	-2.82
R4360	11.75	10.30	11.75	5.82
R4370	12.38	10.30	12.38	5.82
R4380	11.75	10.30	11.75	5.82
R4390	13.20	-30.20	13.20	-4.27
R4400	12.25	36.60	12.25	5.17
R4410	12.45	18.30	12.45	1.88
R4420	12.38	18.40	12.38	5.87
R4430	12.25	33.00	12.03	2.82
R4440	12.25	-19.30	12.25	-6.14
R4450	12.25	19.30	12.25	0.34
R4460	12.25	4.97	2.67	2.18
R4470	12.25	4.97	12.25	1.58
R4480	12.25	4.97	12.25	1.58
R4490	12.25	-5.72	12.25	-1.82

Area 4 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R4500	12.25	-5.72	12.25	-1.82
R4510	12.83	-3.61	2.80	1.21
R4520	12.25	8.50	12.25	2.71
R4530	12.25	56.70	12.25	8.02
R4540	12.25	72.70	12.25	18.17
R4570	12.77	19.70	12.77	11.14
R4590	12.27	380.00	12.25	5.01
R4670	13.02	31.90	13.02	10.21
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	28.50	10.40	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	13.05	9.50	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	0.00	0.00	0.00	0.00
WEIR#21	0.00	0.00	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	0.00	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	0.00	0.00	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
WEIR#30	0.00	0.00	0.00	0.00
WEIR#31	0.00	0.00	0.00	0.00
WEIR#32	0.00	0.00	0.00	0.00
WEIR#33	0.00	0.00	0.00	0.00
WEIR#34	0.00	0.00	0.00	0.00
WEIR#35	0.00	0.00	0.00	0.00
WEIR#36	0.00	0.00	0.00	0.00
WEIR#37	0.00	0.00	0.00	0.00
FREE#1	12.23	55.40	0.00	0.00
FREE#2	10.55	2.07	0.00	0.00

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Area 4 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R4010	12.05	55.40	12.05	17.63
R4020	12.05	-11.10	12.05	-3.54
R4030	12.23	-25.30	12.25	-8.06
R4040	12.25	-25.30	12.25	-8.20
R4050	25.42	9.80	25.42	5.74
R4060	13.40	-7.28	13.40	-4.40
R4070	14.28	12.80	12.62	12.32
R4090	12.43	17.20	12.43	9.72
R4100	14.82	14.40	14.82	4.59
R4110	18.20	27.00	18.20	8.58
R4120	13.07	17.70	13.07	8.45
R4130	13.07	17.70	13.07	6.50
R4140	13.05	17.70	13.05	10.02
R4160	13.40	85.30	13.40	12.16
R4170	12.55	43.80	12.47	15.06
R4171	12.78	107.00	12.78	21.75
R4190	14.87	22.40	14.87	12.66
R4200	12.30	174.00	12.30	24.59
R4210	9.55	2.13	9.55	5.29
R4220	9.53	-2.13	9.53	-2.62
R4230	9.45	2.13	9.45	2.74
R4240	9.32	2.15	9.32	2.74
R4250	20.53	29.60	20.53	9.41
R4260	12.40	28.80	12.40	5.64
R4270	12.38	28.80	16.07	5.51
R4280	12.33	28.80	12.30	7.76
R4290	12.30	28.80	12.30	9.25
R4300	9.13	6.26	9.13	4.99
R4310	25.05	5.95	25.05	4.16
R4320	11.93	5.00	11.93	3.48
R4330	5.02	4.97	4.95	3.42
R4340	4.93	-4.97	4.93	-3.20
R4350	4.93	-4.98	4.93	-2.82
R4360	11.98	10.30	11.98	5.82
R4370	11.98	10.30	11.98	5.82
R4380	11.98	10.30	11.98	5.82
R4390	13.00	-54.80	13.00	-7.76
R4400	12.25	57.30	12.25	8.11
R4410	12.40	33.00	12.40	2.21
R4420	12.22	34.10	12.22	10.87
R4430	12.22	46.30	11.93	2.85
R4440	12.25	-25.30	12.25	-8.07
R4450	12.23	25.40	12.25	0.44
R4460	12.27	6.06	12.27	1.93
R4470	12.27	6.06	12.27	1.93
R4480	12.27	6.05	12.27	1.93
R4490	12.13	-8.32	12.13	-2.65

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Area 4 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R4500	12.13	-8.32	12.13	-2.65
R4510	12.40	-4.61	12.40	-1.47
R4520	12.07	10.50	12.07	3.35
R4530	12.27	65.10	12.27	9.22
R4540	12.23	80.30	12.23	20.08
R4570	12.75	21.80	12.75	12.34
R4590	12.27	535.00	12.27	6.58
R4670	12.33	32.70	12.33	10.48
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	25.45	11.70	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	18.20	14.20	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	13.05	17.70	0.00	0.00
WEIR#9	13.40	70.80	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	14.87	5.61	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	12.15	0.00	0.00	0.00
WEIR#21	0.00	0.00	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	0.00	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	0.00	0.00	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
WEIR#30	0.00	0.00	0.00	0.00
WEIR#31	0.00	0.00	0.00	0.00
WEIR#32	0.00	0.00	0.00	0.00
WEIR#33	0.00	0.00	0.00	0.00
WEIR#34	0.00	0.00	0.00	0.00
WEIR#35	0.00	0.00	0.00	0.00
WEIR#36	0.00	0.00	0.00	0.00
WEIR#37	0.00	0.00	0.00	0.00
FREE#1	12.05	55.40	0.00	0.00
FREE#2	9.55	2.13	0.00	0.00

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Area 5 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R5010	12.25	12.80	12.25	5.94
R5020	12.25	12.90	12.25	5.16
R5030	12.25	13.00	12.25	5.59
R5040	12.25	-13.00	12.25	-5.14
R5050	18.52	6.24	20.02	2.10
R5060	12.80	7.13	12.80	2.27
R5070	13.33	4.75	13.32	3.57
R5080	12.25	-21.30	12.25	-5.66
R5090	12.48	4.19	12.23	3.46
R5100	12.27	4.07	12.50	3.53
R5110	12.03	4.14	12.03	3.43
R5120	10.18	3.23	10.18	2.63
R5130	11.37	2.73	11.37	3.48
R5150	12.25	5.52	12.25	5.10
R5160	12.23	5.55	12.23	4.73
R5170	12.23	-4.99	12.23	-4.06
R5180	12.02	-4.08	11.87	-3.41
R5190	12.85	2.28	12.85	3.00
R5200	11.85	2.82	11.85	3.58
R5210	11.80	3.46	11.80	4.41
R5220	11.80	2.80	11.80	3.56
R5230	12.05	2.63	12.05	3.35
R5240	11.97	15.60	11.97	8.82
R5250	11.90	12.10	11.87	5.81
R5260	11.95	4.01	11.95	3.18
R5270	12.25	5.84	12.25	6.52
R5280	12.25	-5.85	12.25	-4.97
R5290	12.05	4.06	12.05	5.17
R5320	12.25	16.90	12.25	11.63
R5310	0.00	0.00	0.00	0.00
R5330	11.88	1.98	11.88	2.79
R5340	12.25	-1.39	12.25	-1.77
R5350	12.25	8.11	12.17	5.10
R5360	12.07	3.60	12.07	2.59
R5370	12.25	5.17	12.25	3.05
R5390	12.10	25.30	12.10	8.20
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00

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Area 5 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	0.00	0.00	0.00	0.00
WEIR#21	11.68	-0.00	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	11.90	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	11.78	-1.45	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
WEIR#30	0.00	0.00	0.00	0.00
WEIR#31	0.00	0.00	0.00	0.00
WEIR#32	0.00	0.00	0.00	0.00
WEIR#33	0.00	0.00	0.00	0.00
WEIR#34	12.07	1.18	0.00	0.00
WEIR#35	0.00	0.00	0.00	0.00
WEIR#36	0.00	0.00	0.00	0.00
WEIR#37	0.00	0.00	0.00	0.00
WEIR#38	0.00	0.00	0.00	0.00
FREE#1	12.25	12.80	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	12.10	25.30	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

Area 5 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R5010	12.25	17.00	12.25	7.28
R5020	12.25	17.10	12.25	5.98
R5030	12.25	17.10	12.15	6.08
R5040	12.25	-17.50	12.15	-5.86
R5050	18.00	8.39	18.00	2.69
R5060	17.92	6.22	17.92	1.98
R5070	13.17	3.66	12.17	-2.83
R5080	12.15	-23.30	12.15	-6.12
R5090	12.18	5.17	12.18	4.05
R5100	12.22	4.13	12.23	3.59
R5110	12.00	4.13	12.00	3.41
R5120	9.38	3.29	9.38	2.68
R5130	10.30	2.73	10.30	3.48
R5150	12.03	5.40	12.03	5.08
R5160	12.03	5.66	12.03	4.82
R5170	12.03	-5.32	12.03	-4.34
R5180	12.25	-5.71	12.25	-4.66
R5190	12.88	2.27	12.88	2.98
R5200	11.82	2.98	11.82	3.79
R5210	11.82	2.75	11.82	3.50
R5220	11.75	2.04	11.75	2.59
R5230	12.02	2.63	12.02	3.35
R5240	11.88	15.60	11.88	8.82
R5250	11.85	13.00	11.83	5.99
R5260	11.88	4.60	11.88	3.36
R5270	12.25	6.47	12.25	7.05
R5280	12.12	-6.61	12.12	-5.55
R5290	11.75	4.36	11.75	5.55
R5320	12.20	20.40	12.12	11.67
R5310	12.27	-0.25	12.27	-0.40
R5330	11.83	1.98	11.83	2.79
R5340	12.12	-1.70	12.12	-2.16
R5350	12.12	8.76	12.12	5.25
R5360	12.55	3.82	12.95	2.61
R5370	12.25	7.55	12.25	4.27
R5390	12.05	25.30	12.05	8.20
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00

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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	12.03	-0.05	0.00	0.00
WEIR#21	12.03	-6.09	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	11.85	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	11.75	-1.45	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
WEIR#30	0.00	0.00	0.00	0.00
WEIR#31	0.00	0.00	0.00	0.00
WEIR#32	0.00	0.00	0.00	0.00
WEIR#33	0.00	0.00	0.00	0.00
WEIR#34	12.02	1.18	0.00	0.00
WEIR#35	0.00	0.00	0.00	0.00
WEIR#36	0.00	0.00	0.00	0.00
WEIR#37	0.00	0.00	0.00	0.00
WEIR#38	0.00	0.00	0.00	0.00
FREE#1	12.25	17.00	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	12.05	25.30	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Area 5 - 100 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R5010	12.23	22.20	12.25	8.67
R5020	12.18	22.20	12.18	7.24
R5030	12.18	22.20	12.18	7.05
R5040	12.18	-22.20	12.18	-7.05
R5050	16.15	10.50	16.15	3.34
R5060	14.30	10.90	14.30	3.46
R5070	12.18	-4.35	12.13	-3.34
R5080	12.23	-28.50	12.23	-7.27
R5090	11.90	4.28	11.90	3.44
R5100	11.93	4.11	11.95	3.59
R5110	11.88	4.11	11.77	3.46
R5120	8.30	3.27	8.30	2.67
R5130	9.37	2.73	9.37	3.48
R5150	12.17	4.89	12.17	4.96
R5160	11.82	5.13	11.82	4.51
R5170	11.82	-5.13	11.82	-4.25
R5180	12.18	-8.14	12.18	-6.64
R5190	12.18	-4.11	12.18	-5.23
R5200	11.78	2.76	11.78	3.52
R5210	11.78	2.86	11.78	3.64
R5220	11.75	2.05	11.75	2.61
R5230	12.08	2.63	12.08	3.34
R5240	11.83	15.50	11.83	8.79
R5250	11.82	14.10	11.80	6.21
R5260	11.83	8.64	11.83	4.89
R5270	12.25	7.14	12.08	7.17
R5280	12.23	-7.96	12.23	-6.59
R5290	11.75	4.31	11.75	5.49
R5320	12.62	21.60	12.62	12.36
R5310	12.13	-2.18	12.13	-2.80
R5330	12.13	2.48	12.13	3.16
R5340	12.02	-1.70	12.02	-2.16
R5350	12.03	9.05	12.03	5.34
R5360	12.03	6.62	12.03	3.75
R5370	12.23	11.20	12.23	6.31
R5390	11.95	25.30	11.95	8.20
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00

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Area 5 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	11.82	-0.00	0.00	0.00
WEIR#21	12.00	-6.09	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	11.82	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	11.75	-1.45	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
WEIR#30	12.13	0.00	0.00	0.00
WEIR#31	0.00	0.00	0.00	0.00
WEIR#32	0.00	0.00	0.00	0.00
WEIR#33	0.00	0.00	0.00	0.00
WEIR#34	11.92	1.18	0.00	0.00
WEIR#35	12.03	0.00	0.00	0.00
WEIR#36	0.00	0.00	0.00	0.00
WEIR#37	0.00	0.00	0.00	0.00
WEIR#38	0.00	0.00	0.00	0.00
FREE#1	12.23	22.20	0.00	0.00
FREE#2	0.00	0.00	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	11.95	25.30	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Area 6 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R6010	11.87	13.40	11.87	4.61
R6020	11.87	13.00	11.87	4.15
R6030	11.85	14.10	11.85	4.49
R6040	11.85	14.10	11.85	5.41
R6050	11.85	13.60	11.83	4.46
R6060	11.83	14.70	11.82	4.96
R6070	11.83	17.80	11.83	5.76
R6080	11.87	11.00	11.85	6.82
R6090	11.87	11.00	11.87	6.35
R6100	12.25	18.60	12.07	6.43
R6110	12.00	12.40	11.85	7.46
R6120	12.25	23.50	12.25	8.73
R6130	12.25	23.50	12.25	8.02
R6140	12.25	21.30	12.25	6.77
R6150	12.38	11.70	13.18	4.09
R6160	11.80	11.70	11.80	4.13
R6170	11.80	9.45	11.78	3.29
R6115	11.90	-4.95	11.88	-2.92
R6180	11.78	-12.90	11.78	-4.36
R6190	12.47	-5.79	11.78	-3.35
R6200	11.78	9.77	11.78	3.28
R6205	12.47	-4.18	11.78	-2.92
R6210	11.78	13.30	11.78	4.64
R6220	12.25	-19.00	12.25	-6.05
R6230	11.90	11.30	11.90	6.40
R6240	11.90	11.30	11.90	6.40
R6250	12.03	10.40	12.03	5.89
R6260	13.17	6.35	13.18	4.18
R6270	12.15	7.09	12.15	4.15
R6280	12.15	11.20	12.08	7.47
R6290	12.25	4.71	12.13	3.50
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	11.83	3.97	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00

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Area 6 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	0.00	0.00	0.00	0.00
WEIR#21	0.00	0.00	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	0.00	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	11.90	-0.00	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
FREE#1	11.87	13.40	0.00	0.00
FREE#2	12.25	18.60	0.00	0.00
FREE#3	12.25	23.50	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	0.00	0.00	0.00	0.00

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Area 6 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R6010	11.83	13.40	11.83	4.62
R6020	11.83	13.40	11.83	4.26
R6030	11.82	16.10	11.83	5.13
R6040	11.82	16.40	11.82	5.70
R6050	11.82	15.20	11.82	4.94
R6060	11.80	16.20	11.80	5.47
R6070	11.82	18.60	11.80	5.97
R6080	12.82	11.30	12.85	6.89
R6090	12.82	11.00	11.83	6.35
R6100	12.15	19.30	12.03	6.50
R6110	11.83	12.40	11.82	7.49
R6120	12.12	26.00	12.10	8.84
R6130	12.10	25.10	12.10	8.23
R6140	12.25	24.20	12.25	7.72
R6150	11.90	11.50	13.43	4.10
R6160	11.78	11.80	11.77	4.16
R6170	11.77	9.57	11.77	3.31
R6115	11.83	-5.15	11.80	-3.07
R6180	11.78	-13.10	11.77	-4.38
R6190	12.72	-5.84	11.78	-3.36
R6200	11.77	9.68	11.77	3.12
R6205	12.72	-4.18	11.77	-2.91
R6210	11.77	13.40	11.77	4.65
R6220	12.25	-22.40	12.25	-7.12
R6230	11.90	11.30	11.90	6.41
R6240	11.88	11.30	11.88	6.41
R6250	12.00	10.40	12.00	5.88
R6260	13.42	6.29	13.42	4.16
R6270	12.03	6.78	12.05	4.08
R6280	12.03	11.00	12.02	7.56
R6290	11.85	6.53	11.85	4.56
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	11.82	3.97	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00

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Area 6 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	0.00	0.00	0.00	0.00
WEIR#21	0.00	0.00	0.00	0.00
WEIR#22	0.00	0.00	0.00	0.00
WEIR#23	0.00	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	11.83	-0.00	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
FREE#1	11.83	13.40	0.00	0.00
FREE#2	12.15	19.30	0.00	0.00
FREE#3	12.12	26.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	0.00	0.00	0.00	0.00

Area 6 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R6010	11.80	13.50	11.80	4.66
R6020	11.80	13.50	11.80	4.31
R6030	11.80	15.90	11.80	5.07
R6040	11.80	17.30	11.80	5.74
R6050	11.80	15.70	11.78	5.18
R6060	11.78	16.80	11.78	5.59
R6070	11.78	19.60	11.78	6.28
R6080	12.93	11.30	12.97	6.88
R6090	12.92	11.10	11.80	6.35
R6100	12.25	19.80	12.25	6.52
R6110	11.82	13.50	11.82	7.64
R6120	12.05	26.20	12.05	8.84
R6130	12.03	25.10	12.00	8.23
R6140	12.13	26.80	12.13	8.53
R6150	12.77	11.60	13.75	4.09
R6160	11.78	12.70	11.78	4.14
R6170	13.07	9.21	13.47	3.19
R6115	11.78	-5.60	11.78	-3.42
R6180	11.78	-12.90	11.75	-4.24
R6190	11.78	-5.96	11.78	-3.43
R6200	11.75	8.95	13.73	2.93
R6205	11.78	-4.57	11.78	-3.05
R6210	11.75	16.30	11.75	5.25
R6220	12.25	-25.60	12.25	-8.14
R6230	11.82	11.30	11.82	6.39
R6240	11.82	11.30	11.82	6.39
R6250	11.87	10.40	11.87	5.88
R6260	13.72	6.07	11.75	4.03
R6270	11.82	6.45	11.82	3.89
R6280	12.10	5.61	12.10	3.59
R6290	12.05	6.38	12.05	3.61
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	11.78	3.97	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
WEIR#15	0.00	0.00	0.00	0.00
WEIR#16	0.00	0.00	0.00	0.00

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Area 6 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
WEIR#17	0.00	0.00	0.00	0.00
WEIR#18	0.00	0.00	0.00	0.00
WEIR#19	0.00	0.00	0.00	0.00
WEIR#20	0.00	0.00	0.00	0.00
WEIR#21	0.00	0.00	0.00	0.00
WEIR#22	12.25	0.12	0.00	0.00
WEIR#23	0.00	0.00	0.00	0.00
WEIR#24	0.00	0.00	0.00	0.00
WEIR#25	0.00	0.00	0.00	0.00
WEIR#26	0.00	0.00	0.00	0.00
WEIR#27	0.00	0.00	0.00	0.00
WEIR#28	11.80	-0.00	0.00	0.00
WEIR#29	0.00	0.00	0.00	0.00
FREE#1	11.80	13.50	0.00	0.00
FREE#2	12.25	19.80	0.00	0.00
FREE#3	12.05	26.20	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00
FREE#6	0.00	0.00	0.00	0.00
FREE#7	0.00	0.00	0.00	0.00

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Area 7 - 10 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R7150	12.72	18.50	12.72	10.45
R7140	12.28	13.50	12.28	7.71
R7220	13.32	9.02	13.32	5.98
R7240	13.50	10.90	13.50	6.33
WEIR#1	13.57	67.30	0.00	0.00
WEIR#2	13.70	45.70	0.00	0.00
WEIR#3	12.40	-17.60	0.00	0.00
WEIR#4	12.40	14.90	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	12.80	36.80	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.28	13.50	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Area 7 - 25 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R7150	12.33	18.50	12.33	10.45
R7140	12.17	13.50	12.17	7.71
R7220	13.73	11.40	13.73	6.61
R7240	14.18	12.40	14.18	7.13
WEIR#1	14.18	111.00	0.00	0.00
WEIR#2	13.75	81.70	0.00	0.00
WEIR#3	12.35	-23.30	0.00	0.00
WEIR#4	12.35	25.30	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	12.88	52.50	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.17	13.50	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R7150	12.18	18.50	12.18	10.45
R7140	12.03	13.50	12.03	7.71
R7220	14.28	14.50	14.28	8.30
R7240	14.18	14.20	14.18	8.12
WEIR#1	14.68	205.00	0.00	0.00
WEIR#2	14.17	155.00	0.00	0.00
WEIR#3	12.33	-32.00	0.00	0.00
WEIR#4	12.33	42.30	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	14.18	15.20	0.00	0.00
WEIR#14	13.10	82.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.03	13.50	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00
FREE#5	0.00	0.00	0.00	0.00

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Area 7 - 10 Year Storm Event Simulation
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Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R7340	12.43	13.50	12.43	7.71
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	13.37	30.50	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	0.00	0.00	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.43	13.50	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00

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Area 7 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R7340	12.27	13.50	12.27	7.71
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	13.37	71.70	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	13.37	10.40	0.00	0.00
WEIR#8	0.00	0.00	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.27	13.50	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00

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Area 7 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R7340	12.17	13.50	12.17	7.71
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	0.00	0.00	0.00	0.00
WEIR#3	0.00	0.00	0.00	0.00
WEIR#4	23.00	0.85	0.00	0.00
WEIR#5	13.18	120.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	13.18	108.00	0.00	0.00
WEIR#8	14.45	0.79	0.00	0.00
WEIR#9	0.00	0.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.17	13.50	0.00	0.00
FREE#3	0.00	0.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00

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Area 8 - 10 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R8030	23.00	1.17	23.00	2.92
R8060	18.77	2.84	18.87	3.03
R8200	23.00	44.80	0.17	7.39
R8020	12.75	48.20	12.75	2.67
R8170	12.27	50.30	12.25	7.57
R8180	0.00	0.00	0.00	0.00
R8190	12.12	14.40	12.12	5.22
R8070	13.08	14.10	13.08	8.03
R8100	12.85	11.20	12.77	6.92
R8110	12.33	36.80	12.33	0.27
R8120	12.77	89.50	12.77	0.63
R8160	12.30	18.00	12.30	10.16
R8150	12.30	-18.00	12.30	-10.16
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	12.80	547.00	0.00	0.00
WEIR#3	12.93	113.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	12.12	46.00	0.00	0.00
WEIR#8	12.78	41.80	0.00	0.00
WEIR#9	12.75	25.30	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.33	36.80	0.00	0.00
FREE#3	12.77	89.50	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00

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Area 8 - 25 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R8030	23.78	3.64	24.00	4.06
R8060	15.78	5.31	15.87	3.71
R8200	24.07	48.50	0.17	7.39
R8020	12.75	54.40	12.75	2.78
R8170	12.27	76.00	12.25	8.47
R8180	0.00	0.00	0.00	0.00
R8190	12.05	14.40	12.05	5.22
R8070	13.55	16.10	13.55	9.18
R8100	12.73	12.90	12.60	7.47
R8110	12.40	53.00	12.40	0.38
R8120	12.83	137.00	12.83	0.92
R8160	12.18	18.00	12.18	10.16
R8150	12.18	-18.00	12.18	-10.16
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	12.83	697.00	0.00	0.00
WEIR#3	12.97	169.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	12.03	46.00	0.00	0.00
WEIR#8	12.82	72.60	0.00	0.00
WEIR#9	12.73	72.70	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.40	53.00	0.00	0.00
FREE#3	12.83	137.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00

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Area 8 - 100 Year Storm Event Simulation
Maximum Discharges Report

Reach ID	Time of Max Flow hours	Maximum Flow cfs	Time of Max Vel. hours	Maximum Velocity fps
R8030	21.77	9.15	21.77	5.19
R8060	15.03	10.40	15.25	4.72
R8200	24.05	53.40	24.05	7.58
R8020	12.75	66.10	12.75	2.95
R8170	12.27	125.00	12.25	9.80
R8180	15.62	1.99	15.75	5.41
R8190	12.00	14.40	13.22	5.22
R8070	12.95	17.20	12.95	9.75
R8100	12.33	13.50	12.33	7.67
R8110	12.85	96.00	12.85	0.67
R8120	12.95	226.00	12.95	1.40
R8160	12.10	18.00	12.10	10.16
R8150	12.10	-18.00	12.10	-10.16
WEIR#1	0.00	0.00	0.00	0.00
WEIR#2	13.00	951.00	0.00	0.00
WEIR#3	13.03	259.00	0.00	0.00
WEIR#4	0.00	0.00	0.00	0.00
WEIR#5	0.00	0.00	0.00	0.00
WEIR#6	0.00	0.00	0.00	0.00
WEIR#7	11.00	46.00	0.00	0.00
WEIR#8	12.87	127.00	0.00	0.00
WEIR#9	12.40	130.00	0.00	0.00
WEIR#10	0.00	0.00	0.00	0.00
WEIR#11	0.00	0.00	0.00	0.00
WEIR#12	0.00	0.00	0.00	0.00
WEIR#13	0.00	0.00	0.00	0.00
WEIR#14	0.00	0.00	0.00	0.00
FREE#1	0.00	0.00	0.00	0.00
FREE#2	12.85	96.00	0.00	0.00
FREE#3	12.95	226.00	0.00	0.00
FREE#4	0.00	0.00	0.00	0.00

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APPENDIX D - FLOOD DURATION REPORTS

Area 1 - 10 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N1060	94.15	0.00	0.00	0.00	0.85
	94.40	0.25	0.00	0.00	0.74
	94.65	0.50	0.00	0.00	0.55
	94.90	0.75	0.00	0.00	0.52
	95.07	0.92	0.00	0.00	0.00
N1070	99.97	0.00	0.00	0.00	0.81
	100.22	0.25	0.00	0.00	1.14
	100.47	0.50	0.00	0.00	0.16
	100.55	0.58	0.00	0.00	0.00
N1080	102.00	0.00	0.00	0.00	0.36
	102.06	0.06	0.00	0.00	0.00
N1110	100.00	0.00	0.00	0.00	0.84
	100.25	0.25	0.00	0.00	0.67
	100.50	0.50	0.00	0.00	0.21
	100.59	0.59	0.00	0.00	0.00
N1160	109.00	0.00	0.00	0.00	11.80
	109.25	0.25	0.00	0.00	5.13
	109.50	0.50	0.00	0.00	0.25
	109.62	0.62	0.00	0.00	0.00

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Area 1 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N1050	93.26	0.00	0.00	0.00	0.06
	93.51	0.25	0.00	0.00	0.01
	93.55	0.29	0.00	0.00	0.00
N1060	94.15	0.00	0.00	0.00	1.16
	94.40	0.25	0.00	0.00	1.08
	94.65	0.50	0.00	0.00	0.97
	94.90	0.75	0.00	0.00	0.77
	95.15	1.00	0.00	0.00	0.15
	95.24	1.09	0.00	0.00	0.00
N1070	99.97	0.00	0.00	0.00	1.12
	100.22	0.25	0.00	0.00	1.00
	100.47	0.50	0.00	0.00	0.80
	100.72	0.75	0.00	0.00	0.00
	100.72	0.75	0.00	0.00	0.00
N1080	102.00	0.00	0.00	0.00	0.76
	102.11	0.11	0.00	0.00	0.00
N1110	100.00	0.00	0.00	0.00	1.15
	100.25	0.25	0.00	0.00	1.04
	100.50	0.50	0.00	0.00	1.46
	100.75	0.75	0.00	0.00	0.00
	100.75	0.75	0.00	0.00	0.00
N1160	109.00	0.00	0.00	0.00	15.16
	109.25	0.25	0.00	0.00	6.85
	109.50	0.50	0.00	0.00	1.04
	109.67	0.67	0.00	0.00	0.00
N1180	145.00	0.00	0.00	0.00	1.12
	145.25	0.25	0.00	0.00	1.10
	145.41	0.41	0.00	0.00	0.00

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Area 1 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N1050	93.26	0.00	0.00	0.00	0.51
	93.51	0.25	0.00	0.00	0.43
	93.76	0.50	0.00	0.00	0.34
	93.96	0.70	0.00	0.00	0.00
N1060	94.15	0.00	0.00	0.00	1.65
	94.40	0.25	0.00	0.00	3.14
	94.65	0.50	0.00	0.00	1.45
	94.90	0.75	0.00	0.00	1.10
	95.15	1.00	0.00	0.00	0.70
	95.40	1.25	0.00	0.00	0.14
	95.45	1.30	0.00	0.00	0.00
N1070	99.97	0.00	0.00	0.00	1.63
	100.22	0.25	0.00	0.00	1.47
	100.47	0.50	0.00	0.00	0.95
	100.72	0.75	0.00	0.00	0.95
	100.97	1.00	0.00	0.00	0.00
	100.97	1.00	0.00	0.00	0.00
N1080	102.00	0.00	0.00	0.00	1.27
	102.12	0.12	0.00	0.00	0.00
N1110	100.00	0.00	0.00	0.00	1.65
	100.25	0.25	0.00	0.00	1.60
	100.50	0.50	0.00	0.00	1.26
	100.75	0.75	0.00	0.00	0.51
	100.99	0.99	0.00	0.00	0.00
N1160	109.00	0.00	0.00	0.00	10.14
	109.25	0.25	0.00	0.00	8.54
	109.50	0.50	0.00	0.00	1.49
	109.75	0.75	0.00	0.00	1.44
	110.00	1.00	0.00	0.00	0.17
	110.04	1.04	0.00	0.00	0.00
N1180	145.00	0.00	0.00	0.00	2.00
	145.25	0.25	0.00	0.00	2.21
	145.50	0.50	0.00	0.00	0.56
	145.75	0.75	0.00	0.00	0.02
	145.76	0.76	0.00	0.00	0.00

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Area 2 - 10 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2020	81.57	0.00	0.00	0.00	0.31
	81.76	0.19	0.00	0.00	0.00
N2030	87.75	0.00	0.00	0.00	1.29
	88.00	0.25	0.00	0.00	0.16
	88.03	0.28	0.00	0.00	0.00
N2050	93.88	0.00	0.00	0.00	1.07
	94.13	0.25	0.00	0.00	99999.90
	94.15	0.27	0.00	0.00	0.00
N2060	95.54	0.00	0.00	0.00	1.15
	95.79	0.25	0.00	0.00	0.06
	95.84	0.30	0.00	0.00	0.00
N2040	89.25	0.00	0.00	0.00	1.21
	89.50	0.25	0.00	0.00	99999.90
	89.52	0.27	0.00	0.00	0.00
N2070	119.63	0.00	0.00	0.00	0.16
	119.82	0.19	0.00	0.00	0.00
N2080	67.21	0.00	0.00	0.00	0.18
	67.33	0.12	0.00	0.00	0.00
N2090	67.32	0.00	0.00	0.00	1.16
	67.57	0.25	0.00	0.00	1.05
	67.82	0.50	0.00	0.00	0.91
	68.07	0.75	0.00	0.00	0.56
	68.14	0.82	0.00	0.00	0.00
N2170	99.48	0.00	0.00	0.00	0.01
	99.55	0.07	0.00	0.00	0.00
N2210	87.11	0.00	0.00	0.00	0.42
	87.36	0.25	0.00	0.00	0.39
	87.61	0.50	0.00	0.00	0.35
	87.86	0.75	0.00	0.00	0.31
	88.11	1.00	0.00	0.00	0.15
	88.25	1.14	0.00	0.00	0.00
N2290	66.33	0.00	0.00	0.00	1.11
	66.58	0.25	0.00	0.00	1.48
	66.67	0.34	0.00	0.00	0.00
N2300	67.59	0.00	0.00	0.00	1.22
	67.84	0.25	0.00	0.00	1.19

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Area 2 - 10 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2300	68.09	0.50	0.00	0.00	1.16
	68.34	0.75	0.00	0.00	1.13
	68.59	1.00	0.00	0.00	1.10
	68.84	1.25	0.00	0.00	1.06
	69.09	1.50	0.00	0.00	1.00
	69.34	1.75	0.00	0.00	1.68
	69.59	2.00	0.00	0.00	1.13
	69.84	2.25	0.00	0.00	0.29
	70.02	2.43	0.00	0.00	0.00
N2310	67.73	0.00	0.00	0.00	1.28
	67.98	0.25	0.00	0.00	1.26
	68.23	0.50	0.00	0.00	1.23
	68.48	0.75	0.00	0.00	1.19
	68.73	1.00	0.00	0.00	1.15
	68.98	1.25	0.00	0.00	2.10
	69.23	1.50	0.00	0.00	0.55
	69.42	1.69	0.00	0.00	0.00
N2320	69.19	0.00	0.00	0.00	1.11
	69.44	0.25	0.00	0.00	1.31
	69.58	0.39	0.00	0.00	0.00
N2330	69.25	0.00	0.00	0.00	1.22
	69.50	0.25	0.00	0.00	1.14
	69.75	0.50	0.00	0.00	1.76
	70.00	0.75	0.00	0.00	1.04
	70.25	1.00	0.00	0.00	0.24
	70.43	1.18	0.00	0.00	0.00
N2350	90.14	0.00	0.00	0.00	1.28
	90.39	0.25	0.00	0.00	1.24
	90.64	0.50	0.00	0.00	1.20
	90.89	0.75	0.00	0.00	1.17
	91.14	1.00	0.00	0.00	1.07
	91.39	1.25	0.00	0.00	0.88
	91.64	1.50	0.00	0.00	1.16
	91.89	1.75	0.00	0.00	0.57
	92.08	1.94	0.00	0.00	0.00
N2360	90.58	0.00	0.00	0.00	1.36
	90.83	0.25	0.00	0.00	1.32
	91.08	0.50	0.00	0.00	1.28
	91.33	0.75	0.00	0.00	1.24
	91.58	1.00	0.00	0.00	1.19
	91.83	1.25	0.00	0.00	1.10
	92.08	1.50	0.00	0.00	0.88

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Area 2 - 10 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2360	92.33	1.75	0.00	0.00	0.66
	92.58	2.00	0.00	0.00	0.40
	92.83	2.25	0.00	0.00	0.22
	93.06	2.48	0.00	0.00	0.00
N2370	92.30	0.00	0.00	0.00	1.26
	92.55	0.25	0.00	0.00	1.23
	92.80	0.50	0.00	0.00	1.19
	93.05	0.75	0.00	0.00	1.12
	93.30	1.00	0.00	0.00	0.92
	93.55	1.25	0.00	0.00	0.41
	93.78	1.48	0.00	0.00	0.00
N2410	114.40	0.00	0.00	0.00	1.27
	114.65	0.25	0.00	0.00	0.50
	114.90	0.50	0.00	0.00	0.43
	115.15	0.75	0.00	0.00	0.38
	115.40	1.00	0.00	0.00	0.34
	115.65	1.25	0.00	0.00	0.29
	115.90	1.50	0.00	0.00	0.08
	115.96	1.56	0.00	0.00	0.00
N2420	115.14	0.00	0.00	0.00	0.78
	115.39	0.25	0.00	0.00	0.75
	115.64	0.50	0.00	0.00	0.69
	115.89	0.75	0.00	0.00	0.60
	116.14	1.00	0.00	0.00	0.47
	116.39	1.25	0.00	0.00	0.60
	116.60	1.46	0.00	0.00	0.00
N2440	116.31	0.00	0.00	0.00	1.03
	116.56	0.25	0.00	0.00	1.01
	116.81	0.50	0.00	0.00	0.98
	117.06	0.75	0.00	0.00	0.96
	117.31	1.00	0.00	0.00	0.92
	117.56	1.25	0.00	0.00	0.81
	117.81	1.50	0.00	0.00	1.22
	118.06	1.75	0.00	0.00	0.29
	118.31	2.00	0.00	0.00	0.08
	118.37	2.06	0.00	0.00	0.00
N2450	115.93	0.00	0.00	0.00	1.40
	116.18	0.25	0.00	0.00	1.35
	116.43	0.50	0.00	0.00	1.30
	116.68	0.75	0.00	0.00	1.25
	116.93	1.00	0.00	0.00	1.18
	117.18	1.25	0.00	0.00	0.96

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Area 2 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2020	81.57	0.00	0.00	0.00	0.54
	81.82	0.25	0.00	0.00	0.14
	81.89	0.32	0.00	0.00	0.00
N2030	87.75	0.00	0.00	0.00	1.50
	88.00	0.25	0.00	0.00	0.28
	88.16	0.41	0.00	0.00	0.00
N2050	93.88	0.00	0.00	0.00	2.54
	94.13	0.25	0.00	0.00	0.24
	94.29	0.41	0.00	0.00	0.00
N2060	95.54	0.00	0.00	0.00	1.32
	95.79	0.25	0.00	0.00	0.27
	96.04	0.50	0.00	0.00	0.12
	96.24	0.70	0.00	0.00	0.00
N2040	89.25	0.00	0.00	0.00	1.35
	89.50	0.25	0.00	0.00	0.24
	89.65	0.40	0.00	0.00	0.00
N2070	119.63	0.00	0.00	0.00	0.44
	119.88	0.25	0.00	0.00	0.13
	119.94	0.31	0.00	0.00	0.00
N2080	67.21	0.00	0.00	0.00	0.26
	67.39	0.18	0.00	0.00	0.00
N2090	67.32	0.00	0.00	0.00	1.24
	67.57	0.25	0.00	0.00	1.14
	67.82	0.50	0.00	0.00	1.01
	68.07	0.75	0.00	0.00	0.39
	68.18	0.86	0.00	0.00	0.00
N2170	99.48	0.00	0.00	0.00	0.19
	99.62	0.14	0.00	0.00	0.00
N2210	87.11	0.00	0.00	0.00	0.66
	87.36	0.25	0.00	0.00	0.62
	87.61	0.50	0.00	0.00	0.59
	87.86	0.75	0.00	0.00	0.55
	88.11	1.00	0.00	0.00	0.40
	88.29	1.18	0.00	0.00	0.00
N2220	96.65	0.00	0.00	0.00	0.07
	96.90	0.25	0.00	0.00	0.04
	97.15	0.50	0.00	0.00	0.01

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Area 2 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2220	97.21	0.56	0.00	0.00	0.00
N2260	73.29	0.00	0.00	0.00	0.43
	73.35	0.06	0.00	0.00	0.00
N2270	83.91	0.00	0.00	0.00	0.23
	84.03	0.12	0.00	0.00	0.00
N2280	89.99	0.00	0.00	0.00	0.11
	90.10	0.11	0.00	0.00	0.00
N2290	66.33	0.00	0.00	0.00	1.44
	66.58	0.25	0.00	0.00	0.97
	66.68	0.35	0.00	0.00	0.00
N2300	67.59	0.00	0.00	0.00	1.53
	67.84	0.25	0.00	0.00	1.51
	68.09	0.50	0.00	0.00	1.48
	68.34	0.75	0.00	0.00	1.46
	68.59	1.00	0.00	0.00	1.42
	68.84	1.25	0.00	0.00	1.39
	69.09	1.50	0.00	0.00	1.30
	69.34	1.75	0.00	0.00	1.13
	69.59	2.00	0.00	0.00	0.96
	69.84	2.25	0.00	0.00	0.83
	70.09	2.50	0.00	0.00	0.12
	70.15	2.56	0.00	0.00	0.00
N2310	67.73	0.00	0.00	0.00	1.61
	67.98	0.25	0.00	0.00	1.57
	68.23	0.50	0.00	0.00	1.54
	68.48	0.75	0.00	0.00	1.50
	68.73	1.00	0.00	0.00	1.45
	68.98	1.25	0.00	0.00	1.35
	69.23	1.50	0.00	0.00	0.95
	69.48	1.75	0.00	0.00	0.00
	69.48	1.75	0.00	0.00	0.00
N2320	69.19	0.00	0.00	0.00	1.42
	69.44	0.25	0.00	0.00	1.00
	69.62	0.43	0.00	0.00	0.00
N2330	69.25	0.00	0.00	0.00	1.54
	69.50	0.25	0.00	0.00	1.45
	69.75	0.50	0.00	0.00	1.18
	70.00	0.75	0.00	0.00	0.95
	70.25	1.00	0.00	0.00	0.82

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Area 2 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2330	70.50	1.25	0.00	0.00	0.34
	70.60	1.35	0.00	0.00	0.00
N2350	90.14	0.00	0.00	0.00	1.64
	90.39	0.25	0.00	0.00	1.61
	90.64	0.50	0.00	0.00	1.58
	90.89	0.75	0.00	0.00	1.52
	91.14	1.00	0.00	0.00	1.40
	91.39	1.25	0.00	0.00	1.17
	91.64	1.50	0.00	0.00	0.97
	91.89	1.75	0.00	0.00	0.83
	92.14	2.00	0.00	0.00	0.00
	92.14	2.00	0.00	0.00	0.00
N2360	90.58	0.00	0.00	0.00	1.70
	90.83	0.25	0.00	0.00	1.66
	91.08	0.50	0.00	0.00	1.63
	91.33	0.75	0.00	0.00	1.60
	91.58	1.00	0.00	0.00	1.56
	91.83	1.25	0.00	0.00	1.47
	92.08	1.50	0.00	0.00	1.16
	92.33	1.75	0.00	0.00	1.00
	92.58	2.00	0.00	0.00	0.89
	92.83	2.25	0.00	0.00	0.81
	93.08	2.50	0.00	0.00	0.30
	93.12	2.54	0.00	0.00	0.00
N2370	92.30	0.00	0.00	0.00	1.61
	92.55	0.25	0.00	0.00	1.59
	92.80	0.50	0.00	0.00	1.56
	93.05	0.75	0.00	0.00	3.01
	93.30	1.00	0.00	0.00	1.21
	93.55	1.25	0.00	0.00	0.92
	93.80	1.50	0.00	0.00	0.00
	93.80	1.50	0.00	0.00	0.00
N2400	114.79	0.00	0.00	0.00	0.07
	115.04	0.25	0.00	0.00	0.06
	115.29	0.50	0.00	0.00	0.04
	115.54	0.75	0.00	0.00	0.02
	115.79	1.00	0.00	0.00	0.01
	115.89	1.10	0.00	0.00	0.00
N2410	114.40	0.00	0.00	0.00	0.87
	114.65	0.25	0.00	0.00	0.81
	114.90	0.50	0.00	0.00	0.77
	115.15	0.75	0.00	0.00	0.72

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Area 2 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2410	115.40	1.00	0.00	0.00	0.66
	115.65	1.25	0.00	0.00	0.57
	115.90	1.50	0.00	0.00	0.29
	116.15	1.75	0.00	0.00	0.13
	116.37	1.97	0.00	0.00	0.00
N2420	115.14	0.00	0.00	0.00	1.04
	115.39	0.25	0.00	0.00	0.99
	115.64	0.50	0.00	0.00	0.92
	115.89	0.75	0.00	0.00	0.85
	116.14	1.00	0.00	0.00	0.79
	116.39	1.25	0.00	0.00	1.08
	116.64	1.50	0.00	0.00	0.21
	116.84	1.70	0.00	0.00	0.00
N2440	116.31	0.00	0.00	0.00	1.40
	116.56	0.25	0.00	0.00	1.37
	116.81	0.50	0.00	0.00	1.34
	117.06	0.75	0.00	0.00	1.31
	117.31	1.00	0.00	0.00	1.27
	117.56	1.25	0.00	0.00	1.11
	117.81	1.50	0.00	0.00	0.88
	118.06	1.75	0.00	0.00	1.09
	118.31	2.00	0.00	0.00	0.29
	118.56	2.25	0.00	0.00	0.09
	118.64	2.33	0.00	0.00	0.00
N2450	115.93	0.00	0.00	0.00	1.87
	116.18	0.25	0.00	0.00	1.81
	116.43	0.50	0.00	0.00	1.74
	116.68	0.75	0.00	0.00	1.68
	116.93	1.00	0.00	0.00	1.59
	117.18	1.25	0.00	0.00	1.29
	117.43	1.50	0.00	0.00	1.11
	117.68	1.75	0.00	0.00	0.10
	117.72	1.79	0.00	0.00	0.00
N2460	115.00	0.00	0.00	0.00	3.79
	115.25	0.25	0.00	0.00	3.57
	115.50	0.50	0.00	0.00	3.41
	115.75	0.75	0.00	0.00	3.25
	116.00	1.00	0.00	0.00	3.08
	116.25	1.25	0.00	0.00	2.92
	116.50	1.50	0.00	0.00	5.52
	116.75	1.75	0.00	0.00	2.57
	117.00	2.00	0.00	0.00	2.34
	117.25	2.25	0.00	0.00	3.95

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Area 2 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2020	81.57	0.00	0.00	0.00	0.84
	81.82	0.25	0.00	0.00	0.31
	82.00	0.43	0.00	0.00	0.00
N2030	87.75	0.00	0.00	0.00	1.64
	88.00	0.25	0.00	0.00	0.45
	88.25	0.50	0.00	0.00	0.10
	88.28	0.53	0.00	0.00	0.00
N2050	93.88	0.00	0.00	0.00	1.45
	94.13	0.25	0.00	0.00	0.39
	94.38	0.50	0.00	0.00	0.12
	94.42	0.54	0.00	0.00	0.00
N2060	95.54	0.00	0.00	0.00	1.50
	95.79	0.25	0.00	0.00	0.45
	96.04	0.50	0.00	0.00	0.29
	96.29	0.75	0.00	0.00	0.21
	96.54	1.00	0.00	0.00	0.12
	96.67	1.13	0.00	0.00	0.00
N2040	89.25	0.00	0.00	0.00	1.52
	89.50	0.25	0.00	0.00	0.81
	89.75	0.50	0.00	0.00	0.07
	89.77	0.52	0.00	0.00	0.00
N2070	119.63	0.00	0.00	0.00	1.56
	119.88	0.25	0.00	0.00	0.27
	120.05	0.42	0.00	0.00	0.00
N2080	67.21	0.00	0.00	0.00	0.48
	67.46	0.25	0.00	0.00	0.00
	67.46	0.25	0.00	0.00	0.00
N2090	67.32	0.00	0.00	0.00	1.39
	67.57	0.25	0.00	0.00	1.25
	67.82	0.50	0.00	0.00	1.11
	68.07	0.75	0.00	0.00	0.53
	68.24	0.92	0.00	0.00	0.00
N2140	71.76	0.00	0.00	0.00	0.13
	71.90	0.14	0.00	0.00	0.00
N2170	99.48	0.00	0.00	0.00	0.43
	99.70	0.22	0.00	0.00	0.00
N2210	87.11	0.00	0.00	0.00	0.92

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Area 2 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2210	87.36	0.25	0.00	0.00	0.90
	87.61	0.50	0.00	0.00	0.87
	87.86	0.75	0.00	0.00	0.85
	88.11	1.00	0.00	0.00	0.61
	88.36	1.25	0.00	0.00	0.19
	88.51	1.40	0.00	0.00	0.00
N2220	96.65	0.00	0.00	0.00	0.27
	96.90	0.25	0.00	0.00	0.24
	97.15	0.50	0.00	0.00	0.21
	97.40	0.75	0.00	0.00	0.13
	97.43	0.78	0.00	0.00	0.00
N2260	73.29	0.00	0.00	0.00	0.72
	73.35	0.06	0.00	0.00	0.00
N2270	83.91	0.00	0.00	0.00	0.57
	84.12	0.21	0.00	0.00	0.00
N2280	89.99	0.00	0.00	0.00	0.43
	90.19	0.20	0.00	0.00	0.00
N2290	66.33	0.00	0.00	0.00	1.90
	66.58	0.25	0.00	0.00	3.13
	66.69	0.36	0.00	0.00	0.00
N2300	67.59	0.00	0.00	0.00	2.02
	67.84	0.25	0.00	0.00	2.00
	68.09	0.50	0.00	0.00	1.97
	68.34	0.75	0.00	0.00	1.94
	68.59	1.00	0.00	0.00	1.90
	68.84	1.25	0.00	0.00	1.86
	69.09	1.50	0.00	0.00	1.79
	69.34	1.75	0.00	0.00	1.66
	69.59	2.00	0.00	0.00	1.54
	69.84	2.25	0.00	0.00	1.44
	70.09	2.50	0.00	0.00	2.01
	70.34	2.75	0.00	0.00	0.02
	70.35	2.76	0.00	0.00	0.00
N2310	67.73	0.00	0.00	0.00	2.15
	67.98	0.25	0.00	0.00	4.21
	68.23	0.50	0.00	0.00	2.05
	68.48	0.75	0.00	0.00	2.00
	68.73	1.00	0.00	0.00	1.95
	68.98	1.25	0.00	0.00	1.82
	69.23	1.50	0.00	0.00	1.53

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Area 2 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2310	69.48	1.75	0.00	0.00	1.75
	69.59	1.86	0.00	0.00	0.00
N2320	69.19	0.00	0.00	0.00	1.90
	69.44	0.25	0.00	0.00	1.57
	69.68	0.49	0.00	0.00	0.00
N2330	69.25	0.00	0.00	0.00	2.06
	69.50	0.25	0.00	0.00	1.96
	69.75	0.50	0.00	0.00	1.68
	70.00	0.75	0.00	0.00	1.53
	70.25	1.00	0.00	0.00	1.42
	70.50	1.25	0.00	0.00	0.98
	70.75	1.50	0.00	0.00	0.51
	70.87	1.62	0.00	0.00	0.00
N2350	90.14	0.00	0.00	0.00	2.25
	90.39	0.25	0.00	0.00	2.21
	90.64	0.50	0.00	0.00	2.17
	90.89	0.75	0.00	0.00	2.12
	91.14	1.00	0.00	0.00	1.90
	91.39	1.25	0.00	0.00	1.69
	91.64	1.50	0.00	0.00	1.55
	91.89	1.75	0.00	0.00	1.44
	92.14	2.00	0.00	0.00	1.04
	92.33	2.19	0.00	0.00	0.00
N2360	90.58	0.00	0.00	0.00	2.35
	90.83	0.25	0.00	0.00	2.30
	91.08	0.50	0.00	0.00	2.25
	91.33	0.75	0.00	0.00	2.21
	91.58	1.00	0.00	0.00	2.17
	91.83	1.25	0.00	0.00	3.97
	92.08	1.50	0.00	0.00	1.69
	92.33	1.75	0.00	0.00	1.57
	92.58	2.00	0.00	0.00	1.49
	92.83	2.25	0.00	0.00	1.42
	93.08	2.50	0.00	0.00	2.26
	93.33	2.75	0.00	0.00	0.73
	93.47	2.89	0.00	0.00	0.00
N2370	92.30	0.00	0.00	0.00	2.23
	92.55	0.25	0.00	0.00	2.20
	92.80	0.50	0.00	0.00	2.16
	93.05	0.75	0.00	0.00	2.07
	93.30	1.00	0.00	0.00	1.73
	93.55	1.25	0.00	0.00	1.49

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Area 2 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N2370	93.80	1.50	0.00	0.00	1.06
	93.96	1.66	0.00	0.00	0.00
N2400	114.79	0.00	0.00	0.00	0.35
	115.04	0.25	0.00	0.00	0.34
	115.29	0.50	0.00	0.00	0.33
	115.54	0.75	0.00	0.00	0.31
	115.79	1.00	0.00	0.00	0.30
	116.04	1.25	0.00	0.00	0.20
	116.18	1.39	0.00	0.00	0.00
N2410	114.40	0.00	0.00	0.00	1.26
	114.65	0.25	0.00	0.00	1.16
	114.90	0.50	0.00	0.00	1.09
	115.15	0.75	0.00	0.00	1.03
	115.40	1.00	0.00	0.00	0.97
	115.65	1.25	0.00	0.00	1.84
	115.90	1.50	0.00	0.00	0.64
	116.15	1.75	0.00	0.00	0.40
	116.40	2.00	0.00	0.00	0.24
	116.61	2.21	0.00	0.00	0.00
N2420	115.14	0.00	0.00	0.00	1.52
	115.39	0.25	0.00	0.00	1.47
	115.64	0.50	0.00	0.00	1.37
	115.89	0.75	0.00	0.00	1.26
	116.14	1.00	0.00	0.00	1.15
	116.39	1.25	0.00	0.00	1.86
	116.64	1.50	0.00	0.00	0.46
	116.89	1.75	0.00	0.00	0.24
	117.09	1.95	0.00	0.00	0.00
N2440	116 31	0.00	0.00	0.00	2.10
	116.56	0.25	0.00	0.00	2.03
	116.81	0.50	0.00	0.00	1.98
	117.06	0.75	0.00	0.00	1.92
	117.31	1.00	0.00	0.00	1.84
	117.56	1.25	0.00	0.00	1.62
	117.81	1.50	0.00	0.00	1.30
	118.06	1.75	0.00	0.00	0.95
	118.31	2.00	0.00	0.00	0.62
	118.56	2.25	0.00	0.00	0.33
	118.81	2.50	0.00	0.00	0.16
	118 92	2.61	0.00	0.00	0.00
N2450	115.93	0.00	0.00	0.00	2.85
	116.18	0.25	0.00	0.00	2.78

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Area 3 - 10 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N3010	71.58	0.00	0.00	0.00	1.45
	71.83	0.25	0.00	0.00	0.00
	71.83	0.25	0.00	0.00	0.00
N3050	115.27	0.00	0.00	0.00	0.21
	115.39	0.12	0.00	0.00	0.00
N3060	125.26	0.00	0.00	0.00	0.42
	125.40	0.14	0.00	0.00	0.00
N3080	128.12	0.00	0.00	0.00	1.83
	128.37	0.25	0.00	0.00	1.79
	128.62	0.50	0.00	0.00	1.73
	128.87	0.75	0.00	0.00	1.66
	129.12	1.00	0.00	0.00	2.78
	129.37	1.25	0.00	0.00	0.32
	129.51	1.39	0.00	0.00	0.00
N3090	136.19	0.00	0.00	0.00	1.69
	136.44	0.25	0.00	0.00	0.00
	136.44	0.25	0.00	0.00	0.00
N3100	132.56	0.00	0.00	0.00	1.57
	132.66	0.10	0.00	0.00	0.00
N3160	151.04	0.00	0.00	0.00	0.82
	151.29	0.25	0.00	0.00	1.44
	151.54	0.50	0.00	0.00	0.42
	151.62	0.58	0.00	0.00	0.00
N3170	150.75	0.00	0.00	0.00	1.04
	151.00	0.25	0.00	0.00	0.93
	151.25	0.50	0.00	0.00	0.80
	151.50	0.75	0.00	0.00	0.54
	151.64	0.89	0.00	0.00	0.00
N3180	152.39	0.00	0.00	0.00	1.46
	152.59	0.20	0.00	0.00	0.00
N3190	138.57	0.00	0.00	0.00	0.59
	138.68	0.11	0.00	0.00	0.00
N3200	139.58	0.00	0.00	0.00	0.85
	139.73	0.15	0.00	0.00	0.00
N3210	141.27	0.00	0.00	0.00	0.85
	141.38	0.11	0.00	0.00	0.00

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Area 3 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N3010	71.58	0.00	0.00	0.00	1.92
	71.83	0.25	0.00	0.00	1.92
	71.84	0.26	0.00	0.00	0.00
N3030	84.85	0.00	0.00	0.00	0.79
	85.10	0.25	0.00	0.00	0.00
	85.10	0.25	0.00	0.00	0.00
N3050	115.27	0.00	0.00	0.00	1.32
	115.45	0.18	0.00	0.00	0.00
N3060	125.26	0.00	0.00	0.00	0.79
	125.45	0.19	0.00	0.00	0.00
N3080	128.12	0.00	0.00	0.00	2.59
	128.37	0.25	0.00	0.00	2.41
	128.62	0.50	0.00	0.00	2.32
	128.87	0.75	0.00	0.00	2.22
	129.12	1.00	0.00	0.00	3.70
	129.37	1.25	0.00	0.00	1.17
	129.62	1.50	0.00	0.00	0.00
	129.62	1.50	0.00	0.00	0.00
N3090	136.19	0.00	0.00	0.00	2.42
	136.44	0.25	0.00	0.00	0.22
	136.51	0.32	0.00	0.00	0.00
N3100	132.56	0.00	0.00	0.00	1.19
	132.77	0.21	0.00	0.00	0.00
N3120	144.65	0.00	0.00	0.00	0.86
	144.76	0.11	0.00	0.00	0.00
N3130	150.74	0.00	0.00	0.00	0.82
	150.86	0.12	0.00	0.00	0.00
N3160	151.04	0.00	0.00	0.00	1.64
	151.29	0.25	0.00	0.00	1.57
	151.54	0.50	0.00	0.00	1.46
	151.79	0.75	0.00	0.00	1.30
	152.04	1.00	0.00	0.00	1.08
	152.29	1.25	0.00	0.00	0.60
	152.40	1.36	0.00	0.00	0.00
N3170	150.75	0.00	0.00	0.00	1.82
	151.00	0.25	0.00	0.00	1.74
	151.25	0.50	0.00	0.00	1.64

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Area 3 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N3170	151.50	0.75	0.00	0.00	1.50
	151.75	1.00	0.00	0.00	1.33
	152.00	1.25	0.00	0.00	1.12
	152.25	1.50	0.00	0.00	0.72
	152.40	1.65	0.00	0.00	0.00
N3180	152.39	0.00	0.00	0.00	1.16
	152.64	0.25	0.00	0.00	0.11
	152.68	0.29	0.00	0.00	0.00
N3190	138.57	0.00	0.00	0.00	1.72
	138.75	0.18	0.00	0.00	0.00
N3200	139.58	0.00	0.00	0.00	1.08
	139.81	0.23	0.00	0.00	0.00
N3210	141.27	0.00	0.00	0.00	0.65
	141.41	0.14	0.00	0.00	0.00
N3220	141.59	0.00	0.00	0.00	1.05
	141.84	0.25	0.00	0.00	0.05
	141.85	0.26	0.00	0.00	0.00
N3230	146.05	0.00	0.00	0.00	0.80
	146.19	0.14	0.00	0.00	0.00
N3240	146.28	0.00	0.00	0.00	0.91
	146.46	0.18	0.00	0.00	0.00
N3340	79.77	0.00	0.00	0.00	1.33
	79.94	0.17	0.00	0.00	0.00
N3350	84.03	0.00	0.00	0.00	1.01
	84.22	0.19	0.00	0.00	0.00
N3360	92.66	0.00	0.00	0.00	0.83
	92.91	0.25	0.00	0.00	0.82
	93.16	0.50	0.00	0.00	0.81
	93.41	0.75	0.00	0.00	0.79
	93.66	1.00	0.00	0.00	0.77
	93.91	1.25	0.00	0.00	0.74
	94.16	1.50	0.00	0.00	0.71
	94.41	1.75	0.00	0.00	0.66
	94.66	2.00	0.00	0.00	0.57
	94.91	2.25	0.00	0.00	0.24
	95.13	2.47	0.00	0.00	0.00

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Area 3 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N3010	71.58	0.00	0.00	0.00	2.23
	71.83	0.25	0.00	0.00	2.58
	71.84	0.26	0.00	0.00	0.00
N3030	84.85	0.00	0.00	0.00	1.10
	85.10	0.25	0.00	0.00	1.23
	85.18	0.33	0.00	0.00	0.00
N3050	115.27	0.00	0.00	0.00	0.86
	115.52	0.25	0.00	0.00	0.00
	115.52	0.25	0.00	0.00	0.00
N3060	125.26	0.00	0.00	0.00	0.96
	125.50	0.24	0.00	0.00	0.00
N3080	128.12	0.00	0.00	0.00	3.75
	128.37	0.25	0.00	0.00	3.50
	128.62	0.50	0.00	0.00	3.32
	128.87	0.75	0.00	0.00	3.16
	129.12	1.00	0.00	0.00	5.36
	129.37	1.25	0.00	0.00	2.05
	129.62	1.50	0.00	0.00	0.25
	129.79	1.67	0.00	0.00	0.00
N3090	136.19	0.00	0.00	0.00	1.81
	136.44	0.25	0.00	0.00	1.08
	136.61	0.42	0.00	0.00	0.00
N3100	132.56	0.00	0.00	0.00	1.53
	132.81	0.25	0.00	0.00	0.17
	132.86	0.30	0.00	0.00	0.00
N3120	144.65	0.00	0.00	0.00	0.79
	144.80	0.15	0.00	0.00	0.00
N3130	150.74	0.00	0.00	0.00	3.01
	150.96	0.22	0.00	0.00	0.00
N3160	151.04	0.00	0.00	0.00	2.81
	151.29	0.25	0.00	0.00	2.75
	151.54	0.50	0.00	0.00	2.64
	151.79	0.75	0.00	0.00	2.50
	152.04	1.00	0.00	0.00	2.33
	152.29	1.25	0.00	0.00	2.10
	152.54	1.50	0.00	0.00	3.50
	152.79	1.75	0.00	0.00	2.45
	153.04	2.00	0.00	0.00	0.00

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Area 3 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N3160	153.04	2.00	0.00	0.00	0.00
N3170	150.75	0.00	0.00	0.00	3.00
	151.00	0.25	0.00	0.00	2.91
	151.25	0.50	0.00	0.00	2.82
	151.50	0.75	0.00	0.00	2.69
	151.75	1.00	0.00	0.00	2.54
	152.00	1.25	0.00	0.00	2.37
	152.25	1.50	0.00	0.00	2.15
	152.50	1.75	0.00	0.00	3.67
	152.75	2.00	0.00	0.00	2.66
	153.00	2.25	0.00	0.00	0.92
	153.04	2.29	0.00	0.00	0.00
N3180	152.39	0.00	0.00	0.00	2.38
	152.64	0.25	0.00	0.00	1.89
	152.89	0.50	0.00	0.00	1.82
	153.07	0.68	0.00	0.00	0.00
N3190	138.57	0.00	0.00	0.00	1.16
	138.81	0.24	0.00	0.00	0.00
N3200	139.58	0.00	0.00	0.00	1.40
	139.83	0.25	0.00	0.00	0.21
	139.90	0.32	0.00	0.00	0.00
N3210	141.27	0.00	0.00	0.00	0.92
	141.50	0.23	0.00	0.00	0.00
N3220	141.59	0.00	0.00	0.00	1.33
	141.84	0.25	0.00	0.00	0.70
	142.03	0.44	0.00	0.00	0.00
N3230	146.05	0.00	0.00	0.00	1.09
	146.27	0.22	0.00	0.00	0.00
N3240	146.28	0.00	0.00	0.00	1.24
	146.53	0.25	0.00	0.00	0.03
	146.55	0.27	0.00	0.00	0.00
N3250	151.75	0.00	0.00	0.00	0.15
	151.86	0.11	0.00	0.00	0.00
N3260	152.30	0.00	0.00	0.00	0.06
	152.41	0.11	0.00	0.00	0.00
N3310	147.69	0.00	0.00	0.00	0.02

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Area 4 - 10 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N4931	65.00	0.00	0.00	0.00	26.12
	65.25	0.25	0.00	0.00	25.86
	65.50	0.50	0.00	0.00	25.44
	65.75	0.75	0.00	0.00	24.92
	66.00	1.00	0.00	0.00	0.00
	66.00	1.00	0.00	0.00	0.00

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Area 4 - 25 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N4060	75.00	0.00	0.00	0.00	0.06
	75.01	0.01	0.00	0.00	0.00
N4931	65.00	0.00	0.00	0.00	26.57
	65.25	0.25	0.00	0.00	26.33
	65.50	0.50	0.00	0.00	25.99
	65.75	0.75	0.00	0.00	25.58
	66.00	1.00	0.00	0.00	0.00
	66.00	1.00	0.00	0.00	0.00

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Area 4 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N4060	75.00	0.00	0.00	0.00	3.44
	75.01	0.01	0.00	0.00	0.00
N4160	85.00	0.00	0.00	0.00	2.41
	85.25	0.25	0.00	0.00	1.94
	85.50	0.50	0.00	0.00	2.13
	85.67	0.67	0.00	0.00	0.00
N4931	65.00	0.00	0.00	0.00	26.99
	65.25	0.25	0.00	0.00	26.80
	65.50	0.50	0.00	0.00	26.54
	65.75	0.75	0.00	0.00	26.20
	66.00	1.00	0.00	0.00	0.00
	66.00	1.00	0.00	0.00	0.00

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Area 5 - 10 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N5250	72.64	0.00	0.00	0.00	0.76
	72.71	0.07	0.00	0.00	0.00
N5360	95.00	0.00	0.00	0.00	0.57
	95.08	0.08	0.00	0.00	0.00

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Area 5 - 100 Year Storm Event Simulation
Flood Duration Analysis Report

Node ID	Flood Elevation feet	Flood Depth feet	Flood Area acres	Flood Volume ac-ft	Flood Duration hours
N5250	72.64	0.00	0.00	0.00	1.32
	72.71	0.07	0.00	0.00	0.00
N5360	95.00	0.00	0.00	0.00	2.52
	95.08	0.08	0.00	0.00	0.00

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Master Stormwater Management Plan for the Lake Dora Basin

Project 95K260

Volume III

Water Quality Analysis
of the Dora Basin of Lake County, Florida

Prepared for

The St. Johns River Water Management District
and
Lake County

by

Ghioto & Associates

October 1996 (draft)

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EXECUTIVE SUMMARY

The Lake Dora Basin is located in Central Florida, within the Ocklawaha River Basin, and covers an area of approximately 42 square miles. It is situated among the cities of Eustis, Mt. Dora, and Tavares. The basin exhibits hydrologic characteristics of both ridge and valley landforms, as land elevations range from 200 to 60 feet above sea level. Deep sands, characterized by high infiltration rates, are found throughout the north and east portions of the basin, while low permeability, hydric soils are present in the flat and depressional areas to the south and west.

The Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District contracted with Ghioto & Associates to provide consultant and professional engineering services relating to the preparation of a Master Stormwater Management Plan (MSMP) for the Lake Dora Basin. The MSMP evaluates existing water quantity and quality conditions, locates problem areas, recommends measures for improvement and restoration, and provides design for improvement and restoration. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by Lake County in the planning and regulation of future development in the Lake Dora Basin.

This document is the last in a series of three volumes, which together provide results of the problem definition phase of the MSMP. In the preceding volume, entitled *Master Stormwater Management Plan for the Lake Dora Basin, Volume II, Water Quantity Analysis for the Dora Basin of Lake County, Florida*, the hydraulic performance of the primary stormwater conveyance system, under storm event rainfall conditions, was discussed The model described in that previous document was used as the basis for the development of a water quality model of the Lake Dora Watershed. In this final volume, the analysis of the watershed's response to meteorological conditions over a typical year are discussed, with emphasis on the quality of stormwater runoff.

This report presents the results of water quality modeling, including a discussion of model development, testing, and predictive simulations. The development of a typical year rainfall distribution, to drive the long term water quality simulation, is described. Results of simulation of the response of the system to the typical year rainfall are presented in detail, and water quality problem areas are identified.

CHAPTER I. INTRODUCTION

This document describes activities undertaken for the water quality analysis of the Lake Dora Basin. It is the last in a series of three volumes, which together provide results of the problem definition phase of the Master Stormwater Management Plan. This project was jointly funded by the Governing Board of the St. Johns River Water Management District and the Lake County Board of County Commissioners, and was administered by the District.

A. LOCATION AND EXTENT OF THE STUDY AREA

The Lake Dora Basin is located in Central Florida, amid the cities of Eustis, Mount Dora and Tavares. From the Apopka-Beauclair Canal lock and dam to the Lake Dora Canal at US 441, the Lake Dora Basin covers an area of approximately 42 square miles. The study area is generally bounded on the north by Lake Eustis, on the south by Lake Apopka, on the east by the Wolf Branch Basin, and on the west by Lake Harris. A general location map is provided in Figure I-1.

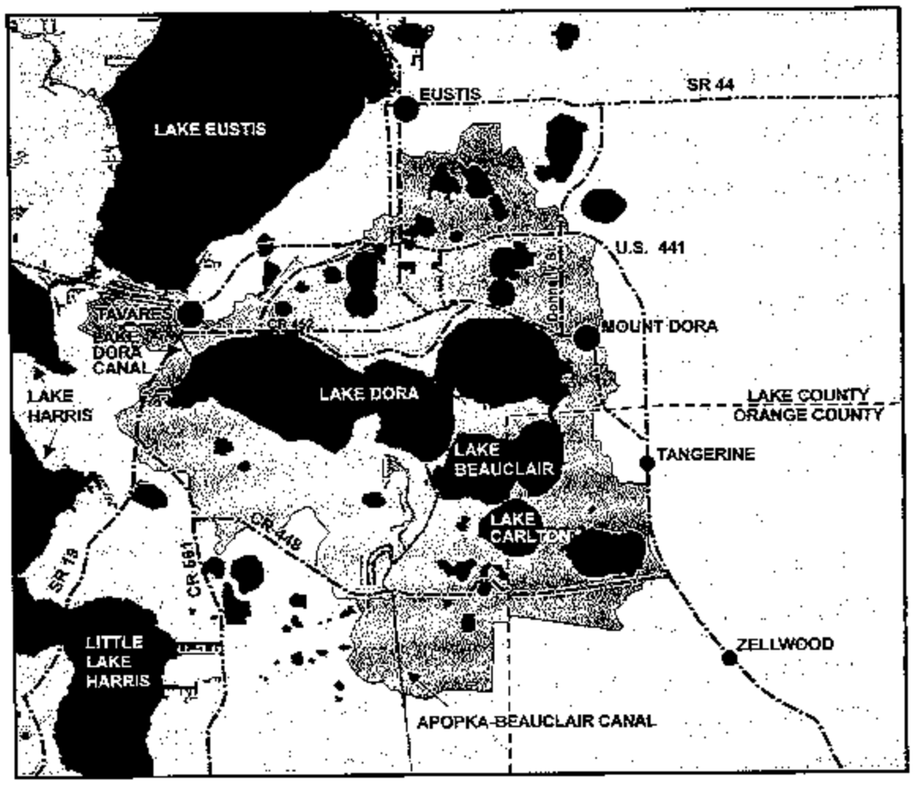
B. PROJECT OBJECTIVES

The primary objective of this study is the development of a Master Stormwater Management Plan (MSMP). The MSMP evaluates existing water quantity and quality conditions, locates problems areas, and recommends and designs measures for improvement and restoration. Feasible structural and non-structural approaches to storm water management will be significant parts of the plan. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by the County in the planning and regulation of future development in the Lake Dora Basin.

C. SCOPE OF WORK

On September 26, 1995, the Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District approved an agreement whereby Ghioto & Associates would provide consultant and professional engineering services relating to preparation of a Master Stormwater Management Plan for the Lake Dora Basin. Under that agreement, the watershed to be studied in detail includes a 42 square mile contributing area, and excludes the Wolf Branch Basin.

Master Stormwater Management Plan for the Lake Dora Basin



Location Map

Figure I-1

Overall, the Master Stormwater Management Plan consists of three (3) phases:

Phase I	The Problem Definition Phase
Phase II	The Conceptual Design and Permitting Phase
Phase III	The Implementation and Construction Phase

Phase I tasks consist of the collection of existing data (including coordination of any previous studies, documents and data and collection of additional information through field survey), the development of water quantity and quality simulation models for the Lake Dora watershed, and the identification of problem areas in the watershed.

The model to be employed is the Environmental Protection Agency's Stormwater Management Model (SWMM). SWMM is to be implemented as a surface water model for storm events, utilizing the Extended Transport block for water quantity simulations. The model is then to be implemented as a surface water model for a typical year's rainfall, utilizing the Transport block for continuous water quality simulations.

D. STUDY PARTICIPANTS

This report is the result of a great deal of effort, not only by Ghioto & Associates staff, but also by the staffs of the St. Johns River Water Management District, and Lake County. Both the District and the County provided extensive assistance by providing GIS coverages, data and other information that made this work product possible.

Mr. John Richmond of the SJRWMD is commended for his support and for his attention to detail in the execution and project management of District activities. Ms. Lora Bailey is gratefully acknowledged for her project management activities on behalf of Lake County. Mr. Elliot Moore, also of Lake County, is commended for his coordination of data collection activities with all other agencies. The members of the SJRWMD review team, Mr. Martien Bergman, Mr Marc Adkins, Mr Lou Donnangelo, and Mr Rolland Fulton, are also gratefully acknowledged.

E. ORGANIZATION OF THIS REPORT

This document is the last in a series of three volumes, which together provide the results of the problem definition phase of the Master Stormwater Management Plan.

The organization of Volume III is briefly described in the following :

Chapter II contains general modeling requirements, including a discussion of the modeling and support programs employed in the analysis, and the meteorological and boundary conditions under which the system is modeled.

Chapter III contains a discussion of model input data assembly, including the methods to define parameters which describe characteristics of the hydrologic system, the manner in which physical attributes of the conveyance system were collected and translated into a model database, and the assignment of Event Mean Concentrations to generate pollutant loadings.

Chapter IV contains a discussion of the typical year rainfall analysis, in which a historical rainfall record was identified that was characteristic of a "typical" year of precipitation. That historical rainfall data would be used, along with historical evaporation data for the same period of time, to drive continuous simulations for pollutant loading analyses.

Chapter V contains a discussion of model testing, addressing the lack of historical data for use in calibration and verification of the model. This chapter refers to the comparisons previously made (and discussed in Volume II of this report) between SWMM simulation results and the results of comparative CHAN simulations, as well as the analysis of sensitivity of the model to parameter selections.

Chapter VI contains an overview of the results of predictive simulation for the Lake Dora Watershed Both water budget and pollutant loading results are discussed and tabulated for the typical year (detailed monthly simulation results are listed in an appended summary table to provide a temporal view of the loadings of all pollutants across the entire watershed).

Chapter VII contains a discussion on problem area identification and classification. Areal pollutant loading rates (in lbs/ac-yr) are tabulated for all nodes in the modeled system. The spatial distribution of those loading rates are depicted graphically, as well.

Chapter VIII contains a summary of this report.

Volume I in the series presents a reconnaissance of existing data. Included in that document is a discussion of data collection, agency coordination, field survey, and preliminary site investigation efforts.

Volume II in the series presents results of water quantity modeling. Included in that document is a discussion of model development, testing, and predictive simulations. Results of simulation of the response of the system to the 10, 25, and 100 Year storm events are presented in detail, and problem areas are identified.

CHAPTER II. GENERAL MODELING REQUIREMENTS

The analysis discussed herein includes a hydrologic evaluation of the primary drainage system under typical, long term meteorological conditions. In order to predict the response of the study area to rainfall and evaluate pollutant loadings across the Lake Dora Watershed, a water quality model was developed. A model, in this context, is a mathematical representation of the physical and behavioral characteristics of a system. With this mathematical representation, meteorological conditions across the watershed are simulated, and the results are analyzed to evaluate the spatial and temporal distribution of pollutant loadings throughout the system.

A. MODEL SELECTION

Numerous types of computer models are available for use in the analysis of surface water hydrology and hydraulics, and can generally be placed into either single event or continuous categories. Single event surface water models are used to evaluate the response of systems to discrete rainfall events, while continuous surface water models evaluate the response of systems to long term meteorological conditions including rainfall and evapotranspiration. A number of available models can be used in both of these computational modes.

The objectives of the Lake Dora Watershed modeling included the evaluation of the response of the drainage system to a set of discrete storm events (as was discussed in a previous volume of this report). In addition, long-term simulations of a "typical year" rainfall were to be performed. The Environmental Protection Agency's Storm Water Management Model (SWMM) was selected for use. SWMM can be operated in either event or continuous mode, and has the ability to account for both the quantity and the quality of surface water runoff.

B. THE STORMWATER MANAGEMENT MODEL

The Environmental Protection Agency's Stormwater Management Model (SWMM Versions 4.2 and 4.31) was used to simulate the response of the study area to rainfall, given a set of parameters that describe the characteristics of the surface water drainage system. Throughout the remainder of this and subsequent chapters, the descriptions of the model formulation will be brief, and will focus only on those capabilities of SWMM that were employed for this particular investigation. A more detailed description of the model, its time, space and mathematical properties, the physical, chemical and biological process that can

be simulated, and input data requirements for various levels of investigation, are very well documented in the SWMM User's Manuals.

SWMM is constructed in the form of "blocks". The Runoff block of SWMM is used to simulate both the quantity and the quality of rainfall excess for a drainage basin. This block generates surface runoff from a basin based upon a rainfall hyetograph, antecedent conditions, land cover and topography. The basin itself is represented by a set of idealized subcatchments, each described by its own set of input parameters. Subcatchment elements represent idealized areas of uniform slope, with parameters such as surface roughness, depression storage and infiltration representative of average conditions across the area. Subcatchments receive rainfall and account for losses due to ponding, evaporation and infiltration. Flow routing of rainfall excess is accomplished by approximating each subcatchment as a non-linear reservoir.

The Runoff block can also be used to route the resulting flows and contaminants to some receiving body through a series of gutters or pipes. Ordinarily, should flow routing be desired during a continuous simulation, those Runoff block channel and pipe elements would be employed. However, in this investigation, the Transport block was selected as an alternative for performing flow routings. Each component of a conveyance system is classified as a certain type of element in the Transport block of SWMM, providing an idealized link and node representation. Elements typically include conduits, manholes, and overflow structures. Flow routing through these elements proceeds during each increment in time, following a kinematic wave approach, until the storm hydrographs have been passed through the system. Backwater effects are not modeled beyond the realm of a single conduit and downstream conditions are assumed not to affect upstream computations.

C. SWMM EXTENSIONS OF THE CHAN PROGRAM

A customized version of Aquarian Software's CHAN for Windows was employed as a pre-processor to the SWMM program. CHAN is a hydrologic and hydrodynamic model, similar in many respect to SWMM, and requires hydrologic and hydraulic input data similar to that required by the Runoff, Transport and Extended Transport blocks of SWMM. However, in some cases CHAN allows model elements to be described in a more intuitive manner. For example, invert elevations of structures are stored directly in the CHAN database, whereas the Extended Transport block of SWMM stores depths above a manhole invert. In addition, CHAN allows the actual (surveyed) manhole bottom elevation to be specified, whereas the Extended Transport block requires that the manhole bottom be defined at the same elevation as the invert of the lowest connected pipe.

These and other differences in the definition and storage of physical data describing the drainage system led to the choice of using CHAN for construction of the model network database. CHAN export and translation functions were then employed to generate SWMM input data files for execution of subsequent simulations.

It is important to reiterate that all modeling was performed using the EPA SWMM model, while the CHAN program was used as a pre-processor for SWMM. Throughout the remainder of this report, the specific manner in which CHAN was employed, in support of the modeling effort, will be detailed so that the reader can fully understand the data manipulation and processing techniques employed in construction of the model database.

D. GEOGRAPHIC INFORMATION SYSTEMS

Development of a computer model of a watershed requires the collection and assimilation of substantial amounts of physical data. Many of the spatially lumped parameters required to describe subcatchments in the SWMM model are most efficiently defined through analysis with a Geographic Information System. The ArcCad and AutoCad programs (by ESRI and AutoDesk, respectively) were employed to digitize, store and process geographic data. The processed, spatial data was imported to the CHAN model database, and subsequently translated into subcatchment parameter values as required by the SWMM model.

E. PERIOD AND CONDITIONS OF ANALYSIS

SWMM may be run for periods ranging from minutes to years. Generally, simulations covering a period of less than a few weeks, which are focused upon one or more discrete storm events, are referred to as single event mode simulations. More lengthy simulations, which concentrate upon the hydrologic response of a system to long-term meteorological conditions are usually referred to as continuous mode simulations.

A long-term, continuous simulation approach was undertaken for this investigation. The period of this continuous simulation was selected to be one year. Over the course of the simulated year, historical hourly rainfall data and average monthly evapotranspiration data were employed to describe the meteorological conditions. The hourly rainfall data employed are representative of conditions for a "typical year".

F. POLLUTANT LOADING AND TRANSPORT

Large uncertainties arise both in the representation of the physical, chemical, and biological processes and in the acquisition of data and parameters for water quality model algorithms. The data required to formulate pollutographs are the most controversial of any SWMM input data. Such data and their possible sources are discussed thoroughly in the SWMM User's Manual. It is also emphasized in the SWMM User's Manual that unless actual field sampling of runoff quality has been performed, the credibility of predicted water quality simulation results cannot be established.

The primary purpose of the water quality model of the Lake Dora Watershed is to provide a framework around which to develop an accounting of pollutant loadings. Specifically, this includes the accounting of total phosphorous, total nitrogen, suspended solids, zinc, and lead loadings to Lake Dora. The model will be used in the future to aid in the assessment of proposed stormwater management alternatives. Despite uncertainties regarding the computed magnitudes of actual pollutant loads, the model will be a useful tool for such management purposes. Pollutant loadings can be compared relative to changing land use within the watershed

Through computation with the SWMM Runoff and Transport blocks, such an accounting is made possible. Pollutant loadings are generated in the Runoff Block, then transferred using an interface file to the Transport block for routing through the drainage system.

CHAPTER III. MODEL INPUT DATA ASSEMBLY

A model input database stores the physical attributes of a drainage system in terms of conceptual model elements. The following describes the methods used to develop parameters to describe characteristics of the hydrologic system, including the assignment of Event Mean Concentrations (EMCs) for pollutant loading. It describes the manner in which physical attributes of the conveyance system were collected and translated to build a model database for simulation.

A. THE MODEL NETWORK

SWMM operates with a network of elements which describe the physical layout of a system. Generally, these elements are comprised of subcatchments, inlets, manholes and conduits. In the SWMM Runoff block, subcatchment elements receive rainfall and account for losses due to ponding, evaporation and infiltration. The excess rainfall is routed across the subcatchment to an inlet element. In the SWMM Transport block, conduit elements link the inlets (and manholes) and provide conveyance for the surface water runoff to receiving bodies.

Nine distinct model networks were developed to describe the surface water conveyance systems within the Lake Dora Watershed. These networks depict individual drainage systems that could be analyzed separately, thus providing for smaller model input and output data sets, faster simulations, and more focused analysis of results. Another advantage to separation into modeled subareas will be experienced during future modifications to the model, for analysis of proposed system modifications. Figure III-1 presents an overview of the segmentation of the overall study area into those nine modeled subareas, and a brief summary description of each is provided in the following.

The first subarea model consists of 8 subcatchments, covering 145 acres. It generally comprises the southern extents of the City of Mount Dora. The second subarea model includes the central portion of the City of Mount Dora. It consists of 24 subcatchments, covering 229 acres. The third subarea model includes the northern extents of the City of Mount Dora and consists of 28 subcatchments, covering 163 acres. Each of these three subareas are characterized primarily by closed storm sewer systems, with few open channel reaches and little surface storage (ponds, depressional wetlands, etc.). All three subareas discharge directly to Lake Dora.

In contrast, the fourth subarea model, comprised of 50 subcatchments covering 5145 acres, contains large surface storage areas, including Lakes Gertrude,

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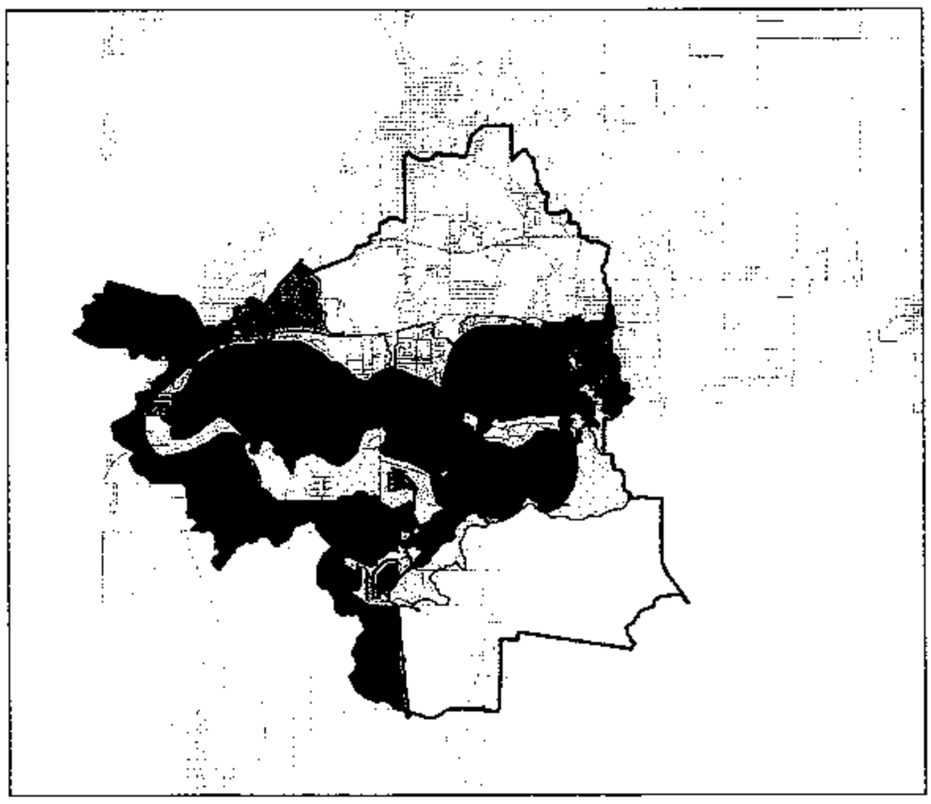

Modeled Subareas

Lakes Dora & Beauclair
Area 1
Area 2
Area 3
Area 4
Area 5
Area 6
Area 7
Area 8
Area 9

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Not To Scale

Figure III-1

John, Tem, and Saunders and numerous wetland depressions, which serve to greatly attenuate flows prior to discharge to Lake Dora. Also contained in this subarea are a number of catchments which surround "closed" lake systems, including East and West Crooked Lakes, Lakes Dicie, Louise and Woodward.

The fifth and sixth subarea models describe portions of the extensive closed storm sewer systems in and around the City of Tavares. These models are comprised of 30 and 18 subcatchments, covering 561 and 50 acres, respectively. Like the three Mount Dora subareas, the Tavares subareas are characterized primarily by closed storm sewer systems, with few open channel reaches and little surface storage.

The seventh and eighth subarea models depict lands generally to the southwest and south of Lake Dora, respectively. Those models consist of 16 and 32 subcatchments, covering 1746 and 4683 acres. Drainage within these portions of the study area can be defined generally by topographic means. That is, drainage patterns are related more to natural topography than to manmade conveyances (ditches, structures, etc.).

The ninth subarea includes land immediately adjacent to Lake Dora, Lake Beauclair and the Apopka-Beauclair Canal.

Many of the subcatchments, particularly those delineated throughout Subareas 4, 7, and 8, do not contribute flows to Lake Dora under most circumstances. Pollutant loadings generated from runoff in these areas do not reach Lake Dora. Rather, each of those subcatchments contributes loadings to other local wetlands and receiving waterbodies.

B. THE MODEL DATABASE

CHAN for Windows was employed as a pre-processor for the SWMM model, for the reasons briefly discussed in the preceding chapter. In order to store collected data describing the study area, and to manipulate that data for use with the SWMM model, a CHAN-format model network database was constructed for each of the nine subareas. Each model database contains a schematic representation of the modeled system, as well as all of the physical data describing hydrologic and hydraulic characteristics of elements in each system. In addition, each model database contains detailed comments regarding the source of data (field survey identifier, field book and page number) and assumptions made in describing the model elements. Additional detail regarding the contents of the network database files will be provided below.

Each CHAN-format network database can be translated to a SWMM input data file for simulation. Translation options include selection of the hydraulic routing

method to be performed (Runoff, Transport, or Extended Transport block), the use of alphanumerics in identification of SWMM model elements, specification of monthly evaporation data, and more. Other support input data files are selected at the time of translation to define meteorological conditions employed by SWMM in modeling the network's performance. For example, the typical year rainfall period was selected for use in water quality simulations. The ability to select external support files removes the storm event rainfall data from the network database itself, so that a single CHAN network database can be used with any selected rainfall file.

C. SUBCATCHMENT DATA

Subcatchment elements define the land area that contributes runoff to a segment of the surface water drainage system. A rainfall hyetograph is assigned to each subcatchment for simulation. Infiltration computations for a subcatchment can be performed using either the Horton or the Green-Ampt methods in the SWMM Runoff block. In this analysis, the Green-Ampt method was selected, due to its physically-based formulation and the experience of staff employing the method. Rainfall excess (runoff) is routed across the subcatchment, to a receiving node, or inlet.

Delineation of Spatial Data. Development of subcatchment element data included the identification of subcatchment, land cover and soil type boundaries. This effort consisted of the delineation and digitization of subcatchment boundaries, using 1 inch = 200 feet aerial photogrammetry. Figure III-2 presents delineations for the entire Lake Dora Watershed.

Land use boundaries were provided, in digital form, by the SJRWMD. In that database, each land use area was identified using the Florida Land Use, Cover and Forms Classification System (FLUCCS). For use with the SWMM model, these land cover categories were cross-referenced into a set of five general land use groups, including Residential, Commercial, Agricultural, Open Space and Water.

Soil type boundaries were also provided, in digital form, by the SJRWMD. In that database, individual soil types were identified using codes from the NRCS Soil Survey. Soil types were used in defining hydrologic parameters for modeling with SWMM.

Processing of Spatial Data. A Geographic Information System was employed to process the spatial database of basin, land use and soils delineations. Figure III-3 depicts the process employed, which results in the segmentation of the entire watershed into hydrologic units, each containing a description of the land use and soil type and the basin in which the hydrologic unit belongs. These

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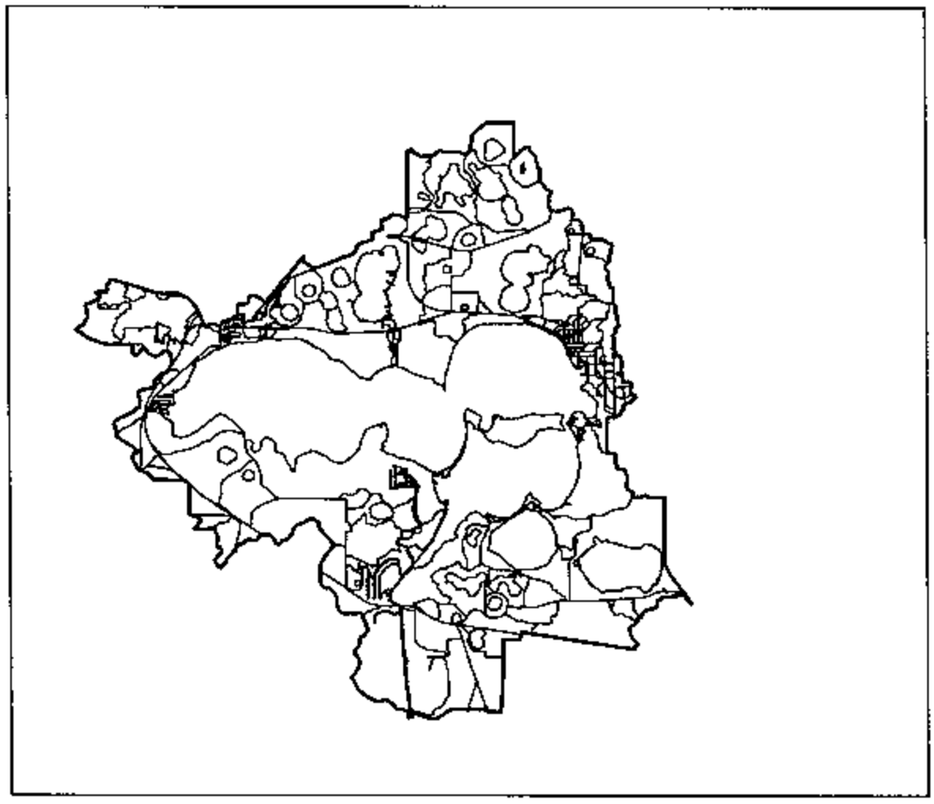

Subcatchment Delineations

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Figure III-2

hydrologic units are imported directly into the CHAN model network database for automated subcatchment parameter development.

The CHAN model network database contains numerous parameter lookup tables. These lookup tables provide a means of automatically translating the intrinsic spatial data of the GIS into related parameters describing subcatchment characteristics, so that for a given land use and soil combination a parameter value (such as hydraulic conductivity) is defined. The processing of parameters for all land use and soil combinations allows the assignment of weighted parameter values for all subcatchments. This weighting was employed for assignment of initial moisture deficit, hydraulic conductivity, average capillary suction, impervious Manning's n, pervious Manning's n, and percentages of imperviousness for each subcatchment in the Lake Dora watershed.

Loading Parameters. The CHAN model network database also allows for the definition of Event Mean Concentration lookup tables, for any number of pollutants. These lookup tables provide a means of automatically assigning weighted EMC values for subcatchments. For a given land use and soil combination a parameter value (such as EMC for Total Nitrogen) is defined. The processing of parameters for all land use and soil combinations allows the assignment of weighted EMC values for all pollutants across all subcatchments.

Other Subcatchment Characteristics. A number of subcatchment parameters were not processed spatially. Subcatchment width and slope are examples of parameters for which manual takeoffs were required. In order to develop these two parameter values, a travel path for each subcatchment was defined. The slope along this travel path was assigned as the subcatchment slope. The subcatchment width was defined as the total area of the subcatchment divided by the travel path length

D. CONVEYANCE SYSTEM DATA

As previously discussed, hydraulic modeling was performed for the primary conveyance system, utilizing the Transport block of SWMM. Data to support this detailed modeling analysis was provided through field survey of drainage structures, and augmented by field estimates of structure geometry and estimates of overflows from photogrammetry. Figure III-4 presents locations of field survey.

As hydraulic data was entered into the CHAN model network database, notes on the source of the data (field book number and page) and other assumptions regarding the modeled features were entered as comments, for later reference. These comments serve to indicate where field data was available and where reliance was placed on estimates and assumptions for modeling.

Layered Approach To Hydrologic Units

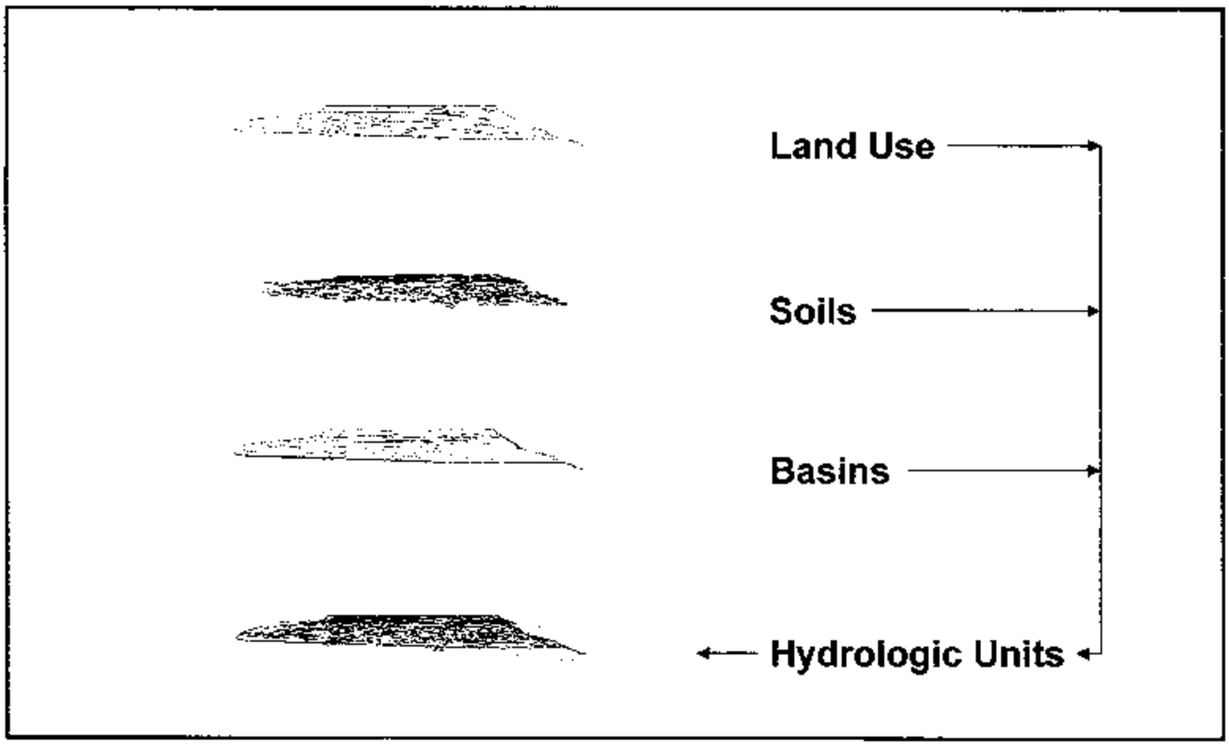
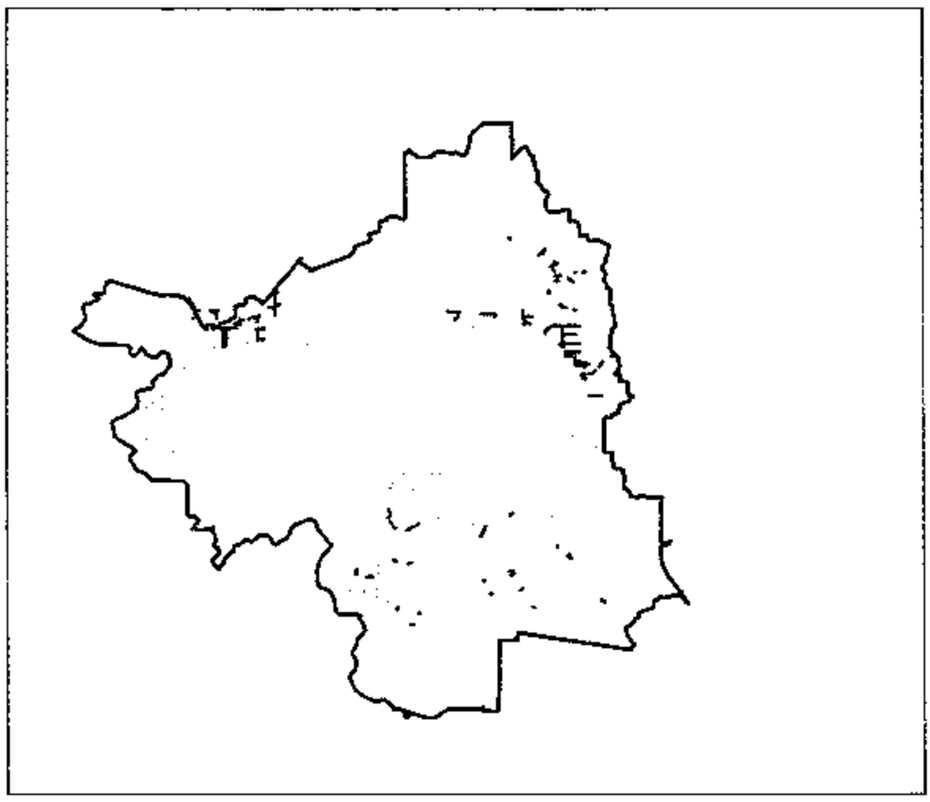


Figure III-3

Master Stormwater Management Plan for the Lake Dora Basin



Field Survey Locations

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Figure III-4

Photogrammetry was used extensively to define storage (as an elevation versus area relation) for the many lakes, wetlands, and depressional areas across the Lake Dora Watershed. Initial conditions in all of these storage areas were defined based upon a review of the aerial photogrammetry. No historical data was available to otherwise define initial stages in the lakes and depressions.

Tailwater boundary conditions in Lake Dora, Lake Beauclair, the Dora Canal and the Apopka Beauclair Canal were assumed static, at an elevation of 63 feet NGVD.

E. RAINFALL

Rainfall volumes (in inches) over one hour intervals were developed for input to SWMM for continuous simulation. Those rainfall volumes were developed for the time period previously described as the typical year, from data provided by the National Weather Service. Rainfall volumes are converted to intensities over the rainfall interval, internally, by SWMM. Those intensities are then applied uniformly to subcatchments to drive the hydrologic simulation.

F. EVAPORATION

Monthly average evaporation rates (in inches per day) were developed for input to SWMM for continuous simulation. Those rates are subtracted from rainfall at each timestep and are used to replenish surface depression storage and to provide an upper bound for soil moisture evaporation. While single event simulations are insensitive to the evaporation rate, evaporation comprises a significant component of the water budget during continuous simulation.

For simulation, monthly average evaporation rates at Lisbon from October 1969 through September 1969 were used (to coincide with the selected period for the typical year rainfall). A coefficient of 0.75 was employed to convert pan evaporation into actual evapotranspiration. Table III-1 presents historical pan evaporation rates, in inches per month, converted average daily values, in inches per day, and the adjusted (actual) evapotranspiration rates, also in inches per day. The latter rates were used for simulation.

Table III-1

Pan Evaporation at Lisbon
(Using data for the period from October 1969 through September 1970 to coincide with typical year rainfall)

Month	Pan Evaporation in Inches per Month	Pan Evaporation in Inches per Day	Evapotranpiration in Inches per Day
January	2.38	0.0768	0.0576
February	3.13	0.1118	0.0838
March	4.45	0.1435	0.1077
April	6.00	0.2000	0.1500
May	7.12	0.2297	0.1723
June	6.36	0.2120	0.1590
July	6.29	0.2029	0.1522
August	5.78	0.1864	0.1399
September	4.69	0.1563	0.1172
October	4.11	0.1326	0.0994
November	2.64	0.0880	0.0660
December	3.17	0.1022	0.0767

(note: Evapotranspiration computed with 0.75 Pan Coefficient)

G. POLLUTANT LOAD GENERATION WITH SWMM

As previously stated, uncertainties in the representation of the processes and in the acquisition of data and parameters for model algorithms for water quality simulation present a major hurdle to prediction of the amount of pollutants that build up on a watershed and the amount that washes off. These difficulties are specifically pointed out and discussed in the SWMM User's Manual, and two methods of dealing with the uncertainties are suggested. The first option is to collect enough calibration and verification data to be able to calibrate the simulation. The second is to abandon the notion of detailed quality simulation altogether and use a constant concentration applied to predicted quantities.

After careful review of available literature, Ghioto & Associates recommended to staff that it would not be advisable to perform buildup and washoff computations without site-specific data. Those data would have to be obtained through costly sequential storm sampling over a sufficient period of time, and was not envisioned for the project.

The original scope of work was structured to use average Florida data to perform calibration of the water quality model. In other words, input data adjustments

would be made so that computed Event Mean Concentrations would approximate the published average values. This would require trial and error use of buildup and washoff function input data to produce the desired average annual Event Mean Concentrations, and there are many potential combinations that could produce the same result. Therefore, the final buildup and washoff input data would be technically indefensible.

Ghiolo & Associates recommendation was to develop individual storm concentrations, using published average data. This approach would avoid issues of defensibility, would insure model calibration, and would retain the hydrologic components that determine resulting time varying pollutant loads over the year of simulation. District and County staff were in general concurrence with this recommendation.

Constant concentrations can be simulated with SWMM by using a rating curve. Parameters are entered for each particular pollutant constituent. The rating curve equation uses the runoff from a subcatchment, providing a loading based on flow rate and the concentration of the pollutant. Event mean concentration data used to describe the rating curves were taken from published stormwater loading rate parameters for Central and South Florida (Harvey H. Harper, Ph.D. - 1994). These loading rate parameters are displayed in Table III-2. The published data was adapted, for assignment to five general land use categories. The adapted loading rate parameters are displayed in Table III-3.

Table III-2 Runoff Concentrations for Selected Land Use Categories From Harper, 1994

Landuse	Total N	Total P	TSS	Total Zn	Total Pb
Low Density Residential	1.77	.177	19.1	.032	.037
Single-Family	2.29	.30	27.0	.057	.048
Multi-Family	2.42	.49	71.7	.055	.087
Low Intensity Commercial	1.18	.15	81.0	111	.136
High Intensity Commercial	2.83	.43	94.3	.170	.214
Industrial	1.79	.31	93.9	.122	.202
Highway	2.08	.34	50.3	.134	.189
Agricultural	2.32	.344	55.3	-	-
Recreational/Open Space	1.25	.053	11.1	.006	.025
Mining	1.18	.15	93.9	.122	.202
Wetland	1.60	.19	10.2	.006	.025
Open Water/Lake	1.25	.11	3.1	.028	.025

Table III-3 Runoff Concentrations for Selected Land Use Categories (adapted from Harper, 1994)

	Typical Runoff Concentration (mg/l)				
Land Use	TN	TP	TSS	TZn	TPb
Residential	2.29	0.30	27.0	0.057	0.048
Commercial	1.79	0.31	93.9	0.122	0.202
Agricultural	2.32	0.344	55 3	0.006	0.025
Open Space	1.25	0.053	11.1	0.006	0.025
Water	1.25	0.11	3.1	0.028	0.025

(note: original data, by Harper, adapted to land use categories in the Lake Dora MSMP)

CHAPTER IV. TYPICAL YEAR RAINFALL ANALYSIS

Rainfall data are the single most important group of hydrologic data required by SWMM. For this analysis, a one year, historical rainfall record was identified that was characteristic of a "typical" year of precipitation. That data would be used, along with historical evaporation data for the same period of time, to drive continuous simulations for pollutant loading analyses.

A. TOTAL RAINFALL VOLUME

The first criterion employed to find that typical year was to identify all historical periods during which the total rainfall volume was approximately equal to the average annual rainfall for the period of record, or 48.4 inches. While restricting the search to 12-month periods beginning on January 1, only eight such periods were found to be within 5 percent of the average annual rainfall. However, by expanding the search to 12-month periods beginning on the first day of any given month, a total of 115 periods were identified as candidates for the typical year.

B. FREQUENCY AND MAGNITUDE OF EVENTS

In order to be considered a typical year rainfall, the selected historical sequence would also be required to contain a certain proportion of small, medium and large storm events. A frequency analysis was performed on historical rainfall data for the period of record, to determine those target proportions. From this analysis, a plot of daily rainfall versus percentage of time exceeded was developed. This plot, or rainfall exceedence curve, graphically demonstrates the frequency with which a rainfall of some magnitude was equaled or exceeded during the entire period of record.

During a "typical" year, the same proportional frequencies of small, medium and large events would be observed, and the rainfall exceedence curves would match that for the period of record. To test each of the 115 candidate periods for this characteristic, each was individually subjected to a frequency analysis. The exceedence curve for each candidate period was then overlaid upon the period of record exceedence curve and qualitatively selected or rejected as being similar in character. As a result of this comparison, four candidate periods remained for consideration as being "typical" for the area.

C. MONTHLY DISTRIBUTION

Finally, each of the remaining four historical periods were compared on a monthly basis to the period of record. Average monthly rainfall totals for the period of record were computed. Monthly rainfall totals for each of the candidate years were compared to the period of record averages. As a result, only one 12-month period remained a candidate for the "typical" year.

D. THE TYPICAL YEAR RAINFALL

The typical year rainfall was determined to be best represented by the historical period from October 1, 1969 through September 30, 1970. Daily rainfall records indicate that the total rainfall was 48.98 inches. During that period, the maximum recorded rainfall was 3.28 inches in a 24-hour period. Four events exceed 1.5 inches and nine others exceed 1.0 inches in a 24-hour period. Thus, the typical year exhibits a favorable number of significant rainfall events.

The month of October presents the largest departure from the average monthly volumes for the period of record. Regardless, the overall monthly distribution of rainfall compares favorably. This is particularly true in light of comparisons that were made for other candidate periods, as shown in Table IV-1 with bold fonts indicative of significant departures from average monthly totals.

Table IV-2 presents the rainfall exceedence relation for the typical year, along with that for the period of record. The distribution of rainfall events of various magnitudes compares well with that for the period of record.

Table IV-1 — **Candidate Period Comparisons to Period of Record Monthly Rainfall Totals as Lisbon**

Month	Recorded Average	Candidate 12-Month Periods (beginning date) Sep 1969	Oct 1969	Feb 1974	Sep 1978
Jan	3.14	3.66	3.66	2.18	7.15
Feb	3.31	5.84	5.84	2.74	2.13
Mar	4.14	4.25	4.25	3.57	3.73
Apr	2.59	2.06	2.06	1.01	0.94
May	4.01	2.19	2.19	3.77	10.51
Jun	5.98	3.47	3.47	13.50	1.60
Jul	6.30	2.44	2.44	6.97	5.21
Aug	6.44	4.84	4.84	5.59	6.45
Sep	5.40	4.35	2.45	4.07	3.03
Oct	2.57	9.22	9.22	0.23	1.02
Nov	2.09	1.49	1.49	0.65	0.00
Dec	2.40	5.17	5.17	1.94	4.86

Table IV-2 — **Typical Year Comparison to Period of Record Rainfall Exceedence Relation**

Rainfall Range	Typical Year Frequency	Typical Year No. Points	Period of Record Frequency	Period of Record No. Points
0.00 - 0.25	.860	314	.860	11305
0.25 - 0.50	.912	19	.913	703
0.50 - 0.75	.948	13	.943	386
0.75 - 1.00	.959	4	.962	259
1.00 - 1.25	.967	3	.974	156
1.25 - 1.50	.984	6	.982	101
1.50 - 1.75	.989	2	.988	76
1.75 - 2.00	.992	1	.992	52
2.00 - 2.25	.995	1	.994	37
2.25 - 2.50	.995	0	.996	16
2.50 - 2.75	.995	0	.997	13
2.75 - 3.00	.997	1	.997	11
3.00 - 3.25	.997	0	.998	7
3.25 - 3.50	1.000	1	.999	6
3.50 - 3.75	1.000	0	.999	5
3.75 - 4.00	1.000	0	.999	5
4.00 - 4.25	1.000	0	1.000	4
4.25 - 4.50	1.000	0	1.000	4
4.50 - 4.75	1.000	0	1.000	1
4.75 - 5.00	1.000	0	1.000	0

CHAPTER V. TESTING, CALIBRATION and VERIFICATION

Mathematical models are traditionally subjected to a calibration process in order to improve their ability to hindcast the response of the system to historical rainfall conditions. Verification of the calibrated model is then performed, to determine the ability of the model to simulate the system response under other meteorological conditions. A verified model is usually assumed to be a good predictor of system response to design storm events. In order to calibrate (and verify) a model, however, historical rainfall, streamflow and lake stage data is required. Such historical data was not available for use in this study. An alternative methodology was therefore developed to test the model, and its sensitivity to parameter selection.

A. MODEL TESTING AND ADJUSTMENTS

Extensive model testing had previously been performed for each of the nine subarea models during the water quantity analysis, as detailed in the preceding volume of this report. Because the same data set was used for quantity and quality modeling, only translated differently from the CHAN network database, no extensive testing effort was required.

One difference in the model networks employed is that the many overflows used in the quantity simulation were not used in the quality simulation. For example, flow down streets during surcharge conditions was not allowed for the quality simulation. It is assumed that during a typical year, such extreme conditions as those encountered in a design storm event would not occur. Therefore, during translation, only a primary conveyance path was allowed from any given node, for transport of flow and pollutants.

B. MODEL CALIBRATION, VERIFICATION AND SENSITIVITY

As in the case of the water quantity modeling, no historical data was available for calibration and verification of the water quality model. This lack of data limits the ability to precisely define the accuracy with which the model reflects actual flow and pollutant loading and transport conditions. However, to the extent possible, the model was refined to provide reasonable results.

The previous testing and comparisons made with the SWMM Runoff and Extended Transport blocks to the CHAN simulations using SCS Curve Number and Unit Hydrograph methods were sufficient to adequately adjust soil parameters, most notably the hydraulic conductivity values employed in the

model. Continuous simulation results indicated that the volume of runoff is far more sensitive to the assignment of imperviousness data to a subcatchment than it is to the minor adjustment of soil parameters. This is due, in part, to the fact that rainfall intensities associated with the typical year rainfall distribution are small, compared to those of the 10, 25 and 100 Year storm events.

C. POTENTIAL SUBSURFACE INTERACTIONS

The model of the Lake Dora Watershed is a surface water application of SWMM. The interactions of the surface water system with the surficial and confined aquifers are not simulated. Baseflow conditions are not modeled explicitly. For portions of the Lake Dora Watershed, particularly when performing long-term simulations to account for the transport of pollutants, such interactions are an important component of the water budget.

For example, significant groundwater flows to Lake Gertrude occur from the surrounding ridge area. These baseflow conditions are neglected in the surface water model of the system. In addition, both upward and downward leakance through the bottom of lakes (Gertrude, Saunders, etc.) may constitute a significant portion of the overall water budget. Ideally, a combined surface and groundwater approach would be used to adequately define long-term baseflow and conditions.

Similarly, portions of the watershed are undoubtedly affected by rising water tables and the interaction of the water table with the soil zone. Again, it would be ideal to model this interaction so that increased runoff rates would be accounted for in such areas. However, no such accounting is being performed in this application.

Regardless of these deficiencies, the long-term simulation of the Lake Dora Watershed, under typical year rainfall conditions, will provide meaningful and useful data regarding pollutant loads across the entire area. The pollutant loading computations of the SWMM Runoff block will be very useful, providing a framework around which to develop an accounting of pollutant loadings and to aid in the assessment of proposed stormwater management alternatives. The model is capable of predicting the effects of changing land use on the nonpoint source loadings and surface runoff of each subcatchment, and the entire Lake Dora Watershed.

The results of Transport block computations are applicable within Subareas 1, 2, 5 and 6, where surface and groundwater interactions have less of an impact on the long term transport of pollutants. However, it is strongly recommended that the Runoff block results be used for problem area determinations and prioritization throughout the entire Lake Dora Watershed.

CHAPTER VI. PREDICTIVE SIMULATIONS

Typical year rainfall simulations were performed for each of the subareas within the Lake Dora Watershed. Due to the complexity of the hydraulic elements modeled (for example, the junctions of conduits in the lower portion of the mainstem of Subarea 1), a small computational time increment (60 seconds) was employed for use in both the Runoff and the Transport blocks. This small computational time increment resulted in very long simulation times of from three to twelve hours, depending upon the subarea modeled.

After each simulation, the results of Runoff and Transport block computations were reviewed to verify that continuity errors in each computational block were minimal. In some cases, Transport continuity errors exceeded ten percent. In order to reduce Transport block continuity errors further, the computational time step would have to be lowered substantially, or the model of the system would have to be greatly simplified. The following discussion briefly summarizes the results of predictive simulations for each subarea model.

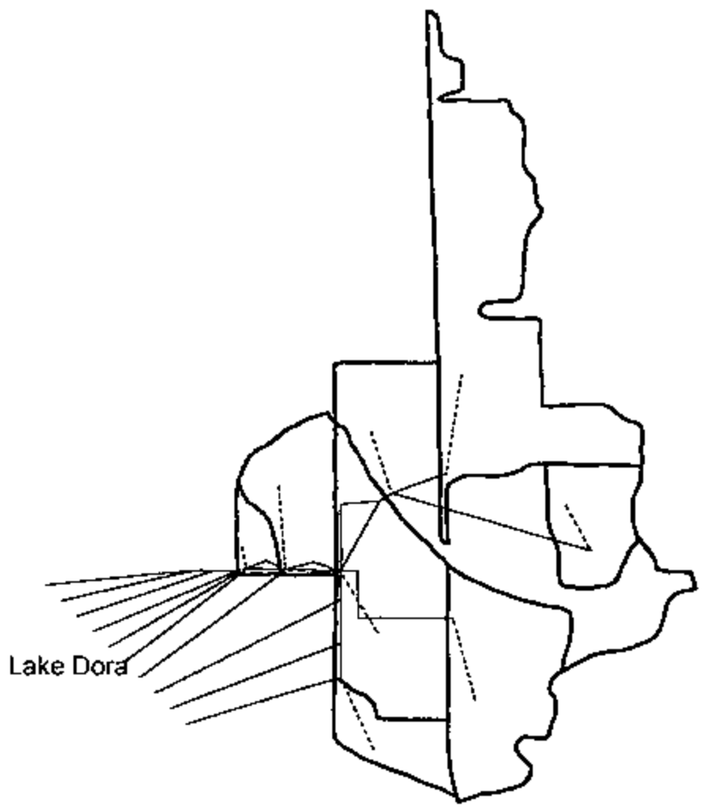
Subarea 1. Figure VI-1 presents the subcatchment layout for Subarea 1, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 1000 to 1999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 52.13 impervious acres and 92.73 pervious acres, a 36 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 28.8 inches infiltrate, 3.7 inches evaporate, and 13.6 inches run off. It is interesting to note that 45 inches of infiltration occurs over the pervious area, indicating that practically all surface runoff is due to the imperviousness of the subarea.

The reported 3.7 inches of evaporation should be viewed in context of the model formulation. A large percentage of the infiltrated volume would actually contribute to the total evaporation and evapotranspiration within the water budget of the soil column, but because of the computational methods employed by the SWMM Runoff block, the infiltrated volume is simply lost from the system.

Table VI-1 presents a pollutant loading summary for all nodes within Subarea 1. Also tabulated are the total and weighted average loadings for each pollutant for

Master Stormwater Management Plan for the Lake Dora Basin



Area 1
Schematic

N
Not To Scale

Figure VI-1

the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

Table VI-1 — Loading Summary for Subarea 1 SWMM Runoff Block Results

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N1050	2.49	13.38	1.75	157.79	0.33	0.28
N1060	10.45	55.86	7.32	658.06	1.39	1.17
N1070	22.41	218.80	32.58	6766.67	9.82	14.09
N1100	6.67	29.20	3.69	353.78	0.66	0.60
N1130	19.58	120.00	14.98	3630.96	4.74	7.73
N1170	33.04	201.89	26.61	3330.24	5.87	6.44
N1180	41.12	267.39	36.02	4539.62	8.05	8.77
N1190	9.08	3.61	0.19	33.22	0.03	0.07
TOTAL	144.86	910.13	123.13	19470.36	30.89	39.15
Per Acre	-	6.28	0.85	134.41	0.21	0.27

Subarea 2. Figure VI-2 presents the subcatchment layout for Subarea 2, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 2000 to 2999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 92.18 impervious acres and 136.84 pervious acres, a 40 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 26.9 inches infiltrate, 4.0 inches evaporate, and 15.2 inches run off. (45 inches of infiltration occurs over the pervious area, indicating that practically all surface runoff is due to the imperviousness of the subarea)

Table VI-2 presents a pollutant loading summary for all nodes within Subarea 2. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

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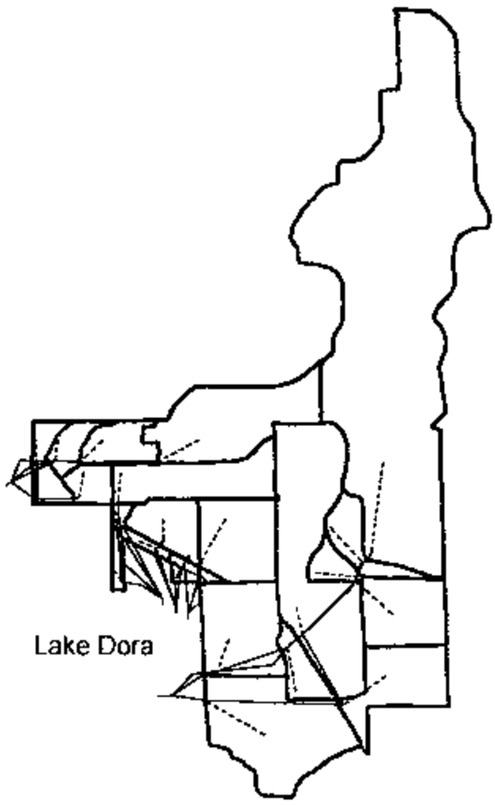


Area 2
Schematic

N
Not To Scale

Figure VI-2

Table VI-2 — **Loading Summary for Subarea 2 SWMM Runoff Block Results**

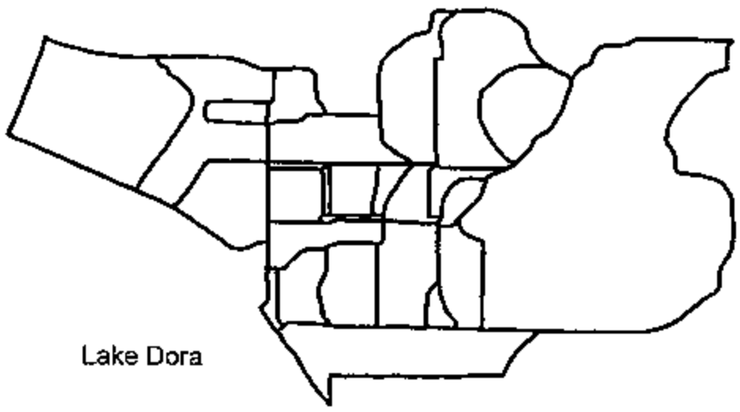
NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N2020	1.43	19.00	3.29	995.87	1.29	2.14
N2030	2.46	32.60	5.65	1710.34	2.22	3.68
N2060	4.25	56.18	9.73	2945.71	3.83	6.34
N2070	15.67	185.92	30.08	7704.78	10.50	16.38
N2080	0.24	3.15	0.54	162.11	0.21	0.35
N2090	1.70	22.57	3.90	1174.41	1.53	2.52
N2110	2.61	34.75	6.01	1822.70	2.36	3.92
N2130	1.10	6.16	0.81	75.41	0.16	0.14
N2160	0.49	6.48	1.12	339.96	0.44	0.73
N2170	10.12	89.13	12.86	2186.84	3.42	4.43
N2190	1.00	4.15	0.51	47.60	0.09	0.09
N2210	0.94	6.39	0.87	104.61	0.19	0.20
N2220	5.11	42.77	6.07	952.86	1.54	1.91
N2250	0.40	2.12	0.28	25.05	0.05	0.04
N2280	9.59	61.49	6.74	606.64	1.28	1.08
N2330	11.14	59.68	7.81	703.40	1.49	1.25
N2350	3.37	18.25	2.39	215.09	0.45	0.38
N2380	24.85	147.77	19.64	2016.35	3.97	3.72
N2410	8.58	58.38	7.93	965.97	1.75	1.85
N2420	2.27	12.20	1.60	143.82	0.30	0.26
N2430	4.56	25.63	3.38	321.78	0.66	0.58
N2460	89.80	618.62	84.95	11789.37	19.40	22.53
N2470	18.40	113.27	15.13	1624.83	3.13	3.03
N2480	8.97	47.98	6.29	566.07	1.19	1.01
TOTAL	229.02	1664.64	237.55	39201.60	61.47	78.56
Per Acre	-	7.27	1.04	171.17	0.27	0.34

Subarea 3. Figure VI-3 presents the subcatchment layout for Subarea 3, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 3000 to 3999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 54.24 impervious acres and 108.98 pervious acres, a 33 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that

Master Stormwater Management Plan for the Lake Dora Basin

Area 3
Schematic



N
Not To Scale

Figure VI-3

30.0 inches infiltrate, 3.4 inches evaporate, and 12.6 inches run off. (45 inches of infiltration occurs over the pervious area, indicating that practically all surface runoff is due to the imperviousness of the subarea)

Table VI-3 presents a pollutant loading summary for all nodes within Subarea 3. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

Table VI-3 — **Loading Summary for Subarea 3 SWMM Runoff Block Results**

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N3030	0.63	6.36	0.96	192.49	0.28	0.40
N3040	5.89	32.38	4.25	395.38	0.82	0.71
N3050	4.07	21.83	2.87	257.25	0.54	0.46
N3060	5.33	57.82	8.95	2008.77	2.85	4.21
N3070	0.75	10.02	1.73	525.57	0.68	1.13
N3080	3.70	47.77	8.12	2363.54	3.10	5.07
N3090	50.32	270.42	35.51	3265.97	6.82	5.84
N3100	2.67	14.34	1.88	169.05	0.36	0.30
N3110	0.31	1.69	0.22	19.88	0.04	0.04
N3120	5.08	27.14	3.55	320.00	0.67	0.57
N3130	2.15	11.55	1.51	136.21	0.29	0.24
N3140	11.03	58.35	7.65	688.08	1.45	1.22
N3160	6.25	33.38	4.37	393.54	0.83	0.70
N3170	9.46	55.33	7.34	740.97	1.47	1.36
N3180	5.41	29.06	3.80	342.48	0.72	0.61
N3200	0.33	1.75	0.23	20.63	0.04	0.04
N3210	0.30	1.60	0.21	18.88	0.04	0.03
N3220	2.12	11.39	1.49	134.12	0.28	0.24
N3230	0.91	4.90	0.64	57.82	0.12	0.10
N3240	1.96	10.63	1.39	126.97	0.27	0.23
N3250	1.24	11.92	1.76	334.98	0.50	0.69
N3260	1.18	12.70	1.95	431.37	0.62	0.90
N3280	15.76	48.38	6.84	930.18	0.71	0.89
N3310	1.16	6.23	0.82	73.50	0.16	0.13
N3320	9.20	43.89	5.60	555.53	1.05	0.98
N3330	5.51	29.26	3.74	396.59	0.75	0.74
N3360	10.48	135.02	23.48	7026.90	9.16	15.10
TOTAL	163.21	995.12	140.87	21926.64	34.64	42.94
Per Acre	-	6.10	0.86	134.34	0.21	0.26

Subarea 4. Figure VI-4 presents the subcatchment layout for Subarea 4, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 4000 to 4999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 1888.66 impervious acres and 3256.41 pervious acres, a 37 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 28.5 inches infiltrate, 3.7 inches evaporate, and 14.0 inches run off. (45 inches of infiltration occurs over the pervious area, indicating that practically all surface runoff is due to the imperviousness of the subarea)

Table VI-4 presents a pollutant loading summary for all nodes within Subarea 4. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

Subarea 5. Figure VI-5 presents the subcatchment layout for Subarea 5, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 5000 to 5999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 154.61 impervious acres and 406.87 pervious acres, a 28 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 32.6 inches infiltrate, 3.0 inches evaporate, and 10.5 inches run off. (45 inches of infiltration occurs over the pervious area, indicating that practically all surface runoff is due to the imperviousness of the subarea)

Table VI-5 presents a pollutant loading summary for all nodes within Subarea 5. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

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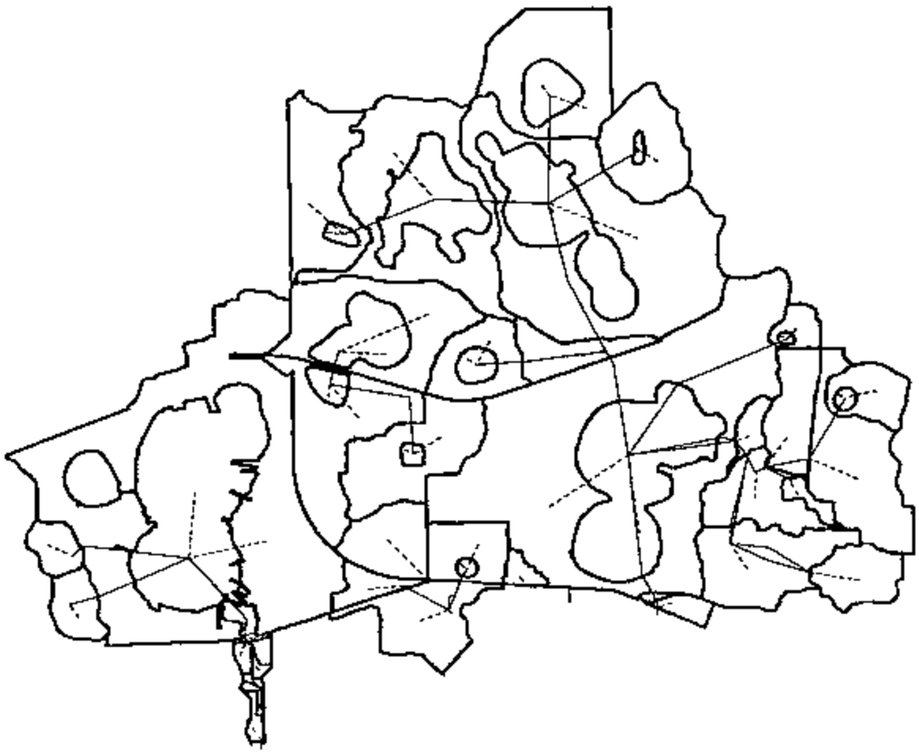
Area 4
Schematic



N
Not To Scale

Figure VI-4

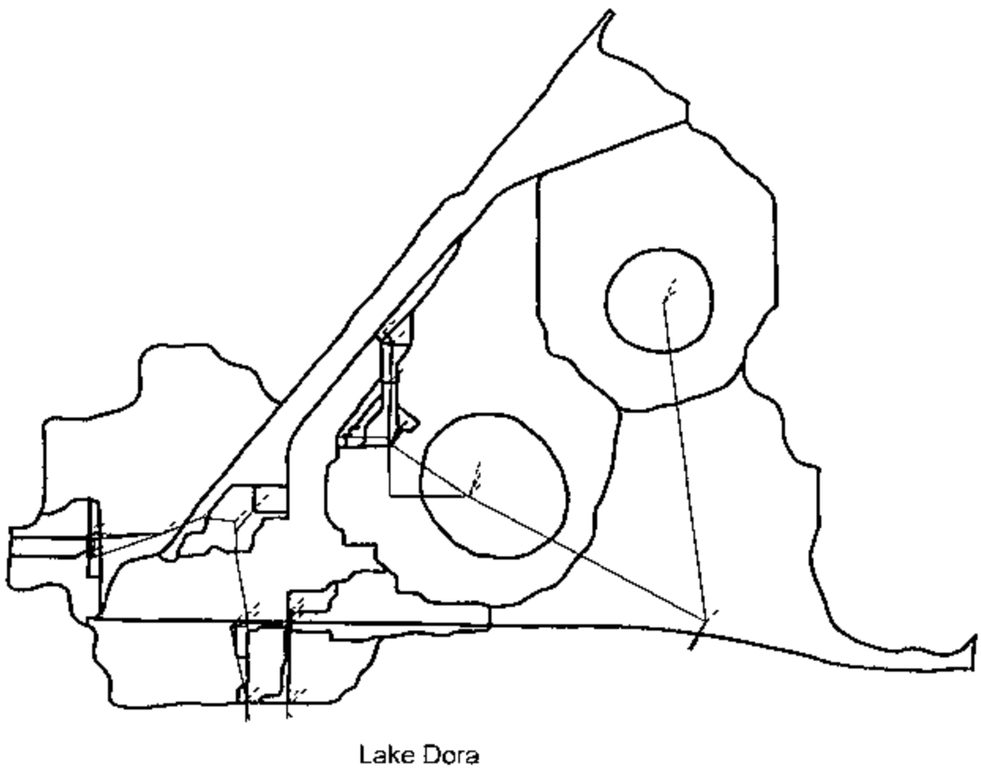
Table VI-4

Loading Summary for Subarea 4
SWMM Runoff Block Results

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N4010	17.22	104.87	13.99	1479.71	2.87	2.75
N4020	3.32	18.48	2.43	228.93	0.47	0.41
N4040	915.01	5145.02	545.85	46891.30	107.96	110.57
N4050	21.29	101.51	13.22	1281.87	2.35	2.06
N4110	89.72	248.70	24.71	2828.77	4.56	5.55
N4150	15.67	29.88	3.35	439.07	0.38	0.53
N4160	78.67	236.38	26.46	5351.16	4.86	8.83
N4170	169.09	269.09	34.58	5033.45	2.83	4.53
N4180	58.91	57.81	5.81	601.94	0.77	0.98
N4190	139.74	524.89	58.78	8247.32	12.85	16.47
N4200	65.15	379.15	50.36	5127.46	10.14	9.44
N4240	14.66	108.81	15.08	2069.42	3.55	4.06
N4250	103.57	588.72	73.62	12842.72	19.05	26.35
N4380	79.78	542.39	72.02	13378.46	19.70	27.56
N4390	69.13	663.64	95.86	17987.17	27.70	37.83
N4400	8.74	46.47	6.09	547.94	1.16	0.97
N4430	4.32	24.02	3.17	298.79	0.61	0.54
N4450	2.54	23.33	3.57	751.93	0.92	1.39
N4480	4.37	15.59	2.34	421.57	0.23	0.42
N4520	13.16	136.01	22.42	5855.18	6.36	10.82
N4530	2.28	30.48	5.27	1592.10	2.07	3.42
N4540	996.80	6012.62	593.11	64285.81	131.14	159.65
N4550	33.79	2.39	0.31	51.37	0.01	0.03
N4560	44.10	62.40	7.50	1121.79	0.65	1.12
N4570	28.97	219.79	30.58	4405.40	7.39	8.71
N4580	150.65	327.02	36.20	4454.67	4.63	6.06
N4590	189.54	1447.26	192.55	38521.09	46.17	71.76
N4600	230.82	1617.78	183.27	20385.25	39.09	44.74
N4610	89.31	486.87	51.86	5206.46	11.68	12.78
N4620	156.45	919.59	121.74	16431.49	23.93	28.32
N4630	366.78	1807.69	184.50	15798.35	33.71	35.58
N4640	568.03	2754.01	281.72	20665.58	54.95	53.37
N4650	215.77	965.46	98.58	7461.83	20.10	19.49
N4660	114.56	46.38	3.35	554.34	0.31	0.85
N4670	57.07	254.87	36.96	5965.33	4.94	7.21
N4700	26.04	33.93	4.38	734.43	0.23	0.58
TOTAL	5145.06	26253.27	2905.60	339279.48	610.30	725.75
Per Acre	-	5.10	0.56	65.94	0.12	0.14

Master Stormwater Management Plan for the Lake Dora Basin

Area 5
Schematic



N
Not To Scale

Figure VI-5

Table VI-5

Loading Summary for Subarea 5
SWMM Runoff Block Results

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N5040	4.84	43.11	6.23	1062.61	1.66	2.16
N5060	1.16	10.47	1.51	255.69	0.40	0.52
N5070	21.28	176.97	24.94	5499.25	7.68	11.54
N5080	44.05	235.28	29.39	4375.11	6.95	8.76
N5120	6.42	73.00	11.65	3009.42	4.08	6.39
N5130	51.04	139.45	18.92	2379.39	2.02	2.32
N5140	53.23	80.30	6.46	798.68	1.09	1.64
N5170	0.66	3.52	0.46	41.51	0.09	0.07
N5180	3.58	19.14	2.51	225.79	0.48	0.40
N5190	2.60	13.83	1.81	163.20	0.34	0.29
N5210	0.80	4.32	0.57	50.88	0.11	0.09
N5220	6.42	46.98	6.50	881.45	1.52	1.73
N5230	1.60	8.56	1.12	100.86	0.21	0.18
N5240	4.02	44.89	7.10	1703.97	2.37	3.60
N5250	10.33	71.33	9.56	1670.11	2.53	3.41
N5260	1.75	22.13	3.70	1039.11	1.38	2.23
N5280	1.04	8.82	1.26	200.23	0.32	0.40
N5290	8.83	79.02	11.42	1957.91	3.06	3.97
N5300	127.78	758.76	86.21	6717.69	16.92	15.20
N5320	2.56	13.75	1.80	162.10	0.34	0.29
N5330	1.16	6.21	0.81	73.21	0.15	0.13
N5340	1.27	6.80	0.89	80.21	0.17	0.14
N5350	1.31	7.06	0.92	83.14	0.18	0.15
N5360	0.99	5.35	0.70	62.99	0.13	0.11
N5370	2.54	13.53	1.77	159.53	0.34	0.28
N5380	97.07	304.77	27.25	1970.03	5.82	6.17
N5390	103.15	211.74	27.43	3951.21	2.62	3.90
TOTAL	561.48	2409.07	292.89	38675.31	62.97	76.07
Per Acre	-	4.29	0.52	68.88	0.11	0.14

Subarea 6. Figure VI-6 presents the subcatchment layout for Subarea 6, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 6000 to 6999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

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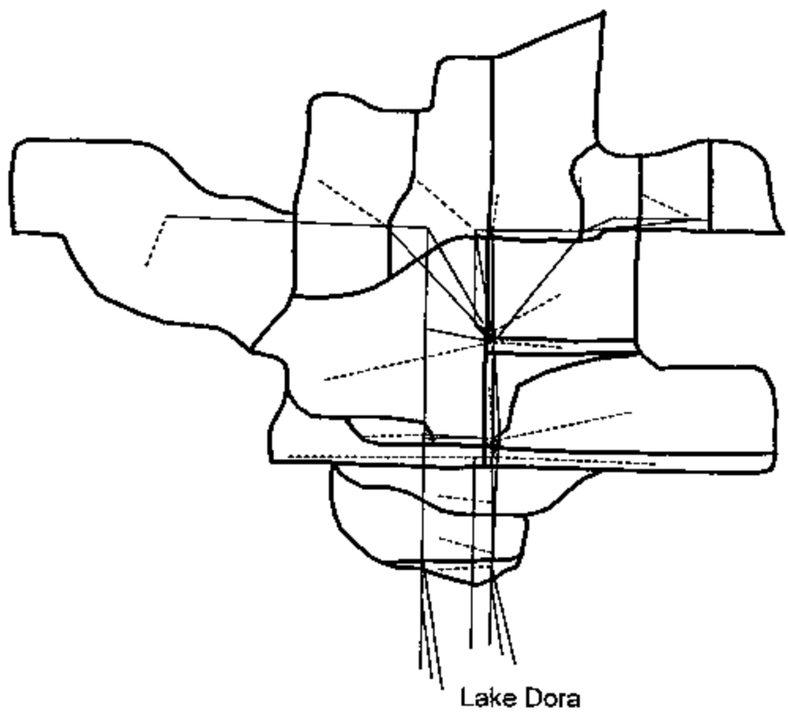
Area 6
Schematic



N
Not To Scale

Figure VI-6

This portion of the Lake Dora watershed is comprised of 29.33 impervious acres and 20.76 pervious acres, a 59 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 18.6 inches infiltrate, 5.3 inches evaporate, and 22.1 inches run off. (45 inches of infiltration occurs over the pervious area, indicating that practically all surface runoff is due to the imperviousness of the subarea)

Table VI-6 presents a pollutant loading summary for all nodes within Subarea 6. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

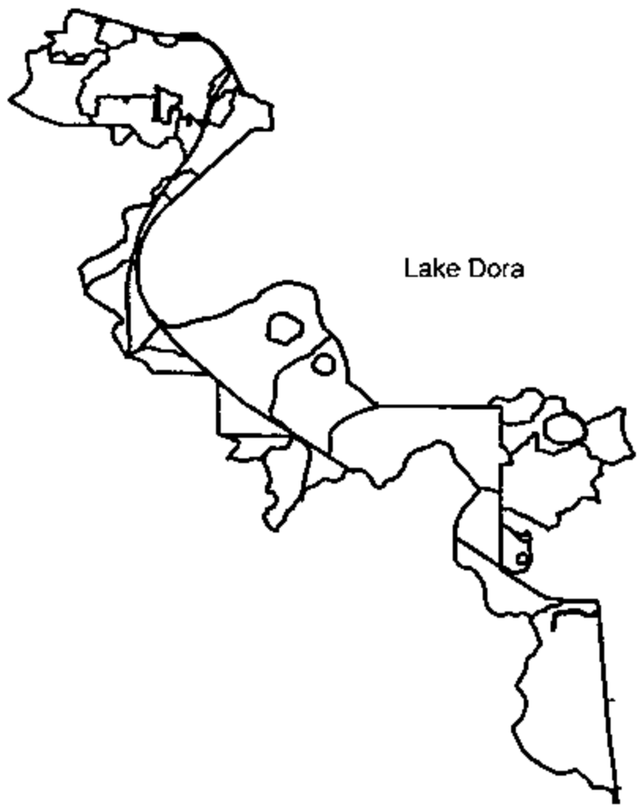
Table VI-6 — **Loading Summary for Subarea 6**
SWMM Runoff Block Results

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N6040	0.43	5.75	1.00	301.42	0.39	0.65
N6070	4.50	46.70	7.08	1484.58	2.16	3.09
N6090	8.63	98.99	15.82	3910.16	5.38	8.27
N6100	1.61	21.21	3.67	1111.60	1.45	2.39
N6110	1.19	13.68	2.19	547.83	0.75	1.16
N6130	0.41	5.46	0.94	284.75	0.37	0.61
N6140	2.48	27.53	4.30	990.01	1.39	2.08
N6160	1.99	26.19	4.52	1361.86	1.77	2.93
N6180	5.24	57.34	8.97	2084.96	2.92	4.38
N6190	0.89	9.48	1.45	316.94	0.45	0.66
N6210	7.56	75.76	11.44	2352.21	3.44	4.88
N6220	3.44	18.36	2.41	216.39	0.46	0.39
N6240	3.45	18.40	2.41	216.99	0.46	0.39
N6250	4.57	43.91	6.51	1252.44	1.88	2.58
N6260	1.16	10.14	1.46	243.63	0.38	0.49
N6280	1.33	7.13	0.93	84.06	0.18	0.15
N6290	1.21	11.92	1.78	347.72	0.52	0.72
TOTAL	50.09	497.94	76.88	17107.56	24.35	35.83
Per Acre	-	9.94	1.53	341.52	0.49	0.72

Subarea 7. Figure VI-7 presents the subcatchment layout for Subarea 7, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the

Master Stormwater Management Plan for the Lake Dora Basin

Area 7
Schematic



N
Not To Scale

Figure VI-7

range from 7000 to 7999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 272.81 impervious acres and 2774.68 pervious acres, a 5 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 40.0 inches infiltrate, 1.9 inches evaporate, and only 4.2 inches run off.

Table VI-7 presents a pollutant loading summary for all nodes within Subarea 7. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

Subarea 8. Figure VI-8 presents the subcatchment layout for Subarea 8, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 8000 to 8999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 1215.74 impervious acres and 3467.27 pervious acres, a 26 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 33.3 inches infiltrate, 2.9 inches evaporate, and 9.9 inches run off.

Table VI-8 presents a pollutant loading summary for all nodes within Subarea 8. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

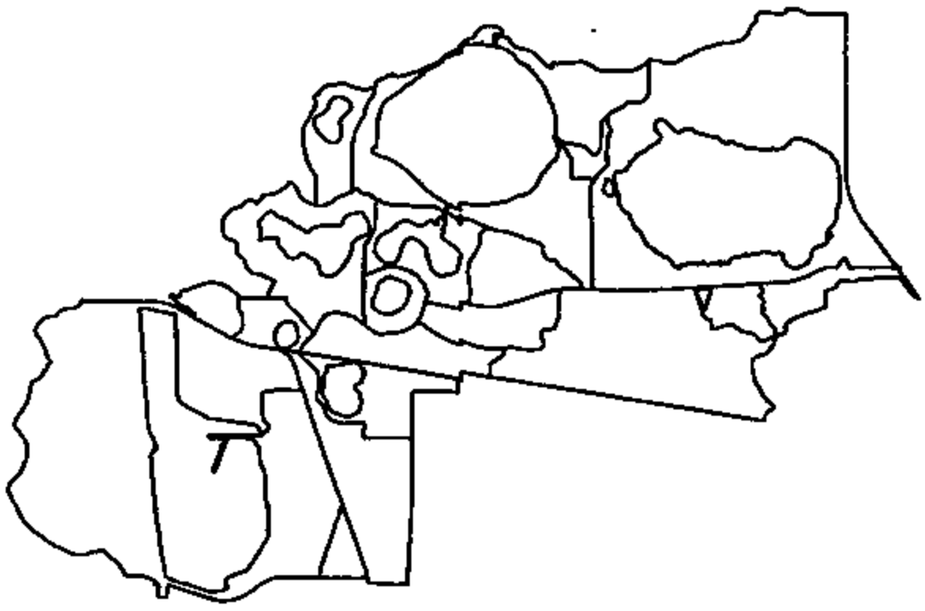
Table VI-7

Loading Summary for Subarea 7
SWMM Runoff Block Results

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N7000	128.17	878.82	117.00	18893.57	29.73	38.37
N7010	24.05	195.02	27.57	4272.32	6.95	8.55
N7020	14.00	74.23	8.88	1854.78	2.52	3.89
N7030	18.42	91.81	10.42	2627.72	3.29	5.63
N7040	28.50	91.87	9.98	1000.46	1.84	1.90
N7050	324.60	320.06	15.44	2838.40	2.19	6.65
N7060	18.48	95.07	12.06	1097.58	2.29	1.99
N7070	107.20	309.55	37.39	4487.52	5.10	5.89
N7080	11.89	2.25	0.10	19.99	0.01	0.04
N7090	40.66	194.46	20.75	3498.16	5.17	7.47
N7100	73.99	470.61	59.65	5392.22	11.07	9.65
N7110	10.39	54.87	7.22	709.54	1.22	1.08
N7120	170.17	25.46	3.61	581.38	0.07	0.29
N7130	21.03	40.28	3.79	443.54	0.68	0.87
N7140	23.15	181.53	26.49	5666.03	6.90	10.62
N7150	78.17	307.74	41.67	7379.43	6.19	10.00
N7160	74.45	177.35	24.04	3854.37	2.26	3.84
N7170	59.86	390.08	55.12	9760.81	11.88	16.78
N7180	23.25	154.13	21.03	4617.77	5.62	8.88
N7190	49.99	240.26	30.45	6611.50	6.78	11.59
N7200	454.62	482.73	35.94	2235.27	8.32	9.84
N7210	267.34	361.40	28.59	2771.00	5.34	7.18
N7220	82.35	19.02	1.66	289.79	0.09	0.32
N7230	43.47	47.61	2.85	699.38	0.63	1.54
N7240	104.73	216.10	20.58	4650.62	3.78	8.02
N7250	43.64	34.02	4.60	719.54	0.17	0.44
N7260	420.76	305.22	35.89	5552.77	1.87	4.45
N7270	47.86	0.99	0.14	23.10	0.00	0.01
N7280	116.87	469.03	45.31	2709.56	9.29	9.03
N7290	74.51	97.44	9.78	1410.34	0.90	1.67
N7300	248.23	45.69	4.34	739.05	0.18	0.71
N7310	98.70	101.80	14.65	2280.57	0.44	1.19
N7320	3.48	4.84	0.71	111.36	0.02	0.05
N7330	43.13	4.04	0.42	71.14	0.01	0.06
N7340	120.54	0.79	0.12	18.76	0.00	0.01
N7350	547.35	114.57	11.16	1903.94	0.45	1.77
TOTAL	4017.99	6600.71	749.41	111793.27	143.25	200.28
Per Acre	-	1.64	0.19	27.82	0.04	0.05

Master Stormwater Management Plan for the Lake Dora Basin

Area 8
Schematic



N
Not To Scale

Figure VI-8

Table VI-8

Loading Summary for Subarea 8
SWMM Runoff Block Results

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N8000	98.07	215.09	19.80	1319.07	3.86	4.04
N8010	769.64	4665.06	438.44	23471.13	95.28	90.43
N8020	24.43	7.00	0.71	116.75	0.03	0.11
N8030	265.78	820.23	79.93	5051.29	15.68	15.29
N8040	150.83	370.74	28.73	2220.26	5.76	7.22
N8050	104.69	6.71	0.89	145.33	0.02	0.08
N8060	65.48	336.05	35.62	2771.57	6.61	6.41
N8070	102.86	0.05	0.01	1.09	0.00	0.00
N8080	42.84	78.15	8.78	1199.66	0.85	1.31
N8090	57.80	121.77	13.56	1348.01	1.75	2.00
N8100	129.74	48.24	6.63	1049.93	0.19	0.59
N8110	175.56	52.31	3.44	629.27	0.24	0.94
N8120	248.78	149.54	15.76	2500.02	0.86	2.30
N8130	384.43	31.58	4.55	733.81	0.09	0.35
N8140	132.51	493.04	45.47	3586.79	8.83	9.74
N8150	212.80	208.91	24.25	3726.95	1.64	3.38
N8160	35.48	240.57	37.49	8194.65	6.72	11.94
N8170	436.77	126.58	15.68	2587.80	0.49	1.74
N8180	54.21	49.08	4.53	646.03	0.41	0.83
N8190	68.57	130.23	12.64	1664.19	2.12	2.96
N8200	1121.76	7073.90	730.92	55185.05	145.24	142.97
TOTAL	4683.01	15224.83	1527.84	118148.65	296.67	304.65
Per Acre	-	3.25	0.33	25.23	0.06	0.07

Subarea 9. Figure VI-9 presents the subcatchment layout for Subarea 9, with the link-node representation of the model network (primary conveyance system) overlaid. A detailed model network schematic, which includes model element identifiers, is provided on the appended map panels. The identifiers used for model elements are alphanumeric, with a one-letter prefix and a four digit numeral. All of the model elements in this subarea are given an identifier in the range from 9000 to 9999, with prefixes as follows: Subcatchment = B, Node = N, and Reach = R.

This portion of the Lake Dora watershed is comprised of 6019.64 impervious acres and 4349.97 pervious acres, a 58 percent imperviousness. Out of the 46.1 inches of rainfall across the subarea during the typical year, the model indicates that 18.8 inches infiltrate, 5 inches evaporate, and 22.3 inches run off.

Table VI-9 presents a pollutant loading summary for all nodes within Subarea 9. Also tabulated are the total and weighted average loadings for each pollutant for the entire subarea. The computed pollutant loadings throughout the system are tabulated by month in Appendix A.

Table VI-9 — **Loading Summary for Subarea 9 SWMM Runoff Block Results**

NODE ID	AREA (ac)	TN (lb)	TP (lb)	TSS (lb)	TZn (lb)	TPb (lb)
N9000	6460.81	61476.87	5133.12	221317.86	1235.77	1226.31
N9010	143.16	362.64	41.72	4978.80	6.02	7.10
N9020	99.28	700.51	94.78	14141.86	23.09	28.18
N9030	340.05	1663.28	219.51	24751.02	38.40	38.77
N9040	397.77	1600.42	192.43	27460.86	37.69	48.51
N9050	50.90	359.41	48.82	7066.26	11.73	14.03
N9060	348.04	409.02	33.56	4822.78	4.99	8.65
N9070	1624.37	1642.41	166.13	24147.88	15.02	28.03
N9080	371.64	81.82	9.78	1610.70	0.27	1.09
N9090	533.60	455.89	57.04	8589.66	3.17	6.53
TOTAL	10369.62	68752.29	5996.90	338887.67	1376.16	1407.18
Per Acre	-	6.63	0.58	32.68	0.13	0.14

CHAPTER VII. PROBLEM AREA DETERMINATIONS

The following discussion examines the simulation results, in order to identify problem areas in the Lake Dora Watershed. Areal loading rates of each pollutant modeled are tabulated for each subcatchment, for the typical year rainfall condition. Areal loading rates are also displayed graphically for each pollutant.

A. AREAL LOADINGS AS A FUNCTION OF LANDUSE

A summary of areal pollutant loading rates, adapted from Harper (1994), is given in Table VII-1. The loading rate values reflect mean loading rates for research studies conducted on various land use types throughout Central and South Florida. As pointed out by Harper, the loading rates follow intuitive patterns. For example, pollutant loading rates for open space are much lower than any other category while contributions of nutrients from agricultural uses are much greater than loading rates from open space and water and appear similar to residential pollutant loadings.

Table VII-1 **Areal Loading Rates for Selected Land Use Categories (adapted from Harper, 1994)**

	Loading Rate (lb/ac-yr)				
Land Use	TN	TP	TSS	TZn	TPb
Residential	10.32	1.310	123.68	0.269	0.183
Commercial	16.09	2.734	844.36	1.197	1.922
Agricultural	7.98	1.215	163.14	0.011	0.046
Open Space	2.36	0.101	16.75	0.011	0.046
Water	7.12	0.602	17.75	0.161	0.143

(note: original data, by Harper, adapted to land use categories in the Lake Dora MSMP)

Since areal loading rates consider the effects of total runoff volumes, as well as runoff concentrations, the listed values are valuable for comparing the computed pollutant contributions for the Lake Dora Watershed.

B. AREAL POLLUTANT LOADINGS IN THE LAKE DORA WATERSHED

Tables VII-2 through VII-10 present areal pollutant loading rates for subcatchments within each subarea model, along with summary statistics of the minimum, maximum and average loading rate for each pollutant within each subarea. Comparison of tabulated subcatchment loading rates with the areal loading rate summary in Table VII-1 (with attention to the type of land use condition comprising each subcatchment) indicates that the results of the typical year simulation are in agreement with the general rates found throughout Central and South Florida.

The spatial distribution of pollutant loading rates for Total Nitrogen, Total Phosphorous, Total Suspended Solids, Total Zinc and Total Lead, across the entire Lake Dora Watershed, are provided graphically in Figures VII-1 through VII-5, respectively. These maps are useful in the evaluation of potential "hot-spots" throughout the study area.

C. WATER QUALITY PROBLEM AREAS

In evaluating the results of the water quality simulation, it is important to distinguish between areas that contribute to Lake Dora and those which primarily contribute to some other waterbody. For example, much of the loading from Subarea 4 is never transported to Lake Dora. Lake Gertrude, East and West Crooked Lakes, Lake Saunders and others are each a receiving body for pollutants from their contributing area. The actual contribution of Subarea 4 runoff to loadings at Lake Dora are minimal in comparison to the loadings at those intermediate receiving waters within Subarea 4. Similarly, all of the lakes and wetlands across the entire watershed, which are contained within closed systems or within systems with limited discharge during typical rainfall conditions, act as receiving waters.

Prioritization of water quality problem areas is defined by the tabulated areal loading rates for each subarea. The subarea with the highest average loading rate for a given pollutant is the priority subarea for that pollutant, while the subcatchment(s) with the highest areal loading rate(s) within that subarea is the highest priority area. For example, the average areal loading rate of Total Nitrogen for all subcatchments in Subarea 6 is 10.19 lb/ac-yr, the highest for all of the modeled subareas. Within that subarea, Nodes 6040 through 6190 all have areal loading rates, ranging from 13.29 to 10.68 lb/ac-yr, greater than the average loading rate for Total Nitrogen for the subarea. The entire vicinity of those nodes is a high priority for mitigation of Total Nitrogen loadings.

Table VII-2

Loading Rate Summary for Subarea 1
SWMM Runoff Block Results

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N1050	5.37	0.70	63.38	0.13	0.11
N1060	5.34	0.70	62.96	0.13	0.11
N1070	9.76	1.45	301.90	0.44	0.63
N1100	4.38	0.55	53.01	0.10	0.09
N1130	6.13	0.76	185.40	0.24	0.39
N1170	6.11	0.81	100.79	0.18	0.19
N1180	6.50	0.88	110.40	0.20	0.21
N1190	0.40	0.02	3.66	0.00	0.01
Min	0.40	0.02	3.66	0.00	0.01
Ave	5.50	0.73	110.19	0.18	0.22
Max	9.76	1.45	301.90	0.44	0.63

Table VII-3

Loading Rate Summary for Subarea 2
SWMM Runoff Block Results

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N2020	13.33	2.31	698.69	0.91	1.50
N2030	13.24	2.29	694.60	0.90	1.50
N2060	13.23	2.29	693.80	0.90	1.49
N2070	11.86	1.92	491.61	0.67	1.04
N2080	13.21	2.27	680.17	0.89	1.47
N2090	13.30	2.30	692.19	0.90	1.49
N2110	13.32	2.31	698.98	0.91	1.50
N2130	5.59	0.73	68.48	0.14	0.12
N2160	13.32	2.31	698.69	0.91	1.50
N2170	8.81	1.27	216.16	0.34	0.44
N2190	4.17	0.51	47.83	0.10	0.09
N2210	6.81	0.92	111.45	0.20	0.21
N2220	8.38	1.19	186.61	0.30	0.37
N2250	5.38	0.70	63.40	0.13	0.11
N2280	5.37	0.70	63.26	0.13	0.11
N2330	5.36	0.70	63.12	0.13	0.11
N2350	5.42	0.71	63.88	0.13	0.11
N2380	5.95	0.79	81.14	0.16	0.15
N2410	6.81	0.92	112.61	0.20	0.22
N2420	5.38	0.70	63.39	0.13	0.11
N2430	5.62	0.74	70.54	0.14	0.13
N2460	6.89	0.95	131.28	0.22	0.25
N2470	6.15	0.82	88.29	0.17	0.16
N2480	5.35	0.70	63.11	0.13	0.11
Min	4.17	0.51	47.83	0.10	0.09
Ave	8.43	1.29	285.14	0.41	0.60
Max	13.33	2.31	698.98	0.91	1.50

Table VII-4

Loading Rate Summary for Subarea 3
SWMM Runoff Block Results

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N3030	10.14	1.52	306.73	0.45	0.64
N3040	5.49	0.72	67.08	0.14	0.12
N3050	5.36	0.70	63.15	0.13	0.11
N3060	10.85	1.68	376.82	0.54	0.79
N3070	13.29	2.30	696.66	0.90	1.50
N3080	12.91	2.20	638.81	0.84	1.37
N3090	5.37	0.71	64.90	0.14	0.12
N3100	5.38	0.70	63.38	0.13	0.11
N3110	5.36	0.70	63.27	0.13	0.11
N3120	5.34	0.70	63.02	0.13	0.11
N3130	5.37	0.70	63.28	0.13	0.11
N3140	5.29	0.69	62.36	0.13	0.11
N3160	5.34	0.70	63.00	0.13	0.11
N3170	5.85	0.78	78.32	0.16	0.14
N3180	5.37	0.70	63.32	0.13	0.11
N3200	5.37	0.70	63.37	0.13	0.11
N3210	5.38	0.70	63.34	0.13	0.11
N3220	5.37	0.70	63.29	0.13	0.11
N3230	5.37	0.70	63.40	0.13	0.11
N3240	5.42	0.71	64.75	0.14	0.12
N3250	9.62	1.42	270.28	0.41	0.56
N3260	10.79	1.66	366.66	0.52	0.77
N3280	3.07	0.43	59.01	0.04	0.06
N3310	5.38	0.70	63.39	0.13	0.11
N3320	4.77	0.61	60.36	0.11	0.11
N3330	5.31	0.68	71.97	0.14	0.13
N3360	12.88	2.24	670.56	0.87	1.44
Min	3.07	0.43	59.01	0.04	0.06
Ave	6.87	0.99	170.91	0.26	0.34
Max	13 29	2.30	696.66	0.90	1.50

Table VII-5 — **Loading Rate Summary for Subarea 4 SWMM Runoff Block Results**

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N4010	6.09	0.81	85.94	0.17	0.16
N4020	5.56	0.73	68.90	0.14	0.12
N4040	5.62	0.60	51.25	0.12	0.12
N4050	4.77	0.62	59.27	0.11	0.10
N4110	2.77	0.26	31.53	0.05	0.06
N4150	1.91	0.21	28.01	0.02	0.03
N4160	3.00	0.34	68.02	0.06	0.11
N4170	1.59	0.20	29.77	0.02	0.03
N4180	0.98	0.10	10.22	0.01	0.02
N4190	3.76	0.42	59.02	0.09	0.12
N4200	5.82	0.77	78.70	0.16	0.14
N4240	7.42	1.03	141.16	0.24	0.28
N4250	5.68	0.71	124.00	0.18	0.25
N4380	6.80	0.90	167.69	0.25	0.35
N4390	9.60	1.39	260.20	0.40	0.55
N4400	5.31	0.70	62.66	0.13	0.11
N4430	5.56	0.73	69.18	0.14	0.12
N4450	9.17	1.40	295.59	0.36	0.54
N4480	3.57	0.54	98.50	0.05	0.10
N4520	10.34	1.70	444.97	0.48	0.82
N4530	13.36	2.31	697.81	0.91	1.50
N4540	6.03	0.60	64.49	0.13	0.16
N4550	0.07	0.01	1.52	0.00	0.00
N4560	1.41	0.17	25.44	0.01	0.03
N4570	7.59	1.06	152.06	0.26	0.30
N4580	2.17	0.24	29.57	0.03	0.04
N4590	7.64	1.02	203.23	0.24	0.38
N4600	7.01	0.79	88.32	0.17	0.19
N4610	5.45	0.58	58.30	0.13	0.14
N4620	5.88	0.78	105.02	0.15	0.18
N4630	4.93	0.50	43.07	0.09	0.10
N4640	4.85	0.50	36.38	0.10	0.09
N4650	4.47	0.46	34.58	0.09	0.09
N4660	0.40	0.03	4.84	0.00	0.01
N4670	4.47	0.65	104.52	0.09	0.13
N4700	1.30	0.17	28.21	0.01	0.02
Min	0.07	0.01	1.52	0.00	0.00
Ave	5.07	0.67	108.61	0.16	0.21
Max	13.36	2.31	697.81	0.91	1.50

Table VII-6

Loading Rate Summary for Subarea 5
SWMM Runoff Block Results

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N5040	8.91	1.29	219.67	0.34	0.45
N5060	9.00	1.30	219.90	0.35	0.45
N5070	8.32	1.17	258.40	0.36	0.54
N5080	5.34	0.67	99.33	0.16	0.20
N5120	11.38	1.82	468.96	0.64	1.00
N5130	2.73	0.37	46.62	0.04	0.05
N5140	1.51	0.12	15.00	0.02	0.03
N5170	5.35	0.70	63.09	0.13	0.11
N5180	5.34	0.70	63.02	0.13	0.11
N5190	5.32	0.70	62.76	0.13	0.11
N5210	5.37	0.70	63.32	0.13	0.11
N5220	7.32	1.01	137.36	0.24	0.27
N5230	5.37	0.70	63.23	0.13	0.11
N5240	11.18	1.77	424.24	0.59	0.90
N5250	6.91	0.93	161.74	0.24	0.33
N5260	12.62	2.11	592.45	0.79	1.27
N5280	8.52	1.21	193.28	0.31	0.39
N5290	8.95	1.29	221.66	0.35	0.45
N5300	5.94	0.67	52.57	0.13	0.12
N5320	5.36	0.70	63.24	0.13	0.11
N5330	5.36	0.70	63.17	0.13	0.11
N5340	5.35	0.70	63.08	0.13	0.11
N5350	5.37	0.70	63.25	0.13	0.11
N5360	5.37	0.70	63.31	0.13	0.11
N5370	5.32	0.70	62.76	0.13	0.11
N5380	3.14	0.28	20.29	0.06	0.06
N5390	2.05	0.27	38.31	0.03	0.04
Min	1.51	0.12	15.00	0.02	0.03
Ave	6.40	0.89	143.11	0.23	0.29
Max	12.62	2.11	592.45	0.79	1.27

Table VII-7 — **Loading Rate Summary for Subarea 6 SWMM Runoff Block Results**

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N6040	13.29	2.30	697.15	0.91	1.50
N6070	10.39	1.58	330.23	0.48	0.69
N6090	11.47	1.83	453.07	0.62	0.96
N6100	13.16	2.28	689.78	0.90	1.48
N6110	11.52	1.85	461.49	0.63	0.98
N6130	13.29	2.30	692.38	0.90	1.49
N6140	11.08	1.73	398.52	0.56	0.84
N6160	13.18	2.27	685.35	0.89	1.47
N6180	10.95	1.71	398.08	0.56	0.84
N6190	10.68	1.64	357.09	0.51	0.75
N6210	10.03	1.51	311.30	0.45	0.65
N6220	5.34	0.70	62.90	0.13	0.11
N6240	5.33	0.70	62.82	0.13	0.11
N6250	9.60	1.42	273.79	0.41	0.56
N6260	8.74	1.25	209.88	0.33	0.42
N6280	5.35	0.70	63.11	0.13	0.11
N6290	9.85	1.47	287.32	0.43	0.59
Min	5.33	0.70	62.82	0.13	0.11
Ave	10.19	1.60	378.49	0.53	0.80
Max	13.29	2.30	697.15	0.91	1.50

Table VII-8

Loading Rate Summary for Subarea 7
SWMM Runoff Block Results

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N7000	6.86	0.91	147.41	0.23	0.30
N7010	8.11	1.15	177.66	0.29	0.36
N7020	5.30	0.63	132.50	0.18	0.28
N7030	4.98	0.57	142.65	0.18	0.31
N7040	3.22	0.35	35.10	0.06	0.07
N7050	0.99	0.05	8.74	0.01	0.02
N7060	5.15	0.65	59.41	0.12	0.11
N7070	2.89	0.35	41.86	0.05	0.05
N7080	0.19	0.01	1.68	0.00	0.00
N7090	4.78	0.51	86.04	0.13	0.18
N7100	6.36	0.81	72.88	0.15	0.13
N7110	5.28	0.70	68.27	0.12	0.10
N7120	0.15	0.02	3.42	0.00	0.00
N7130	1.92	0.18	21.09	0.03	0.04
N7140	7.84	1.14	244.73	0.30	0.46
N7150	3.94	0.53	94.40	0.08	0.13
N7160	2.38	0.32	51.77	0.03	0.05
N7170	6.52	0.92	163.05	0.20	0.28
N7180	6.63	0.90	198.60	0.24	0.38
N7190	4.81	0.61	132.26	0.14	0.23
N7200	1.06	0.08	4.92	0.02	0.02
N7210	1.35	0.11	10.37	0.02	0.03
N7220	0.23	0.02	3.52	0.00	0.00
N7230	1.10	0.07	16.09	0.01	0.04
N7240	2.06	0.20	44.41	0.04	0.08
N7250	0.78	0.11	16.49	0.00	0.01
N7260	0.73	0.09	13.20	0.00	0.01
N7270	0.02	0.00	0.48	0.00	0.00
N7280	4.01	0.39	23.16	0.08	0.08
N7290	1.31	0.13	18.93	0.01	0.02
N7300	0.18	0.02	2.98	0.00	0.00
N7310	1.03	0.15	23.11	0.00	0.01
N7320	1.39	0.20	32.00	0.00	0.02
N7330	0.09	0.01	1.65	0.00	0.00
N7340	0.01	0.00	0.16	0.00	0.00
N7350	0.21	0.02	3.48	0.00	0.00
Min	0.01	0.00	0.16	0.00	0.00
Ave	2.88	0.36	58.29	0.08	0.11
Max	8.11	1.15	244.73	0.30	0.46

Table VII-9

Loading Rate Summary for Subarea 8
SWMM Runoff Block Results

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N8000	2.19	0.20	13.45	0.04	0.04
N8010	6.06	0.57	30.50	0.12	0.12
N8020	0.29	0.03	4.78	0.00	0.00
N8030	3.09	0.30	19.01	0.06	0.06
N8040	2.46	0.19	14.72	0.04	0.05
N8050	0.06	0.01	1.39	0.00	0.00
N8060	5.13	0.54	42.33	0.10	0.10
N8070	0.00	0.00	0.01	0.00	0.00
N8080	1.82	0.20	28.00	0.02	0.03
N8090	2.11	0.23	23.32	0.03	0.03
N8100	0.37	0.05	8.09	0.00	0.00
N8110	0.30	0.02	3.58	0.00	0.01
N8120	0.60	0.06	10.05	0.00	0.01
N8130	0.08	0.01	1.91	0.00	0.00
N8140	3.72	0.34	27.07	0.07	0.07
N8150	0.98	0.11	17.51	0.01	0.02
N8160	6.78	1.06	230.96	0.19	0.34
N8170	0.29	0.04	5.92	0.00	0.00
N8180	0.91	0.08	11.92	0.01	0.02
N8190	1.90	0.18	24.27	0.03	0.04
N8200	6.31	0.65	49.20	0.13	0.13
Min	0.00	0.00	0.01	0.00	0.00
Ave	2.16	0.23	27.05	0.04	0.05
Max	6.78	1.06	230.96	0.19	0.34

Table VII-10

Loading Rate Summary for Subarea 9
SWMM Runoff Block Results

NODE ID	TN (lb/ac)	TP (lb/ac)	TSS (lb/ac)	TZn (lb/ac)	TPb (lb/ac)
N9000	9.52	0.79	34.26	0.19	0.19
N9010	2.53	0.29	34.78	0.04	0.05
N9020	7.06	0.95	142.44	0.23	0.28
N9030	4.89	0.65	72.79	0.11	0.11
N9040	4.02	0.48	69.04	0.09	0.12
N9050	7.06	0.96	138.81	0.23	0.28
N9060	1.18	0.10	13.86	0.01	0.02
N9070	1.01	0.10	14.87	0.01	0.02
N9080	0.22	0.03	4.33	0.00	0.00
N9090	0.85	0.11	16.10	0.01	0.01
Min	0.22	0.03	4.33	0.00	0.00
Ave	3.83	0.45	54.13	0.09	0.11
Max	9.52	0.96	142.44	0.23	0.28

Master Stormwater Management Plan for the Lake Dora Basin

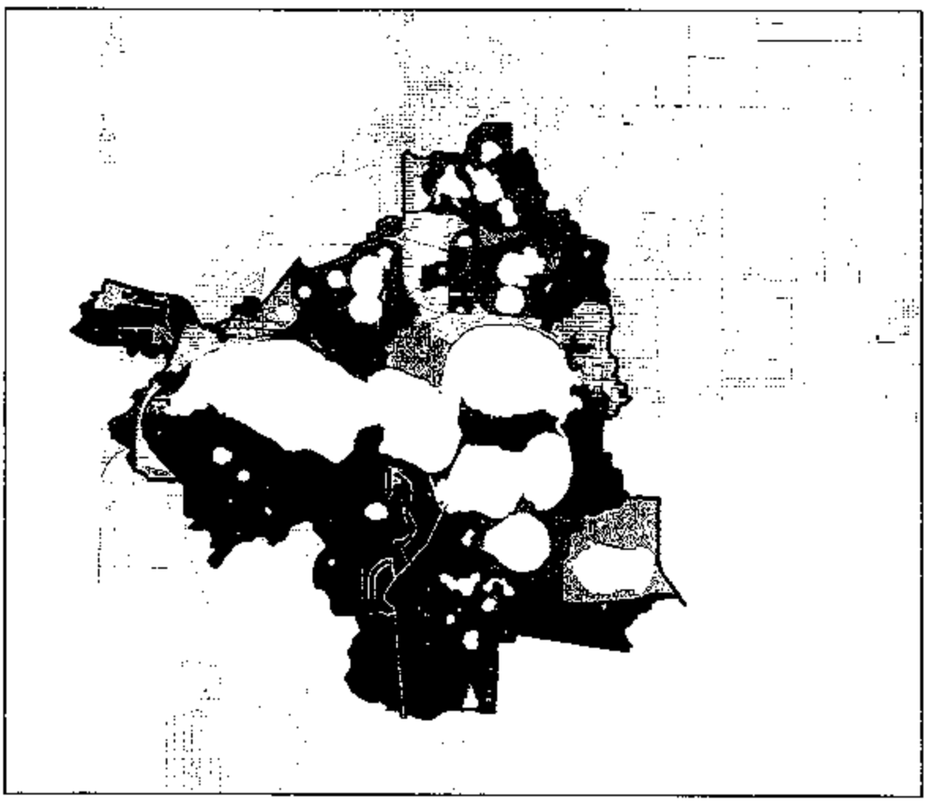
TN
(lbs/ac-yr)

0.0-0.5
0.5-1.0
1.0-1.5
1.5-2.0
2.0-2.5
2.5-3.0
3.0-3.5
3.5-4.0
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
6.5-7.0
7.0-7.5
7.5-8.0
8.0-8.5
8.5-9.0
9.0-9.5
9.5-10.0
10.0-10.5
10.5-11.0
11.0-11.5
11.5-12.0
12.0-12.5
12.5-13.0
13.0-13.5
13.5-14.0
14.0-14.5
14.5+

N
Not To Scale

Figure VII-1

Master Stormwater Management Plan for the Lake Dora Basin



TP
(lbs/ac-yr)

0.00-0.05
0.05-0.10
0.10-0.15
0.15-0.20
0.20-0.25
0.25-0.30
0.30-0.35
0.35-0.40
0.40-0.45
0.45-0.50
0.50-0.55
0.55-0.60
0.60-0.65
0.65-0.70
0.70-0.75
0.75-0.80
0.80-0.85
0.85-0.90
0.90-0.95
0.95-1.00
1.00-1.05
1.05-1.10
1.10-1.15
1.15-1.20
1.20-1.25
1.25-1.30
1.30-1.35
1.35-1.40
1.40-1.45
1.45+

N
Not To Scale

Figure VII-2

Master Stormwater Management Plan for the Lake Dora Basin

TSS
(lbs/ac-yr)

0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100

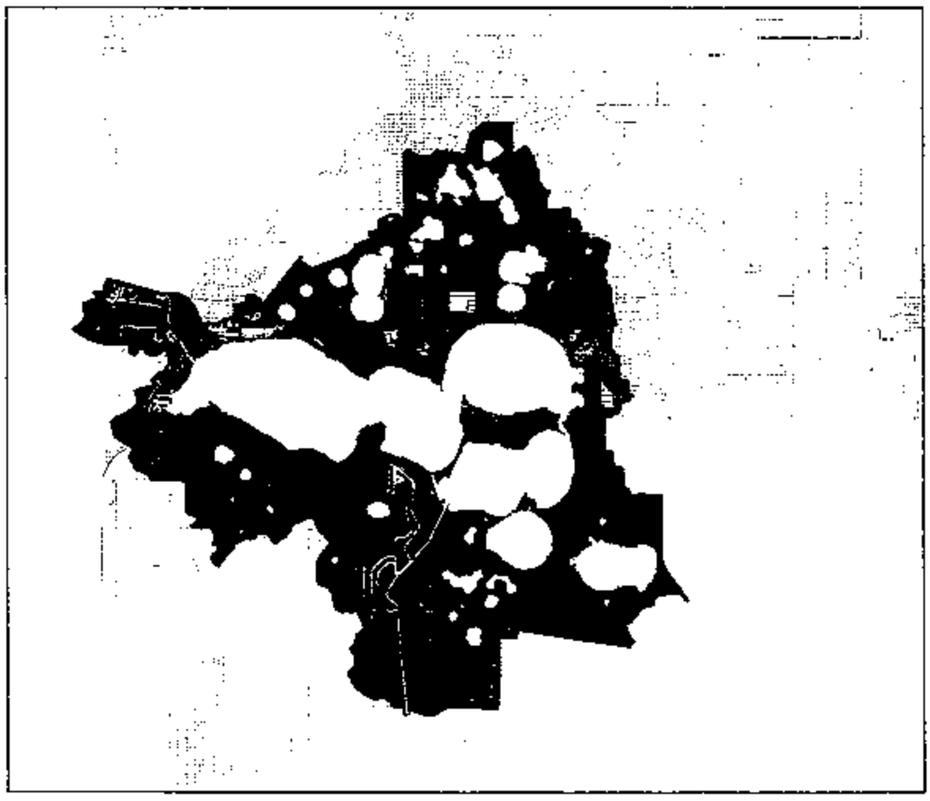
100-110
110-120
120-130
130-140
140-150
150-160
160-170
170-180
180-190
190-200

200-210
210-220
220-230
230-240
240-250
250-260
260-270
270-280
280-290
290+

N
Not To Scale

Figure VII-3

Master Stormwater Management Plan for the Lake Dora Basin



TZn
(lbs/ac-yr)

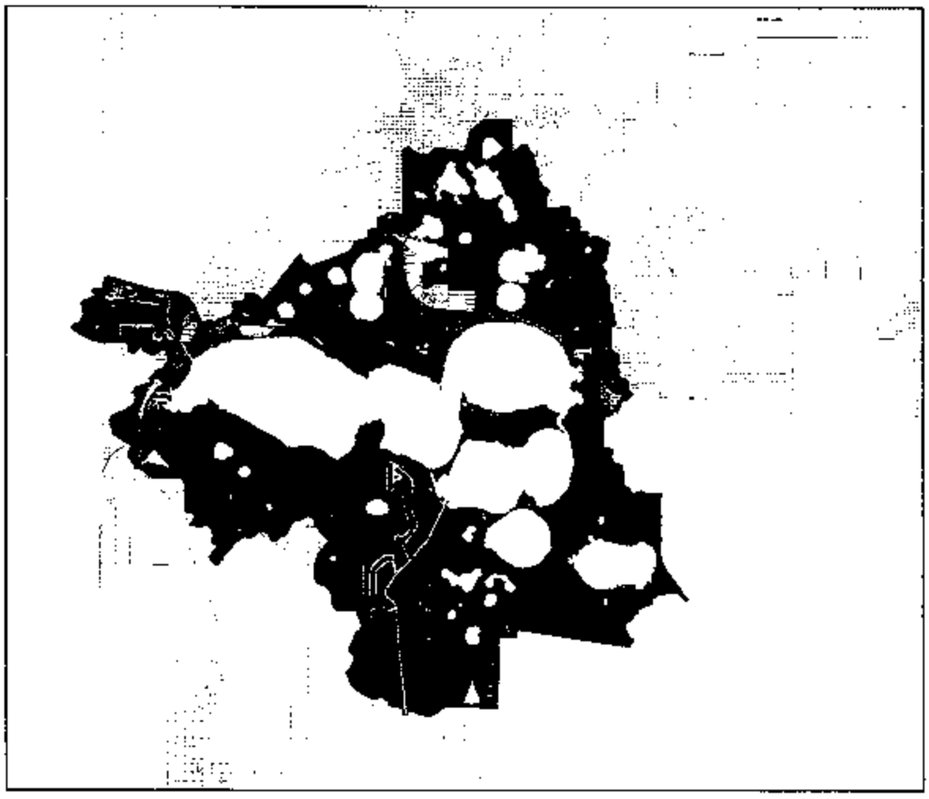
- 0.000-0.025
- 0.025-0.050
- 0.050-0.075
- 0.075-0.100
- 0.100-0.125
- 0.125-0.150
- 0.150-0.175
- 0.175-0.200
- 0.200-0.225
- 0.225-0.250
- 0.250-0.275
- 0.275-0.300
- 0.300-0.325
- 0.325-0.350
- 0.350-0.375
- 0.375-0.400
- 0.400-0.425
- 0.425-0.450
- 0.450-0.475
- 0.475-0.500
- 0.500-0.525
- 0.525-0.550
- 0.550-0.575
- 0.575-0.600
- 0.600-0.625
- 0.625-0.650
- 0.650-0.675
- 0.675-0.700
- 0.700-0.725
- 0.725+

N

Not To Scale

Figure VII-4

Master Stormwater Management Plan for the Lake Dora Basin



TPb
(lbs/ac-yr)

0.000-0.025
0.025-0.050
0.050-0.075
0.075-0.100
0.100-0.125
0.125-0.150
0.150-0.175
0.175-0.200
0.200-0.225
0.225-0.250
0.250-0.275
0.275-0.300
0.300-0.325
0.325-0.350
0.350-0.375
0.375-0.400
0.400-0.425
0.425-0.450
0.450-0.475
0.475-0.500
0.500-0.525
0.525-0.550
0.550-0.575
0.575-0.600
0.600-0.625
0.625-0.650
0.650-0.675
0.675-0.700
0.700-0.725
0.725+

N

Not To Scale

Figure VII-5

CHAPTER VIII. SUMMARY

The Lake County Board of County Commissioners and the Governing Board of the St. Johns River Water Management District contracted with Ghioto & Associates to provide consultant and professional engineering services relating to the preparation of a Master Stormwater Management Plan for the Lake Dora Basin. The MSMP evaluates existing water quantity and quality conditions, locates problem areas, recommends measures and provides design for improvement and restoration. The MSMP also identifies significant existing natural systems and discusses their importance relative to the water quantity and quality of the basin. Results of the MSMP will be used by Lake County in the planning and regulation of future development in the Lake Dora Basin.

This document is the last in a series of three volumes, which together provide results of the problem definition phase of the MSMP. In the preceding volume, entitled *Master Stormwater Management Plan for the Lake Dora Basin, Volume II, Water Quantity Analysis for the Dora Basin of Lake County, Florida*, the hydraulic performance of the primary stormwater conveyance system, under storm event rainfall conditions, was discussed. The model described in that previous document was used as the basis for the development of a water quality model of the Lake Dora Watershed. In this final volume, the analysis of the watershed's response to meteorological conditions over a typical year are discussed, with emphasis on the quality of stormwater runoff.

This volume presents the results of water quality modeling, including a discussion of model development, testing, and predictive simulations. The development of a typical year rainfall distribution, to drive the long term water quality simulation, is described. The results of simulation of the response of the watershed to the typical year rainfall are presented in detail, and water quality problem areas are identified.

A. WATER QUALITY MODELING

This water quality modeling and problem area analysis includes the hydrologic evaluation of the Lake Dora Watershed under typical year rainfall conditions. In order to predict the response of the study area to rainfall and evaluate pollutant loadings, a computer model was developed. The model employed was the Environmental Protection Agency's Stormwater Management Model (SWMM). SWMM was implemented as a surface water model for storm events, utilizing the Runoff and Transport blocks for water quality simulations.

A model input database was constructed, utilizing the CHAN model as a pre-processor to store the physical attributes of a drainage system in terms of conceptual model elements. Parameters were developed to describe characteristics of the hydrologic system, while physical attributes of the conveyance system were collected and input to describe the physical geometry of hydraulic model elements. In addition, areally weighted Event Mean Concentration (EMC) data were assigned to each subcatchment, as a function of landuse, to describe concentrations of Total Nitrogen, Total Phosphorous, Total Suspended Solids, Total Zinc and Total Lead.

Lacking historical data with which to calibrate the model, reliance was placed on the experience of the hydrologists in parameter selection and model construction. Literature values for parameters were used as a starting point. However, without some comparative tool, the ultimate reliability of the models remained in doubt. Therefore, comparative simulations were made, utilizing the CHAN model and an alternative methodology for computation of runoff hydrographs. Based upon those comparative simulations and testing of model sensitivity, a final set of model parameters was selected for use.

A one year, historical rainfall record was selected that was characteristic of a "typical" year of precipitation. That data was then used, along with historical evaporation data for the same period of time, to drive continuous simulations for pollutant loading analyses. Long term simulations were performed for areas within the Lake Dora Watershed. After each simulation, the results of Runoff and Transport block computations were reviewed to verify that continuity errors in each computational block were minimal.

The predictive simulations were then summarized and tabulated. Those simulation results were further analyzed, in order to identify problem areas in the Lake Dora Watershed. Pollutant loadings and areal pollutant loading rates throughout the entire Lake Dora Watershed were tabulated, mapped, and discussed.

B. REMAINING TASKS - PHASES II and III of the MSMP

Phase I tasks consist of the collection of existing data (including coordination of any previous studies, documents and data and collection of additional information through field survey), the development of water quantity and quality simulation models for the Lake Dora watershed, and the identification of problem areas in the watershed.

As described in this volume, the EPA SWMM model has been implemented as a surface water model for the typical year rainfall condition, utilizing the Runoff

and Transport blocks for water quality simulations. Problem areas associated with the quality of runoff from the typical year rainfall have been identified.

This concludes the problem definition phase of the MSMP for the Lake Dora Watershed. Phase II of the MSMP is the Conceptual Design and Permitting Phase, which will itemize planning aspects of the project. Conceptual designs are to be the product of that next phase, and will include assisting Lake County in the application for conceptual approval permits from the St. Johns River Water Management District.

REFERENCES

[Final Bibliography will be placed here]

APPENDIX A - SUMMARY OF MONTHLY POLLUTANT LOADINGS

Monthly Loadings For Total Nitrogen (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N1050	2.97	0.18	1.59	1.11	1.87	1.24	0.59	0.60	0.78	0.63	1.20	0.61	13.38
N1060	12.40	0.74	6.68	4.67	7.84	5.18	2.45	2.51	3.23	2.64	4.98	2.52	55.86
N1070	48.70	2.89	26.22	18.29	30.66	20.27	9.60	9.85	12.54	10.31	19.42	9.83	218.80
N1100	6.48	0.39	3.48	2.44	4.11	2.70	1.29	1.31	1.69	1.38	2.61	1.32	29.20
N1130	26.70	1.59	14.41	10.05	16.93	11.13	5.27	5.41	6.85	5.66	10.62	5.38	120.00
N1170	45.02	2.66	24.24	16.90	28.60	18.69	8.86	9.06	11.50	9.49	17.84	9.03	201.89
N1180	59.75	3.51	32.28	22.48	37.94	24.83	11.72	12.03	14.95	12.54	23.42	11.92	267.39
N1190	0.97	0.05	0.40	0.28	0.49	0.31	0.15	0.15	0.20	0.16	0.30	0.15	3.61
N2020	4.22	0.25	2.27	1.59	2.68	1.76	0.84	0.86	1.10	0.90	1.70	0.86	19.00
N2030	7.25	0.43	3.91	2.73	4.59	3.03	1.43	1.47	1.87	1.54	2.89	1.47	32.60
N2060	12.49	0.74	6.74	4.70	7.93	5.21	2.47	2.53	3.23	2.65	4.98	2.52	56.18
N2070	41.34	2.46	22.34	15.57	26.25	17.24	8.16	8.35	10.62	8.75	16.48	8.35	185.92
N2080	0.70	0.04	0.38	0.26	0.45	0.29	0.14	0.14	0.18	0.15	0.28	0.14	3.15
N2090	5.01	0.30	2.69	1.88	3.17	2.09	0.99	1.02	1.31	1.07	2.02	1.02	22.57
N2110	7.70	0.46	4.16	2.89	4.87	3.23	1.53	1.56	2.02	1.64	3.11	1.57	34.75
N2130	1.42	0.08	0.72	0.51	0.86	0.56	0.27	0.27	0.35	0.29	0.54	0.27	6.16
N2160	1.44	0.09	0.78	0.54	0.91	0.60	0.29	0.29	0.38	0.31	0.58	0.29	6.48
N2170	19.82	1.18	10.70	7.48	12.57	8.27	3.91	4.02	5.10	4.19	7.90	3.99	89.13
N2190	0.94	0.06	0.49	0.34	0.58	0.38	0.18	0.18	0.24	0.20	0.37	0.18	4.15
N2210	1.42	0.09	0.76	0.53	0.89	0.59	0.28	0.29	0.37	0.30	0.57	0.29	6.39
N2220	9.49	0.57	5.10	3.57	6.00	3.96	1.88	1.93	2.49	2.02	3.82	1.93	42.77
N2250	0.47	0.03	0.25	0.18	0.30	0.20	0.09	0.10	0.12	0.10	0.19	0.10	2.12
N2280	11.44	0.69	6.14	4.28	7.22	4.76	2.26	2.32	3.00	2.43	4.62	2.33	51.49
N2330	13.28	0.80	7.14	4.98	8.38	5.52	2.62	2.68	3.45	2.81	5.32	2.69	59.68
N2350	4.16	0.24	2.16	1.51	2.54	1.67	0.80	0.82	1.06	0.86	1.62	0.82	18.25
N2380	32.85	1.97	17.67	12.35	20.78	13.68	6.48	6.65	8.55	6.97	13.17	6.65	147.77
N2410	12.97	0.78	6.99	4.87	8.21	5.41	2.57	2.62	3.37	2.76	5.21	2.63	58.38
N2420	2.72	0.16	1.45	1.02	1.71	1.13	0.54	0.55	0.71	0.58	1.09	0.55	12.20
N2430	5.69	0.34	3.06	2.14	3.60	2.37	1.13	1.16	1.50	1.21	2.29	1.16	25.63
N2460	138.47	8.10	74.75	52.10	88.06	57.48	27.10	27.78	34.26	28.88	54.08	27.55	618.62
N2470	25.20	1.50	13.56	9.46	15.94	10.48	4.98	5.10	6.51	5.35	10.08	5.10	113.27
N2480	10.65	0.64	5.75	3.99	6.74	4.45	2.11	2.16	2.79	2.27	4.28	2.17	47.98
N3030	1.41	0.09	0.76	0.53	0.89	0.59	0.28	0.29	0.37	0.30	0.57	0.29	6.36
N3040	7.19	0.43	3.88	2.70	4.53	3.00	1.42	1.46	1.88	1.53	2.89	1.46	32.38
N3050	4.84	0.29	2.61	1.82	3.06	2.02	0.96	0.98	1.27	1.03	1.95	0.99	21.83
N3060	12.86	0.77	6.94	4.84	8.16	5.35	2.54	2.60	3.31	2.73	5.13	2.60	57.82
N3070	2.22	0.13	1.20	0.84	1.41	0.93	0.44	0.45	0.58	0.47	0.89	0.45	10.02
N3080	10.62	0.83	5.72	3.99	6.74	4.42	2.10	2.15	2.75	2.25	4.25	2.15	47.77
N3090	60.31	3.57	32.56	22.68	38.23	25.09	11.86	12.18	15.29	12.71	23.84	12.09	270.42
N3100	3.20	0.19	1.71	1.19	2.00	1.33	0.63	0.65	0.84	0.68	1.28	0.65	14.34
N3110	0.37	0.02	0.20	0.14	0.24	0.16	0.07	0.08	0.10	0.08	0.15	0.08	1.69
N3120	6.03	0.36	3.26	2.26	3.82	2.51	1.19	1.22	1.57	1.28	2.42	1.22	27.14
N3130	2.57	0.15	1.38	0.96	1.62	1.07	0.51	0.52	0.67	0.55	1.03	0.52	11.55
N3140	13.00	0.77	7.02	4.90	8.24	5.41	2.56	2.62	3.31	2.75	5.15	2.62	58.35
N3160	7.42	0.44	3.99	2.79	4.70	3.09	1.47	1.50	1.93	1.57	2.97	1.50	33.38
N3170	12.29	0.74	6.63	4.62	7.79	5.13	2.43	2.49	3.20	2.61	4.93	2.49	55.33
N3180	6.48	0.39	3.45	2.42	4.08	2.69	1.28	1.31	1.70	1.37	2.60	1.31	29.06
N3200	0.39	0.02	0.21	0.15	0.25	0.16	0.08	0.08	0.10	0.08	0.16	0.08	1.75
N3210	0.36	0.02	0.19	0.13	0.22	0.15	0.07	0.07	0.09	0.08	0.14	0.07	1.60
N3220	2.53	0.15	1.36	0.95	1.59	1.05	0.50	0.51	0.67	0.54	1.02	0.52	11.39
N3230	1.09	0.07	0.58	0.41	0.69	0.45	0.22	0.22	0.29	0.23	0.44	0.22	4.90
N3240	2.36	0.14	1.27	0.89	1.49	0.98	0.47	0.48	0.62	0.50	0.95	0.48	10.63
N3250	2.65	0.16	1.43	1.00	1.68	1.10	0.52	0.54	0.69	0.56	1.06	0.54	11.92
N3260	2.82	0.17	1.52	1.06	1.78	1.18	0.56	0.57	0.74	0.60	1.14	0.57	12.70
N3280	10.76	0.65	5.78	4.02	6.77	4.47	2.13	2.18	2.82	2.29	4.33	2.19	48.38
N3310	1.39	0.08	0.74	0.52	0.87	0.57	0.27	0.28	0.37	0.29	0.56	0.28	6.23
N3320	9.83	0.59	5.24	3.65	6.14	4.05	1.93	1.97	2.54	2.07	3.91	1.98	43.89
N3330	6.54	0.39	3.43	2.40	4.36	2.66	1.27	1.30	1.68	1.36	2.58	1.30	29.26
N3360	30.30	1.80	16.42	11.44	19.34	12.66	4.62	6.14	7.73	6.43	12.03	6.12	135.02
N4010	23.28	1.40	12.54	8.75	14.72	9.71	4.62	4.73	6.09	4.96	9.34	4.73	104.87
N4020	4.11	0.25	2.21	1.54	2.59	1.71	0.81	0.83	1.08	0.87	1.65	0.84	18.48
N4040	1143.97	68.24	614.46	430.40	724.89	475.71	225.96	231.34	297.32	242.67	458.72	231.34	5145.02
N4050	22.54	1.35	12.15	8.47	14.27	9.40	4.47	4.56	5.86	4.79	9.06	4.59	101.51
N4110	55.78	3.31	29.73	20.73	34.83	22.96	10.90	11.16	14.33	11.69	22.09	11.18	248.70
N4150	6.65	0.40	3.57	2.49	4.19	2.77	1.31	1.35	1.73	1.41	2.66	1.35	29.88
N4160	52.67	3.11	28.32	19.79	33.41	21.92	10.39	10.65	13.48	11.13	20.93	10.59	236.38
N4170	60.03	3.54	32.28	22.57	37.94	24.95	11.81	12.12	15.32	12.69	23.79	12.06	269.09

Monthly Loadings For Total Nitrogen (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N4180	12.91	0.77	6.85	4.79	8.21	5.32	2.53	2.59	3.37	2.72	5.15	2.60	57.81
N4190	117.23	6.94	62.86	43.89	73.90	48.70	23.02	23.59	30.01	24.72	46.44	23.59	524.89
N4200	84.86	4.98	45.59	31.71	53.60	35.11	16.62	17.05	21.41	17.84	33.41	16.96	379.15
N4240	24.24	1.43	13.08	9.12	15.40	10.08	4.79	4.90	6.17	5.13	9.60	4.87	108.81
N4250	131.39	7.70	71.07	49.55	83.53	54.65	25.80	26.45	33.13	27.64	51.54	26.28	586.72
N4380	121.48	7.08	65.69	45.59	77.30	50.40	23.73	24.35	30.01	25.37	47.29	24.10	542.39
N4390	148.66	8.69	80.42	55.78	94.86	61.45	29.17	29.73	36.53	31.15	57.76	29.45	663.64
N4400	10.34	0.62	5.58	3.88	6.54	4.30	2.04	2.09	2.67	2.19	4.13	2.09	46.47
N4430	5.32	0.32	2.86	2.01	3.37	2.23	1.06	1.08	1.40	1.14	2.15	1.09	24.02
N4450	5.15	0.31	2.79	1.95	3.28	2.16	1.03	1.05	1.36	1.10	2.09	1.05	23.33
N4480	3.45	0.21	1.86	1.30	2.19	1.44	0.69	0.70	0.91	0.74	1.39	0.71	15.59
N4520	30.30	1.79	16.37	11.41	19.25	12.60	5.97	6.12	7.70	6.40	12.01	6.09	136.01
N4530	6.74	0.41	3.62	2.54	4.28	2.82	1.34	1.38	1.79	1.44	2.74	1.38	30.48
N4540	1342.18	79.57	719.23	501.19	855.14	554.99	263.34	269.85	342.62	282.59	532.34	269.57	6012.62
N4550	0.59	0.03	0.28	0.19	0.32	0.21	0.10	0.10	0.14	0.11	0.21	0.11	2.39
N4560	13.87	0.83	7.48	5.21	8.78	5.78	2.74	2.81	3.60	2.94	5.55	2.81	62.40
N4570	48.89	2.89	26.50	18.46	31.15	20.39	9.63	9.88	12.40	10.34	19.34	9.83	219.79
N4580	72.77	4.33	39.08	27.32	46.44	30.30	14.36	14.70	18.75	15.40	28.88	14.70	327.02
N4590	322.80	19.00	174.43	121.48	205.86	134.22	63.43	65.13	81.27	67.96	127.14	64.56	1447.26
N4600	359.61	21.61	193.12	134.78	227.38	149.51	71.07	72.77	94.01	76.45	144.41	73.06	1617.78
N4610	108.17	6.46	58.33	40.49	68.52	45.02	21.41	21.92	28.23	22.99	43.32	21.97	486.87
N4620	205.86	12.06	111.28	77.30	131.10	85.23	40.21	41.34	50.97	43.04	80.13	41.06	919.59
N4630	402.09	24.07	215.48	150.36	255.96	166.78	79.28	81.27	104.77	85.23	161.12	81.27	1807.69
N4640	611.63	36.81	328.47	229.64	387.93	254.84	120.91	124.02	159.70	129.97	245.78	124.31	2754.01
N4650	214.64	12.91	115.25	80.42	135.63	89.20	42.47	43.32	56.07	45.59	86.36	43.61	965.46
N4660	10.82	0.62	5.44	3.79	6.37	4.22	2.01	2.06	2.69	2.16	4.11	2.07	46.36
N4670	56.92	3.34	30.56	21.38	36.24	23.64	11.18	11.47	14.36	11.98	22.40	11.38	254.87
N4700	7.70	0.45	4.02	2.80	4.73	3.11	1.48	1.52	1.97	1.59	3.03	1.52	33.93
N5040	9.68	0.56	5.13	3.57	6.43	3.94	1.86	1.91	2.40	2.00	3.74	1.90	43.11
N5060	2.36	0.14	1.23	0.86	1.57	0.95	0.45	0.46	0.59	0.48	0.91	0.46	10.47
N5070	40.21	2.31	21.15	14.72	25.03	16.31	7.70	7.90	9.97	8.27	15.52	7.87	176.97
N5080	52.67	3.09	28.32	19.76	33.41	21.83	10.31	10.56	13.17	11.04	20.61	10.51	235.28
N5120	16.23	0.97	8.78	6.12	10.31	6.77	3.20	3.28	4.16	3.45	6.46	3.28	73.00
N5130	31.15	1.84	16.76	11.67	19.71	12.91	6.12	6.26	7.93	6.57	12.32	6.23	139.45
N5140	17.81	1.07	9.60	6.71	11.30	7.45	3.54	3.62	4.64	3.79	7.14	3.62	80.30
N5170	0.78	0.05	0.42	0.29	0.50	0.33	0.15	0.16	0.21	0.17	0.31	0.16	3.52
N5180	4.25	0.26	2.29	1.60	2.69	1.77	0.84	0.86	1.11	0.90	1.71	0.86	19.14
N5190	3.06	0.18	1.66	1.16	1.95	1.28	0.61	0.62	0.80	0.65	1.23	0.62	13.83
N5210	0.95	0.06	0.52	0.36	0.61	0.40	0.19	0.19	0.25	0.20	0.39	0.20	4.32
N5220	10.48	0.62	5.66	3.94	6.65	4.36	2.06	2.11	2.65	2.21	4.13	2.10	46.98
N5230	1.89	0.11	1.02	0.71	1.20	0.79	0.38	0.39	0.50	0.40	0.77	0.39	8.56
N5240	10.05	0.59	5.44	3.77	6.40	4.16	1.97	2.02	2.49	2.10	3.91	2.00	44.89
N5250	15.94	0.93	8.64	6.00	10.17	6.63	3.11	3.20	3.96	3.34	6.23	3.17	71.33
N5260	4.93	0.29	2.65	1.85	3.11	2.05	0.97	1.00	1.27	1.04	1.97	0.99	22.13
N5280	1.98	0.11	1.04	0.73	1.31	0.80	0.38	0.39	0.50	0.41	0.77	0.39	8.82
N5290	18.09	1.03	9.40	6.54	11.16	7.25	3.43	3.51	4.47	3.68	6.94	3.51	79.02
N5300	168.46	10.08	90.89	63.43	107.03	70.22	33.41	34.26	43.61	35.68	67.39	34.26	758.76
N5320	3.06	0.18	1.64	1.15	1.93	1.27	0.60	0.62	0.80	0.65	1.23	0.62	13.75
N5330	1.38	0.08	0.74	0.52	0.87	0.57	0.27	0.28	0.36	0.29	0.55	0.28	6.21
N5340	1.51	0.09	0.81	0.57	0.95	0.63	0.30	0.31	0.39	0.32	0.61	0.31	6.80
N5350	1.57	0.09	0.84	0.59	0.99	0.65	0.31	0.32	0.41	0.33	0.63	0.32	7.08
N5360	1.19	0.07	0.64	0.44	0.75	0.50	0.24	0.24	0.31	0.25	0.48	0.24	5.35
N5370	3.00	0.18	1.62	1.13	1.91	1.25	0.59	0.61	0.76	0.64	1.20	0.61	13.53
N5380	67.96	4.08	36.24	25.34	42.76	28.15	13.37	13.70	17.78	14.39	27.24	13.76	304.77
N5390	47.00	2.82	25.34	17.70	29.73	19.62	9.32	9.54	12.23	10.00	18.89	9.54	211.74
N6040	1.27	0.08	0.69	0.48	0.81	0.53	0.25	0.26	0.33	0.27	0.51	0.26	5.75
N6070	10.39	0.62	5.58	3.91	6.54	4.33	2.05	2.10	2.70	2.20	4.16	2.10	46.70
N6090	22.11	1.30	11.95	8.32	14.04	9.17	4.33	4.45	5.55	4.64	8.69	4.42	98.99
N6100	4.73	0.28	2.55	1.78	3.00	1.97	0.93	0.95	1.20	1.00	1.87	0.95	21.21
N6110	3.06	0.18	1.65	1.15	1.95	1.27	0.60	0.61	0.76	0.64	1.20	0.61	13.68
N6130	1.22	0.07	0.65	0.46	0.78	0.50	0.24	0.24	0.31	0.26	0.48	0.25	5.46
N6140	6.17	0.37	3.28	2.30	3.88	2.55	1.21	1.23	1.58	1.29	2.44	1.23	27.53
N6160	5.83	0.35	3.14	2.19	3.71	2.42	1.15	1.18	1.50	1.23	2.32	1.18	26.19
N6180	12.83	0.75	6.94	4.81	8.16	5.32	2.51	2.57	3.20	2.68	5.01	2.55	57.34
N6190	2.11	0.12	1.13	0.79	1.36	0.87	0.41	0.42	0.54	0.44	0.84	0.42	9.46
N6210	16.99	1.00	9.06	6.31	10.68	6.99	3.31	3.40	4.33	3.57	6.71	3.40	75.76
N6220	4.08	0.24	2.20	1.53	2.58	1.70	0.81	0.83	1.06	0.87	1.64	0.83	18.36

Monthly Loadings For Total Nitrogen (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N6240	4.11	0.24	2.20	1.54	2.59	1.70	0.81	0.83	1.06	0.87	1.63	0.83	18.40
N6250	9.80	0.58	5.30	3.68	6.23	4.08	1.93	1.97	2.48	2.06	3.85	1.96	43.91
N6260	2.25	0.14	1.21	0.85	1.43	0.94	0.44	0.48	0.59	0.48	0.90	0.46	10.14
N6280	1.58	0.10	0.85	0.59	1.00	0.66	0.31	0.32	0.42	0.34	0.64	0.32	7.13
N6290	2.64	0.16	1.43	1.00	1.68	1.10	0.52	0.54	0.69	0.56	1.06	0.54	11.92
N7000	196.80	11.50	106.47	73.90	125.18	81.55	38.51	39.36	48.70	41.06	76.74	39.08	878.82
N7010	43.61	2.58	23.53	16.37	27.69	18.09	8.55	8.75	10.93	9.15	17.10	8.69	195.02
N7020	16.56	0.96	8.92	6.23	10.51	6.86	3.26	3.34	4.22	3.48	6.54	3.31	74.23
N7030	20.47	1.22	10.96	7.65	12.88	8.49	4.02	4.13	5.32	4.33	8.18	4.13	91.81
N7040	21.07	1.20	10.93	7.62	12.94	8.44	3.99	4.11	5.18	4.28	8.04	4.08	91.87
N7050	71.64	4.19	38.51	26.87	45.31	29.73	14.02	14.38	17.98	15.04	28.09	14.30	320.06
N7060	21.92	1.25	11.21	7.82	13.31	8.69	4.13	4.22	5.44	4.45	8.38	4.25	95.07
N7070	69.66	4.11	36.81	25.77	43.32	28.60	13.58	13.87	17.87	14.65	27.52	13.90	309.55
N7080	0.50	0.03	0.27	0.19	0.31	0.21	0.10	0.10	0.13	0.11	0.20	0.10	2.25
N7090	43.89	2.54	23.47	16.31	27.69	17.98	8.49	8.72	10.73	9.09	16.90	8.64	194.46
N7100	104.49	6.26	56.35	39.36	66.26	43.61	20.70	21.18	27.10	22.20	41.91	21.21	470.61
N7110	12.23	0.72	6.63	4.62	7.79	5.10	2.40	2.46	3.09	2.57	4.81	2.45	54.87
N7120	5.63	0.34	3.03	2.12	3.57	2.36	1.12	1.15	1.49	1.21	2.29	1.15	25.46
N7130	8.95	0.53	4.84	3.37	5.69	3.74	1.77	1.81	2.30	1.90	3.57	1.81	40.28
N7140	40.49	2.38	21.92	15.26	25.82	16.85	7.96	8.16	10.17	8.52	15.91	8.10	181.53
N7150	68.81	4.02	37.09	25.85	43.69	28.50	13.48	13.82	17.16	14.41	26.90	13.70	307.74
N7160	39.36	2.36	21.24	14.84	24.95	16.42	7.79	7.99	10.25	8.38	15.80	7.99	177.35
N7170	87.21	5.10	47.29	32.85	55.78	36.24	17.07	17.50	21.49	18.24	33.98	17.33	390.08
N7180	34.55	2.02	18.66	12.97	21.97	14.30	6.74	6.91	8.52	7.22	13.42	6.85	154.13
N7190	53.52	3.17	28.88	20.08	33.98	22.23	10.53	10.79	13.73	11.30	21.27	10.79	240.26
N7200	107.03	6.43	57.76	40.21	67.96	44.74	21.24	21.75	27.98	22.82	43.04	21.78	482.73
N7210	80.42	4.79	43.32	30.30	50.97	33.41	15.89	16.28	20.73	17.05	32.00	16.25	361.40
N7220	4.22	0.26	2.27	1.59	2.66	1.76	0.84	0.86	1.11	0.90	1.71	0.86	19.02
N7230	10.59	0.63	5.69	3.96	6.68	4.42	2.09	2.14	2.75	2.25	4.25		

Monthly Loadings For Total Nitrogen (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N1050	2.97	0.18	1.59	1.11	1.87	1.24	0.59	0.50	0.78	0.63	1.20	0.61	13.38
N1060	12.40	0.74	6.60	4.67	7.84	5.18	2.45	2.51	3.23	2.64	4.98	2.52	55.86
N1070	48.70	2.89	26.22	18.29	30.66	20.27	9.60	9.85	12.54	10.31	19.42	9.83	218.60
N1100	6.48	0.39	3.46	2.44	4.11	2.70	1.29	1.31	1.69	1.38	2.61	1.32	29.20
N1130	26.70	1.59	14.41	10.05	16.93	11.13	5.27	5.41	6.85	5.66	10.62	5.38	120.00
N1170	45.02	2.66	24.24	16.90	28.60	18.69	8.86	9.06	11.50	9.49	17.84	9.03	201.89
N1180	59.75	3.51	32.28	22.48	37.94	24.83	11.72	12.03	14.95	12.54	23.42	11.92	267.39
N1190	0.97	0.05	0.40	0.28	0.49	0.31	0.15	0.15	0.20	0.16	0.30	0.15	3.61
N2020	4.22	0.25	2.27	1.59	2.66	1.76	0.84	0.86	1.10	0.90	1.70	0.86	19.00
N2030	7.25	0.43	3.91	2.73	4.59	3.03	1.43	1.47	1.87	1.54	2.89	1.47	32.60
N2060	12.49	0.74	6.74	4.70	7.93	5.21	2.47	2.53	3.23	2.65	4.98	2.52	56.18
N2070	41.34	2.46	22.34	15.57	26.25	17.24	8.16	8.35	10.62	8.75	16.48	8.35	185.92
N2080	0.70	0.04	0.38	0.26	0.45	0.29	0.14	0.14	0.18	0.15	0.28	0.14	3.15
N2090	5.01	0.30	2.69	1.88	3.17	2.09	0.99	1.02	1.31	1.07	2.02	1.02	22.57
N2110	7.70	0.46	4.16	2.89	4.87	3.23	1.53	1.56	2.02	1.64	3.11	1.57	34.75
N2130	1.42	0.08	0.72	0.51	0.86	0.56	0.27	0.27	0.35	0.29	0.54	0.27	6.16
N2160	1.44	0.09	0.78	0.54	0.91	0.60	0.29	0.29	0.38	0.31	0.58	0.29	6.48
N2170	19.82	1.18	10.70	7.48	12.57	8.27	3.91	4.02	5.10	4.19	7.90	3.99	89.13
N2190	0.94	0.06	0.49	0.34	0.58	0.38	0.18	0.19	0.24	0.20	0.37	0.19	4.15
N2210	1.42	0.09	0.76	0.53	0.89	0.59	0.28	0.29	0.37	0.30	0.57	0.29	6.39
N2220	9.49	0.57	5.10	3.57	6.00	3.96	1.88	1.93	2.49	2.02	3.82	1.93	42.77
N2250	0.47	0.03	0.25	0.18	0.30	0.20	0.09	0.10	0.12	0.10	0.19	0.10	2.12
N2280	11.44	0.69	6.14	4.28	7.22	4.76	2.26	2.32	3.00	2.43	4.62	2.33	51.49
N2330	13.28	0.80	7.14	4.96	8.38	5.52	2.62	2.68	3.46	2.81	5.32	2.69	59.68
N2350	4.16	0.24	2.16	1.51	2.54	1.67	0.80	0.82	1.06	0.86	1.62	0.82	18.25
N2360	32.85	1.97	17.67	12.35	20.78	13.68	6.48	6.65	8.55	6.97	13.17	6.65	147.77
N2410	12.97	0.78	6.98	4.87	8.21	5.41	2.57	2.62	3.37	2.76	5.21	2.63	58.36
N2420	2.72	0.16	1.46	1.02	1.71	1.13	0.54	0.55	0.71	0.58	1.09	0.55	12.20
N2430	5.69	0.34	3.06	2.14	3.60	2.37	1.13	1.16	1.50	1.21	2.29	1.16	25.63
N2460	138.47	8.10	74.75	52.10	88.00	57.48	27.10	27.78	34.26	28.88	54.08	27.55	618.62
N2470	25.20	1.50	13.56	9.46	15.94	10.48	4.98	5.10	6.51	5.35	10.08	5.10	113.27
N2480	10.65	0.64	5.75	3.99	6.74	4.45	2.11	2.16	2.79	2.27	4.28	2.17	47.98
N3030	1.41	0.09	0.76	0.53	0.80	0.59	0.28	0.29	0.37	0.30	0.57	0.29	6.36
N3040	7.19	0.43	3.88	2.70	4.53	3.00	1.42	1.46	1.88	1.53	2.80	1.46	32.38
N3050	4.64	0.29	2.61	1.82	3.06	2.02	0.96	0.98	1.27	1.03	1.95	0.99	21.83
N3060	12.86	0.77	6.94	4.84	8.16	5.36	2.54	2.60	3.31	2.73	5.13	2.60	57.82
N3070	2.22	0.13	1.20	0.84	1.41	0.93	0.44	0.45	0.58	0.47	0.89	0.45	10.02
N3080	10.62	0.63	5.72	3.99	6.74	4.42	2.10	2.15	2.75	2.25	4.25	2.15	47.77
N3090	60.31	3.57	32.56	22.68	38.23	25.09	11.86	12.16	15.29	12.71	23.84	12.09	270.42
N3100	3.20	0.19	1.71	1.19	2.00	1.33	0.63	0.65	0.84	0.68	1.28	0.65	14.34
N3110	0.37	0.02	0.20	0.14	0.24	0.16	0.07	0.08	0.10	0.08	0.15	0.08	1.69
N3120	6.03	0.36	3.26	2.26	3.82	2.51	1.19	1.22	1.57	1.28	2.42	1.22	27.14
N3130	2.57	0.15	1.38	0.95	1.62	1.07	0.51	0.52	0.67	0.55	1.03	0.52	11.55
N3140	13.00	0.77	7.02	4.90	8.24	5.41	2.56	2.62	3.31	2.75	5.15	2.62	58.35
N3160	7.42	0.44	3.99	2.79	4.70	3.09	1.47	1.50	1.93	1.57	2.97	1.50	33.38
N3170	12.29	0.74	6.63	4.62	7.79	5.13	2.43	2.49	3.20	2.61	4.93	2.49	55.33
N3180	6.46	0.39	3.45	2.42	4.08	2.69	1.28	1.31	1.70	1.37	2.60	1.31	29.06
N3200	0.39	0.02	0.21	0.15	0.25	0.16	0.08	0.08	0.10	0.08	0.16	0.08	1.75
N3210	0.36	0.02	0.19	0.13	0.22	0.15	0.07	0.07	0.09	0.08	0.14	0.07	1.60
N3220	2.53	0.15	1.36	0.95	1.59	1.05	0.50	0.51	0.67	0.54	1.02	0.52	11.39
N3230	1.09	0.07	0.58	0.41	0.69	0.45	0.22	0.22	0.29	0.23	0.44	0.22	4.90
N3240	2.36	0.14	1.27	0.89	1.49	0.98	0.47	0.48	0.62	0.50	0.95	0.48	10.63
N3250	2.65	0.16	1.43	1.00	1.68	1.10	0.52	0.54	0.69	0.56	1.06	0.54	11.92
N3260	2.82	0.17	1.52	1.06	1.78	1.18	0.56	0.57	0.74	0.60	1.14	0.57	12.70
N3280	10.76	0.65	5.78	4.02	6.77	4.47	2.13	2.18	2.82	2.29	4.33	2.19	48.38
N3310	1.39	0.08	0.74	0.52	0.87	0.57	0.27	0.28	0.37	0.29	0.56	0.28	6.23
N3320	9.83	0.59	5.24	3.65	6.14	4.05	1.93	1.97	2.54	2.07	3.91	1.98	43.89
N3330	6.54	0.39	3.43	2.40	4.36	2.66	1.27	1.30	1.68	1.36	2.59	1.30	29.26
N3360	30.30	1.80	16.42	11.44	19.34	12.66	4.62	6.14	7.73	6.43	12.03	6.12	135.02
N4010	23.28	1.40	12.54	8.75	14.72	9.71	4.62	4.73	6.09	4.96	9.34	4.73	104.87
N4020	4.11	0.25	2.21	1.54	2.59	1.71	0.81	0.83	1.06	0.87	1.65	0.84	18.48
N4040	1143.97	68.24	614.46	430.40	724.89	475.71	225.96	231.34	297.32	242.67	456.72	231.34	5145.02
N4050	22.54	1.35	12.15	8.47	14.27	9.40	4.47	4.56	5.86	4.79	9.06	4.59	101.51
N4110	55.78	3.31	29.73	20.73	34.83	22.96	10.90	11.16	14.33	11.69	22.09	11.18	248.70
N4150	6.65	0.40	3.57	2.49	4.19	2.77	1.31	1.35	1.73	1.41	2.66	1.35	29.88
N4160	52.67	3.11	28.32	19.78	33.41	21.92	10.39	10.65	13.48	11.13	20.93	10.59	236.38
N4170	60.03	3.54	32.28	22.57	37.94	24.95	11.81	12.12	15.32	12.69	23.79	12.06	269.09
N4180	12.91	0.77	6.85	4.79	8.21	5.32	2.53	2.59	3.37	2.72	5.15	2.60	57.81
N4190	117.23	6.94	62.86	43.89	73.90	48.70	23.02	23.59	30.01	24.72	46.44	23.59	524.89
N4200	84.66	4.98	45.59	31.71	53.80	35.11	16.62	17.06	21.41	17.84	33.41	16.98	370.15
N4240	24.24	1.43	13.08	9.12	15.40	10.08	4.79	4.90	6.17	5.13	9.60	4.87	108.81
N4250	131.39	7.70	71.07	49.55	83.53	54.65	25.80	26.45	33.13	27.64	51.54	26.28	588.72
N4380	121.48	7.08	65.69	45.59	77.30	50.40	23.73	24.35	30.01	25.37	47.29	24.10	542.39

Monthly Loadings For Total Nitrogen (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N4390	148.66	8.69	80.42	55.78	94.86	61.45	29.17	29.73	36.53	31.15	57.76	29.45	663.64
N4400	10.34	0.62	5.58	3.88	6.54	4.30	2.04	2.09	2.67	2.19	4.13	2.09	46.47
N4430	5.32	0.32	2.86	2.01	3.37	2.23	1.06	1.08	1.40	1.14	2.15	1.09	24.02
N4450	5.15	0.31	2.79	1.95	3.28	2.16	1.03	1.05	1.36	1.10	2.09	1.05	23.33
N4480	3.45	0.21	1.86	1.30	2.19	1.44	0.69	0.70	0.91	0.74	1.39	0.71	15.59
N4520	30.30	1.79	16.37	11.41	19.25	12.60	5.97	6.12	7.70	6.40	12.01	6.09	136.01
N4530	6.74	0.41	3.62	2.54	4.28	2.82	1.34	1.38	1.79	1.44	2.74	1.38	30.48
N4540	1342.18	79.57	719.23	501.19	855.14	554.99	263.34	269.85	342.62	282.50	532.34	269.57	6012.62
N4550	0.59	0.03	0.28	0.19	0.32	0.21	0.10	0.10	0.14	0.11	0.21	0.11	2.39
N4560	13.87	0.83	7.46	5.21	8.78	5.76	2.74	2.81	3.60	2.94	5.55	2.81	62.40
N4570	48.99	2.89	26.50	18.46	31.15	20.39	9.63	9.88	12.40	10.34	19.34	9.83	219.79
N4580	72.77	4.33	39.08	27.32	46.44	30.30	14.36	14.70	18.75	15.40	28.88	14.70	327.02
N4590	322.80	19.00	174.43	121.48	205.86	134.22	63.43	65.13	81.27	67.06	127.14	64.56	1447.26
N4600	359.61	21.61	193.12	134.78	227.38	149.51	71.07	72.77	94.01	76.45	144.41	73.06	1617.78
N4610	108.17	6.48	58.33	40.49	68.52	45.02	21.41	21.82	28.23	22.99	43.32	21.97	486.87
N4620	205.86	12.06	111.28	77.30	131.10	85.23	40.21	41.34	50.07	43.04	80.13	41.06	919.59
N4630	402.00	24.07	215.48	150.36	255.98	166.78	79.28	81.27	104.77	85.23	161.12	81.27	1807.69
N4640	611.63	36.81	328.47	229.64	387.93	254.84	120.01	124.02	159.70	120.97	245.78	124.31	2754.01
N4650	214.64	12.91	115.25	80.42	135.63	89.20	42.47	43.32	56.07	45.50	86.36	43.61	965.46
N4660	10.82	0.62	5.44	3.79	6.37	4.22	2.01	2.06	2.69	2.16	4.11	2.07	46.36
N4670	56.92	3.34	30.58	21.38	36.24	23.64	11.18	11.47	14.36	11.98	22.40	11.38	254.87
N4700	7.70	0.45	4.02	2.80	4.73	3.11	1.48	1.52	1.97	1.59	3.03	1.52	33.93
N5040	9.68	0.56	5.13	3.57	6.43	3.94	1.86	1.91	2.40	2.00	3.74	1.90	43.11
N5060	2.36	0.14	1.23	0.86	1.57	0.95	0.46	0.46	0.59	0.48	0.91	0.46	10.47
N5070	40.21	2.31	21.15	14.72	25.03	16.31	7.70	7.90	9.97	8.27	15.52	7.87	176.97
N5080	52.67	3.00	28.32	19.76	33.41	21.83	10.31	10.56	13.17	11.04	20.61	10.51	235.28
N5120	16.23	0.97	8.78	6.12	10.31	6.77	3.20	3.28	4.16	3.45	6.46	3.28	73.00
N5130	31.15	1.84	16.76	11.67	19.71	12.91	6.12	6.26	7.93	6.57	12.32	6.23	139.45
N5140	17.81	1.07	9.60	6.71	11.30	7.45	3.54	3.62	4.64	3.79	7.14	3.62	80.30
N5170	0.78	0.05	0.42	0.29	0.50	0.33	0.15	0.16	0.21	0.17	0.31	0.16	3.52
N5180	4.25	0.26	2.29	1.60	2.69	1.77	0.84	0.86	1.11	0.90	1.71	0.86	19.14
N5100	3.06	0.18	1.66	1.16	1.95	1.28	0.61	0.62	0.80	0.65	1.23	0.62	13.83
N5210	0.95	0.06	0.52	0.36	0.61	0.40	0.19	0.19	0.25	0.20	0.39	0.20	4.32
N5220	10.48	0.62	5.66	3.94	6.65	4.36	2.06	2.11	2.65	2.21	4.13	2.10	46.98
N5230	1.89	0.11	1.02	0.71	1.20	0.79	0.38	0.39	0.50	0.40	0.77	0.39	8.56
N5240	10.05	0.59	5.44	3.77	6.40	4.16	1.97	2.02	2.49	2.10	3.91	2.00	44.89
N5250	15.94	0.93	8.64	6.00	10.17	6.63	3.11	3.20	3.96	3.34	6.23	3.17	71.33
N5260	4.93	0.29	2.65	1.85	3.11	2.05	0.97	1.00	1.27	1.04	1.97	0.99	22.13
N5280	1.98	0.11	1.04	0.73	1.31	0.80	0.38	0.39	0.50	0.41	0.77	0.39	8.82
N5290	18.09	1.03	9.40	6.54	11.16	7.25	3.43	3.51	4.47	3.68	6.94	3.51	79.02
N5300	168.48	10.08	90.89	63.43	107.03	70.22	33.41	34.26	43.61	35.68	67.39	34.26	758.76
N5320	3.06	0.18	1.64	1.15	1.93	1.27	0.60	0.62	0.80	0.65	1.23	0.62	13.75
N5330	1.38	0.08	0.74	0.52	0.87	0.57	0.27	0.28	0.36	0.29	0.55	0.28	6.21
N5340	1.51	0.09	0.81	0.57	0.95	0.63	0.30	0.31	0.39	0.32	0.61	0.31	6.80
N5350	1.57	0.09	0.84	0.59	0.99	0.65	0.31	0.32	0.41	0.33	0.63	0.32	7.06
N5360	1.19	0.07	0.64	0.44	0.75	0.50	0.24	0.24	0.31	0.25	0.48	0.24	5.35
N5370	3.00	0.18	1.62	1.13	1.91	1.25	0.59	0.61	0.78	0.64	1.20	0.61	13.53
N5380	67.96	4.08	36.24	25.34	42.76	28.15	13.37	13.70	17.76	14.38	27.24	13.76	304.77
N5390	47.00	2.82	25.34	17.70	29.73	19.62	9.32	9.54	12.23	10.00	18.69	9.54	211.74
N6040	1.27	0.08	0.69	0.48	0.81	0.53	0.25	0.26	0.33	0.27	0.51	0.26	5.75
N6070	10.39	0.62	5.58	3.91	6.54	4.33	2.05	2.10	2.70	2.20	4.16	2.10	46.70
N6090	22.11	1.30	11.95	8.32	14.04	9.17	4.33	4.45	5.55	4.64	8.69	4.42	98.99
N6100	4.73	0.28	2.55	1.78	3.00	1.97	0.93	0.95	1.20	1.00	1.87	0.95	21.21
N6110	3.06	0.18	1.65	1.15	1.95	1.27	0.60	0.61	0.76	0.64	1.20	0.61	13.68
N6130	1.22	0.07	0.65	0.46	0.78	0.50	0.24	0.24	0.31	0.26	0.48	0.25	5.46
N6140	6.17	0.37	3.28	2.30	3.88	2.55	1.21	1.23	1.58	1.20	2.44	1.23	27.53
N6160	5.83	0.35	3.14	2.19	3.71	2.42	1.15	1.18	1.50	1.23	2.32	1.18	26.19
N6180	12.83	0.75	6.94	4.81	8.16	5.32	2.51	2.57	3.20	2.68	5.01	2.55	57.34
N6190	2.11	0.12	1.13	0.79	1.36	0.87	0.41	0.42	0.54	0.44	0.84	0.42	9.48
N6210	16.99	1.00	9.00	6.31	10.68	6.99	3.33	3.40	4.33	3.57	6.71	3.40	75.76
N6220	4.08	0.24	2.20	1.53	2.58	1.70	0.81	0.83	1.06	0.87	1.64	0.83	18.36
N6240	4.11	0.24	2.20	1.54	2.59	1.70	0.81	0.83	1.06	0.87	1.63	0.83	18.40
N6250	9.80	0.58	5.30	3.68	6.23	4.08	1.93	1.97	2.49	2.06	3.85	1.96	43.91
N6260	2.25	0.14	1.21	0.85	1.43	0.94	0.44	0.46	0.59	0.48	0.90	0.46	10.14
N6280	1.58	0.10	0.85	0.59	1.00	0.66	0.31	0.32	0.42	0.34	0.64	0.32	7.13
N6290	2.64	0.16	1.43	1.00	1.68	1.10	0.52	0.54	0.69	0.56	1.06	0.54	11.92
N7000	198.80	11.50	100.47	73.90	125.16	81.55	38.51	39.36	48.70	41.06	76.74	39.08	878.82
N7010	43.61	2.56	23.53	16.37	27.89	18.09	8.55	8.75	10.93	9.15	17.10	8.69	195.02
N7020	16.56	0.98	8.92	6.23	10.53	6.88	3.26	3.34	4.22	3.48	6.54	3.31	74.23
N7030	20.47	1.22	10.96	7.65	12.88	8.40	4.02	4.13	5.32	4.33	8.18	4.13	91.81
N7040	21.07	1.20	10.93	7.62	12.94	8.44	3.99	4.11	5.18	4.28	8.04	4.08	91.87
N7050	71.64	4.10	38.51	26.87	45.31	29.73	14.02	14.38	17.98	15.04	28.09	14.30	320.06
N7060	21.92	1.25	11.21	7.82	13.31	8.69	4.13	4.22	5.44	4.46	8.38	4.25	95.07

Monthly Loadings For Total Nitrogen (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N7070	69.66	4.11	36.81	25.77	43.32	28.60	13.56	13.87	17.87	14.55	27.52	13.90	309.55
N7080	0.50	0.03	0.27	0.19	0.31	0.21	0.10	0.10	0.13	0.11	0.20	0.10	2.25
N7090	43.89	2.54	23.47	16.31	27.69	17.98	8.49	8.72	10.73	9.09	16.90	8.64	194.46
N7100	104.49	6.26	56.35	39.36	66.26	43.61	20.70	21.18	27.10	22.20	41.91	21.21	470.61
N7110	12.23	0.72	6.63	4.62	7.70	5.10	2.40	2.46	3.09	2.57	4.81	2.45	54.87
N7120	5.63	0.34	3.03	2.12	3.57	2.36	1.12	1.15	1.49	1.21	2.29	1.15	25.48
N7130	8.95	0.53	4.84	3.37	5.69	3.74	1.77	1.81	2.30	1.90	3.57	1.81	40.28
N7140	40.49	2.38	21.92	15.26	25.82	16.85	7.96	8.16	10.47	8.52	15.91	8.10	181.53
N7150	68.81	4.02	37.09	25.85	43.89	28.60	13.48	13.82	17.16	14.41	26.90	13.70	307.74
N7160	38.36	2.36	21.24	14.84	24.95	16.42	7.79	7.99	10.25	8.38	15.80	7.99	177.35
N7170	87.21	5.10	47.29	32.85	55.78	36.24	17.07	17.50	21.69	18.24	33.98	17.33	390.00
N7180	34.55	2.02	19.66	12.97	21.97	14.30	6.74	6.91	8.52	7.22	13.42	6.85	154.13
N7190	53.52	3.17	28.88	20.08	33.98	22.23	10.53	10.79	13.73	11.30	21.27	10.79	240.26
N7200	107.03	6.43	57.78	40.21	67.96	44.74	21.24	21.75	27.98	22.82	43.04	21.78	482.73
N7210	80.42	4.79	43.32	30.30	50.97	33.41	15.89	16.28	20.73	17.05	32.00	16.25	361.40
N7220	4.22	0.26	2.27	1.59	2.66	1.76	0.84	0.86	1.11	0.90	1.71	0.86	19.02
N7230	10.59	0.63	5.69	3.96	6.68	4.42	2.09	2.14	2.75	2.25	4.25	2.15	47.61
N7240	48.42	2.83	26.19	18.21	30.86	20.05	9.46	9.71	11.89	10.11	18.77	9.60	216.10
N7250	7.65	0.46	4.05	2.82	4.73	3.14	1.49	1.53	1.99	1.60	3.03	1.53	34.02
N7260	68.24	3.99	36.81	25.68	43.32	28.32	13.39	13.73	17.05	14.33	26.73	13.62	305.22
N7270	0.22	0.01	0.12	0.08	0.14	0.09	0.04	0.05	0.06	0.05	0.09	0.05	0.99
N7280	103.92	6.29	56.07	39.08	65.99	43.32	20.61	21.12	27.35	22.17	41.91	21.21	463.03
N7290	21.72	1.31	11.61	8.10	13.62	9.00	4.28	4.39	5.69	4.62	8.72	4.39	97.44
N7300	10.34	0.61	5.41	3.79	6.34	4.19	2.00	2.05	2.67	2.15	4.08	2.06	45.69
N7310	22.77	1.36	12.15	8.47	14.24	9.40	4.47	4.59	5.89	4.79	9.09	4.59	101.80
N7320	1.10	0.06	0.54	0.38	0.63	0.42	0.20	0.21	0.27	0.22	0.41	0.21	4.84
N7330	2.12	0.02	0.20	0.14	0.63	0.16	0.07	0.08	0.10	0.08	0.15	0.08	4.04
N7340	0.27	0.01	0.08	0.05	0.09	0.06	0.03	0.03	0.04	0.03	0.06	0.03	0.79
N7350	25.60	1.53	13.66	9.54	16.03	10.50	5.04	5.15	6.65	5.41	10.22	5.15	114.57
N8000	47.85	2.89	25.63	17.90	30.30	19.85	9.43	9.68	12.52	10.14	19.20	9.71	215.09
N8010	1036.37	62.30	557.83	387.93	656.93	430.40	205.01	209.82	271.27	220.30	416.25	210.67	4665.06
N8020	1.57	0.09	0.83	0.58	0.98	0.65	0.31	0.31	0.41	0.33	0.63	0.32	7.00
N8030	182.36	10.96	97.69	68.24	115.53	75.60	35.96	36.81	47.86	38.79	73.34	37.09	820.23
N8040	83.25	4.93	43.69	30.56	52.95	33.98	16.17	16.59	21.52	17.39	32.85	16.65	370.74
N8050	1.48	0.09	0.80	0.56	0.94	0.62	0.29	0.30	0.40	0.32	0.60	0.31	6.71
N8060	74.75	4.50	39.93	27.95	47.29	31.15	14.76	15.12	19.57	15.86	30.01	15.18	336.05
N8070	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
N8080	17.41	1.04	9.32	6.51	10.93	7.22	3.43	3.51	4.56	3.68	6.99	3.54	78.15
N8090	27.13	1.63	14.47	10.11	17.24	11.21	5.32	5.46	7.08	5.75	10.87	5.49	121.77
N8100	10.65	0.65	5.75	4.02	6.77	4.47	2.12	2.18	2.83	2.29	4.33	2.19	48.24
N8110	11.61	0.70	6.26	4.36	7.36	4.84	2.30	2.35	3.03	2.47	4.67	2.36	52.31
N8120	33.41	1.99	17.87	12.48	20.98	13.82	6.57	6.71	8.64	7.05	13.31	6.74	149.54
N8130	11.04	0.35	3.11	2.18	3.82	2.42	1.15	1.18	1.53	1.24	2.35	1.19	31.58
N8140	109.58	6.57	58.90	41.00	69.66	45.59	21.63	22.17	28.60	23.22	43.89	22.17	493.04
N8150	46.44	2.77	25.03	17.47	29.45	19.34	9.17	9.40	12.01	9.85	18.56	9.40	208.91
N8160	53.60	3.17	28.88	20.16	33.98	22.28	10.56	10.82	13.62	11.33	21.21	10.76	240.57
N8170	28.15	1.67	15.21	10.59	17.87	11.72	5.59	5.69	7.25	5.97	11.21	5.69	126.58
N8180	10.93	0.65	5.86	4.08	6.88	4.53	2.15	2.21	2.86	2.32	4.39	2.21	49.06
N8190	28.88	1.74	15.60	10.90	18.32	12.06	5.72	5.86	7.53	6.14	11.61	5.86	130.23
N8200	1574.37	94.01	846.65	588.97	999.55	654.10	311.48	317.14	407.75	334.13	628.62	317.14	7073.90
N9000	13704.94	821.16	7305.53	5096.88	8740.64	5663.20	2690.02	2757.98	3567.82	2888.23	5464.99	2766.47	61470.87
N9010	81.27	4.84	43.32	30.30	50.69	33.41	15.89	16.28	20.98	17.07	32.28	16.31	362.64
N9020	155.45	9.32	84.10	58.61	98.82	64.84	30.88	31.43	40.21	33.13	62.30	31.43	700.51
N9030	370.94	21.80	201.04	139.86	236.72	154.32	73.05	74.75	92.88	78.15	145.54	74.19	1663.28
N9040	356.78	20.95	193.68	134.78	227.94	148.65	70.22	71.92	89.20	75.04	139.88	71.36	1600.42
N9050	80.42	4.70	43.04	30.01	52.10	33.13	15.66	16.06	20.10	16.70	31.43	15.97	359.41
N9060	91.18	5.38	49.27	34.26	58.05	37.94	17.95	18.41	23.11	19.23	35.96	18.29	409.02
N9070	365.28	21.61	197.65	137.90	232.76	152.34	72.21	73.90	93.10	77.30	144.69	73.62	1642.41
N9080	16.12	1.10	9.77	6.82	11.47	7.55	3.60	3.68	4.79	3.88	7.33	3.71	81.82
N9090	101.09	6.09	54.65	37.94	63.99	42.19	20.05	20.53	26.45	21.55	40.78	20.59	455.89

Monthly Loadings For Total Phosphorous (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N1050	0.391	0.023	0.209	0.146	0.245	0.162	0.077	0.070	0.102	0.083	0.157	0.079	1.763
N1060	1.625	0.098	0.875	0.612	1.028	0.677	0.323	0.328	0.425	0.345	0.651	0.331	7.318
N1070	7.249	0.430	3.908	2.724	4.587	3.030	1.430	1.464	1.869	1.535	2.888	1.464	32.578
N1100	0.821	0.049	0.442	0.309	0.518	0.343	0.162	0.166	0.214	0.174	0.328	0.166	3.693
N1130	3.341	0.198	1.798	1.254	2.112	1.387	0.657	0.674	0.855	0.705	1.325	0.671	14.978
N1170	5.918	0.351	3.200	2.228	3.766	2.466	1.167	1.198	1.518	1.252	2.353	1.192	26.606
N1180	8.042	0.473	4.361	3.030	5.125	3.341	1.577	1.620	2.010	1.690	3.143	1.608	36.018
N1190	0.051	0.002	0.021	0.015	0.026	0.016	0.008	0.008	0.010	0.008	0.016	0.008	0.190
N2020	0.731	0.044	0.394	0.274	0.462	0.306	0.145	0.148	0.191	0.155	0.294	0.149	3.292
N2030	1.254	0.075	0.677	0.473	0.796	0.524	0.248	0.254	0.326	0.266	0.501	0.254	5.649
N2060	2.163	0.129	1.167	0.813	1.370	0.900	0.428	0.439	0.558	0.459	0.864	0.438	9.725
N2070	6.683	0.398	3.624	2.517	4.247	2.786	1.320	1.354	1.719	1.416	2.665	1.351	30.077
N2080	0.121	0.007	0.065	0.045	0.077	0.050	0.024	0.024	0.031	0.026	0.048	0.024	0.542
N2090	0.866	0.052	0.464	0.326	0.546	0.360	0.171	0.176	0.227	0.184	0.348	0.176	3.897
N2110	1.334	0.080	0.719	0.501	0.844	0.558	0.264	0.271	0.348	0.283	0.538	0.272	6.012
N2130	0.186	0.011	0.095	0.067	0.113	0.074	0.035	0.036	0.046	0.038	0.071	0.036	0.809
N2160	0.249	0.015	0.134	0.094	0.158	0.104	0.049	0.051	0.065	0.053	0.100	0.051	1.123
N2170	2.860	0.170	1.543	1.076	1.812	1.192	0.563	0.578	0.736	0.606	1.141	0.578	12.856
N2190	0.114	0.007	0.060	0.042	0.071	0.046	0.022	0.023	0.029	0.024	0.045	0.023	0.506
N2210	0.193	0.012	0.103	0.072	0.121	0.080	0.038	0.039	0.051	0.041	0.078	0.039	0.867
N2220	1.348	0.081	0.725	0.507	0.849	0.561	0.267	0.273	0.354	0.286	0.544	0.274	6.069
N2250	0.062	0.004	0.033	0.023	0.039	0.026	0.012	0.013	0.016	0.013	0.025	0.013	0.278
N2280	1.498	0.090	0.804	0.561	0.943	0.623	0.297	0.303	0.394	0.320	0.603	0.306	6.742
N2330	1.741	0.104	0.934	0.651	1.096	0.722	0.343	0.351	0.453	0.368	0.697	0.351	7.812
N2350	0.544	0.032	0.283	0.197	0.331	0.219	0.104	0.107	0.139	0.112	0.212	0.107	2.367
N2360	4.361	0.262	2.350	1.639	2.761	1.818	0.864	0.883	1.135	0.926	1.750	0.880	19.635
N2410	1.761	0.106	0.949	0.663	1.116	0.733	0.348	0.357	0.459	0.374	0.705	0.357	7.926
N2420	0.357	0.021	0.190	0.133	0.223	0.148	0.070	0.072	0.093	0.076	0.143	0.072	1.599
N2430	0.750	0.045	0.402	0.281	0.473	0.311	0.148	0.152	0.197	0.160	0.303	0.153	3.376
N2460	19.000	1.110	10.279	7.136	12.091	7.872	3.709	3.823	4.728	3.993	7.419	3.794	84.954
N2470	3.370	0.201	1.812	1.263	2.129	1.402	0.665	0.680	0.872	0.714	1.345	0.682	15.135
N2480	1.306	0.084	0.750	0.524	0.883	0.583	0.276	0.283	0.365	0.297	0.561	0.283	6.287
N3030	0.212	0.013	0.114	0.080	0.134	0.088	0.042	0.043	0.056	0.045	0.086	0.043	0.955
N3040	0.946	0.057	0.507	0.354	0.597	0.394	0.187	0.192	0.247	0.201	0.379	0.192	4.254
N3050	0.637	0.038	0.343	0.238	0.402	0.265	0.126	0.129	0.167	0.135	0.256	0.129	2.865
N3060	1.991	0.119	1.073	0.748	1.260	0.830	0.394	0.402	0.515	0.422	0.798	0.402	8.950
N3070	0.385	0.023	0.208	0.145	0.244	0.161	0.076	0.078	0.100	0.082	0.155	0.078	1.735
N3080	1.807	0.108	0.974	0.680	1.144	0.753	0.357	0.365	0.467	0.382	0.722	0.365	8.124
N3090	7.826	0.467	4.276	2.973	5.040	3.285	1.557	1.597	2.008	1.671	3.115	1.589	35.505
N3100	0.416	0.025	0.224	0.156	0.263	0.174	0.082	0.085	0.110	0.089	0.168	0.085	1.876
N3110	0.049	0.003	0.026	0.018	0.031	0.020	0.010	0.010	0.013	0.010	0.020	0.010	0.221
N3120	0.790	0.047	0.425	0.297	0.498	0.328	0.156	0.160	0.205	0.168	0.317	0.160	3.552
N3130	0.337	0.020	0.181	0.126	0.212	0.140	0.067	0.068	0.088	0.072	0.135	0.068	1.514
N3140	1.705	0.101	0.920	0.640	1.082	0.708	0.337	0.343	0.436	0.360	0.677	0.343	7.650
N3160	0.971	0.058	0.524	0.365	0.614	0.405	0.192	0.197	0.253	0.206	0.391	0.197	4.374
N3170	1.631	0.098	0.878	0.614	1.034	0.680	0.323	0.331	0.422	0.345	0.654	0.331	7.341
N3180	0.847	0.051	0.453	0.317	0.532	0.351	0.167	0.172	0.223	0.180	0.340	0.172	3.805
N3200	0.051	0.003	0.027	0.019	0.032	0.021	0.010	0.010	0.013	0.011	0.021	0.010	0.229
N3210	0.047	0.003	0.025	0.017	0.029	0.019	0.009	0.009	0.012	0.010	0.019	0.009	0.210
N3220	0.331	0.020	0.178	0.124	0.209	0.138	0.065	0.067	0.087	0.071	0.134	0.067	1.491
N3230	0.143	0.009	0.076	0.054	0.090	0.059	0.028	0.029	0.038	0.030	0.057	0.029	0.643
N3240	0.309	0.019	0.166	0.116	0.195	0.129	0.061	0.063	0.081	0.066	0.125	0.063	1.393
N3250	0.391	0.023	0.211	0.147	0.248	0.163	0.078	0.079	0.102	0.083	0.157	0.080	1.762
N3260	0.433	0.026	0.234	0.163	0.274	0.181	0.086	0.088	0.114	0.092	0.175	0.089	1.954
N3280	1.521	0.091	0.816	0.569	0.957	0.631	0.300	0.309	0.399	0.323	0.612	0.309	6.836
N3310	0.182	0.011	0.097	0.068	0.114	0.075	0.036	0.037	0.047	0.039	0.073	0.037	0.817
N3320	1.252	0.074	0.668	0.467	0.784	0.518	0.245	0.251	0.323	0.264	0.498	0.252	5.598
N3330	0.835	0.049	0.439	0.308	0.555	0.340	0.162	0.166	0.215	0.174	0.328	0.166	3.735
N3360	5.238	0.309	2.829	1.971	3.313	2.178	1.031	1.056	1.331	1.104	2.070	1.051	23.480
N4010	3.115	0.187	1.671	1.167	1.965	1.294	0.614	0.629	0.810	0.660	1.249	0.631	13.991
N4020	0.541	0.033	0.292	0.203	0.340	0.223	0.107	0.110	0.142	0.115	0.217	0.110	2.433
N4040	121.192	7.249	65.410	45.569	77.020	50.680	23.984	24.578	31.431	25.739	48.420	24.550	545.848
N4050	2.945	0.176	1.580	1.104	1.858	1.223	0.580	0.595	0.765	0.623	1.178	0.595	13.221
N4110	5.550	0.328	2.946	2.059	3.455	2.282	1.085	1.110	1.424	1.164	2.194	1.110	24.706
N4150	0.745	0.045	0.402	0.280	0.470	0.311	0.147	0.151	0.194	0.158	0.300	0.151	3.354
N4160	5.890	0.348	3.171	2.217	3.738	2.455	1.161	1.192	1.509	1.246	2.342	1.186	26.456
N4170	7.702	0.456	4.162	2.888	4.899	3.200	1.518	1.555	1.968	1.628	3.058	1.549	34.582
N4180	1.303	0.078	0.688	0.481	0.824	0.535	0.254	0.261	0.337	0.274	0.518	0.262	5.814
N4190	13.139	0.779	7.051	4.899	8.268	5.437	2.580	2.642	3.370	2.769	5.210	2.639	58.781
N4200	11.241	0.663	6.060	4.219	7.138	4.672	2.209	2.265	2.892	2.367	4.448	2.251	50.360
N4240	3.370	0.198	1.812	1.263	2.132	1.396	0.663	0.677	0.855	0.708	1.331	0.674	15.079
N4250	16.452	0.966	8.891	6.173	10.449	6.824	3.226	3.313	4.134	3.455	6.456	3.285	73.624
N4380	16.140	0.943	8.721	6.060	10.279	6.683	3.143	3.228	3.964	3.370	6.286	3.200	72.016

Monthly Loadings For Total Phosphorous (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N4390	21.492	1.257	11.638	8.070	13.705	8.891	4.191	4.304	5.267	4.474	8.325	4.247	95.881
N4400	1.354	0.081	0.731	0.510	0.858	0.563	0.268	0.274	0.348	0.286	0.541	0.274	6.087
N4430	0.699	0.042	0.379	0.264	0.445	0.294	0.139	0.143	0.184	0.150	0.283	0.143	3.167
N4450	0.790	0.046	0.428	0.297	0.501	0.331	0.157	0.161	0.208	0.169	0.320	0.161	3.572
N4460	0.518	0.031	0.280	0.196	0.328	0.217	0.103	0.106	0.136	0.111	0.210	0.106	2.342
N4520	4.984	0.294	2.701	1.880	3.171	2.081	0.985	1.008	1.271	1.056	1.979	1.005	22.418
N4530	1.164	0.071	0.629	0.439	0.739	0.487	0.232	0.238	0.309	0.249	0.473	0.239	5.268
N4540	132.236	7.844	71.073	49.553	84.382	54.933	25.986	26.617	33.696	27.863	52.395	26.560	593.107
N4550	0.078	0.004	0.036	0.025	0.042	0.028	0.013	0.014	0.018	0.014	0.027	0.014	0.315
N4560	1.668	0.100	0.898	0.626	1.053	0.694	0.328	0.337	0.433	0.354	0.668	0.337	7.496
N4570	6.824	0.402	3.681	2.568	4.332	2.852	1.342	1.376	1.727	1.438	2.693	1.368	30.584
N4580	8.070	0.479	4.332	3.030	5.125	3.341	1.580	1.628	2.076	1.705	3.200	1.625	36.199
N4590	43.040	2.526	23.218	16.168	27.382	17.839	8.438	8.636	10.788	9.033	16.876	8.608	192.554
N4600	40.775	2.447	21.888	15.262	25.739	16.933	8.042	8.240	10.647	8.665	16.367	8.268	183.272
N4610	11.525	0.691	6.201	4.332	7.306	4.785	2.279	2.333	3.001	2.449	4.616	2.330	51.858
N4620	27.268	1.594	14.724	10.250	17.358	11.298	5.323	5.465	6.739	5.692	10.619	5.408	121.739
N4630	41.058	2.458	22.002	15.347	26.107	17.046	8.098	8.297	10.675	8.693	16.423	8.297	184.501
N4640	62.578	3.766	33.696	23.474	39.642	26.051	12.374	12.686	16.338	13.280	25.116	12.714	281.716
N4650	21.917	1.317	11.751	8.212	13.847	9.118	4.332	4.446	5.748	4.644	8.806	4.446	98.582
N4660	0.779	0.044	0.394	0.274	0.462	0.306	0.145	0.149	0.194	0.156	0.297	0.150	3.349
N4670	8.240	0.484	4.446	3.115	5.238	3.426	1.620	1.662	2.084	1.739	3.266	1.654	36.964
N4700	0.968	0.059	0.521	0.362	0.612	0.402	0.192	0.197	0.255	0.206	0.391	0.197	4.382
N5040	1.399	0.081	0.739	0.515	0.976	0.569	0.269	0.276	0.348	0.289	0.541	0.274	6.226
N5060	0.340	0.020	0.177	0.124	0.226	0.137	0.065	0.067	0.086	0.070	0.132	0.067	1.509
N5070	5.653	0.326	2.973	2.076	3.540	2.296	1.087	1.113	1.404	1.167	2.180	1.110	24.941
N5080	6.569	0.385	3.540	2.469	4.191	2.727	1.288	1.320	1.642	1.370	2.574	1.311	29.395
N5120	2.591	0.154	1.399	0.977	1.645	1.079	0.513	0.524	0.665	0.549	1.031	0.524	11.650
N5130	4.219	0.249	2.274	1.586	2.676	1.753	0.830	0.849	1.076	0.892	1.671	0.847	18.921
N5140	1.433	0.086	0.773	0.541	0.909	0.597	0.283	0.292	0.374	0.306	0.575	0.292	6.460
N5170	0.102	0.006	0.055	0.039	0.065	0.043	0.020	0.021	0.027	0.022	0.041	0.021	0.462
N5180	0.555	0.033	0.300	0.210	0.354	0.232	0.110	0.113	0.145	0.118	0.224	0.113	2.505
N5190	0.402	0.024	0.217	0.152	0.255	0.168	0.080	0.082	0.104	0.086	0.161	0.082	1.813
N5210	0.125	0.008	0.067	0.047	0.079	0.052	0.025	0.026	0.033	0.027	0.051	0.026	0.566
N5220	1.450	0.085	0.784	0.546	0.920	0.603	0.286	0.292	0.365	0.306	0.572	0.292	6.502
N5230	0.248	0.015	0.134	0.093	0.157	0.104	0.049	0.051	0.065	0.053	0.101	0.051	1.121
N5240	1.580	0.093	0.858	0.597	1.011	0.657	0.311	0.320	0.394	0.331	0.620	0.317	7.098
N5250	2.138	0.125	1.155	0.804	1.362	0.886	0.419	0.430	0.532	0.447	0.835	0.425	9.560
N5260	0.824	0.049	0.445	0.309	0.521	0.343	0.163	0.167	0.213	0.175	0.328	0.167	3.702
N5280	0.282	0.016	0.148	0.103	0.187	0.115	0.054	0.055	0.071	0.058	0.110	0.055	1.255
N5290	2.611	0.150	1.359	0.946	1.611	1.048	0.496	0.510	0.646	0.532	1.002	0.507	11.416
N5300	19.170	1.144	10.307	7.192	12.148	7.985	3.794	3.879	4.955	4.078	7.674	3.879	86.205
N5320	0.399	0.024	0.215	0.150	0.252	0.166	0.079	0.081	0.105	0.085	0.161	0.081	1.800
N5330	0.181	0.011	0.097	0.068	0.114	0.075	0.036	0.037	0.047	0.039	0.073	0.037	0.814
N5340	0.198	0.012	0.106	0.074	0.125	0.082	0.039	0.040	0.052	0.042	0.080	0.040	0.891
N5350	0.205	0.012	0.110	0.077	0.129	0.086	0.040	0.042	0.054	0.044	0.083	0.042	0.924
N5360	0.158	0.009	0.084	0.058	0.098	0.065	0.031	0.031	0.041	0.033	0.063	0.032	0.700
N5370	0.394	0.024	0.212	0.148	0.250	0.164	0.078	0.080	0.102	0.084	0.158	0.080	1.773
N5380	6.060	0.365	3.256	2.265	3.823	2.517	1.195	1.226	1.569	1.286	2.435	1.229	27.246
N5390	6.088	0.365	3.285	2.294	3.851	2.543	1.206	1.235	1.580	1.297	2.447	1.237	27.433
N6040	0.221	0.013	0.119	0.083	0.140	0.092	0.044	0.045	0.058	0.047	0.089	0.045	0.996
N6070	1.577	0.095	0.847	0.592	0.994	0.654	0.311	0.317	0.411	0.334	0.631	0.320	7.083
N6090	3.540	0.207	1.906	1.328	2.245	1.467	0.694	0.711	0.889	0.742	1.387	0.705	15.824
N6100	0.818	0.048	0.442	0.309	0.518	0.340	0.161	0.165	0.208	0.173	0.323	0.164	3.669
N6110	0.493	0.029	0.265	0.184	0.311	0.203	0.096	0.099	0.122	0.103	0.192	0.098	2.194
N6130	0.210	0.013	0.113	0.078	0.135	0.087	0.041	0.042	0.054	0.044	0.084	0.042	0.944
N6140	0.963	0.057	0.513	0.360	0.606	0.396	0.186	0.193	0.246	0.202	0.379	0.193	4.295
N6160	1.005	0.060	0.541	0.377	0.640	0.419	0.198	0.203	0.259	0.213	0.399	0.203	4.516
N6180	2.008	0.117	1.085	0.753	1.277	0.832	0.394	0.402	0.498	0.419	0.784	0.399	8.969
N6190	0.323	0.019	0.174	0.121	0.209	0.134	0.063	0.065	0.083	0.068	0.128	0.065	1.453
N6210	2.565	0.151	1.368	0.954	1.611	1.056	0.501	0.513	0.657	0.538	1.014	0.513	11.441
N6220	0.535	0.032	0.289	0.201	0.337	0.220	0.106	0.108	0.139	0.114	0.214	0.108	2.406
N6240	0.536	0.032	0.289	0.201	0.340	0.220	0.106	0.108	0.139	0.114	0.214	0.108	2.412
N6250	1.453	0.085	0.784	0.546	0.923	0.603	0.286	0.292	0.368	0.306	0.572	0.292	6.510
N6260	0.323	0.019	0.174	0.122	0.205	0.135	0.064	0.066	0.084	0.069	0.130	0.066	1.457
N6280	0.207	0.013	0.112	0.078	0.131	0.086	0.041	0.042	0.054	0.044	0.084	0.042	0.934
N6290	0.394	0.024	0.213	0.148	0.250	0.165	0.078	0.080	0.103	0.084	0.158	0.080	1.778
N7000	26.164	1.529	14.158	9.854	16.678	10.845	5.125	5.267	6.484	5.493	10.194	5.210	117.602
N7010	6.145	0.362	3.341	2.316	3.908	2.560	1.209	1.240	1.546	1.294	2.421	1.232	27.574
N7020	1.982	0.117	1.068	0.745	1.254	0.824	0.391	0.399	0.504	0.419	0.784	0.398	8.884
N7030	2.322	0.139	1.243	0.869	1.461	0.963	0.459	0.467	0.603	0.493	0.920	0.470	10.418
N7040	2.288	0.131	1.189	0.830	1.407	0.917	0.433	0.445	0.563	0.464	0.875	0.442	9.985
N7050	3.455	0.202	1.860	1.297	2.192	1.430	0.677	0.694	0.866	0.725	1.354	0.688	15.439
N7060	2.781	0.159	1.421	0.994	1.688	1.101	0.524	0.535	0.694	0.563	1.065	0.538	12.060

Monthly Loadings For Total Phosphorous (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N7070	6.410	0.496	4.446	3.115	5.238	3.455	1.639	1.676	2.158	1.758	3.313	1.682	37.386
N7080	0.022	0.001	0.012	0.008	0.014	0.009	0.004	0.004	0.006	0.005	0.009	0.004	0.098
N7090	4.672	0.271	2.509	1.744	2.945	1.923	0.906	0.932	1.147	0.971	1.807	0.923	20.749
N7100	13.252	0.793	7.164	4.984	8.410	5.522	2.622	2.684	3.426	2.815	5.295	2.684	59.650
N7110	1.611	0.095	0.872	0.606	1.025	0.671	0.317	0.326	0.405	0.340	0.634	0.323	7.225
N7120	0.799	0.048	0.430	0.300	0.504	0.334	0.159	0.163	0.212	0.171	0.323	0.163	3.606
N7130	0.844	0.050	0.456	0.317	0.535	0.351	0.166	0.171	0.217	0.179	0.337	0.170	3.794
N7140	5.918	0.345	3.200	2.226	3.766	2.455	1.161	1.189	1.481	1.243	2.322	1.181	26.487
N7150	9.316	0.546	5.040	3.511	5.918	3.851	1.826	1.872	2.322	1.954	3.653	1.858	41.667
N7160	5.352	0.320	2.888	2.008	3.370	2.226	1.056	1.082	1.387	1.133	2.138	1.082	24.040
N7170	12.346	0.722	6.683	4.644	7.872	5.125	2.413	2.475	3.030	2.580	4.785	2.449	55.123
N7180	4.700	0.275	2.548	1.770	3.001	1.951	0.920	0.946	1.164	0.985	1.832	0.934	21.028
N7190	6.768	0.402	3.653	2.548	4.304	2.823	1.337	1.370	1.744	1.436	2.701	1.368	30.454
N7200	7.957	0.481	4.304	3.001	5.040	3.341	1.583	1.620	2.087	1.699	3.200	1.623	35.936
N7210	6.343	0.379	3.426	2.390	4.049	2.648	1.254	1.286	1.639	1.348	2.537	1.286	28.585
N7220	0.368	0.022	0.198	0.138	0.232	0.153	0.073	0.075	0.097	0.078	0.149	0.075	1.658
N7230	0.634	0.038	0.343	0.238	0.402	0.264	0.125	0.128	0.165	0.135	0.254	0.129	2.855
N7240	4.616	0.269	2.492	1.733	2.945	1.908	0.900	0.923	1.133	0.963	1.787	0.912	20.580
N7250	1.034	0.062	0.546	0.382	0.640	0.425	0.201	0.207	0.268	0.217	0.411	0.207	4.600
N7260	8.013	0.470	4.332	3.030	5.097	3.341	1.572	1.611	2.002	1.682	3.143	1.600	35.893
N7270	0.032	0.002	0.017	0.012	0.020	0.013	0.006	0.006	0.008	0.007	0.013	0.007	0.143
N7280	10.052	0.606	5.408	3.766	6.371	4.191	1.993	2.042	2.642	2.144	4.049	2.050	45.314
N7290	2.178	0.131	1.167	0.813	1.368	0.903	0.430	0.442	0.572	0.462	0.875	0.442	9.781
N7300	0.983	0.058	0.515	0.360	0.603	0.399	0.190	0.195	0.254	0.204	0.388	0.196	4.345
N7310	3.285	0.195	1.744	1.218	2.050	1.354	0.643	0.657	0.849	0.691	1.305	0.660	14.651
N7320	0.160	0.009	0.079	0.055	0.121	0.061	0.029	0.030	0.039	0.031	0.059	0.030	0.705
N7330	0.243	0.003	0.023	0.016	0.056	0.018	0.008	0.009	0.011	0.009	0.017	0.009	0.421
N7340	0.041	0.001	0.012	0.008	0.014	0.009	0.004	0.004	0.006	0.005	0.009	0.004	0.117
N7350	2.492	0.149	1.328	0.929	1.560	1.031	0.490	0.501	0.648	0.527	0.997	0.504	11.156
N8000	4.389	0.265	2.359	1.648	2.798	1.820	0.869	0.892	1.152	0.934	1.770	0.895	19.800
N8010	97.407	5.861	52.385	36.528	61.729	40.492	19.255	19.736	25.484	20.659	39.076	19.783	438.445
N8020	0.159	0.009	0.084	0.059	0.099	0.065	0.031	0.032	0.041	0.033	0.063	0.032	0.709
N8030	17.811	1.070	9.514	6.654	11.241	7.390	3.511	3.596	4.644	3.766	7.136	3.596	79.930
N8040	6.456	0.382	3.398	2.370	4.106	2.633	1.252	1.283	1.665	1.348	2.551	1.286	28.732
N8050	0.197	0.012	0.106	0.074	0.125	0.083	0.039	0.040	0.053	0.042	0.080	0.040	0.893
N8060	7.928	0.476	4.247	2.973	5.012	3.285	1.563	1.603	2.078	1.682	3.171	1.608	35.624
N8070	0.002	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.007
N8080	1.957	0.118	1.045	0.731	1.229	0.810	0.385	0.396	0.513	0.413	0.784	0.396	8.777
N8090	3.030	0.181	1.611	1.124	1.917	1.249	0.595	0.609	0.787	0.637	1.208	0.608	13.557
N8100	1.467	0.089	0.790	0.552	0.929	0.614	0.292	0.300	0.388	0.314	0.595	0.300	6.630
N8110	0.762	0.046	0.411	0.289	0.484	0.320	0.151	0.155	0.198	0.162	0.306	0.155	3.439
N8120	3.540	0.209	1.880	1.311	2.209	1.455	0.691	0.708	0.909	0.742	1.399	0.708	15.760
N8130	1.591	0.051	0.450	0.314	0.552	0.348	0.166	0.170	0.221	0.179	0.340	0.171	4.554
N8140	10.109	0.606	5.437	3.794	6.428	4.191	1.996	2.044	2.625	2.144	4.049	2.047	45.470
N8150	5.380	0.323	2.917	2.026	3.426	2.245	1.065	1.090	1.393	1.144	2.155	1.090	24.253
N8160	8.382	0.493	4.502	3.143	5.295	3.483	1.642	1.682	2.121	1.761	3.313	1.676	37.493
N8170	3.483	0.207	1.883	1.314	2.214	1.453	0.688	0.705	0.898	0.739	1.390	0.705	15.679
N8180	1.008	0.060	0.541	0.377	0.634	0.419	0.199	0.204	0.263	0.214	0.405	0.204	4.527
N8190	2.809	0.168	1.512	1.056	1.775	1.169	0.555	0.569	0.731	0.597	1.124	0.569	12.636
N8200	162.534	9.712	87.496	61.103	103.393	67.675	31.997	32.847	41.908	34.546	64.844	32.847	730.921
N9000	1143.966	68.525	608.794	424.740	730.553	472.877	224.829	230.209	297.318	241.535	458.719	231.050	5133.124
N9010	9.344	0.555	4.984	3.483	5.833	3.851	1.829	1.872	2.415	1.955	3.709	1.877	41.718
N9020	21.039	1.257	11.355	7.928	13.337	8.778	4.162	4.276	5.465	4.474	8.438	4.276	94.785
N9030	48.087	2.898	26.532	18.462	31.148	20.308	9.627	9.882	12.761	10.307	19.227	9.797	219.506
N9040	43.040	2.547	23.276	16.168	27.382	17.839	8.438	8.636	10.703	9.033	16.820	8.580	192.433
N9050	10.902	0.637	5.861	4.078	7.079	4.502	2.127	2.180	2.730	2.279	4.276	2.169	48.820
N9060	7.475	0.442	4.049	2.817	4.757	3.115	1.472	1.509	1.897	1.580	2.945	1.501	33.560
N9070	37.094	2.183	19.991	13.931	23.502	15.404	7.277	7.475	9.401	7.815	14.639	7.419	166.133
N9080	2.169	0.131	1.167	0.816	1.370	0.906	0.430	0.442	0.572	0.462	0.878	0.442	9.784
N9090	12.629	0.762	6.824	4.757	8.013	5.295	2.509	2.568	3.313	2.696	5.097	2.577	57.040

Monthly Loadings For Total Suspended Solids (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N1050	35.1	2.1	18.6	13.1	22.1	14.6	5.9	7.1	9.2	7.4	14.1	7.1	157.8
N1060	146.1	8.8	78.7	54.9	92.3	60.9	28.9	29.7	38.2	31.1	58.6	29.7	658.1
N1070	1503.6	89.8	812.7	565.3	954.2	625.8	297.3	305.8	387.9	320.0	600.3	303.0	6766.7
N1100	78.7	4.7	42.2	29.4	49.8	32.6	15.5	15.9	20.5	16.7	31.4	15.9	353.8
N1130	807.0	48.1	436.1	303.0	512.5	337.0	159.4	163.4	207.6	171.0	322.8	163.1	3631.0
N1170	741.9	43.9	399.3	279.2	470.0	308.6	146.4	150.1	190.0	156.9	294.5	149.5	3330.2
N1180	1013.7	59.5	549.3	382.3	645.6	421.9	198.8	203.9	253.1	212.9	396.4	202.2	4539.6
N1190	9.0	0.4	3.7	2.6	4.5	2.9	1.4	1.4	1.8	1.5	2.8	1.4	33.2
N2020	220.9	13.3	118.9	83.2	139.9	92.3	43.9	44.7	57.8	47.0	88.9	45.0	995.9
N2030	379.4	22.7	205.0	143.0	241.0	158.6	75.3	77.0	98.5	80.7	152.1	77.0	1710.3
N2060	654.1	39.1	354.0	246.3	416.2	273.0	129.4	132.5	168.8	138.7	261.4	132.2	2945.7
N2070	1715.9	101.9	925.9	645.6	1087.3	713.6	339.8	345.5	438.9	362.4	682.4	345.5	7704.8
N2080	36.0	2.2	19.4	13.5	23.0	15.0	7.1	7.3	9.4	7.6	14.4	7.3	162.1
N2090	261.1	15.7	140.2	98.0	164.8	108.5	51.5	53.0	68.2	55.5	105.1	53.0	1174.4
N2110	404.9	24.4	217.8	152.1	256.7	168.8	80.1	82.1	105.6	86.1	162.8	82.4	1822.7
N2130	17.4	1.0	8.9	6.2	10.5	6.9	3.3	3.4	4.3	3.5	6.7	3.4	75.4
N2160	75.3	4.5	40.8	28.3	47.9	31.4	15.0	15.3	19.7	16.1	30.3	15.3	340.0
N2170	487.0	28.9	262.2	182.9	308.6	202.5	96.0	98.3	125.2	103.1	194.0	98.3	2186.8
N2190	10.8	0.6	5.6	3.9	6.6	4.4	2.1	2.1	2.8	2.2	4.2	2.1	47.6
N2210	23.2	1.4	12.5	8.7	14.6	9.7	4.6	4.7	6.1	5.0	9.4	4.7	104.6
N2220	211.5	12.8	113.8	79.3	133.7	89.1	42.9	43.0	55.5	45.0	85.2	43.0	952.9
N2250	5.6	0.3	3.0	2.1	3.5	2.3	1.1	1.1	1.5	1.2	2.2	1.1	25.0
N2280	134.8	8.1	72.5	50.4	84.9	56.1	26.7	27.4	35.4	28.5	54.4	27.4	606.6
N2330	156.6	9.4	84.1	58.6	98.5	65.1	30.9	31.7	40.8	33.1	62.9	31.7	703.4
N2350	49.0	2.9	25.4	17.8	30.0	19.7	9.4	9.6	12.5	10.1	19.1	9.7	215.1
N2380	447.4	26.9	241.5	168.5	283.2	186.9	88.6	90.9	116.7	95.1	179.8	90.9	2016.4
N2410	214.6	12.9	115.5	80.7	135.9	89.5	42.5	43.3	55.6	45.6	86.1	43.6	966.0
N2420	32.0	1.9	17.1	12.0	20.1	13.3	6.3	6.5	8.4	6.8	12.9	6.5	143.8
N2430	71.4	4.3	38.5	26.8	45.0	29.7	14.1	14.5	18.8	15.2	28.9	14.6	321.8
N2460	2639.1	154.3	1427.1	991.1	1670.1	1093.0	515.4	529.5	654.1	552.2	1030.7	523.8	11789.4
N2470	362.4	21.6	194.5	135.6	228.5	150.4	71.4	73.1	93.4	76.5	144.4	73.1	1624.8
N2480	125.7	7.6	67.7	47.3	79.6	52.4	24.9	25.5	32.8	26.7	50.4	25.5	566.1
N3030	42.8	2.6	23.0	16.0	27.0	17.8	8.5	8.7	11.2	9.1	17.2	8.7	192.5
N3040	87.8	5.3	47.3	32.8	55.5	36.5	17.4	17.8	23.0	18.7	35.4	17.9	395.4
N3050	57.2	3.5	30.6	21.5	36.0	23.8	11.3	11.6	15.0	12.2	23.0	11.6	257.3
N3060	447.4	26.6	240.7	167.9	282.9	186.0	88.3	90.3	115.2	94.6	178.4	90.3	2008.8
N3070	116.7	7.0	62.9	43.9	73.9	48.7	23.1	23.6	30.3	24.8	47.0	23.7	525.6
N3080	523.8	31.4	283.2	197.6	334.1	218.9	103.9	106.5	135.9	111.6	210.1	106.5	2363.5
N3090	727.7	43.0	393.6	273.8	461.6	303.0	143.3	147.0	184.6	153.5	288.8	146.1	3266.0
N3100	37.7	2.3	20.1	14.1	23.8	15.6	7.4	7.6	9.9	8.0	15.1	7.6	169.0
N3110	4.4	0.3	2.4	1.7	2.8	1.8	0.9	0.9	1.2	0.9	1.8	0.9	19.9
N3120	71.1	4.2	38.2	26.7	45.0	29.7	14.0	14.4	18.5	15.1	28.6	14.4	320.0
N3130	30.3	1.8	16.3	11.4	19.1	12.6	6.0	6.1	7.9	6.4	12.2	6.1	136.2
N3140	153.2	9.1	82.7	57.8	97.4	63.7	30.3	30.9	39.1	32.3	60.9	30.9	688.1
N3160	87.5	5.2	47.0	32.8	55.2	36.5	17.3	17.7	22.8	18.6	35.1	17.8	393.5
N3170	164.8	9.9	88.6	62.0	104.2	68.5	32.6	33.4	42.8	34.8	66.0	33.4	741.0
N3180	76.2	4.6	40.8	28.6	47.9	31.7	15.1	15.4	20.0	16.2	30.6	15.5	342.5
N3200	4.6	0.3	2.5	1.7	2.9	1.9	0.9	0.9	1.2	1.0	1.8	0.9	20.6
N3210	4.2	0.3	2.3	1.6	2.6	1.7	0.8	0.9	1.1	0.9	1.7	0.9	18.9
N3220	29.7	1.8	16.0	11.2	18.8	12.4	5.9	6.1	7.8	6.3	12.0	6.1	134.1
N3230	12.9	0.8	6.9	4.8	8.1	5.4	2.5	2.6	3.4	2.7	5.2	2.6	57.8
N3240	28.2	1.7	15.1	10.6	17.8	11.8	5.6	5.7	7.4	6.0	11.4	5.7	127.0
N3250	74.6	4.4	40.2	28.0	47.0	31.1	14.7	15.1	19.3	15.8	29.7	15.1	335.0
N3260	95.7	5.8	51.5	36.0	60.6	39.9	19.0	19.4	25.1	20.4	38.5	19.5	431.4
N3280	207.0	12.5	111.0	77.6	130.3	86.1	40.8	41.9	54.1	43.9	83.2	41.9	930.2
N3310	16.4	1.0	8.7	6.1	10.3	6.8	3.2	3.3	4.3	3.5	6.6	3.3	73.5
N3320	124.3	7.4	66.3	46.2	77.9	51.3	24.4	24.9	32.3	26.2	49.6	25.0	555.5
N3330	88.6	5.2	46.4	32.6	55.9	36.0	17.2	17.6	22.9	18.5	35.1	17.7	396.6
N3360	1565.0	92.3	846.6	589.0	993.9	651.3	308.6	317.1	396.4	331.3	620.1	314.3	7026.0
N4010	328.5	19.7	177.0	123.5	207.8	137.0	65.1	66.5	85.8	69.9	132.0	66.8	1479.7
N4020	51.0	3.1	27.3	19.1	32.0	21.2	10.1	10.3	13.3	10.8	20.5	10.3	228.9
N4040	10420.3	620.1	5634.9	3935.0	6625.9	4332.3	2058.6	2109.5	2678.7	2208.6	4102.5	2103.9	46801.3
N4050	280.3	16.8	150.9	105.3	177.3	116.9	55.5	56.9	73.1	59.5	112.4	56.9	1261.9
N4110	634.3	37.7	337.0	235.9	390.4	261.4	124.0	127.1	163.1	133.4	251.4	127.1	2828.8
N4150	97.7	5.9	52.4	36.5	61.7	40.8	19.3	19.8	25.4	20.7	39.1	19.8	439.1
N4160	1192.1	70.8	642.8	447.4	756.0	495.5	235.0	240.7	308.8	252.0	472.9	240.1	5351.2
N4170	1121.3	66.3	606.0	421.9	710.7	467.2	220.9	226.2	285.0	237.0	444.6	225.4	5033.5
N4180	135.4	8.0	73.4	49.8	84.9	55.2	26.3	27.0	35.1	28.3	53.5	27.0	601.9
N4190	1640.5	109.3	988.2	688.1	1161.0	764.5	362.4	370.0	472.9	387.9	730.6	370.9	8247.3
N4200	1144.0	67.4	617.3	430.4	727.7	475.7	224.8	230.5	288.8	241.3	450.2	229.4	5127.5
N4240	461.6	27.3	249.2	173.6	291.7	192.0	90.9	93.2	117.5	97.4	182.6	92.6	2069.4
N4250	2859.9	168.5	1561.7	1078.8	1826.4	1192.1	563.5	577.6	719.2	603.1	1127.0	574.8	12842.7
N4380	3001.5	174.7	1619.7	1124.1	1906.5	1240.2	586.1	600.3	739.0	625.8	1160.8	594.6	13378.5

Monthly Loadings For Total Suspended Solids (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N4390	4020.9	235.9	2183.2	1517.7	2573.9	1670.6	787.2	807.0	988.2	841.0	1563.0	708.5	17987.2
N4400	121.8	7.3	65.7	45.8	77.3	50.7	24.1	24.7	31.4	25.9	48.7	24.6	547.9
N4430	66.3	4.0	35.7	24.9	41.8	27.7	13.1	13.5	17.4	14.1	26.7	13.5	298.8
N4450	168.5	10.1	89.8	62.9	105.6	69.7	33.1	34.0	43.6	35.7	67.1	34.0	751.9
N4480	93.4	5.6	50.4	35.1	59.2	39.1	18.5	19.0	24.6	19.9	37.7	19.1	421.6
N4520	1305.4	77.0	705.1	489.8	829.7	543.7	256.8	263.3	331.3	275.5	516.4	262.2	5855.2
N4530	351.1	21.4	190.0	132.0	223.1	147.5	70.2	71.9	93.4	75.3	143.0	72.2	1592.1
N4540	14356.2	843.8	7730.3	5360.0	9146.1	5946.4	2817.4	2888.2	3624.4	3029.8	5603.2	2859.9	64265.8
N4550	12.7	0.7	6.9	4.5	6.9	4.6	2.2	2.2	2.9	2.4	4.5	2.3	51.4
N4560	249.5	14.9	134.2	93.7	157.7	103.9	49.3	50.4	64.8	53.0	100.0	50.4	1121.8
N4570	982.6	57.8	529.5	370.9	625.8	407.8	193.1	197.9	248.3	207.0	387.9	196.8	4405.4
N4580	991.1	58.9	535.2	373.8	628.6	413.4	195.7	200.2	254.6	209.8	393.6	199.9	4454.7
N4590	8608.1	504.0	4643.8	3228.0	5493.3	3567.8	1687.6	1732.9	2157.7	1809.4	3369.6	1718.8	38521.1
N4600	4530.6	272.4	2435.2	1701.0	2859.9	1885.8	894.8	917.4	1183.6	962.7	1820.7	920.3	20385.3
N4610	1158.1	69.4	623.0	436.1	730.6	481.4	228.6	234.2	300.1	245.8	464.4	234.7	5206.5
N4620	3681.1	214.9	1987.8	1381.8	2344.6	1523.4	719.2	739.0	908.9	770.2	1430.0	730.6	16431.5
N4630	3511.2	210.4	1888.7	1316.7	2228.5	1461.1	693.7	710.7	914.6	744.7	1407.3	710.7	15798.3
N4640	4587.2	275.2	2472.0	1724.4	2916.5	1911.3	908.9	928.8	1194.9	974.1	1840.5	931.8	20665.6
N4650	1662.1	99.7	889.1	623.0	1044.9	690.9	328.5	337.0	433.2	351.1	665.4	337.0	7461.8
N4660	129.1	7.4	65.1	45.3	76.5	50.4	24.0	24.7	32.3	25.9	49.0	24.7	554.3
N4670	1330.9	78.2	719.2	501.2	846.0	552.2	261.4	268.2	337.0	280.3	523.8	266.5	5965.3
N4700	165.4	9.8	87.2	60.9	102.5	67.7	32.3	32.8	42.0	34.5	65.4	33.1	734.6
N5040	238.7	13.8	126.3	87.8	158.3	97.1	45.9	47.0	59.2	49.3	92.3	47.0	1062.6
N5060	57.5	3.3	30.0	21.0	38.2	23.2	11.0	11.3	14.5	11.9	22.4	11.3	255.7
N5070	1248.7	71.9	656.9	458.7	778.7	506.9	239.8	245.8	308.6	257.1	481.4	244.7	5499.3
N5080	978.9	57.2	529.5	368.1	623.0	404.9	191.7	196.5	244.7	205.3	382.3	195.1	4375.1
N5120	688.3	39.9	362.4	252.0	424.7	276.9	132.2	135.4	171.9	141.9	266.7	136.1	3009.4
N5130	529.5	31.4	286.0	199.3	337.0	220.6	104.5	107.0	135.4	112.1	210.1	106.5	2379.4
N5140	177.3	10.6	95.7	66.8	112.4	73.9	35.1	38.0	46.2	37.7	71.1	36.0	798.7
N5170	9.2	0.6	5.0	3.5	5.8	3.9	1.8	1.9	2.4	2.0	3.7	1.9	41.5
N5180	50.1	3.0	27.0	18.9	31.7	20.9	9.9	10.2	13.1	10.7	20.1	10.2	225.8
N5190	36.2	2.2	19.6	13.0	23.0	15.1	7.3	7.3	9.4	7.7	14.5	7.3	163.2
N5210	11.2	0.7	6.1	4.2	7.1	4.7	2.2	2.3	3.0	2.4	4.6	2.3	50.9
N5220	186.5	11.6	106.2	73.9	124.9	81.8	38.8	39.6	40.8	41.3	77.6	39.4	861.4
N5230	22.3	1.4	12.0	8.4	14.1	9.3	4.4	4.6	5.9	4.8	9.0	4.6	100.9
N5240	382.3	22.3	205.9	143.3	242.4	158.0	74.5	76.5	94.6	79.9	148.7	75.9	1704.0
N5250	373.8	21.8	201.9	140.4	237.8	154.9	73.1	75.0	92.8	78.2	145.8	74.5	1670.1
N5260	231.1	13.8	124.8	86.9	146.6	95.3	45.6	46.7	58.7	49.0	92.3	46.7	1039.1
N5280	45.0	2.6	23.6	16.5	29.7	18.3	8.7	8.9	11.3	9.3	17.5	8.9	200.2
N5290	447.4	25.6	233.0	162.3	278.4	179.8	85.2	87.2	110.7	91.5	171.9	86.9	1957.9
N5300	1495.1	88.9	804.2	560.7	945.6	623.0	294.5	303.0	385.1	317.1	597.5	303.0	6717.7
N5320	36.0	2.2	19.3	13.5	22.7	15.0	7.1	7.3	9.5	7.7	14.5	7.3	162.1
N5330	16.3	1.0	8.7	6.1	10.3	6.8	3.2	3.3	4.2	3.5	6.5	3.3	73.2
N5340	17.8	1.1	9.6	6.7	11.3	7.4	3.5	3.6	4.6	3.8	7.2	3.6	80.2
N5350	18.5	1.1	9.9	6.9	11.6	7.7	3.7	3.7	4.8	3.9	7.4	3.8	83.1
N5360	14.0	0.8	7.5	5.2	8.8	5.8	2.8	2.8	3.7	3.0	5.6	2.9	63.0
N5370	35.4	2.1	19.1	13.3	22.5	14.8	7.0	7.2	9.2	7.5	14.2	7.2	159.5
N5380	438.9	26.4	234.5	163.9	275.8	182.1	86.4	88.6	115.0	93.2	176.4	88.9	1970.0
N5390	877.8	52.7	472.9	331.3	555.0	365.3	173.0	177.8	228.5	186.6	351.1	178.4	3951.2
N6040	66.8	4.0	36.0	25.2	42.5	27.9	13.3	13.6	17.5	14.2	26.9	13.6	301.4
N6070	331.3	19.8	177.3	123.7	208.4	137.3	65.1	66.8	85.8	69.9	132.2	66.8	1484.6
N6090	872.1	51.3	472.9	328.5	555.0	362.4	171.3	175.8	219.7	183.8	342.6	174.7	3910.2
N6100	247.8	14.6	133.7	93.2	157.2	103.1	48.7	50.1	63.1	52.4	98.0	49.8	1111.8
N6110	122.8	7.2	66.3	45.9	77.9	50.7	24.0	24.6	30.6	25.7	47.9	24.4	547.8
N6130	63.4	3.8	34.0	23.7	40.5	26.3	12.5	12.8	16.4	13.4	25.3	12.8	284.7
N6140	222.0	13.1	118.4	82.7	139.3	91.5	43.3	44.5	56.6	46.4	87.8	44.5	990.0
N6160	303.0	18.0	163.4	113.8	193.1	126.0	59.7	61.2	77.9	64.0	120.6	61.2	1361.9
N6180	467.2	27.2	251.7	175.3	297.3	193.1	91.2	93.4	115.8	97.7	182.1	92.9	2085.0
N6190	70.5	4.2	37.9	26.4	45.6	29.2	13.8	14.2	18.1	14.9	28.0	14.2	316.9
N6210	526.7	31.1	281.2	196.2	331.3	217.5	103.1	105.6	134.8	110.7	208.4	105.6	2352.2
N6220	46.1	2.9	25.9	18.1	30.3	20.0	9.5	9.7	12.5	10.2	19.3	9.8	216.4
N6240	48.4	2.9	26.0	18.1	30.6	20.1	9.5	9.7	12.5	10.2	19.3	9.7	217.0
N6250	279.2	16.5	150.9	105.1	177.5	116.1	54.9	56.3	70.8	58.9	110.1	56.1	1252.4
N6260	54.1	3.3	29.2	20.4	34.3	22.6	10.7	11.0	14.1	11.5	21.7	11.0	243.6
N6280	18.6	1.1	10.1	7.0	11.8	7.8	3.7	3.8	4.9	4.0	7.5	3.8	84.1
N6290	77.0	4.6	41.6	29.2	49.0	32.3	15.3	15.7	20.1	16.4	30.9	15.7	347.7
N7000	4219.1	247.5	2287.9	1591.4	2692.9	1752.6	826.0	849.5	1047.7	886.3	1650.8	841.0	18893.6
N7010	954.2	56.1	515.4	359.6	606.0	396.4	187.5	192.0	239.8	200.8	373.8	190.8	4272.3
N7020	413.4	24.4	223.1	155.5	262.2	171.9	81.3	83.5	105.3	87.2	163.9	83.0	1854.8
N7030	586.1	35.1	314.3	219.2	368.1	243.0	115.2	118.1	152.1	124.0	234.2	118.4	2627.7
N7040	229.4	13.1	119.2	83.0	141.0	91.7	43.6	44.5	58.3	46.7	87.5	44.5	1000.5
N7050	634.3	37.1	342.6	238.4	402.1	263.3	124.3	127.4	150.4	133.4	249.2	126.9	2838.4
N7060	253.1	14.5	129.4	90.3	153.8	100.2	47.6	48.7	62.0	51.3	96.8	49.0	1097.6

Monthly Loadings For Total Suspended Solids (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N7070	1008.0	59.7	535.2	373.8	628.6	413.4	196.5	201.3	258.8	211.2	399.3	201.6	4487.5
N7080	4.5	0.3	2.4	1.7	2.8	1.8	0.9	0.9	1.2	0.9	1.8	0.9	20.0
N7090	787.2	45.6	421.9	294.5	498.4	322.8	152.0	156.9	193.4	163.4	305.8	155.5	3498.2
N7100	1197.8	71.6	645.6	450.2	758.9	501.2	237.0	242.7	311.5	254.6	478.5	242.7	5392.2
N7110	156.3	9.3	85.5	59.5	100.8	65.7	31.1	32.0	39.9	33.4	62.3	31.7	709.5
N7120	128.6	7.8	69.4	48.4	81.6	53.8	25.6	26.3	34.0	27.6	52.1	26.4	581.4
N7130	98.5	5.9	53.2	37.1	62.6	41.1	19.5	20.0	25.4	20.9	39.4	19.9	443.5
N7140	1285.7	74.2	685.2	475.7	804.2	526.7	248.3	254.6	317.1	265.9	495.5	252.9	5666.0
N7150	1650.8	96.6	892.0	620.1	1050.5	685.2	322.8	331.3	410.6	345.5	645.6	328.5	7379.4
N7160	858.0	51.3	461.0	322.8	540.8	356.8	169.3	173.3	222.6	181.8	342.6	173.6	3854.4
N7170	2186.0	127.7	1183.8	821.2	1393.1	906.1	427.6	438.9	538.0	455.9	840.5	433.2	9760.8
N7180	1033.5	60.3	560.7	387.9	659.6	427.6	202.2	207.3	255.1	216.1	402.1	205.3	4817.8
N7190	1472.4	87.6	792.8	552.2	931.6	611.6	291.7	297.3	379.4	311.5	588.1	297.3	6611.5
N7200	495.5	29.7	268.4	187.2	314.3	207.3	98.3	100.8	128.6	105.6	198.8	100.8	2235.3
N7210	617.3	36.5	334.1	231.9	390.8	256.8	121.5	124.6	157.7	130.5	244.9	124.3	2771.0
N7220	64.3	3.9	34.6	24.2	40.5	26.8	12.7	13.1	17.0	13.7	26.0	13.1	289.8
N7230	155.5	9.3	83.5	58.3	98.3	64.8	30.9	31.4	40.5	33.1	62.3	31.4	699.4
N7240	1042.0	60.9	563.8	390.8	665.4	430.4	203.6	209.0	256.0	217.5	404.9	205.7	4650.6
N7250	161.7	9.7	85.5	59.7	100.2	66.3	31.4	32.3	41.9	34.0	64.3	32.6	719.5
N7260	1240.2	72.8	671.1	467.2	790.0	515.4	243.2	249.5	308.6	260.2	487.0	247.5	5552.8
N7270	5.1	0.3	2.7	1.9	3.2	2.1	1.0	1.0	1.4	1.1	2.1	1.0	23.1
N7280	600.3	36.2	322.8	225.7	382.3	250.6	119.2	122.0	157.7	128.0	242.4	122.3	2709.6
N7290	314.3	18.9	167.9	117.2	197.4	130.3	62.0	63.4	82.4	66.5	126.3	63.7	1410.3
N7300	167.1	9.9	87.5	61.2	102.8	68.0	32.3	33.1	43.0	34.8	66.0	33.4	739.0
N7310	509.7	30.3	271.8	189.7	320.0	210.7	100.0	102.5	132.2	107.6	203.3	102.8	2280.6
N7320	25.2	1.4	12.5	8.7	19.2	9.7	4.6	4.7	6.1	5.0	9.4	4.8	111.4
N7330	40.5	0.4	3.8	2.6	10.3	2.9	1.4	1.4	1.9	1.5	2.9	1.4	71.1
N7340	0.5	0.2	1.9	1.3	2.2	1.4	0.7	0.7	0.9	0.7	1.4	0.7	16.8
N7350	424.7	25.5	227.1	158.6	266.5	175.8	83.3	85.8	110.7	89.6	170.2	85.8	1903.9
N8000	291.7	17.7	157.4	109.9	185.8	122.0	58.0	59.5	77.0	62.3	118.1	59.7	1319.1
N8010	5210.1	311.5	2803.3	1956.6	3313.0	2171.6	1030.7	1056.2	1359.2	1107.2	2092.6	1059.0	23471.1
N8020	26.2	1.6	13.9	9.7	16.3	10.8	5.1	5.2	6.8	5.5	10.4	5.3	116.8
N8030	1129.8	67.7	600.3	419.1	707.9	487.2	221.4	227.1	294.5	238.1	450.2	227.9	5051.3
N8040	504.0	29.4	261.9	182.9	314.3	203.0	96.6	99.1	128.6	103.9	197.1	99.4	2220.3
N8050	32.0	2.0	17.3	12.1	20.3	13.5	6.4	6.6	8.6	6.9	13.1	6.6	145.3
N8060	617.3	37.1	331.3	230.5	387.9	256.0	121.8	124.6	161.4	130.8	247.8	125.2	2771.6
N8070	0.3	0.0	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1	1.1
N8080	267.3	16.1	143.0	100.0	167.9	110.7	52.7	54.1	69.9	56.6	107.3	54.1	1199.7
N8090	300.1	18.0	160.3	112.1	190.3	124.3	59.2	60.6	78.4	63.4	120.3	60.9	1348.0
N8100	232.2	14.1	125.4	87.5	147.0	97.1	46.2	47.3	61.4	49.8	94.3	47.6	1049.9
N8110	139.6	8.4	75.3	52.7	88.6	58.3	27.7	28.3	36.2	29.7	56.1	28.3	629.3
N8120	560.7	33.1	297.3	208.4	351.1	231.1	109.6	112.1	144.1	117.8	222.3	112.4	2500.0
N8130	256.3	8.2	72.5	50.7	88.9	66.3	26.8	27.4	35.7	28.9	54.6	27.6	733.8
N8140	798.5	47.6	430.4	300.1	506.9	331.3	157.4	161.4	205.9	169.0	317.1	161.1	3586.8
N8150	829.7	49.6	447.4	311.5	523.8	345.5	163.7	167.3	214.1	175.6	331.3	167.6	3727.0
N8160	1634.9	107.6	985.4	685.2	1158.1	758.9	360.6	368.1	464.4	385.1	722.1	365.3	6194.7
N8170	574.8	34.3	311.5	216.6	365.3	239.8	113.5	116.4	146.1	122.0	229.4	116.1	2587.8
N8180	140.8	8.6	77.0	53.8	90.6	59.7	28.3	29.2	37.4	30.6	57.8	29.2	646.0
N8190	370.9	22.1	199.1	138.7	233.9	154.0	73.1	74.8	96.0	78.4	148.1	75.0	1664.2
N8200	12289.1	727.7	6625.9	4615.6	7815.2	5125.2	2421.0	2480.5	3143.1	2590.6	4870.4	2474.8	55185.1
N9000	49269.8	2944.9	26305.6	18377.1	31430.8	20387.5	9684.1	9938.9	12855.5	10420.3	19736.3	9957.2	221317.9
N9010	1115.7	66.3	594.6	413.4	696.6	458.7	218.3	223.4	288.8	234.5	444.6	224.0	4978.8
N9020	3143.1	187.7	1693.3	1183.0	1990.6	1311.0	620.1	637.1	812.7	658.3	1257.2	637.1	14141.9
N9030	5521.6	325.6	3001.5	2081.2	3511.2	2296.4	1084.5	1112.8	1381.8	1161.0	2169.0	1104.3	24751.0
N9040	6144.6	359.6	3313.0	2310.6	3907.6	2548.4	1203.4	1234.6	1526.2	1288.4	2401.2	1223.3	27460.9
N9050	1580.0	92.0	846.6	589.0	1025.0	651.3	308.6	314.3	396.4	331.3	617.3	314.3	7066.3
N9060	1076.0	63.4	580.5	404.9	682.4	447.4	211.5	216.9	272.4	226.8	424.7	215.8	4822.8
N9070	5380.0	317.1	2916.5	2021.8	3426.2	2237.0	1059.0	1084.5	1364.8	1135.5	2126.5	1078.8	24147.9
N9080	356.6	21.6	192.3	134.2	225.7	146.9	70.8	72.8	94.3	76.2	144.4	72.8	1610.7
N9090	1902.8	114.7	1027.9	716.4	1206.3	795.7	379.4	387.9	498.4	404.0	767.4	387.9	8589.7

Monthly Loadings For Total Zinc (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N1050	0.074	0.004	0.040	0.028	0.047	0.031	0.015	0.015	0.019	0.016	0.030	0.015	0.333
N1060	0.309	0.019	0.166	0.116	0.195	0.129	0.061	0.063	0.080	0.066	0.124	0.063	1.390
N1070	2.183	0.130	1.178	0.821	1.385	0.909	0.430	0.442	0.563	0.462	0.872	0.442	9.817
N1100	0.148	0.009	0.080	0.055	0.093	0.061	0.029	0.030	0.039	0.031	0.059	0.030	0.665
N1130	1.056	0.063	0.569	0.396	0.668	0.439	0.208	0.213	0.271	0.223	0.419	0.213	4.739
N1170	1.308	0.078	0.705	0.493	0.830	0.544	0.258	0.264	0.334	0.277	0.521	0.264	5.875
N1180	1.798	0.105	0.971	0.677	1.144	0.745	0.351	0.362	0.450	0.377	0.705	0.360	8.045
N1190	0.007	0.000	0.003	0.002	0.004	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.026
N2020	0.288	0.017	0.155	0.108	0.182	0.120	0.057	0.058	0.075	0.061	0.116	0.058	1.293
N2030	0.493	0.029	0.266	0.186	0.314	0.206	0.098	0.100	0.128	0.105	0.198	0.100	2.223
N2060	0.852	0.051	0.459	0.320	0.541	0.354	0.168	0.172	0.219	0.180	0.340	0.172	3.828
N2070	2.036	0.139	1.260	0.878	1.481	0.974	0.462	0.473	0.600	0.496	0.929	0.470	10.497
N2080	0.047	0.003	0.025	0.018	0.030	0.020	0.009	0.009	0.012	0.010	0.019	0.010	0.212
N2090	0.340	0.020	0.182	0.127	0.214	0.141	0.067	0.069	0.089	0.072	0.136	0.069	1.528
N2110	0.524	0.032	0.283	0.198	0.331	0.219	0.104	0.106	0.137	0.112	0.212	0.107	2.365
N2130	0.036	0.002	0.018	0.013	0.022	0.014	0.007	0.007	0.009	0.007	0.014	0.007	0.156
N2160	0.098	0.006	0.053	0.037	0.062	0.041	0.019	0.020	0.026	0.021	0.039	0.020	0.442
N2170	0.762	0.045	0.411	0.286	0.484	0.317	0.151	0.154	0.196	0.161	0.303	0.154	3.424
N2190	0.021	0.001	0.011	0.008	0.013	0.009	0.004	0.004	0.005	0.004	0.008	0.004	0.095
N2210	0.042	0.003	0.023	0.016	0.027	0.018	0.008	0.009	0.011	0.009	0.017	0.009	0.190
N2220	0.343	0.021	0.184	0.129	0.216	0.143	0.068	0.069	0.090	0.073	0.138	0.070	1.542
N2250	0.012	0.001	0.006	0.004	0.007	0.005	0.002	0.002	0.003	0.002	0.005	0.002	0.053
N2280	0.286	0.017	0.153	0.107	0.180	0.119	0.056	0.058	0.075	0.061	0.115	0.058	1.283
N2330	0.331	0.020	0.177	0.124	0.208	0.137	0.065	0.067	0.086	0.070	0.133	0.067	1.485
N2350	0.103	0.006	0.054	0.037	0.063	0.042	0.020	0.020	0.026	0.021	0.040	0.020	0.454
N2380	0.863	0.053	0.476	0.331	0.558	0.368	0.175	0.179	0.230	0.187	0.354	0.179	3.973
N2410	0.388	0.023	0.209	0.146	0.246	0.162	0.077	0.079	0.101	0.082	0.156	0.079	1.747
N2420	0.068	0.004	0.036	0.025	0.042	0.028	0.013	0.014	0.018	0.014	0.027	0.014	0.304
N2430	0.146	0.009	0.079	0.055	0.092	0.061	0.029	0.030	0.039	0.031	0.059	0.030	0.659
N2460	4.332	0.254	2.347	1.634	2.764	1.801	0.849	0.872	1.078	0.909	1.696	0.864	19.401
N2470	0.697	0.042	0.374	0.261	0.439	0.289	0.137	0.141	0.180	0.148	0.278	0.141	3.125
N2480	0.265	0.016	0.143	0.100	0.168	0.111	0.052	0.054	0.069	0.056	0.107	0.054	1.194
N3030	0.063	0.004	0.034	0.024	0.040	0.026	0.012	0.013	0.017	0.013	0.025	0.013	0.283
N3040	0.182	0.011	0.098	0.069	0.115	0.076	0.036	0.037	0.048	0.039	0.073	0.037	0.821
N3050	0.121	0.007	0.065	0.045	0.076	0.050	0.024	0.024	0.032	0.026	0.049	0.025	0.544
N3060	0.634	0.038	0.343	0.238	0.402	0.264	0.125	0.128	0.164	0.135	0.253	0.128	2.853
N3070	0.151	0.009	0.082	0.057	0.096	0.063	0.030	0.031	0.039	0.032	0.061	0.031	0.683
N3080	0.691	0.041	0.371	0.260	0.436	0.289	0.136	0.140	0.178	0.146	0.276	0.140	3.104
N3090	1.521	0.089	0.821	0.572	0.966	0.631	0.300	0.306	0.385	0.320	0.600	0.306	6.817
N3100	0.079	0.005	0.042	0.030	0.050	0.033	0.016	0.016	0.021	0.017	0.032	0.016	0.357
N3110	0.009	0.001	0.005	0.003	0.006	0.004	0.002	0.002	0.002	0.002	0.004	0.002	0.042
N3120	0.150	0.009	0.081	0.056	0.095	0.063	0.030	0.030	0.039	0.032	0.060	0.030	0.674
N3130	0.064	0.004	0.034	0.024	0.040	0.027	0.013	0.013	0.017	0.014	0.026	0.013	0.287
N3140	0.323	0.019	0.175	0.122	0.205	0.135	0.064	0.065	0.083	0.069	0.128	0.065	1.452
N3160	0.184	0.011	0.099	0.069	0.117	0.077	0.037	0.037	0.048	0.039	0.074	0.037	0.831
N3170	0.328	0.020	0.176	0.123	0.207	0.136	0.065	0.066	0.085	0.069	0.131	0.066	1.473
N3180	0.161	0.010	0.086	0.060	0.101	0.067	0.032	0.033	0.042	0.034	0.065	0.033	0.724
N3200	0.010	0.001	0.005	0.004	0.006	0.004	0.002	0.002	0.003	0.002	0.004	0.002	0.044
N3210	0.009	0.001	0.005	0.003	0.006	0.004	0.002	0.002	0.002	0.002	0.004	0.002	0.040
N3220	0.063	0.004	0.034	0.024	0.040	0.026	0.012	0.013	0.017	0.013	0.025	0.013	0.283
N3230	0.027	0.002	0.015	0.010	0.017	0.011	0.005	0.005	0.007	0.006	0.011	0.006	0.122
N3240	0.059	0.004	0.032	0.022	0.037	0.025	0.012	0.012	0.016	0.013	0.024	0.012	0.266
N3250	0.112	0.007	0.060	0.042	0.071	0.047	0.022	0.023	0.029	0.024	0.045	0.023	0.504
N3260	0.137	0.008	0.074	0.051	0.086	0.057	0.027	0.028	0.036	0.029	0.055	0.028	0.616
N3280	0.157	0.009	0.084	0.059	0.099	0.065	0.031	0.032	0.041	0.033	0.063	0.032	0.708
N3310	0.035	0.002	0.018	0.013	0.022	0.014	0.007	0.007	0.009	0.007	0.014	0.007	0.155
N3320	0.236	0.014	0.125	0.088	0.148	0.097	0.046	0.047	0.061	0.050	0.094	0.048	1.053
N3330	0.168	0.010	0.088	0.062	0.142	0.069	0.033	0.033	0.043	0.035	0.067	0.034	0.754
N3360	2.042	0.120	1.101	0.767	1.297	0.849	0.402	0.411	0.518	0.430	0.807	0.411	9.156
N4010	0.837	0.038	0.343	0.240	0.402	0.266	0.126	0.129	0.166	0.135	0.256	0.129	2.867
N4020	0.105	0.006	0.056	0.039	0.066	0.044	0.021	0.021	0.027	0.022	0.042	0.021	0.472
N4040	23.984	1.436	12.912	9.004	15.234	9.996	4.729	4.870	6.230	5.097	9.590	4.870	107.980
N4050	0.521	0.031	0.281	0.196	0.331	0.218	0.103	0.106	0.135	0.111	0.210	0.106	2.351
N4110	1.025	0.061	0.544	0.379	0.640	0.422	0.200	0.205	0.263	0.215	0.405	0.205	4.564
N4150	0.085	0.005	0.046	0.032	0.054	0.035	0.017	0.017	0.022	0.018	0.034	0.017	0.381
N4160	1.082	0.064	0.583	0.406	0.685	0.450	0.213	0.218	0.277	0.229	0.430	0.218	4.858
N4170	0.631	0.037	0.340	0.237	0.399	0.262	0.124	0.127	0.161	0.133	0.250	0.127	2.831
N4180	0.171	0.010	0.091	0.063	0.109	0.071	0.033	0.034	0.044	0.036	0.068	0.035	0.765
N4190	2.860	0.170	1.540	1.076	1.809	1.189	0.563	0.578	0.736	0.606	1.141	0.578	12.847
N4200	2.262	0.133	1.223	0.852	1.438	0.940	0.445	0.456	0.572	0.476	0.892	0.453	10.143
N4240	0.790	0.047	0.428	0.297	0.501	0.328	0.156	0.159	0.201	0.167	0.314	0.159	3.548
N4250	4.247	0.250	2.302	1.600	2.707	1.767	0.835	0.855	1.068	0.895	1.671	0.852	19.049
N4380	4.417	0.258	2.387	1.659	2.812	1.826	0.861	0.883	1.087	0.923	1.713	0.875	19.702

Monthly Loadings For Total Zinc (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N4390	6.201	0.362	3.370	2.330	3.964	2.565	1.212	1.243	1.521	1.294	2.404	1.229	27.696
N4400	0.257	0.015	0.139	0.097	0.163	0.107	0.051	0.052	0.067	0.055	0.103	0.052	1.157
N4430	0.136	0.008	0.074	0.051	0.086	0.057	0.027	0.028	0.036	0.029	0.055	0.028	0.615
N4450	0.204	0.012	0.110	0.077	0.129	0.085	0.040	0.041	0.054	0.044	0.082	0.042	0.920
N4480	0.050	0.003	0.027	0.019	0.032	0.021	0.010	0.010	0.013	0.011	0.020	0.010	0.227
N4520	1.418	0.084	0.765	0.532	0.900	0.589	0.279	0.286	0.360	0.300	0.561	0.286	6.358
N4530	0.459	0.028	0.247	0.173	0.289	0.192	0.091	0.093	0.121	0.098	0.186	0.094	2.071
N4540	29.165	1.733	15.715	10.958	18.689	12.119	5.748	5.890	7.475	6.173	11.581	5.890	131.137
N4550	0.002	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.007
N4560	0.144	0.009	0.077	0.054	0.091	0.060	0.028	0.029	0.037	0.031	0.057	0.029	0.647
N4570	1.648	0.097	0.889	0.620	1.048	0.685	0.323	0.331	0.416	0.348	0.651	0.331	7.388
N4580	1.031	0.061	0.555	0.388	0.657	0.428	0.203	0.208	0.266	0.218	0.411	0.208	4.633
N4590	10.307	0.606	5.578	3.879	6.569	4.276	2.022	2.073	2.588	2.166	4.049	2.061	46.175
N4600	8.693	0.521	4.672	3.256	5.493	3.624	1.716	1.756	2.208	1.843	3.463	1.761	39.087
N4610	2.594	0.156	1.390	0.974	1.642	1.082	0.513	0.527	0.677	0.552	1.042	0.527	11.680
N4620	5.352	0.314	2.888	2.013	3.426	2.217	1.048	1.073	1.325	1.121	2.087	1.065	23.030
N4630	7.504	0.447	4.021	2.800	4.765	3.115	1.475	1.512	1.951	1.586	3.001	1.515	33.713
N4640	12.204	0.733	6.569	4.587	7.730	5.069	2.413	2.472	3.200	2.594	4.809	2.478	54.847
N4650	4.474	0.269	2.398	1.673	2.823	1.858	0.883	0.903	1.169	0.949	1.795	0.909	20.104
N4660	0.073	0.004	0.037	0.026	0.043	0.028	0.014	0.014	0.018	0.015	0.028	0.014	0.312
N4670	1.101	0.065	0.595	0.413	0.699	0.459	0.217	0.222	0.278	0.232	0.433	0.221	4.936
N4700	0.052	0.003	0.027	0.019	0.031	0.021	0.010	0.010	0.013	0.011	0.020	0.010	0.226
N5040	0.374	0.022	0.197	0.138	0.248	0.152	0.072	0.074	0.093	0.077	0.144	0.073	1.663
N5060	0.090	0.005	0.047	0.033	0.060	0.037	0.017	0.018	0.023	0.019	0.035	0.018	0.402
N5070	1.741	0.101	0.917	0.640	1.087	0.706	0.334	0.343	0.433	0.360	0.674	0.343	7.681
N5080	1.552	0.091	0.838	0.583	0.988	0.646	0.306	0.311	0.388	0.326	0.609	0.311	6.949
N5120	0.906	0.054	0.490	0.343	0.575	0.377	0.179	0.183	0.233	0.192	0.362	0.183	4.076
N5130	0.450	0.027	0.244	0.170	0.286	0.188	0.089	0.091	0.115	0.095	0.179	0.091	2.025
N5140	0.242	0.015	0.131	0.091	0.154	0.101	0.048	0.049	0.063	0.052	0.097	0.049	1.092
N5170	0.019	0.001	0.010	0.007	0.012	0.008	0.004	0.004	0.005	0.004	0.008	0.004	0.088
N5180	0.106	0.006	0.057	0.040	0.067	0.044	0.021	0.021	0.028	0.023	0.042	0.022	0.476
N5190	0.076	0.005	0.041	0.029	0.048	0.032	0.015	0.016	0.020	0.016	0.031	0.016	0.345
N5210	0.024	0.001	0.013	0.009	0.015	0.010	0.005	0.005	0.006	0.005	0.010	0.005	0.107
N5220	0.340	0.020	0.183	0.127	0.215	0.141	0.067	0.068	0.086	0.071	0.134	0.068	1.520
N5230	0.047	0.003	0.025	0.018	0.030	0.020	0.009	0.010	0.012	0.010	0.019	0.010	0.213
N5240	0.530	0.031	0.286	0.199	0.337	0.219	0.104	0.106	0.131	0.111	0.207	0.105	2.366
N5250	0.566	0.033	0.306	0.213	0.360	0.235	0.111	0.114	0.140	0.119	0.221	0.113	2.520
N5260	0.305	0.018	0.165	0.115	0.194	0.128	0.061	0.062	0.079	0.065	0.123	0.062	1.376
N5280	0.072	0.004	0.038	0.027	0.046	0.029	0.014	0.014	0.018	0.015	0.028	0.014	0.322
N5290	0.699	0.040	0.365	0.254	0.433	0.281	0.133	0.136	0.173	0.143	0.268	0.136	3.062
N5300	3.766	0.225	2.025	1.413	2.384	1.566	0.742	0.762	0.974	0.799	1.506	0.762	16.923
N5320	0.076	0.005	0.041	0.029	0.048	0.032	0.015	0.015	0.020	0.016	0.031	0.015	0.342
N5330	0.034	0.002	0.018	0.013	0.022	0.014	0.007	0.007	0.009	0.007	0.014	0.007	0.155
N5340	0.038	0.002	0.020	0.014	0.024	0.016	0.007	0.008	0.010	0.008	0.015	0.008	0.169
N5350	0.039	0.002	0.021	0.015	0.025	0.016	0.008	0.008	0.010	0.008	0.016	0.008	0.176
N5360	0.030	0.002	0.016	0.011	0.019	0.012	0.005	0.006	0.008	0.006	0.012	0.006	0.133
N5370	0.075	0.004	0.040	0.028	0.048	0.031	0.015	0.015	0.019	0.016	0.030	0.015	0.337
N5380	1.294	0.078	0.694	0.484	0.816	0.538	0.255	0.262	0.340	0.275	0.521	0.262	5.818
N5390	0.583	0.035	0.314	0.219	0.368	0.243	0.115	0.118	0.151	0.124	0.233	0.118	2.622
N6040	0.097	0.005	0.047	0.033	0.055	0.036	0.017	0.018	0.023	0.018	0.035	0.018	0.391
N6070	0.481	0.029	0.258	0.180	0.303	0.199	0.095	0.097	0.125	0.102	0.192	0.097	2.157
N6090	1.201	0.071	0.648	0.453	0.765	0.498	0.238	0.242	0.303	0.253	0.473	0.240	5.382
N6100	0.323	0.019	0.174	0.121	0.204	0.134	0.063	0.065	0.082	0.068	0.127	0.065	1.446
N6110	0.168	0.010	0.091	0.063	0.107	0.070	0.033	0.034	0.042	0.035	0.066	0.033	0.751
N6130	0.082	0.005	0.044	0.031	0.053	0.034	0.016	0.017	0.021	0.017	0.033	0.017	0.370
N6140	0.311	0.018	0.167	0.116	0.196	0.129	0.061	0.063	0.080	0.065	0.123	0.063	1.393
N6160	0.394	0.023	0.212	0.148	0.251	0.164	0.078	0.080	0.101	0.084	0.157	0.080	1.771
N6180	0.654	0.038	0.354	0.246	0.416	0.271	0.128	0.131	0.163	0.137	0.255	0.130	2.924
N6190	0.101	0.006	0.054	0.038	0.065	0.042	0.020	0.020	0.026	0.021	0.040	0.020	0.455
N6210	0.770	0.045	0.411	0.286	0.484	0.317	0.151	0.154	0.197	0.162	0.300	0.154	3.438
N6220	0.102	0.006	0.055	0.038	0.064	0.042	0.020	0.021	0.026	0.022	0.041	0.021	0.457
N6240	0.102	0.006	0.055	0.038	0.065	0.042	0.020	0.021	0.026	0.022	0.041	0.021	0.458
N6250	0.419	0.025	0.226	0.157	0.266	0.174	0.082	0.084	0.106	0.088	0.165	0.084	1.875
N6260	0.086	0.005	0.046	0.032	0.054	0.036	0.017	0.017	0.022	0.018	0.034	0.017	0.385
N6280	0.039	0.002	0.021	0.015	0.025	0.016	0.008	0.008	0.010	0.008	0.016	0.008	0.176
N6290	0.115	0.007	0.062	0.043	0.073	0.048	0.023	0.023	0.030	0.024	0.046	0.023	0.517
N7000	6.654	0.388	3.596	2.500	4.247	2.755	1.303	1.334	1.648	1.393	2.594	1.322	29.735
N7010	1.552	0.091	0.838	0.583	0.988	0.646	0.306	0.311	0.391	0.326	0.612	0.311	6.956
N7020	0.563	0.033	0.303	0.211	0.357	0.234	0.111	0.113	0.143	0.119	0.223	0.113	2.523
N7030	0.733	0.044	0.394	0.274	0.462	0.306	0.145	0.148	0.191	0.155	0.294	0.148	3.294
N7040	0.422	0.024	0.218	0.152	0.259	0.168	0.080	0.082	0.103	0.086	0.161	0.082	1.836
N7050	0.490	0.029	0.264	0.184	0.311	0.203	0.096	0.098	0.123	0.103	0.192	0.098	2.191
N7060	0.527	0.030	0.270	0.188	0.320	0.209	0.099	0.102	0.131	0.106	0.202	0.102	2.285

Monthly Loadings For Total Zinc (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N7070	1.147	0.088	0.609	0.425	0.714	0.470	0.223	0.229	0.294	0.240	0.453	0.229	5.101
N7080	0.003	0.000	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.011
N7090	1.164	0.067	0.623	0.433	0.736	0.479	0.226	0.232	0.286	0.241	0.450	0.229	5.166
N7100	2.455	0.147	1.328	0.926	1.560	1.025	0.487	0.498	0.637	0.521	0.963	0.498	11.066
N7110	0.271	0.016	0.147	0.102	0.173	0.113	0.053	0.055	0.068	0.057	0.107	0.054	1.216
N7120	0.016	0.001	0.009	0.006	0.010	0.007	0.003	0.003	0.004	0.004	0.007	0.003	0.074
N7130	0.151	0.009	0.082	0.057	0.096	0.063	0.030	0.031	0.039	0.032	0.061	0.031	0.682
N7140	1.540	0.090	0.832	0.580	0.980	0.640	0.303	0.309	0.386	0.323	0.606	0.309	6.897
N7150	1.385	0.081	0.748	0.521	0.881	0.575	0.271	0.278	0.345	0.280	0.541	0.276	6.189
N7160	0.504	0.030	0.271	0.189	0.317	0.210	0.099	0.102	0.131	0.107	0.201	0.102	2.262
N7170	2.662	0.155	1.438	1.000	1.690	1.101	0.521	0.532	0.654	0.555	1.034	0.527	11.875
N7180	1.257	0.074	0.680	0.473	0.801	0.521	0.246	0.252	0.311	0.263	0.490	0.250	5.618
N7190	1.509	0.090	0.813	0.566	0.957	0.620	0.297	0.306	0.388	0.320	0.600	0.306	6.781
N7200	1.841	0.111	0.994	0.694	1.168	0.770	0.365	0.374	0.464	0.394	0.745	0.377	8.317
N7210	1.186	0.071	0.640	0.447	0.753	0.496	0.234	0.240	0.309	0.252	0.476	0.240	5.345
N7220	0.019	0.001	0.010	0.007	0.012	0.008	0.004	0.004	0.005	0.004	0.008	0.004	0.085
N7230	0.140	0.008	0.076	0.053	0.089	0.059	0.028	0.028	0.037	0.030	0.056	0.029	0.632
N7240	0.847	0.049	0.459	0.317	0.538	0.351	0.165	0.170	0.208	0.177	0.328	0.168	3.777
N7250	0.038	0.002	0.020	0.014	0.023	0.015	0.007	0.008	0.010	0.009	0.015	0.008	0.168
N7260	0.419	0.025	0.227	0.157	0.267	0.174	0.082	0.084	0.104	0.088	0.164	0.084	1.874
N7270	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
N7280	2.061	0.124	1.107	0.773	1.308	0.858	0.408	0.419	0.541	0.439	0.820	0.419	9.287
N7290	0.201	0.012	0.107	0.075	0.126	0.083	0.040	0.040	0.053	0.042	0.081	0.041	0.901
N7300	0.041	0.002	0.022	0.015	0.025	0.017	0.008	0.008	0.011	0.009	0.016	0.008	0.183
N7310	0.098	0.006	0.052	0.037	0.061	0.040	0.019	0.020	0.025	0.021	0.039	0.020	0.437
N7320	0.004	0.000	0.002	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.016
N7330	0.007	0.000	0.001	0.000	0.004	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.014
N7340	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
N7350	0.100	0.006	0.053	0.037	0.063	0.041	0.020	0.020	0.026	0.021	0.040	0.020	0.447
N8000	0.858	0.052	0.499	0.320	0.546	0.357	0.170	0.174	0.225	0.182	0.345	0.174	3.662
N8010	21.152	1.274	11.355	7.928	13.422	8.806	4.191	4.276	5.550	4.502	8.523	4.304	85.283
N8020	0.007	0.000	0.004	0.003	0.005	0.003	0.001	0.001	0.002	0.002	0.003	0.001	0.033
N8030	3.483	0.210	1.869	1.305	2.211	1.450	0.688	0.705	0.912	0.739	1.402	0.708	15.682
N8040	1.286	0.077	0.682	0.476	0.824	0.530	0.251	0.258	0.334	0.270	0.513	0.259	5.758
N8050	0.004	0.000	0.002	0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.020
N8060	1.470	0.088	0.787	0.549	0.932	0.612	0.292	0.297	0.385	0.311	0.592	0.297	6.612
N8070	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N8080	0.189	0.011	0.101	0.071	0.118	0.078	0.037	0.038	0.049	0.040	0.076	0.038	0.846
N8090	0.391	0.023	0.208	0.145	0.249	0.161	0.077	0.079	0.102	0.082	0.156	0.079	1.753
N8100	0.043	0.003	0.023	0.016	0.027	0.018	0.008	0.009	0.011	0.009	0.017	0.009	0.193
N8110	0.053	0.003	0.028	0.020	0.033	0.022	0.010	0.011	0.014	0.011	0.021	0.011	0.237
N8120	0.193	0.011	0.103	0.072	0.121	0.080	0.038	0.039	0.050	0.040	0.077	0.039	0.863
N8130	0.030	0.001	0.008	0.006	0.010	0.007	0.003	0.003	0.004	0.003	0.008	0.003	0.095
N8140	1.962	0.118	1.053	0.736	1.249	0.816	0.388	0.395	0.510	0.416	0.787	0.396	8.828
N8150	0.365	0.022	0.196	0.137	0.230	0.151	0.072	0.074	0.094	0.077	0.145	0.074	1.637
N8160	1.504	0.090	0.807	0.563	0.951	0.623	0.294	0.303	0.379	0.314	0.592	0.300	6.720
N8170	0.109	0.006	0.059	0.041	0.069	0.045	0.021	0.022	0.028	0.023	0.043	0.022	0.489
N8180	0.091	0.005	0.049	0.034	0.058	0.038	0.018	0.018	0.024	0.019	0.037	0.019	0.411
N8190	0.473	0.028	0.254	0.178	0.297	0.197	0.093	0.096	0.123	0.100	0.189	0.096	2.124
N8200	32.280	1.931	17.356	12.119	20.529	13.422	6.371	6.541	8.382	6.852	12.912	6.541	145.238
N9000	275.515	16.480	148.677	102.504	175.842	113.830	54.084	55.499	71.639	58.048	110.149	55.499	1235.767
N9010	1.348	0.080	0.719	0.501	0.844	0.555	0.264	0.270	0.348	0.283	0.535	0.271	6.020
N9020	5.125	0.306	2.769	1.931	3.256	2.141	1.017	1.039	1.328	1.090	2.053	1.039	23.095
N9030	8.680	0.501	4.644	3.228	5.465	3.558	1.679	1.722	2.141	1.798	3.370	1.710	38.405
N9040	8.438	0.493	4.559	3.171	5.380	3.483	1.651	1.693	2.095	1.767	3.285	1.679	37.694
N9050	2.622	0.153	1.407	0.980	1.702	1.082	0.513	0.524	0.657	0.546	1.025	0.521	11.731
N9060	1.113	0.065	0.600	0.419	0.708	0.462	0.219	0.224	0.282	0.234	0.439	0.223	4.988
N9070	3.341	0.198	1.800	1.260	2.127	1.393	0.660	0.677	0.849	0.706	1.325	0.671	15.018
N9080	0.061	0.004	0.033	0.023	0.038	0.025	0.012	0.012	0.016	0.013	0.024	0.012	0.273
N9090	0.702	0.042	0.379	0.265	0.445	0.294	0.139	0.143	0.184	0.150	0.283	0.143	3.170

Monthly Loadings For Total Lead (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N1050	0.082	0.004	0.033	0.023	0.039	0.026	0.012	0.013	0.016	0.013	0.025	0.013	0.280
N1060	0.260	0.016	0.140	0.098	0.165	0.108	0.052	0.053	0.068	0.055	0.104	0.053	1.170
N1070	3.143	0.187	1.688	1.178	1.985	1.305	0.617	0.634	0.807	0.663	1.249	0.634	14.090
N1100	0.133	0.008	0.072	0.050	0.084	0.055	0.026	0.027	0.035	0.028	0.053	0.027	0.598
N1130	1.719	0.102	0.929	0.646	1.090	0.716	0.340	0.348	0.442	0.365	0.685	0.348	7.731
N1170	1.436	0.085	0.773	0.541	0.909	0.597	0.283	0.289	0.368	0.303	0.569	0.289	6.442
N1180	1.959	0.115	1.059	0.736	1.246	0.813	0.385	0.394	0.490	0.411	0.787	0.391	8.765
N1190	0.020	0.001	0.008	0.006	0.010	0.006	0.003	0.003	0.004	0.003	0.006	0.003	0.073
N2020	0.476	0.029	0.256	0.179	0.300	0.198	0.094	0.097	0.125	0.101	0.191	0.097	2.143
N2030	0.818	0.049	0.442	0.309	0.518	0.340	0.162	0.166	0.212	0.174	0.328	0.166	3.682
N2060	1.410	0.084	0.759	0.530	0.895	0.586	0.278	0.286	0.362	0.297	0.563	0.286	6.337
N2070	3.653	0.216	1.965	1.370	2.311	1.518	0.719	0.736	0.934	0.770	1.450	0.733	16.376
N2080	0.078	0.005	0.042	0.029	0.050	0.032	0.015	0.016	0.020	0.016	0.031	0.016	0.349
N2090	0.561	0.034	0.300	0.210	0.354	0.234	0.111	0.114	0.147	0.119	0.226	0.114	2.523
N2110	0.869	0.052	0.467	0.328	0.549	0.362	0.172	0.176	0.227	0.185	0.351	0.177	3.919
N2130	0.031	0.002	0.016	0.011	0.019	0.012	0.006	0.006	0.008	0.006	0.012	0.006	0.136
N2160	0.162	0.010	0.087	0.061	0.103	0.068	0.032	0.033	0.042	0.035	0.065	0.033	0.732
N2170	0.985	0.059	0.532	0.371	0.626	0.411	0.195	0.199	0.254	0.209	0.394	0.199	4.433
N2190	0.020	0.001	0.010	0.007	0.012	0.008	0.004	0.004	0.005	0.004	0.008	0.004	0.086
N2210	0.044	0.003	0.024	0.017	0.028	0.019	0.009	0.009	0.012	0.009	0.018	0.009	0.200
N2220	0.425	0.026	0.228	0.159	0.268	0.177	0.084	0.086	0.111	0.090	0.171	0.086	1.911
N2250	0.010	0.001	0.005	0.004	0.006	0.004	0.002	0.002	0.003	0.002	0.004	0.002	0.045
N2280	0.240	0.014	0.129	0.090	0.151	0.100	0.048	0.049	0.063	0.051	0.097	0.049	1.079
N2330	0.279	0.017	0.149	0.104	0.175	0.116	0.055	0.056	0.072	0.059	0.112	0.056	1.250
N2350	0.087	0.005	0.045	0.032	0.053	0.035	0.017	0.017	0.022	0.018	0.034	0.017	0.383
N2380	0.827	0.050	0.445	0.311	0.524	0.345	0.164	0.167	0.215	0.170	0.331	0.168	3.722
N2410	0.411	0.025	0.222	0.155	0.261	0.172	0.081	0.083	0.107	0.087	0.165	0.084	1.851
N2420	0.057	0.003	0.031	0.021	0.036	0.024	0.011	0.012	0.015	0.012	0.023	0.012	0.256
N2430	0.129	0.008	0.069	0.048	0.082	0.054	0.026	0.026	0.034	0.027	0.052	0.026	0.582
N2460	5.040	0.294	2.727	1.897	3.200	2.093	0.988	1.014	1.252	1.056	1.968	1.005	22.534
N2470	0.674	0.040	0.362	0.253	0.425	0.280	0.133	0.136	0.174	0.143	0.269	0.136	3.026
N2480	0.223	0.013	0.120	0.084	0.141	0.093	0.044	0.045	0.058	0.046	0.090	0.045	1.006
N3030	0.089	0.005	0.048	0.033	0.056	0.037	0.018	0.018	0.023	0.019	0.036	0.018	0.399
N3040	0.158	0.009	0.085	0.059	0.100	0.066	0.031	0.032	0.041	0.033	0.063	0.032	0.710
N3050	0.102	0.006	0.055	0.038	0.064	0.042	0.020	0.021	0.027	0.022	0.041	0.021	0.458
N3060	0.937	0.056	0.504	0.351	0.592	0.391	0.185	0.189	0.242	0.198	0.374	0.189	4.209
N3070	0.251	0.015	0.135	0.095	0.159	0.105	0.050	0.051	0.065	0.054	0.101	0.051	1.131
N3080	1.127	0.067	0.609	0.425	0.714	0.470	0.223	0.228	0.292	0.239	0.450	0.228	5.072
N3090	1.303	0.077	0.705	0.490	0.827	0.541	0.256	0.263	0.331	0.275	0.515	0.261	5.844
N3100	0.067	0.004	0.036	0.025	0.042	0.028	0.013	0.014	0.018	0.014	0.027	0.014	0.300
N3110	0.008	0.000	0.004	0.003	0.005	0.003	0.002	0.002	0.002	0.002	0.003	0.002	0.035
N3120	0.126	0.008	0.068	0.048	0.080	0.053	0.025	0.026	0.033	0.027	0.051	0.026	0.568
N3130	0.054	0.003	0.029	0.020	0.034	0.022	0.011	0.011	0.014	0.011	0.022	0.011	0.242
N3140	0.272	0.016	0.147	0.103	0.173	0.114	0.054	0.055	0.070	0.057	0.108	0.055	1.224
N3160	0.155	0.009	0.084	0.058	0.098	0.065	0.031	0.031	0.040	0.033	0.062	0.031	0.699
N3170	0.303	0.018	0.163	0.114	0.191	0.126	0.060	0.061	0.078	0.064	0.121	0.061	1.361
N3180	0.136	0.008	0.073	0.051	0.085	0.056	0.027	0.027	0.036	0.029	0.055	0.028	0.610
N3200	0.008	0.000	0.004	0.003	0.005	0.003	0.002	0.002	0.002	0.002	0.003	0.002	0.037
N3210	0.007	0.000	0.004	0.003	0.005	0.003	0.001	0.002	0.002	0.002	0.003	0.002	0.034
N3220	0.053	0.003	0.028	0.020	0.033	0.022	0.010	0.011	0.014	0.011	0.021	0.011	0.238
N3230	0.023	0.001	0.012	0.009	0.014	0.010	0.005	0.005	0.006	0.005	0.009	0.005	0.103
N3240	0.050	0.003	0.027	0.019	0.032	0.021	0.010	0.010	0.013	0.011	0.020	0.010	0.227
N3250	0.153	0.009	0.082	0.057	0.097	0.064	0.030	0.031	0.040	0.033	0.061	0.031	0.689
N3260	0.200	0.012	0.108	0.075	0.127	0.084	0.040	0.041	0.052	0.043	0.081	0.041	0.903
N3280	0.198	0.012	0.106	0.074	0.125	0.082	0.039	0.040	0.052	0.042	0.080	0.040	0.891
N3310	0.029	0.002	0.016	0.011	0.018	0.012	0.006	0.006	0.008	0.006	0.012	0.006	0.131
N3320	0.218	0.013	0.116	0.081	0.136	0.090	0.043	0.044	0.057	0.046	0.087	0.044	0.975
N3330	0.166	0.010	0.087	0.061	0.110	0.067	0.032	0.033	0.043	0.035	0.065	0.033	0.741
N3360	3.370	0.198	1.818	1.268	2.138	1.399	0.663	0.680	0.855	0.711	1.331	0.677	15.104
N4010	0.012	0.037	0.328	0.229	0.385	0.254	0.121	0.124	0.159	0.130	0.245	0.124	2.748
N4020	0.092	0.006	0.049	0.034	0.058	0.038	0.018	0.019	0.024	0.020	0.037	0.019	0.412
N4040	24.578	1.470	13.252	9.231	15.602	10.222	4.842	4.984	6.371	5.210	9.826	4.984	110.571
N4050	0.459	0.028	0.247	0.172	0.289	0.191	0.091	0.093	0.119	0.097	0.184	0.093	2.063
N4110	1.246	0.074	0.663	0.462	0.779	0.513	0.243	0.249	0.320	0.261	0.493	0.249	5.550
N4150	0.119	0.007	0.064	0.044	0.075	0.049	0.023	0.024	0.031	0.025	0.048	0.024	0.533
N4160	1.065	0.136	1.059	0.739	1.246	0.818	0.388	0.396	0.504	0.416	0.782	0.396	8.826
N4170	1.011	0.060	0.544	0.379	0.640	0.410	0.199	0.204	0.258	0.214	0.399	0.203	4.529
N4180	0.219	0.013	0.118	0.081	0.140	0.090	0.043	0.044	0.057	0.048	0.087	0.044	0.982
N4190	3.681	0.218	1.971	1.376	2.316	1.523	0.722	0.739	0.943	0.778	1.461	0.739	16.460
N4200	2.107	0.124	1.138	0.793	1.339	0.875	0.413	0.425	0.532	0.445	0.830	0.422	9.443
N4240	0.903	0.054	0.490	0.340	0.575	0.377	0.178	0.183	0.230	0.191	0.360	0.182	4.062
N4250	5.890	0.345	3.171	2.214	3.738	2.444	1.155	1.184	1.478	1.237	2.311	1.178	26.345
N4380	6.173	0.360	3.341	2.319	3.936	2.554	1.206	1.237	1.521	1.288	2.398	1.223	27.557

Monthly Loadings For Total Lead (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N4390	8.486	0.406	4.687	3.200	5.408	3.511	1.656	1.699	2.076	1.707	3.265	1.879	37.830
N4400	0.216	0.013	0.117	0.082	0.137	0.090	0.043	0.044	0.056	0.046	0.087	0.044	0.975
N4430	0.119	0.007	0.064	0.045	0.076	0.050	0.024	0.024	0.031	0.025	0.048	0.024	0.539
N4450	0.306	0.019	0.168	0.116	0.195	0.129	0.061	0.063	0.081	0.066	0.124	0.063	1.386
N4480	0.094	0.008	0.051	0.035	0.059	0.039	0.019	0.019	0.025	0.020	0.038	0.019	0.424
N4520	2.407	0.142	1.303	0.906	1.532	1.002	0.478	0.487	0.614	0.510	0.954	0.484	10.818
N4530	0.756	0.046	0.408	0.286	0.479	0.317	0.151	0.155	0.201	0.162	0.309	0.155	3.424
N4540	35.678	2.104	19.142	13.337	22.709	14.753	6.994	7.164	9.061	7.504	14.073	7.136	159.654
N4550	0.007	0.000	0.003	0.002	0.004	0.003	0.001	0.001	0.002	0.001	0.003	0.001	0.029
N4560	0.248	0.015	0.134	0.093	0.157	0.103	0.049	0.050	0.065	0.053	0.099	0.050	1.116
N4570	1.942	0.114	1.051	0.731	1.235	0.807	0.382	0.391	0.493	0.411	0.767	0.391	8.714
N4580	1.351	0.080	0.725	0.507	0.858	0.561	0.266	0.272	0.348	0.286	0.538	0.272	6.064
N4590	16.027	0.940	8.665	6.031	10.194	6.654	3.143	3.228	4.021	3.370	6.286	3.200	71.758
N4600	9.939	0.597	5.352	3.738	6.286	4.134	1.965	2.013	2.597	2.112	3.993	2.018	44.746
N4610	2.832	0.170	1.529	1.068	1.798	1.184	0.561	0.575	0.742	0.603	1.141	0.578	12.780
N4620	6.343	0.371	3.426	2.381	4.049	2.625	1.237	1.271	1.569	1.325	2.466	1.260	28.324
N4630	7.928	0.473	4.247	2.945	5.040	3.265	1.557	1.597	2.059	1.673	3.171	1.600	35.576
N4640	11.864	0.714	6.371	4.446	7.532	4.927	2.345	2.401	3.086	2.520	4.757	2.407	53.370
N4650	4.332	0.261	2.325	1.623	2.738	1.801	0.855	0.878	1.135	0.920	1.741	0.881	19.490
N4660	0.199	0.011	0.100	0.070	0.118	0.078	0.037	0.038	0.050	0.040	0.076	0.038	0.855
N4670	1.608	0.095	0.869	0.606	1.022	0.668	0.317	0.323	0.405	0.340	0.634	0.323	7.210
N4700	0.132	0.008	0.069	0.048	0.081	0.053	0.025	0.026	0.034	0.027	0.052	0.026	0.579
N5040	0.484	0.028	0.256	0.178	0.323	0.197	0.093	0.096	0.120	0.100	0.187	0.095	2.158
N5060	0.117	0.007	0.061	0.042	0.078	0.047	0.022	0.023	0.029	0.024	0.045	0.023	0.519
N5070	2.616	0.151	1.379	0.963	1.631	1.062	0.504	0.515	0.651	0.541	1.011	0.513	11.537
N5080	1.957	0.115	1.059	0.736	1.246	0.813	0.385	0.394	0.490	0.411	0.767	0.391	8.762
N5120	1.421	0.085	0.767	0.535	0.903	0.592	0.281	0.289	0.365	0.300	0.566	0.286	6.391
N5130	0.518	0.031	0.279	0.195	0.328	0.215	0.102	0.104	0.132	0.109	0.205	0.104	2.324
N5140	0.362	0.022	0.196	0.137	0.230	0.152	0.072	0.074	0.095	0.077	0.146	0.074	1.637
N5170	0.016	0.001	0.009	0.006	0.010	0.007	0.003	0.003	0.004	0.003	0.007	0.003	0.074
N5180	0.089	0.005	0.048	0.033	0.056	0.037	0.018	0.018	0.023	0.019	0.036	0.018	0.401
N5100	0.064	0.004	0.035	0.024	0.041	0.027	0.013	0.013	0.017	0.014	0.026	0.013	0.290
N5210	0.020	0.001	0.011	0.008	0.013	0.008	0.004	0.004	0.005	0.004	0.008	0.004	0.090
N5220	0.385	0.023	0.208	0.145	0.245	0.160	0.076	0.078	0.097	0.081	0.152	0.077	1.725
N5230	0.040	0.002	0.021	0.015	0.025	0.017	0.008	0.008	0.010	0.009	0.016	0.008	0.179
N5240	0.804	0.047	0.433	0.303	0.513	0.334	0.157	0.161	0.200	0.168	0.314	0.160	3.595
N5250	0.765	0.045	0.413	0.286	0.487	0.317	0.150	0.153	0.189	0.160	0.297	0.152	3.414
N5260	0.498	0.029	0.266	0.186	0.314	0.205	0.098	0.100	0.128	0.105	0.197	0.100	2.225
N5280	0.090	0.005	0.048	0.033	0.060	0.037	0.017	0.018	0.023	0.019	0.035	0.018	0.403
N5290	0.909	0.052	0.473	0.328	0.561	0.365	0.173	0.177	0.225	0.185	0.348	0.177	3.974
N5300	3.370	0.202	1.818	1.269	2.144	1.407	0.668	0.685	0.878	0.716	1.354	0.685	15.195
N5320	0.064	0.004	0.034	0.024	0.040	0.027	0.013	0.013	0.017	0.014	0.026	0.013	0.288
N5330	0.029	0.002	0.016	0.011	0.018	0.012	0.006	0.006	0.008	0.006	0.012	0.006	0.130
N5340	0.032	0.002	0.017	0.012	0.020	0.013	0.006	0.006	0.008	0.007	0.013	0.006	0.143
N5350	0.033	0.002	0.018	0.012	0.021	0.014	0.007	0.007	0.009	0.007	0.013	0.007	0.148
N5360	0.025	0.002	0.013	0.009	0.016	0.010	0.005	0.005	0.007	0.005	0.010	0.005	0.112
N5370	0.053	0.004	0.034	0.024	0.040	0.026	0.012	0.013	0.016	0.013	0.025	0.013	0.284
N5380	1.373	0.083	0.736	0.513	0.866	0.569	0.271	0.278	0.360	0.292	0.552	0.279	6.171
N5390	0.866	0.052	0.467	0.326	0.549	0.362	0.172	0.176	0.225	0.184	0.348	0.176	3.904
N6040	0.144	0.009	0.078	0.054	0.091	0.060	0.029	0.029	0.038	0.031	0.058	0.029	0.648
N6070	0.698	0.041	0.368	0.258	0.433	0.286	0.136	0.139	0.179	0.146	0.275	0.139	3.088
N6090	1.846	0.108	0.997	0.694	1.175	0.767	0.362	0.371	0.464	0.388	0.728	0.371	8.272
N6100	0.532	0.031	0.289	0.200	0.337	0.222	0.105	0.108	0.136	0.112	0.211	0.107	2.390
N6110	0.260	0.015	0.140	0.097	0.165	0.108	0.051	0.052	0.065	0.054	0.101	0.052	1.161
N6130	0.136	0.008	0.073	0.051	0.087	0.057	0.027	0.027	0.035	0.029	0.054	0.027	0.613
N6140	0.467	0.028	0.249	0.174	0.294	0.192	0.091	0.093	0.119	0.098	0.184	0.093	2.084
N6160	0.651	0.039	0.351	0.245	0.416	0.271	0.129	0.132	0.167	0.139	0.259	0.131	2.930
N6180	0.980	0.057	0.530	0.368	0.623	0.408	0.192	0.197	0.244	0.205	0.382	0.193	4.380
N6190	0.148	0.009	0.079	0.055	0.095	0.061	0.029	0.030	0.038	0.031	0.059	0.030	0.663
N6210	1.096	0.065	0.583	0.408	0.688	0.450	0.214	0.219	0.280	0.230	0.433	0.219	4.885
N6220	0.086	0.005	0.046	0.032	0.054	0.036	0.017	0.017	0.022	0.018	0.034	0.017	0.385
N6240	0.086	0.005	0.046	0.032	0.054	0.036	0.017	0.017	0.022	0.018	0.034	0.017	0.386
N6250	0.575	0.034	0.311	0.217	0.365	0.239	0.113	0.116	0.146	0.121	0.227	0.116	2.580
N6260	0.110	0.007	0.059	0.041	0.069	0.046	0.022	0.022	0.029	0.023	0.044	0.022	0.493
N6280	0.033	0.002	0.018	0.012	0.021	0.014	0.007	0.007	0.009	0.007	0.013	0.007	0.150
N6290	0.159	0.010	0.086	0.060	0.101	0.067	0.032	0.032	0.041	0.034	0.064	0.032	0.718
N7000	8.580	0.501	4.644	3.228	5.465	3.588	1.682	1.724	2.129	1.798	3.341	1.707	38.368
N7010	1.908	0.112	1.031	0.719	1.215	0.793	0.374	0.385	0.479	0.402	0.750	0.382	8.550
N7020	0.869	0.051	0.467	0.326	0.549	0.360	0.171	0.175	0.221	0.183	0.343	0.174	3.889
N7030	1.254	0.075	0.671	0.470	0.790	0.521	0.247	0.253	0.326	0.265	0.501	0.254	5.628
N7040	0.436	0.025	0.227	0.158	0.268	0.175	0.083	0.085	0.107	0.089	0.166	0.084	1.902
N7050	1.487	0.087	0.801	0.558	0.943	0.617	0.292	0.297	0.374	0.311	0.583	0.297	6.648
N7060	0.459	0.026	0.234	0.164	0.278	0.182	0.086	0.088	0.114	0.093	0.175	0.089	1.988

Monthly Loadings For Total Lead (lbs)
Typical Year Rainfall Analysis

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
N7070	1.322	0.078	0.702	0.490	0.824	0.544	0.208	0.284	0.340	0.277	0.524	0.265	5.888
N7080	0.010	0.001	0.005	0.004	0.006	0.004	0.002	0.002	0.003	0.002	0.004	0.002	0.045
N7090	1.685	0.098	0.903	0.629	1.065	0.691	0.326	0.334	0.413	0.348	0.654	0.331	7.474
N7100	2.141	0.128	1.158	0.807	1.359	0.895	0.425	0.433	0.555	0.450	0.858	0.433	9.648
N7110	0.241	0.014	0.131	0.091	0.153	0.100	0.047	0.049	0.061	0.051	0.095	0.048	1.081
N7120	0.065	0.004	0.035	0.024	0.041	0.027	0.013	0.013	0.017	0.014	0.026	0.013	0.292
N7130	0.193	0.012	0.104	0.073	0.123	0.081	0.038	0.039	0.050	0.041	0.077	0.039	0.870
N7140	2.373	0.139	1.283	0.892	1.509	0.985	0.464	0.479	0.595	0.498	0.932	0.473	10.622
N7150	2.237	0.131	1.209	0.841	1.421	0.926	0.439	0.450	0.556	0.467	0.875	0.445	9.999
N7160	0.855	0.051	0.459	0.320	0.541	0.357	0.169	0.173	0.222	0.181	0.343	0.173	3.844
N7170	3.766	0.219	2.031	1.413	2.393	1.555	0.733	0.753	0.926	0.784	1.458	0.745	16.779
N7180	1.988	0.116	1.076	0.748	1.269	0.824	0.388	0.399	0.490	0.416	0.773	0.396	8.883
N7190	2.580	0.153	1.390	0.971	1.634	1.073	0.510	0.521	0.663	0.546	1.028	0.521	11.590
N7200	2.160	0.131	1.178	0.821	1.385	0.912	0.433	0.442	0.589	0.464	0.878	0.445	9.838
N7210	1.597	0.095	0.861	0.600	1.014	0.665	0.314	0.323	0.411	0.337	0.637	0.323	7.177
N7220	0.071	0.004	0.038	0.027	0.045	0.029	0.014	0.014	0.019	0.015	0.029	0.014	0.319
N7230	0.343	0.021	0.185	0.129	0.217	0.143	0.068	0.069	0.089	0.073	0.137	0.069	1.542
N7240	1.798	0.105	0.971	0.674	1.144	0.745	0.351	0.360	0.442	0.374	0.697	0.357	8.016
N7250	0.099	0.006	0.052	0.037	0.061	0.040	0.019	0.020	0.026	0.021	0.039	0.020	0.439
N7260	0.994	0.058	0.538	0.374	0.634	0.413	0.195	0.200	0.246	0.209	0.391	0.198	4.453
N7270	0.002	0.000	0.001	0.001	0.002	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.011
N7280	2.002	0.121	1.076	0.753	1.271	0.835	0.396	0.408	0.527	0.428	0.807	0.408	9.032
N7290	0.371	0.022	0.198	0.139	0.233	0.154	0.073	0.075	0.097	0.079	0.149	0.075	1.666
N7300	0.160	0.010	0.084	0.059	0.099	0.065	0.031	0.032	0.041	0.033	0.063	0.032	0.710
N7310	0.267	0.016	0.142	0.099	0.167	0.110	0.052	0.054	0.069	0.056	0.106	0.054	1.194
N7320	0.012	0.001	0.006	0.004	0.009	0.005	0.002	0.002	0.003	0.002	0.005	0.002	0.054
N7330	0.029	0.000	0.003	0.002	0.015	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.059
N7340	0.003	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.009
N7350	0.396	0.024	0.211	0.146	0.248	0.164	0.078	0.080	0.103	0.084	0.158	0.080	1.772
N8000	0.898	0.054	0.481	0.337	0.569	0.374	0.177	0.182	0.235	0.190	0.360	0.182	4.038
N8010	20.076	1.209	10.788	7.532	12.742	8.353	3.964	4.078	5.267	4.276	8.070	4.078	90.433
N8020	0.024	0.001	0.013	0.009	0.015	0.010	0.005	0.005	0.006	0.005	0.010	0.005	0.107
N8030	3.398	0.204	1.824	1.271	2.155	1.413	0.671	0.688	0.889	0.722	1.368	0.691	15.294
N8040	1.617	0.096	0.852	0.597	1.034	0.663	0.314	0.323	0.419	0.340	0.643	0.323	7.220
N8050	0.018	0.001	0.010	0.007	0.011	0.008	0.004	0.004	0.005	0.004	0.007	0.004	0.081
N8060	1.424	0.088	0.765	0.532	0.900	0.592	0.281	0.289	0.374	0.303	0.572	0.289	6.407
N8070	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N8080	0.292	0.018	0.156	0.109	0.183	0.121	0.057	0.059	0.076	0.062	0.117	0.059	1.311
N8090	0.447	0.027	0.238	0.166	0.283	0.184	0.088	0.090	0.116	0.094	0.178	0.090	2.002
N8100	0.130	0.008	0.070	0.048	0.082	0.054	0.026	0.027	0.035	0.028	0.053	0.027	0.587
N8110	0.209	0.013	0.113	0.079	0.133	0.087	0.041	0.042	0.054	0.044	0.084	0.042	0.942
N8120	0.515	0.031	0.275	0.192	0.323	0.213	0.101	0.103	0.133	0.108	0.205	0.104	2.303
N8130	0.123	0.004	0.035	0.024	0.042	0.027	0.013	0.013	0.017	0.014	0.026	0.013	0.352
N8140	2.163	0.129	1.161	0.813	1.376	0.900	0.428	0.439	0.563	0.458	0.866	0.439	9.737
N8150	0.753	0.045	0.405	0.283	0.476	0.314	0.149	0.152	0.195	0.160	0.300	0.152	3.384
N8160	2.673	0.157	1.436	1.000	1.688	1.107	0.524	0.535	0.677	0.561	1.051	0.532	11.939
N8170	0.388	0.023	0.209	0.146	0.246	0.162	0.076	0.078	0.100	0.082	0.155	0.078	1.744
N8180	0.185	0.011	0.099	0.069	0.117	0.077	0.037	0.037	0.048	0.039	0.074	0.038	0.833
N8190	0.660	0.039	0.354	0.247	0.416	0.274	0.130	0.133	0.171	0.140	0.264	0.133	2.963
N9200	31.714	1.903	17.103	11.949	20.246	13.224	6.286	6.428	8.240	6.730	12.714	6.428	142.973
N9000	273.249	16.367	145.544	101.654	174.427	112.981	53.800	54.933	71.073	57.765	109.300	55.216	1226.309
N9010	1.589	0.095	0.847	0.592	0.994	0.654	0.311	0.320	0.411	0.334	0.631	0.320	7.097
N9020	6.258	0.374	3.370	2.359	3.964	2.614	1.240	1.269	1.623	1.331	2.509	1.269	28.177
N9030	8.665	0.507	4.672	3.266	5.522	3.586	1.699	1.741	2.163	1.818	3.398	1.730	38.767
N9040	10.845	0.634	5.861	4.078	6.909	4.502	2.124	2.178	2.696	2.274	4.247	2.161	48.508
N9050	3.143	0.183	1.682	1.169	2.035	1.294	0.612	0.626	0.784	0.654	1.226	0.623	14.032
N9060	1.925	0.114	1.042	0.725	1.226	0.801	0.379	0.388	0.487	0.408	0.762	0.388	8.645
N9070	6.258	0.368	3.370	2.350	3.964	2.599	1.229	1.260	1.589	1.320	2.472	1.254	28.033
N9080	0.241	0.015	0.130	0.091	0.153	0.101	0.048	0.049	0.064	0.052	0.098	0.049	1.089
N9090	1.447	0.087	0.782	0.544	0.917	0.603	0.286	0.294	0.370	0.309	0.583	0.294	6.526