GEORGIA DEPARTMENT of TRANSPORTATION

Guidelines for Processing Drainage Data in CAiCE

Current with CAiCE Visual Transportation 10

First Edition, Version 1.2

MARCH 15, 2006

REVISION HISTORY

Date	Revision Number	By	Section	Description
March 15, 2004	1.1	Joe Bozarth	Sec 1/p 1-1	Added entries in **Table 1.1** for drainage area sub-system boundary points and chains.
March 15, 2006	1.2	Holly A. Cross	Sec 1/p 1-7	Revised the Location of web-page link to download Project Data Sheet Forms.

PREFACE

These guidelines have been developed as part of the statewide implementation of CAiCE's *Visual Drainage* module. The intent of this document is to provide guidelines and standards for processing drainage design data in CAiCE. These Guidelines must be followed in detail in order to conform to the GDOT standards for producing the resulting drainage computation reports and DGN files used for plan production. Updates to this document will be made periodically when minor revisions, additional information, and/or enhancements are added.

If there is any approved deviation from the standard file and data naming/feature code conventions as prescribed by this document, a detailed description of the deviation(s) and approved reasons for the deviation(s) shall be documented and included with the project files in electronic format.

All electronic documentation files shall be provided in a Microsoft Word format and located in a *Documentation* sub folder of the project directory.

TABLE OF CONTENTS

OVERVIEW

These guidelines address the process of roadway drainage design utilizing the CAiCE *Visual Drainage* module, standards for storing drainage objects within CAiCE, brief explanations of the standard drainage files, automated drainage design processes within the Department, plan production, and other information.

Document Content

Below is a list of topics covered in this document:

- Standard Object Names, Standard File Names, and Standard GDOT Files
- Processing the Proposed Surface DTM
- Processing the Drainage Data
- Drainage Output
- Appendix
- Index

1

Standard Object Names, Standard File Names, and Standard GDOT Files

1. Standard Object Names, Standard File Names, and Standard GDOT Files

Standard object and file naming conventions have been established in order to promote consistency and assist in the organization of project data. These standard naming schemes help to ensure uniformity for all users who may work on the project.

This section covers the following topics:

- Standard Object Names
- Standard DTM File Names and Surface Names
- Standard GDOT Drainage Files
- Project Data Sheet
- Location of Project Data Sheet Forms

1.1 Standard Object Names

Table 1.1 prescribes the standard naming convention for database objects used for drainage design. The unique object name prefixes identify these items as "drainage design" objects as opposed to "roadway design" objects with the *KC* prefix. **Table 1.2** prescribes the standard naming convention for storm drain networks and their associated nodes and links.

Note: All standard design object names must begin with the prescribed prefix. *Please see the guidelines in* **Table 1.1** *for additional information.*

Table 1.1

Drainage Design Object Names

Object	Prefix	Starting Number	Feature Code
Gutter chain point	GUTTER	1	GUTTER
Gutter chain	GUTTER	1	GUTTER
Channel chain point	CHAN	1	CHAN
Channel chain	CHAN	1	CHAN
Drainage area boundary (major) chain point	BASIN	1	BASIN
Drainage area boundary (major) chain	BASIN	1	BASIN
Drainage area boundary (sub-system) chain point	BASIN	1	SBASIN
Drainage area boundary (sub-system) chain	BASIN	1	SBASIN
Cross drain chain point	XD	1	XD
Cross drain chain	XD	1	XD

Table 1.2			
Storm Drain Networks Names			
Item	**Name**	**Feature Code**	**Example**
Storm Drain Network	CAiCE roadway project name + alpha character designator for drainage system		123456A
Drainage Structure Nodes	alpha character designator for drainage system + structure number	NODE	A1
Drainage Pipe Links	alpha character designator for drainage system + upstream structure number	LINK	A1

1.2 Standard DTM File Names and Surface Names

A standard naming convention has been established for the Digital Terrain Model (DTM) surfaces that will be created for the drainage design process. Numerous files will be created and used to process these DTMs, and a standard naming convention has also been established for these files. The DTM surface name is currently limited to seven characters. For projects with multiple horizontal alignments, multiple DTM surfaces may be produced, as described in ***Section 2*** of this document. **Table 1.3** prescribes the standard naming convention for all files and DTM surfaces associated with processing the final proposed DTM surface.

Table 1.3			
DTM File Names and Surface Names			
Item	**DTM Surface for an Alignment**	**Multiple SRV and CLP files for a Single Alignment***	**Feature Code**
Cross Section Files			
Existing X-Section File**	"alignment chain name" + _drain_exist.ear *Example:* KC1_drain_exist.ear		
Proposed X-section File**	"alignment chain name" + _drain_prop.ear *Example:* KC1_drain_prop.ear		
X-Section Design File**	"alignment chain name" + _drain_prop.vrs *Example:* KC1_drain_prop.vrs		
Files for Converting Cross Sections to Surfaces			
SRV File	"alignment chain name".srv *Example:* KC1.srv	"alignment chain name" + "alpha character designator".srv *Example:* KC2a.srv, KC2b.srv	
CLP File	"alignment chain name".clp *Example:* KC1.clp	"alignment chain name" + "alpha character designator".clp *Example:* KC2a.clp, KC2b.clp	
DTM Surface Names			
Single Alignment Surface	D + "alignment chain name" *Example:* DKC1		DRAIN
Multiple Alignment Surface***	DRAIN		DRAIN

* In some cases it is necessary to create multiple sets of SRV and CLP files for a single alignment.

** These cross section files are not the same files that are created for producing cross section sheets for the project plan set. These are a separate set of cross section files used for creating the proposed DTM surface.

*** In the event it becomes necessary to modify this surface due to updated topographical data or changes in the roadway design, the modified surface name will be *DRAIN + "occurrence number"*. For example: first modification, *DRAIN2*; second modification, *DRAIN3*; etc.

1.3 GDOT Standard Drainage Files

Table 1.4 lists the standard GDOT drainage files and provides a brief description of each file.

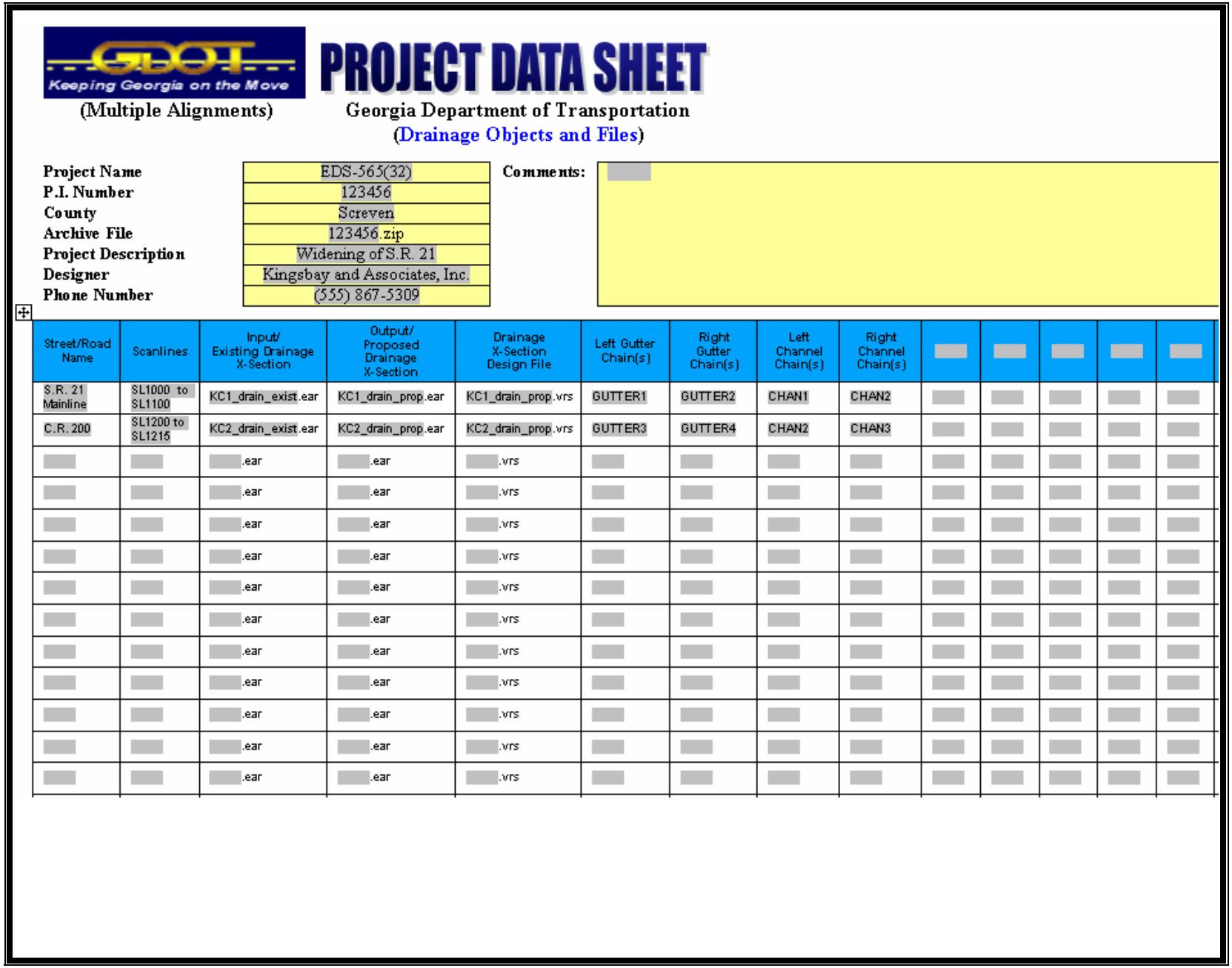
Table 1.4

File	Description	Comments
Inlet Table Files	Inlet structure tables and inlet type tables have been developed for standard GDOT drainage structures. The following is a list of the inlet tables: **InletStructureTypes.tbl** — English units inlet table **InletTypes.tbl** — English units inlet table **InletStructureTypes_m.tbl** — Metric units inlet table **InletTypes_m.tbl** — Metric units inlet table	These files reside in the following subdirectory: **CAiCE\Drainage**
INI Files	The standard CAiCE INI files that have been developed for creating drainage projects are listed below: **kcvddb_e.ini** — English **kcvddb_m.ini** — Metric	
Microstation Seed Files	When exporting CAiCE drainage elements to Microstation design files the following standard Microstation seed files should be used: Plan View Elements — **GDOT2D.dgn** (English) **GDOT2Dm.dgn** (Metric) Profile View Elements — To be developed	Seed files reside in the following directory: ***CAiCE/Seed***

1.4 Project Data Sheet

A **Project Data Sheet** form for drainage design has been created for documentation purposes. This Project Data Sheet must be used to conform to current GDOT standard guidelines. **This form shall be included in electronic format with all submissions of the electronic CAiCE project archive file. All electronic documentation files shall be provided in a Microsoft Word format and located in a *Documentation* sub-folder of the project directory.**

An example of the **Project Data Sheet (Drainage Objects and Files)** is shown on the following page in **Figure 1-1**.



PROJECT DATA SHEET

(Multiple Alignments)

Georgia Department of Transportation

(Drainage Objects and Files)

Project Name	EDS-565(32)
P.I. Number	123456
County	Screven
Archive File	123456.zip
Project Description	Widening of S.R. 21
Designer	Kingsbay and Associates, Inc.
Phone Number	(555) 867-5309

Comments:

Street/Road Name	Scanlines	Input/ Existing Drainage X-Section	Output/ Proposed Drainage X-Section	Drainage X-Section Design File	Left Gutter Chain(s)	Right Gutter Chain(s)	Left Channel Chain(s)	Right Channel Chain(s)					
S.R. 21 Mainline	SL1000 to SL1100	KC1_drain_exist.ear	KC1_drain_prop.ear	KC1_drain_prop.vrs	GUTTER1	GUTTER2	CHAN1	CHAN2					
C.R. 200	SL1200 to SL1215	KC2_drain_exist.ear	KC2_drain_prop.ear	KC2_drain_prop.vrs	GUTTER3	GUTTER4	CHAN2	CHAN3					
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									
		.ear	.ear	.vrs									

Figure 1-1

1.5 Location of Project Data Sheet Forms

The Project Data Sheet forms are available in electronic format and are available for download from both the internal and external Web site.

1.5.1 Internal to GDOT

All GDOT standard forms can be downloaded internally from the GDOT "*R.O.A.D.S.*" Homepage. To access the Internal GDOT "*R.O.A.D.S.*" Homepage, enter Internet Explorer or Netscape. For the Address or Location at the top, enter *TOPPS*. Then, make the following selections from the screens that follow:

- GDOT Internal Web Server
- DOT Division and Office Pages
- Preconstruction Division
- R.O.A.D.S. Homepage
- Software Specific Files and Documentation
- Civil Design Software
- CAiCE Documentation

OR

Go straight to the link at:

http://www.dot.state.ga.us/dot/preconstruction/R-O-A-D-S/SWFilesDocs/SW_Design/SW_Design_KC_Docs/index.shtml

1.5.2 External to GDOT

All GDOT standard forms can be downloaded externally from the GDOT *"R.O.A.D.S."* Homepage. To access the External GDOT *"R.O.A.D.S."* Homepage, enter Internet Explorer or Netscape. For the Address or Location at the top, enter http://www.dot.state.ga.us/ . Then, make the following selections from the screens that follow:

Select the following from the Main Menu options on the left side of the screen:

- About Georgia DOT
- General Information
- Divisions
- Preconstruction Division
- R.O.A.D.S Homepage
- Software Specific Files and Documentation
- Civil Design Software
- CAiCE Documentation

OR

Go straight to the link at:

http://www.dot.state.ga.us/dot/preconstruction/R-O-A-D-S/SWFilesDocs/SW_Design/SW_Design_KC_Docs/index.shtml

2

Processing the Proposed Surface DTM

2. Processing the Proposed Surface DTM

A proposed surface digital terrain model (DTM) will be constructed before beginning the drainage design. This will require completed design cross section EAR files for each horizontal alignment in the roadway project.

This section covers:

- Prerequisites
- Create Drainage EAR Files
- Create the Drainage DTM
- Processing Changes to the Drainage DTM

2.1 Prerequisites

The following items must exist within the CAiCE roadway project **before** the proposed surface DTM for drainage design is processed:

- Horizontal Alignments
- Vertical Alignments
- Edge of Pavement Chains
- Completed Design Cross Sections EAR Files

2.1.1 Horizontal Alignment

Horizontal alignments must be defined for all streets/roads that will affect the drainage design.

2.1.2 Vertical Alignments

Vertical alignments must be defined for all streets/roads that will affect the drainage design.

2.1.3 Edge of Pavement Chains

Inside and outside edge of pavement chains should be defined accurately for all street/road alignments that will affect the drainage design.

2.1.4 Completed Design Cross Sections EAR Files

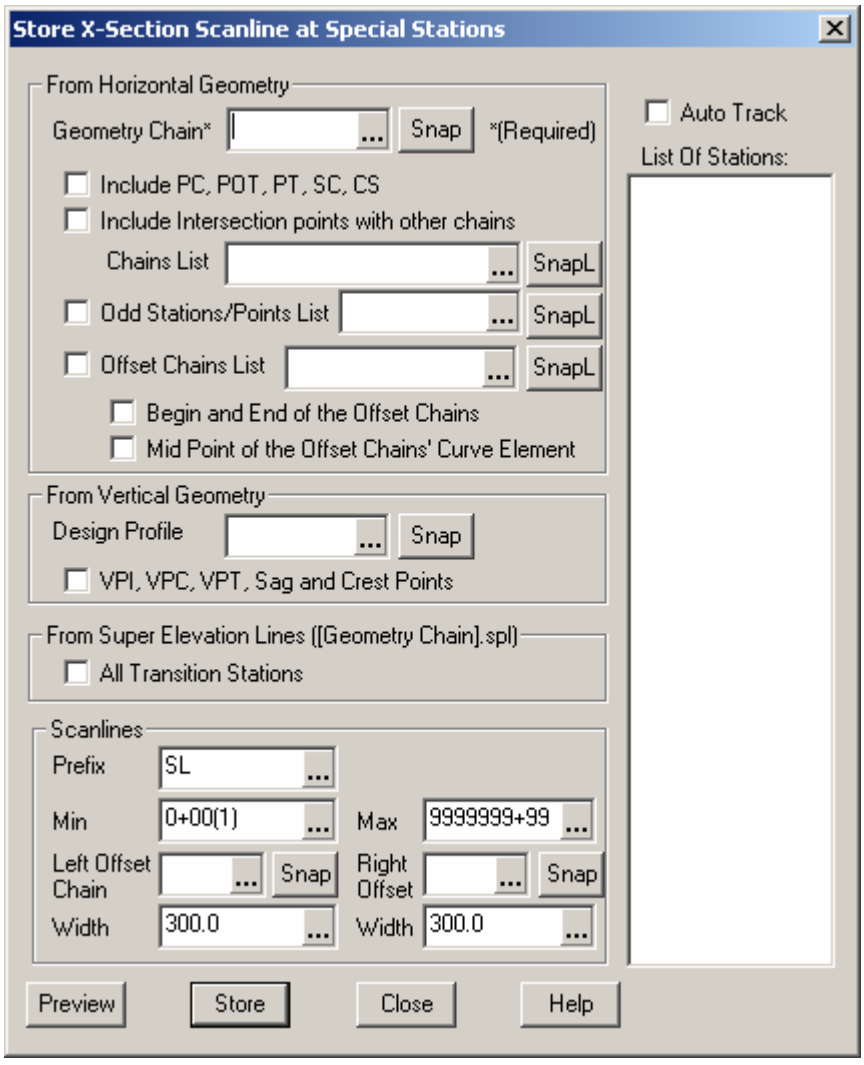
Design cross sections EAR files must be completed for all street/road alignments that will affect the drainage design. While it is recognized that the drainage design process normally begins before all design decisions are finalized, it is still necessary for the designer to complete preliminary cross sections EAR files for all street/road alignments that will affect the drainage design. It is also necessary to save the proposed cross section design in each EAR file in the form of a VRS file.

2.2 Create Drainage EAR Files

Separate EAR files will be created for use in processing the proposed DTM surface for drainage design. Follow the steps below to create a new EAR file for each horizontal alignment in the roadway project:

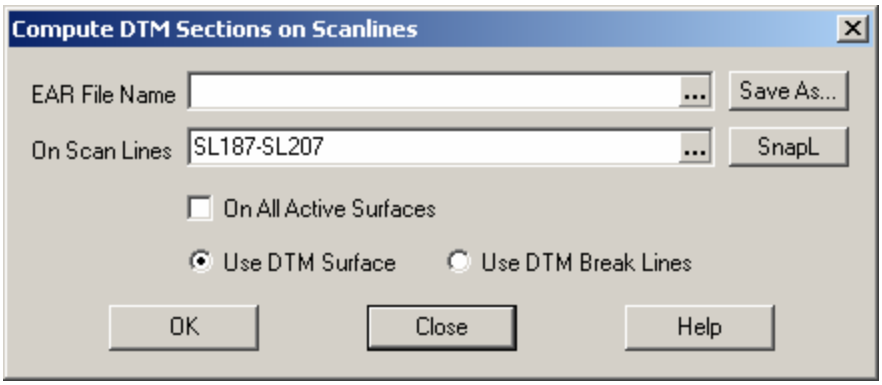
1. From the CAiCE main pull-down menu, click ***X-Sections >> Store X-Section Scanlines at Special Stations*** and the *Store X-Section Scanline at Special Stations* dialog appears as shown in **Figure 2-1**. Store new scanlines at all stations where horizontal and vertical geometric transitions occur. Also store scanlines for every station included in the proposed cross section design (VRS) file, or include the original scanlines for the alignment in the next step.

Figure 2-1



2. Ensure that *EXIST* is displayed in the *Active DTM surface* field on the Global Options Toolbar. From the CAiCE main pull-down menu, click ***X-Sections >> Store X-Sections from Scanlines and DTM*** and the *Compute DTM Sections on Scanlines* dialog appears as shown in **Figure 2-2**.

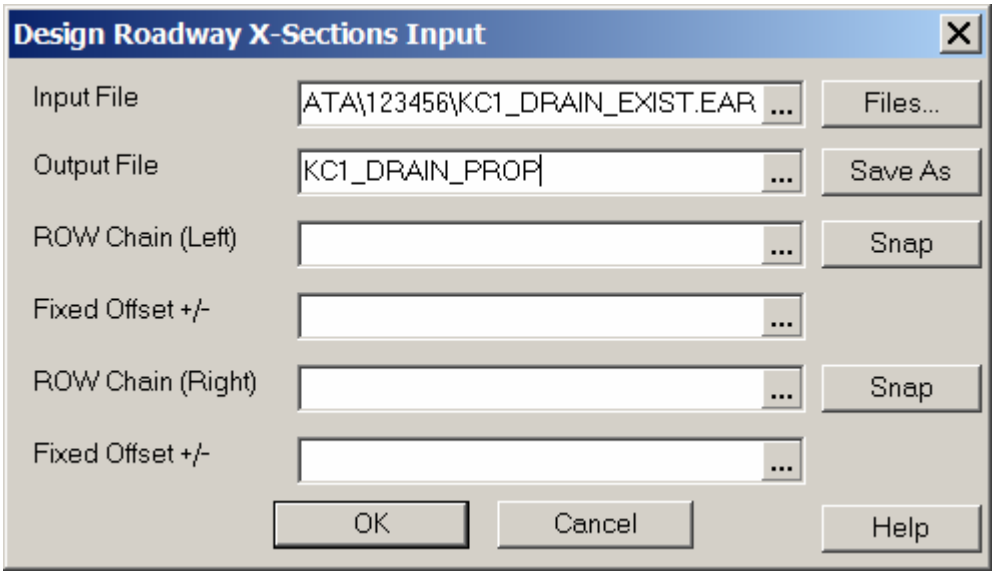
Figure 2-2



Enter the appropriate EAR file name (see **Table 1.3**) in the *EAR File Name* field. Click on the ***OK*** button to store the *EXIST* surface cross sections. After the process is completed, click ***Close***.

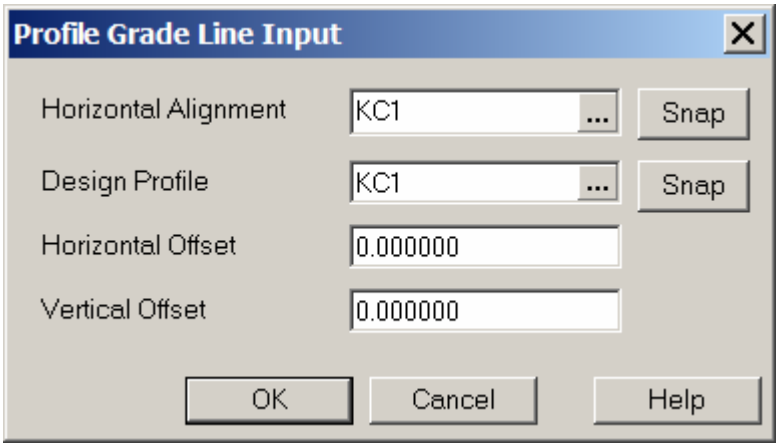
3. From the CAiCE main pull-down menu, click ***X-Sections >> Design Roadway X-Sections*** and the *Design Roadway X-Sections Input* dialog appears as shown in **Figure 2-3**.

Figure 2-3



Enter the EAR file created in the previous step in the *Input File* field and enter the appropriate EAR file name (see **Table 1.3**) in the *Output File* field. Click ***OK*** and the *Profile Grade Line Input* dialog appears as shown in **Figure 2-4**.

Figure 2-4



Enter the appropriate horizontal alignment name in the *Horizontal Alignment* field and enter the appropriate design profile name in the *Design Profile* field, then click ***OK***.

4. From the CAiCE main pull-down menu, click ***Macro >> Run Design*** and select the appropriate proposed cross section design (VRS) file (see ***Section 2.1.4***). Run this VRS file to add the proposed cross sections at the original stations. Use these proposed sections as a base to add proposed sections at all of the additional stations to accurately reflect all of the horizontal and vertical transitions. Much of this work can be accomplished from the main pull-down menu commands ***Apply >> Next Station*** and ***Apply >> Previous Station***.

5. After the design of the drainage EAR file is complete, save a new VRS file with the appropriate name (see **Table 1.3**).

6. Repeat steps 1 through 5 for each horizontal alignment in the roadway project.

2.3 Create the Drainage DTM

The drainage EAR files will be used to create the proposed surface drainage DTM by the following process:

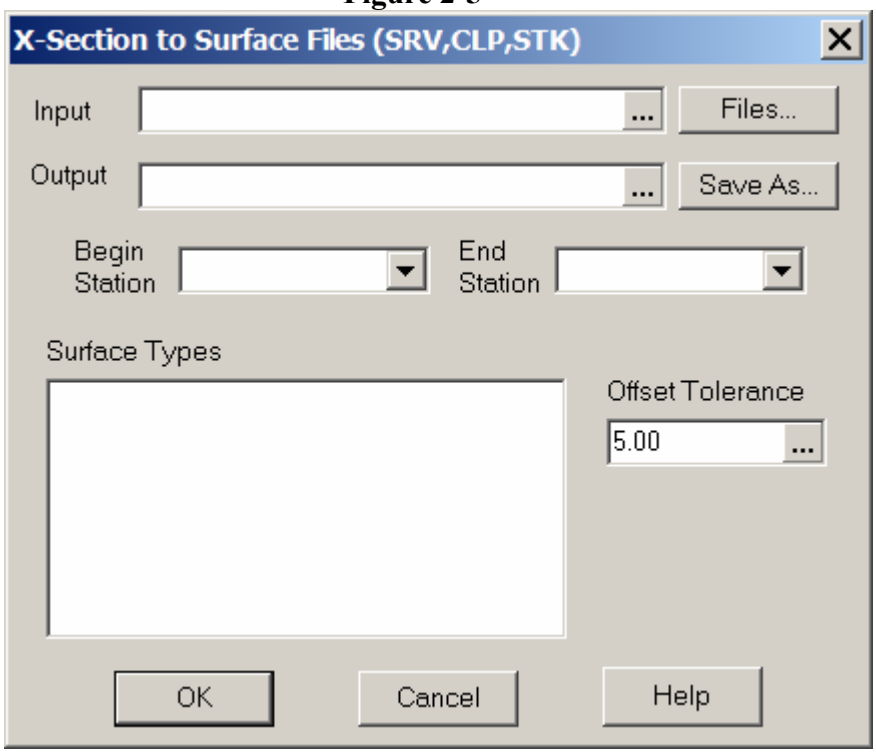
- Convert the EAR File Data to Survey Data
- Use the *DTM Surface Composer* macro to create the *DRAIN* surface model
- Edit the DTM

2.3.1 Convert the EAR File Data to Survey Data

Use the following steps to convert the drainage EAR file data to survey data:

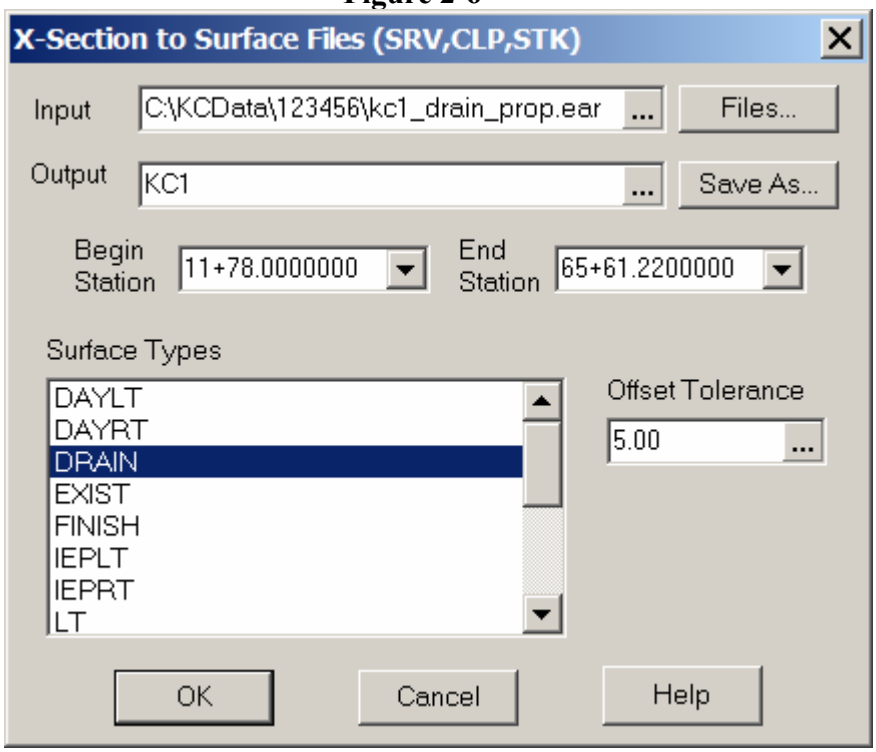
1. From the CAiCE main pull-down menu, click ***X-Sections >> Convert X-Sections to Surfaces*** and the *X-Section to Surface Files (SRV, CLP, STK)* dialog appears as shown in **Figure 2-5**.

Figure 2-5



2. Enter the appropriate drainage EAR file in the *Input* field and the corresponding horizontal alignment name in the *Output* field. In the *Surface Types* field, select *DRAIN*, as shown in **Figure 2-6**.

Figure 2-6



Click ***OK*** and three files with the *Output* name and the extensions listed in the dialog header will be created and placed in the project directory.

3. Repeat steps 1 and 2 for each drainage EAR file.

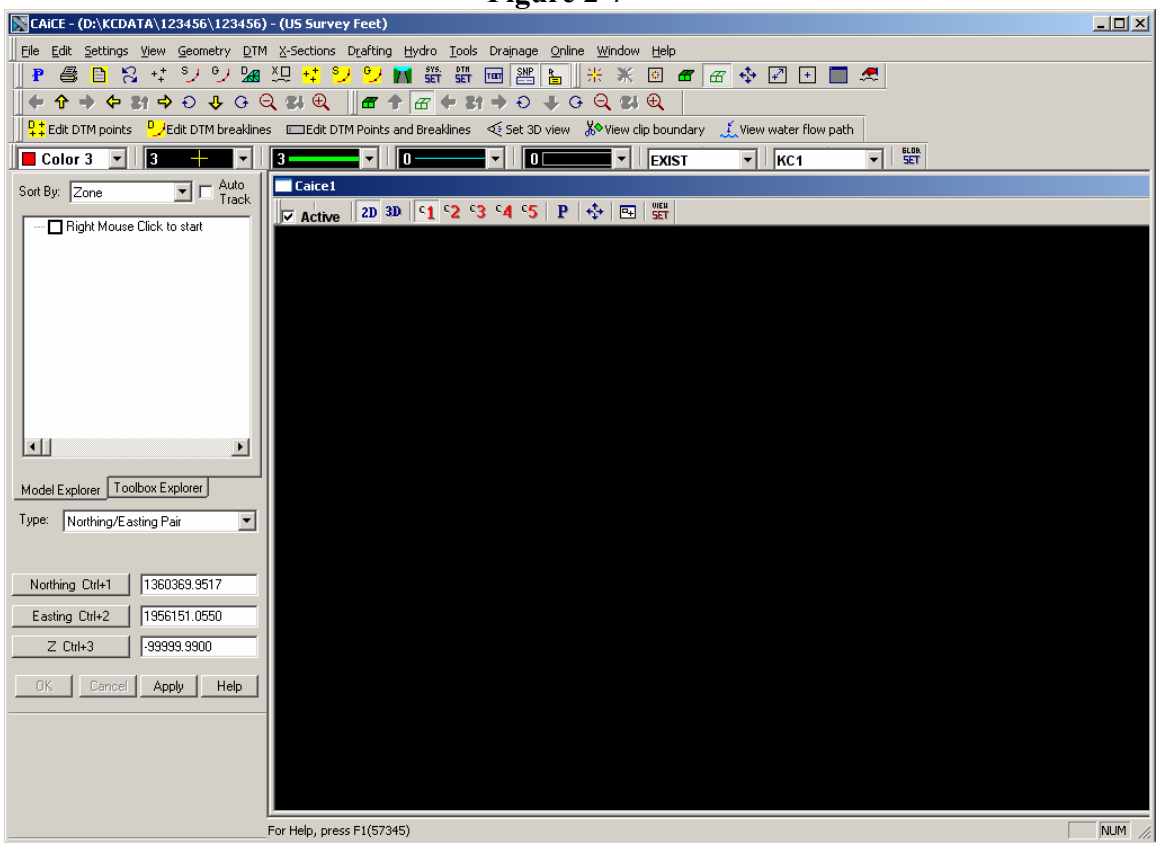
2.3.2 Use the DTM Surface Composer macro to create the DRAIN surface model

The *DRAIN* DTM surface may be created, loaded, triangulated, and viewed from one user interface. The *DTM Surface Composer* dialog is shown in **Figure 2-8**. This dialog allows the user to enter all of the necessary information for creating the DTM surface with the exception of the surface feature code. The feature code assigned will be the same as the *Surface Name* entry. Since the proposed surface name for this project is the same as the feature code, this does not present a problem. However, if you have a situation where you intend to create more than one proposed surface for drainage design (*DKC1*, *DKC2*, *DRAIN2*), it will be necessary to close the *DTM Surface Composer* **after** composing the surface components and **BEFORE** building the triangles. You may then open the *DTM Database Manager* dialog, assign a surface feature code, and update the surface **BEFORE** building the triangles. The feature code must be assigned before the triangles are built in order for the triangles to receive the feature code defined attributes. Each File Type and File Name entry in the spreadsheet will be processed sequentially, so it is critical that you

enter the files in the correct order. Use the following steps to create the DRAIN DTM surface:

1. From the CAiCE main pull-down menu, click ***Window >> Explorer Center/Snap Bar*** and the *Explorer Center/Snap Bar* will appear to the left of the *Caice1* window as shown in **Figure 2-7**.

Figure 2-7

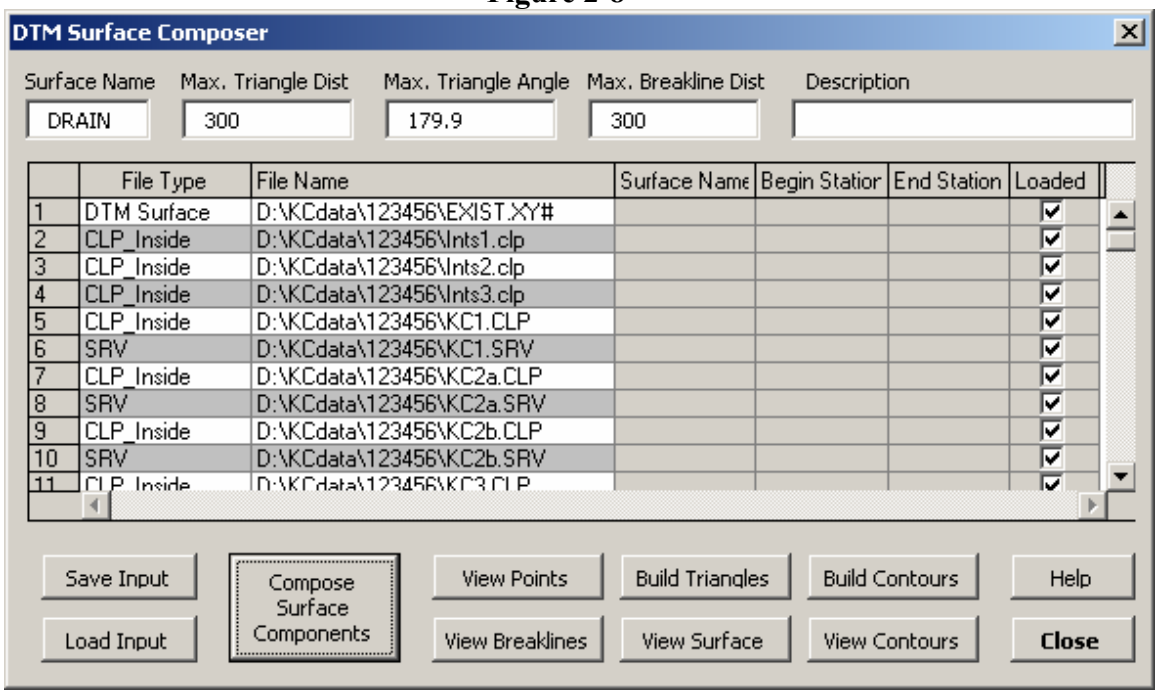


2. Click on the *Toolbox Explorer* tab and then click on *Street Intersection ToolBox* in the field above the tab. Click on the ***Open*** button to activate the toolbox.

3. In the *Folder Items* section of the toolbox, click the + symbol next to *Surfaces* to expand the tree and then left-click on *DTM Surface Composer* to view the *DTM Surface Composer* description file. Next, right-click on *DTM Surface Composer* and then click ***Insert Object*** to activate the *DTM Surface Composer* interface.

4. **Figure 2-8** shows an example of the appropriate user inputs.

Figure 2-8



5. Click the ***Compose Surface Components*** button, and the entries in each row which has a check mark in the *Loaded* column will be processed sequentially. The DTM may be composed to represent only the proposed surface roadway or it may be composed to represent both the proposed surface and the existing surface outside of the construction limits, depending on the files used. If the existing surface outside of the construction limits is to be included in the model, the first file listed in the spreadsheet must be *EXIST.XY#* and the *File Type* will be *DTM Surface*. This dialog also allows the user to save an input file and then load that input file if this surface must be re-composed.

6. Click the ***Build Triangles*** button to triangulate the model, and then click the ***View Surface*** button to view the new *DRAIN* surface.

2.3.3 Edit the DTM

From the CAiCE main pull-down menu, use the following commands to edit the *DRAIN* surface model as necessary:

DTM >> Edit DTM Points
DTM >> Edit DTM Breaklines
DTM >> Edit DTM Points and Breaklines

2.4 Processing Changes to the Drainage DTM

Any changes to the topographical data or changes in the roadway design will necessitate modifications to the *DRAIN* surface DTM. The modified surface name is prescribed in **Table 1.3** (see the note). The procedure for processing these modifications is outlined for the following scenarios:

1. **If the modification is due to topographical data updates**, the survey data must be updated as described in the document *Guidelines for Processing Design Data in CAiCE*, and then all necessary modifications to roadway design elements must be made. The affected proposed surface drainage EAR files will then be updated and new SRV and CLP files will be created for the affected station range. If the new EAR file clip boundary falls **outside** of the previous clip boundary, the modified *DRAIN* surface may be composed by entering files in the *DTM Surface Composer* dialog in the following order:

File Type	File Name
DTM Surface	*DRAIN.XY#*
CLP_Inside	new EAR clip boundary
SRV	new SRV file

   If the new EAR clip boundary falls **inside** of the previous clip boundary, it will be necessary to first create a DTM which represents only the updated topography data. This DTM will be named *TE1* (Topography Enhancement 1) to clearly distinguish it from all other DTM surfaces in the project. Once the modified *DRAIN* surface DTM is processed, **the *TE1* DTM surface will be deleted**. The *TE1* surface may be composed by entering files in the *DTM Surface Composer* dialog in the following order:

File Type	File Name
DTM Surface	*EXIST.XY#*
CLP_Outside	clip boundary which encompasses all of the updated topography data

   After the *TE1* surface is created, the modified *DRAIN* surface may be composed by entering files in the *DTM Surface Composer* dialog in the following order:

File Type	File Name
DTM Surface	*DRAIN.XY#*
CLP_Inside	clip boundary which encompasses all of the updated topography data
DTM Surface	*TE1.XY#*
CLP_Inside	new EAR clip boundary
SRV	new SRV file

2. **If the modification is due to changes in the roadway design**, all necessary modifications to roadway design elements must be made prior to updating the proposed surface drainage EAR files. New SRV and CLP files will then be created for the EAR data within the affected station range. If the new EAR file clip boundary falls **outside** of the previous clip boundary, the modified *DRAIN* surface may be composed by entering files in the *DTM Surface Composer* dialog in the following order:

File Type	**File Name**
DTM Surface	*DRAIN.XY#*
CLP_Inside	new EAR clip boundary
SRV	new SRV file

If the new EAR clip boundary falls **inside** of the previous clip boundary, it will be necessary to first create a DTM which represents the *EXIST* surface data in the affected area **only**. This DTM will be named *PES* (Partial Exist Surface) to clearly distinguish it from all other DTM surfaces in the project. Once the modified *DRAIN* surface DTM is processed, **the *PES* DTM surface will be deleted**. The *PES* surface may be composed by entering files in the *DTM Surface Composer* dialog in the following order:

File Type	**File Name**
DTM Surface	*EXIST.XY#*
CLP_Outside	clip boundary which encompasses the affected area **only**

After the *PES* surface is created, the modified *DRAIN* surface may be composed by entering files in the *DTM Surface Composer* dialog in the following order:

File Type	**File Name**
DTM Surface	*DRAIN.XY#*
CLP_Inside	clip boundary which encompasses the affected area **only**
DTM Surface	*PES.XY#*
CLP_Inside	new EAR clip boundary
SRV	new SRV file

3

Processing the Drainage Data

3. Processing the Drainage Data

This section provides an overview of the necessary steps to process the drainage data in accordance with GDOT standards. Topics include the following:

- Create Flow Line Survey Chains
- Network Setup
- Nodes and Links

3.1 Create Flow Line Survey Chains

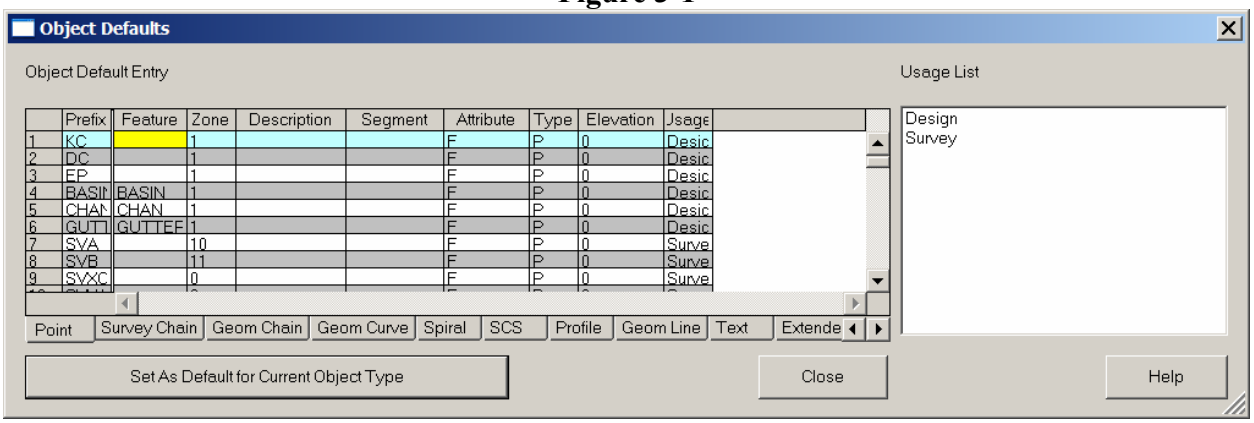
The following survey chains which represent water flow lines will be created:

- Gutter Chains
- Channel Chains

3.1.1 Gutter Chains

1. From the CAiCE main pull-down menu, click ***Settings >> Object Defaults*** and the *Object Defaults* dialog appears as shown in **Figure 3-1**.

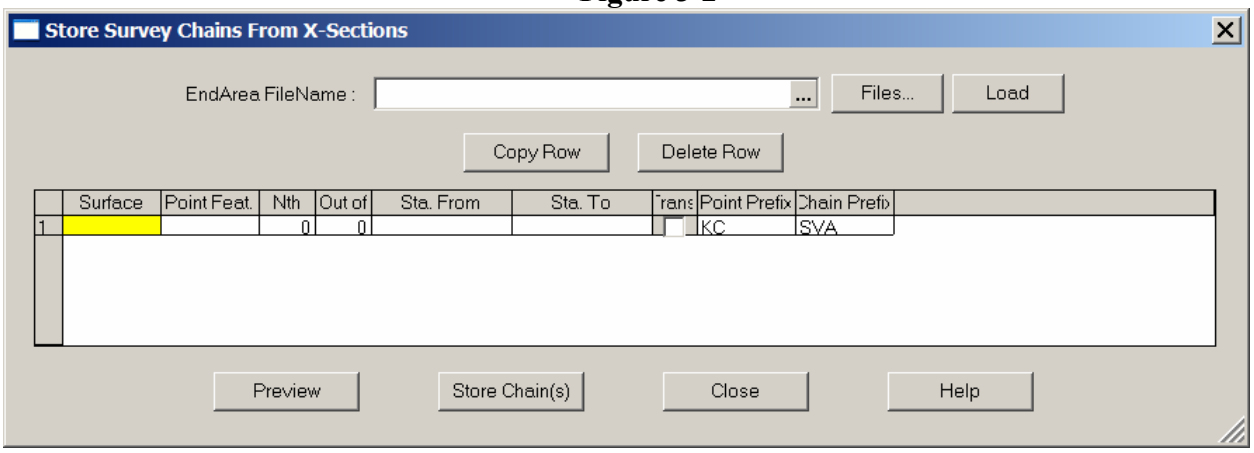
Figure 3-1



Click on *GUTTER* in the *Prefix* column to highlight the row and then click on the ***Save AS Default for Current Object Type*** button. Click on the ***Survey Chain*** tab, click on *GUTTER* in the *Prefix* column to highlight the row, and then click on the ***Save AS Default for Current Object Type*** button. Click on the ***Close*** button.

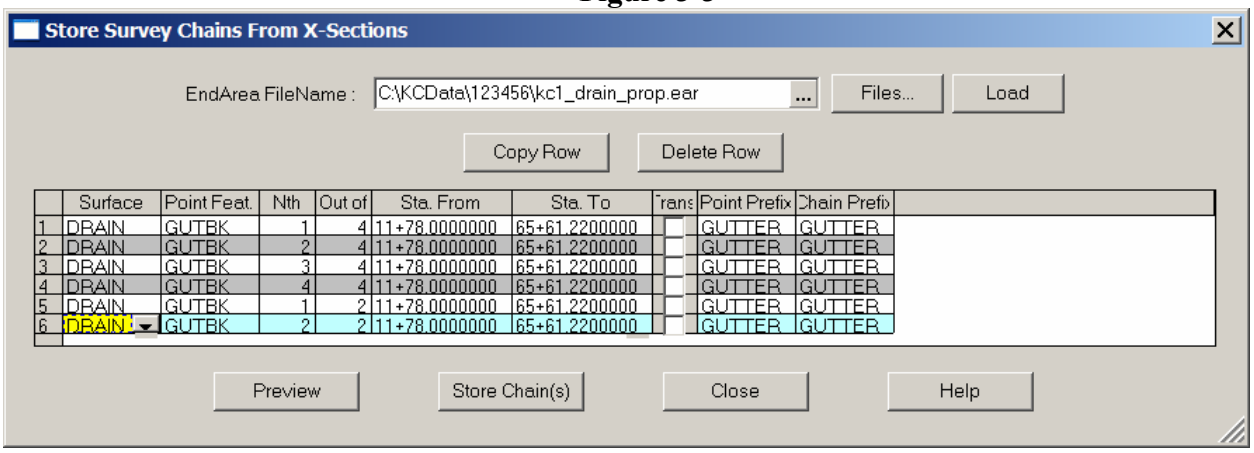
2. From the CAiCE main pull-down menu, click ***Geometry >> Survey Chains >> Store From X-Sections*** and the *Store Survey Chains From X-Sections* dialog appears as shown in **Figure 3-2**.

Figure 3-2



3. Enter the appropriate drainage EAR file in the *EndArea FileName:* field and click the ***Load*** button. Click the copy row button to add enough new rows for the total number of gutters in the EAR file. Enter the appropriate information in the remaining fields as shown in **Figure 3-3** and click the ***Store Chain(s)*** button to store the gutter chains.

Figure 3-3



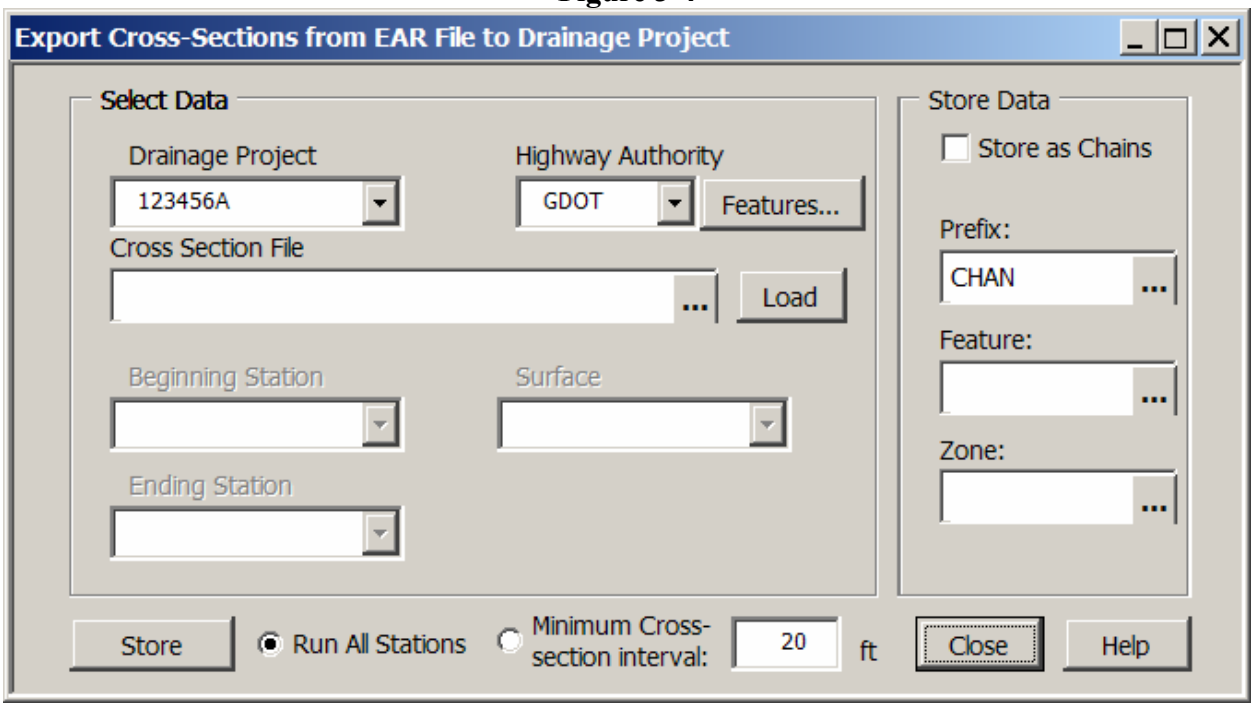
4. Repeat steps 2 and 3 for each drainage EAR file which includes urban sections.

3.1.2 Channel Chains

1. From the CAiCE main pull-down menu, click ***Settings >> Object Defaults***. In the *Object Defaults* dialog, set *CHAN* as the current default for both points and survey chains.

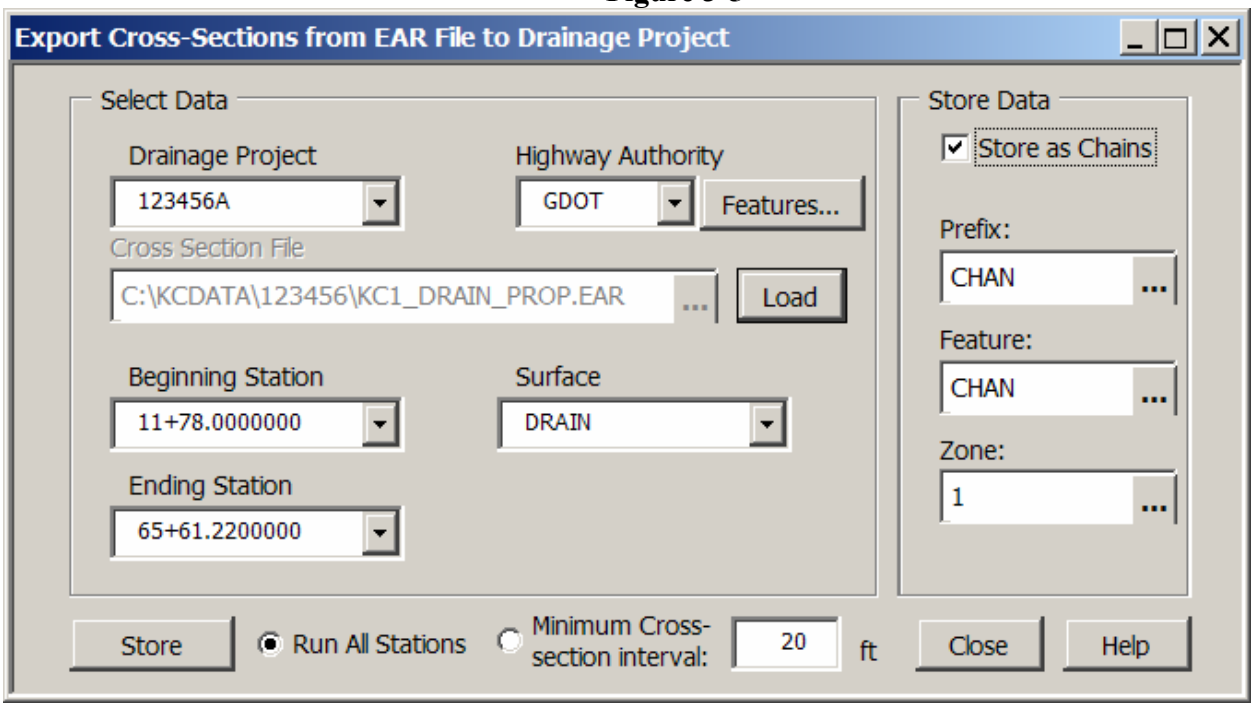
2. From the Visual Toolbox, click ***Open Channel >> Extract Channel Geometry*** and the *Export Cross-Sections from EAR File to Drainage Project* dialog appears as shown in **Figure 3-4.**

Figure 3-4



3. Enter the appropriate drainage EAR file in the *Cross Section File* field and click the ***Load*** button. Enter the appropriate information in the remaining fields as shown in **Figure 3-5** and click the ***Store*** button to store the channel chains.

Figure 3-5



4. Repeat steps 2 and 3 for each drainage EAR file which includes open channels.

3.2 Network Setup

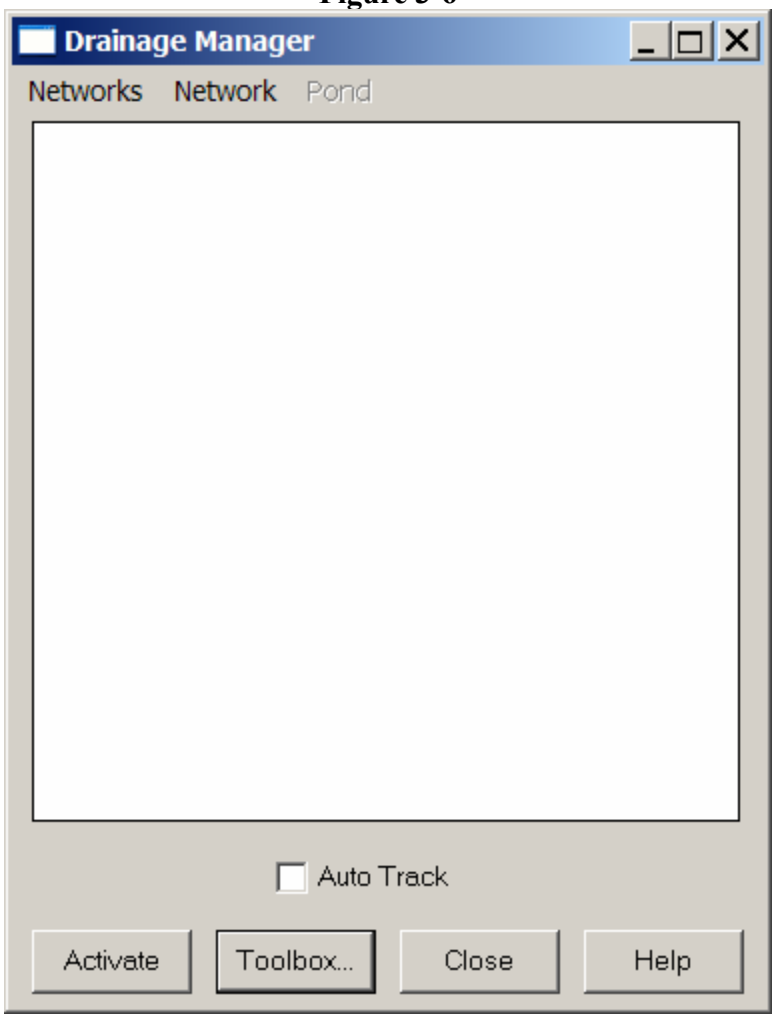
A new network must be created for each drainage system in the project. The following tasks must be accomplished to process the drainage data in accordance with GDOT standards:

- Create a New Network
- Set the Hydrology Defaults
- Set the Node and Link Defaults

3.2.1 Create a New Network

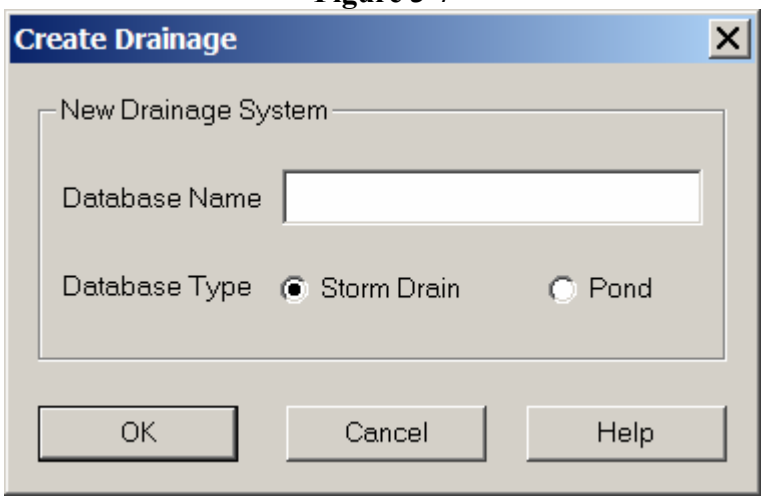
1. From the CAiCE main pull-down menu, click ***Drainage >> Drainage Manager*** to display the *Drainage Manager* dialog shown in **Figure 3-6**.

Figure 3-6



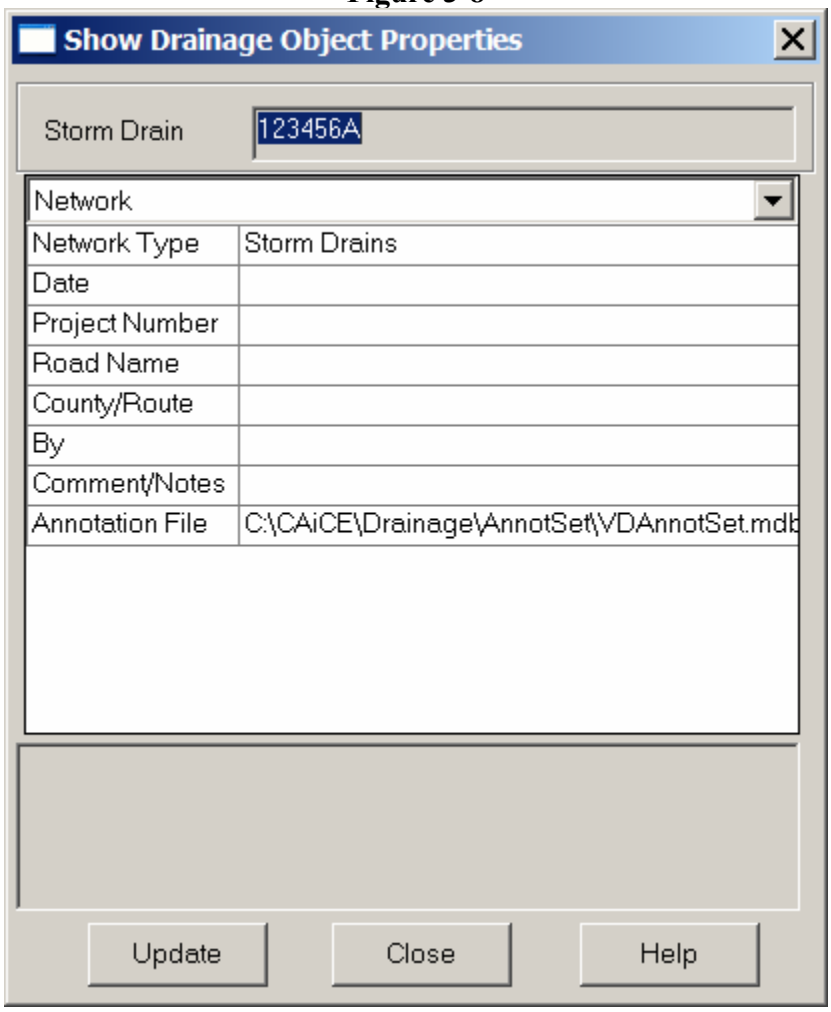
2. From the *Drainage Manager* dialog pull-down menu, click ***Networks >> Create*** to display the *Create Drainage* dialog shown in **Figure 3-7**.

Figure 3-7



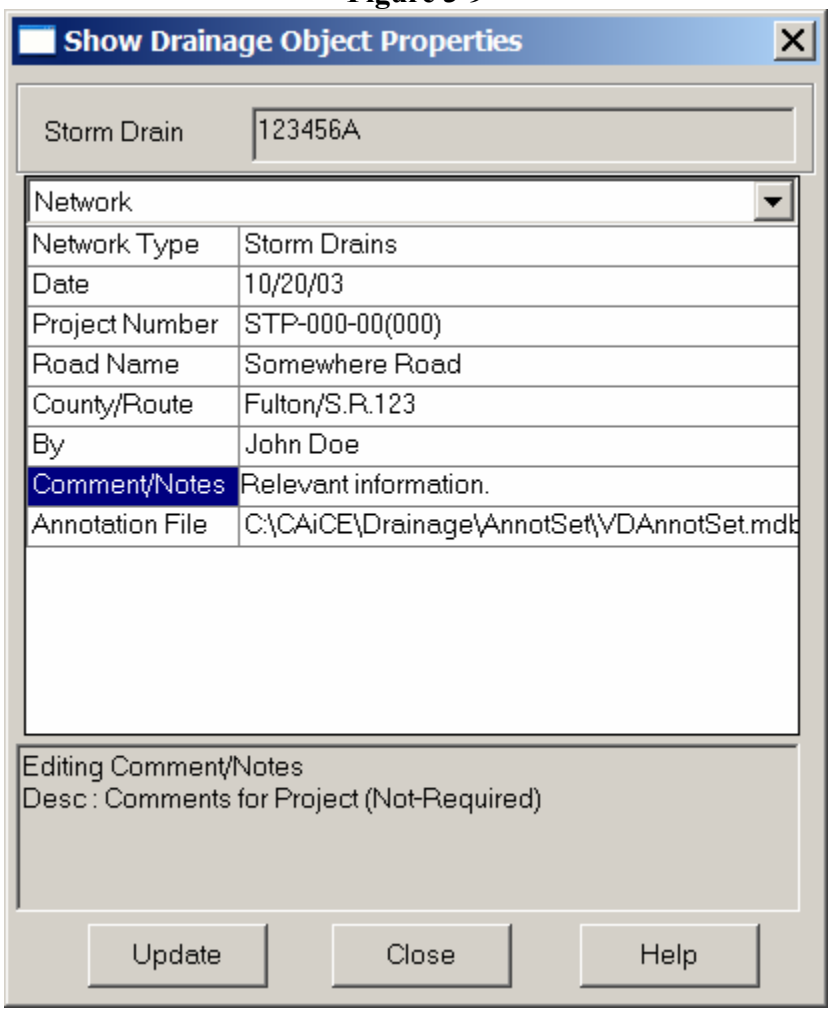
In the *Database Name* field, enter the roadway project name plus the drainage system letter designator (123456A) as prescribed in **Table 1.2**. For *Database Type*, click the *Storm Drain* radio button, and then click ***OK***. The drainage network project is created and the *Show Drainage Object Properties* dialog appears as shown in **Figure 3-8**.

Figure 3-8



3. Enter the appropriate data in each of the data fields under the *Network* option. For an example, see **Figure 3-9.**

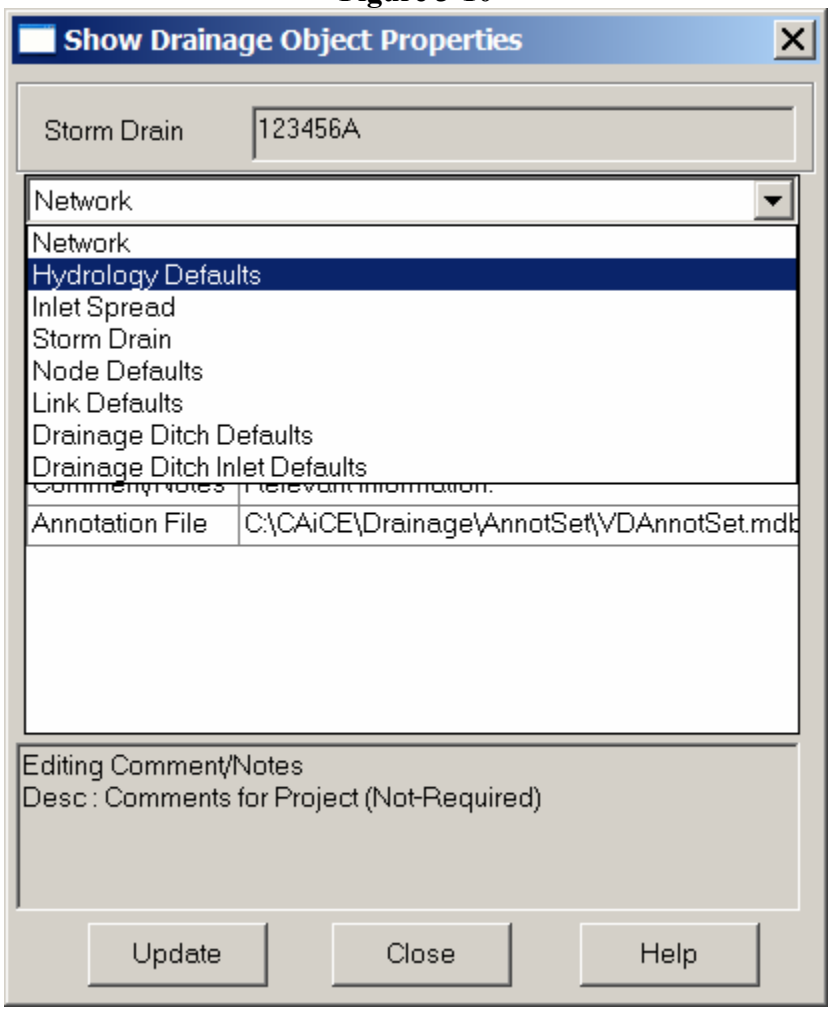
Figure 3-9


Show Drainage Object Properties
Storm Drain
123456A
Network
Network Type
Storm Drains
Date
10/20/03
Project Number
STP-000-00(000)
Road Name
Somewhere Road
County/Route
Fulton/S.R.123
By
John Doe
Comment/Notes
Relevant information.
Annotation File
C:\CAiCE\Drainage\AnnotSet\VDAnnotSet.mdb
Editing Comment/Notes
Desc : Comments for Project (Not-Required)
Update
Close
Help

3.2.2 Set the Hydrology Defaults

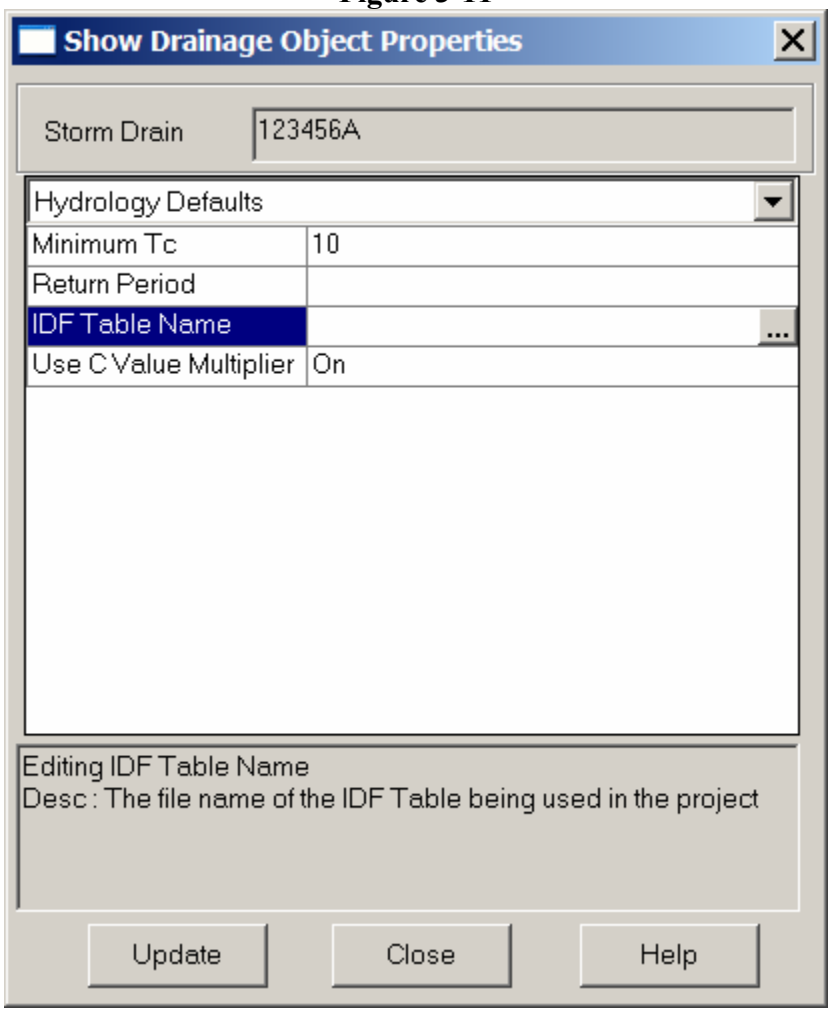
1. In the *Show Drainage Object Properties* dialog, click the pull-down menu arrow in the top field and select the *Hydrology Defaults* option as shown in **Figure 3-10**.

Figure 3-10



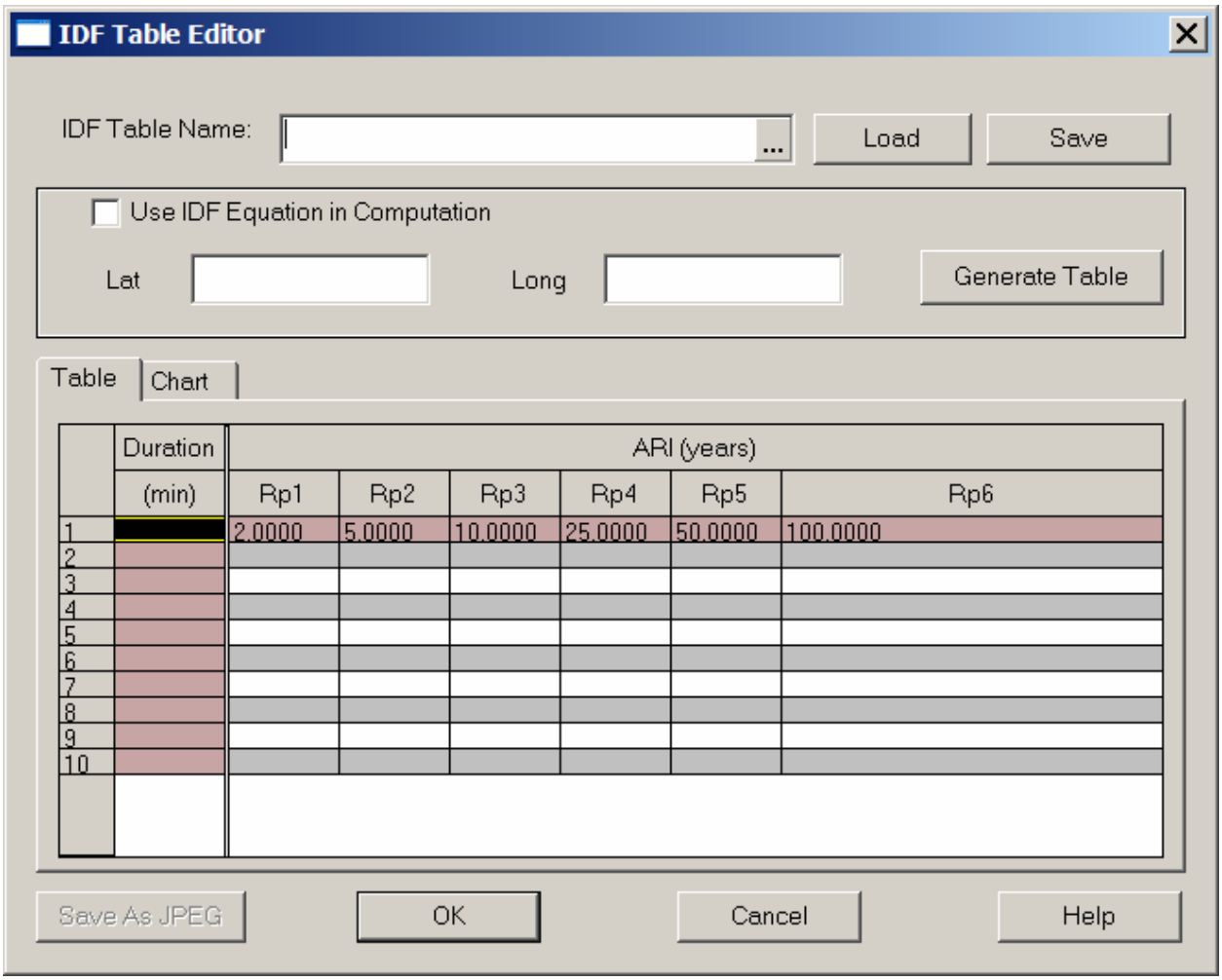
2. Click in the *IDF Table Name* data field and then click on the picker control that appears (see **Figure 3-11**).

Figure 3-11



3. In the *IDF Table Editor* dialog, enter the appropriate latitude and longitude for the roadway project in the *Lat* and *Long* fields. Ensure that the *Use IDF Equation in Computation* check box is **not checked**. Click ***Generate Table*** to generate the IDF table for the given latitude and longitude (see **Figure 3-12**).

Figure 3-12



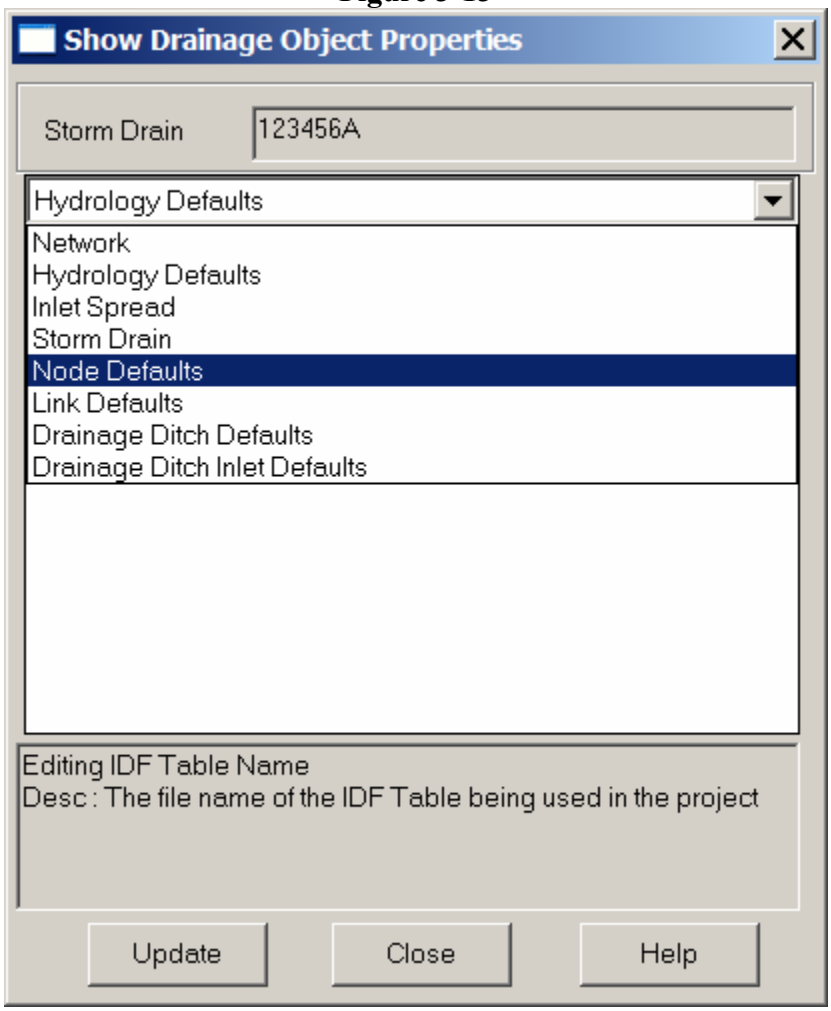
Click ***Save*** to save this table for use in other drainage network systems in this roadway project.

4. In the *Return Period* data field, enter the appropriate number (see **Figure 3-11**).

3.2.3 Set the Node and Link Defaults

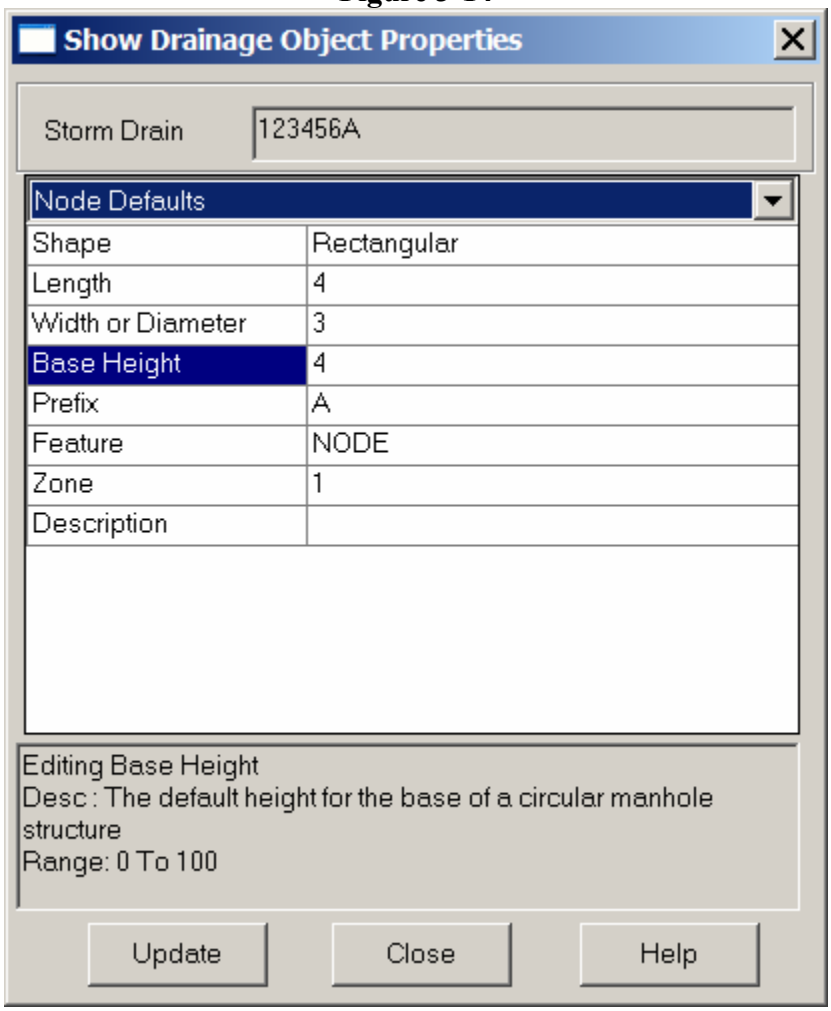
1. In the *Show Drainage Object Properties* dialog, click the pull-down menu arrow in the top field and select the *Node Defaults* option as shown in **Figure 3-13**.

Figure 3-13



2. In the *Prefix* field, enter the appropriate letter for the drainage network system to be designed. In the *Feature* field, enter *NODE*. Enter *1* in the *Zone* field. See **Figure 3-14** for an example.

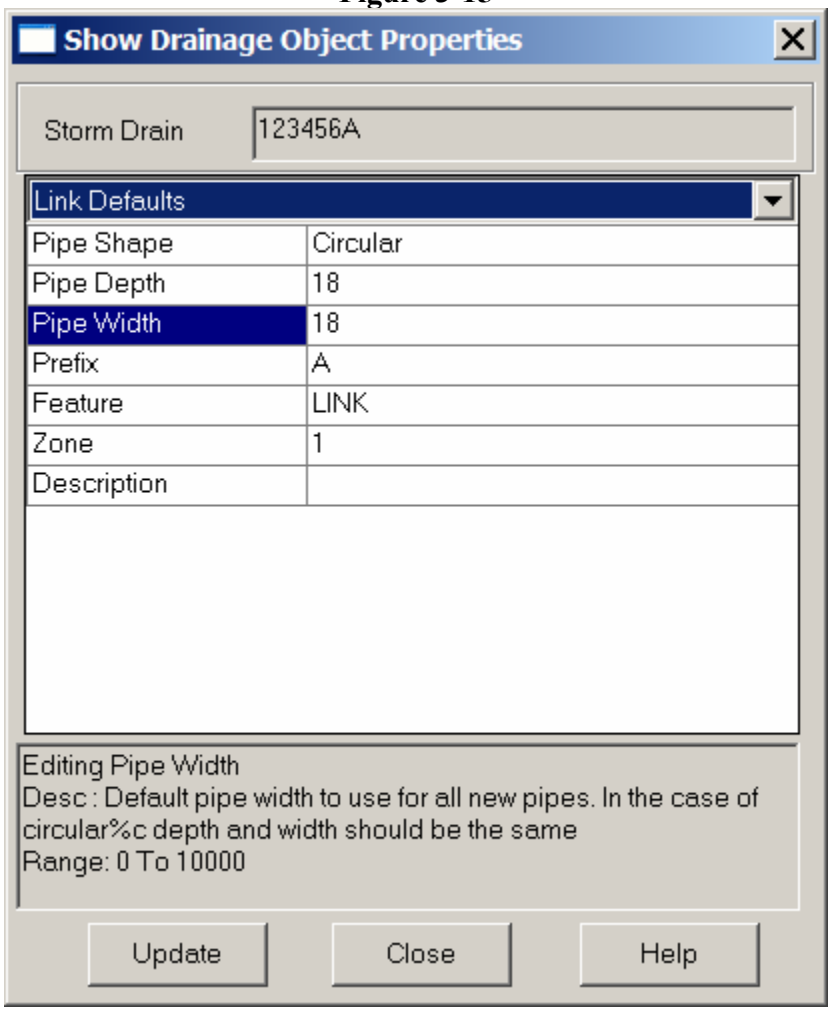
Figure 3-14



3. In the *Show Drainage Object Properties* dialog, click the pull-down menu arrow in the top field and select the *Link Defaults* option.

4. In the *Prefix* field, enter the appropriate letter for the drainage network system to be designed. In the *Feature* field, enter *LINK*. Enter *1* in the *Zone* field. See **Figure 3-15** for an example.

Figure 3-15



5. Click ***Update*** to update all of the changes to the drainage object properties, and then click ***Close***.

3.3 Nodes and Links

Follow the guidelines in this section for processing nodes and links.

3. All gutter inlet nodes will be "snapped" to the appropriate gutter chain and all channel inlet nodes will be snapped to the appropriate channel chain.

4. Use the standard naming convention for all nodes as prescribed in **Table 1.2**.

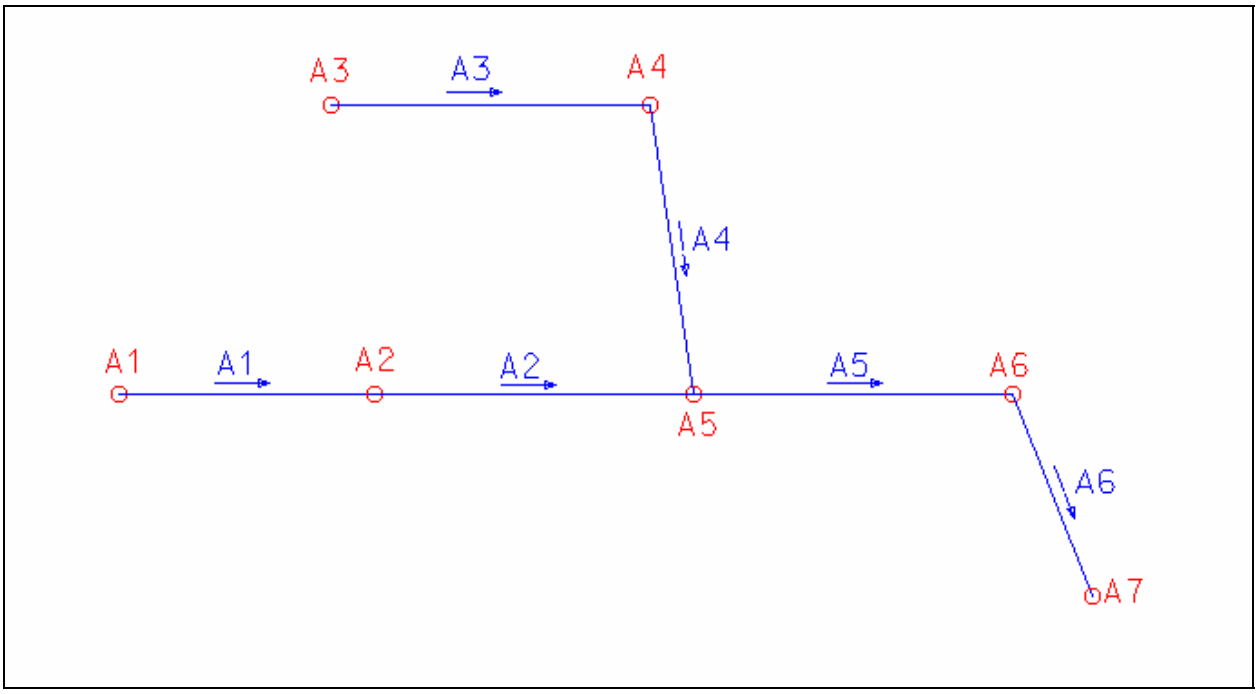
5. When renumbering nodes (see **Note** below), ensure that all node names follow the standard naming convention as prescribed in **Table 1.2**.

6. Links names shall correspond to the "upstream" node name as prescribed in **Table 1.2** and as shown in **Figure 3-16**.

7. When renumbering links (see **Note** below), ensure that all link names follow the standard naming convention as prescribed in **Table 1.2** and number 4 above.

   Note: Any time that nodes are renumbered, links **must** also be renumbered.

Figure 3-16



4

Drainage Output

4. Drainage Output

This section covers the process for producing required drainage output from the CAiCE database. Topics include the following:

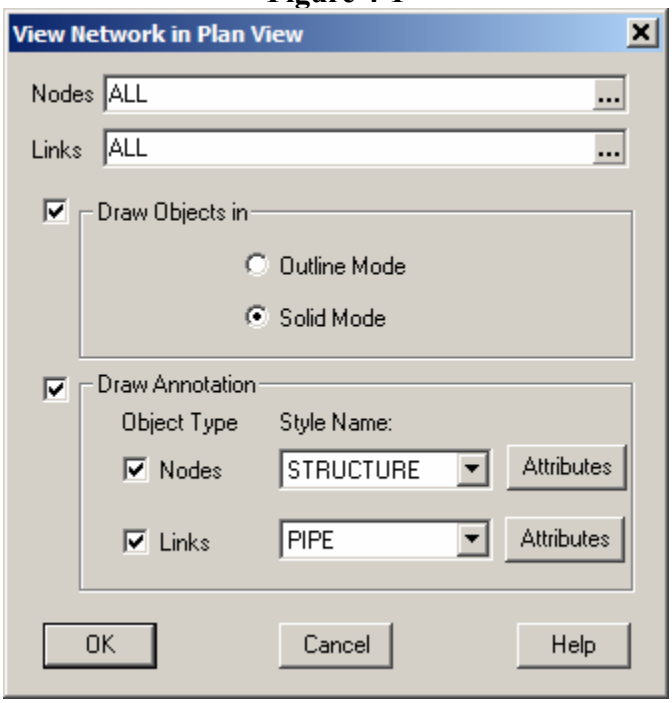
- Exporting Structure Nodes and Pipe Links to a Microstation DGN File
- Drainage Profile Sheets
- Drainage Calculations Report

4.1 Exporting Structure Nodes and Pipe Links to a Microstation DGN File

Use the following steps to export graphics and annotations for structure nodes and pipe links to a Microstation DGN file:

1. From the *Drainage Manager* dialog, activate the drainage network that you want to view, and then click ***Network >> View Network in Plan View*** and the *View Network in Plan View* dialog appears as shown in **Figure 4-1**.

Figure 4-1



2. In the *Draw Objects in* section of the dialog, click in the radio button next to *Outline Mode*.

3. In the *Draw Annotation* section of the dialog, click the ***Attributes*** button to the right of the *Nodes Style Name* field and change the *Size* entry to *5*. Click the ***OK*** button to view the drainage network.

   Note: The nodes and their associated annotations ***will not*** be plotted to the plan sheet. These items are intended to be used for informational purposes ***only***.

4. Once the graphics of all of the drainage networks are viewed, use the *GDOT2D.dgn* seed file to export the screen graphics to Microstation. Use the following naming convention for the new DGN file: *(CAiCE project name)* + *DRNG.dgn*; example, *123456DRNG.dgn*.

5. Once the nodes and links and the associated annotations are in a DGN file, the appropriate Microstation drainage structure cells may be placed on the nodes and the links may be patterned with the appropriate drainage pipe line style.

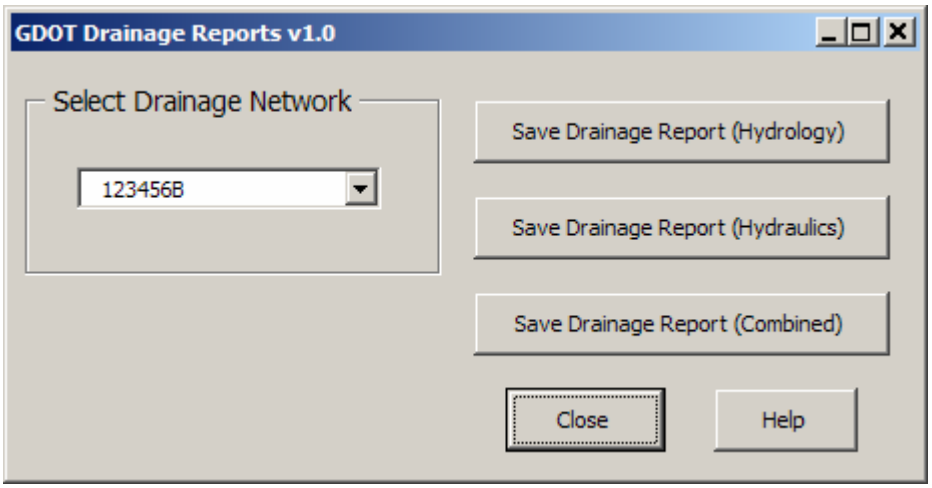
4.2 Drainage Profile Sheets

(This process is in development)

4.3 Drainage Calculations Report

The drainage calculations report may be produced in a standard GDOT format by accessing the *GDOT Report* macro from the Visual Drainage toolbox. From the *Folder Items* list in the Visual Drainage toolbox, click on the + next to ***GDOT Drainage Programs*** to expand the list, and then click on ***GDOT Drainage Reports*** to view the description/help file. Right-click on ***GDOT Drainage Reports***, and then click on ***Insert Object*** to open the *GDOT Drainage Reports v1.0* dialog shown in **Figure 4-2.**

Figure 4-2



This macro will create a report in one of the three format options shown on the dialog. The report will be given the name of the drainage network and it will be saved in the *Documentation* folder in the project directory.

Appendix

A

Quick Reference Guide to Design Tables

APPENDIX A QUICK REFERENCE GUIDE TO DRAINAGE TABLES

Table 1.1
Drainage Design Object Names

Object	Prefix	Starting Number	Feature Code
Gutter chain point	GUTTER	1	GUTTER
Gutter chain	GUTTER	1	GUTTER
Channel chain point	CHAN	1	CHAN
Channel chain	CHAN	1	CHAN
Drainage area boundary (major) chain point	BASIN	1	BASIN
Drainage area boundary (major) chain	BASIN	1	BASIN
Drainage area boundary (sub-system) chain point	BASIN	1	SBASIN
Drainage area boundary (sub-system) chain	BASIN	1	SBASIN
Cross drain chain point	XD	1	XD
Cross drain chain	XD	1	XD

Table 1.2
Storm Drain Networks Names

Item	Name	Feature Code	Example
Storm Drain Network	CAiCE roadway project name + alpha character designator for drainage system		123456A
Drainage Structure Nodes	alpha character designator for drainage system + structure number	NODE	A1
Drainage Pipe Links	alpha character designator for drainage system + upstream structure number	LINK	A1

Table 1.3			
DTM File Names and Surface Names			
Item	**DTM Surface for an Alignment**	**Multiple SRV and CLP files for a Single Alignment***	**Feature Code**
Cross Section Files			
Existing X-Section File**	"alignment chain name" + _drain_exist.ear *Example:* KC1_drain_exist.ear		
Proposed X-section File**	"alignment chain name" + _drain_prop.ear *Example:* KC1_drain_prop.ear		
X-Section Design File**	"alignment chain name" + _drain_prop.vrs *Example:* KC1_drain_prop.vrs		
Files for Converting Cross Sections to Surfaces			
SRV File	"alignment chain name".srv *Example:* KC1.srv	"alignment chain name" + "alpha character designator".srv *Example:* KC2a.srv, KC2b.srv	
CLP File	"alignment chain name".clp *Example:* KC1.clp	"alignment chain name" + "alpha character designator".clp *Example:* KC2a.clp, KC2b.clp	
DTM Surface Names			
Single Alignment Surface	D + "alignment chain name" *Example:* DKC1		DRAIN
Multiple Alignment Surface***	DRAIN		DRAIN

* In some cases it is necessary to create multiple sets of SRV and CLP files for a single alignment.

** These cross section files are not the same files that are created for producing cross section sheets for the project plan set. These are a separate set of cross section files used for creating the proposed DTM surface.

*** In the event it becomes necessary to modify this surface due to updated topographical data or changes in the roadway design, the modified surface name will be *DRAIN + "occurrence number"*. For example: first modification, *DRAIN2*; second modification, *DRAIN3*; etc.

<table>
<tr><th colspan="3">Table 1.4</th></tr>
<tr><th>File</th><th>Description</th><th>Comments</th></tr>
<tr><td>Inlet Table Files</td><td>Inlet structure tables and inlet type tables have been developed for standard GDOT drainage structures.
The following is a list of the inlet tables:<table><tr><td>InletStructureTypes.tbl</td><td>English units inlet table</td></tr><tr><td>InletTypes.tbl</td><td>English units inlet table</td></tr><tr><td>InletStructureTypes_m.tbl</td><td>Metric units inlet table</td></tr><tr><td>InletTypes_m.tbl</td><td>Metric units inlet table</td></tr></table></td><td>These files reside in the following subdirectory:
CAiCE\Drainage</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>INI Files</td><td>The standard CAiCE INI files that have been developed for creating drainage projects are listed below:<table><tr><td>kcvddb_e.ini</td><td>English</td></tr><tr><td>kcvddb_m.ini</td><td>Metric</td></tr></table></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Microstation Seed Files</td><td>When exporting CAiCE drainage elements to Microstation design files the following standard Microstation seed files should be used:<table><tr><td>Plan View Elements</td><td>GDOT2D.dgn (English)
GDOT2Dm.dgn (Metric)</td></tr><tr><td>Profile View Elements</td><td>To be developed</td></tr></table></td><td>Seed files reside in the following directory:
CAiCE/Seed</td></tr>
</table>

Index