

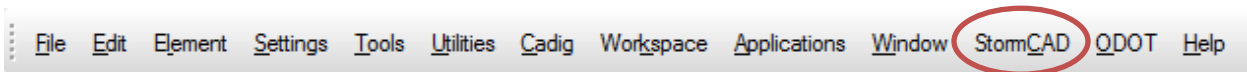
ODOT Quick Start Guide – StormCAD for MicroStation

What Is StormCAD and Why Do We Want to Use It?

StormCAD is a third-party application which allows the user to design a new storm sewer system or analyze an existing system. As an alternative to the ODOT CDSS storm sewer modules, StormCAD includes custom features to support ODOT drainage design criteria (see Location and Design Manual, Volume 2). StormCAD for MicroStation operates in the familiar CADD environment, uses standard ODOT levels and line styles, and can assist the designer with drainage basemap development. For more detailed information, see the “ODOT User Guide for StormCAD”.

Getting Started

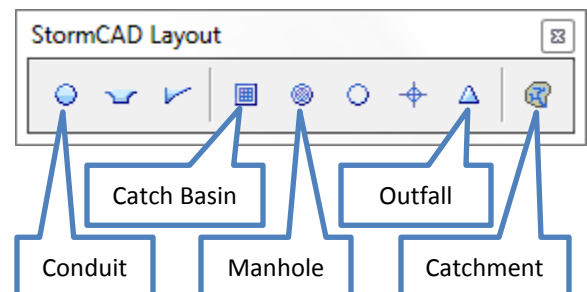
- Check with your Network Administrator (or CADD Manager) to verify the software is installed per the ODOT installation guidelines. The “ODOT User Guide for StormCAD” has installation instructions.
- Launch StormCAD V8i for MicroStation (User: stormcad). The first time you use StormCAD, you may notice your individualized MicroStation environment (e.g., toolbars) has reverted to default settings. Find the familiar toolbars (Tools > Tool Boxes) and adjust workspace preferences as needed. **StormCAD toolbars** are also found under the MicroStation Tools Menu and in the Tasks Dialog. StormCAD tool and dialog boxes are likewise dockable. The **Properties** dialog (StormCAD > View > Properties) is used frequently and can be launched by double clicking an element.
- A StormCAD project requires multiple files. **Create the new .dgn file from seed** (ODOTstd\V8istd\seed\StormCADSeed.dgn). If using the StormCAD stand-alone version, the project can be attached to a .dgn file later if desired.



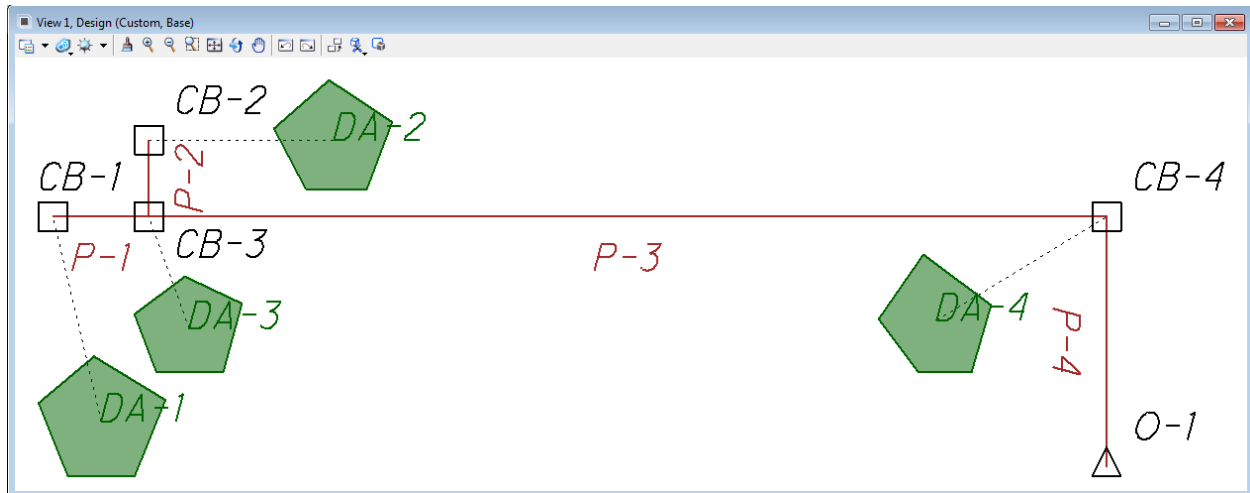
- **Create a new StormCAD project from seed** (StormCAD > Project > Seed > New from Seed). Navigate to the StormCAD project seed file (ODOTstd\V8istd\StormCAD\StormCADSeed.sews). The seed file (.sews) creates multiple StormCAD project files (.stws, .mdb).
- **Save the attached StormCAD project** file (StormCAD > Project > Save Attached As). Navigate to the appropriate directory. The default file name is the .dgn file name with the .stws extension. StormCAD for MicroStation automatically saves changes to the StormCAD project.

Layout System and Edit Properties

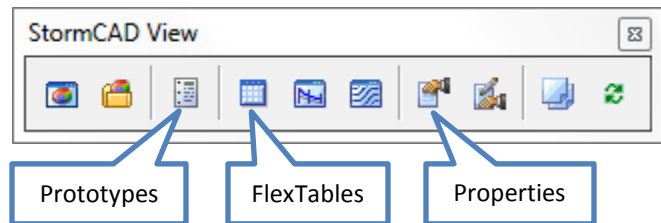
- Before creating new elements, review the **Prototypes** (StormCAD > View > Prototypes). The default conduits are To Scale. For a basic schematic, select User Defined conduits (Make Current).
- Use the StormCAD **Layout** tools to draw the system (StormCAD > Tools > Layout). MicroStation placement tools (e.g., Snap Mode) can be used. Catch basins, manholes and outfall nodes can be placed on the fly as you layout conduit. Otherwise, place the node cells first and then connect with conduits (link elements). Draw catchment polygons to represent contributing drainage areas (the default prototype is not to scale).



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- **Properties** – the number of attribute and results fields can be overwhelming. Use the dropdown menu in the Properties dialog box to select Custom Properties (Project) instead of <Show All>.
- Use **FlexTables** (StormCAD > View) to enter element information quickly (Hint: Global Edit can also save time – right click on a column heading to activate). Alternately, use the **Properties** dialog box to edit single element attributes.
- **Catch Basins** – select the ODOT inlet from the FlexTable dropdown menu. The Inlet Location should be In Sag to capture all inflow for storm sewer calculations. Enter the ground and invert elevations for existing analysis. For a new system design, only the ground elevation is necessary.



	Label	Roadway Station (ft)	Side	Inlet Type	Inlet	Inlet Location	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Notes
310:	CB-1	715+00	Left	Catalog Inlet	CB No. 3A (Curb)	In Sag	970.00	0.00	
311:	CB-2	715+20	Left	Catalog Inlet	CB No. 2-3	In Sag	968.30	0.00	
312:	CB-3	715+20	Left	Catalog Inlet	CB No. 3A (Curb)	In Sag	969.80	0.00	
314:	CB-4	717+20	Left	Catalog Inlet	Generic Default 100%	In Sag	968.30	0.00	

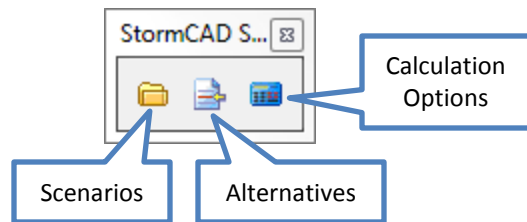
4 of 4 elements displayed

- **Conduits** – review and modify the section size (diameter), invert elevations and length as needed. StormCAD automatically adjusts the size and inverts when it runs a design scenario.
- **Outlet** – all systems require an outfall. Enter the ground and invert elevations. Free Outfall is appropriate for design mode. For HGL analysis, enter the User Defined tailwater elevation.
- **Catchments** – specify the outflow catch basin (dropdown menu...select from drawing). Enter the time of concentration, area, and rational coefficient (multiple subareas can be included).

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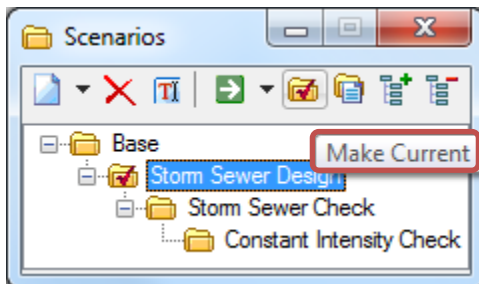
Design and Analysis

- Perhaps the greatest difference between StormCAD and ODOT's CDSS program is the way that design and analysis **Scenarios** need to be run separately, with distinct **Alternatives** and **Calculation Options**. For ODOT purposes, it is necessary to specify different rainfall runoff alternatives for design and analysis. The outlet tailwater elevation (boundary condition alternative) affects the HGL analysis, but it should not be a factor for just-full design and the velocity computation. In addition to conduit size, design criteria include minimum velocity and cover constraints that govern the invert elevations (Components > Default Design Constraints). The physical system may be modified during the design process but not in the analysis mode.



Design a New System

- Select the 10-year **Storm Sewer Design Scenario** (StormCAD > Analysis > Scenarios > Make Current). In the **Properties** dialog box, select the appropriate **Rainfall Runoff Alternative** from the dropdown list. For design purposes, the **Outfall Boundary Condition** (Properties) should be **Free Outfall**.



User Data Extensions	<> Base User Data Extensions
Physical	Design Physical
Boundary Condition	<> Base Boundary Condition
Initial Settings	<> Base Initial Settings
Hydrology	<> Base Hydrology
Output	<> Base Output
Infiltration and Inflow	<> Base Infiltration and Inflow
Rainfall Runoff	Zone C - 10 Year

- Validate** the input data (StormCAD > Analysis). Resolve errors with **red** icons (**User Notifications**).
- Compute** (StormCAD > Analysis) the scenario. In design mode, there will be a popup query – it is not necessary to create a new physical alternative, but it is fine if you do. By default, the **Base Physical Alternative** with the attributes you originally entered will be associated with the Base Scenario, and the other scenarios in the seed file are associated with the **Design Physical Alternative**.
- Use **FlexTables** or the **Properties** dialog box to view results. From the **Storm Sewer Design FlexTable**, select the **Report** icon to create a .pdf. You can use landscape orientation and a larger paper size (Page Setup) or modify the column widths to fit everything on one row.

The screenshot shows the "Conduit FlexTable: Storm Sewer Design (Example2.stsw)" window. The "Report" icon is highlighted. The table below shows the data for four conduit elements.

	Diameter (in)	Length (Unified) (ft)	Report (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Manning's n	Velocity (ft/s)	Capacity (Design) (cfs)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)
317: P-1	15.0	20.0	0.0882	966.55	964.79	0.015	7.87	17.88	970.00	969.80	2.20	3.76
318: P-2	15.0	16.0	0.0040	964.85	964.79	0.015	3.00	3.79	968.30	969.80	2.20	3.76
319: P-3	21.0	200.0	0.0021	964.29	963.86	0.015	3.00	6.83	969.80	968.30	3.76	2.69
320: P-4	21.0	80.0	0.0021	963.86	963.69	0.015	3.00	6.81	968.30	969.50	2.69	4.06

4 of 4 elements displayed

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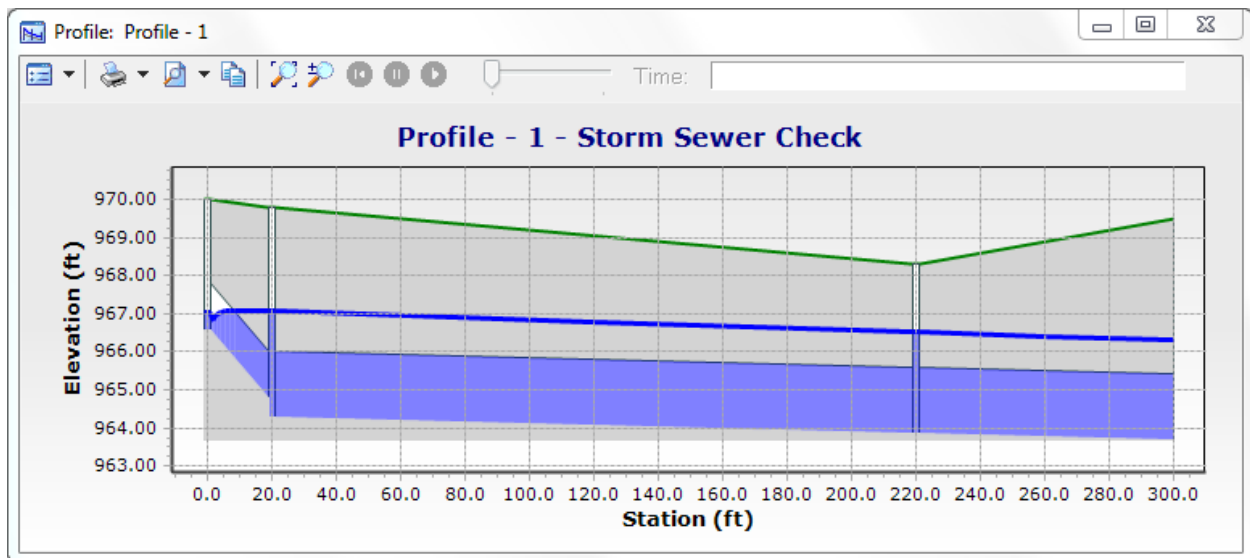
Analyze a New or Existing System

- For the **25-year HGL analysis**, select the **Storm Sewer Check Scenario** (StormCAD > Analysis > Scenarios > Make Current) to analyze the new physical alternative. To analyze an existing system, you can use either the Base Scenario or the Storm Sewer Check Scenario. Select the appropriate **Rainfall Runoff Alternative** (Properties). For the Outfall Boundary Condition, enter the **User Defined Tailwater** (Properties) and then **Compute**.
- The **Constant Intensity Check Scenario** requires storm data modification based on the 25-year System Intensity at the outlet (StormCAD > Components > Storm Data > User Defined IDF Table). You may not need to perform this step if the HGL meets ODOT criteria with the Storm Sewer Check Scenario, because it is generally more conservative than using a constant intensity storm.

Conduit FlexTable: HGL Report
Active Scenario: Storm Sewer Check

-Node- Upstream Downstream	Upstream Inlet Area (acres)	System Drainage Area (acres)	Upstream Inlet C	System CA (acres)	Upstream Inlet Tc (min)	System Flow Time (min)	System Intensity (in/h)	Flow (cfs)	Diameter (in)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	-Invert- Upstream Downstream (ft)	Friction Slope (ft/ft)	-HGL- Upstream Downstream (ft)	-Ground- Upstream Downstream (ft)	Ground Minus HGL (ft)
0	0.25	0.25	0.900	0.22	10.00	10.00	6.49	1.47	12.0	20.0	0.0892	966.83	0.0216	967.34	970.00	2.66
1												964.30		967.06	969.80	
EXCB	0.75	0.75	0.630	0.47	15.00	15.00	5.34	2.55	15.0	16.0	0.0040	964.86	0.0021	967.09	968.30	1.21
1												964.30		967.06	969.80	
1	0.95	1.95	0.660	1.32	12.00	15.13	5.32	7.10	21.0	200.0	0.0021	964.30	0.0027	967.06	969.80	2.74
2												963.87		966.53	968.30	
2	0.10	2.05	0.900	1.41	10.00	16.26	5.12	7.30	21.0	80.0	0.0021	963.87	0.0028	966.53	968.30	1.77
3												963.70		966.30	969.50	

- **FlexTable Report** – the **HGL Analysis FlexTable** (2-line format, shown above) is recommended. A new design requires separate reports for the design and check storms.
- The **Profiles** tool (StormCAD > View) is also helpful for visualizing the hydraulic grade line, and it can be used to generate a graphic report.



- You can **add new elements** to the system or create additional systems in the same project. The Base Physical Alternative associated with the Base Scenario is a **parent alternative** from which the Design Physical Alternative inherits unmodified data. To prevent modifications to any “fixed” system elements during design mode, change the design attributes (e.g., Design Conduit? False).

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Other Key Features

- In addition to the above settings (e.g., FlexTables, Scenarios, etc.), the ODOT custom seed files incorporate the following components and features:
 - **Engineering Libraries** – ODOTstd\V8istd\StormCAD\EngineeringLibraries
 - **Catalogs** – project file includes conduits and inlets imported from Engineering Libraries
 - **Storm Data** – IDF curves per L&D Volume 2 (ODOTstd\V8istd\StormCAD\EngineeringLibraries)
 - **Element Levels** – .dgn seed file has default levels for StormCAD elements and annotations
- The **element labels** can be edited using the FlexTables or Properties editor. To reset the numbering, go to StormCAD > Tools > Options > Labeling.
- StormCAD SELECTseries 3 is compatible with **MicroStation SS2**.
- **Drainage basemap** – when opening the .dgn file with regular MicroStation, elements are displayed with standard ODOT levels, line styles and colors. StormCAD for MicroStation sets the line weights to 0, but these can be updated with Element Selection and the Change Element Attributes tool. StormCAD labels are not subject to the MicroStation annotation scale. The Replace Cells tool can be used for the various ODOT catch basins, etc.
- The StormCAD **standalone version** can open a project file created by StormCAD for MicroStation. It can be used to edit the network and element properties, but manual file saving is required, and some cleanup may be necessary in the .dgn file. It might be necessary for IT to fix your desktop shortcut if you encounter an error when trying to launch the standalone version (it should point to C:\Program Files (x86)\Bentley\StormCAD8\StormCAD.exe).
- The **StormCAD Help** is comprehensive, and it includes Quick Start Lessons.
- Play with the software. Check out the icons on the toolbars and the StormCAD menu options. Look up the tools and settings in the ODOT User Guide for StormCAD and read about how they work.

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Contact Information:

For StormCAD technical support, it is recommended that you take advantage of the Bentley Knowledge Base or Service Request Manager (<http://selectservices.bentley.com/en-US>). You will need to sign in, and you can contact your CADD administrator if you need assistance with setting up an account. The StormCAD help menu also offers extensive guidance and background information. If you have any hydraulic questions please contact the ODOT Office of Hydraulic Engineering. For MicroStation questions or problems please contact the Office of CADD and Mapping Services, CADD Support team.