Guide To Bridge Planning Tools

The following bridge planning and hydrotechnical analysis tools (Excel spreadsheets, some with associated databases and VBA code), and GIS data-sets are available from the AT WWW site at :

www.transportation.alberta.ca/PlanningTools

Data\GIS Folder :

This folder includes GIS data-sets for AT bridges as well as links to GeoBase and GeoGratis (free Canadian GIS data-sets including hydrography and road vectors and NTS map rasters), a link to the Global Mapper GIS application, and projection files for 3TM and 10TM for use in Global Mapper. A guide to using Global Mapper for Hydrotechnical Data Extraction and a step by step guide for automatic drainage area delineation using Green Kenue are also included.

Data\Hydraulics folder :

This folder contains a zipped file ("**gauging.zip**") with data and analysis of site visit summary sheets from WSC (in more detail than included with PeakFlow). The Gauging sub-folder contains files presenting some actual gauging measurement data.

Data\Hydrology Folder :

Large Storm Analysis sub-folder :

This folder contains a file with depth area data for all of the largest storms recorded by Environment Canada covering Alberta ("**Large Storm Analysis.xls**") ; a file with rain gauge location, name, and maximum storm rainfall depth in a text file that can be used with Global Mapper ("**All Storm Points.csv**") ; a file with detailed temporal storm data for this event based on AENV gauge data ("**Jun 95 Rain.xls**") ; and a zipped file with CSV files for each storm with gauge location and storm rainfall amount ("**Storm Spatial Files.zip**") which can be imported into Global Mapper.

Hydrographs sub-folder :

This folder contains zip files with re-built hydrographs for all significant runoff events analysed in Alberta, BC and Saskatchewan, including a summary file for Alberta events.

Tools\HIS Folder :

Hydrotechnical Information System (HIS) :

This tool provides access to an array of useful hydrotechnical information that has been compiled by the department, including : query of streams by bridge file or name or highway, link between tributaries and receiving streams, list of bridges by stream, flood data and photos, hydrotechnical file histories and summaries, basin visualizations, stream profiles, and scour survey data. Instructions for installing this tool and the associated files are included in a text file.

Tools\Hydraulics folder :

Channel Capacity Calculator :

This tool does simple steady flow hydraulic calculations based on typical channel properties and in a manner consistent with the AT Hydrotechnical Design Guidelines.

Flow Profile :

1D Calculation of section averaged depths and velocities through a system of channel and structure elements, based on a combination of Gradually Varied Flow and Rapidly Varied Flow calculations. This tool can be used to model multi-slope culverts and constrictive bridge openings. A PDF file documenting the tool is included.

HydroCulv :

This tool does 1D steady flow culvert hydraulic calculations, accounting for the range of complex hydraulic profiles that can exist at culvert installations. Most common culvert shapes can be selected, as well as user defined geometry. Multiple boundary conditions and culverts can be handled in one run. Performance curve feature has been added.

Flow Constrict :

This tool does simple rapidly varied flow calculations to model the expansion and contraction of flow at a constricted bridge opening using simplified cross sections for the typical natural channel and bridge opening. Headloss and velocity through the opening are presented.

HydroChan :

This tool does 1D gradually varied flow for a prismatic channel, reporting the extent of hydraulic influence (e.g. backwater curve). Uses include estimating the impact of d/s hydraulic controls on tailwater at a structure, and evaluating the impact of

headloss at a structure on flood sensitive upstream infrastructure.

HydroTools sub-folder :

This folder contains versions of older tools, some in Excel and some in VB format.

Tools\Hydrology Folder :

PeakFlow Folder :

This folder contains a tool that provides easy access to WSC data including annual peak flows, large runoff hydrographs, rating curves, and gauging measurement summary data. A list of gauges can be identified using a built-in query interface.

HydroRoutLake :

This tool will do storage routing calculations for a lake based on an inflow hydrograph, stage/storage curve, and an outlet rating curve.

Tools\Hydrology\Storm sub-folder :

This folder contains a tool that will plot rainfall contours on top of an outline of a selected WSC or user defined basin for any of about 140 identified historic storms in Alberta. The net rainfall over a basin will be presented. Also, the largest rainfall events over a selected basin can be identified.

Tools\Planning Folder :

Bridge Fill Slopes Calculator :

This tool will calculate and plot the slopes for standard AIT bridge fills for a range of headslope and sideslope ratios and skew angles.

Grid Ground Correction :

This tool will calculate the correction factor for grid to ground coordinate transformation for multiple points.

BPG :

The BPG (Bridge Planning Geometry) tool combines horizontal alignment, gradeline, and bridge fill and protection works geometry, including export files for interaction with Global Mapper and volume calculations for protection works and road grading.

Tools\Planning\Old Sub-folder :

BGrade :

This tool facilitates highway gradeline calculations with graphical VPI adjustment, sag and crest K reporting, detailed gradeline info including grades on bridge, and approximate cut/fill volume calculations.

Bridge Elevation View Plotting Tool :

This tool plots a bridge elevation view based on input channel cross sections, bridge opening geometry, and rock protection data.

Bridge Fill Plotting Tool :

This tool plots geo-referenced bridge fill extents in plan view, based on bridge layout data and ground elevation DEM. Plots can be exported to Global Mapper for evaluation.

RPW Bridge Fill Plotting Tool :

This tool plots geo-referenced bridge fill and rock protection extents for headslopes and guidebanks. Plots can be exported to Global Mapper for evaluation. Rock volume calculations are included.

Profile Digit :
This tool facilitates digitization of graphic images based on calibrated points. Uses include extracting cross section data from bridge drawings.

Bridge HAT :

This tool prepares geo-referenced simple and spiral curve layouts between two specified tangent lines for given parameters (R,A). Output can be exported for use in Global Mapper.

Tools\Planning\ Hwy Lookup sub-folder :

This folder contains 2 tools to lookup Hwy CS and STA for a given point and present the profile with curve data (grade, K). The **RT** version works in real-time when connected to a GPS unit. The **Desktop** version can look up Hwy data based on geographic coordinate, specified CS and STA, or bridge file number. The RT version uses GPSBabel to read from a Garmin USB GPS and output to a file (GPSBabel files included – v1.3.4).

Presentations Folder :

This folder contains several PPT files related to bridge planning. The **"2008 Seminar"** sub-folder contains copies of the material presented. The Culvert Installation Video file (CIV.wmv) is also in this folder (linked from AT Bridge WWW page).