

# CIS Util Volume Tab Help

## Overview

The CIS Util volume tab was developed to provide calculated traffic volumes as an alternative to the traffic volumes provided by the Collision Information System (CIS). CISutil uses the same source volume data as CIS, but can produce results in situations where CIS does not

It was developed primarily for the following reasons: (See Jira issues CIS-197, CIS-198 for details)

- Situations were discovered where CIS was producing incorrect volume results, primarily when the specified section spanned multiple nodes. This was confirmed by manually calculating the results using the algorithm described in CIS help (see Algorithm below).
- CIS is unable to produce volume results if the Uniform Traffic Volume Sections (UTVS) change within the queried date range.
- When the UTVS change within the queried date range, the CIS Volume Data Extract produces volumes separately for each distinct UTVS year-span, resulting in overlapping sections. Where old and new UTV sections overlap, CISutil treats the overlap as a separate section and produces a single calculated volume.

## Usage

### Section Definition

**Start Segment** – Required – The first segment in the search path.

**End Segment** – Optional – The end segment in the search path. If omitted, will default to the start segment.

**Start Km** – Optional – The starting kilometre point of the starting segment. If omitted, will default to 0.

**End Km** – Optional – The ending kilometre point of the ending segment. If omitted, will default to the End Segment length.

### Date Range

The user must enter a Start Date and End Date in format <yyyy-mm-dd> between 1987 and the latest year of volume data in the LKI Version. This determines the date range for which volume data is queried.

### Month Range

The user must specify a numeric month range for which volume data is queried. Numbers 1 thru 12 represent months January thru December. A month range spanning December-January is allowed.

The results will then reflect only the selected months, within the date range.

For example:

- Months From 4 to 8 will provide data from April thru August.
- Months From 10 to 2 will provide data from October thru February.

## Search Path Source

A volume calculation requires the user to choose a search path source. The search path is the ordered list of segments and nodes from the Start Segment / Start KM to the End Segment / End KM.

The search path can be defined either by the Landmark Kilometre Inventory (LKI), or a CIS Subset History.

LKI Search Path:

- Defined in the LKI (of the specified LKI version)
- For details, see topic **LKI Segment Search Sequence** in CIS Help

CIS Subset History search path:

- Defined in a CIS collision subset history, such as in a Specified Sections Analysis
- A full file name must be defined in the Volume tab 'Full File Name' box

## Output

After clicking 'Run', summary results for the entire section will be shown in the Status box, with detailed results in the selected format being written to the specified Output File, in the specified Output Folder.

### Output Format – By UTVS

'By UTVS' format breaks down output data rows by each possible UTVS within the date range. This means that if the UTV sections change between years in the date range, they are broken down into sub-UTV sections to allow for volume calculations across the date range. Each row of data represents data across the entire date range.

For example, Segment 0380 in years 2002 and 2003:

2002 UTVS	2003 UTVS	'By UTVS' Output Format
0.1 → 2.5	0.1 → 2.9	0.1 → 2.5
2.6 → 4.7	3.0 → 4.8	2.6 → 2.9
		3.0 → 4.7
		4.8 → 4.8

### Output Format – By Year / UTVS

'By Year / UTVS' format breaks down output data rows by each UTVS in each year.

## Notes on Missing Data

-‘-1’ is returned if any MADT is missing in the specified range

-‘gap in UTVS’ is printed if there is a gap in UTVS coverage

## Algorithm

The following algorithm, extracted from CIS Help, was used to produce volume results in CIS Util. It is also how the Collision Information System ‘should’ be calculating traffic volumes.

### Calculating lengths of sub-segments and nodes

To calculate the length of a section, CIS must add up all the sub-segments and nodes between the start and end point of the section. Nodes are given a length of 0.1km, which means that segments must start at 0.1km and end at  $\text{SegLength} - 0.1$ .

All UTVS StartKM/EndKM records for a segment are offset from each other by 0.1km to prevent overlapping.

This means that, when calculating lengths of sub-segments, 0.05km must be added to each end of each UTVS to account for 100m gaps.

### Internal Sub-Segments - Volume Algorithm

An “internal sub-segment” is any contiguous part of an LKI Segment which does NOT include a Node.

Given:

- LKI segment number
- start and end km of the sub-segment
- start and end dates
- a month range (which may span the year end)

For each year in the date range:

For each UTVS spanned (fully or partially) by the sub-segment in that year, obtain:

**K** - the length (in kms) of the portion of the UTVS which is in the sub-segment.

For each MADT which is in the year, the date range, and the month range, obtain:

**V** - the MADT

**D** - the number of days which are in the month (and in the date range),

Accumulate  $V * D$  in **total\_VD**, and **total\_D**

Endfor

$\text{VDK} = \text{total\_VD} * K$

Accumulate totals in Total\_VDK, Total\_DK

Endfor

Endfor

To check to see if any MADTs were missing, or any length not covered by UTVSs, we calculate:

L - the length of the sub-segment

N - the number of days in the date range

$\text{Complete\_DK} = N * L$

If  $\text{Total\_DK} < \text{Complete\_DK}$ , then the MADT coverage was incomplete, so return zero (No Volume Available)

The Total Volume – the total number of vehicles which (theoretically) drove from one end of the sub-segment to the other, in the date and month ranges – is calculated as:

$\text{Total\_Volume} = \text{Total\_VDK} / L$

(Total\_Volume has units of “vehicles” because V represents vehicles PER DAY. The units of K and L are kms, so they cancel. D in VD cancels the PER DAY, leaving Vehicles.)

The Average Daily Traffic (ADT) over the whole date range and subsegment can then be calculated by dividing the Total Volume by the number of days in the date range.

$\text{ADT} = \text{Total\_Volume} / N$

ADT and Volume are normally reported as integers, so, finally:

$\text{int\_ADT} = \text{Round}(\text{ADT})$

$\text{int\_Total\_Volume} = \text{int\_ADT} * N$

## Node - Volume Algorithm

Given:

- an LKI Node name
- start and end dates
- a month range (which may span the year end)

Obtain all the MADTs for the node in the date range.

For each MADT which is in the date and month range, obtain:

V - the MADT

D - the number of days which are in the month

$\text{VD} = V * D$

and accumulate the totals in Total\_VD and Total\_D

Endfor

Calculate:

$\text{ADT} = \text{Total\_VD} / \text{Total\_D}$

$\text{int\_ADT} = \text{Round}(\text{ADT})$

$\text{int\_Total\_Volume} = \text{int\_ADT} * N$

... where N is the number of days in the date and month ranges.

## Section of a Search Path – Volume Algorithm

### Introduction

The ADT of a Section is calculated as the length-weighted average of all the ADTs of the sub-segments and nodes which comprise the Section.

A “Section” in this context:

- is any part of the Search Path.
- may be a single node, a single non-node location, an internal sub-segment, or it may span one or more nodes and segments.
- is defined by a start location and an end location (each defined as an LKI segment and kmmark).

A "sub-segment" in this context is an internal sub-LKI-segment, that is, a contiguous part of an LKI Segment which does not include the LKI Segment's start or end node.

### Algorithm

For each search path element completely or partially in the Section:

For search path element type:

Seg: get the sub-segment Volume of the part of the search path sub-segment which is inside the Section

Node: get the Node Volume

Accumulate (using Length = 0.1 km for a node):

Total ADTK = ADT times Length in km (0.1 km for a node)

Total\_K = Length

Calculate:

$ADT = Total\_ADTK / Total\_K$

$int\_ADT = Round(ADT)$

$int\_Total\_Volume = int\_ADT * N$

(N being the number of days in the date and month ranges)