

ROAD INFRASTRUCTURE
MANAGEMENT FORUM

Our Carbon Equation

Modern Tools for Modern Data Implementing the CSA

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Northland Transportation Alliance

NORTHLAND TRANSPORTATION ALLIANCE



in association with



What is Candidate Selection Algorithm - CSA

- Premise for the CSA came from the 2016 'Research Report 599 Review of the NZ Transport Agency treatment selection algorithm'
- This paper suggested improvement to the old TSA. This transpired into the development of open-source CSA Trigger logic based on TSA with improvement from report 599
- RIMS were tasked with the development and implementation of CSA
- Report 'FINAL_03July20_IDS_RIMSCSARep.pdf' published July 2020 by RIMS contains
 - The Trigger Logic, SQL scripts to extract data from RAMM and the testing results as applied to the Auckland Transport test network.

NTA – Modern Data

- NTA do not undertake Sealed Rating
- This has been replaced by LCMS cracking/pothole data along with full HSD rutting, rough, texture and Video capture
- Given the flexibility of JunoViewer we could take full advantage of the LCMS cracking/pothole data into the input file with ease
- NTA have a good coverage of Falling Weight data, CSA is built to take advantage of this form of data – one of the key improvement areas from report 599

CSA – Modern Data Minimum Standard

- HSD Rutting, Texture, Roughness
- HSD Cracking
 - LCMS or other need to ensure you have validated and understand the data
- Network Video – Priceless in so many ways
- Network and Project Level FWD
- Good Pavement and Surfacing maintenance data
- Surfacing data accurate
- Traffic ADT/ONRC accurate – Roughness trigger impact
- Treatment Length segmentation

CSA - Under the Hood

- Understand the SQL and how data is extracted from RAMM
 - Check SQL select criteria against DB. To ensure all data available has been extracted
- Run the SQL dump into spreadsheet and just check through the data being created
 - Do some checks against DB for numbers in the Output file (CSA_TL_V0) . Being open source, you can alter the SQL to gather more data as it represents key characteristics of your network or service approach

CSA - Under the Hood

- Do the normal data backfill in the output file e.g. missing surface attribute. Critical ones are
 - Surface Dates, material, function, top surface life
 - Condition Defaults where none exist
- Working through this process will provide better understanding of the data being used and the CSA Trigger Logic
- Taking ownership of the Data and what is being used is key in this process

Techo Stuff - CSA

- Use of SCI seems surplus in the trigger logic
- FWD - Radius of Curvature (RoC) trigger was driving a lot of Rehab. Revised to trigger to use curvature (D0-D200)
- Need to consider the use of the Rutting trigger dependent on whether this is HSD Rutting or Manual Rating data
- Roughness was main trigger for Rehab,
 - Short lengths especially,
 - Urban high-volume rough roads triggered Rehab – needs consideration
- Surface triggers worked well with the LCMS data
- Resurface Next Time – None triggered in the outputs

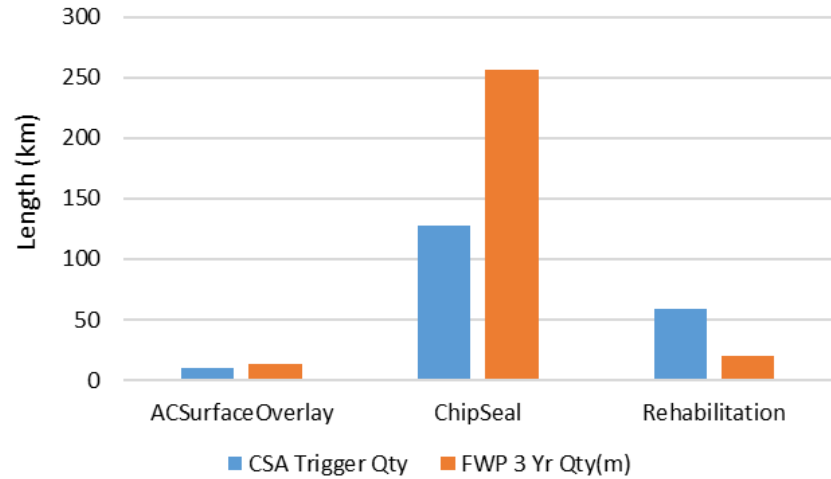
Can a mere mortal RUN CSA? Or an Engineer!

- It will take several skill sets.
 - An understanding of your RAMM database and how it works
 - An understanding of SQL statements in general
 - An understanding of the network being modelled (very important)
 - Ability to manipulate data both in SQL and Excel to make the process efficient and to get a deeper understanding of the data
- It may be that this comes from several people with specific skills in these areas

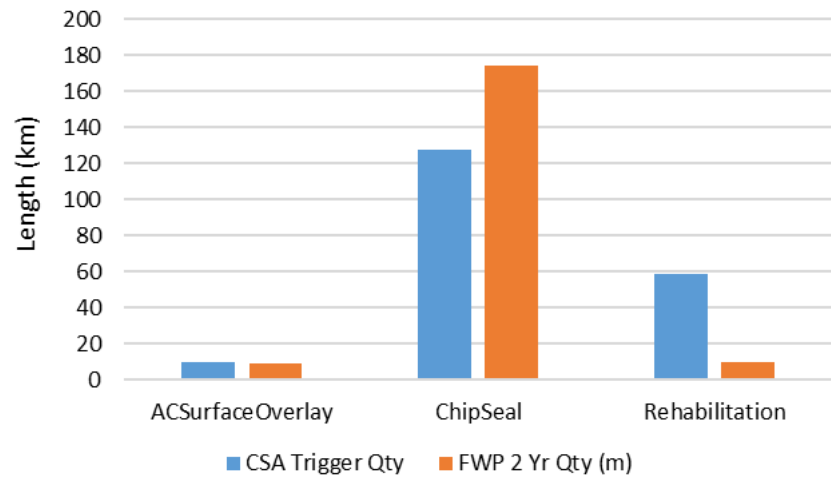
How Open Source is CSA

- Getting Data out and prepping to run is straight forward
- You will need to create the Trigger Logic in a tool of some sort.
 - I understand dTIMS has been coded with CSA Trigger Logic
 - CSA Logic could be coded into a Spreadsheet
 - Could be coded in SQL if you had the right skill set or similar tool
 - Coded into other AM tools like JunoViewer that allow this
- This make the CSA as it stands very flexible based on the chosen environment to create the trigger logic

CSA Quantity vs. 3 Year FWP Quantity



CSA Quantity vs. 2 Year FWP Quantity



NTA Output CSA vs. FWP

- Compare 2 & 3 Year FWP
 - CSA Rehab High
 - High Urban Roughness and ADT/ONRC
 - Short lengths high Roughness
 - Good outcomes Rutting, FWD
 - CSA ChipSeal Low – FWP more risk-based treating with Pre-seal and resurface
 - CSA Thin AC – reasonable fit with FWP quantities

Treatment Category	CSA Qty(m)	FWP 2 Yr Qty (m)	FWP 3 Yr Qty(m)
ACSurfaceOverlay	9668	9327	12867
ChipSeal	127233	174571	256891
Rehabilitation	58487	10281	19757
Tota	195388	194179	289515

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Site Selection CSA vs. FWP

- Urban Roads High ADT and Rough

The screenshot shows a web browser window displaying a map application. The browser's address bar shows the URL: `secure.junoviewerweb.com/pages/mainViews/networkMapV2.aspx`. The browser's bookmark bar contains various sites like Banking, Brewing, Water Weather Surf, Commercial, Music, NZTA, WAGs, ONRC, Travel, WDC, NTA, JunoViewer, Google, Netflix, Login - Dropbox, 365 Sign in to your..., google - Google Se..., Home - Dropbox, and Other bookmarks. The map application interface includes a left-hand sidebar with the following sections:

- Network**: Whangarei DC
- Sections**: Search box and a list of checked sections: A-F - AARTS PL, A-F - ABBEY CAVES RD, A-F - ABBOTS WAY, A-F - ABRAHAM ST, A-F - ADAMS PL, A-F - ADAMS RD, A-F - ADDISON RD, A-F - ADMIRAL WAY.
- Plot Sections**: Toggle switch (off).
- Enable FWP**: Toggle switch (on).
- FWP Version**: WDC_CSAV0_VII
- FWP Alignment Version**: Toggle switch (off).
- Show FWP by:** Category (checked), Type, Year.
- Select FWP data from:** 4 selected.
- Category**: Rehabilitation (checked).

The map displays a network of roads in Whangarei, DC. Red lines indicate road sections requiring rehabilitation, while green lines indicate sections with ACSurfaceOverlay. A dialog box titled "Select Layers to plot on the map" is open, showing the following layers:

- General Layers**: Accidents, Notes, Photos, FWP (selected), Maintenance.
- Video Layers**: Video.

A "Layer Info" panel for "FWP (info)" is also visible, displaying the following details:

Section Name	MAUNU RD
Location	22-537
FWP Version	WDC_CSAV0_VII
Lane	all
Area Group Name	WDC_15244_WOODHILL
Area Name	1223-MAUNU RD-FR22-TO537
Treatments XML	2022 - Rehab
Naasra 90th	313.5
Accidents Count	38
Surfacing Date	24-Mar-2013

A legend in the bottom right corner identifies the colors: Red for Rehabilitation and Green for ACSurfaceOverlay.

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Site Selection CSA vs. FWP

The screenshot displays the JunoViewer web application interface. On the left, the 'Network' sidebar shows a tree view for 'Whangarei DC' with sections like 'maun'. The 'Plot Sections' are visible, and 'Enable FWP' is turned on. The 'Show FWP by:' section is set to 'Category', and 'ACSurfaceOverlay' is selected. The main map area shows a street network with a red line indicating a selected route. A 'Select Layers to plot on the map' dialog is open, showing 'General Layers' (Accidents, Notes, Photos, FWP, Maintenance) and 'Video Layers' (Video). A 'Video (info)' popup is also visible, showing details for video 1223B1R1_ROW_WDC_2020-21_HSD. On the right, the 'Video and Strip View' panel shows a video player and a 'Strip View' graph. The graph displays 'FWD Curvature' and '100m rough' data points along the route.

Stationing	101	151	201	251	301	351	401	451	501	551	601
100m rough	222.0	129.0	158.0	...	85.0	76.0	119.0	89.0	70.0		

Site Selection CSA vs. FWP

JunoViewer - Virtual FIT | Asset

secure.junoviewerweb.com/pages/mainviews/customviews/VirtualFieldInspectionTool_V3.aspx#

Banking Brewing Water Weather Surf Commercial Music NZTA WAGs ONRC Travel WDC NTA

JunoViewer NTA Analyse FWP Modelling Manage Tools

Section: Whangarei DC, L-P - MAUNU RD, From 22 to 120, All

Video Lane: L1 Video: MAUNU RD 2-820.L1 Oct-2

WDC_fwp_MSTR (ALL)	TAC-22/23, TAC-...	STAC-21/22, TAC-22/23		TAC-21/22, TAC-22/23			
WDC_CSAVO_VII (ALL)	Rehab-22/23		Rehab-22/23				
FWD D0 90th	694		576		432		
Curvature	159.9	101.0	127.1	105.6	148.9	67.1	97.7 38.2 0
Rut in LWP 90th	11.1		6.0		5.9		
Naasra 90th	230		165		148		
Roughness IRI 90th	6.7		6.4		5.6		
Texture LWP Mean 90th	1.96		1.96		1.00		

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Virtual FIT Video - JunoViewer Web - Google Chrome

secure.junoviewerweb.com/pages/mainviews/customviews/fullPageVideoPlayer.aspx?VM=0&VCM=1

Switch to panel

Survey ID: 00290_VI_12208413
Date: 22/10/2022
Lane: 22/23/23/23/23/23
Speed: 12.1

Description: DESIGN BY: WILSON HULLS CIV
Survey Start: 9
Start: 0.00000000
End: 100.1

Direction: Inc
Alt: 177.0
Ch: 120.1

319

01:20 / 03:38

Virtual FIT Map - JunoViewer Web - Google Chrome

secure.junoviewerweb.com/pages/mainviews/customviews/fullScaleMap.aspx

Switch to panel

How Does CSA and TSA Compare

- CSA Not as simple to use – Not a User plug and play like TSA
- Building Logic from scratch will require effort
- Forces users to look carefully at data being extracted for use
- Flexibility; introducing more data as required and building triggers, good and bad

Carbon Question

- Better up-front decision-making results in less wasted effort e.g.
 - Site assessments, design input where site may not be required
- Programmes still require onsite validation – but with more desktop validation this can reduce onsite visits

Why JunoViewer

- Part of the NTA Tactical/Operational tool-box
 - Video Analysis, Short to Medium term decision making, FWP Site validation
- Lonrix did the heavy lifting to code the Logic for JunoViewer
- Easy to understand Logic and setup
- Access to tweaking logic/triggers to take account of our network characteristics
- Ease of Adding further info to the input file for individual reporting
- Quick data extract and programme analysis
- Virtual Fit tool to review sites
 - Excellent Condition data Visualisation to assess site deterioration
 - Hours of historical video to support condition data
- For Example ability to add Policy decisions into the Logic AC vs. chip seal replacement

CSA - Is it Good to Go

- Overall; a good step forward as the Industry and data is changing rapidly. CSA open-source nature allows industry to move with this change
- It would appear to be working in terms of its intent as short-term site selection tool
- Given the NTA condition data the CSA is good fit to take full advantage of this data
- CSA will be a key component in the tool-box for our evidence base
- However, what are the expectations from Investment partners? Who owns the tool and is looking after change/implementation?

Opportunities For Improvement

- Development of Training/User Documentation based on user cases/Industry training
 - Explanation on Key Data Attributes and how these impact Trigger Logic
 - Explanation of the SQL in full to allow people to upskill
- Introduce Treatment Unit Costs as per TSA
 - NTA have introduced this as part of JunoViewer setup
- Introduction of temporal logic based on simple prioritization / ranking process to spread treatments over a 3-year planning horizon