LCAP is a tool designed to determine the available traffic capacity under freeway work-zone operations and to estimate the resulting queues from candidate work-zone schedules.

Developed by University of Maryland and MDOT SHA
LCAP: Basic and Pro

Two versions are available:

- **LCAP-Basic**: provides users a tool for quick estimation of the queue/delay caused by freeway work-zone operations using a capacity estimation model from HCM 6th Edition.

- **LCAP-Pro**: integrates a microscopic simulation module (i.e., TSIS-CORSIM), which can estimate the impact of the work-zone with consideration of various factors, including complex geometry features, drivers interaction to work-zone warning signs, and traffic conditions.
System Framework

**Input Module**
- Demand Information
- Truck Distribution
- General Geometric Information
- Advanced Geometric Information (LCAP Pro)

**Estimation Module**
- Model-Based Estimation of Available Capacity (LCAP Basic)
- Simulation-Based Estimation of Available Capacity (LCAP Pro)

**Output Module**
- Time-Varying Distribution of Delay / Queue Information
- Detailed Comparison of Multiple Scenarios
Users can quickly obtain an estimate of the available capacity for a typical freeway work-zone configuration and evaluate the resulting traffic queues.

Introduction of LCAP Version 1.3_Basic

Overview
LCAP is a lane closure analysis program developed for the State of Maryland for estimating the impacts of lane closures and determining the best lane closure schedules with its friendly interface.

This program was developed by the University of Maryland under the contract to the Maryland Department of Transportation State Highway Administration.

Operation Instruction
Step 1. Create a new project file or load information from an existing file.
Step 2. Input demand information for the work-zone link and the traffic composition if available.
Step 3. Provide basic work zone information, including criteria for evaluation and comparison. The user can view results of the queue (or delay) analysis on the screen and print reports.
Step 4. Save the file. Be sure to use the "Save Case" button in the main interface to save the project, instead of using any saving function from the menu bar.

January 2019 Updates
2. Added input boxes for geometric conditions and HCM model parameters.
3. Added a notification to users to show the currently applied model.
4. Allowed the number of open lanes to be equal to that of total lanes to indicate shoulder only work zone.
Input Module (LCAP – Basic v 1.3)

- Hourly volume
- Truck percentage
- PCE value

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Estimation Module (LCAP – Basic v 1.3)

- Output type
- Lane closure condition
- Geometric condition
- Estimated capacity
- Options (input/output display, comparison)
Estimation Module (LCAP – Basic v 1.3)

Please select the below model for determining the work zone capacity. More models are to be integrated in LCAP.


- Percentage drop in pre-breakdown capacity of the work zone due to queuing condition (%): 13.4
- Lane Closure Severity Index (LCSI): 4
- Heavy vehicle Percentage: 5%
- Peak Hour Factor: 0.95
- Capacity: 1356 vphl

Reference for Workzone Capacity Estimation:

Work Zone Capacity (prebreakdown flow rate, Qd) is given as

\[ Q_{d} = \frac{Q_{D/5}}{100 - a_{w}} \times 100 \]

Where

\[ Q_{D/5} = \text{average 15-min queue discharge rate (pcv/ln) at the work zone bottleneck} \]

- \( a_{w} \) = percentage drop in prebreakdown capacity at the work zone due to queuing conditions (%), The average value of this in work zones is 13.8%.
- \( f_{D} \) = indicator factor for area type:
  - 0 for urban areas (i.e., typified by high development densities or concentrations of population), and
  - 1 for rural areas (i.e., areas with thinly scattered development and low housing and employment densities);
- \( f_{L} \) = lateral distance from the edge of travel lane adjacent to the work zone to the barrier, barricades, or cones (0-12 ft);

\[ LCSI = \frac{1}{f_{D} \times N_{c}} \]

where

- \( N_{c} \) = number of open lanes in the work zone (ft).
Output Module (LCAP – Basic v 1.3)

- **Input:** time, base demand, approach volume and roadway volume
- **Output:** vehicles in queue, queue length (miles) or delay (min), WZ up
- **WZ up**
  - “X” indicates that work zone is set up and in operations.
  - Help users to understand the impacts of work zone on traffic condition (i.e., queue formation)
Precisely estimate the available capacity of freeway work-zone operations on a complex roadway segment, including ramp impacts.

Embedded ability to execute CORSIM.

Perform detailed simulations of work-zone traffic conditions and compute the MOEs at a microscopic level.
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**Operation Instruction**

1. Create a new project file or load information from an existing file.
2. Input demand information for the work-zone link and the traffic composition if available.
3. Provide basic work zone information, including criteria for evaluation and comparison. The user can view results of the queue (or delay) analysis on the screen and print reports.
4. Save the file. Be sure to use the "Save Case" button in the main interface to save the project, instead of using any saving function from the menu bar.
Input Module (LCAP – Pro v 1.2)

- Hourly volume
- Truck percentage
- PCE value
Estimation Module (LCAP – Pro v 1.2)

- Lane closure condition
- Work-zone time plan
- Geometric condition
- Output type
- Options (input/output display, comparison)
Estimation Module (LCAP – Pro v 1.2)

- Allow to input detailed geometry features
  - Both before and after work zone
  - On-Ramp and off-Ramp
- Analyze using CORSIM

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Output Module (LCAP – Pro v 1.2)

- **Input:** time, base demand, approach volume and roadway volume
- **Output:** vehicles in queue, queue length (miles) or delay (min), WZ up
- **WZ up**
  - “X” indicates that work zone is set up and in operations.
  - Help users to understand the impacts of work zone on traffic condition (i.e., queue formation)
Summary

LCAP

- User friendly interface
- Help perform a quick analysis on freeway work zones
- Capable of running CORSIM with simple data input
- Capable of improving for any changes
  - Car following factors, rubber necking factors
- Capable of capturing impacts from ramps
THANK YOU!

For questions or technical support, contact us at ATTAP@umd.edu.

ATTAP research team
http://attap.umd.edu