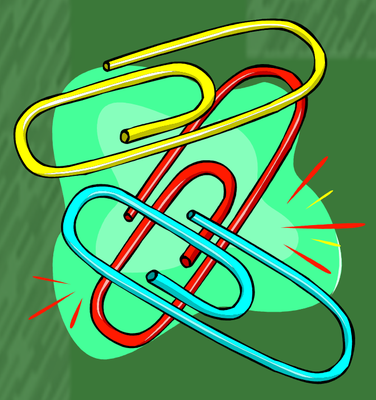
RoadPE: LHI

Thickness Design of Low-Volume Road Pavements

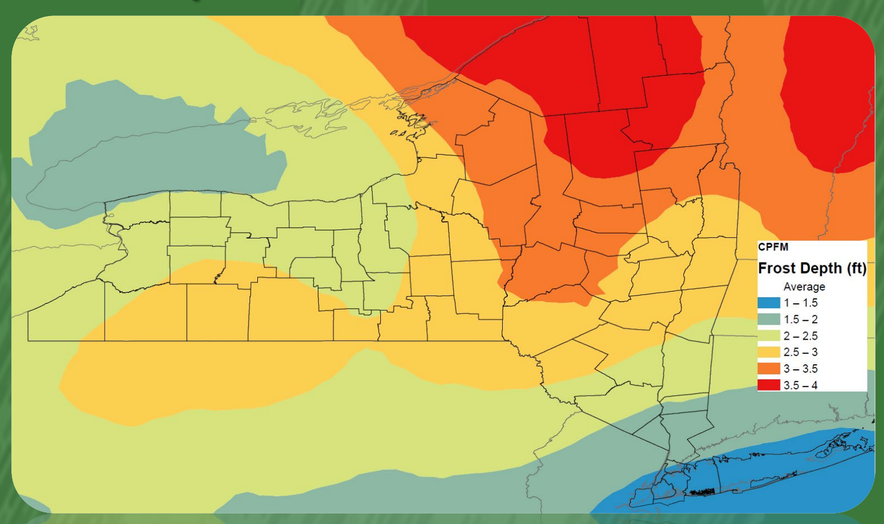
US DOT Region 2 University Transportation Center

---technology transfer of research to practitioners---



Need for Low-Volume Roads (LVR)

- Most LVR pavements are not designed
- LVR managers need a design tool that:
  - Considers local knowledge and experience
  - Uses modern mechanistic-empirical (fatigue-based) design
- Inputs are easily obtainable or precalculated
  - Such as frost depth
  - While setup for NYS easy to build data for any location



Frost depth map *RoadPE: LHI*

Straightforward process!

Check Existing

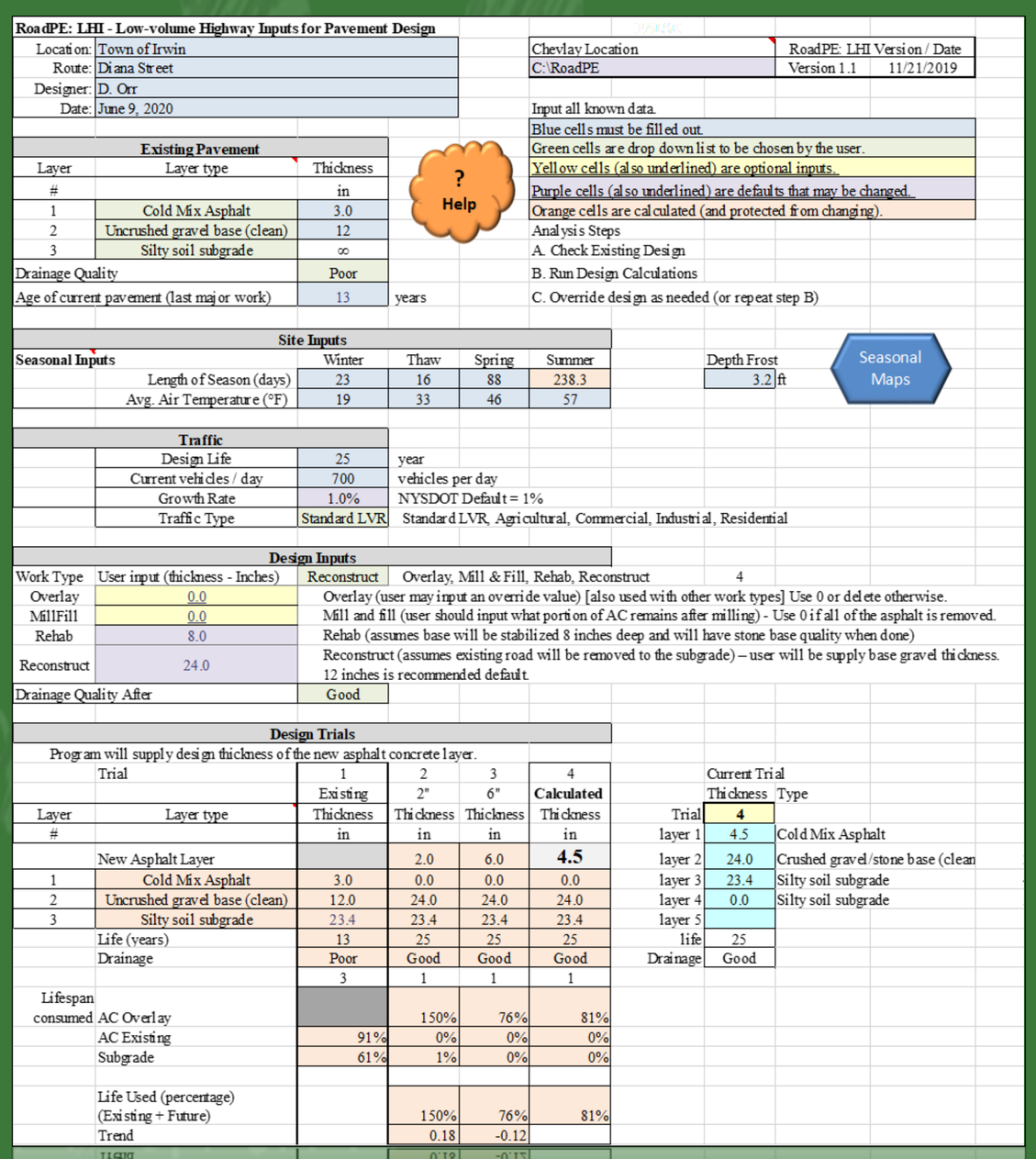
- Obtain inputs for existing highway
- Determine remaining life

Run Design

- Decide Work Type
  - Overlay
  - Mill & Fill
  - Rehabilitation
  - Reconstruction
- Choose design life
- Design asphalt thickness

Tweak or One Step

- Design set to closest $\frac{1}{2}$ inch
- Can … check each step
- … review all calculations
- … tweak design



RoadPE: LHI - Low-volume Highway Inputs for Pavement Design

Location:	Town of Irwin	Chevlay Location	RoadPE: LHI Version / Date
Route:	Diana Street	C:\RoadPE	Version 1.1 11/21/2019
Designer:	D. Orr		
Date:	June 9, 2020		

Input all known data.
Blue cells must be filled out.
Green cells are drop down list to be chosen by the user.
Yellow cells (also underlined) are optional inputs.
Purple cells (also underlined) are defaults that may be changed.
Orange cells are calculated (and protected from changing).
Analysis Steps
A. Check Existing Design
B. Run Design Calculations
C. Override design as needed (or repeat step B)

? Help

Existing Pavement

Layer #	Layer type	Thickness in
1	Cold Mix Asphalt	3.0
2	Uncrushed gravel base (clean)	12
3	Silty soil subgrade	∞
Drainage Quality		Poor
Age of current pavement (last major work)		13 years

Site Inputs

Seasonal Inputs	Winter	Thaw	Spring	Summer
Length of Season (days)	23	16	88	238.3
Avg. Air Temperature (°F)	19	33	46	57

Depth Frost 3.2 ft

Seasonal Maps

Traffic

Design Life	25	year
Current vehicles / day	700	vehicles per day
Growth Rate	1.0%	NYSDOT Default = 1%
Traffic Type	Standard LVR	Standard LVR, Agricultural, Commercial, Industrial, Residential

Design Inputs

Work Type	User input (thickness - Inches)	Reconstruct	Overlay, Mill & Fill, Rehab, Reconstruct 4
Overlay	0.0		Overlay (user may input an override value) [also used with other work types] Use 0 or delete otherwise.
MillFill	0.0		Mill and fill (user should input what portion of AC remains after milling) - Use 0 if all of the asphalt is removed.
Rehab	8.0		Rehab (assumes base will be stabilized 8 inches deep and will have stone base quality when done)
Reconstruct	24.0		Reconstruct (assumes existing road will be removed to the subgrade) – user will be supply base gravel thickness. 12 inches is recommended default.
Drainage Quality After		Good	

Design Trials

Program will supply design thickness of the new asphalt concrete layer.

Layer #	Layer type	Trial 1 Existing Thickness in	2 2" Thickness in	3 6" Thickness in	4 Calculated Thickness in
	New Asphalt Layer		2.0	6.0	4.5
1	Cold Mix Asphalt	3.0	0.0	0.0	0.0
2	Uncrushed gravel base (clean)	12.0	24.0	24.0	24.0
3	Silty soil subgrade	23.4	23.4	23.4	23.4
	Life (years)	13	25	25	25
	Drainage	Poor	Good	Good	Good
		3	1	1	1
Lifespan consumed	AC Overlay		150%	76%	81%
	AC Existing	91%	0%	0%	0%
	Subgrade	61%	1%	0%	0%
	Life Used (percentage) (Existing + Future)		150%	76%	81%
	Trend		0.18	-0.12	

Current Trial	Thickness	Type
Trial	4	
layer 1	4.5	Cold Mix Asphalt
layer 2	24.0	Crushed gravel/stone base (clean
layer 3	23.4	Silty soil subgrade
layer 4	0.0	Silty soil subgrade
layer 5		
life	25	
Drainage	Good	

Screen shot from Excel-based *RoadPE: LHI*

Try it Yourself!

https://www.clrp.cornell.edu/researchprojects/RoadPE_LHI.htm

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