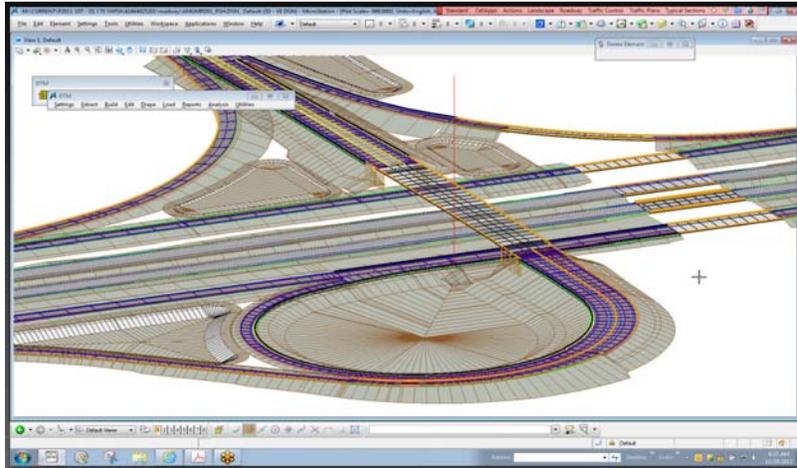


3D Design Overview



It's Not New

- These are some of the projects we've assisted with:
 - SR200 /US301 near Baldwin, Horizon - D2
 - US90 Hurricane Creek, CO Design - D3
 - I-4 at SR46 near Lake Mary, Horizon - D5
 - SR30/US98 in Destin, Michael Baker – D3
 - US90 Mahan Drive Michael Baker – D3
 - I-10 Resurfacing Analysis near Marianna– D3
 - I-75 at SW International Airport, C3TS – D1
 - SR 485 (Powerline Rd.) 3R – D4
 - I-75 Griffin Rd. Interchange – D4
 - SR 435 John Young PB – D5

What are those doing it saying?

- ◆ “I won’t do another project with “criteria,” it’s a much better way to do design”
- ◆ “I use the Corridor Modeling tools to check all of our project plans for errors”
- ◆ “We have reduced check plots! Designers/engineer’s come to my machine to evaluate right from the screen”
- ◆ “I can evaluate design changes easier and make better decisions much quicker ”
- ◆ “The Roadway Designer / Corridor Modeling tools can be used as a design aid to help find design conflicts and assist the engineer correct issues that otherwise would not get noticed in 2D”



Why aren't we there already?

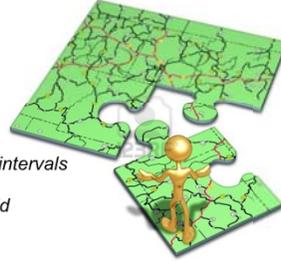
- ◆ FDOT has been depreciating Surveying activities over the years (i.e. 1000' cross sections) to save preconstruction cost.
- ◆ Most designers still using 2D design tools and techniques - 3D design is relatively new and Designers need to invest in training
- ◆ Reluctance to provide electronic survey and design data with contract documents (a question of accountability and liability?) – this is changing
- ◆ Fear of misuse or misapplication – FDOT has developed legal language to address this, but at some point anticipate Signing and Sealing of data will need to be addressed more comprehensively
- ◆ Current plans are 2 dimensional, easily understood by laymen, and leave a paper trail



Limitations of 2D Plans

Plan Information is Limited

- ✓ Typical Section, Plan (Top View), Cross Sections at specific intervals
- ✓ Plans provide Project puzzle pieces for the Contractor to build



Crossing details are not defined well

- ✓ How do side slopes tie at Intersections, Driveways, Bridges, Canals, Railways, etc.

Constructability, Operations & Sequencing *not modeled in 2D well*

- ✓ 3D Design can also help promote 4D (schedule) and 5D (cost) modeling as alternatives can be collaboratively examined

Utility Conflicts

- ✓ clash detection are difficult to visualize

Visualization, Rendering, Animation *not available*



What does the contractor do with the 2D plans?

- ◆ Generate Geometry & Section reports for Stakeout
 - Trace or digitize cross sections to get earthwork
 - Create a model from 2D Plans to attempt machine control
 - Construction Sequencing and Scheduling
- ◆ A LOT OF EXTRA WORK = \$\$\$!

Estimated service fees for these just surface modeling conversions:

- ✓ \$500 EOP to EOP, per driving lane mile
- ✓ \$750 TOE to TOE, per driving lane mile
- ✓ Additional expenses for ramps and intersections

(Source – <http://www.takeoffpros.com>)

The Designer has the ability to provide the model more effectively !



Why would the contractor spend money to model 2D plans?

◆ Significant productivity increases.

- ✓ Productivity improved by up to 50%
- ✓ Survey costs cut up to 75%
- ✓ Reduced equipment, idle time and Less rework
 - reduces fuel consumption and greenhouse gas emissions by up to 40 percent



FHWA – Every Day Counts - Three-Dimensional Modeling:
http://www.fhwa.dot.gov/everydaycounts/edctwo/2012/pdfs/edc_3d.pdf



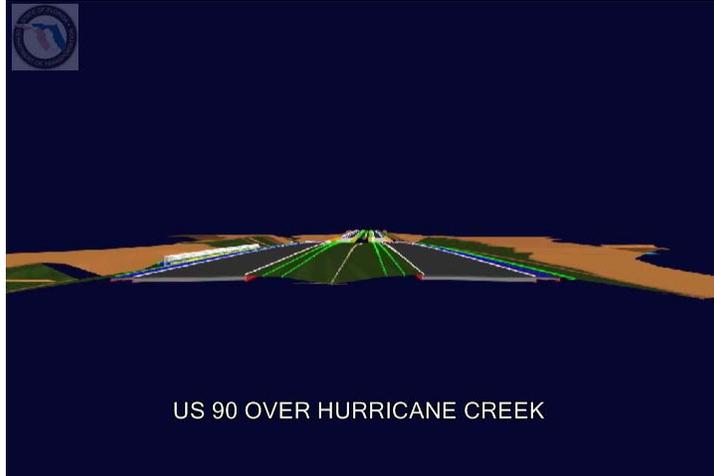
Engineering and Modeling in 3D

◆ Advantages

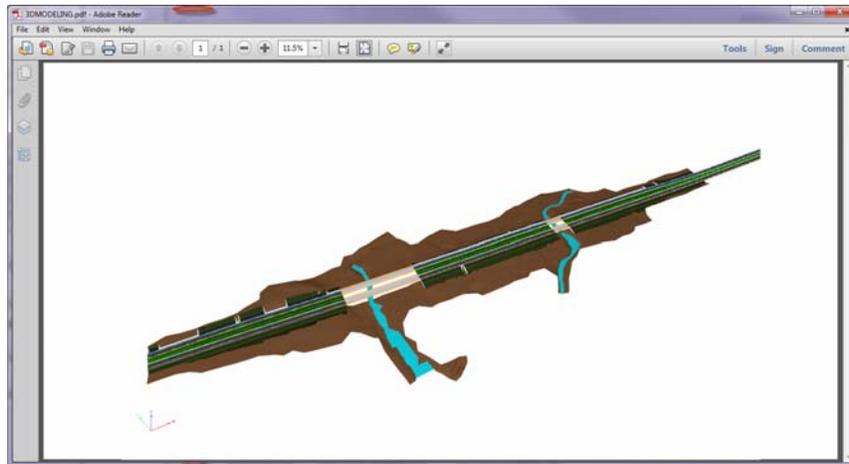
- ✓ *Easier to evaluate design alternatives*
- ✓ *Better quality control, identify conflicts early*
- ✓ *Immediate visualization*
- ✓ *Good for public understanding*
- ✓ *Generate Automated Machine Guidance (AMG) information for construction*
- ✓ *Virtual computer model helps determine constructability*
- ✓ *Modeling and modern software tools enable agile Construction Integrated Management (CIM) where 4D (Schedule) and 5D (Cost) can also be integrated and managed*



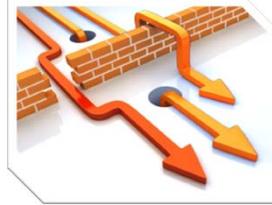
Visualization



3D PDF



Obstacles for 3D Design



- ◆ 2D Mindset
 - ✓ “We’ve always done it that way.”
 - ✓ Many Policies, Procedures and Manuals are written for 2D workflows.
- ◆ Better Surveys Required
- ◆ Training Commitment Required
 - ✓ Funding must be committed.
 - ✓ Personnel must be dedicated.



Keys to 3D Modeling Success

- ◆ Start with best 3D survey data available
- ◆ Plan the work – (limits, participants, namespace, etc.)
- ◆ Build the design from the simple concept, then add to and refine the design over the design lifecycle
- ◆ Communication between the FDOT, the Designer and the Contractor – may effect corridor frequency and model refinement needed (not building Swiss watches, but need to model “just enough”)
- ◆ Keep model and 2D plans coordinated and updated



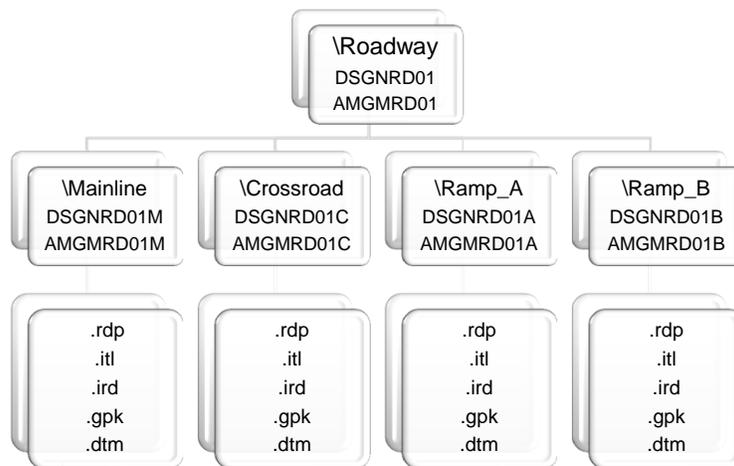
◆ Checks between model, plans, and the real world

Planning the Work

- ✓ TIN size
 - Larger tin files may need to be split-out
 - Split-out tin files will require divided corridors
 - Smaller tin files may need to be combined
 - Trail and error with the Roadway Designer dialog
 - Roadway Designer performance
- ✓ Potential # of designers on project
 - Determines # of project sub-folders
- ✓ Substantial Length of Corridor
 - Determines potential # of corridors within a project



Planning the Work Example: Multi-user Project file setup

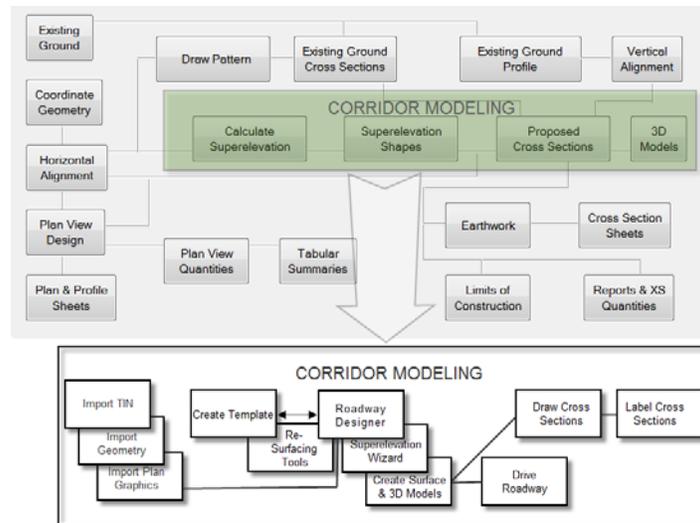


What do I Need to Get Started?

- ◆ A project with a reasonable schedule.
- ◆ Existing Surface (DTM)
- ◆ Baseline
- ◆ Proposed Profile
- ◆ Typical Section

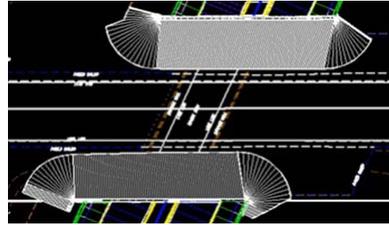


Workflow



It's a Design Tool

- ◆ Let the model help with the decisions.
 - ✓ Grading around bridge abutments
 - ✓ Drainage pipes and structures
 - ✓ Placement of Walls
 - Length
 - Profiles
 - ✓ Profile adjustments
 - Reduce earthwork
 - Improve drainage
 - Intersections and curb returns



What are the risks?

- ◆ Learning curve, Fear of the unknown, Biting the Bullet (commitment)
- ◆ Initial Loss of productivity (proficiency), Assuming problems, Can I risk investment in new technology or training?
- ◆ Technology - Workflow will change (we've always done it this way)



When will a model be required?

A goal of December 2014 has been set.



Even if you're on the right track, you'll get run over if you just sit there.
-Will Rogers



Every Day Counts

- ◆ FHWA and FDOT have been working together to develop an implementation plan.
- ◆ An implementation plan has been developed and is underway.
- ◆ Timeline of the plan goes through December 2014.



Available Learning Resources

- ◆ FDOT Course Guide
<http://www.dot.state.fl.us/ecso/downloads/documentation/FDOTCorridorModeling/FDOTCorridorModeling.shtm>
- ◆ Virtual CADD Academy Training Sessions
<http://www.dot.state.fl.us/downloads/documentation/GoToMeetingTraining/GoToMeetingWebinars.shtm>
- ◆ Webinars
<http://www.dot.state.fl.us/ecso/downloads/clips/Files/CorridorModelerWebinars.shtm>
- ◆ FLUG
<http://www.flugsite.com/>
- ◆ FDOT Design Expo
<http://www.dot.state.fl.us/structures/DesignExpo2012/>
<http://www.dot.state.fl.us/structures/DesignExpo2013/>



In Summary, Why Use 3D Design?

- ◆ You will get a better design.
 - ✓ Visualize you project at any stage
 - Your not just seeing every 50', 100' or 300'
 - ✓ Identify problems earlier
 - Geometric errors and omissions are more recognizable
 - Fewer revisions
 - ✓ Easier to find cost savings
 - ✓ Improved communication of design concept
 - Generate Videos and Pictures for Public involvement
- ◆ Construction Cost Savings
 - ✓ Survey Fuel, Time



Questions

- ◆ Questions, comments, or suggestions can be sent to ecso.support@dot.state.fl.us.

