

FAQ: UDOT IN 3D

UDOT CONTACT:

George Lukes

Standards & Design Engineer

801 965-4986

glukes@utah.gov

UDOT is moving to an all-3D environment which includes greater use of available design capabilities and an eventual move to a full 3D project workflow.

Fully embracing 3D capabilities will produce comprehensive planning, construction and design solutions that will benefit UDOT and all contract partners.

What benefits are expected to be realized by fully embracing a 3D environment?

The Transportation Research Board has found that 3D design and visualization can have a fifteen to one return on investment based on reduced change orders and construction cost savings. Generally, using 3D tools means:

- **Design verification is more effective.** Diagrams show exactly how the structure or roadway features interact with the surrounding environment.
- **Visualization is more lifelike.** Photo-realistic images, animations and diagrams that can be viewed from all angles create a precise representation of completed projects.
- **Clash detection is more easily discoverable.** The location of all known utilities can be combined into a unified view that indicates clash points.
- **Contractor interface is seamless.** UDOT 3-D designs, provided to the contractor, convey the department's requirements more effectively and eliminate the need for the contractor to recreate 3-D designs from flat diagrams. Contractors will have less work to do before construction. Ultimately UDOT will get as-built model information at the end of construction.

A photo-realistic image: UDOT built a new bridge over the Virgin River on SR-9 near Hurricane to accommodate increased traffic volume. Here, a rendered image of the new bridge is superimposed over the existing bridge, which remains in use.



What 3D tools are or will be available?

The 3D workflow environment will encourage the use of:

- Models that can be viewed from all angles in order to assess constructability
- Utility clash detection models that show a full representation of underground utilities
- Animations that can show the built project, along with expected traffic flow
- Photo-realistic images that can show the built project or show project options

3D models, animations and illustrations can help bridge the communication gaps that sometimes occur among specialties at UDOT, or between the agency and stakeholder groups, since complex engineering data is more easily understood when presented in 3D.

UDOT designers have the tools to build 3D models, photo-realistic images, animations, etc. now, although not all designers fully utilize those tools. Bentley software training for UDOT employees is offered regularly. For more information, contact Bob Peterson at 801-965-4041 or bobpeterson@utah.gov

What is a full 3D workflow?

Designers at UDOT have been working in 3D for about 20 years. Currently, when projects are advertised, 2D plan sets are made available to all bidding contractors. The contractor takes those 2D sets and rebuilds the project in 3D. That information is then used by the winning contractor for automated guidance or Automated Machine Guidance (AMG).

A full 3D workflow means that projects will be modeled and provided to contractors as a 3D engineered model at advertising. Bidding contractors will realize a big efficiency by not having to create baseline models from scratch. The winning contractor will also have UDOT's model to modify for construction. In addition, the contractor will have the model for as-built preparation at the end of construction.

The full 3D workflow will convey UDOT's requirements more effectively, and streamline work for contractors and UDOT designers. 2D plan sheets will eventually be phased out. Construction, as well as design, will work with 3D plan sets.

Cited article: Hixson III, Charles L., and Bergman Associates. "Visualization for Project Development." NCHRP Synthesis 361 Jan. 2006: 17. Print.

TIMELINE

UDOT is on the fast-track to adopting a full 3D work flow:

Full implementation is expected to be reached by the end of 2016 by following a short-term, mid-range and long-range plan. CMGC contracting will be used to engage in a full-range critical examination and dialog with a construction contractor. Feedback from UDOT and contractors during the planning process will inform the subsequent planning segment.

Short-term plan, April - December 2014:

- Provide electronic files on 10 or more projects as "For Information Only"
- Get feedback from construction crews on needs
- Get feedback from contractors for data needs
- Contractor Surveyor and UDOT Committee for construction implementation
- Use feedback to more fully inform a mid-range plan

Mid-range plan, January - December, 2015:

- Develop special provisions for file availability
- Modify AMG special provision
- Advertise some projects with electronic files as legal copy and paper copy "For Information Only"
- Continue Bentley training to more fully utilize tools
- Incorporate tools on construction side – determine how to use mobile devices in field that utilize models
- Use CMGC methods to maximize model use throughout project

Long-range plan, January - December 2016

- Advertise projects with model as legal document and paper as "For Information Only"
- Develop QC/QA for models
- Address electronic signature for models
- Address file transfer and model ownership challenges