As early as 2012, construction will begin on the Bakersfield section of the High Speed Rail. In addition to the estimated 150,000 new jobs it will bring to the Central Valley, the proposed platform and station will change the face of downtown Bakersfield. KernCOG chose to use GIS-based 3D models to interact with the public and facilitate decision-making. This presentation will highlight the steps we took to get started, and tips on how you can make your own 3D visualization project successful.
High-Speed rail currently exists in other countries, however California will be the first state in the US. Consisting of 800-miles of infrastructure and up to 24 stations, trains will travel at speeds up to 220 mph - all powered by renewable energy. It is no wonder this project has captured nationwide media coverage and has been deemed “the largest public infrastructure project in the nation”.

You can visit their website to learn more about the status of each section, or join their arcgis online group to view most recent maps.
Kern County will have more HSR infrastructure than any other county. One station in Bakersfield, 108 miles of track, 4 bridges, and 9 tunnels.

Two Heavy Maintenance Facility sites are under consideration in Kern

Last month, the federal funding is now designated for the first phase of construction to be Central Valley. As you can imagine, local leaders were very excited to hear this news. It is expected to create 16,500 construction-related jobs for the central valley.
Due to Kern’s central location, Bakersfield is known as a main transportation hub for many businesses. KernCOG is an MPO and responsible for developing and updating a variety of transportation plans and for allocating the federal and state funds to implement them. KernCOG is responsible to establish regional landuse plans, transportation planning, GIS data warehousing, and many other services for its member agencies.
All MPOs are required to comply with certain mandated requirements. Specifically, they are required to employ visualization techniques to increase public understanding of the projects.
“DESIGN VISUALIZATION” – What is it?

DESIGN VISUALIZATION is:

Use of 2-D and 3-D images to describe design ideas, solutions and options
Images can be generated using any variety of traditional and/or digital media
A tool for engaging people in decision-making
An integral part of the design process

The goal of DESIGN VISUALIZATION is to improve service to our clients.

Our objectives are:

Communication: achieve a shared understanding of issues and ideas
Team building: develop consensus
Productivity: expedite decision-making
Creativity: improve solutions
KernCOG recognized that they did not have this expertise available in-house, and decided to issue an open RFP to consultants to perform this work. The team of PSOMAS and TC Technology was awarded the contract in Oct 2009 and have been working on 3D visualizations since then.

As project manager, this project was/is challenging because it really does merge together science, technology and art. It is easy to scope out and budget science, but art not so much. So the team we put together had very specific roles to ensure KernCOG’s vision was implemented as efficiently as possible. TC Technology did all the pre-planning (or storyboarding), built the 3D model and final product with Psomas’ help in the field and with transportation/land use planners. I should also mention this was a highly collaborative project as we also worked with HSR Authority, City of Bakersfield, and many other consulting companies to develop data sharing agreements for this project.
The contract was setup on an as-needed basis, with a pre-defined rate structure for each 2D or 3D simulation. KernCOG really could not have anticipated the various project requirements they would have. So this type of arrangement allowed them to quickly react to the ever-changing needs and public concerns and build cost-effective visualization tools as the project evolved.

Initially, the main project goals were to simply comply with the federally mandated requirements. It was important to communicate effectively with the public, between co-workers, and multiple agencies. We wanted to increase overall project understanding and set clear expectations. They also wanted to reach a diverse audience, young and old, blue and white collar, particularly new audiences who otherwise would not participate normally.

As the project evolved, a new set of project goals were revealed. Not only could it be a communication tool, but the 3D models were also assisting with accurate decision-making. They were able to determine feasibility of conceptual design, identify potential obstacles, and manage multiple alignment options and design scenarios. In the end, we were able to identify opportunities to leverage existing investments and create momentum for project locally.
I have been working in GIS for 12 years, and have been working with 3D visualizations/cartography for about 5 of those years. I have worked with true digital artists all over the country and multiple firms. I have seen how these professionals (some GIS, some graphic design experts) implement these projects. I have worked on 3D visualizations that cost over $100K and ones that cost $5K. But one thing remains constant: the importance of pre-planning the visualization and developing a storyboard.

It should answer these questions:

- What is the “story to be told”?
- What is the area to be modeled?
- Who is the audience?
- What is the final output?
- Audio? Voice over narration?
- How will it be used?
- Level of detail needed?
- Accuracy requirements?
- What GIS data layers are available?
Sometimes these storyboards are elaborate hand-sketches, which show each scene one by one. Or if you are more comfortable, you can use your GIS skills to simply map the area to be modeled and describe in words the various scenes and approach. But overall, it simply needs to summarize the plan for the animated movie and ensure expectations are consistent.

Storyboard should contain:

- Map showing area to be modeled
- Buildings/features to be modeled
- Camera locations
- Flight path and elevation
- Description of movie opening, middle, end
- Physical recognizable landmarks
- Title, credits
In the early stages of developing a storyboard, I often use Google StreetView to drive the site and get inspired on which flight path/vantage point is appropriate. Once the storyboard is accepted, we integrate the available GIS data layers. Since you are all GIS users, you are familiar with using the USGS DEM datasets to build the topography. I have also used LiDAR 3D laser scanning to quickly build accurate and cost-effective base maps. Building outlines can be used and elevations extracted from assessor databases to quickly build 3D models. Also there are many pre-existing 3D models of many downtown cities and buildings available publically or thru third parties.
Depending on the level of detail you want for your 3D visualization, you may want to visit the site and take detailed digital photos and measurements of each building. I have included some tips and tricks I have used thru the years. Many times I send a GIS technician or office staff member to the site to a distant site, so a simple check-list and map of the area will ensure they did not miss anything.

➤ Pre-plan your visit
   ➤ Create site map and checklist
   ➤ Identify which building faces to be modeled
   ➤ Obtain permission to enter site
   ➤ Assign block number and building number (ie: 001-002)

➤ Field Conditions
   ➤ Sunday mornings ideal
   ➤ Cloudy days better than full sun
   ➤ 9am – 3pm least shadow

➤ Taking photos
   ➤ Take photos in consistent order (west to east)
   ➤ “Dead-center” perspective as well as shot from each corner
Looking back over the diverse 3D visualization I have done, the ones I am most proud of have 1-2 personal, local details. Examples include zooming in on a car’s bumper sticker, the starts at night in the desert sky, a local newspaper sitting on an outdoor café. Make sure your check list includes reminders to take photos of signage, signage, signage. Being able to replicate the local vibe, culture or window molding detail – makes the difference between that “wow” and “where is that, again?”
After you have collected all the background data on the existing conditions, the next step of the project typically is creating the conceptual design. For the high-speed rail project, it was all conceptual – and URS was actually working on the actual design in parallel. This is the portion of the project where I relied on my good friends at Psomas for their planning and architectural expertise, as they had the subject matter expertise to help the GIS team design new buildings to fit specific needs. However for High-Speed rail, this map was basically all we had to go on. We knew there were 2 alignment options (red and blue) where the track would enter and exit downtown Bakersfield.
Once we started overlaying the conceptual design with actual parcel GIS layers and topography, we realized it was going to be quite challenging. The existing Amtrak station (busiest in the Nation) was next to the proposed new HSR station location. Thus a second set of train tracks made accessibility challenging between a new Mill Creek development, park system, library and parking. This map is an example of some early maps that I had to send to Troy to quickly get KernCOG to make decisions on how to model the site.
Then we were able to build 3D shells of the proposed structures…
Overlay with GIS data and further refine…
The station design proved to be more complicated due to the fact that the train is elevated 60’ in the air. And the Amtrak is below. Thus we were able to use the 3D model to better understand logistically how it would work.
We scrutinized every decision to identify creative, cost-saving approaches. Reducing length of elevated walkways, solar panels, and even exploring entire new concepts such as building the platform on top of the existing Amtrak station.
Conceptual Design
Typically our draft deliverable includes a series of still-shots which illustrate what the 3D movie will look like. It helps us get confirmation that the structures are modeled correctly, set locations of cameras, and review flight path. Obviously we always compare to the storyboard to confirm the correct message is conveyed.

We typically don’t fully texturize the back of buildings or, rooftops unless the vantage point required us to do so in the storyboard.
Play movie
In addition, KernCOG decided to submit 2 proposals for HSR Authority’s consideration for the new Heavy Maintenance Facility. HSR Trains from the entire state would come here for scheduled and unscheduled emergency maintenance. For this task, we had to really review the design guidelines and learn how long the test tracks had to be in order to achieve a certain speed. Troy helped me understand the logistics of how trains will be able to enter and exit the maintenance facility. Once the parcels were identified which met these needs, we were able to lay out the proposed site for a competitive submission.
In conclusion, the public saw more than high-speed rail coming down the tracks—they witnessed downtown revitalization. In fact, KernCOG received additional funding 2 weeks ago to pursue additional 3D visualizations for Station Area Planning. An RFP will be coming out soon for additional landuse planning consultation services to further conceptualize mixed land-use building types within __ miles of the Bakersfield station. We have also received positive feedback including the Federal Highway Administration and we also learned the City of Bakersfield believes the 3D visualization was instrumental in attracting a new hotel to their downtown.
Questions?

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