

High-Definition Survey provides accurate DTM and cross sections of busy highway



From the side of the roadway, Cyra[®] 2500 laser scanner captures detailed road surface geometry

Scope:

Digital terrain model of 6,500 feet of a busy four and six lane roadway and railroad bridge overpass; ASCII file of cross sections

Owner:

New Jersey Department of Transport (DOT)

Date:

July - August 2002

Project Facts

Field: 5 days; two-person Cyra[®] crew plus two-person survey crew; 46 scans
Office: 15 days; one person

Deliverables:

Digital Terrain Model of roadway and adjacent area
ASCII list of points on cross sections at 25 ft intervals

"The Cyra scanning system saved us \$24,000 in lane closure costs, cut our field surveying crew hours in half and allowed us to give our customer more than they expected without a return visit to the site. And since we worked on the side of the road, our crew was safe and drivers weren't aggravated by lane closures."

Ken Moscetti,
Project Surveyor,
Medina Consultants, P.C.

Background

New Jersey Department of Transport (DOT) is replacing a traffic circle at a heavy traffic intersection of State routes 30 and 130. A professional engineering design and consulting firm hired Medina Consultants, P.C. to provide accurate cross-sections and a digital terrain model (DTM) of the existing four and six-lane roadway. The contract was awarded based on conventional and aerial survey techniques. After winning the bid, Medina Consultants agreed to use their Cyra[®] 2500 (since rebranded as HDS2500) for the project. The Cyra system could save \$24,000 budgeted for lane closure costs and halve survey labor to five days with a four-person crew from 20 days with a two-person crew. In addition, operators would not be at risk in traffic lanes and drivers would not be aggravated by closing lanes.

Project Workflow

A four-person crew worked on the project for five nights, from 7pm to about 6am, when traffic was at its lightest. Two members of the crew moved and surveyed the targets with a Leica TCR 1101 reflectorless total station to tie them into the control system. The Cyra scanner was mounted on a CST-Berger heavy duty, 42 ft tripod. A

cable connected the scanner to a laptop controller at ground level. The crew moved the Cyra system to positions at 150 ft intervals along each side of the roadway. The scanner was elevated about 11-1/2 ft to obtain scans with a wider and longer field of view with more detail of the shoulder and sidewalks. They obtained 46 scans, with the range typically between 160 and 170 ft. The roadway was scanned with a minimum 3.5 inch point density, each point better than 6mm accuracy. Each scan included a minimum of four hemispherical targets. Targets were scanned with a very high density point spacing to allow accurate extraction of the target center. In the office, one operator processed the field data in about 15 days using Cyclone[™], CloudWorx[™], Bentley MicroStation and InRoads software. Point clouds were registered and referenced to the control system in Cyclone[™] software. Customers were shown the registered point clouds of the roadway, railroad bridge and surrounding features. They gained confidence in the accuracy and completeness of the scan data. They also realized they could obtain more data in the future - wire heights, railroad bridge clearances, pole size/locations, and information to settle potential encroachment disputes. After discus-

sion, Medina Consultants agreed to provide cross sections at 25 ft (instead of 50 ft) intervals and define 3D elevation points randomly at 7-1/2 to 12 ft intervals between cross sections at no additional cost.

Cyclone™ software was used to extract the cross-sections and define 3D elevation points for the DTM. Some cross-sections were also created using CloudWorx™ in MicroStation. They matched the Cyclone™ cross-sections accurately.

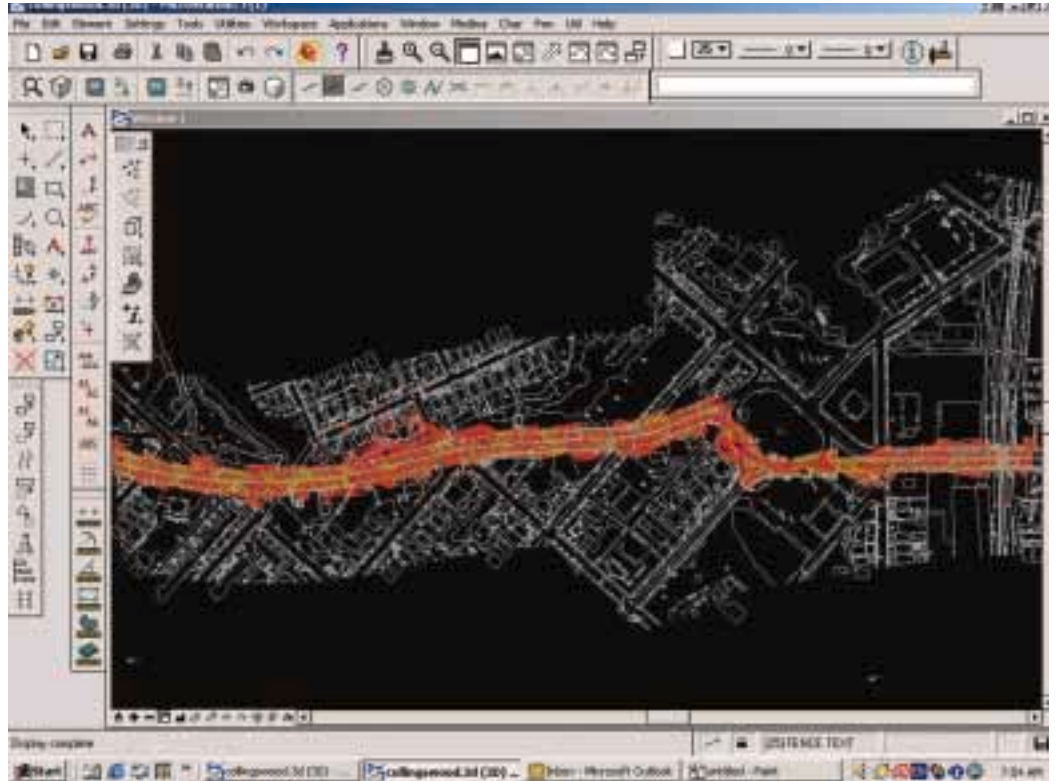
The cross-sections and 3D points were imported to InRoads to create a DTM with contour lines at 1/2 ft intervals. The DTM data was imported to Cyclone™ and checked with the point cloud for errors.

By using Leica's 3D laser scanning system instead of conventional equipment, Medina Consultants eliminated \$24,000 in road closure fees, cut their field labor and per diem by 50 percent, and gave their customer more accurate and complete information than specified in the contract. In addition, the scan data could be used in the future to provide more information.

Laslo Vespremi

Benefits:

- * Saved \$24,000 in road closure fees and cut field labor cost by 50 percent
- * More detailed scan provided accurate DTM with contour lines and elevation points
- * 3D scan provided more cross sections at closer intervals, 3D elevations, other information needed in the future
- * Off-road operation kept operators safe and didn't interfere with traffic flow
- * Scan cloud gave customer confidence in data and showed information for future use



Laser scans of roadway in Microstation

High-Definition Surveying™: Laser Scanning Re(de)efined

Leica Geosystems has coined a new name for laser scanning technology: High-Definition Surveying or HDS. Why? First, High-Definition better describes its single most distinguishing feature - high density data and rich images - compared to point-by-point surveying. Second, by describing it as High-Definition Surveying, Leica is stating that its new family of hardware and software products is fully fit and friendly for surveying and engineering. For example, the new Leica HDS3000 not only has the look and feel of a surveying instrument, now you can geo-reference to local or assumed coordinates more efficiently by setting up over a survey point. Other survey-friendly features include a standard tribrach mount, H.I. measurement capability, efficient battery swapping, and improved weight/portability. In addition, Leica's Cyclone™ and CloudWorx™ are feature-rich software products that make creating surveying and engineering deliverables easier than ever before. Welcome to the world of HDS! Learn more about the HDS family of products at www.cyra.com.

The HDS family of products (left-to-right clockwise): The super-fast HDS4000, the all-new HDS3000, world's best selling HDS2500 and the Cyclone and CloudWorx software products.

