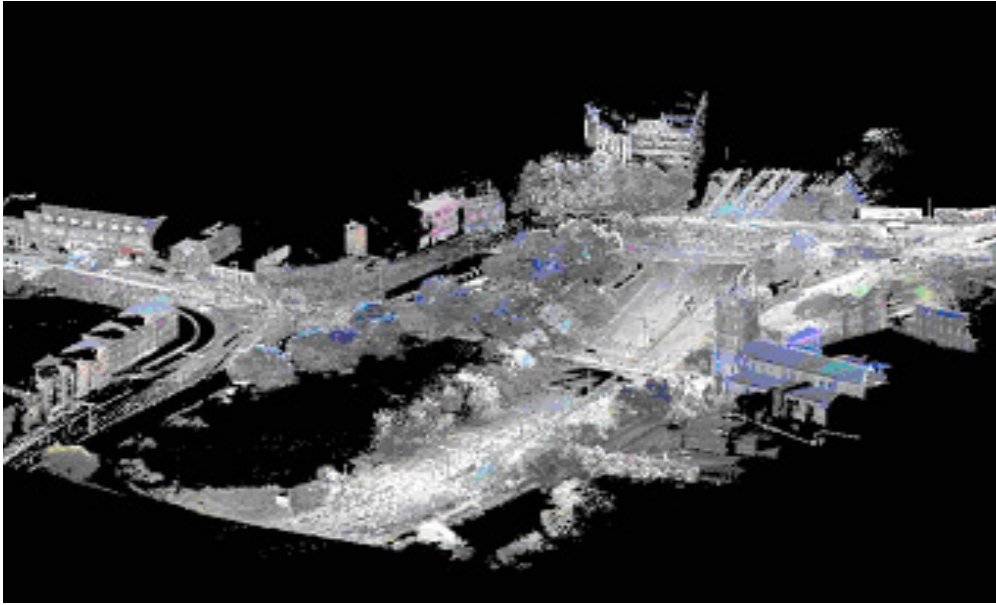


# Leica Geosystems **TruStory**

## Urban Roadway Survey

### with Leica HDS3000; Derby, UK



*High-Definition Survey point cloud data of Derby Inner Ring Road*

Plowman Craven was approached by the Derby City Council to provide a detailed topographic survey to facilitate an integrated maintenance scheme for the Derby Inner Ring Road. Derby City Council specifically requested that laser scanning be used due to limited traffic management availability in such an urban environment. Final deliverables consisted of comprehensive topographic information in AutoCAD drawings. Information included strings and levels for carriageway lanes, channels, tops of curbs, back of footway/verge, and top of parapet plinth/retaining walls. It also included dimensions, positions, and locations of features such as parapets, pedestrian guardrails and safety fences, lighting columns, abutments, piers, and gantry supports.

In addition, location and girth of trees and other features within 4.5 m of the carriageway were required. Besides traditional drawings, deliverables included the complete point cloud data as an "as-is" archive for future use.

Plowman Craven completed the project ahead of schedule with better accuracy than specified by the Council, and saved the Derby City Council substantial cost (est. £500K) due to no lane closures or disruptions to the motoring public. In addition, the quality and completeness of data collected by the Leica HDS3000 not only saved Plowman Craven valuable time in the field and office, but also resulted in supplementary survey work for measuring clearances and building heights.

#### ■ Scope

Topographic survey of 1.5 kilometer of carriageway with sub-centimetre accuracy for locating a new bridge and general beautification of the area. The site included multi-level interchange and elevation sections of carriageway supported by retaining walls.

#### ■ Customer

PCA for Derby City Council, UK

#### ■ Date

2005

#### ■ Actual Field Time

14 Days, 5-person crew (scanning and control)

#### ■ Office

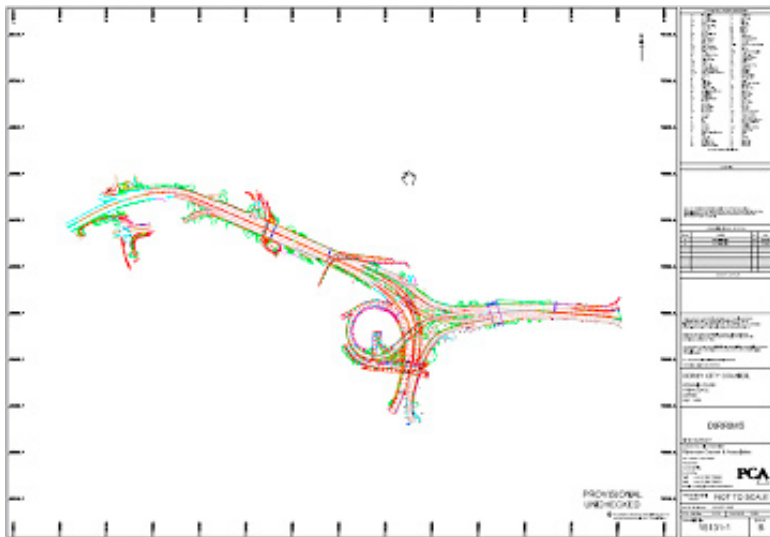
4 weeks, 3 CAD technicians

#### Software

Cyclone, Leica CloudWorx for AutoCAD, AutoCAD

#### ■ Benefits:

- 35% Field time saved vs. Conventional methods
- 25% Office time saved using Leica HDS Software with AutoCAD
- No lane closures, saving approx. £500K
- No omissions, eliminated revisits
- No nighttime work
- Increased safety of surveyors and motorists
- Quicker final drawings
- Point cloud data is legal record of "as-were" conditions



Final DWG deliverable with linework and mapping symbols

### Project Workflow: Field

Since the job site was heavily urbanized and road safety is a key part of the Council's work on transportation projects, laser scanning was an obvious choice for this project. To meet the strict timeline, accuracy requirements, and the extent of coverage, Plowman Craven took advantage of two Leica HDS3000 scanners. Primary control was established traditionally with GPS, and secondary control with TPS. To increase the coverage from each scanner set-up, high spots such as bridges, banks, and office buildings were selected for scanner setups.

Using multiple scanners not only expedited the data collection process, but also resulted in complete coverage along curb faces including the flowlines. A five-person crew was utilized - one person at each scanner, one for target placement, and two at the Total Station for collecting control data. Five to seven targets were used per scan to ensure more than required accuracy for registering the various scans.

Since City Council wanted all Inspection Chambers' (IC) centre points precisely delineated on plans, Plowman Craven decided to survey them with a Total Station, not only to locate them accurately, but also to use them as check shots to compare the XYZ coordinates obtained from scans.

### Project Workflow: Office

All scans were registered and geo-referenced to control in the office using a tight 5mm tolerance. Since most scans had redundant targets, some targets were disabled during registration to achieve higher accuracy. After registration, besides comparing coordinates on this project from ICs, a standard QA practice Plowman Craven uses is to check distances, for instance along building sides. Then, Plowman Craven took advantage of Cyclone's powerful Region Grow and other tools to remove noise from each scan (traffic/people), before breaking the project down into various layers and chopping into 3-4 GB size pieces. Cutting project data into manageable chunks allowed various teams to

"The essential practice of field checking now reveals significantly fewer corrections in CAD drawings extracted exclusively from point cloud data, minimising the costs in the QA process."

*Duncan Lees, 3D Team Leader, Plowman Craven*

work on different parts of the project simultaneously. Lastly, final drawings were created using CloudWorx for AutoCAD containing 3D lines and mapping symbols, leveraging the versatile slicing feature. Overall, Plowman Craven estimated that using HDS technology saved 25% field time over conventional methods, plus an additional 75% of the time usually required for field-checking of plans for QA purposes in such urban environments. In addition, using Cyclone and CloudWorx and office QA practices led to 25% savings in the office-production of final deliverables.