



## Mobile Mapping: A Game-Changer in Construction

For the past decade, static lidar (or laser scanning) has been used on construction sites to effectively monitor and provide spatial data for analysis of critical construction components. The term *static* typically refers to tripod-mounted instruments such as a Total Station or IRLIS-3D. These devices, while highly useful, have specialized utility and are therefore limited to specific functions.

*Figure 1: Lynx Mobile Mapper mounted on survey vehicle at road construction project*

Enter mobile lidar mapping. *Mobile* lidar differs dramatically from *static* lidar in that the laser scanner is mounted on a vehicle (SUV, light truck, railroad car, motor boat) and operates while the vehicle drives through the area of interest at normal traffic speed (Figure 1). The use of mobile lidar mapping is radically changing the way contractors think about surveying for construction support activities, and has enabled improved safety, compressed schedules and reduced costs for the world's largest infrastructure projects.

Optech Incorporated has been working closely with one of the leading infrastructure construction firms to prove the value of mobile mapping throughout the construction life cycle. Lynx Mobile Mapper™ has been used in various phases of construction with very impressive results. The construction process has benefitted from using mobile mapping by:

- Reducing the need for maintenance of traffic during survey operations
- Expediting material quantity surveys and computations (volume estimates)
- Capturing as-built or as-is conditions to support project management and client relations
- Using image capture to enhance 3D point cloud data through RGB color draping as well as to record field conditions in the event of litigation
- Ensuring overall project safety
- Streamlining and compressing the project schedule.

### A valuable tool in all phases of construction

Regardless of the phase, mobile mapping can be used to facilitate the construction process throughout the project:

- In pursuit, mobile mapping data can provide the basis for any 3D analysis or design modeling needed for the estimating process. The detailed accuracy of georeferenced point cloud data instills confidence in the prospective contractor by reducing risk and ensuring that the bid is as competitive as possible.
- While building, mobile mapping provides an ongoing source of rich 3D data for a variety of functions. Whether collecting and verifying earthwork quantities (Figure 2) or matching cross-slopes for paving, the Lynx Mobile Mapper is extremely versatile.
- In post-construction, the Lynx Mobile Mapper can collect a complete 3D point cloud of the final product, capturing and archiving the as-built process and project closeout.

### Improving speed and safety

On large infrastructure projects, meeting or exceeding the schedule is critical. However, increasing productivity at the expense of safety is not an option. Mobile mapping allows the contractor to accelerate certain aspects of the project while improving the risk profile. Safety can remain the top priority while expediting survey functions by using this innovative approach to construction support. In a recent study, a large topographic survey was performed both conventionally and with a Lynx Mobile Mapper. The results showed a reduction in turnaround time from 22 days to 5 days using Lynx.

## Lidar data requirements

|                             |   |
|-----------------------------|---|
| <b>Data capture methods</b> | Maximum coverage in minimum time while being least disruptive to traffic—critical when surveying heavily travelled highways and rail corridors.<br>Maximum coverage in minimum time while being least disruptive to construction activities—important when working in active construction zones where earthwork materials are being acquired or moved (volume estimates).   |
| <b>Accuracy</b>             | Absolute accuracy with respect to the position on project coordinates is required. The use of RTK positioning from a connected site should be considered.   |
| <b>Density</b>              | Depending on the type of data collection: <ul style="list-style-type: none"><li>• Data must be dense enough to extract realistic 3D models of the surrounding area. Roadway surfaces, retaining walls and bridge structures require high-density scans.</li><li>• For earthwork material surveys, the density can be set to minimum levels to attain sufficient results. Scanning at low-density also produces smaller, more manageable data files.</li></ul> |
| <b>Volume</b>               | Collected data should be kept to a manageable size. A one-day turnaround from data collection to results output in CAD format is required.  |
| <b>Output file formats</b>  | LAS, DGN, DWG   |

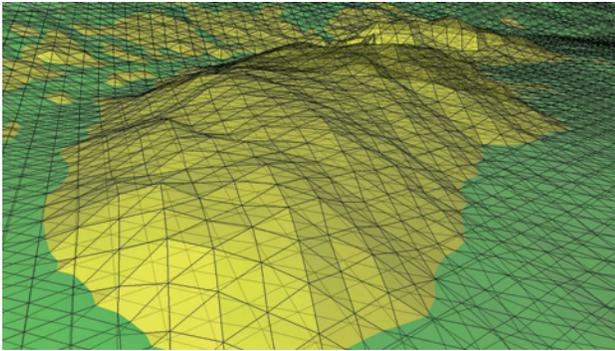


Figure 2: Wire mesh model of earthworks used to verify quantities of delivered materials

Turnaround time is crucial in large construction projects. The contractor is often expected to acquire data, process it, and produce deliverables within 24 hours. The Lynx Mobile Mapper has proven it can produce reliable data within the tight mission-critical schedules that drive most projects. On a project in Southern California, the Lynx Mobile Mapper was used to survey over 2 miles of retaining wall in just under an hour. The acquired data was delivered the following day.

Surveying an active transportation corridor can be very dangerous when using conventional techniques. Even with safety systems and lane closures, roadway workers are at risk performing these functions. Mobile mapping not only reduces the exposure of personnel in the field, but it can also reduce the costs associated with maintenance of traffic and lane closures. Even the travelling public benefits from the low-impact and non-invasive process of mobile mapping, as lane closures are not typically needed to acquire data (Figure 3).

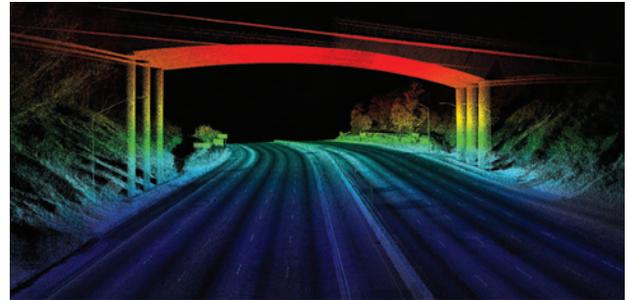


Figure 3: 3D georeferenced point cloud of roadway and overpass bridge scanned by the Lynx Mobile Mapper

### Litigation mitigation

Unfortunately, litigation and claims are a reality on many construction projects. Having complete and timely data is invaluable when it comes to mitigating the ever-present threat of claims.

The Lynx Mobile Mapper has the ability to collect both 3D *measurable* data as well as high-resolution digital camera feeds for up to 4 different perspectives. This wealth of data can be decisive in maintaining up-to-date information on the job site and to quickly confirm or rebut unsubstantiated claims.

### Conclusion

The versatility of mobile lidar mapping technology is revolutionizing the construction industry throughout all project phases, from planning to closeout, enabling contractors to ensure improved safety conditions while streamlining multiple tasks. The gains made through increased efficiency and compressed project schedules have yielded significant savings.

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