



## Certainty 3D

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To: General Release

From: Ted Knaak  
Certainty 3D, Inc.

### Re: System Selection Based on Return on Investment Criteria (#1011)

#### Background

Certainty 3D customers often solicit our opinion as to the “best” system(s) available in today’s market. In principle, C3D will take a neutral position as TopoDOT is designed to work with any point cloud data. Clearly the interest of our customers as well as C3D is best served when the most productive systems are selected. This is all too often not the case as the selection process is typically constructed such that the least productive and therefore most expensive operational system is selected.

For example, both private enterprises and/or government agencies will often lower performance specifications of laser scanners to allow bids from at least two competing vendors. Often the least expensive equipment is chosen, at times by law, without thoroughly evaluating the actual costs of the system field-to-finish process. The result is that often less expensive systems are selected only to find that the operational costs are several times greater and/or production output quality is far below that of the more expensive system. Typically these increased operational costs accumulate over years and far exceed the additional up front costs of the more productive systems.

This document offers a suggested method for system selection emphasizing:

- System productivity
- Return on investment
- Output production quality

Also, the method presented in this document shifts focus away from very complex and confusing operating parameters for hardware and software and focuses on the process and result thereby providing all parties with easily understood selection criteria.

#### Generic Method for Evaluation and Selection of Complex Systems for Production of 3D Topography

7039 Grand National Drive, Suite 100, Orlando, FL 32819  
Phone: 407-248-9927 Fax: 407-248-2636

[www.facebook.com/Certainty3D](http://www.facebook.com/Certainty3D) | [www.Certainty3D.com](http://www.Certainty3D.com)

Note that the following method uses a generic “DOT” but is applicable for any commercial or government agency.

### **System Description**

DOT seeks a system to dramatically improve the process productivity associated with development of ground surface topographies and similar land survey deliverables typical required in its daily operations. DOT is primarily considering systems based on laser scanning technology. Laser scanning systems yield high quality data sets consisting of point clouds, calibrated images and relevant metadata which describe the scene in great detail. However, DOT is open to consideration of alternative technologies should a vendor present comparative data output, quality, productivity and cost.

DOT has identified potential software data post-processing solutions designed to efficiently extract features and develop the 3D topographic models. Therefore, DOT is seeking a system which demonstrates: 1) data output of precision necessary to produce high quality 3D topographies and models, 2) improved field productivity over conventional methods, 3) a significant return on capital investment gained through total field-to-finish (3D topography model output) productivity increases over current methods.

### **Return on Investment (ROI) Justification**

DOT focus on this procurement will be the overall system field-to-finish performance, productivity and ROI. Laser scanning system technology is in itself complex with each component typically described by many operational parameters. Furthermore the feature extraction and modeling process add additional complexity. Thus side by side comparisons based purely on technology and software specifications are difficult and impractical. In light of this, DOT recognizes that fundamentally we are procuring a system which yields an output, the 3D topography, which we can define, place requirements on and describe in great detail. Therefore the best interests of DOT are represented by a strict focus on the quality of the output, field-to-finish productivity and ROI associated with its development.

### **Evaluation Process**

DOT shall identify a specific length of roadway typical of the intended system application. Detailed specifications for the delivery of a 3D topography model of the designated area will be offered to each system vendor. Each vendor shall submit a written summary describing the field-to-finish solution as applied to this specific application. The field-to-finish solution shall include, but not be limited to:

- Hardware description
- Control network requirements (DOT shall place control as required by each vendor)
- Field processes and workflows
- MOT requirements
- Office processes and workflows
- QA/QC procedures

Each vendor shall apply their respective field-to-finish solution to the project under similar climatic conditions. DOT shall have control network in place per vendor requirements prior to the system application. DOT shall assist the vendor in any necessary MOT operations which may be required by the field process. This is not training and DOT will observe but will not do anything to delay or hinder each vendor's process.

Upon completion of field activities, each vendor shall post-process the data to extract the 3D topographic model. Only one person shall process the data so as to provide an accurate estimate of required man-hours.

Note: DOT shall also apply conventional survey field-to-finish processes and technology to produce a 3D topography model of this road. The time and cost taken to acquire, process and produce this model conventionally shall serve as the evaluation baseline.

### **Evaluation Criteria**

DOT shall base process performance on several metrics. These are:

- **Deliverable Quality** – DOT shall first evaluate the quality of the final deliverable to assure that it meets at least the minimum standards required by DOT. If in DOT's judgment the vendor's deliverable does not meet the minimum requirements set by DOT, that system may be disqualified at DOT's discretion.
- **Field Cost** – DOT shall use the standard hourly rate for their conventional survey as a baseline comparison. To this rate, the amortized cost of "total" cost of each system shall be added to the baseline hourly rate. If DOT expects a three year lifetime for the system, the system total cost shall be divided by the total working days over three years, times eight hours per day. For example, if the system costs \$100,000, it's amortized hourly rate over three years is  $\$100,000 / (750 \text{ working days} \times 8 \text{ hours per day}) = \$16.67$  per hour. This cost is then added to the hourly cost of the DOT field crew. That total cost is then multiplied by the number of hours the vendor spent to acquire the data in the field.
- **Processing Cost** – DOT shall estimate the office processing cost as follows. The per workstation purchase price of a processing license plus annual maintenance fees shall be added over three years. This sum shall be divided by the number of working hours over three years as done to estimate the field costs. For example, a software license which costs \$15,000 initially and \$4,000 in maintenance annually thereafter could be amortized over three years to an hourly rate calculated as  $(\$15,000 + \$4,000 + \$4,000) / (750 \times 8) = \$3.83$  per hour. Thus this hourly rate will be added directly to the baseline DOT CAD technician hourly rate. The cost of post-processing will be calculated by multiplying this resultant hourly rate by the total processing hours required to produce the 3D topographic deliverable.
- **Final Evaluation and Selection** – DOT will base its final selection on the system providing deliverables meeting DOT requirements at the lowest overall field-to-finish price. Obviously the technology costs are added to the hourly DOT baseline costs in

the field and office. Therefore the selected system must demonstrate at least sufficient productivity based on reductions in field and/or processing time to compensate these additional costs and produce a deliverable below the baseline cost of conventional survey and processing techniques.

Certainty 3D provides this document as a general service to our customers and the market in general. Increases in productivity and return on investment serve the collective best interests of the market and will motivate all vendors to adopt best practices and technology.

We welcome questions and comments. If C3D can be of any further service, please do not hesitate to contact us directly.

*Questions and/or Comments*

Ted Knaak, President  
Certainty 3D, LLC  
7039 Grand National Drive, Suite 100  
Orlando, FL 32819  
Tel: 407 248 0160  
Email: [Info@certainty3d.com](mailto:Info@certainty3d.com)  
[www.certainty3d.com](http://www.certainty3d.com)