



Putting your business into motion



MONITORING SYSTEMS





## TAKE THE OPPORTUNITY TO EXPAND YOUR BUSINESS WITH MONITORING SYSTEMS FROM TRIMBLE

### WHERE WILL YOUR NEXT MONITORING PROJECT BE?

Demand for monitoring is on the rise. Aging infrastructure, the impacts of construction projects on surrounding structures, and natural events are creating the need for improved awareness of motion. These trends, and others, are opening new opportunities for surveyors.

Monitoring plays a crucial role in today's project environment.

- **Safety:** A monitoring system can detect motion and alert the project team. You can move people and equipment away from hazardous areas and prevent accidents before they can occur.
- **Reduced Risk:** You can reduce risk by understanding how structures behave. With a Trimble Monitoring System, you can create a solid basis for decisions and project planning. A monitoring system can even reduce project insurance costs.
- **Compliance:** Many regions have regulations for project safety and management. These regulations often call for monitoring to detect movement. And monitoring is commonly mandated in project contracts. A Trimble Monitoring System can help you meet these requirements.

When you provide monitoring services, your clients can increase safety, reduce risk and save money. You can put your expertise in measurement and data analysis to work in new and profitable ways. With Trimble Monitoring, you are ready to offer new services to your existing clients. And you can attract new clients as well. It's a great way to make your business grow.

## 1 | Project DURCHMESSELIN (ZURICH)

Surveyor: **Terra Vermessung, Urs Mueller**

The construction of Zürich's new railway line has put the highest demand on geologists, construction engineers, and surveyors. Intensive construction has been going on since September 2007 for the new Durchmesselin, but engineers were busy long before the first groundbreaking to ensure the best engineering solution.

Get the full story: [www.trimble.com/monitor](http://www.trimble.com/monitor)



# TRIMBLE MONITORING SYSTEMS TO MEET EVERY CHALLENGE



## **FLEXIBLE, SCALABLE MONITORING SYSTEMS FROM TRIMBLE**

Everything on Earth is affected by various sources of motion. On projects that require monitoring, it's your job to understand: How fast is it moving? In what direction? At what acceleration? Is it consistent with what you are expecting? Answering these questions calls for reliable, high-precision measurements and advanced data management and analysis.

Success in monitoring depends on flexibility. Each monitoring project brings different requirements in locations, conditions, deliverables and performance. A 'one size fits all' solution won't work for most situations. You need different solutions for each monitoring project. With Trimble, you have the tools you need to adapt to a wide variety of project requirements.

- Long-range, high-precision measurements
- Complete control of instruments and observations
- Advanced data management and analysis
- Flexible and reliable communications
- Project reports and alerts

Trimble's scalable systems lets you create a monitoring solution that can change and grow with your needs. You can add more instruments, conduct detailed analyses, and share your results with others. You can even control your monitoring system from remote locations. It's all fast, easy, and cost-effective.

## SCALEABLE SYSTEMS FOR A RANGE OF MONITORING PROJECTS

### CONSTRUCTION

Trimble systems are used to measure collateral impact to buildings and structures adjacent to construction sites. You can also monitor subsidence, cut and fill slopes, and incomplete structures. Rugged Trimble instruments easily handle the tough environments of construction sites.

### STRUCTURAL

Trimble Monitoring Systems are used for dams and levees, bridges, buildings, and other man-made objects. Trimble provides the high-precision measurements needed in structural applications.

### UTILITIES

Utility companies utilize Trimble Monitoring Systems to monitor pipelines, transmission structures, and production and storage facilities. Trimble Monitoring can provide information about movement and changes to improve safety and reliability.

### MINING AND TUNNELING

Trimble Monitoring Systems are used in open pit and underground mines for monitoring highwalls, tunnels, subsidence and stockpiles. Trimble's reliable radio datalinks help you place instruments in locations where ground-based communications is not practical.

### TRANSPORTATION

Transportation agencies need to monitor structures, cut and fill slopes and railways. Objects adjacent to transportation corridors are also monitored for movement. Trimble Monitoring Systems handle the frequent measurements and large data sets required in these applications.

### GEOPHYSICAL / GEOTECHNICAL

Engineers and researchers can use Trimble solutions to monitor landslides, landfills, subsidence and natural structures. Trimble's connectivity and flexible measurement control helps you to monitor projects over larger land easily.

## 2 | Project PITT RIVER BRIDGE

Surveyor: **Peter Kiewit Sons, Jeff Zagalski**

The 200 m long, cable-stay bridge near Vancouver, Canada will provide 16 m of vertical marine clearance and support a seven-lane deck for 80,000 vehicles a day. Trimble solutions are playing a big role in this massive project, monitoring the movement of the towers and bridge in real time throughout the construction.

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## **FLEXIBILITY AND SCALABILITY ARE YOUR KEYS TO SUCCESS**

### **REAL-TIME CONTINUOUS AUTOMATED MONITORING**

Projects that require frequent measurement utilize automated monitoring. Target points are measured repeatedly—often hundreds of times each day. Trimble's real-time, continuous approach provides immediate feedback. You can develop extensive data sets for analysis and trend information. Trimble 4D Control™ software acts as the control center for your Trimble automated monitoring system.

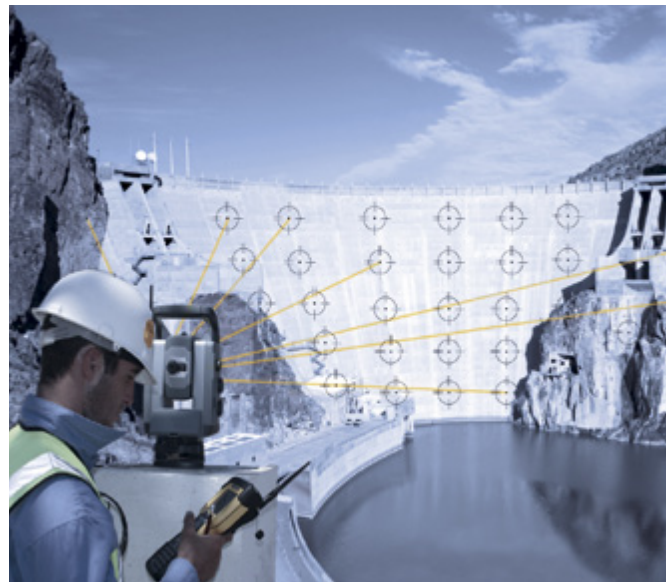
### **POSTPROCESSED CAMPAIGN MONITORING**

Other projects do not require continuous, real-time monitoring. These projects can be handled with measurements taken at intervals of weeks or months. The target points and instrument stations are in fixed locations, and survey teams visit the site to conduct measurements. By using the Engineering Option for Trimble Survey Controller™ software, you can easily employ your Trimble S6 or Trimble S8 Total Stations for postprocessed monitoring.

## LEVERAGE YOUR SURVEY TOOLS FOR SPECIALIZED OPPORTUNITIES

A Trimble Monitoring System combines instruments, software and specialized knowledge to produce accurate, reliable results for your clients.

- The Trimble S8 Total Station is Trimble's high-performance total station for monitoring. It delivers precise measurements even under demanding conditions.
- In the office, Trimble 4D Control software is the core of your automated monitoring system. It controls the instruments, manages the measurement activities, computes and analyzes the data, and provides reports and alerts.
- For campaign monitoring in the field, the Engineering Option for Trimble Survey Controller software enables surveying field crews to conduct monitoring measurements quickly and reliably. It adds productivity, reduces rework, and provides new uses for Trimble total stations.
- Trimble training and support is ready to get you started and keep you going. With a variety of web-based and on site training programs, you have a reliable partner in your successful monitoring business. Trimble's extended warranties and software maintenance keep your system running smoothly.



### ONE INVESTMENT, UNLIMITED POTENTIAL

Put the full capability of your Trimble equipment to work creating new business for you. By taking advantage of existing business assets, you can move into monitoring quickly and with little cost. You can use your Trimble S8 Total Station and Trimble data collector to make campaign monitoring measurements. With options for high-precision and long-range measurement, your Trimble instrument provides accurate, reliable monitoring data. And when it's not on a monitoring project, your Trimble instrument stays busy on all of your other surveying jobs.

It's easy on your field crews as well. With the Engineering Option for Trimble Survey Controller software, there's virtually no learning curve. With Trimble's familiar survey workflow and data formats your crews will be productive from the beginning.

## SPECIALIZED OPTIONS

Many factors determine the exact specifications of the monitoring system that is right for a given job.

### TIGHT SPACING

When designing monitoring projects, you need to place prisms in specific locations. They may be located along narrow sight lines or close to other prisms. Trimble FineLock™ technology handles these difficult situations with ease. It combines a smart tracker sensor with narrow field of view and high power tracking beam to automatically acquire and measure your prism targets.

### LONG DISTANCE PRECISION

With Trimble's Long Range FineLock you can confidently measure prisms with 1 cm accuracy, up to 2,500 m away. It's a great tool for monitoring in open pit mines, quarries and large sites. With Trimble FineLock, you have the flexibility to place your targets where you need them and receive fast, accurate results.

### COMMUNICATIONS AND REPORTING

Accurate and reliable communication is vital to the success of any monitoring project. Trimble's technology gives you the options and flexibility to meet a wide range of needs. Secure, license-free radio links and fast USB connectivity make it easy to obtain and deliver the information you require. Trimble helps you communicate with project stakeholders by providing detailed reports, alerts and remote access.



## 3 | Project

### GREEN POINT STADIUM



Surveyor: **GNA Geomatics, Julian Gray**

The sweeping silhouette of newly erected Green Point Stadium in Cape Town, South Africa will seat nearly 70,000 fans per game during the 2010 FIFA World Cup. A demanding project in a cramped worksite, GNA used forced-centering techniques and Trimble's high-precision prisms and targets. Instrument were mounted on concrete pillars, and mini-prism control points placed in permanent mounts.

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## THE TRIMBLE S8 TOTAL STATION PROVIDES ACCURATE RESULTS, DAY AFTER DAY AFTER DAY

### DESIGNED WITH MONITORING IN MIND

Major construction sites are difficult places to work. The Trimble S8 Total Station is built to deliver reliable results under extreme conditions. It's a rugged, field-proven instrument packed with advanced Trimble technology and tailored for monitoring applications.

#### Fast Operation

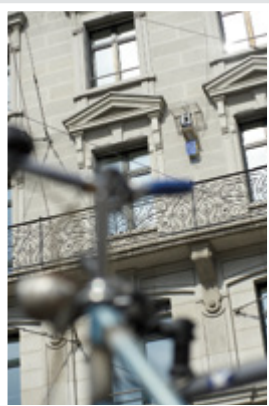
Using Trimble's MagDrive™ technology, the Trimble S8 turns 40% faster than conventional servos. Each measurement set can be completed in less time. MagDrive offers more than speed. Its electromagnetic direct-drive mechanism is nearly frictionless. So the instrument can operate for long periods and with low maintenance.

#### Long Range Accuracy

Trimble's high-precision EDM produces millimeter results in seconds. With Trimble SurePoint™ technology, you are assured of high-precision angle measurements, even in difficult conditions. With Trimble FineLock you can confidently measure difficult and long range targets.

#### Reliable Performance

The Trimble S8 is built to work in the toughest environments. Because it is so reliable, you can put the instrument in remote locations that provide the best measurements. You'll have less downtime and fewer visits to the instrument.



### THE TRIMBLE S8: QUIET PERFECTION

Many projects in urban areas require continuous monitoring, often times with total stations attached to nearby buildings. When placed near office or residential space, occupants require a low-noise monitoring solution.

The silent operation of Trimble's advanced total stations allows you to choose the optimal locations and schedules for your monitoring instruments. Trimble's advanced optical solutions, like the Trimble S8 Total Station, include MagDrive servo technology. Virtually silent, the wear-free electromagnetic mechanism is designed for precision operation with very low maintenance requirements.

There are many issues to consider when developing a complete monitoring plan. At least now, disturbing the neighbors is not one of them.

## TRIMBLE 4D CONTROL SOFTWARE

At the core of your Trimble automated monitoring system is Trimble 4D Control software. Developed especially for monitoring applications, Trimble 4D Control handles even the most demanding projects. It takes care of all your monitoring activities

### Measurement

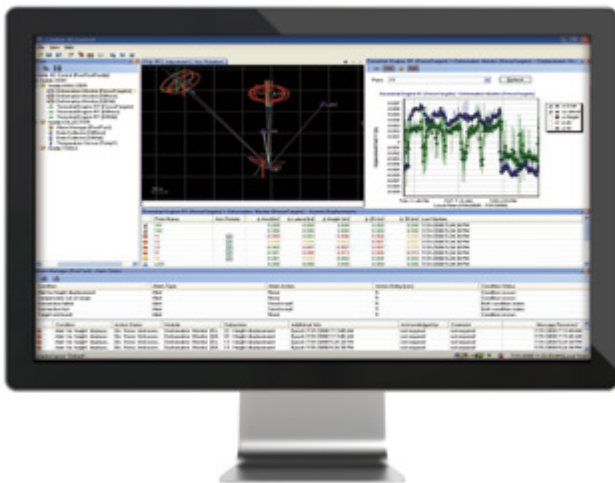
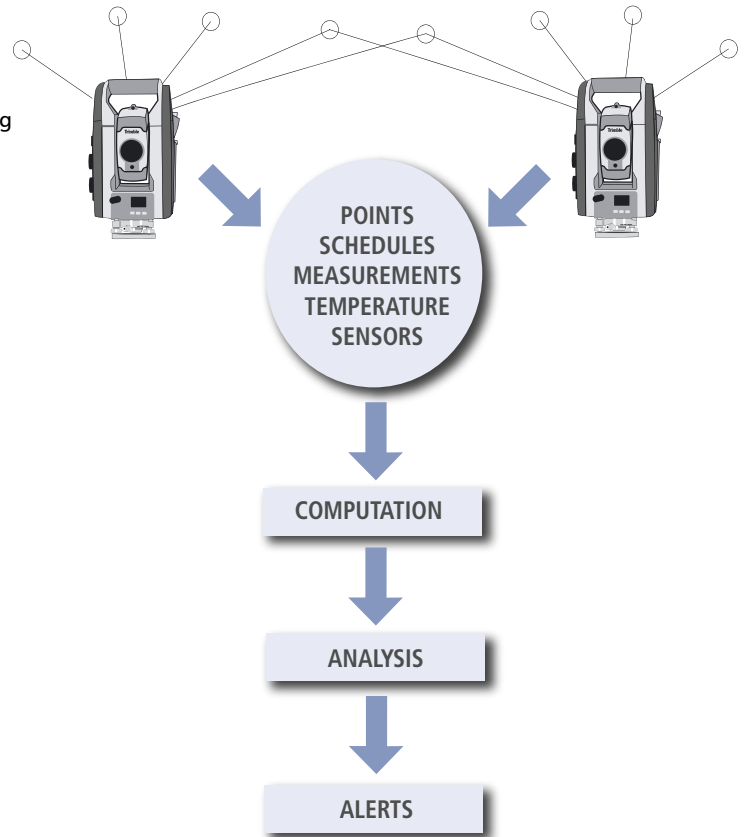
Trimble 4D Control manages the automated measurement process for your project. It controls the total stations and observation schedules, and automatically collects data according to your needs.

### Data Management

Trimble 4D Control organizes your data and keeps it ready for analysis. Raw observations are reduced to information about time and position. Your data is ready for analysis with Trimble's built-in tools, or it can be directly accessed via SQL.

### Analysis

Trimble's advanced analysis tools let you examine your data in detail, spotting trends and changes. You can visualize the data using charts, graphs and tables generated by Trimble 4D Control software.



### Reports and Alerts

Trimble 4D Control makes it easy to create reports of your project's status. And when needed, Trimble 4D Control sends e-mail alerts to the specified people.

### Remote Management

You can view and manage your system from remote locations. And you can provide access to others to review the data and use the analysis tools. As your monitoring business grows, you can supervise multiple monitoring projects from a single location.



### EASE INTO MONITORING WITH TRIMBLE SURVEY CONTROLLER

The Engineering Option for Trimble Survey Controller is ideal for projects that require regular monitoring visits over intervals of days, weeks or months. Because it's integrated into the Trimble Survey Controller software workflow, there's no startup or learning curve. Your monitoring projects blend in with day-to-day surveying tasks to help your business grow.

- Dams and levees
- Subsidence and landslides
- Construction sites
- Cut slopes and highwalls
- Bridges, piers and abutments

### EASY SETUP AND ORIENTATION

The Engineering Option for Trimble Survey Controller software increases productivity by reducing setup and orientation time. Use control points stored in the Trimble Survey Controller software database to establish your instrument coordinates and orientation. For fastest setup, you can use simple instrument and backsight point selections. Or you can use Trimble's resection routines to establish position and orientation by measurement to multiple control points. For highest confidence, the software can automatically measure multiple rounds. On subsequent visits to the site, the monitoring points can be read from a coordinate file loaded into measure rounds.



## INSTRUMENTS AND SOFTWARE FOR MONITORING



### FAST RESULTS

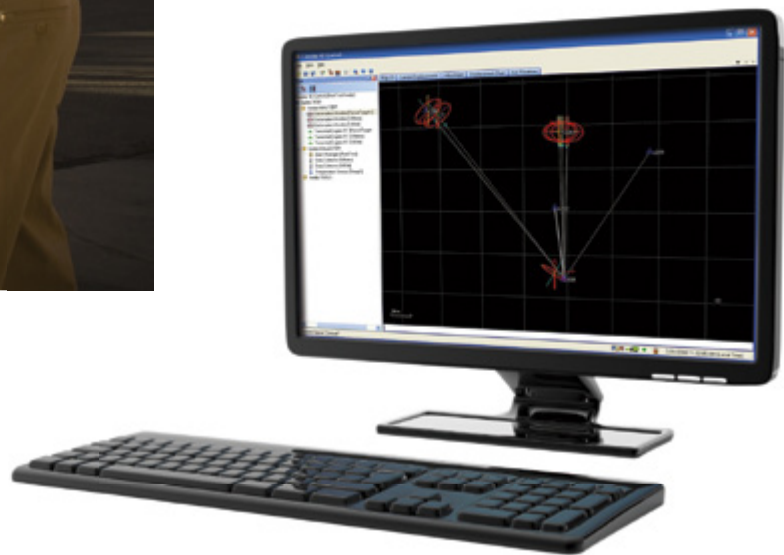
Using the Engineering Option in Trimble Survey Controller software, the system automatically makes rounds of measurements using the Trimble S8 or Trimble S6 Total Station connected to a Trimble TSC2® or Trimble CU controller.

### IN THE FIELD

Before leaving the site, you need to know that your data is accurate and complete. After it finishes its measurements, use monitoring style sheets to generate basic reports on the spot. You can get accurate, reliable data with no need for rework.

### IN THE OFFICE

For comprehensive reporting, Trimble 4D Control software provides advanced data management and analysis tools for the most demanding applications. For comprehensive reporting, Trimble 4D Control provides advanced data management and analysis tools for the most demanding applications.



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