




# GPS Machine Guidance Construction

**MACHINE GUIDANCE FOR HIGHWAY CONSTRUCTION**



**DON TAYLOR**  
Vice President, National Division

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**CORPORATE HISTORY**

Dwayne McAninch founded the McAninch Corporation in 1967 with one D7 dozer building farm ponds. Today McAninch Corporation has one of the biggest fleets of Caterpillar equipment in the Midwest...close to 450 pieces and 550 experienced personnel.



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**EARTHMOVING**

McAninch is one of the construction industry's leading highway and site-development contractors. We specialize in high production earthmoving and underground utilities.



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# GPS Machine Guidance Construction

## UNDERGROUND UTILITIES



Advanced trenching techniques let McAninch dig deeper. Productivity is enhanced by custom configured backhoes with wider tracks, longer booms, and bigger buckets. With these more powerful tools, McAninch crews can lay more pipe per day, deeper, bigger and in the most challenging conditions.



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## EQUIPMENT INNOVATIONS



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## RESEARCH PARTNERS



- Caterpillar Tractor
  - Field Follow Program
  - Collaborative Design
- Trimble Navigation
  - Field Testing, Fabrication, and Design
  - Software Evolutions
- Iowa State University -- CTRE
  - Partnership for Geotechnical Advancement
  - Mobile Geotechnical Laboratory

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**PARTNERING**

McAninch. GPS

Dwayne McAninch serves on the board of the international CTCT – Caterpillar Trimble Control Technologies



**CATERPILLAR®** **McAninch**  
**Trimble**

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**GPS GRADING COMPONENTS**

McAninch. GPS



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**McANINCH TIMELINE**

McAninch. GPS

- June 1999 - McAninch buys a Survey Grade GPS Receiver
- July to September 2000 - McAninch installs first Trimble SiteVision System on a D6R and a D9R Towed Scraper
- April 2001 – 3 more D9R Scrapers and another D6R was equipped
- May 2001 – Project Foreman’s truck was equipped with GPS
- July 2001 – D5M equipped with Automatic Blade Control GPS System
- July 2002 – First excavator in the nation equipped with SiteVision System

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## McANINCH TIMELINE



September 2002 – McAninch starts to install systems on Motor graders  
Spring 2003 – GPS tracking units installed on over the road truck fleet  
2004 – Collaborate with stakeholders on Data Preparation  
2005 – R & D: Cycle Monitoring and Laser Augmentation  
Fall 2005 – McAninch fleet includes 22 Base Stations, 60 machine systems, 13 truck units, 10 survey grade systems and 70 tracking units. \$7,000,000 Invested to date.

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## WHAT DO WE DO WITH IT?



- DTM MODELING FOR ALL JOBS
- TOPOGRAPHIC MAPPING
  - ORIGINAL GROUND
  - PROGRESS QUANTITIES
- GRADE CONTROL
- MACHINE CONTROL
- FLEET MANAGEMENT
- PRODUCTION ANALYSIS

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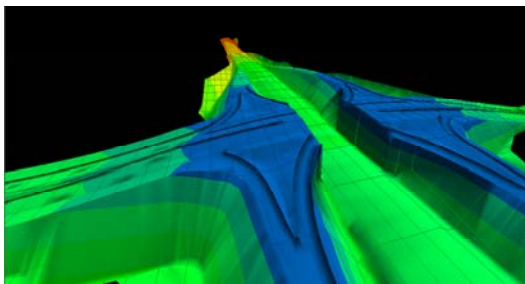
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## Digital Data Rules



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## Data Delivery Challenges



In God We Trust, Everyone else bring "Data." W. Edwards Deming

### Pre-Bid or Post Bid Issues

- Missouri Department of Transportation
  - Draft Specification for Data Delivery
  - Construction Office Data Set
  - Contractor Data Set
- Cooperation from other States and Agencies
  - Hold Harmless Agreements
  - Design Files in 2-D and 3-D

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## Data Composition Issues



### Design Inconsistencies

- Examples:
  - US 36, Macon County, Missouri
  - Civic Parkway, West Des Moines, Iowa
  - NC 16, Catawba County, North Carolina

### Designer Push Back

- CAD Artifacts
- 2D Vs 3D

### Layer Format Conventions - - National

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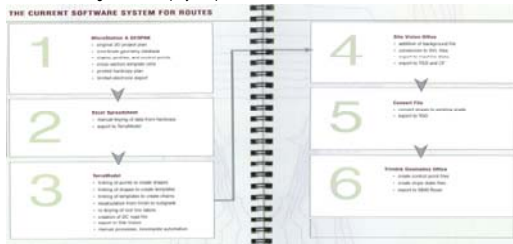
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## Software Manipulation



Today all these software products are needed to create an accurate Machine Control File. Within each program a host of keystrokes are required to generate the output. Work is being done to simplify the process.



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# GPS Machine Guidance Construction

**Improved Highway Design System** 

- 1. DOT Project Designs**
  - Route & Specification Planning
  - **ELECTRONIC** Distribution of Plans
  - Solicitation of Bids
- 2. Contractor Bids**
  - Confirmation Investigation
  - Volume and Quantity Calculations
  - Submission of Bids
- 3. Project Inception**
  - **SEAMLESS DOWNLOAD** of Electronic Files
  - Conversion of 2D Plan to 3D Model
  - Manipulation of 3D Model for GPS
  - Download of Plan to Machines

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**ORIGINAL GROUND TOPOGRAPHY** 



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**PROGRESS TOPOGRAPHY** 



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## HUMBLE BEGINNINGS GRADE CONTROL?



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## MODERN DAY TOOLS FOR GRADE CONTROL



TRIMBLE 5800  
SURVEY GRADE

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## MODERN DAY GRADE CONTROL



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## MACHINE CONTROL SYSTEMS



- CAT D6R BULLDOZER
- CAT D9R/L TRACTOR & SCRAPER
- FOREMAN PICKUP UNITS
- CAT MOTOR GRADERS
- EXCAVATORS: CAT 330 – CAT 385

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## CAT D6R



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## CAT D9L, CAT D6N AND PICKUP



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## CAT 16H MOTOR GRADER



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## CAT 385 EXCAVATOR



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## FLEET MANAGEMENT



GPS tracking units installed on over-the-road truck fleet, mechanics trucks, and service trucks. Proprietary software monitors the fleet utilization and availability.

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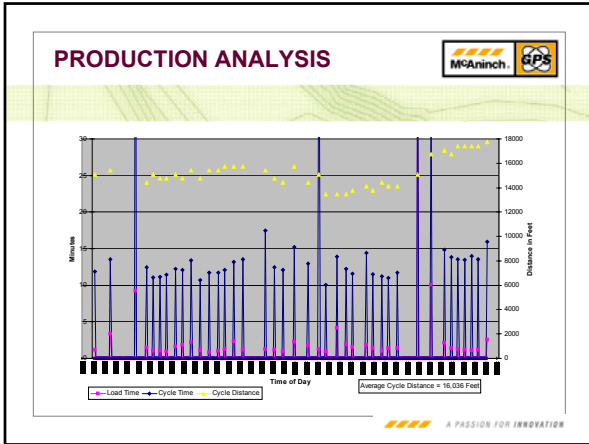
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### TECHNOLOGY SPECTRUM

#### McAninch Corporation

- High-Speed Internet Access (Office, Project, Field)
- Wireless Data Collection (Weather, GPS Files, E-Mail)
- Wireless Timesheets and Payroll (Proprietary Software - MacTrack)
- RTK Compaction-On-Board (Partnering Study: CAT-CTRE)

McAninch GPS

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### TECHNOLOGY SPECTRUM

#### McAninch Corporation

- GPS For Project Control (Formerly Machine Control)
- GPS For Asset Management (Lowboys, Mechanics, Theft)
- GPS For Cycle Monitoring (Time, Distance, and Location)

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ADCIC 26FEB03



- Automated controls
- Viewing the Site Remotely
- File transfers from office
- Diagnostics
- Daily as-built reports
- Productivity Research
- GPS Paving

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CATALYTIC DRIVERS



CHAMPION  
CULTURE  
COMMITMENT  
VISION

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THANK YOU FROM THE  
McANINCH CORPORATION



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