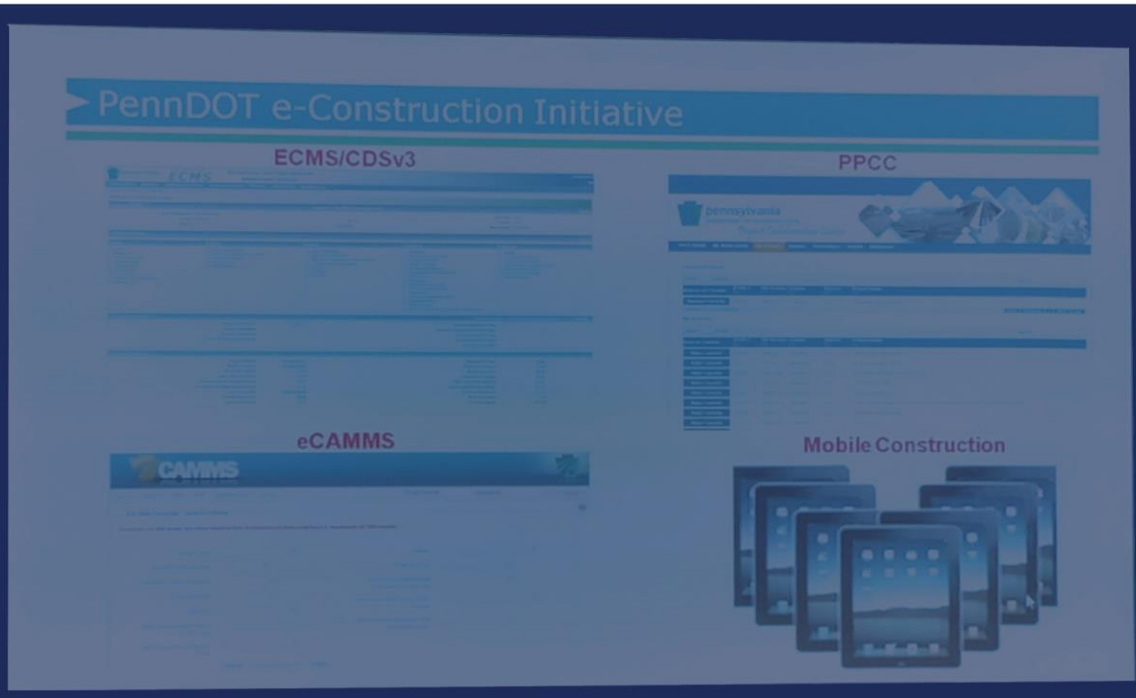
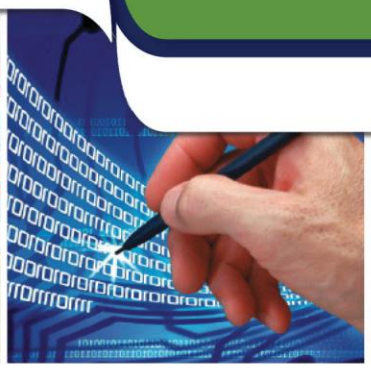
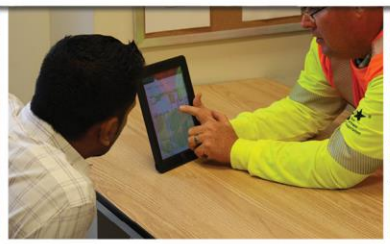


e-Construction
PEER-TO-PEER EXCHANGE
Summary Report


All Photos: FHWA

Nevada DOT and
Oregon DOT

January 17-18, 2018
Salem, OR

U.S.Department of Transportation
Federal Highway Administration

Table of Contents

1. Background

The Oregon Department of Transportation (ODOT) hosted a peer exchange on e-Construction with the Nevada Department of Transportation (NDOT) in Salem, Oregon on January 17 and 18, 2018. e-Construction is defined as paperless construction administration delivery processes that include electronic submission of construction documentation by stakeholders, electronic document routing and approvals (with digital/electronic signatures) and digital management of all construction documentation in a secure environment that allows access to authorized project stakeholders. The event was sponsored by the Federal Highway Administration (FHWA), and representatives from FHWA Headquarters and Oregon's FHWA Division Office also participated in the event. ODOT provided details on the procurement process for a recent implementation of Doc Express, a project collaboration tool, along with its overall vision for implementation of AASHTOWare Preconstruction (2016), Civil Rights and Labor (2019), and Project. NDOT is using FieldManager software, with plans to upgrade to AASHTOWare Project Construction and Materials.

The morning sessions on the first day (see Appendix A for the full agenda) served as a preface to the peer exchange and allowed for personal introductions along with background information on each State's construction program and e-Construction activities. ODOT outlined the procurement process for Doc Express and provided a demonstration. Both agencies also discussed their use of ProjectWise software, mainly for design applications but also with consideration for how this tool can be used during construction. The group also discussed practices for application of digital signatures and electronic approvals, such as through DocuSign and CoSign. One specific area of interest for both agencies is in application of electronic versus digital signatures, and the fact that a digital signature allows for a third-party verification similar to an in-person notary. Participants discussed specific items for application of the more formal digital signature (such as change orders and contract modifications) and where general approvals may be sufficient (such as for basic workflow approvals).

The morning of the second day consisted of additional discussion sessions on e-Construction field devices with a focus on the use of iPads for project inspection documentation. Additionally, participants discussed materials management including the acceptance of contractor quality control data for project records. Each agency has a quality assurance program for sampling materials in the field to ensure compliance with project specifications and materials testing protocols. Participants also discussed next steps, action items, and follow-up activities for how to maintain the momentum from the exchange and continue the dialogue.

The Peer Exchange was the fifteenth and final event for EDC-3; FHWA continues to offer peer exchange opportunities through EDC-4 on e-Construction and Construction Partnering. This report includes a summary of key findings from the event, links to relevant documents, and the full notes from the peer exchange discussions.

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2. e-Construction Implementation – Key Peer Exchange Findings

The peer exchange produced several relevant and practical findings identified through group roundtable discussions. The following sections outline the items that were highlighted by the group as next steps, implementation ideas, document exchanges, or focus areas—all of which are designed to assist with future implementation within the States' e-Construction programs. Where available, website links are provided for some of the practices currently in use by the agencies. ODOT and NDOT also shared some documents, presentations, and information by email that are not publicly available on the internet.

Oregon DOT and Nevada DOT shared detailed information on **legacy systems, requirements development, and plans for software upgrades** during implementation of e-Construction applications such as AASHTOWare. NDOT is currently using FieldManager for project inspection documentation and also uses B2GNOW software for managing civil rights and labor requirements, while ODOT has implemented AASHTOWare Preconstruction and has plans to implement other modules such as Civil Rights and Labor and web-based Project Construction and Materials.

> Link to ODOT eConstruction home page:
> http://www.oregon.gov/ODOT/Construction/Pages/e-Construction.aspx
>
> Link to Nevada DOT Business-to-Government B2GNOW software application guidelines:
> https://www.nevadadot.com/home/showdocument?id=7069
>
> Link to ODOT ProjectWise home page:
> http://www.oregon.gov/ODOT/Business/Pages/ProjectWise.aspx

To further enhance project efficiencies through e-Construction, **ODOT has implemented 3D models to help facilitate the use of automated machine guidance** by contractors on projects within the State. A few contractors in Oregon served as a catalyst on the initial implementation. While the process is not universally applied to all projects, most contractors are using the technology at different levels in bidding and during construction. Deliverables such as the existing ground surface, a finish grade surface, and primary alignment files are typically provided during design and allow for clash detection in design and automated grading and stringless paving during construction.

> Link to ODOT Engineering Automation home page:
> http://www.oregon.gov/ODOT/ETA/pages/index.aspx
>
> Link to ODOT 3-D Design Website:
> http://www.oregon.gov/ODOT/ETA/Pages/3D-Design.aspx

Cloud data storage is a cost effective option that agencies are using to alleviate firewall issues and also reduce the need for hardware for data archiving. Some agencies then host the final project archives (once projects are completed) on an internal system inside the firewall. **Software as a service (SAS)** is also becoming more common with State DOTs as e-Construction systems may be subscription based (with data also housed in the cloud) as opposed to a one-time purchase model with future upgrades.

> Link to Federal information about approved cloud service providers:
> http://www.fedramp.gov/

A local university performed a return-on-investment study for ODOT that includes an independent review of construction practices with business process recommendations. NDOT updated some business practices to match software applications as part of the process to upgrade legacy systems. This consideration in matching software process and business processes is important in any e-Construction implementation.

> See "Advanced Technology: Return on Investment at the Oregon Department of Transportation" Project 30530-16-14, Oregon State University.

Grants are available for implementation of e-Construction, and DOTs have received grants to support digital data collection on projects as well as provide for efficiencies and cost savings in administering construction contracts and procuring devices. ODOT and NDOT have both tested iPads in the field.

> Links to grant and State Transportation Innovation Council funding sources:
> http://www.fhwa.dot.gov/accelerating/grants/index.cfm
> http://www.fhwa.dot.gov/stic/
>
> Link to FHWA e-Construction website:
> https://www.fhwa.dot.gov/construction/econstruction/

3. Peer Exchange Discussion Notes

This section provides additional notes following the organization of the agenda. Question and answer sessions followed each presentation and demonstration.

Bernie Kuta of FHWA introduced participants to FHWA's e-Construction program. Every Day Counts is designed to document where States are in business processes and how to take the next step in implementation of paperless e-Construction practices.

Sharon Foerschler with NDOT presented on challenges with managing construction contracts and plans for implementation of e-Construction. Nevada is a FieldManager user and the DOT is upgrading and customizing AASHTOWare software used in the State. NDOT is upgrading FieldManager and implementing AASHTOWare Materials software. NDOT is 95/5 pro-rata share in Federal to State participation in funding projects.

Joe Squire with ODOT provided a brief overview of the Oregon e-Construction implementation activities. ODOT is using a laboratory information management System (LIMS) for materials management but is planning to upgrade to AASHTOWare Project. The highway department accounts for about 2,000 of ODOT's 4,200 employees. About 70 percent of design currently is outsourced, and that level is likely to continue. A recent funding package totaled $500 million, an increase from past funding.

3.1 Nevada DOT Overview

In 2011, NDOT obtained legislative budget approval to move forward with e-Construction. One primary challenge involves contractor payment and documented quantities information, and this became the e-Construction focus. NDOT released a request for information and subsequent request for proposals in 2012 and received bids from four vendors. NDOT made the decision to move forward with AASHTOWare as an off-the-shelf tool and changed business processes to match the software. NDOT only used FieldManager at the time, so the vendor developed a process to remove retainage from the software cost totals and incorporated this into FieldManager. NDOT is upgrading to AASHTOWare Project Construction and Materials, and with a sunset date of 2019 for existing software (it will be no longer supported without additional fees), the upgrade is key to successful processing of project requirements and payments. NDOT has plans for web-based implementation with cloud-based data hosting. NDOT's five-year plan is to implement a document management system and the AASHTOWare software statewide.

NDOT has an interface with FieldBuilder and ExeVision software tools to incorporate bid information into construction project start-up documentation activities. Seamless transition from construction to records retention is another focus area that may require additional tools to accomplish. DocuSign is being used currently for document approvals.

ODOT includes 2.5% retainage on certain bid items and releases it when all documentation is complete. There is still an issue with prime contractors withholding retainage from subcontractors. Oregon has a State requirement of payment within 10 days. Withholding payment due to documentation issues encourages fulfilling the contract requirements and documentation requirements. ODOT uses BidExpress.

Q: Will NDOT implement the AASHTOWare Civil Rights and Labor (CRL) Module?

A: Tracking of prevailing wage data is now administered through B2GNOW, and other available software tools include AASHTOWare and LCPTracker. NDOT construction noted that the NDOT organization that manages the data and information on labor and wages may use the AASHTOWare CRL software in the future. Developing goals and objectives for DBE usage is enhanced through use of these software tools.

Q: Does NDOT's leadership have goals and progress metrics for e-Construction?
A: There is a department goal to be completely paperless by 2021.

3.2 Oregon DOT e-Construction Overview

Oregon DOT has five regions with 16 consultant crews and 12 consultant project managers. There are 240 full time inspectors, with 100 staff members in the headquarters construction group. ODOT implements 130 to 180 projects per year, with most projects in the under $5M range. Maintenance activities utilize mostly State funds, with 80/20 Federal to State participation on construction projects.

3D engineered models for construction have been used for the past five years, and contractors may use the model to verify quantities during the bid advertisement. ODOT also has survey-quality data using mobile light detection and ranging (LiDAR) surveys. ODOT also uses ProjectWise for design data and is working to determine how ProjectWise can be incorporated into construction processes. ProjectWise will be used to store documentation behind the firewall (the single source of truth) from Doc Express where all data is outside the firewall. Doc Express also allows one contractor point of contact that can allow access to others within the company and for that specific project. Wet signatures are required on ODOT contract documents currently. ODOT has also piloted a work windows schedule that allows contractors to get an idea of how to fit the work within the overall contract window. ODOT uses completion date or calendar day contracts as opposed to work day contracts.

In 2014, ODOT set a goal to reduce paperwork and paper processes in conjunction with contractors. If a document is created on a computer, the goal is to keep it electronic (no printing for signatures). ODOT decided that the goal would not significantly change processes nor reduce documentation needs. ODOT has a 20 year records retention requirement for contract administration, and this is a critical element to consider in the cost of data storage. In comparison, NDOT noted use of a 3 year contract records retention requirement. Both DOTs have the objective of a single source of collaborative truth in e-Construction project documentation from previous projects.

Pilot projects with Doc Express are underway, and as others are let they will be incorporated into the system as well. ODOT is also scanning documentation into Doc Express. ODOT is also considering taking a picture of the weight ticket information and including a bar code or QR code on the truck to scan weight information and other data associated with that haul.

3.3 Document Management and Collaborative Project Sites (Doc Express)

Vanessa Baker with ODOT provided a presentation on Doc Express, a recent implementation of a project collaboration site. The process begins with ProjectWise, and ODOT's design group uses the software for design collaboration. A pilot project in 2016 tested ProjectWise on a live construction project, and ODOT learned that several construction items were missing and needed. Communication on document status was cumbersome, and additional workflows for documents was needed. File formats such as PDF forms and opening edit features versus opening the file as read-only was an issue. Files would then get saved on local

drives instead of changes being saved to ProjectWise. There was also no way to electronically sign documents in ProjectWise. Doc Express provides a solution that improves these practices and alleviates these challenges.

The tool is a secure digital filing cabinet and document exchange service. Workflow approvals and digital or electronic signatures are also implemented through Doc Express. Training on use of the system takes a few hours and ODOT also provides web-based training on use and application for contractors. It is important to note that if a DOT is having issues, those will continue – the document management system is just a file storage and project collaboration tool.

Q: Does ODOT own the Doc Express licensing and can allow outside entity access without cost?
A: Yes, contractors are only required to provide their own internet access and device.

Q: Where is the data stored?
A: Amazon cloud service, with a backup from IBM. All of this happens directly through the vendor.

3.4 ProjectWise and Consultant Access

Pete Wallace with ODOT presented on ProjectWise including IT security and consultant access. The goal is to provide seamless consultant access to ODOT data in ProjectWise from outside the DOT. One of the first steps in the process was to modify the contract language for consultants to identify best practices such as virus checks, liability for damages on ODOT systems, personnel management, etc. The consultants then fill out a consultant access enrollment form and submit to ODOT as related to their particular Statewide Transportation Improvement Program (STIP) project. Users then sign an external user access agreement with a wet ink signature. ODOT then has a project creation request form that is submitted to create the folders and project records. Users then follow a defined process to enroll. IT security is managed in a number of ways, one of which is a security technology software named Netwrix that allows users to define security questions and answers for use as needed in access.

With Doc Express hosting data in the cloud, a different set of security requirements exist. Having no dedicated server hardware to support made things easier for ODOT. Even though a separate entity hosts the cloud location, ODOT still owns the data. Data backup locations are also critical – as a storm hit one server location, the vendor sent a note that a difference location had the backup information and the data was secure. The third-party vendors outlined how the cloud security is handled. The system also enhances the audit trail by providing records on submittals and timing of file access.

Doc Express also works on any type of device or operating system. ODOT provided a demonstration of Doc Express through a demo site developed by the vendor.

Q: Did ODOT explore one solution from design through construction?
A: ODOT did explore this and found that only certain tools (ProjectWise, FileNET, etc.) can handle certain file types and what is associated with each. That way there are always multiple tools needed, but ProjectWise will handle the final documents as a repository. Getting the right configurable software tool that meets DOT requirements is critical.

Q: Does ODOT use ProjectWise for as-built drawings?
A: As-built drawing involve a red-lined PDF file as opposed to updates to the original design files.

Q: Can you include attorney client privilege features in Doc Express?
A: Yes, information can be locked to allow only certain users to access. Claim information is current kept in paper format by ODOT for legal reasons.

3.5 Contractor Perspectives on e-Construction

Rick Miller representing the Associated General Contractors of America – Oregon Contractors Association participated in discussions on the benefits of Doc Express. In the digital age, contractors are using GPS and lasers to perform automated machine guidance for stakeless construction. Also, contractors all have iPads and can access the information and data in real-time. Video communication tools also help office personnel and inspectors share information from the field to verify actual field conditions. Decisions are needed quickly for items such as RFIs and the system saves time and allows decisions and communication to occur more efficiently. The system allows subcontractors to see when contractors are paid for a portion of the work.

Another primary benefit is faster processing of change orders. With Doc Express, users know where the change order is in the process. By the specification, work cannot continue until the change order process is worked through. However, contractors want to continue making progress, and this system allows identification of these risks and builds trust. Oregon contractors are also using 3D models, automated machine guidance, and drone data for conditions pre-construction.

Q: Who develops the as-built drawings? Does the contractor have involvement in the process?
A: The ODOT project manager's office is responsible for the as-built drawing requirements.

3.6 Discussion on Digital/Electronic Signatures

Steve Cooley, Contract Administration Engineer with ODOT, presented on the use of Doc Express for digital and electronic signatures. A pilot specification included performance criteria for a Level II third-party digital signature. The policy that allowed cloud-based data hosting and subsequent use of Doc Express facilitated greater implementation of electronic signatures by contractors. ODOT uses Cosign for PE stamp signatures. ODOT only allows the prime contractor to submit signed documents, and primes handle submission of any document approvals that subcontractors are required to have.

ODOT also uses approvals versus signatures, and Doc Express facilitates this based on the user logged in. Approvals have certain criteria but are not as stringent on requirements as the digital signature. Acceptance in Doc Express of a workflow item includes the terms received, accepted, approved, and rejected, while those terms should not be confused with similarly used terms that exist in the construction contract.

Q: What is the difference between an electronic signature and a digital signature?
A: A digital signature has a third-party verification, while an electronic signature is self-verifying. An electronic signature can be applied through various software packages, but a digital signature would require a third-party verification that obtains information on each individual and acts similar to a notary for ink signatures.

3.7 e-Construction Mobile Devices and Applications

Sue Herring with ODOT presented on the use of mobile devices by inspectors and others within the DOT. ODOT piloted the iPad, Surface Pro, and Android-based tablet. A limited distribution pilot showed success with the tablet devices especially the Surface Pro devices due to compatibility with Windows-based systems internal to ODOT. The decision was made later to adopt the iPad as the preferred device due to lower cost. ODOT will also begin use of Microsoft 365 at some point. The iPad, hardware, and software configuration in use costs $600 per user. ODOT also has a bring-your-own-device (BYOD) policy in use with appropriate documentation.

Nevada DOT uses iPads for inspection documentation; Surface Pro is also being considered. IT considerations are being worked through. Nevada DOT uses Mobile Inspector on the iPad for collecting inspection documentation. Consultants are required to bring their own device for documentation requirements in both Nevada and Oregon.

Q: Does ODOT charge field office rental to a project?
A: ODOT does not typically set up a temporary field office for ODOT personnel. NDOT does not generally require the contractor to pay for the field office. This is charged to overhead for both ODOT and NDOT.

3.8 Discussion on FHWA Division Office Pilot Program for Tablets

The group discussed a recent pilot project to evaluate use of tablet devices in the FHWA Division Offices. FHWA completed the pilot in 2017, with Florida, Michigan, and Iowa Division Offices piloted iPads, while Missouri, North Carolina, Pennsylvania, Texas, Utah, Virginia, and West Virginia Division Offices piloted the Surface Pro. FHWA has support costs built in to the reported costs of each device, and the Surface Pro is comparable in price to the standard laptop configuration. The consultant study team recommended that FHWA users with a need to access State DOT e-Construction systems be provided with an option for a tablet device to better facilitate field reviews and required approvals.

3.9 Materials Management Practices

Under ODOT's current laboratory information system, test results are emailed in PDF format. AASHTOWare Project Construction and Materials will replace this legacy system in the future, allowing for greater use of search features and analysis of data and results. The documentation will be added to Doc Express drawers and stored including photographs of truck weight tickets. ODOT has a dispute resolution program for any test results that may be different from the QA results.

NDOT accepts contractor test results for pavement smoothness and retroreflectivity and thickness of striping. NDOT handles quality control in-house.

Q: Do you accept contractor test data for acceptance?
A: Yes, contractor quality control tests are used for acceptance as well as a quality assurance verification. ODOT pays based on the contractor results for contract payment.

Appendix A – e-Construction Peer Exchange Agenda

Oregon DOT and Nevada DOT e-Construction Peer Exchange

800 Airport Road SE
Salem, OR 97301

Agenda

Day 1 – January 17, 2018		
Time	**Topic**	**Presenters / Facilitators**
8:00am – 8:30am	Welcoming Remarks and Introductions Peer Exchange Background and Overview Goals and Objectives	Bernie Kuta – FHWA Joe Squire – Oregon DOT Sharon Foerschler – Nevada DOT Tom Zagorski – Michael Baker International
8:30am – 9:00am	Background on Nevada DOT's e-Construction Systems – AASHTOWare, DocuSign, and Document Mgmt. System Needs	Sharon Foerschler – Nevada DOT
9:00am – 9:30am	Overview of e-Construction Applications in Oregon	Joe Squire – Oregon DOT
9:30am – 10:15am	Document Management and Collaborative Project Sites – Oregon's Implementation of Doc Express	Vanessa Baker – Oregon DOT
10:15am – 10:30am	Break	
10:30am – 11:30am	Doc Express Demonstration – Workflows, Approvals, Managing Change Orders	Vanessa Baker – Oregon DOT
11:30am – 12:45pm	Lunch (on our own)	
12:45pm – 1:30pm	ProjectWise and Doc Express – IT Security Challenges and Solutions	Pete Wallace/Vanessa Baker – Oregon DOT
1:30pm – 3:00pm	Discussion on Digital/Electronic Signatures: Doc Express and Specs (Oregon) and DocuSign (Nevada)	Nevada DOT/ Steve Cooley - Oregon DOT
3:00pm – 3:15pm	Break	
3:15pm – 3:45pm	Contractor Perspectives on e-Construction – Access, Benefits, Needs	Oregon Contractors Association/All
3:45pm – 4:00pm	Discussion on Day 1 Takeaways for Implementation Preview of Day 2 Agenda Items	Tom Zagorski – Michael Baker International
4:00pm	Adjourn	
Dinner on our own		

Day 2 – January 18, 2018		
Time	**Topic**	**Presenters / Facilitators**
8:00am – 8:15am	Recap of Day 1 Discussion Themes	Tom Zagorski – Michael Baker International
8:15am – 10:00am	e-Construction Mobile Devices and Applications/iPad Air 2 and Surface Pro 4 – Lessons Learned	Sue Herring – Oregon DOT All
10:00am – 10:15am	Break	
10:15am – 10:45am	Discussion on FHWA Division Office Pilot Program for Tablets	FHWA/All
10:45pm – 11:00pm	Materials Management – Material Tracking, Mix Designs, Sampling Test Results, e-Ticketing Needs	Joe Squire– Oregon DOT
11:00pm – 11:15pm	Discussion on Takeaways for Implementation	Tom Zagorski, Michael Baker International
11:15pm – 11:45pm	Closing Remarks, Feedback on Peer Exchange, and Next Steps	All
12:00pm	Adjourn	

Appendix B – e-Construction Peer Exchange Roster

Name	Agency
Vanessa Baker	Oregon DOT
Chris Bucher	FHWA Oregon Division
Lori Butler	Oregon DOT
Steve Cooley	Oregon DOT
Sharon Foerschler	Nevada DOT
Summer Guthrie	Oregon DOT
Steven Hale	Nevada DOT
Morgan Harrington	Oregon DOT
Sue Herring	Oregon DOT
Tim Luttrell	Leidos
Kristen McDaniel	Nevada DOT
Ric Miller	K&E Excavating
Mike Morrow	FHWA Oregon Division
Charlie Pan	Nevada DOT
Joe Squire	Oregon DOT
Bernie Kuta	FHWA Resource Center
Tom Zagorski	Michael Baker International