



Internal Audit Report

Highway Performance Monitoring System (HPMS)-
Pavement Condition Data Collection Resources

TxDOT Office of Internal Audit

Objective

To evaluate the efficiency and sustainability of pavement condition data collection resources for the Highway Performance Monitoring System (HPMS).

Based on the scope/coverage performed during the Planning phase of this engagement, the title and focus of the audit was changed to Highway Performance Monitoring System – Pavement Condition Data Collection Resources.

Opinion

Based on the audit scope area reviewed, control mechanisms require improvement and only partially address risk factors and exposures considered significant relative to impacting operational execution and compliance. The organization's system of internal controls requires improvement in order to provide reasonable assurance that key goals and objectives will be achieved. Improvements are required to minimize existing process variation and control gap corrections that may result in potentially significant negative impacts to the organization including the achievement of the organization's business/control objectives.

| Overall Engagement Assessment | | Needs Improvement | | |
|--------------------------------------|---|--------------------------|-------------------------|-------------------|
| Findings | | | | |
| | Title | Control Design | Operating Effectiveness | Rating |
| Finding 1 | Data Collection Safety and Process Review | x | x | Unsatisfactory |
| Finding 2 | Inertial Profiler Host Van Maintenance and Safeguarding | x | x | Needs Improvement |
| Finding 3 | Control Environment for HPMS | x | x | Needs Improvement |

Management concurs with the above findings and prepared management action plans to address deficiencies.

Control Environment

The Transportation Planning and Programming Division (TPP) is the Office of Primary Responsibility (OPR) for the Highway Performance Monitoring System (HPMS) data collection, analysis, and reporting of inventory data for all public roadways in Texas.

There is an overall positive tone throughout TPP, the Districts, and the Maintenance Division who perform roles and responsibilities that affect HPMS. Both TPP management and staff recognize the importance of the processes, the risks associated with HPMS, and the impact to TxDOT. As the OPR, TPP generally communicates verbally the reporting structures, authority, and responsibilities to department employees who perform the collection functions at the districts; however, there is an increasing need for documented policies and procedures to drive consistency and accuracy of reported data and ensure compliance with Federal Highway Administration.

Summary Results

| Finding | Scope Area | Evidence |
|---------|---------------------------|---|
| 1 | Data Collection Resources | Data collection procedures in the sampled districts noted: <ul style="list-style-type: none"> • Two of three HPMS Coordinators/Data Collectors interviewed indicated they worked alone to collect HPMS samples • A supplemental survey of HPMS Coordinators/Data Collectors indicated that 14 of 31 (45%) worked alone when collecting HPMS data |
| 2 | | Routine maintenance logs for 9 of 15 (60%) inertial profiler vans indicated past due maintenance (i.e., oil change, tire rotation, air filter). These vans do not currently have the fleet navigator tool to track routine maintenance. |
| 3 | | <u>Policies and procedures:</u> <ul style="list-style-type: none"> • HPMS Standard Operating Procedures include incomplete and undocumented sections, as well as, conflicting statements within the field reviews section <u>System security and disaster recovery protocols:</u> <ul style="list-style-type: none"> • System security policies and procedures, as well as, disaster recovery and business continuity plans for HPMS do not exist • The District Data Collection Software (DDCS) application and data, which stores all 25 districts' information, are located on a desktop that is not backed up routinely <u>Pavement collection training:</u> <ul style="list-style-type: none"> • 15 of 37 (41%) HPMS Coordinators/Data Collectors did not attend either one of the Pavement Visual Distress Rater Certification classes in Fiscal Year (FY) 2014 • 7 of 23 (30%) employees identified as Inertial Profiler Van Operators did not take Automated Measurement Pavement System training in FY 2014 |

Audit Scope

The scope of the audit work focused on the safety, education, and training provided to employees performing pavement condition data collection for HPMS. In addition, equipment safeguarding and maintenance requirements for the data collection procedures and vehicles were also reviewed. These activities were reviewed to assess the efficiency and sustainability of pavement condition data collection resources for the HPMS.

Auditors visited the Beaumont, El Paso, and San Antonio districts as part of audit fieldwork testing. In addition, a supplemental survey was conducted of 31 employees throughout all 25 districts to determine data collection practices.

The audit was performed by Milan Hawkins, Cindy Scheick, Sonam Sohal, and Karen Henry (Engagement Lead). The audit was conducted during the period from March 24, 2014 to May 23, 2014.

Methodology

The methodology used to complete the objectives of this audit included:

- Reviewing TxDOT internal documents, including policy and procedures manuals, contracts, organization charts, process maps, training, and equipment logs
- Reviewing federal codes and manuals, including Federal Highway Administration (FHWA) HPMS Field Manual, FHWA and American Association of State Highway and Transportation Officials (AASHTO) guides, and Government Code sections for HPMS data collection and reporting rules
- Interviewing of key personnel
- Reviewing prior audit and consultation reports from TxDOT's Office of Internal Audit and the State Auditor's Office
- Evaluating control design and operating effectiveness of the HPMS organizational tone/environment, safety, equipment, and training and education necessary for data collection
- Conducting an internal survey of HPMS Coordinators/Data Collectors located throughout the 25 districts
- Obtaining supporting documentation
- Testing on a sample basis for preventive maintenance on the inertial profiler host vans
- Performing an overall risk assessment of the HPMS data collection and reporting function
- Observing personnel re-performing key function areas in the data collection process

These procedures were applied as necessary to perform the audit fieldwork.

Background

This report is prepared for the Texas Transportation Commission, TxDOT Administration, and Management. The report presents the results of the Highway Performance Monitoring System (HPMS) – Pavement Condition Data Collection Resources Audit which was conducted as part of the Fiscal Year (FY) 2014 Audit Plan.

HPMS is a federally mandated program used by the Federal Highway Administration (FHWA) to provide data to the United States Congress on the nation's streets and highways. Congress uses the data for allocation of funds to states. Roadway mileage and vehicle miles traveled are directly related to the apportionment formulas. The authority for HPMS is found in a variety of Federal laws including United States Code and Code of Federal Regulations.

The data is designed to provide an inventory of all on-system roads and other public roads that are functionally classified. HPMS includes data on the extent, condition, performance, use, and operating characteristics of the nation's highways and covers, in greater detail, the National Highway System, which is a network of highways important to the nation's economy, defense, and mobility. Specific data collected under HPMS includes location by jurisdiction, the number of lanes, median widths, shoulder widths, and other basic road attributes. Inventory information of the public road mileage is certified by the Governor of Texas annually. All roads open to public travel are reported in HPMS regardless of ownership, including Federal, State, county, city, and privately owned roads such as toll facilities. The State is required to annually furnish all data per the reporting requirements specified in the FHWA HPMS Field Manual.

TxDOT district offices collect, update, and submit the required information of roadways within their district to the Transportation Planning and Programming Division (TPP). TxDOT uses the Texas Reference Marker mainframe database to compile the HPMS data for on-system roadways, while data for off-system roadways is maintained in a Geographic Information System (GIS) database. Additionally, data from the Roadway Inventory files and the Pavement Management Information System are also used in fulfilling HPMS requirements. Information in these TxDOT mainframe systems and the GIS is off-loaded each year into FHWA's HPMS software for reporting.

The responsibilities for collecting and reporting HPMS data is a cooperative process between the Austin central office, who prepares, analyzes, and submits HPMS data on behalf of the state, and the districts, who are responsible for field data collection activities, including roadway inventory, and traffic and pavement data collection. There is one HPMS Coordinator/Data Collector in each district that coordinates and/or performs pavement data collection for their district. The process of coordinating these activities is performed under the direction of an HPMS Coordinator within TPP. TPP serves as the primary liaison with the FHWA on all matters related to the preparation and submittal of the State's HPMS data and is the office of primary responsibility for HPMS.

We conducted this performance audit in accordance with *Generally Accepted Government Auditing Standards* and in conformance with the *International Standards for the Professional Practice of Internal Auditing*. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. Recommendations to mitigate risks identified were provided to management during the engagement to assist in the formulation of the management action plans included in this report. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. The Office of Internal Audit transitioned to Committee of Sponsoring

Organizations of the Treadway Commission (COSO) Internal Control – Integrated Framework version 2013 in December 2013.

A defined set of control objectives was utilized to focus on operational and compliance goals for the identified scope areas. Our audit opinion is an assessment of the health of the overall control environment based on (1) the effectiveness of the enterprise risk management activities throughout the audit period and (2) the degree to which the defined control objectives were being met. Our audit opinion is not a guarantee against operational sub-optimization or non-compliance, particularly in areas not included in the scope of this audit.

Detailed Findings and Management Action Plans (MAP)

Finding No. 1: Data Collection Safety and Process Review

Condition

Based on fieldwork testing performed, data collection is generally performed by only one person in each district leading to safety concerns for those employees while they are collecting the information. Highway Performance Monitoring System (HPMS) Coordinators/Data Collectors individually collect sample data, input the data into the District Data Collection Software (DDCS) system, and then send completed samples to Transportation Planning and Programming Division (TPP). Additionally, no supervisory review or verification of the data is being conducted upon collection to help ensure more accurate reporting of the pavement condition.

Effect/Potential Impact

Employees are at times put into unsafe circumstances while collecting pavement data. In the instances noted, one individual would be responsible for collecting pavement data while driving the vehicle. The same individual is also responsible for documenting the data they are collecting, which could result in distracted driving and pose a safety concern for themselves and others.

TPP has a responsibility to ensure reported data is accurate. The potential for data reporting inaccuracy increases when only one individual is performing HPMS data collection in the district.

Criteria

A TxDOT memorandum dated June 13, 2012 from the Deputy Executive Director requires a minimum of two operators while performing data collection for pavement condition reporting.

Highway Performance Monitoring System (HPMS) FHWA Review Guidelines – CY 2013 recommends: two technicians to measure roughness, as a good safety factor.

TxDOT FY 2014 Pavement Management Information System (PMIS) Rater's Manual – Safety Information states: Two raters should conduct ratings. One rater cannot see all the distresses and operate the vehicle safely.

Cause

This condition is due to:

- Limited number of staff available to perform HPMS data collection
- Data collected for PMIS during the same timeframe as HPMS, thus causing limited staff availability/support to be focused on each job responsibility
- HPMS Coordinators/Data Collectors performing data collection as a small part of their overall job responsibility

Evidence

Auditors interviewed and observed personnel re-performing key function areas in the data collection process by HPMS Coordinators/Data Collectors in three districts, Beaumont, El Paso, and San Antonio. Two of three indicated they worked alone to collect the HPMS samples which occurs over a three month time frame.

Survey Results:

A supplemental survey of HPMS Coordinators/Data Collectors throughout all 25 districts indicated that 14 of 31 (45%) worked alone when collecting HPMS data.

Management Action Plan (MAP):

MAP Owner:

James Koch, Director, Transportation Planning and Programming Division (TPP)

MAP 1.1:

An email will be sent from the Director of the TPP Division to all of the District Engineers that outlines the necessity of having no less than two people tasked with conducting HPMS data collection.

Completion Date:

September 15, 2014

MAP 1.2:

Language specifying the necessity of having no less than two people tasked with conducting HPMS data collection will be added to the HPMS Standard Operating Procedures.

Completion Date:

January 15, 2015

MAP Owners:

Randy Hopmann, Director of Urban and Rural District Operations
Bill Hale, Director of Metro District Operations

MAP 1.3:

The requirement to have no less than two people tasked with conducting data collection will be discussed with all District Engineers and Engineering Division Directors during a weekly conference call on July 30, 2014.

Completion Date:

Action Completed

Finding No. 2: Inertial Profiler Host Van Maintenance and Safeguarding

Condition

Instances of past due routine maintenance of inertial profiler vans were identified through review of routine maintenance logs. Documentation to support routine maintenance on inertial profiler vans was not available for review.

In addition, safeguarding of inertial profiler vans used to collect data that is reported for Highway Performance Monitoring System (HPMS) could be strengthened. The inertial profiler vans are not behind a locked gated area at their current location.

Effect/Potential Impact

Vehicles that are not properly maintained in accordance with manufacturer's specifications are at risk for potential reliability issues with collected data and could pose a risk to those driving the vehicles as well as others sharing the road. Additionally, vehicles could suffer operational issues causing potential additional maintenance, replacement costs, and vehicle downtime which would impact vehicle availability for staff to be able to perform their job functions.

Valuable equipment inside the vans and attached to the exterior of the vans are at risk for vandalism or burglary. TxDOT currently operates a fleet of 15 inertial profiler vans at an average cost of \$250K each. If multiple vans are susceptible to vandalism or burglary, the data collection process and reporting timeframe would be impacted.

Criteria

Office of the Comptroller Texas State Vehicle Fleet Management Plan requires agencies to maintain a maintenance schedule for all vehicles in accordance with manufacturer's recommended service intervals.

TxDOT Equipment Manual Chapter 6, Section 1, states: "The frequency of periodic inspections (lube-oil-filter) is normally scheduled to coincide with servicing as recommended by the manufacturer."

American Association of State Highway and Transportation Officials (AASHTO) R 57, Standard Practice for Operating Inertial Profiling Systems, requires agencies to maintain the host vehicle and all system components to be in good repair and proven to be within the manufacturer's specifications. In addition, cold tire air pressure on the wheels of the host vehicle must be checked at least daily and maintained according to the manufacturer's recommendations.

Cause

When maintenance is performed in the districts, receipts or invoices indicating the work performed is not always retained or submitted to Fleet Operations as policies and procedures do not provide specific guidance or requirements. In addition, there is no control in place to ensure preventive maintenance is performed on the inertial profiler vans prior to them becoming over-due for required maintenance per manufacturer's specifications.

Evidence

Routine maintenance logs for 9 of 15 (60%) inertial profiler vans selected for review indicated past due maintenance. Logs reviewed included being past due on one or more of three categories including: 7 vans - oil changes, 4 vans - tire rotations, and 2 vans - air filters.

- 5 of 9 (56%) vans with past due maintenance were 10,000 or more miles past the required maintenance for two of the three categories (oil changes and tire rotations) per manufacturer's specifications

Survey Results:

HPMS Coordinators/Data Collectors across the state indicated that 5 of 28 (18%) respondents felt that machine malfunction stood in the way of performing their job. A comment in the survey stated that the inertial profiler van broke down each of the last two years.

Management Action Plan (MAP):

MAP Owner:

Magdy Mikhail, Pavements Branch Manager – Maintenance Division

MAP 2.1:

Maintenance Division will contact the Fleet Operations Division to schedule an implementation of fleet navigator into the Maintenance Division: Pavement Preservation Branch operations. Mission is to align HPMS/PMIS data collection mobile fleet operations into the department programs and objectives for standard fleet maintenance policies and procedures. With the incorporation of fleet navigator, the challenges of how this fleet may operate virtually on occasion shall be incorporated into the processes and procedures. Risks related to fleet management in a remote setting should be controlled by the automated benefits of fleet navigator. Upon evaluation of these concerns and during implementation, the Pavement Preservation Branch would, if needed, define and outline requirements and/or standard operating procedures of virtual usage with DDO's.

Completion Date:

October 15, 2014

MAP 2.2:

The Pavement Preservation Branch will be relocated to the Austin district. The pavement data collection equipment will be stored in a locked gated area.

Completion Date:

September 15, 2014

Finding No. 3: Control Environment for HPMS

Condition

Highway Performance Monitoring System (HPMS) resource manuals and policies and procedures are not consistently updated or readily available to HPMS Coordinators/Data Collectors to help them perform their roles/responsibilities. Examples of the resource manuals and policies and procedures not available include:

- data collection
- inertial profiler van usage training and checkout requirements
- van checkout and trip logging
- equipment calibration retention and maintenance
- general safeguarding requirements of equipment

In addition, there is no guidance in place for system security, disaster recovery, or business continuity plans for the District Data Collection Software (DDCS) system and the HPMS Master Database. Finally, there are no defined training requirements or tracking tools used for the attendance of training for HPMS Coordinators/Data collectors.

Effect/Potential Impact

Without a clear set of established Department standards and expectations, the Department is susceptible to inefficient and ineffective processes resulting in:

- Inaccurate data reporting
- Need for re-performance of data collection functions
- Missed deadlines for annual reporting and certification of pavement data

Criteria

The following citations include requirements directing the department to implement policies, maintain documentation, provide training, and protect assets:

- Title 43, Texas Administrative Code, Part 1, Chapter 1, Subchapter A, Rule 1.2 (b)(1) states that TxDOT is responsible for formulating and applying operating procedures.
- Office of the Texas Comptroller Texas State Vehicle Fleet Management Plan states that agencies establish procedures for vehicle assignment and trip logging.
- State of Texas – Texas Department of Transportation Records Retention Schedule, EQP03, Item Number 5.2.005 states that equipment calibration records be kept for 10 years.
- Title 1, Texas Administrative Code, Part 10, Chapter 202, Subchapter B, Rule 202 requires business continuity plans and safeguards over information systems.
- U.S. Department of Transportation Federal Highway Administration (FHWA) Practical Guide for Quality Management of Pavement Condition Data Collection provides guidance for retaining calibration documentation and training.
- American Association of State Highway and Transportation Officials (AASHTO) R 43, Standard Practice for Quantifying Roughness of Pavements states that agencies should establish a plan specifying personnel qualifications, equipment accuracy and calibration records, and training and/or certifying data collection personnel for proficiency in using profile measuring equipment.

Cause

Employees performing HPMS oversight have multiple roles and responsibilities. Current drafts of policies and procedures refer staff to FHWA and AASHTO guides for expectations. However, FHWA and AASHTO do not provide requirements specific to TxDOT policy nor do they address state law requirements.

In addition, Transportation Planning and Programming (TPP) management is generally focused on the FHWA submission. Accuracy of the data collection relies heavily on the knowledge and experience of the district HPMS Coordinators/Data Collectors. As a result, a control environment that provides direction and clarity to district staff related to HPMS activities that help ensure accurate and timely pavement condition data has not been fully designed or shared with the district data collection employees.

Evidence

Policies and Procedures:

- Documentation of specific policies and procedures did not exist including:
 - Inertial profiler van vehicle assignment procedures, including checkout process and trip log
 - Requirements to retain equipment calibration records for equipment calibrated during the data collection process in accordance with the records retention schedule
 - Training and certification requirements (frequency/type) for HPMS Coordinators/Data Collectors and no tracking mechanism to help monitor training participation
 - System security for the District Data Collection Software (DDCS) system and HPMS Master Database, including their respective disaster recovery or business continuity plans
 - Processes to ensure staff are sufficiently trained and that training is tracked and documented for use of the inertial profiler vans
- HPMS Standard Operating Procedures include incomplete and undocumented sections, as well as, contradictory statements regarding quantity and frequency of field reviews.

System Security and Disaster Recovery Protocols:

- The DDCS application and HPMS database are not supported by TxDOT Information Technology or NTT Data.
- DDCS data is maintained by HPMS Coordinators/Data Collectors on individual hard drives or flash drives and transmitted electronically without encryption via email to TPP.
- The DDCS consolidated data and application, which stores all 25 district's pavement data information, are located on a single desktop that is not backed up routinely.

Pavement Collection Training:

- 15 of 37 (41%) and 13 of 36 (36%) HPMS Coordinators/Data Collectors did not attend either one of the Pavement Visual Distress Rater Certification classes offered by TxDOT in FY 2014 and FY 2013, respectively.

- 7 of 23 (30%) employees identified as Inertial Profiler Van Operators did not take Automated Measurement Pavement System training offered by TxDOT in FY 2014.

Management Action Plan (MAP)

MAP Owner:

David Freidenfeld, Branch Manager, Transportation Planning and Programming Division (TPP)

MAP 3.1:

TPP will communicate expectations to the districts through a memo regarding:

- The importance of the HPMS program
- TPP's expectation of district resource commitment (personnel and time)
- TPP's HPMS training program

Completion Date:

September 15, 2014

MAP 3.2:

A disaster recovery and business continuity plans will be created for HPMS. In addition, the HPMS Standard Operating Procedures will be completed and will include requirements for the following:

- data collection
- inertial profiler van usage training and checkout requirements
- equipment calibration retention and maintenance
- general safeguarding requirements of equipment
- system security policy and procedures to be followed for the DDCS system and HPMS Master Database
- training (frequency and type) required for HPMS Coordinators/Data collectors and the tracking mechanism that will be established to help monitor training participation

The HPMS Standard Operating Procedures will include TPP's expectations of the districts regarding:

- the importance of the HPMS program
- TPP's expectation of district resource commitment (personnel and time)
- TPP's HPMS training program

In addition, the HPMS Standard Operating Procedures will be made available to all staff involved in data collection and reporting submission of HPMS and will be posted on the TxDOT crossroads intranet site for accessibility.

Completion Date:

January 15, 2015

Observations and Recommendations

Audit Observation (a): Succession Plan

Transportation Planning and Programming Division (TPP) does not have a succession plan for the Highway Performance Monitoring System (HPMS) program. Fourteen of 38 (37%) HPMS Coordinators/Data Collectors have 20 or more years of service with TxDOT with 7 of those currently eligible to retire.

A succession plan helps ensure that business operations continue to run properly during critical time periods in case of unanticipated absences or separations of employees considered to be subject matter experts.

Effect/Potential Impact

Disruption during the collection, consolidation, verification, and reporting of data could result in a failure to provide complete, current, and accurate HPMS data to the Federal Highway Administration (“FHWA”).

Audit Recommendation

TPP should assess and develop a succession plan that includes training to ensure the sustainability of business operations for data collection and HPMS reporting roles and responsibilities. Developing a succession plan will help in the risk management process supporting a vital data collection effort to help substantiate funding for future Texas roadways.

Audit Observation (b): Texas Transportation Institute (TTI) Contract Compliance

TTI did not send the eight agreed upon personnel to the TxDOT Pavement Management Information System (PMIS) Rater Certification Class per the requirements of the contract.

Effect/Potential Impact

Not attending TxDOT training as required by the TTI contract can result in contract noncompliance and may impact quality control and expenditures for services not provided.

Audit Recommendation

The Contract Administrator should take necessary and appropriate actions to either amend the contract or ensure TTI sends the required number of employees to the PMIS Rater Certification training to comply with the contract requirements. In addition, current controls to ensure regular contract compliance oversight of this agreement should be strengthened to ensure quality control and services contracted for are provided. Documented procedures for the contract oversight function should be established and related contract compliance reviews should be documented and available for review.

Summary Results Based on Enterprise Risk Management Framework

| Audit Results Dashboard | | |
|---|--|---------------------------|
| Highway Performance Monitoring System (HPMS) - Pavement Condition Data Collection Resources | | |
| | | Scope Areas Evaluated |
| Business Objectives (Reporting, Operational, Compliance) | | 0, c |
| ERM Component | Control Activities | Data Collection Resources |
| Control Environment | Organizational Tone | 1, 3 |
| | Planning | 1 |
| | Forecasting | |
| | Goal-Setting | |
| | Cost-Benefit Analysis | |
| Risk Assessment | Business Continuity | 3, (a) |
| | Evaluations/Analysis | |
| | Management Action Plans | |
| Control Activities | Policies/Procedure Development & Maintenance | 2, 3, (a) |
| | Approvals/Authorizations | |
| | Supporting Evidence/Records Availability | 2, 3 |
| | Segregation of Duties | 1 |
| | Safeguarding Assets | 2 |
| Information & Communication | Information Classification | |
| | Information Input | 1, 2, 3 |
| | Information Processing | |
| | Output/Reporting and Messaging | |
| Monitoring | Exception Reporting Review | |
| | Reconciliations/Root-Cause Analysis | |
| | Peer Reviews | |
| | Management Representations | 2, 3, (b) |
| Scope Area Assessment | | |

| | | | | |
|------------------------|-----------|--------------|-------------------|----------------|
| Rating Assessment Grid | Exemplary | Satisfactory | Needs Improvement | Unsatisfactory |
|------------------------|-----------|--------------|-------------------|----------------|

Closing Comments

The results of this audit were discussed with the Transportation Planning and Programming Division (TPP) Director and Deputy Director on July 17, 2014. We appreciate the assistance and cooperation received from personnel in the Districts, TPP, Maintenance, Fleet Operations, Human Resources, and Finance Divisions contacted during this audit.